

TURKI BUKHARI'S NOTES

THE ULTIMATE PEM REVIEW
FOR SAUDI BOARD MCQS EXAM

First Edition

Turki Salah Aldeen Bukhari - 2026

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Bukhari , Turki Salah Aldeen

TURKI BUKHARIS NOTES THE ULTIMATE PEM

REVIEW FOR SAUDI BOARD MCQS EXAM. / Bukhari

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Turki
Bukhari's
Notes

INTRODUCTION

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

الحمد لله رب العالمين و الصلاة و السلام على أشرف الأنبياء و المرسلين
نبيينا محمد و على آله و صحبه أجمعين, أما بعد ..

This book, booklet or call it a notebook, is a compilation of my journey while preparing & studying for the Final Exam of the Pediatric Emergency Medicine Fellowship, It is the product of months of studying, collecting questions, organizing notes, and trying to make sense of everything that is Pediatric Emergency. My hope is that it helps you get one step closer to the success you're aiming for!

About the book

Sources

Inside, you will find a collection of Questions gathered from these sources:

- All Previous Final Exam Questions (2016-2025)
- All Dr. Amal Yousof's Discussion Questions
- Almost All PEM Review 2023 Questions
- Almost All PEM Review 2017 Questions
- Selected Promotion Questions
- Selected PREP EM, Rosh, MD Challenger Questions
- Minimal PREP and Pediatric board Questions

Alongside my notes on each question and topic, reviewed from these sources:

- Fleisher & Ludwig 8th, Rosen 9th, PEM Guide 12, PEM Practice Articles and other PEM resources

Chapters

1. Resus
2. Medical
3. Surgical
4. Trauma
5. Toxicology
6. Environmental
7. Others

How to use this book

This file is designed as a full review. You may approach it in these ways:

1. Study the main sources in conjunction with this book to quickly locate my notes on that specific topic
2. Use it as a rapid review tool after completing the main sources
3. Study this book then go over the main sources

Each topic follows this structure:

- Disease
 - Info: general information on the disease
 - Path: Pathology
 - Sx: Presentation
 - Invx: Investigations
 - Tx: Management
- Pedz | Question and Answers from Pediatric Board
- PREP | Question and Answers from Pediatric PREP
- PEM R | Question = Answer (Not the answer nor this answer)
- Promo | Question = Answer (Not the answer nor this answer)
- Amal | Question = Answer (Not the answer nor this answer)
 - Notes from Dr. Amal's discussion sessions
- Final | Question = Answer (Not the answer nor this answer)

For the book

Acknowledgments

By the grace of Allah Almighty, this work was completed with the support of my colleagues

1. Lama Alfakhri
2. Abdulrahman Alzahrani

Feedback

I would love to hear your feedback, notes, corrections on this work as I hope to continue adding more questions and notes to this book, if so, please feel free to contact me through my email: DrTurkiB@gmail.com

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RESUS

Resuscitation

BLS

- BLS Steps

- Tap and shout
- Call for help
- Check for pulse and breathing 5-10 seconds
- Push hard and fast
 - 2 inches or 5cm (1/3 diameter) deep for Child & 1.5 inches or 4cm deep for Infant
 - 100-120 compressions per minute
 - 30:2 ratio for 1 rescuer & 15:2 ratio for 2 rescuers (Adult only 30:2)
 - Allow complete chest recoil
 - Minimize breaks/interruptions in compressions to < 10 seconds
 - Swab compressors & Check Pulse & Breathing every 2 minutes
- Use AED as soon as it arrives but don't delay CPR
(Pediatric pads preferred for children < 8 Y/O, otherwise use Adult pads)
- CPR with Advanced Airway... continuous compressions 100-120/min & 1 breath q2-3 seconds (20-30 bpm)
 - PETCO₂ > 10 mmHg indicates high quality CPR
 - PETCO₂ < 10 mmHg indicates poor CPR (push harder, allow more chest recoil, etc.)
- BLS Termination of Resuscitation (TOR): Arrest not witnessed, No ROSC, No Shock given

PEM R | 7 Y/O boy, unresponsive without pulse, CPR w/ paramedic intubated, in ED ETT in place, as team leader, how do redirect CPR as now 1/3 diameter & rate of 85/min = 100-120 min

PEM R | 3 Y/O, prolonged submersion, obtunded/apneic w/ pulse, ventilated 18-20 w/ EMS reporting difficult obtaining adequate seal & oxygenation, HR 122 RR 18, BP 95/48 SpO₂ 74%, ED provider takes over w/ little air entry bilateral, next intervention = initiate 2 person mask ventilation

Promo | CPR one rescuer = 30:2

Amal | 4 M/O infant limp, cyanotic, on the way to hospital stopped breath, no pulse, on bag valve ventilation 100%, appropriate approach = use two thumb encircling technique (No more 2 fingers but 2 thumbs) (Not Compression 80/min nor 30:2 nor external automated device nor stop when hr more than 40)

Amal | 33 Y/O nurse, had chest pain then LOC went into cardiac arrest, correct chest compression to ventilation ratio is = 30:2 in 1 & 2 Rescuer (Adult x1 & x2 = 30:2 | Peds = x1 30:2 & x2 Rescuer = 15:2)

Final | Rate of Compression = 100 / Min (100-120 per min)

- Collapse

- Collapse w/ Noisy Breath = Adjust airway & check for breathing
- Witnessed Collapse = Leave get Help/AED/EMS before starting CPR
- Unwitnessed Collapse = Perform CPR 2min before leaving to get Help/AED/EMS

Promo | while checking saturation in ED pt. Collapse, immediate action = Support ABC (Not Take to RR room nor CPR)

Promo | 7 Y/O school age playing soccer then suddenly collapsed on field, Next = CPR (Not Activate EMS nor connect AED)

Promo | You are PEM Fellow in park saw 3 Y/O collapse & became unresponsive, immediate action = Bring AED analyze (Not Open airway check for FB nor 2 rescue breath nor Compression)

Chapter 1: Resus

Promo | During night shift, you went to take coffee when you passed beside ED corner you meet gentleman while standing fell down to the ground, your best action = Assess patient, Activate EMS, AED, Then CPR (Not Assess the PT CPR then AED)

Amal | You witnessed at hospital corridor a gentle man who suddenly collapsed with **noisy breathing**, next step = Adjust airway and check for breathing (Not Activate code nor Give 2 breaths then check pulse)

Amal | You found a 50 Y/O male on corridor with noisy, irregular breathing, patient is not responding to painful stimuli, no sign of trauma at the scene. what to do next = Adjust the Airway, and assess breathing (Not Check pulse & breath nor Give 2 breath then re-check nor Start chest compression)

Final | Unresponsive and AED activated & arrived w/ automated defib pulse is 60, What is next step = Start chest compression 15:2 (Unsure if not: Attach AED) (Not Give rescue breath every 2-3 seconds nor Start chest compression 30:2)

- BLS SHA: Use AED as soon as it arrives
- Dr. Amal Discussion: But Always Don't delay CPR

Final25 | 2 paramedic arrest case = Attach AED (unsure if other options like CPR was there)

- Arrest

PEM R | 14 M/O, Alter LoC, comes w/ grandfather but doesn't know past Hx, pale/lethargic/shallow respi, HR 52 RR 18 BP 66/38, SpO2 93% on RA, PPV given and no improvement, Next step = Start CPR

Promo | Best justifies reason to continue CPR = Reversible & treatable cause (Not Family wish nor Expiration of DNR)

Promo | At scene w/ child arrested, immediately open airway & begin CPR, while colleague calls ambulance, Paramedics arrive in 10min, then brought to Pediatric ED, which of the following has greatest impact on survival = Bystander CPR (Not Paramedic ALS Resus nor Initial ED management nor Post Resus PICU)

Promo | Paramedic brought a cardiac arrest case, most predictive of Outcome = Bystander CPR before arrival to Hospital

Promo | 4 D/O Term to 25 Y/O Mother brought to ED Limp/Pale, Temp 38.9, Initial VS indicates Cardiac arrest = HR 60 bpm

Other | 6 Y/O in ED after being unconscious w/ no trauma, CPR started by school personnel then paramedic arrived found pulseless/apneic, intubated & IV obtained, CPR continued w/ x2 Epi at scene then x2 in route then pulse returned, in ED palpable pulse, manually ventilated 100%, HR 120 BP 60/40, Most likely ax w/ likelihood of survival to hospital discharge = Return of spontaneous circulation in field (Lower survival for weekday events, Non-shockable initial rhythm, ≥ 3 Epi given)

Amal | 4 D/O Term of 25 Y/O mother he is limp and pale T:38.9 what if the initial vitals indicate impending cardiac arrest = HR 60 (Not HR 100 nor RR 25 nor RR 70)

- Hypoxia > Tachypnea > Tachycardia > more Tachypnea > Bradycardia > Cardiac Arrest
- Most ominous/dangerous/impending cardiac arrest = Bradycardia

Final | Impending arrest, Sx = HR < 60

- BLS Termination of Resus

- 2025 BLS/ALS Criteria, If all present then Terminate resus, if any present but not all continue Resus:
 - Arrest not witnessed or not witnessed by EMS
 - No Bystander CPR
 - No ROSC (Before transport)
 - No Shock given (Before transport)
- Dead on arrival = Fixed/Dilated pupil, Dependent lividity (blood settling in lowest part of body), Rigor mortis
- Sx of brain death = Fixed/Dilated Pupils, Apnea

PEM R | 5 M/O, girl, unresponsive, CPR & ventilation 100% child found full cardiopulmonary arrest, prior 4hr took early morning feed was normal burp, no URTI Sx, in ED continued CPR for 20min then found fixed dilated pupils 6mm, bluish discoloration of back & lower extremity, next step = Terminate resus efforts

PEM R | 6 Y/O unresponsive on bed EMS found her full Cardiopulmonary arrest CPR started 20min en route to ED, your team continues as asystole protocol of PALS for 35 min, given x3 cycles, x2 epi, fixed 5mm pupils, Temp 35.3 HR 0 RR 0, flatline on monitor, next step = Terminate resus efforts

Chapter 1: Resus

PALS

- Primary & Secondary Survey

PEM R | 4 Y/O 3 days non-bilious non-bloody vomit, pale/listless/sunken eye, HR 172 RR 24 BP 90/48 Temp 38.1 glucose 77 mg/dL, bolus 20ml/kg, Next step = Reassess the patient

Amal | Which of the following is management goal of the primary survey = Assess & Stabilize ABC

Final | First thing for all healthcare provider to know in emergency is = Airway positioning

Final | Dusky color child w/ normal breath & normal HR, Tx = 100% FiO2 (Not ABG nor Intubate nor Cardiac compression)

Final | RR 4 gasping, next = BVM

- ROSC

○ Achieved ROSC

- Palpable pulse
- EtCO2: > 30 (sudden rise in EtCO2)
- BP: Normal for age
- Organized Rhythm/Motion

○ Post ROSC

- Airway & Breathing
 - Monitor
 - Titrate FiO2 to reach SpO2 > 94%-99%
 - EtCO2 35-45 mmHg
 - Consider Intubation
- Circulation
 - Monitor
 - Arterial BP
 - Serum Lactate, U/O, ScvO2
 - IV/IO Access, Boluses, Maintenance
 - Inotropes (in fluid refractory)
 - Normotensive: Epi, Milrinone
 - Hypotensive: Epi, Norepi
- Neurological
 - Neuro monitoring (for Agitation or Seizures)
 - Treat Seizures
 - Consider Early Brain imaging (to diagnose treatable cardiac arrest causes)
- Sedatives & Anxiolytics
- Temperature
 - Monitor core temp, Avoid Hyperthermia or Hypothermia
 - Prevent shivering
- Electrolytes & Glucose
 - Monitor blood glucose, Avoid Hypoglycemia
 - Maintain Normal Electrolytes
- Prognosis
 - Consider EEG, MRI within 7 days

PEM R | After cardiac arrest & prolong resus, your ROSC but remains unconscious, placed on cardiopulmonary monitor, checking electrolytes, glucose, and urine for Tox, next considered = Head CT

Promo | Pt. Arrested given x2 Epi, Now ROSC, saturation maintained on Tube ventilation bag, HR 130, BP Low, NEXT = Rapidly push NS 10ml/kg (Not Connect to MV nor Dobutamine 10mg/kg/min nor Albumin 20% infusion)

Chapter 1: Resus

Amal | 10 Y/O, suddenly collapsed at street, Unresponsive & pulseless. ECG: wide complex QRS, Next step = Therapeutic hypothermia for 24 hr following successful resuscitation (Not Defibrillation first then initiation of CPR -always CPR first !- nor Amiodarone Ax with improve survival at hospital nor Biphasic defibrillation improve survival compare to monophasic)

Amal | Successfully performed CPR to 8 Y/O what is the post resuscitation measures would improve the outcome = Hypothermia

Final25 | 4 Y/O previously healthy child presents to your emergency department in cardiac arrest. After ten minutes of effective pediatric advanced life support interventions including chest compressions, intubation and ventilation, and intravenous epinephrine, achieved ROSC what is next important ROSC management = Prevent Hyperthermia (Not Intensive glycemic control nor Early wean from ventilation)

NRP

- NRP

- NRP Steps: Initial steps > Assess > PPV > ETT > CPR > Epinephrine > IVF
 - Initial Steps: Warm, dry, stimulate, position airway, clear airway if needed
 - Assess: Term? Tone? Breathing/crying?
 - If apnea/gasping or HR < 100 bpm = start PPV
 - Reassess HR after 30 sec of effective PPV
 - If HR ≥ 100 bpm: Stop PPV, support breathing if needed
 - If HR < 100 bpm: Correct ventilation (MRSOPA)
 - If HR < 60 bpm despite 30 sec of effective PPV with O₂ = Start CPR w/ 100% O₂ + consider ETT or LMA
 - If HR < 60 bpm after 60 sec of compressions + PPV = Give epinephrine + consider volume expansion
- Cord Clamping: Delay for 60 seconds (for newborn who don't require immediate resus)
- Cord Milking:
 - 35-42 wk + Non-vigorous = Milking (reasonable alternative to early cord clamp)
 - 28-34 wk + Non-vigorous = not enough recommendation for milking
 - < 28 wk = Avoid Milking
- Ventilation:
 - Initial PIP
 - < 32 wk 20-25 cm H₂O
 - ≥ 32 wk = 25-30 cm H₂O
 - Initial FiO₂
 - < 32 wk = > 30% + ETT 2.5
 - 32-35 wk = 21-30% + ETT 2.5
 - ≥ 35 wk = 21% + ETT 3.5
 - Rate
 - During PPV: (Breath Two Three = 30-60 Breath/min)
 - During CPR: 90 compressions to 30 Breaths = 3:1 ratio (One and Two and Three and Breath)
- Newborn Central cyanosis 5-10min after birth as SpO₂ 85-95% by 10min of age, Persistent = Abnormal

Target Oxygen Saturation Table		INTERVENTION SEQUENCE AND TIMING		
1 min	60%-65%	1	Warm, dry, stimulate. Clear and position airway if necessary	0-30 seconds
2 min	65%-70%	2	Oxygenation and ventilation	30-60 seconds
3 min	70%-75%	3	Chest compressions	60-90 seconds
4 min	75%-80%	4	Administration of Epinephrine and/or volume expansion	> 90 seconds
5 min	80%-85%	5	Post-resuscitation care	> 90 seconds
10 min	85%-95%	Neonatal resuscitation retains the Airway-Breathing-Circulation (ABC) sequence compared to the Circulation, Airway, Breathing Sequence (CAB) in children and adults. Advanced Resuscitation is defined as: Intubation, chest compressions or Epinephrine		

Chapter 1: Resus

PEM R | Neonate in ED poor tone, **no resp effort** at birth, dried, stimulated/secretions cleared, now on warmer HR 110, next step = PPV

PEM R | NRP 2min of PPV/CPR better skin color but limp and HR < 50, unable to get IV = Epi by umbilical cath 0.01mg/kg (1:10000)

PEM R | EMS transport to ED term, newborn, crying weakly, clamped umbilical cord, pink lips, cyanotic hand/feet, first step = Dry, warm & stimulate newborn

PEM R | newly baby FT 3000g, after 1min initial resus efforts, poor respiratory, HR 90, next step = Initiate PPV 21% O₂

PEM R | After initial steps, HR 70 gasping, O₂ 80%, started PPV and O₂/HR improved briefly, but ineffective ventilation and poor chest rise and HR drops, Next = confirm mask fit & re-position head

PEM R | 34 wk GA, NSVD, after drying/warming, gasping resp. HR 90 PPV w/ O₂ initiated good chest rise HR remains 90 bpm, Next = initiate CPR

PEM R | Newborn past 5 min, Intubated/Ventilated/CPR, past minutes, IV line HR < 50, next = give Epi IV

PEM R | Newborn to 28 Y/O G2P1 having RD after dryness/wrapping in blanket, now persistent RD for 2hr, Temp 36.6 HR 180 RR 26 BP 68/48 SPO₂ 80% on RA, Facial cyanosis/retraction/bilateral rhonchi, has no murmur/rubs/gallops, Pale/CRT delayed w/ acrocyanosis, Glucose 58 Hgb 16 Ph 7.15 HCO₃ 14 pCO₂ 76 pO₂ 40, Next step = Give PPV 100%

- Initial step to improve ventilation > give PPV
- > IF pO₂ didn't improve w/ Hyper-oxygenation > Cyanotic CHD > give PGE
- PGE not needed as initial, this is newborn so NRP > give PPV 100%
- RD & Metabolic acidosis

Promo | Mother delayed labor delivered baby in ED, GA 40, Wt. 3.2 kg, vigorous, Active but has blue lips/tongue, HR 160 given 100% O₂ blow by but no improvement, nurse asking why baby blue after 20min of birth, True = Start PGE & Immediate Cardio

Promo | Neonate delivered desating HR 60, Cyanosed Next = PPV

Promo | You are treating Newborn FT, Wt 3 kg, after 1 min of initial resuscitative measures, note poor respiratory error & tone, HR 90, Most appropriate Next = PPV w/ 21% FiO₂

Promo | Nurse brought newborn for you, Blue, not moving, HR 80, Initial step = Dry & Stimulate or PPV or Intubate

Amal | Triage nurse rushes with neonate who is mottled and Limp with HR 80. Next step = Dry and suction

- If not given time consider as newborn and start initial steps

Amal | Term neonate delivered in car in the way to hospital in ED she has no respiratory effort, cyanosed with decrease perfusion, what is true = initial Epinephrine dose is 0.35 ml which is 35 micrograms (Not Appropriate ETT size 2 mm diameter nor Appropriate ETT length is 15 cm nor Appropriate IV fluid bolus 100 ml)

- Epi Dose max in NRP is 0.02mg/kg

Amal | 40 W/O delivered baby 3.2 kilo in the ED few minutes ago After a prolonged labor. You notice that the baby's skin & lips are blue in color, HR 188, has strong cry & good extremity, started to dry baby & give him O₂ by blue, nurse is wondering why the baby is still blue, correct statement = It is still within the acceptable variations unless it continues beyond 20 min (Not Absence of cardiac murmur should exclude CHD as a possible cause. Nor Most likely the cause is intraventricular hemorrhage 2ndry to the prolonged labor time. Nor PGE bolus and infusion is indicated, a cardiologist should be consulted)

- Lower saturation up to 10 min
- Acrocyanosis up to 20min

Final | NRP question about how many breath/compression = 40 breath/more than 120 compressions (Not 60 breath/more than 140 compression or 20 breath/more than 100 compression)

- If 90 compressions to 30 breaths = For 30 compressions there is 10 breaths
- So 120 compressions 40 breaths is the appropriate answer
- Note: New NRP use Two thumbs only

Final | Newborn Full term, 1 min of initial steps w/ HR 90, Mild respiratory efforts w/ decrease tone, Next = PPV 21% FiO₂

Final | Newborn delivery with abnormal tone and breathing after initial steps no change in HR 90 = PPV FiO₂ 21%

Final | Neonate for ambo bagging = PPV 21%

Final | Nurse brought a newborn for you, blue, not moving, HR 80, Initial step = Dry and stimulate (Not PPV)

Final | Newborn w/ meconium intubated hr still 70 next = bagging

Final x2 | Neonate HR 50, SpO₂ 70, when to do CPR = if HR < 60

Final25 | Newborn with grunting and cyanosis when to start chest compression = HR less than 60

Chapter 1: Resus

Airway

Intubation

- Open Airway
 - o Unresponsive Unknown/Trauma = Jaw thrust
 - o Unresponsive non-trauma = Head tilt chin left

PEM R | 13 Y/O unresponsive on C-collar, preferred 1st method to open airway = Jaw thrust

- Oropharyngeal Airway

Promo | case of Trauma came w/ Epistaxis, Lip laceration, planned for intubation = Orotracheal tube (Not Nasotracheal)

Amal | For which clinical situation is placement of oropharyngeal airway is **least** appropriate = Conscious patient (Not Absent gag reflex or Lingual angioedema nor Nasopharyngeal obstruction nor Obtunded obese)

- o Choanal atresia in infants is the only choice for oropharyngeal airway in conscious patient

- Pediatric Airway

- o Large occiput, Large tongue, Elongated/floppy Epiglottis, Anterior & Superior (Cephalad) Larynx, Short Neck, Short Trachea, Narrowest portion is Cricoid cartilage

PEM R | 9 M/O RSI for RF, anatomic difference between child & adult = Large occiput

Amal | Regarding Airway pediatric VS adult what is TRUE = Tongue relatively large

- Intubation

- o Indication of intubation (Severe Asthma or Trauma)
 - Altered GCS
 - Cardiac Arrest
 - Respiratory Arrest
 - Progressive Exhaustion
 - Severe Hypoxemia w/ Maximal O2 Delivery
- o Goal of intubation:
 - Decrease work of breath
 - Ensure adequate oxygenation
 - Ensure sufficient gas exchange
- o Monitoring: EtCO2 (AAP Recommendation for early detection of Respiratory depression during sedation)

PEM R | 3 Y/O found apneic cyanotic at home, pinpoint pupil, pulse present HR 75 given BVM but still 89% on 100% O2, given naloxone but still unresponsive and no change in respiratory drive, next step = ETT

PEM R | 18 M/O vomiting/drooling after vomiting laundry pod, soon after arrival **deep somnolence**, slight movement, no eye open, responds to pain only w/ moaning, HR 120 RR 28 BP 95/50, Ph 7.02 CO2 38 O2 94 HCO3 10 Lactate 8, Tx = ETT

PEM R | 17 Y/O Hx of anxiety/depression, medics brought him after 45min after ingestion of 150 tablet diphenhydramine, becoming progressively more **somnolent**, hypertensive/tachycardic, during transport initial GCS 10 Temp 37.6 HR 160 RR 35 BP 150/90 SpO2 95%, ECG tachycardia w/ QTc 488msec, Next step = ETT (after that think of NGT then using AC)

PEM R | 14 Y/O MVA, in ED w/ severe abdomen pain had Temp 36.5 HR 130 RR 18 BP 110/55 diffuse tender abdomen, hgb 8.4 CXR has subdiaphragmatic free air, prior to transfer to OR vitals changed HR 150 BP 100/50 RR 32 SpO2 78% on 3L NC, surgeons ready for OR, next step = perform ETT

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PEM R | 10 Y/O, struck by car while bicycling, on backboard & C-Collar, Temp 36.8 HR 125 RR 14 SpO2 95% BP 96/68 on Primary survey breath spontaneous, clear bilateral breath, Radial pulse +2, open eye to painful stimuli, incomprehensible sound and flex Lt arm in response to IV placement, has rt. Parietal-temporal scalp hematoma, rt. Chin laceration, rt. Deformity of forearm, immediate Next step = Administer O2 via Non-rebreather Intubate

PEM R | 16 Y/O girl present w/ Altered mental status, Temp 37.6 HR 96 RR 16 BP 120/62 SpO2 98%, GCS 3 & no gag reflex, Next step = Perform ETT

Promo | Reason to intubate Asthmatic patient = Fatigue & decrease mentation

Promo | Indication of intubation in Asthma = Change in Mentation

Amal | Which of the following is true regarding the reflex sympathetic response in Laryngoscope = Usually Tolerated by healthy individuals (Not Decreases myocardial O2 demand or Fentanyl enhance this response or associated with decrease in ICP or Usually not blunted by Beta Blockers)

- Laryngoscope intubation Side effects
 - Stimulate vagal = parasympathetic = bradycardia
 - Takes long time till it comes back
 - Can give Atropine to block it
 - Sympathetic response = Tachycardia, Hypertensive, Increase consumption of O2
 - rare, if happened before then risky
 - Can give BB to block it

Final | Intubation axis = Oral > Pharynx > Larynx > Trachea

Final | Asthma intubation indication = Change mental state

- DOPES: Displacement, Obstruction, Pneumothorax, Equipment failure, Stacking of breaths
 - Stacking of breath: gradual deterioration w/ barrel appearance

PEM R | 5 M/O intubated for pneumonia & RF, SpO2 72% on RA, No change after suction & after removal from ventilator w/ bag ventilation by hand, sounds diminished bilateral w/ trachea midline, cause & Tx for oxygenation = Dislodged ETT & Treat w/ Replacing

PEM R | 2 Y/O girl, mitochondrial disorder, RSI Fenta/Midaz/rocuronium then Intubated, XR (deep ETT), next = ETT Adjustment

PEM R | 2 Y/O Hx of Epilepsy & Mitochondrial disorder, present w/ increase SZ frequency, given IN Midazolam by EMS, in ED has rhonchi breath sound Temp 36.9 HR 135 RR 14 SpO2 82% BP 94/65, SpO2 improved by airway position & BMV, having SZ so IV Fosphenytoin given then Intubated w/ Fenta/Midaz/Roc, using Mac 2 video laryngoscope ETT 4.0, CXR shows (tube above clavicle), Next step = Advance ETT

PEM R | 13 M/O girl, 2 days fever/cough/rhinorrhea/vomit, during triage Tonic-Clonic SZ activity persisted despite IV Ativan & fosphenytoin, Temp 38.8 HR 165 RR 20 SpO2 98% BP 96/68 ETCO2 75, became apneic, BVM started then IV propofol/roc given and intubated 4.0 depth 14cm, post intubation, mist present, breath sound finished in Lt, ETCO2 30, no air entry appreciated, Next step = Reposition ETT

PEM R | 6 Y/O Hx of Anoxic Brain injury & SZ, having SZ & Apnea, intubated w/ Fenta/Mida/Roc by 5.0 cuffed ETT depth 15cm, HR 115 RR 20 SpO2 97% BP 98/64 ETCO2 55, while transferred to CT now having decrease Chest rise, SpO2 83%, ETCO2 70 ETT depth confirmed on 15cm, manual bagging done but w/ resistance, decrease air movement w/ auscultation, FiO2 increased to 100%, Most next = Suction ETT

PEM R | 6 M/O intubated due to depressed mental status, CXR (ETT above glottic), receiving manual PPV, being transferred to CT brain, suddenly EtCO2 tracing becomes flat/chest rise no longer there, SpO2 100% > 80%, explanation = ET tube is now above glottic opening

Amal | You inserted ETT to a 2 Y/O who has severe head trauma after an MVA. Initially, she has a good chest rise, oxygen saturation 99% and 100% oxygen while you were doing a BVM ventilation. 10 min later, deteriorated, Her SpO2 drops to 60 & her **HR 50 & falling rapidly**, and you notice poor breath sounds on both sides of her chest and poor chest rise. Of the following, the best initial management of this patient is to = Remove the endotracheal tube and resume ventilation with bag valve mask (Not Perform deep suction through the endotracheal tube using an 8-French flexible)

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- Remove that tube & bag him bcz patient HR dropping fast !, Empty the bag and pray to God that the heart rate picks up. Otherwise, you're just going to start CPR on the patient. Forget about any other trials or maneuver. Forget it. Just remove it. Let her pick up. Get her heart rate back again. And then re-intubate her.
- If it was on a ventilator, you can disconnect to start bagging

Difficult Airway

- Difficult Airway

- Definition: Can't intubate & can't Ventilate
- No PPV w/ BVM or Laryngeal Mask, NO ETT in a pt. requiring both oxygenation & ventilation
- Example: Trauma, Bleeding, Foreign body or Edema (anaphylaxis, infection, smoke inhalation)
- Airway Mnemonics:
 - MOANS (Difficult BVM Ventilation)
 - LEMON (Difficult Direct Laryngoscopy)
 - RODS (Difficult Extra-Glottic Device)
 - SMART (Difficult Cricothyrotomy)
- Whenever possible, invasive airway management should occur in the OR
- But in Resp. Compromise may force immediate intervention
- Ideal Setup: Call help, Direct laryngoscope, double suction (rigid/soft), bougie, Also LMA, prepare surgical
- Equipment:
 - Direct Laryngoscope = Direct Visualization
 - Bleed only = can start with Video but Direct is the way w/ Rigid Yankauer
 - Video Laryngoscope = Camera Visualization (Blood, Secretions impair view)
 - Extensive facial injury & less manipulation & 1st attempt success = Video
 - Bougie = Helps when Visualization is affected
 - Small Suction = will get clogged
 - Flexible Suction = helpful after intubation
 - Rigid Yankauer Suction = helpful during intubation

PEM R | 17 Y/O fell from 2nd story deck during party w/ drinking, now on backboard & C-Collar, Temp 36.3 HR 80 RR 10 SpO2 87% BP 122/86 GCS 8, having bloody secretions in mouth, multiple dental fracture, nasal bridge swell w/ deviation, large rt. Fronto-temporal scalp hematoma, bilateral forearm deformity, technique = Video laryngoscopy (as 1st trial)

PEM R | 3 Y/O requires ETT due to ongoing bleed from tonsils 9 days after uncomplicated tonsillectomy, given Roc/Etomidate and with large bore suction, attempt to intubate using video laryngoscopy but visualization is poor, you abort current attempt = Attempt intubation again using direct laryngoscopy

PEM R | 8 Y/O assisting colleague in video laryngoscope using 5.5 cuffed tube (pic of tube going into esophagus), appropriate advice = ET tube should be removed

PEM R | 4 Y/O severe peanut allergy, took cookie from friend and now having lip swell/stridor/retraction, given x3 IM Epi, Antihistamine, steroid, x2 Racemic epi, no improvement and pt becoming sleepier & stridor persist, next airway management = Have rescue device & expert airway backup before RSI

PEM R | 12 Y/O gunshot in neck, EMS transfer w/ Non rebreather face mask, Active bleed from Anterior neck, GCS 11, Next = Consult Anesthesia & proceed w/ Awake Nasotracheal intubation

- Neck trauma = Airway difficult = ENT/Anesthesia for intubation

Promo | 9 Y/O Multiple trauma including Head/Face/Chest, Failed Intubation 4 times, Next step = Laryngeal mask (LMA)

Promo | Life threatening bronchial asthma, you decided to intubate using video guided laryngoscope, main reasons = Hypoplastic mandible (Not Hypoxia nor increased secretion nor bleeding)

Promo x2 | Patient post tonsillectomy came with bleeding not improved with oxygen what you will prepare for intubation = intubation with bougie (Not Flexible tube suction nor Nasopharyngeal device)

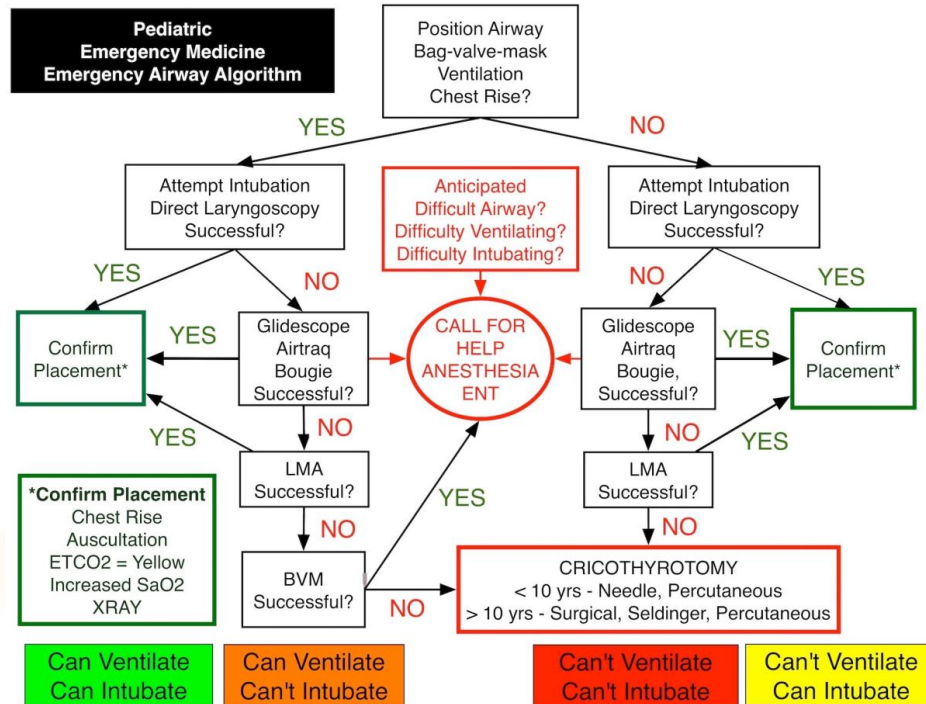
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Challenger | You receive EMS pre-notification of a 14 Y/O boy coughing up large volumes of blood with clots. He had a tonsillectomy and adenoidectomy 8 days prior. He is described as anxious and alert, with frequent coughing. He has respiratory distress and a pOx of 89% on RA. Which of the following equipment is likely to be most helpful and should be ready on the patient's arrival = Traditional laryngoscope and bougie (Not Flexible suction catheter nor Nasopharyngeal device nor Oral airway device nor Indirect fiberoptic laryngoscope)

Other | EMS w/ 14 Y/O Coughing large volumes of blood w/ clots, Hx of Adeno-Tonsillectomy 8 days ago, RD SpO2 89% RA, which equipment is likely to be most helpful & should be ready upon pt arrival = laryngoscope and bougie

Amal | 7 Y/O boy w/ asthma, increased RD and decreased LOC, which of the following causes is a reason to use video laryngoscope for intubation = Hypoplastic mandible (Not Excessive Secretions nor GCS 8 nor Loose incisors)

- Use Video Laryngoscopy w/ Syndromes, Micrognathia, Hypoplastic mandible, High Mallampati score



- Surgical Airway

- Types:
 - All Ages = Needle Cricothyrotomy
 - > 1 Y/O = Percutaneous Cricothyrotomy
 - ≥ 10-12 Y/O = Surgical cricothyrotomy
- Contraindication: Absolute = Laryngeal/Tracheal injury, Relative = Anatomical Anomalies
- Complications:
 - Hemorrhage (the cricothyroid artery runs on the superior border of the cricothyroid membrane)
 - Recurrent Laryngeal N. Injury (runs parallel to the lateral margins of the thyroid cartilage)
 - Crepitus & perforation of posterior tracheal wall or esophagus

PEM R | 7 Y/O agitated w/ RD after bee sting to face, swell/angioedema of lips/tongue, SpO2 75% ETT attempt with no acids SpO2 56%, Next = Percutaneous transtracheal ventilation

PEM R | 12 M/O, RF after aspiration of marble, after visualization w/ ET seen above vocal cord and unable to remove w/ forceps, cyanotic, SpO2 40%, HR 60, BVM lead to minimal chest rise but no audible breath sound, back-blows and CPR unsuccessful, next = Perform needle cricothyrotomy

Promo | 8 M/O presented to ED w/ RF due to foreign body aspiration, when you try to intubate, you can find foreign body above vocal cord, but can't remove it, patient become cyanotic & bradycardic, you attempt a back blow & chest compression but unsuccessful to remove, Most appropriate Next step = Perform needle Cricothyrotomy (Not BVM ventilation use laryngeal mask airway nor Continue attempt at removing foreign body nor Perform Surgical Cricothyrotomy)

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Promo | 12 M/O RF after aspirating marble, on ETT attempt marble visualized & unable to remove it w/ forceps or suction, Now Cyanotic w/ SpO2 40% & HR dropped to 60 bpm, BMV lead to minimal chest rise but no audible breath sound, back-blows & CPR unsuccessful, Next = Perform Needle Cricothyrotomy (Not Attempt non-invasive CPAP nor Surgical Cric nor Continue attempt foreign body removal nor BMV w/ Laryngeal mask airway)

Promo | Witnessed foreign body ingestion, able to see it over vocal cord, multiple attempt failed, Next = Needle cricothyrotomy

Amal | 4 Y/O boy, ejected at MVA, facial trauma and head trauma, RD, what is true = Needle cricothyrotomy if you cannot intubate or ventilate (Not Use appropriate size LMA to prevent aspiration -can use but not to prevent aspiration- nor Extended neck to visualize airway structures -no bcz this is trauma- nor Attempt blind ET intubation with appropriate size ETT)

- Oropharyngeal airway = ONLY in deeply unresponsive
- Nasopharyngeal airway = Can use in Awake, Do not Mid-Face trauma or Basal skull fracture

Amal | Young male has Christmas disease, had MVA, has facial injuries and upper airway injuries, you are considering cricothyrotomy for his airway management, which of the following statement is true = Fewer complication than tracheostomy

- Christmas disease = Hemophilia B

Amal | 8 Y/O boy in respiratory arrest after MVA, ejected from window with facial injury, regarding airway management what is true = Needle cricothyrotomy is preferred over surgical thyrotomy (Not Inadequate extension of neck is most common cause of intubation failure nor Tracheal opening is more posteriorly and inferior than adult nor When in doubt larger ETT and smaller laryngoscope should be used)

- Cricothyroid cutting is inferior due to artery & recurrent laryngeal nerve

Amal | Where to cut in Cricothyroid membrane for surgical Thyrotomy = Inferior

Final | 8 Y/O Boy, Resp. Arrest after MVA, ejected from window w/ facial injury, regarding airway management what is true = Needle cricothyrotomy is preferred over surgical thyrotomy (Not inadequate extension of neck is most common cause of intubation failure)

Final | Where to cut in Cricothyroid membrane for surgical Thyrotomy = Inferior

Final | Needle cricothyrotomy = inferior membrane (Not Sup membrane nor sup thyroid or inferior thyroid)

- Airway Edema

PEM R | 3 Y/O loud Inspiratory stridor, poor air movement, RD severe, lethargy without drooling, but tripod position, had 3 days rhinorrhea, temp 38 RR 50 BP 90/56 SpO2 78% given multiple Racemic Epi & HFNC but remains hypoxia w/ SpO2 86%, Best next step = intubate & have ETT smaller than predicted by age

PEM R | 2 Y/O arrives stridor, RD, 3 days URTI fever 38.8 seal like cough, taking normally po, Temp 37 RR 42 SpO2 88% RA, lethargic, loud Inspiratory stridor, poor aeration, severe retraction, XR shows steeple sign, intubation needed, most appropriate = ETT smaller than routine

Chapter 1: Resus

Breathing

Oxygenation

- Hypoxia

- Hypoxic Hypoxia:
 - Low oxygen in the blood.
 - Causes: High altitude, lung diseases (ARDS, Pneumonia), Hypoventilation.
- Anemic Hypoxia:
 - Reduced oxygen-carrying capacity.
 - Causes: Anemia (SCA), CO poisoning, methemoglobinemia.
- Stagnant Hypoxia:
 - Poor blood flow.
 - Causes: Shock (cardiogenic, septic, hypovolemic), Heart Failure, Vascular obstruction (e.g., embolism)
- Histotoxic Hypoxia:
 - Cells cannot use oxygen
 - Causes: Sepsis (Mitochondrial dysfunction), Cyanide (blocks oxidative phosphorylation), Alcohol

Other | 8 Y/O male, Headache/Dizzy/N/V 1 day, Ice fishing w/ family last few days in enclosed shelter w/ portable propane heater, Temp 37.2 HR 120 RR 28 BP 108/58 O2 100% RA, Irritable, Pale, Mucous membrane mildly red, Breath normal, warm/perfused extremities, Father has same Sx, you suspect CO Poisoning & initiate 100% O2 FM, True = Has Anemic Hypoxia

- Respiratory Failure

- Definition: State of inadequate Oxygenation/Ventilation/Both, Diagnosed by Clinical & Blood Gas
- Types:
 - Type 1 Hypoxemic = $\text{PaO}_2 \leq 60 \text{ mmHg}$ + $\text{SpO}_2 < 90\%$
 - ABG: $\text{PaO}_2 = \leq 60 \text{ mmHg}$ (w/ SaO_2 usually $< 90\%$, VBG $\text{PaO}_2 < 30 \text{ mmHg}$)
 - Type 2 Hypercapnic = $\text{Ph} < 7.35$ + $\text{PCO}_2 > 45 \text{ mmHg}$
 - ABG: $\text{PaCO}_2 = \geq 40 \text{ mmHg}$ (more w/ RD) | $\text{PaCO}_2 = \geq 50 \text{ mmHg}$ (more w/ Acidosis)

PREP EM | 10 Y/O, in resus RD, previously healthy, for past week sick w/ cough/congestion, diffuse wheeze/rales at base w/ severe intercostal/suprasternal retractions, HR 122 Temp 38, ABG taken before putting him on O2, RT concerned about impending Resp. Failure, Best Support his theory = RR 20 SaO_2 on RA 90%, Ph 7.32 CO_2 50 HCO_3 27

- Breathing

- BVM = Ventilation/Oxygenation = Collapsing patient, CPR
- Non-Rebreather = Oxygenation = RSI (Preoxygenation)

Promo | EMS brought child who had cardiac arrest, given x2 Epi & Intubated on 100% O2, Upon arrival has weak pulse & Apneic, BP 70/40 SpO_2 100% other vitals unremarkable, Next = Ventilate at rate 20-30 or Ventilate RA or Give Bolus

Promo | 3 Y/O prolonged submersion, Obtunded/Apneic but with pulse, EMS Mask ventilation 18-20 bpm reporting difficult seal but SpO_2 100%, HR 122 RR 18 BP 95/48 SpO_2 RA 74%, Cyanotic, limited chest wall & minimal air entry w/ bagging, Next = Initiate 2-Person Mask Ventilation or Hold mask ventilation to place C-Collar or Needle decompress both lungs or ETT w/o meds

Promo | Best way to oxygenate apneic unresponsive pt. = BVM or NC or Non-Rebreather

Final | Difficult ventilation w/ poor chest rise Tx = x2 Person ambu bag

Final | Anesthesia bag & Ambubag = Need O2 source

Final25 | Difference between Anesthesia bag & Ambubag = Need O2 source

Chapter 1: Resus

Final25 | 3 Y/O, prolonged submersion, obtunded/apneic w/ pulse, ventilated 18-20 w/ EMS reporting difficult obtaining adequate seal & oxygenation, HR 122 RR 18, BP 95/48 SpO₂ 74%, ED provider takes over w/ little air entry bilateral, next intervention = Initiate 2 person mask ventilation (Not Needle decompression)

- End Tidal CO₂
 - o EtCO₂ Purpose:
 - ETT placement = 35-45 mmHg or continues waveform capnography
 - CPR quality monitor = > 10 mmHg (goal of good chest compressions)
 - Assessment of ROSC = sudden rise in ETCO₂ (>30 mmHg) indicates ROSC
- Coulometric CO₂ Detector
 - o False Positive (**Not in Trachea**)
 - Failure to measure before 6 breaths are given
 - Carbonated beverages
 - Air in stomach (secondary to bagging)
 - Bicarbonate administration
 - Contact with gastric contents (Esophageal intubation)
 - Contact with acidic drugs like lidocaine and epinephrine
 - o False Negative (**In Trachea**)
 - Failure to measure before 6 breaths are given
 - Cardiac arrest
 - Device or ETT clogged with secretions
 - Severe airway obstruction
 - Pulmonary edema
 - Severely hypocarbic (must have at least ETCO₂ of 2%)

PEM R | 5 M/O, refractory SZ, given several doses of benzo, Best way to assess ET tube placement = Calorimetric detector/capnography

PEM R | 1 M/O transported from outside after intubated for prolonged apneic episode related to Dx of Bronchiolitis, upon ED arrival, sedated/paralyzed w/ Mida/Roc infusions, no bed currently in PCIU, boarded in ED for hours, in addition to monitoring cardiopulmonary, which monitoring modality delayed in managing this pt. = Continuous capnography

PEM R | 12 Y/O, intubated, you are reassured that ETT correct by = Presence of EtCO₂ reading 55 mmHg (Confirming tube)

Promo x2 | Best way to confirm ETT = CO₂ Detector (Not Auscultation nor CXR nor Vapor in ETT)

Promo | Less sensitive indicator of Esophageal not Tracheal intubation = Small vapor (Not Auscultation nor CO nor CXR)

Amal | Which one of the following is the least reliable in esophageal intubation = Observation of vapor in the tube (Not Auscultation of the chest and abdomen nor Direct visualization nor Using ECOT2 detector)

- o EtCO₂: Quality of CPR ≥ 10 | Respiration 30-35

Amal | Patient just intubated, the best method to check ETT = EtCO₂ (Always Calorimetric or EtCO₂)

Amal | 6 Y/O After intubating you used CO₂ detector, what will give false negative CO₂ detection = Patient had cardiac arrest (Not Pt. had carbonated beverages nor Patient received NaHCO₃ doses nor Rt. main stem bronchus nor Esophageal intubation)

Amal | 13 Y/O is transported by the EMS after a diving is unresponsive with dilated pupils bilaterally, and end tidal co₂ connected, what is the optimal end tidal CO₂ for this boy, While waiting CT = 30

- o Transported (uncontrolled area) = EtCO₂ ~30
- o ICU (controlled area) = EtCO₂ ~40

Final | EtCO₂ intubated = 30 mmHg

Final | Patient for intubation, what is the best confirmatory test post intubation = Capnography

Final | Intubated then SpO₂ fall with purple co detector = in esophagus

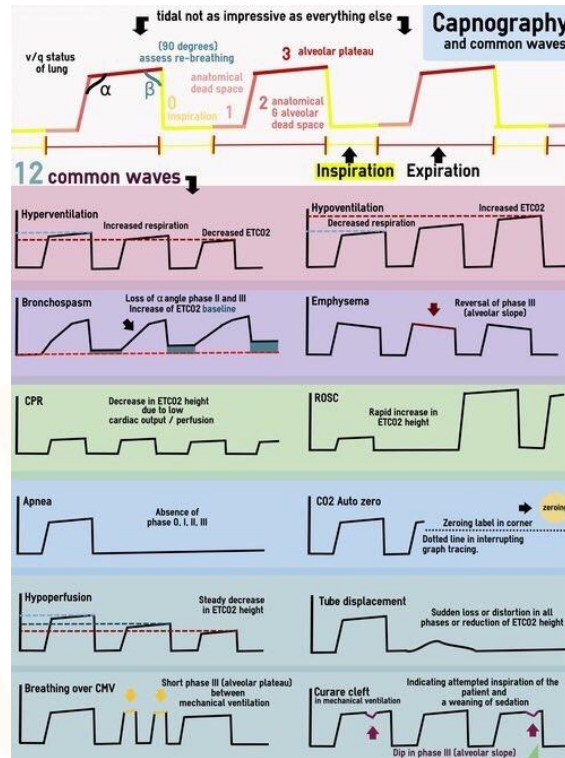
- o Yellow = Yes
- o Blue/Purple = Bad

Final | Confirm ET tube = CO₂ detector

Chapter 1: Resus

- EtCO₂ Waveforms

- Hypoventilation = getting bigger then bigger
- Hyperventilation (Pulmonary Hypoperfusion, PE) = getting smaller then smaller
- Obstruction = Shark fin (Up sloping)
- Rebreathing (Air trapping) = increase baseline
- Periodic breath = stop & returns
- Apnea = stop



PEM R | 3 Y/O RD after intubation O₂ falls 70s despite manual ventilation, bilateral equal air entry, CO₂ peak 32 (Shark fin wave)
= Give Albuterol through ETT (Bronchospasm)

Final | Post cardiac arrest patient with this capnography (pic of getting smaller & smaller) = Pulmonary hypoperfusion, pulmonary edema or pulmonary obstruction (Not normal, or Severe BA or Partial airway obstruction)

- Breathing pattern

- Hyperventilation: Rapid over breathing beyond metabolic need causing respiratory alkalosis
 - Sx: Breathlessness, chest pain, palpitation, paresthesia
 - ABG: Alkalotic Ph, Low CO₂, Normal O₂ & HCO₃
- Kussmaul: Deep, regular respirations from metabolic acidosis (e.g., DKA)
- Cheyne Stokes: Gradual deeper > shallow breaths w/ regular apnea from brain injury or low cerebral perfusion
- Biot's (Ataxic): Completely irregular breathing with random apnea due to medullary damage.
- Periodic (infants): Normal short pauses followed by rapid breathing in infants

PEM R | 12 Y/O Hx of repaired VSD and now difficult breathing/head pain, older sister report she said there is a shadow following her then started breathing fast, episode 60 min, Temp 38 HR 102 RR 38 BP 102/59 SpO₂ 100%, Blurry vision w/ numbness in hands/fingers, ABG shows = Ph 7.48 CO₂ 20 O₂ 90 HCO₃ 24

PEM R | 16 Y/O found unresponsive in park w/ breath from very deep to very shallow followed w/ regular period of apnea, pattern = Cheyne-Stokes respiration

Chapter 1: Resus

Ventilation

- Non-Invasive Ventilation

PEM R | 10 Y/O, hepatoblastoma w/ fever, known on chemo induced neutropenia, poor perfusion, on initial presentation given 80ml/kg over 45min, on dopamine, Norepi, on 2L NC, now having crackles, want to set up and having SOB, Hgb 9 HR 146 RR 43 BP 98/52 SpO2 92% on 2L, Next = Increase O2 to 6L HFNC

- Invasive Ventilation

- Improve Ventilation, Increase = RR, VT, Delta P (Amplitude)
- Improve Oxygenation, Increase = PEEP, FiO2, MAP (Mean Airway Pressure)
- Ventilator Calculations
 - $\text{Oxygen Index} = (\text{MAP} \times \text{FiO}_2 / \text{PaO}_2) \times 100$
 - $\text{Ventilation Index} = \text{RR} \times (\text{PIP} - \text{PEEP}) \times \text{PCO}_2 / 1000$
 - Other Calculation = $\text{RR} \times (\text{PIP} - \text{PEEP}) / \text{PaO}_2$

Pedz | Infant w/ Bronchiolitis + Desating, XR shows Collapse Rt. Upper lobe, 10 Lpm, Next = Non-invasive Ventilation

Pedz | 2 Y/O SIMV-VC mode, FiO2 100% can't get SpO2 > 88%, PEEP 5, VT 7ml/kg, RR 30 (pt. Taking 50), Blood gas showing normal Ph + CO2, Next step to improve oxygenation = Increase PEEP to 7 (not change to pressure control, not VT, not RR)

Pedz | 5 Y/O, Admitted to PICU w/ Respiratory failure, Kept on SPRVC mode for 6hr; PEEP 6 FiO2 30% VR 25 TV 6ml/kg, pt. Is stable w/ Q6hr VBG, latest Ph 7.3 CO2 62 O2 88 HCO3 27, Intervention = Increase Ventilation Rate (to wash out CO2)

Promo | Pt. On MV w/ Respiratory Alkalosis, 1st action to change MV settings to correct it = Decrease Rate (Not Increase TV)

Amal | First maneuver to correct **Respiratory Alkalosis** in MV patient = Decrease RR (Not Increase TV nor Increase RR)

	PEEP	Tidal Volume (TV)	Respiratory Rate (RR)	I:E Ratio	FiO ₂
Asthma	Low (3–5)	6–8 mL/kg	LOW (↓ age norm; ~10–20)	1:3–1:4	Lowest to keep SpO ₂ ≥92%
ARDS	Moderate-High	6 mL/kg	Normal-High	1:2	Titrate w/ PEEP to SpO ₂ 88–95%
Salicylate Toxicity	Low	10–12 mL/kg	HIGH (≥25 or match pre-intubation MV)	1:2	100% initially
cITBI	Low-Moderate	6–8 mL/kg	Adjust to EtCO ₂ target 35–45 For Hyperventilation 30–35	1:2	Maintain SpO ₂ ≥95%

- Asthma Ventilation Strategy

- Asthma Ventilation settings: **Low RR, Low TV, Low PEEP, Low I:E, Low Inspiratory time & High Expiratory time**
 - Low RR 12–20, I:E 1:3–4, Tv 7 ml/kg, PEEP 3–5, FiO2 > 92%
 - Permissive Hypercapnia strategy to Decrease risk of Barotrauma

PEM R | 8 Y/O severe persistent asthma in RF despite 36hr of frequent bronchodilator therapy at home, after insufficient response to continues albuterol/ipratropium/IV steroid/MgS, intubated w/ 5.5 cuffed ETT using Keta/Roc, post intubation gas Ph 7.11 pCO2 82 PaO2 45 HCO 19, Tx = Set ventilator setting to low rate & short Inspiratory time

PEM R | 11 Y/O severe asthma, intubated, RT asks to optimize ventilator setting = Decrease RR lower than typical

Final | Asthma ventilator setting = Low RR Low inspiratory time (& Increase Expiratory time)

Final25 | an asthma patient came with difficulty breathing and desaturation patient received nebulization and magnesium and didn't improve patient intubated size 5.5 his VBG : ph 7.10 co: 80 Po2 50, What strategy of MV settings = Low RR and short inspiratory time (Not High RR and increase Expiratory time nor increase fio2 nor High PEEP)

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- ARDS Ventilation Strategy

- **Low Tidal volume**, Low PEEP (higher than Asthma ventilation)
Prone posterior, PEEP & FiO₂ titrate as per SpO₂ (minimize prolong hypoxia or O₂ toxicity)

PEM R | 18 Y/O 5 days fever/headache/alter rate, ill appearing, RD/lethargic, SpO₂ 74% RR 34 HR 130 BP 100/65, COVID Pos., CXR bilateral alveolar infiltrates, non-invasive vent & decision to intubate ABG PaO₂ 80 on 60% FiO₂, RT asks ventilator setting = Target tidal volume 6 ml/kg

- Salicylate toxicity Ventilation Strategy

- Safest Intubation settings: **High TV 10-12 mL/kg** & **High RR 25 bpm**
- Intubating a Salicylate toxicity patient can lead to rapid deterioration & immediate death
- AVOID intubation Acidotic patient: Salicylate, DKA, Asthma

- ciTBI Ventilation Strategy

- Keep Normocapnia EtCO₂ = 35-40 (35-45 in PEM Practice) | Hyperventilate only if Herniation EtCO₂ = 30-35
- Emergent Herniation management
 - Hyperventilate to pupillary response (pupils becomes normal) & reversal of Cushing
 - Rise bed head 30 > Hyperosmolar 3% NaCl > Airway protection > NSx
- Cushing triad stages
 - Stage 1: Tachy, RR normal, HTN
 - Stage 2: Brady, irregular RR, HTN
 - Stage 3: Brady, irregular RR, HTN, Brain stem affected

PEM R | 3 Y/O fall from 2nd floor window, during transport became obtunded Temp 35.8 HR 64 RR 8 BP 138/96 SpO₂ 98% on NRB mask, has large temporal hematoma w/ pupil Rt. 6mm Lt. 3mm, react to light, withdraw to pain, unarousable, you decided to intubate w/ rocuronium/etomidate, ventilatory strategy = Begin BMV & ventilate EtCO₂ 30-35

Final x2 | Uncal herniated = Hyperventilate 31-33 (30-35)

Chapter 1: Resus

Circulation

Shock

General

- Shock Info

- Shock Definition: Acute state of Cardio-Vascular insufficiency leading to failure of O₂ delivery to tissues resulting in Cellular/Metabolic dysfunction
- Shock Signs
 - Compensated (Early) Signs:
 - Orthostatic BP/Pulse Changes
 - Tachycardia, Mild Tachypnea
 - Change in Mental status
 - Slight delay in CRT (2-3 sec), Slight cool extremities
 - Slight Metabolic acidosis (Increased Lactate)
 - Decrease U/O
 - Decompensated (Late) Signs:
 - Hypotension
 - Worsening Tachycardia > Bradycardia, Worsening Tachypnea > RD
 - Altered Mental status
 - Marked CRT Delay, Marked cool extremities, Cyanosis, Mottled skin
 - Marked Metabolic Acidosis
- Shock Types
 - Obstructive (Pump) [Narrow PP, Low CO, High SVR]
 - Cardiogenic (Pump) [Narrow PP, Low CO, High SVR]
 - Hypovolemic or Hemorrhagic (Tank) [Narrow PP, Low CO, High SVR]
 - Distributive: Anaphylactic (Pipe) [Wide PP, High CO, Low SVR]
 - Distributive: Neurogenic (Pipe) [Wide PP, High CO, Low SVR]
 - Distributive: Septic (Pipe) Early: [Wide PP, High CO, Low SVR]
 - Distributive: Septic (Pipe) Late: [Narrow PP, Low CO, Low SVR]
 - PP: Pulse Pressure = Difference between SBP – DBP
 - Wide PP: > 40 mmHg difference | Narrow PP: < 40 mmHg difference
 - CO: Cardiac Output, SVR: Systemic Vascular Resistance

Promo | Low BP 80/32, what is age is this accepted as minimum = 3 Y/O (could be 5 Y/O)

Amal | Compensatory mechanism is seen in early shock = release of ADH and activation of Angiotensin renin pathway (Not Decrease in O₂ tissue consumption nor decrease mixed venous gas oxygenation nor Parasympathetic nervous system activation)

- Crystalloids management definitions

- Crystalloid responsive Shock = Normotensive after 40-60 ml/kg Bolus
- Crystalloid refractory **Hypovolemic/Septic** Shock = Hypotensive despite 60 ml/kg Bolus
- Crystalloid refractory **Hemorrhagic** Shock = Hypotensive despite 40 ml/kg Bolus

- Compensated Shock

Final | Child w/ divorced parents came w/ Abdomen ecchymosis, diffuse pain & Tachycardia 200, Normal BP, 1st thing = NS bolus (Not child protection nor Abdomen imaging)

Chapter 1: Resus

- POCUS IVC

- POCUS IVC to Aorta Ratio $< 0.8 - 1$ = Hypovolemia | $1-1.4$ = Euvolemia | > 1.4 = Hypervolemia
- Collapsibility of IVC
 - Collapsed IVC: Diameter Collapse $> 50\%$ with inspiration
 - Low CVP/Volume Depletion = Hypovolemia
 - Shock: Hypovolemic or Distributive (Septic)
 - Distended IVC: Diameter Change $< 50\%$ with inspiration
 - High CVP/Venous Congestion = Overload
 - Shock: Obstructive or Cardiogenic (Usually with affected Contractility)

Promo | 3 Y/O, Low grade fever for 3 days, SOB, Unwell, Tachycardic, Hypotensive, Prolonged CRT, Currently Afebrile, POCUS **distended IVC**, No B line or Effusion on heart/lung, Most likely type of Shock = Cardiogenic (Not Obstructive nor Distributive)

Hypovolemic Shock

- Hypovolemic Shock

PEM R | 2 Y/O persistent vomit, watery diarrhea for last 2 days, intermittent fever, non-bloody non-bilious vomit, foul smell watery diarrhea, lethargy, Temp 40 HR 190 RR 44 BP 65/38 Ph 7.23 Na 122 K 3.2 HCO₃ 8, Glucose 58, Bolus 20ml/kg over 10min given, no change, next = 20ml/kg NS

Amal | Previously healthy 15 months old, presented with 5 days Hx of fever diarrhea and decrease oral intake, on Ex lethargic HR:200 RR54 BP:70/40 CR:4sec what is IVF to be given = 20ml/kg NS as fast as possible

Amal | 1 Y/O presenting w/ diarrhea Temp 39.2 HR 188 BP 70/48 SpO₂ 98%, CRT 5 sec, initial management = 20ml NS over 20min (Not 20ml/kg over 1hr nor 20ml/kg ORS nor 20ml/kg/hr)

Final | Hypoglycemia & Hypotension = Dextrose and NS bolus

Final | Respiratory failure Intubated then Tachycardic w/ BP drop = Bolus 20 ml NS

- Hemorrhagic Shock

- ATLS Pediatric Pathway: Surgical Consult
 - > HD Stable = Transfer > Observe/OR
 - > HD Unstable > NS Bolus 20ml/kg > PRBC 10ml/kg
 - > Abnormal = OR
 - > Normal = Transfer > Observe/OR
- Fleisher Best RBC for Transfusion: Cross matched & Typed > Typed > O Negative > O negative whole blood
- If in Qs take O negative (the fastest available)
- MTP 1:1:1 (PRBC, PLT, FFP)

PEM R | 14 Y/O Boy, MVA w/ Severe Abdomen pain/Distention/Tender T 36.5 °C HR 1 50 RR 1 8 BP 87/45 eFAST Positive, Hgb 7.4 g/dL, Transfer to OR will be delayed, next best step = MTP

PEM R | 15 Y/O ejected from ATV, intubated in field receiving fluids w/ rapid infuser, obtunded & has large amount of blood pooling from his open rt humeral & femoral fr, chest tube placed on rt. drain 1L x2 units of O- blood, Tx = FFP & PLT

PEM R | 15 Y/O girl MVA unrestrained front passenger on C-Collar/Backboard, HR 130 RR 30 BP 80/40 SpO₂ 98% on FM O₂, GCS 13, has regular rhythm without murmur, clear breath bilateral, large hematoma overlying Lt temporal skull as well as abrasions over Lt forehead & cheek, Tenderness to palpation of abdomen & obvious deformity of Lt forearm, Next = NS 20 ml/kg (Not Dexamethasone 0.5 mg per kg nor Fentanyl IV 1 mcg per kg nor Mannitol 0.1 mg per kg)

Promo | Crystalloid refractory Hemorrhagic Shock definition = Hypotension despite 40ml NS Bolus

Promo | Boy w/ handlebar injury, Tachycardic w/ Normal BP & CRT, class of Hemorrhage = 1 (Not 2)

Promo | 13 Y/O brought to ED after he was involved in MVA with blood in his clothes, Conscious, Breathing spontaneous, BP 75/30 HR 140 SpO₂ 100% RA, immediate Next = NS 20 ml/kg (Not O negative PRBC nor Intubate and ventilate)

Chapter 1: Resus

Promo | 13 Y/O MVA, Abdomen injury brought by paramedics, in distress RR 44 SpO2 85% BP 60/30, You activate Trauma team, given bolus 20 ml/kg NS, no changes & BP still low, Next = Give PRBC (Not Give NS 20ml/kg nor Give Inotropes nor Intubate)

Promo | MVA received x2 boluses NS, x2 PRBC still Hypotensive, Best Tx = Take to OR (Not PRBC nor 20m/kg NS nor Inotropes)

Promo | Hx of Trauma (pic of seat belt sign) patient Hypotensive, Next = Bolus NS (Not CT nor UA nor CBC)

Amal | The initial management of hemorrhagic shock should consist of = Adequate Oxygenation and ventilation (Not Stabilization of long bones Fracture or Rapid infusion of Isotonic fluid or Pharmacology meds to maintain stability)

- Always if all are options are correct, choose the ABCDE pathway
 - AB = O2
 - C = Isotonic fluid > O negative blood
 - D = stabilize long bones

Amal | 14 Y/O boy, hemoptysis after trauma, RD and hypotension. Suspected pulmonary laceration, for chest tube, have IV line
What should be done before chest tube = O- blood available STAT (Not cross match blood nor OR)

- Stable = Cross matched blood (Cross match will take time to be brought)
- Unstable = O- blood (fast & ready)

Final | Case of trauma waiting for call from OR, pt hypotensive after fluid resus next = O- blood

Final | Patient with massive trauma hypotensive, received 40-60ml/kg NS, still hypotensive what to do next = PRBCs (Not OR)

- Massive trauma with hypotension received NS boluses, next will be PRBC

Final | Trauma hypotensive and received 60 ml/kg & still hypotensive next step = O negative whole blood (Give Blood 1st then OR) (not O positive PRBC nor NS bolus nor OR)

Final | Trauma + hemorrhage = O- whole blood

Final | Case of trauma was hypotensive, tachycardia, poor perfusion given 60 ml/kg not improve next = OR (Not NS bolus nor Dopamine nor Epi)

Final | Case of trauma with hemorrhagic shock suspected abdominal injury given 40 ml/kg bolus still not improved what next = OR (Not cross match blood nor NS bolus)

- Refractory hemorrhagic shock immediately push to OR and request blood

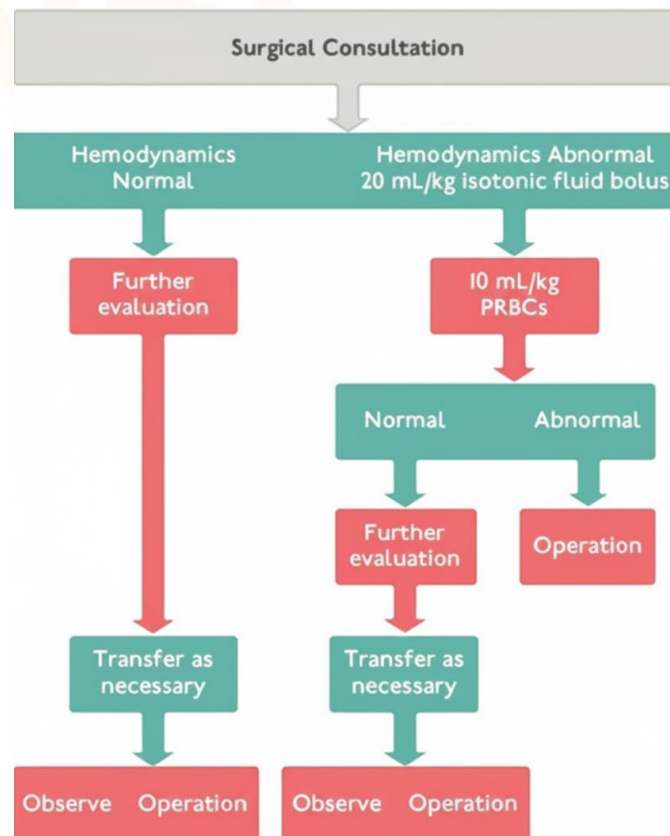


FIGURE 10-6 Resuscitation Flow Diagram for Pediatric Patients with normal and abnormal hemodynamics.

Chapter 1: Resus

- Massive Transfusion Complication

- Path: Giving Large amount of pRBC without MTP (without FFP, Cryo) or at rate > 1 ml/kg/min
- Causes:
 - Coagulopathy
 - Dilutional coagulopathy (No FFP = No clotting factors | No Cryo = No fibrinogen)
 - Hypothermia (Cold blood products > Reduce clotting function)
 - Acidosis (Poor perfusion + massive transfusion > inhibits coagulation)
 - Electrolyte Abnormalities
 - Low Ca (due to stored pRBC that is always citrated which binds to Ca)
 - Low Mg
 - Low or High K (hypokalemia depending on storage age)
- Prevention:
 - Use MTP 1:1:1 (Massive Transfusion Protocol)
 - Give Ca Gluconate (If anticipating Hypocalcemia)
 - Give Washed pRBC (If anticipating Hyperkalemia)

PEM R | 10 Y/O critically ill trauma pt having refractory hemorrhage & Coagulopathy after receiving 10 unit of pRBC to replace blood loss, which of the following is not contributing to her coagulopathy = Hypermagnesemia

PEM R | 15 Y/O male critically ill, ejected from high speed MVC, initiate MTP after multiple units of pRBC, what meds to prepare for anticipation in this patient course = Ca Gluconate

Amal | 9 Y/O girl required multiple Blood transfusion after trauma, following MVA, while waiting for surgical management. what other product needs to be given next = FFP (Not Cryoprecipitate nor Platelet)

- Blood transfusion:
 - Hypocalcemia (due to citrate), Hypomagnesemia, and Hypo/HyperKalemia
 - Massive transfusion protocols utilize pRBCs, in addition to FFP (to replace coagulation factors), cryoprecipitate (to replace fibrin), and platelets often in a 1 : 1 : 1 : 1 ratio
 - If anticipating hyperkalemia give washed pRBCs

Amal | Liver disease, given citrated blood at rate of > 1 ml/kg/min (the rate of MTP), will cause = Prolong QT (Not Ventricle fibrillation)

Amal | Comparing Ringer lactate versus normal saline which statement is true = RL contains calcium, which affects bio availability of drugs & binds to citrated anticoagulants of blood products

- NS causes Hyperchloremic Metabolic Acidosis
- RL has Ca which binds to citrated blood products & interacts w/ bioavailability of meds

Cardiogenic Shock

- Cardiogenic Shock

- HF Causes: CHD, Pulmo, Renal, Metabolic, Hyperthyroid
- Sx: Cardiac wheeze (if given bronchodilator > worsen CHF > Dysrhythmias)
- Tx:
 - Neonate < 3 W/O + CHD = Prostaglandin
 - Heart failure without Shock = Loop diuretic
 - Cardiogenic Shock: Compensated = Dobutamine (low dose) or Milrinone
 - Cardiogenic Shock: Hypotensive = Epinephrine (low dose)

PREP | 15 Y/O, came to ED w/ Resp. Tract infection 2 weeks ago, suddenly worsened today, Mottled, in moderate RD, Temp 37.5, HR 155, RR 20, BP 105/65, O2 90%, diffuse Rales/Rhonchi on chest exam, Heart exam quiet precordium 3/6 systolic murmur and 2/6 diastolic murmur, Abdomen soft lax, liver 5-6cm, CRT 5 sec, +2 Edema in both leg to knee, on O2, IV line in, Labs taken, Meds infusion to give = Milrinone (⬆ Cardiac contractility, ⬇ Pulmonary + SVR > Overall ⬆ CO)

- Myocarditis > Acute HF > Cardiogenic shock (Poor systemic perfusion, Hepatomegaly, Pulmonary edema)

Chapter 1: Resus

PEM R | 2 M/O low grade fever/runny nose/decrease PO/decrease UO/rapid breath over 24hr, brother has flu-like sx, Hx of sweating w/ feeds, hole in heart for F/U w/ Cardio, Temp 38 HR 154 RR 44 BP 60/32 SpO2 94%, Tachycardia II/VI systolic ejection murmur, Abdomen distended, liver a cm below costal, CRT 3sec, given Racemic epi but no improvement, Next = Furosemide (Not Dopamine nor Digoxin nor HFNC)

PEM R | 13 Y/O Female, Hx of waking up w/ SOB, Hx of exercise intolerance, had ankle swollen after running mile at school day before, No Fever/URTI Sx, Temp 37.8 HR 146 RR 44 BP 120/78 SpO2 95%, Moderate RD, tachycardia, wheeze bilateral w/ intercostal retractions, bilateral +2 non-pitting ankle edema, Salbutamol given but unchanged, Next = Furosemide

Promo | Child healthy, came w/ Tachycardia, Tachypnea, murmur grade 3 w/ Hepatomegaly 4cm, lung clear, Tx = Lasix (Not Digoxin nor Diltiazem)

Promo | Child w/ Picture of AGE from previous shift, given Fluid boluses after that became Tachycardic, Hypotensive, Dx = Cardiogenic shock (Incomplete Q, supposed to be Carditis not AGE)

Promo | Pt. W/ Hypotension, No Fever, Last week had Flu Sx, Now Given Abx, IVF 60ml/kg, still Hypotensive, not responding to Tx, Dx = Cardiogenic Shock (Myocarditis post Viral disease)

Promo | pt. W/ Cardiogenic shock what to give = Epinephrine 0.01 mg/kg IV 1:10000 (Not Dopamine 10mcg/kg/min)

Promo | Pt. Presented w/ sudden syncope, LSB ejection systolic murmur III, Hepatomegaly, Tachycardic Tachypneic, Not desating on RA, Next = Furosemide (Not Diltiazem)

Amal | 3 M/O baby, SOB, cough for several days and difficulty feeding, in distress, Tachycardia, no murmur heard HR 180 RR 60, Diffuse wheezing and palpable liver, management includes = IV Lasix (Not Racemic epinephrine nor Intubation nor Ventolin)

Final | Pt came with cardiogenic shock what to give = Epinephrine 0.01 mg/kg IV 1:10000

- Fleisher says Hypotensive Cardiogenic shock = Epinephrine
 - Although Dobutamine can be safe for heart and pump

Distributive Shock

- Septic Shock

- Sepsis: Suspected/Confirmed Infection w/ Organ Dysfunction: Resp, CVS, CNS, Coagulation (Includes Lactic acidosis, Altered mental state, Oliguria)
- Septic Shock: Sepsis w/ Hypotension despite fluid resus & requiring vasopressors
- SIRS Systemic inflammatory response syndrome) ≥ 2 :
 - Temp > 38 or < 36
 - HR > 90 (Above normal per age)
 - RR > 20 or PaCO2 > 32 mmHg
 - WBC > 12 or < 4 or Neutrophils $> 10\%$
- Tx:
 - 1st: IV Bolus up to 60 ml/kg + Broad Spectrum Abx within 60 min!
 - 2nd: Inotropes: New: All Epinephrine, Old:
 - Brisk CRT, Warm extremities, BP Low, Crystalloid refractory = Nor-Epinephrine (Nar = Warm)
 - Delay CRT, Cold extremities, BP Low, Crystalloid refractory = Epinephrine
 - 3rd: Adrenal insufficiency: Hydrocortisone
 - 4th: Intubation
 - To Lower Respiratory effort & Divert heart supply to other organs
 - AVOID if Hypotensive (optimize BP 1st as if intubated while BP low > Decrease Preload > CVS Collapse)
 - 5th: DIC Screening

Pedz | Late sign of Septic Shock = High capillary wedge pressure (PCWP in septic shock initially LOW then late HIGH)

PEM R | 14 M/O boy 2 days Fever/Lethargy Temp 39.7 HR 180 RR 40 BP 60/25 minimal responsive, delayed CRT, IV established, Intubated, Blood C/S & Lactate taken, NS 20ml/kg given, what Tx important in 1st hour = Broad spectrum Abx

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PEM R | 6 Y/O ALL fever/lethargy, Temp 38.9 HR 182 RR 52 BP 70/42 SpO2 98% RA, groaning/respond only to painful stimuli, shallow resp., without crackles/wheeze, bounding pulse/warm, CBC/Blood C/S, next = Administer isotonic fluid & order Abx

PEM R | 5 Y/O, Hx ALL w/ fever/lethargy, sleeping all day, Temp 39.8 HR 178 RR 52 BP 90/40, SpO2 96% on RA, groaning/respond only to painful stimuli, shallow resp., without crackles/wheeze, bounding pulse/warm, CBC/Blood C/S Abx, next = Administer isotonic fluid

PEM R | 17 Y/O girl, w/ fever/lethargy/rash for 4 days, HR 39.5 HR 165 RR 36 BP 79/42, x2 boluses and empiric Abx without improvement, in mental state or vital, IV therapy = Norepi

PEM R | 3 Y/O w/ Septic Shock, Abx/Aggressive IVF/Inotropes given for Hypotension, found Hx of Severe Eczema on Topical triamcinolone & PO Prednisone, what to give = Hydrocortisone

PEM R | 3 Y/O Hx BMT, in ED w/ septic shock, broad abx/fluid resus/inotropes given for hypotension, he is known to have GVHD on systemic meds, next = Hydrocortisone

PEM R | 16 Y/O 1 Day Fever/Stiff neck/Headache/photophobia, Temp 39 HR 110 RR 16 BP 92/60 having CSF gram neg cocci in pairs, given Abx, decompensates, he is for RSI, recommended agent should be avoided = Etomidate

Promo | Meningococcal rash Hypotensive, given 60ml/kg NS, dopamine started 10mg/kg then = Epi infusion or Norepi (unsure)

Promo | Warm shock what to give = Nore-Epi (Contraindicated Etomidate due to septic shock)

Promo | Septic shock scenario, Ex flushed, BP 60/20, Given multiple NS Boluses, Best Inotrope = Norepi

Promo | Child warm septic shock, Flushed CRT, Bounding peripheral pulse, Next = Norepinephrine

Promo | Septic shock, boluses & Abx given along w/ Inotropes, No respond, Next = Hydrocortisone

Promo | Child w/ Septic shock given boluses & started on Epi but still did not improve, Next = Hydrocortisone

Promo | Septic Shock w/ CRT 4 sec, after NS bolus, to give = Epi (Not Norepi)

Promo | Pt. Presenting w/ Septic Shock, IO secured, sequence of Tx = Fluids, Inotropes, Abx, Correct Anemia (As per Dr Amal)

Other | 2 Y/O ALL, in ED 1 day fever, 39 HR 160 RR 23 SBP 70 CRT 4 given 40ml/kg NS & Cefepime through Central line, most accurately describes current condition = Septic shock (Not Fluid refractory nor Fluid responsive nor Sepsis)

Amal | 3 Y/O presented to the ED with fever, and flushing it the skin is in septic shock, it remains hypotensive despite your aggressive fluid resuscitation. Which of the following best practices is the best choice = Norepi

Amal | 5 Y/O old girl ALL finished chemotherapy, presented to ED with fever T40 and chills, mild restlessness, and pallor, which of the following is serious finding = BP 73/42 (Not HR 180 nor RR 60 nor T40)

Amal | Which of the following is useful in differentiating hypovolemic from septic shock = Pulse Pressure

- Narrow pulse pressure in hypovolemic shock & Wide pulse pressure in Septic shock
- More than 40 difference

Amal | 8 M/O, presented to ED in septic shock, Airway has been taking care of, what is the sequence priority in management = Volume resuscitation, use inotrope & vasopressor, empirical antibiotics, correct anemia

Final | Patient presented with septic shock, you secured IO appropriate sequence in management = Fluid, correct anemia, antibiotic, inotropes (unsure, check Dr. Amal Answer in Q above)

Final | a case of warm shock = Norepinephrine

Final | Case of septic shock, hypotensive. IV line inserted (no fluid was given), Next = 20ml/kg crystalloid bolus (Not Ceftriaxone nor Immediately start Nore-epinephrine)

Final | case of meningococemia presented with warm septic shock, started on dopamine 5 mcg/kg/min Still hypotensive, while waiting for PICU, what is next = Increase dopamine dose (Not Epinephrine nor Milrinone nor Dobutamine)

- As long as you have dopamine, better to increase to the actual dose rather than starting new vasoactive drug
- Dopamine doses
 - < 5 mcg/kg/min = renal supportive dose
 - 5-10 mcg/kg/min = Shock dose for Beta1 > Increase CO
 - 10-15 mcg/kg/min = Shock dose for Alpha1 > Increase SVR

Final | Shock on Dopamine not improving, Next = Epi (unsure, if dopa 5 mcg then right answer: increase dopamine dose)

Final | Septic shock scenario (warm) after iv next = Norepinephrine

Final | Septic shock with CRT less than 4 sec what to give after bolus of NS = Epinephrine (Not Norepinephrine)

Final25 | Scenario of patient with Warm septic shock bounding pulse, HR 180, given bolus, no improvement, next = Epinephrine (Not Dopamine nor Milrinone nor Dobutamine)

Chapter 1: Resus

- Anaphylactic Shock

- Definition New:
 - Known/Likely = Low BP or Resp. (Laryngeal/Bronchial Spasm/Obstruction)
 - Unknown = Skin/Mucosa + ≥ 1 : Resp. | Severe GI | Low BP or End-Organ DMG
 - *Resp. = Respiratory compromise (Dyspnea, Wheeze, Stridor, reduced PEF, Hypoxemia)
 - *GI = Severe GI Sx (Severe Abdomen pain, repetitive vomit, especially if post non-food allergen)
- Definition Old:
 - Known = Low BP
 - Likely = ≥ 2 : Skin/Mucosa | GI | Resp. | Low BP or End-Organ DMG
 - Unknown = $\geq$ Skin/Mucosa + ≥ 1 : Resp. | Low BP or End-Organ DMG
- Tx: x1-2 IM Epinephrine 0.01 mg/kg 1:1000 (every 5-15min)
 - O₂, NS Bolus
 - Nebbs: Salbutamol (for wheeze), Epinephrine (for stridor)
 - Antihistamine: Diphenhydramine 1mg/kg (max 50mg) or Ranitidine 1mg/kg (max 50mg)
- Refractory Anaphylaxis:
 - Definition: Received Epi ≥ 2 with No improvement
 - Tx: Start Infusion Epinephrine 0.05-1 mcg/kg/min or Norepinephrine 0.05-2 mcg/kg/min
- Propranolol Refractory Anaphylaxis
 - Definition: Received Epi 1-2 with No improvement + Known on Propranolol
 - Tx: Give Glucagon 20-30 mcg/kg (1mg) over 5min then infuse 5-15 mcg/kg/min

PEM R | 10 Y/O Boy, known peanut allergy, having SOB, urticaria, vomiting after eating cake, Temp 37.5 HR 127 RR 36 BP 92/52 SpO₂ 97%, on non-rebreather mask, lips swollen diffuse wheeze, IM epi, IV diphen given, pt. Continues wheeze & vomits again, next = IM Epi

PEM R | 14 Y/O male, known peanut allergy, having SOB, urticaria, vomiting after eating cake, Temp 37.5 HR 127 RR 36 BP 92/52 SpO₂ 97%, on non-rebreather mask, lips swollen diffuse wheeze, best next = IM Epi

PEM R | 4 Y/O stung by bee, having anaphylaxis, appropriate IM Epi = EPI 1:1000, 0.18mg (0.01mg/kg)

PEM R | 15 M/O girl known allergy to peanuts, vomiting once, T 37, HR: 145, RR 36, BP 65/35 spo299% RA. Sleepy but arousable, no urticaria or angioedema. No wheeze CP 2-3 seconds = 0.01mg/kg (1mg/ml) IM epinephrine

PEM R | 10 Y/O male known asthma, having sudden difficult breath at during party, Mod RD, HR 125 RR 36 BP 80/30 SpO₂ 90% on RA, stridor, Inspiratory/expiratory wheeze, scattered hives, Tx = IM Epi

PEM R | 8 Y/O, w/ known SVT on propranolol, having hives/angioedema/wheeze/vomiting after ingesting peanuts, received x2 IM Epi w/ ongoing angioedema, hives, wheeze, Meds next = Glucagon

Promo x2 | Anaphylaxis after food allergy w/ Facial swell & Angioedema, given x2 Epi, x1 Steroid, Not improving & desating with significant stridor, Next step = Have backup airway & consult expert to intubate (Not Give another Epi nor Salbutamol Nebbs)

- Definitive airway needed for a progressive upper airway obstruction unresponsive to therapy, delay > change a difficult/partly obstructed airway to an impossible, completely obstructed airway requiring a cricothyrotomy

Promo | Refractory Anaphylaxis, vitally unstable, Next (Incomplete A) = Call for Help to prepare RSI (Not Epinephrine infusion)

Promo | Anaphylaxis w/ Edema of Face & Lips, Next = Prepare for RSI w/ Back up

Promo | Anaphylaxis for intubation = back up expert and device rescue

Promo | Anaphylaxis w/ Hypotension, Given IM Epinephrine didn't respond, dad gave Hx that child on BB Tx, Next = Glucagon

Promo | child Known cardiac disease on propranolol coming w/ Anaphylaxis, not responding to Epi, Next = Glucagon

Amal | 7 Y/O girl, difficulty breathing after eating peanut butter sandwich, has rash and flushing, BP 60/40, Audible wheezing, most appropriate next step = IM Epinephrine 1:1000 0.01 mg/kg

Amal | Which statement true about anaphylaxis = In a patient taking Propranolol who is having anaphylactic shock with no response to epinephrine give IV glucagon

Amal | 6 Y/O, eating peanuts then developed RD, swelling lips, stridor, most important intervention now = IM Epinephrine

Amal | 12 Y/O girl in ED diaphoresis, SOB 2 min after an Ant bit her, Vitals Temp 36.8, HR 132 BP 70/40 SpO₂ 92% on Ex she's pale, cold extremities, wheezing, given 100% O₂ & IV line established, appropriate Next step is = 0.03 mcg/kg/min, 1 to 10,000 IV (Not 0.3 - 0.5 ml of 1 in 1000 epinephrine & IV. Nor 0.3 - 0.5 ml of 1 in 1000 epinephrine SC. Nor 0.3-0.5 mL of 1 in 10,000 Epi IM)

- In Anaphylactic Shock: Epi given as x2 doses IM 1:1000 > Infusion 1:10000

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Final | Child known cardiac disease in propranolol came with anaphylactic not respond to epi what = Glucagon

Final | 5 Y/O girl, was playing outside in backyard, suddenly fainting, came to ED, has low BP, desating, chest decrease air entry bilaterally, no wheezes, Cardiac exam normal, Next = IM epinephrine 1:1000 (Not Epinephrine 1:10000 or NS bolus)

Final | Epinephrine IM dose for anaphylaxis = 0.01 mg/kg 1:1000 (1mg/ml)

Final | Anaphylaxis = 0.3 mg 1:1000 (weight more than 30 Kg, less than 30 Kg 0.15 mg)

Final | Anaphylaxis dose = 0.15mg IM

Final | Epinephrin dose = 0.1mg/1ml

Final | girl was walking barefoot legs in yard, then having pallor tachycardia, flushing (case of anaphylaxis), Tx = Epi IM

Final | Resistant anaphylaxis = Intubated with expert back up (refractory anaphylaxis)

Final | 6 Y/O eating chocolate, having sudden Severe wheeze given x2 IM Epi, x2 boluses of 20ml/kg, HR 133 BP 50/30 SpO2 93%, still not fully conscious but respond to pain, having mild stridor w/ poor bilateral air entry & wheeze, given O2/Salbutamol, Next epi best choice = Epi 0.1-1 mcg/kg/min 1:10000 IV

Final25 | 20kg child anaphylaxis received 2 IM epi and 2 boluses in route hypotensive, you will give = Epi 0.1-1 mcg/kg/min infusion 1:10000 (Not Epi 2mg IM nor Epi 0.1-1 mcg/kg/min infusion 1:1000)

Final25 | 5 Y/O ? On Bactrim, developed itchy rash and mild lip/facial swelling his symptoms didn't change in last 2 hours, Denies SOB or chest pain (I don't remember all the vitals) RR 24 normotensive. what the management = Steroids (Not IM epinephrine nor Racemic epinephrine nor Ventolin NBS)

- Neurogenic Shock

o Definitions:

- Neurogenic Shock (sympathetic nervous system "power outage": low BP, low HR, low SVR)
- Spinal Shock (spinal cord "silent mode": no reflexes, no motor/sensory, No HD changes)

o Tx: Usually post trauma to spine

- C-Collar, keep flat, slight lowered head (to improve venous return), O2
- IVF, Atropine (For Bradycardia)
- Norepinephrine (for Bradycardia/Hypotension)

o If Q had Neurogenic Shock and had answers of Epi & Nore; both are correct but better is Norepinephrine

PEM R | 17 Y/O, closed head injury ATV crash, speaking, able to move arm but unable to move legs, sensory lvl 2cm above umbilicus after given 40 ml/kg isotonic fluid given 2 PRBC, urine cath. inserted & drained 500ml of urine into attached bag HR 82 RR 26 BP 83/54 next = Administer Norepi

Other | 13 Y/O, in ED post head injury by MVA, He is speaking, able to move his arms but unable to move his legs, sensory level 2 cm above his umbilicus, After receiving 40 mL/kg of isotonic fluid & 2 units of PRBCs, A Foley cath. inserted w/ drainage of 500 mL of urine, HR 82, RR 26, BP 83/54 (Hypotension), Next = Administer norepinephrine (Neurogenic shock !)

Other | 15 Y/O after head injury while riding his bicycle without helmeted had LoC, EMS transported placed on cervical collar on him & backboard, HR 45 RR 11 BP 80/50 SpO2 97% on RA, airway is patent breathing well, has diminished pulses in all 4 extremities, PRBC ordered & 1 liter of 0.9% NS given without improvement in BP, appropriate vasopressor = Epinephrine

Final | a case of spinal shock: (bradycardia, hypotensive, wide pulse pressure, warm skin) = Norepinephrine (I think Neurogenic shock not spinal shock)

Final25 | 12 Y/O Patient fall down from a height on his head intubated in scene BP low and HR ~70 what will give = Epinephrine (Not Milrinone nor Dobutamine nor PRBC)

Chapter 1: Resus

Obstructive Shock

- Cardiac Tamponade

- Sx: Beck triad:
 - Distant/Muffled heart sound
 - Hypotension w/ Narrow pulse pressure
 - Jugular Venous Distention (Kussmaul sign)
- **Pulses paradoxus** (↓ Aortic pressure > 10-15mmhg instead of ↓ 4-10mmhg normal with inspiration)
- ECG: Low voltage QRS
- Echo: Shows pericardial effusion
- Tx: Immediate Pericardiocentesis
 - (some cardiologist relay on Low BP w/ Narrow PP or Pulsus Paradoxus to indicate procedure)
 - Technique:
 - Subxiphoid: Below/Left of Xiphoid on 35-45 toward Lt. shoulder/scapula
 - Apical: 1cm lateral to Apex in 5-7th intercostal space toward Rt. Shoulder
 - Parasternal: Lt 5th intercostal adjacent to sternum toward Rt. Shoulder
- Tx: 1st Fluid bolus (fluid is lost around heart) >

PEM R | 14 female, SLE acute onset left sided chest pain w/ exertion & dyspnea for 1 day, low grade fever, denies trauma, has relax undiscovered & hematologic abnormality, Temp 38.1 RR 36 HR 136 BP 80/46 SpO2 94% on RA, peripheral pulse weak, CXR Cardiomegaly but with clear lung field, next best = immediate echo

PEM R | 14 Y/O male shot Lt Anterior chest w/ handgun on arrival GCS 14 HR 125 RR 25 BP 85/50 SpO2 98% on 100% FiO2, pale anxious w/ equal breath sounds, distant heart sound, JVD, weak radial pulse, delayed CRT centrally, 20ml/kg bolus given, trauma team, Next = Pericardiocentesis

PEM R | 15 Y/O fell from rock wall 20 feet, EMS intubated & given 40 ml/kg NS, HR 130 GCS 3, having rhonchi bilateral w/ ventilator, Heart sound barely audible, neck JVD, Femoral pulses not palpable, CPR started, placed on stretcher & monitor, Next = Perform Pericardiocentesis

PEM R | 6 Y/O male, worsening cough/chest pain, recent URTI, now sx worsen when supine, HR 150 RR 48 BP 66/55 SpO2 83% RA, Evernote cough & heart sound distant, No JVD, Next = Perform Pericardiocentesis

PEM R | 17 Y/O Hx of T cell ALL finished treatment 3 months prior, having RD/Chest pain/SOB for 2 weeks, over last 24hr having more difficult breath & lightheadedness, Temp 37 HR 125 RR 34 BP 85/55 SpO2 94% on RA, has diaphoresis & RD, has Jugular venous distension, muffled heart sound, thready peripheral pulse & wide cardiac silhouette, common Ax = > 10 mmHg drop in BP w/ inspiration (Pulses paradoxus)

PEM R | 13 Y/O boy, previously healthy, Sharp Chest pain/RD, chest pain worsening for 1 week worse w/ deep breaths, now ill appearing, HR 135 RR 30 Has Beck triad (JVD, distant heart sound, Weak Peripheral pulses), emergent Tx = Insertion of 20 g spinal needle inserted below Xiphoid process 45 degree angle toward Lt shoulder

PEM R | 8 Y/O girl w/ cardiac tamponade, Pericardiocentesis location = Insertion of needle Lt subxiphoid process aiming toward Lt scapula

Final | Teenager in MVA signs of cardiac tamponade = Pericardiocentesis

Final | Child with infection then developed signs of cardiac tamponade = Pericardiocentesis

Final | Case of pericardial effusion what to do = Pericardiocentesis

Chapter 1: Resus

- Tension Pneumothorax

- Sx: SOB, Decrease Air entry, JVD
- Pth: Trachea/Mediastinum deviation to opposite > kinking IVC > Obstruct Venous Return > Drop BP > PEA
- Tx: Needle Thoracostomy (Decompression), AVOID ETT & Epi No benefit
 - Technique: Insert needle on 2nd intercostal space above 3rd rib in Midclavicular line

PEM R | 14 Y/O Trauma w/ bicycle damaged, GCS 7 BVM ventilation 100% FiO₂, difficulty in ventilation, on C-Spine, HR 120 RR 24 BP 80/40 in ED threads pulses, decreased breath sound in Ant. Rt. Lung, GCS 3, Jugular venous distention, suddenly more difficult to ventilate & BP 50/36 CRT 4 sec Pulseless, ECG strip (PEA), Tx = Needle Thoracostomy

PEM R | 16 Y/O in after MVC ejection, intubated and EtCO₂ good, but saturation drops to 70s during XR, XR (shows pneumothorax) next step = Perform needle thoracocentesis

PEM R | 8 Y/O MVA collided to tree, on C-Collar w/ EMS, Temo 37 HR 165 RR 44 BP 70/40 SpO₂ 88%, on O₂ Non-rebreather, Airway patent but asymmetry of lung sounds dismissed in Lt, eFAST (Barcode in M) = Needle Thoracostomy

PEM R | 14 Y/O bicycle damaged w/ no eyewitness of injury, GCS 7, on C-Spine, ventilating 100% FiO₂, Temp 36 HR 120 RR 24 on BVM BP 80/40 SpO₂ 92% on 100%, has thought pulse, decrease breath sound on rt lung, GCS 3, JVD, suddenly difficult to ventilate BP 50/36, CRT 4, becomes pulseless ECG (PEA), immediate next = Needle thoracostomy

PEM R | 14 Y/O high speed MVC thrown 15 feet, CPR initiated, attempt ventilate via BVM, unsuccessful, Auscultation Rt. chest decreases breath sound, ECG (PEA), as you prepare intubation, what to do simultaneous = Needle Thoracostomy

PEM R | 13 Y/O Hx of Asthma Hx of Chest pain difficult breathing, sudden Rt. Side chest pain while playing basketball, Now deteriorating HR 140 RR 40 BP 75/40 SpO₂ 85 on RA, decrease breath sound on Rt. & Trachea deviated to Lt, Next = Decompress chest w/ 20g cath over needle

PEM R | 15 Y/O Adolescent known Asthma, ongoing CPR, has pneumothorax location = Rt 2nd intercostal space above 3rd rib in Midclavicular line

PEM R | 12 Y/O unrestrained ejected, Tracheal deviation to left, Tension pneumothorax needle location = Rt 2nd intercostal space above 3rd rib in Midclavicular line

PEM R | 5 Y/O girl unrestrained back seater in MVA rollover, GCS 8 HR 135 RR 40 BP 110/65 SpO₂ 90% on 100% FiO₂, C-Collar placed, poor RR shallow breathing, then intubated during primary survey suddenly HR increases to 150 BP 80/40 RR 25, on Re-Ex has Weak dorsalis pedis & femoral pulse w/ decreased breath sound on Rt. Lung, Next = Needle decompression

PEM R | 8 Y/O healthy riding ATV collided to tree, Temp 37 RR 44 HR 165 BP 70/40 SpO₂ 88%, Airway patent, asymmetric findings, diminished breath sounds of Lt side, eFAST, Next = Needle thoracostomy

Promo | Picture of XR asking about abnormality = Pneumothorax

Promo | Chest Trauma, Ex decrease air entry on Rt. Side, Hyper-resonance per percussion, trachea deviated to Lt. side, diagnosis = Pneumothorax

Promo | 3 Y/O RTA w/ distended neck veins, normal heart sounds, decrease air entry on Rt. Side, poor air entry, Tx = Needle decompression (Not CXR nor Chest tube nor Intubate)

Promo | 5 Y/O Girl unrestrained back seat in high speed MVA roll over, GCS 8 HR 135 RR 40 BP 110/65 SpO₂ 90% on 100% FiO₂, C-Collar in place, poor Respiratory effort, shallow breath Intubated during Primary survey, Suddenly HR increase to 150 BP 80/90 RR 25, weak Dorsalis pedis & Femoral pulses, decrease breath sound in Rt. Lung, Next = Rt. Needle decompression

Promo | 3 Y/O Severe Asthma intubated because of Acute Resp. & Cardiac Deterioration evident by Tachycardia/Tachypnea/Decrease BP/SpO₂ 75%, During Ex you note Trachea shift to Left w/ Decreased aeration on Rt. Side, Needle decompression best site for insertion = Immediately above 3rd Rib (Not Immediately Below 2nd Rib)

Promo | 3 Y/O w/ Osteogenesis imperfecta, After MVA presented to Ed Hypotensive, Tachycardic, RR 8 w/ Decreased Air entry over Lt. side, Action = Needle decompression or Chest Tube or IVF Bolus or CXR

Promo | 10 Y/O MVA, Distress, Hypotensive, Chest pain, Rt. Side chest diminished breath sound & trachea deviated to Lt, after giving NS Bolus, Next step = Chest tube insertion (Not Crico nor Take to OR for intubation)

Promo | Trauma patient, Hypotensive w/ Decrease air entry & Hyper-resonance on Rt. Side w/ distended neck veins = Chest tube or Pericardiocentesis or Intubation (Incomplete Q)

- Decrease air entry + Hypotension = Tension Pneumothorax = Needle decompression then Chest Thoracostomy
- IF more hints about Cardiac tamponade, then Pericardiocentesis is the answer

Promo | Difference between Cardiac Tamponade & Pneumothorax = Decrease air entry (Not Jugular vein congestion)

Chapter 1: Resus

Amal | Which physical finding differentiate Tamponade from Tension pneumothorax = Presence of Breath sounds (Not Agitation nor Acute hypotension nor Distended neck veins)

Amal | 2 Y/O old k/c of OI came after trauma to left chest HR59 RR60 BP 60/35 SPO2 56 on RA. On examination: severe RD decrease air entry on left side. Next best action = Needle decompression

Amal | 11 Y/O boy known case of bronchial asthma presented to ED with severe respiratory distress, he is hypoxic with decrease breath sounds in the RT side, trachea deviated to the left side, needle thoracotomy should be inserted in = Above 3rd rib midclavicular line

Final | ATLS new updated site of needle decompression = 2-3 mid-clavicular

Final | Tension pneumothorax = Needle decompression

- US Lung Findings

- Normal = Pos. Lung sliding/A lines | M mode: Seashore sign
- Pneumothorax = Neg. Lung sliding/B lines/Lung Pulse | Pos. Lung Point | M mode: Barcode sign
- Pneumonia = Pos. B lines/Hypoechoic lung/Pleural irregular
- Pulmonary Edema = Pos. B lines

Turki
Bukhari's
Notes

Chapter 1: Resus

Arrhythmia

PALS Arrhythmias

- CPR = Asystole, PEA (Pulseless Electrical Activity)
- Defibrillation = Pulseless Ventricular Fibrillation, Pulseless Ventricular Tachycardia, Polymorphic Ventricular Tachycardia
- Cardioversion = SVT, Monomorphic Ventricular Tachycardia w/ Pulse

No Pulse Arrhythmias

- Cardiac Arrest
 - o Highest priority is High Quality CPR & (if necessary) Defib then Medication administration & Treating underlying cause (H & T)
 - o During 1st Cycle = insert IV/IO | After 1st Cycle Consider Advanced Airway
- Non-Shockable Rhythms (PEA or Asystole)
 - o 1st Cycle: Epi > CPR
 - o 2nd Cycle: Epi > CPR + Treat H & T
 - o Repeat Last Cycle

PEM R | 14 Y/O in ED collapsed at basketball, pulseless, (PEA) IO, after resuming chest compression = IV/IO Epi

Promo | Child unresponsive, CPR started after 2min still asystole, Next = Epinephrine (Not Continue CPR)

Amal | When you are resuscitating a patient with PEA, your options include = Fluid challenge (Not Calcium chloride nor Amiodarone nor MgSO₄)

Final | Case of cardiac arrest ongoing CPR, Asystole, intubated & IO line was insert what is next = IO Epinephrine 0.09mg; 1:10000 (0.1mg/ml) (Not Epinephrine through ETT 0.9mg 1:1000 (1mg/ml) nor Unsynchronized cardioversion)

Final | Epinephrine dose for arrested case = 0.01 mg/kg 1:10,000 (0.1mg/ml) IV

Final | Cardiac arrest with Asystole given epi dose and lidocaine no improvement what to give next = Epi 0.2mg/kg or Amiodarone 5 mg/kg If become shockable rhythm (unsure)

Final | Child came to you; you start the CPR after 2 min still asystole what next = Epi

- Shockable Rhythms (Pulseless VT/VFib)
 - o 1st Cycle: Defib 2j/kg > CPR
 - o 2nd Cycle: Defib 4j/kg > CPR > Epi
 - o 3rd Cycle: Defib (max 10j/kg or adult) > CPR > Amiodarone or Lidocaine or Magnesium (if Torsade de points)
 - o Repeat Last Cycle

PEM R | 2 Y/O Female, found w/ empty bottle of promethazine syrup, Apneic, pulseless, HR 0 BP 0 RR 0 SpO₂ 80% on 100% FiO₂ an unsync cardio shock 2j/kg no change, CPR resumed, (ECG shows Polymorph Torsade de point), to be administered next = Magnesium (Not Epinephrine nor Lidocaine nor Amiodarone nor Procainamide)

PEM R | 12 Y/O collapsed, unresponsive/pulseless, first dose of epi 2min ago, having wide complex tachy, CPR paused and no pulse, Next step = Defib 2j/kg

PEM R | 12 Y/O recent Heart transplant, became pulseless, IV line inserted, ECG shows Vtach, immediate next = Defib 2 J/kg

PEM R | 4 M/O cyanotic, no pulse, started CPR, on 100% O₂, IO access, (ECG VTach), Next = Defib 2 j/kg resume CPR

Chapter 1: Resus

Challenger | 3 Y/O male in ED w/ cardiopulmonary arrest. Paramedics report that the child was sent home from his dental office after having multiple dental caries filled. His parents noted he was slumped over in his car seat when they arrived home. Upon arrival of the paramedics, the patient was unresponsive, apneic, and pulseless. CPR was initiated, and an IV was placed. His ED vital signs Temp 35.6°C, HR 0, RR 0, BP 0/0, and pOx 80% with bagged 100% FiO₂, (Pic of ECG w/ Torsades de pointe) Which should administer next = Defibrillation (Not Procainamide nor Epinephrine nor Magnesium nor Amiodarone)

Challenger | 2 Y/O female in ED in cardiopulmonary arrest. An empty bottle of promethazine syrup was found at her side. Her parents state that her PCP prescribed the medication for a chronic cough. Upon arrival of the paramedics, the patient was unresponsive, apneic and pulseless. CPR was initiated, and an IV was placed. Her T is 35.1°C, HR 0, RR 0, BP 0/0, and pOx 80% with bagged 100% FiO₂. (ECG showed Torades de pointes) unsynchronized shock of 2 J/kg is given but there is no change in the rhythm. Chest compressions are resumed. Which of the following should be administered next = Magnesium (Not Amiodarone nor Procainamide nor Epinephrine nor Lidocaine)

Promo x2 | VT Pulseless = Defibrillation (2j/kg)

Promo | 6 Y/O collapsed in playground, CPR started, AED delivered one shock prior to EMS who intubated/ventilated/IV accessed the patient, ECG showing (VFibrillation) 1st Defib w/ Epi remains pulseless/apneic without rhythm change, 2nd Defib w/ Epi no change, Most appropriate meds = Amiodarone (Not Lidocaine nor Mg nor Procainamide)

Promo | Nurse rushed to you w/ cyanotic 4 M/O no pulse, ECG (VT) IO inserted, CPR started, Assisted Ventilation 100% on BVM, Next = Defib 2 J/Kg, Resume CPR

Promo x2 | Unconscious, No Pulse, Asks what Dx (ECG VT) = VT | Immediate action = Unsynchronized Cardioversion 2-4 J/Kg

Promo | 5 Y/O w/ VFib in ED, type of Shock & how many Jules to give to treat = Defib 40J (Not Defib 20J nor Cardiover 40)

- Will need to calculate weight from age $ATLS = (Age \times 2) + 10$ | then Defib initial dose 2 j/kg

Promo | Girl collapsed w/ ECG showing Polymorphic waves, you will give = Defib

Other | 12 Y/O girl collapsed during game but no direct trauma, athletic trainer started CPR, gave x2 AED shocks was still unresponsive, BLS continued CPR and gave last shock 3 min before arrival to ED, Unresponsive pulseless and IO obtained, ECG (VT), Most appropriate Next = Defib w/ 4j/kg (Not Amiodarone 5mg/kg IO nor Lidocaine 1 mg/kg IO nor ETT nor Sync Cardio)

- AED = Low Doses of shocks, Once Patient in ED Start Shock Protocol from the beginning

Amal | 13 Y/O, frontal trauma, the patient is unresponsive, not breathing. monitor showed this rhythm (ECG Vtach) = VT

Amal | (for above Q) CPR started for the previous patient, epinephrin given, what would you do next = Unsynchronized cardioversion 2-4 J/kg

Amal | 6 M/O baby, presented to ED restless HR 250 with narrow complex on monitor, **no pulse**, next step in management = Defibrillation (Because no pulse will follow shockable rhythm)

Amal | 5 Y/O boy, known case of congenital heart disease went under many repair procedures, presented to ED with VT, next step = Unsynchronized defibrillation 40 (Use the formula for the weight)

Final | scenario about patient **pulseless** and ECG showing Torsades de pointe received one shock (defibrillation) without improvement next is = Magnesium (Unsure if not: Epinephrine) (Not Adenosine nor Lidocaine)

- BIG DILEMMA Q: Same as PEM R Q above
 - Epinephrine choice: As per New PALS we use VT/VF Shockable rhythm algorithm for Pulseless Torsade de point, starting with 1st cycle Defib then CPR > 2nd cycle Defib then CPR then Epi > 3rd cycle Defib then CPR then Anti-arrhythmic drugs: Amiodarone or Lidocaine or Magnesium (if Torsade de points)
 - Magnesium choice: As per PEM R epinephrine have been shown to provoke torsade de points & should not be used in this scenario (source 5 min PEM) & as per MD Challenger answer is Magnesium

Final | 5 Y/O w/ Ventricular fibrillation in your ED, What type of shock and how many Jules = Defibrillation by 40

- ATLS estimated weight by Age = $(Age \times 2) + 10$

Final | 4 M/O Cyanotic, No Pulse, CPR, RT provides 100% BVM, IO established (Vtach), Next = Defib 2 J/Kg, resume CPR

Final x2 | VT no pulse = un-synchronized 2-4 j/kg

Final | Pulseless Vtach Tx = Defib

Final | Pulseless Vtach = Amiodarone (Not lidocaine)

Final | Vtach with no pulse = Unsynch 2 j/kg

Final | Girl collapses, her ECG showed polymorphic waves, you will give her = Defibrillation

Final25 | ECG Pulseless Vtach, Next = Defib 2 j/kg

Chapter 1: Resus

Tachyarrhythmia

- Approach

- Unstable: Hypotension, Altered Mental status, Signs of Shock
- Narrow QRS < 0.09 = SVT | Wid QRS > 0.09 = VT

- VT w/ Pulse

- Monomorphic = wide QRS, regular R-R and fast
 - Monomorphic VT w/ Pulse + Stable = Adenosine > Cardio Consult (possibly for Amiodarone)
 - Monomorphic VT w/ Pulse + Unstable = Sync Cardioversion
- Polymorphic = wide QRS, irregular R-R and fast
 - Polymorph VT w/ Pulse + Stable = Mg Sulfate
 - Polymorph VT w/ Pulse + Unstable = Sync Cardioversion > Cardio Consult (possibly for Mg Sulfate)

PEM R | 5 Y/O, 3 days of worsening chest pain/fever/bilateral knee & ankle pain/ blanching macular erythematous rash w/ pale center on trunk/extremities, lethargy, Dx w/ strep throat 2 wks but only took 2 days abx, ill-appearing, T 38.9 °C, HR 140, RR 40, BP 80/49, SpO₂ 94% RA. Findings include tachycardia without murmur/gallop, bilateral rales with intercostal retractions, hepatosplenomegaly, cap refill 3 sec, and weak 1+ peripheral pulses, ECG shows Vtach = Sync Cardio 0.5-1 j/kg

Promo | ECG Wide complex tachycardia w/ Pulse (VT) Next = Sync cardioversion

Amal | Vtach w/ Pulse unstable (hypotensive) = Sync Cardio

Amal | A female child with repetitive polymorphic ventricular tachycardia is seen in the ED what is the drug of choice for arrhythmia = Magnesium Sulfate (Not Amiodarone nor Lidocaine nor Procainamide)

Final | Boy came with chest pain. O/E HR 180 bpm, BP 70/35 mmHg, ECG showed (Vtach) = Cardioversion

- SVT

- ECG: P Absent/Inverted/After QRS/In T | QRS Narrow | R-R regular | HR > 180 bpm child, > 220 infant
- Stable = Vasovagal (Ice on face 10 sec) > Adenosine > Cardioversion
- Unstable + Line Secured = Adenosine > Cardioversion | Unstable + NO Line = Cardioversion

PEM R | 2 W/O 3 days poor feed, distress, has tactile fevers overnight, two brothers have rhinorrhea & low-grade fever, Temp 38.2 HR 270 RR 60 BP 85/62 SpO₂ 96%, CRT 2 sec, (ECG SVT) Next step = apply bag of ice water to face

PEM R | 2 M/O, Afebrile, poor feed/fussiness 2 bouts of non-bloody, non-bilious vomit, mild tachypnea without wheeze/rhinorrhea, CRT 2 sec, after initial maneuvers failed, HR 288 next = IV Adenosine

PEM R | 2 M/O, Afebrile, poor feed/fussiness 2 bouts of non-bloody, non-bilious vomit, mild tachypnea without wheeze/rhinorrhea, CRT 2 sec, after initial maneuvers failed, next = IV Adenosine

PEM R | 6 W/O lethargy pale, Temp 37 HR 270 RR 70 BP 58/32 SpO₂ 94%, rhythm strip, received x2 doses adenosine, Next = perform sync cardio

PEM R | 6 W/O, persistent vomit/lethargy pale, minimal responsive Temp 37 HR 232 RR 70 BP 58 IV line failed = Sync Cardio

PEM R | 15 D/O irritable/lethargy/poor intake, having pale/cyanosis/diaphoresis, HR 260 having no spontaneous eye opening and CRT 4, BP 60/40 (normal), RR 60, (ECG SVT) Next step = sync Cardio

- Signs of unstable = Altered LoC, Signs of Shock, Hypotension

PEM R | 4 Y/O girl pale/unresponsive w/ SVT on ECG BP 68/35 HR 220, Next = Cardioversion 0.5 g/kg

Promo | 4 M/O w/ fussiness, lethargy, Prolonged CRT, IV line inserted & shifted to Resus bed, Tachycardic, Hypotensive, ECG shows SVT, Next step = Adenosine (Not Sync Cardioversion)

Promo | ECG SVT, Pt. Unstable = Cardioversion (0.5j/kg)

Promo | ECG SVT HR 220, Neonate, BP normal, CRT 4 sec. Next = Sync Cardioversion (Not Adenosine nor Defib)

Promo | SVT w/ Lethargy & CRT 4 sec = Sync Cardioversion

Promo | SVT w/ Hypotension = Sync Cardioversion

Chapter 1: Resus

Promo | 12 Y/O, HR 193, Stable, good perfusion, Tx = Carotid Massage or Adenosine 0.1mcg/kg (dose is 0.1 mg/kg)

- Unsure if wrong dose don't choose it

Promo | 6 M/O Crying/Irritable HR 230, Temp 36.6 BP 80/54, ECG (SVT), Initial Tx = Vagal maneuver (Not Adenosine nor Sync)

Promo | Contraindicated Tx in 5 M/O w/ SVT = Verapamil (Not Ice on face nor Propranolol nor Adenosine)

Amal | 6 M/O infant w/ decreased feed for 12hr, pale, 7kg, weak palpable pulses, HR 250 w/ narrow complex O2 100%, mom trying to put pacifier, sucks pacifier, best action = IV Adenosine (Not Defib 14j nor perform carotid massage)

- Dr. Amal Discussion: This baby is stable. She is sucking intermittently on her pacifier. So, if you must choose between adenosine and cardiovascular, you are going to go for adenosine. If they give you that she's not responding to her mom or not interacting with her mom, low BP, or perfusion, Even with the heart rate of 250. She is still awake, so she is stable
- in case of unstable SVT but has IV access in Rt. Antecubital fossa give Adenosine then Sync Cardio

Amal | 14 M/O baby presented to ED with Irritability, auscultation showed tachycardia, ECG showed narrow complex tacky Hr260, absent P wave: vitals: T:38.9 HR:260 RR:28 BP:60/35, initial management = Sync Cardioversion

Final | Which treatment contraindicated in 5 M/O w/ SVT = Verapamil

- Verapamil contraindicated in < 1 Y/O (Causes bradycardia, hypotension)

Final | SVT unstable = Cardioversion

Final | SVT just arrive 1st line = Ice on face

Final | SVT, in shock = Immediate sync cardioversion

Final25 | Unstable SVT with ECG picture next step (no mention of IV line) = Synchronized cardioversion (Not IV adenosine)

Final25 | Patient with CHD, came with Atrial Fibrillation, Cardiology consulted, Patient became hypotensive (Unsure if developed unstable SVT but they didn't mention in the Q whether the patient had IV line or not) = Synchronized cardioversion (Not Continue antiarrhythmic nor IV adenosine)

Chapter 1: Resus

Bradyarrhythmia

- **Bradycardia**
 - Causes: Hypothermia, Hypoxia, Medications/Poisoning
 - Meds: Epinephrine: 0.01mg/kg 1:10000 | Atropine: 0.02mg/kg
 - Minimum dose 0.1mg (< 0.1mg risk of paradoxical effect on heart > Brady, Max 0.5mg)
 - Atropine indication:
 - Increased vagal tone (During Airway manipulation (intubation/Suction) or High ICP)
 - Organophosphate
 - 1st degree HB
 - While Preparation of pacing or in Refractory Brady despite O2/Epi
 - Atropine won't work with:
 - Cardiac transplant (Due to autonomic denervation)
 - 2nd degree HB Mobitz 2
 - 3rd degree HB (relative work)
 - Pacing indications:
 - Refractory to previous interventions
 - 2nd degree HB Mobitz 2
 - 3rd HB
- **Bradycardia Algorithm approach**
 - PALS Brady < 60
 - Initiate Oxygenation Ventilation (Hypoxia 1st cause) = for 1 min
 - > Chest compression = for 2 min (then continue)
 - > Epinephrine
 - +/- Atropine (if due to Vagal or HB block, repeatable dose once)
 - > External Pacing (refractory, unstable, 3rd HB, Mobitz II)
 - > Cardiology Consult
 - NPR Brady < 60
 - At 0 min > Respiration/HR
 - After 1min > PPV (PPV for 15s > check HR + corrective steps > Vent 30s)
 - After 2 min > CPR
 - After 3 min > Epi
 - Heart transplant Bradycardia
 - Stable = Isoproterenol (As it causes rapid changes in BP, thus not given in low BP)
 - Unstable = External pacing

PEM R | 4 M/O irritable/poor feed/RD worsen in 24hr, U/O decreased, no ill contact, Temp 39.6 HR 43 RR 10 BP unable to obtain SpO2 86% mottled CRT 5 sec, instruct RT to initiate bag valve mask ventilation FiO2 100%, IV access, next = Start CPR

PEM R | 4 Y/O Hx of cardiac transplant 2ndry to CHD, now fatigue/weakness, intermittent SOB 2 days, No Fever/Vomit/Diarrhea, Temp 36.3 HR 38 RR 44 BP 56/30, SpO2 88% on RA, difficult to arouse, thin, CRT 4 sec, CPR w/ IV access, Intubated, Epi given no change, next = Initiate External pacing

Other | 3 M/O arrested CPR by EMS, in ED Intubated/Ventilated 100% O2, w/ Good EtCO2, but Comatose, Mottled, Weak peripheral pulse BP 60/40, IO inserted, wt 5kg, ECG (shows bradycardia), Next = **Epi 1:10000 0.05mg** (Not Atropine 0.1 mg)

Amal | 2 D/O old baby looks pale and lethargic HR:60 CPR started WITH 100% oxygen while ventilation HR: still <60, the best next IV medication = Epi 1:10000 0.01mg/kg (not NS 10ml/kg)

Final | Patient with heart block, awake, after initial stabilization given, what is the best Tx = External pacing (Not Epi)

- Bradycardia w/ Pulse & poor perfusion: CPR if HR < 60bpm, IV/IO, Epi > Atropine (if Vasovagal or HB 1st degree) > Pacing (Refractory bradycardia or Complete HB)

Final | 3rd heart block, Post cardiac x3, 2 weeks w/ bradycardia = Epinephrine (Not atropine nor External pacing -after epi trial-)

Chapter 1: Resus

Final | 3 Y/O Congenital heart disease, post cardiac surgery, ECG (? Heart block), Next = Epinephrine

- Post Transplant = Epi > Pacing | Post CHD repair = Epi > Atropine > Pacing | Transportation = Pacing

- Heart Block

- 1st Degree Heart Block
 - ECG: Prolonged PR (> 200) But No Skip Tx = Atropine
- 2nd Degree Heart Block
 - Mobitz 1 ECG: PR gets longer and longer until a QRS Skipped
 - Mobitz 2 ECG: PR unchanged + Random QRS Skip Tx = Epinephrine > Atropine, Pacing
- 3rd Degree Heart Block
 - ECG: No relation between P waves & QRS complexes Tx = Pacing

Promo | ECG identify Arrhythmia = 3rd Block

- Cardiac Pacing Steps

- Sedate, attach pacing pads
- Pacing mode
- Pacing rate = Higher of normal HR
- Pacing output (current)
- Adjust output = Start high/titrate down or Start low/titrate up
- Check Capture
 - Electrical capture (the system) compare w/ Mechanical
 - Mechanical Capture: check Carotid/Brachial pulse synced w/ Pacing

Final | 5 Y/O, cardiac pacing steps = Lowest output to capture and rate 100 (Not Use minimum age appropriate heart rate -needs faster rate-)

- Rate always 100, Output depend on Q
 - Fleisher Start with = Highest output to capture then adjust down
 - Another method is = Lowest output to capture then adjust up

- Pacemaker

- Holding Magnet = Turn it into Asynchronous pacing Fixed mode (Almost as resetting it)
Result in constant paced rate regardless of native rate/rhythm

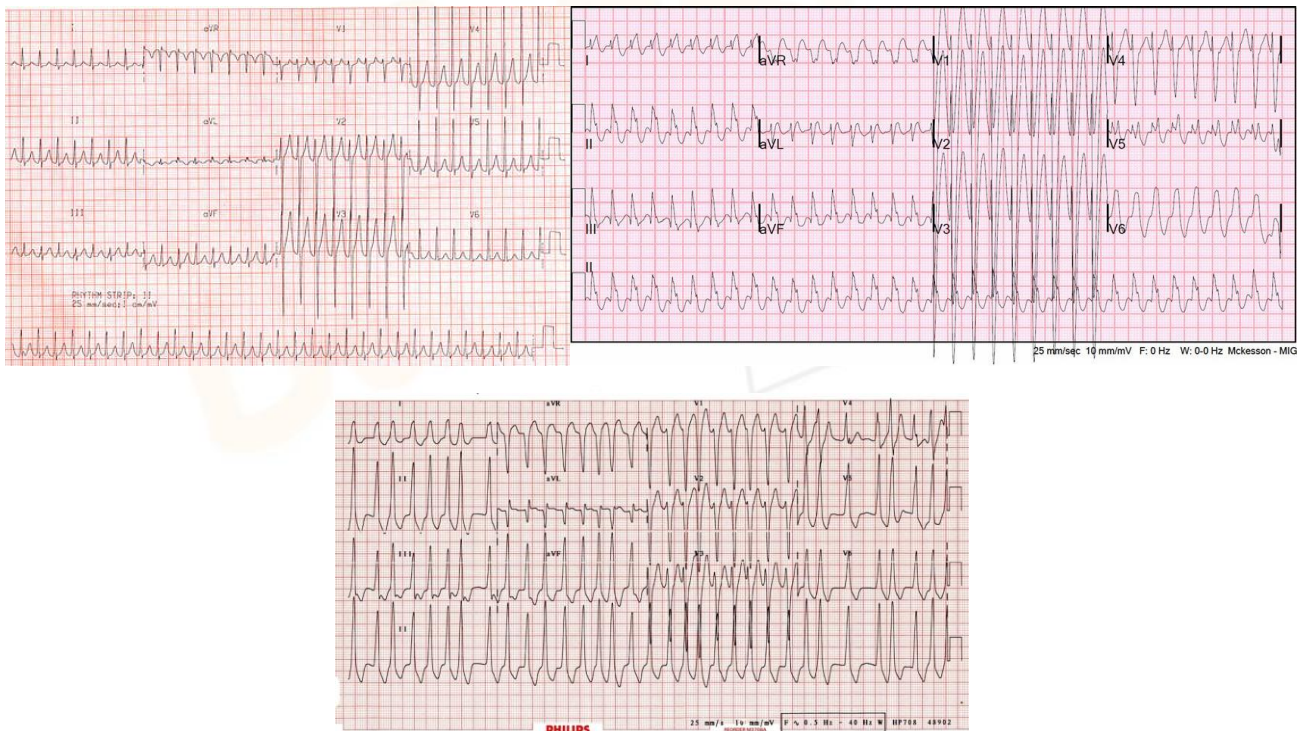
Amal | By Holding Magnet over pacemaker, you are = Converting it to AC of fixed mode

Amal | An ECG finding that suggest pacemaker abnormality = RBBB (Not -All are normal- Pacer spikes smaller than 5mm nor Lack of P wave nor LBBB)

Chapter 1: Resus

Other Arrhythmias

- **WPW (Wolff Parkinson White)** = Wide QRS, PR short, Wave of Delta
 - Ax: Isolated (75%), Ebstein Anomaly, L-TGA
 - Sx: Dizziness, Chest pain, Syncope, Palpitation, Sudden cardiac arrest
 - Complication: AFib (with rapid conduction > Vfib), Frequent SVT, AFib/Flutter
 - ECG: Wide QRS, PR Short, Wave of Delta
 - Definitive Tx: Ablation
 - Acute Tx:
 - Stable + Narrow Complex (Orthodromic AVRT) = Vagal maneuvers, Adenosine (1st line)
 - As OPD meds: BB, CCB (If no WPW on resting ECG)
 - Stable + regular Wide complex (Antidromic AVRT) = Procainamide
 - Stable + irregular Wide complex (AF w/ WPW) = Procainamide or Amiodarone +/- Sync Cardioversion
 - Unstable = Sync Cardioversion
 - Contraindications in Wide complex & Absolute in irregular/unstable WPW:
 - Adenosine, BB, CCB, Diltiazem, Digoxin, Verapamil



PEM R | 14 boy, PMD abnormal ECG, no Hx of exercise intolerance/chest pain/palpitation/syncope/SOB, unremarkable Ex, Neg. FM Hx, Vital signs, ECG (WPW), next step = Reassurance & D/C

Promo | Appropriate Tx of WPW w/ **Irregular wide complex Tachycardia** = Procainamide (Not Adenosine)

Promo | 4 M/O Infant w/ Irritability HR 190 ECG (Wide QRS, PR Short, Delta wave) = WPW

Promo | most appropriate treatment for WPW w/ irregular wide complex tachycardia = Procainamide

- WPW contraindicated = Adenosine, BB, CCB, Diltiazem, Digoxin, Verapamil

Amal | 10 Y/O boy, come to ED with history of multiple fainting episodes sometimes with tonic clonic seizures, mother reports usually he has these episodes happened in early morning with clock alarm voice or with certain sport activity, his father has similar issue, what medical management is indicated (ECG pic of WPW) = BB (Not ICD nor CCB nor Amiodarone)

- Diagnosis is WPW, it is not Prolong QT

Chapter 1: Resus

Amal | 13 Y/O old athlete, passed out during soccer game, felt palpitations before game and witnessed by other person when he passed out just as he was going to start the game, ECG done (Shows WPW) Next step = Cardiology as outpatient (Not Immediate Cardiology consultation nor Council him to stop using Ventolin nor Council him that it is benign condition)

- WPW Red flags (When can't discharge)
 - Multiple episodes in short periods
 - Ax w/ Chest pain (w/ episodes of syncope)
 - Episodes occurring during vigorous exercise or during rest

Amal | 9 Y/O, collapsed at school after running, few seconds then awoken up, which of the following cardiac disease could cause it = WPW Syndrome (Not PDA or Truncus arteriosus or Psychological or Situs inversus)

Amal | 6 M/O, girl, presented with lethargy and poor feeding, rapid HR, on examination: T 36.9 HR 190 RR 34 BP 87/58 O2 sat 97%. ECG (Antidromic wide QRS & delta wave) = WPW

Final x2 | WPW = Procainamide (Not amiodarone)

- Torsade de point

- Causes: Heart Block, Hypokalemia, Hypomagnesemia, Acquired/Congenital Prolonged QT
 - Meds: Abx, Antiemetic (Promethazine), Antipsychotic, phenothiazines through overdose or drug-drug interactions especially in high risk individuals > (As they shorten the QT intervals)
- Tx:
 - Stable with pulse = **Mg Sulfate**, Isoproterenol, BB, Lidocaine, Amiodarone
 - Unstable with pulse = Cardioversion
 - Unstable without pulse = Defibrillation > Mg Sulfate
 - AVOID Epinephrin (provoke Torsades and thus should not be used)

Promo | Unstable w/ ECG Torsade de Point (Incomplete Q) = Cardioversion or Defibrillation

Promo | Torsade de point to give = MgSO4

Amal | A female child with repetitive polymorphic ventricular tachycardia is seen in the ED what is the drug of choice for arrhythmia = Magnesium Sulfate (Not Amiodarone nor Lidocaine nor Procainamide)

- Stable Pulse VT = Adenosine > Amiodarone
- Unstable Pulse VT = Adenosine > Cardioversion
- Pulseless VT = Defib
- Polymorphic VT = Mg Sulfate

Amal | Patient with Torsade de Points, medication of choice = Magnesium sulfate

Final | ECG Torsade de point what to give = MgSO4 (will be the answer if stable)

- Brugada Syndrome

- AD, Normal heart structure
- Path: Cardiac ion channel dysfunction associated with sudden cardiac arrest
- Sx: Chest pain, Syncope
 - Vfib or Vtach, or Inducible Vtach
 - FH sudden cardiac death at < 45 years
 - Coved ST elevation in ECG of family members
- Invx: Dx by Clinical & ECG
- ECG: ECG with RBBB-like pattern
 - Type 1: coved ST elevation > 2 mm in at least 2 leads (V1–V3) followed by negative T wave (Brugada sign)
 - Type 2: saddleback ST elevation > 2 mm followed by upright or biphasic T wave
 - Type 3: coved or saddleback ST elevation < 2 mm
 - Type 2 and 3 changes are nondiagnostic and require further workup
- Tx: ICD (Implantable Cardioverter Defibrillator)

Chapter 1: Resus

Promo | 14 Y/O after an episode of syncope in church this morning, he ate breakfast & felt well, Vitals/Ex Unremarkable, ECG shows (V2 Saddleback sign) = Brugada Syndrome

Final | 14 Y/O after episode of syncope in church this morning, Ate Breakfast otherwise feels well, Temp 101 HR 92 RR 16 BP 112/72, Ex unremarkable, ECG (Brugada on V2), Dx = Brugada

- Commotio Cordis

- Sx: Thoracic blunt trauma at 20-40 millisecond at ascending phase of T wave > VT/Vfib
- Tx: Defibrillation within 3 minutes (Get AED > Analyze rhythm > Give Defib. Shock)

PEM R | 12 Y/O playing lacrosse when struck in chest by ball at high-speed, suddenly fell to ground unresponsive, immediately check no pulse, not breathing, not responding to painful stimuli, ideal next step = Defibrillation

PEM R | 15 Y/O girl fell of horse & horse kicked her chest, No Respiratory effort no palpable pulse, evaluated by team physician, likely cause = Dysrhythmia

Other | 14 Y/O boy in ED after Cardiac arrest from chest kick during martial arts, initial rhythm was VF, resolved w/ Defibrillation, at what phase of cardiac cycle did the trauma occur = During the ascending phase of T wave

- PVC (Premature Ventricular Contraction)

- Info: PVCs are normal & usually not requiring Invx or Tx
 - PVC w/ Underlying disease (WPW, Ischemic heart disease) can cause re-entrant tachydysrhythmia
 - PVC w/ Prolong QTc > High risk for R on T phenomenon > Torsades de Pointes
 - PVC > 3 usually concerning, can be called NVST
 - NVST (Non sustained VT): 3-30 consecutive PVC w/ rate > 100bpm (Ventricle rhythm rate < 100 bpm)
- Causes: Anxiety, Excess caffeine
 - Sympathomimetics (Dopamine, epi, noepi, dobutamine, salbutamol) Beta-agonists, Digoxin toxicity
 - Hypokalemia, Hypomagnesaemia
 - Myocardial ischemia
- Path: Ectopic beat within ventricles as Unifocal or Bifocal
- ECG:
 - RBBB w/ dominant R in V1 (if PVC arising from Left Ventricle)
 - LBBB w/ dominant S in V1 (if PVC arising from Right Ventricle)
 - Pattern: Bigeminy (every other beat is a PVC), Trigeminy (every third beat is a PVC) Quadrigeminy, Couplet (x2 consecutive PVCs)
- Tx: BB, CBB, Ablation

PEM R | 7 Y/O w/ septic shock, awaiting transfer to PICU, HR 170 RR 56 BP 70/42 SpO2 91% on RA, initial resus mental state and SOB improved, now 5L FM and received 80ml/kg of isotonic fluid, having crackles at lung bases but no gallop, on dopamine 20mcg/kg/min & Norepi 0.1 mcg/kg/min now HR 122 RR 45 BP 114/62, you note premature ventricular contraction, next = Wean dopamine

- Dopamine at higher dose rate can potentially cause harmful Tachydysrhythmia
As Pt. improved, weaning dopamine is best choice

- Circulation Assessment

Promo | 3 Y/O w/ CRT > 3 sec, Ex unremarkable, normal pulses, good perfusion, all true about CRT except = Interdisciplinary personal judgment doesn't affect CRT reading or Environmental temp can affect Temp or CRT > always means poor perfusion or CRT can't be affected by Vasopressors

Chapter 1: Resus

Line Access

- Peripheral IV Cannula

Promo x2 | 5 Y/O Trauma patient, appropriate for him = IV Access 20 GA (Not Chest tube 36 nor OGT tube 16 nor Foley cath 5)

- All options are wrong, Couldn't find Pediatrics IV gauge only Adult 18 in ATLS
- OGT/NGT/Foley = 10 | Chest Tube = 21

Promo | Most factor affect on giving IVF through IV Cannula = Radius of IV Cannula (Not Length nor Height nor Consistency)

Amal | 3 Y/O, suspected liver laceration following blunt trauma you will provide fluid resus w/ high flow rate = **2.5cm 20G**

- Highest flow rate line is the largest & shortest (Peripheral can deliver it faster than central)
- Most important factor in cannula is the Radius

Amal | 5 Y/O girl involved in MVA, comatose, upon resuscitation she needed intubated, secured line, foleys catheter and chest tube. what's the matching correct size for her management = 20g IV cath

Amal | Most important limiting of flow through IV cannula = Radius of cannula (Always first radius (Gauge) then length)

Final x2 | 5 Y/O Trauma Patient, what is appropriate for him = IV access size 20 GA

- IO (Intraosseous)

- IO Sites: Proximal Tibia > Distal Femur > Distal Tibia > Proximal Humerus
- IO Lab accuracy:
 - Reliable = Hgb, Ph, pCO₂, HCO₃, Glucose, Chloride, Creatinine, Urea, C/S, Drug level
 - Non-Reliable = WBC, Sodium/Potassium, Ionized Ca, AST/ALT, paO₂

PEM R | 10 Y/O, Fever & RUQ abdomen pain, prolonged transport, pain improves but droops fever & rigors, tachycardia, hypotension & lethargy, paramedic finger stick glucose 200 mg/dL, unable to obtain IV access multiple attempts, next step = Place IO line for isotonic fluid bolus

PEM R | 7 Y/O girl in MVA, multiple IV unsuccessful, Right tibia deformed, tried IO on left leg proximal tibia but not working, best place for IO = Proximal Femur (Not Distal Tibia nor Proximal Tibia nor Proximal tibia)

- PEM R answered Distal Tibia, but Fleisher: Proximal Tibia > Distal Femur

Procedure

Preferred locations are the proximal tibia or distal femur for ease of access and safety. Prepare the selected site by cleansing with antiseptic solution. In the awake patient, infiltrate from the skin to the periosteum with 1% lidocaine for anesthesia. The desired site for placement in the proximal tibia is the flat, medial surface 1 to 2 cm below the tibial tuberosity (**Fig. 130.9A**). Alternatively, the lower third of the femur in the midline approximately 3 cm above the lateral condyle (**Fig. 130.9B**) or the distal tibia 1 to 2 cm proximal to the medial malleolus (**Fig. 130.9C**) can be used. In the absence of an intraosseous needle, a bone marrow sampling needle or a spinal needle with bevel can be used.

PEM R | 3 Y/O best IO = Proximal Tibia

PEM R | After placement of IO for resus, needle remains in place without support, attempt of Bone marrow aspiration is unsuccessful = Infuse w/ saline & evaluate for swell or resistance

Promo | Apneic patient unresponsive, x4 IV line trials failed, Next = IO Tibia

Promo | Pt. Arrested w/ CPR started, no success of Peripheral IV line, Next = IO

Amal | 6 Y/O, arrest after MVA, obvious open fracture of left tibia and Ulna, attempted IO insertion in right proximal tibia but failed. Next appropriate IO site = Distal Rt. Femur

- Never put in Sternum
- Don't try again at same site

Amal | 5 M/O with history of vomiting and diarrhea, BP not measurable, 2 attempts failed to insert IV line what is the next step = IO Below tibial tuberosity

Amal | Which statement is true concerning IO in pediatrics = No upper age limit to insert IO (Not IO infusion can be used)

Chapter 1: Resus

indefinitely in management of injured children or IO preferred for intravascular access or soft tissue swelling at site of insertion
IO is not a reason to stop using it)

Final | Resus case with no IV line next = IO

Final | Most accurate in IO sample = Glucose

Final | IO accurate = Glucose

Final | Failed x2 IV line, next = IO

Final | No IV line = IO

Final | 1 D/O full term with cardiac arrest no IV line next = IO (Not UVC)

- Dr. Amal Discussion: UVC is better as vascular access and even continuous infusions. Yet in this scenario with cardiac arrest IO is definitely faster and has high success rate
- Fleisher UVC Indication: To gain vascular access rapidly in a newborn with respiratory failure or cardiovascular collapse. Venous catheterization is possible until approximately 2 weeks of age
- Fleisher IO Indication: Emergency vascular access, favored if intravenous access cannot be rapidly obtained in life-threatening situations

Final25 | 3 M/O, having a difficult peripheral Line what next = IO in Proximal Tibia (Not UVC)

- Venous cut down

Promo | Venous cut down approach = Saphenous vein or Medial Malleolus or Lateral Malleolus

Amal | Best site to access emergency vein line of Saphenous vein cutdown = 1-2 cm Above medial malleolus

Final | Venous cut down approach = Medial malleolus

Final | When performing emergency vein line, Best site to access Saphenous vein cutdown = 1-2 cm above medial malleolus

- Central Line

- Femoral Central Line = Lateral N(AV)L Medial
- Jugular Central Line = Lateral N(VA) Medial
- Complications: Infection (More w/ Femoral), Accidental arterial puncture, Hematomas, Pneumothorax (most commonly in subclavian line placement)

PEM R | 8 Y/O for internal jugular vein cannulation, location = Below apex of triangle between two heads of SCM directed toward ipsilateral nipple

PEM R | 3 Y/O central line landmark = 1cm medial to femoral pulse 1cm below Inguinal ligament

Promo | Most common Central line site at risk of Complications = Subclavian

Promo | Most common Central line site at risk of Infection = Femoral

Amal | Which of the following CVC site has highest risk of complications = Subclavian

- High risk of infection = Femoral
- High risk of complication = Subclavian

Amal | Performing Rt. Subclavian vein cath, how to know if arterial or venous = Blood gas analysis (Not Apical lordotic CXR nor lateral CXR nor AP CXR nor BP response to fluid)

- Central line air embolism

- Triad: Sudden Tachypnea/Tachycardia/Hypotension

PEM R | 12 Y/O on Central line having extreme SOB, No Hx of Respiratory illness, admits playing football w/ strings, No trauma, Afebrile, RR 40 HR 150 BP 70/30, immediate action = Apply high flow O2, clamp cath, put in Trendelenburg position

Chapter 1: Resus

- Umbilical Catheter

	Insertion	Duration of use
Umbilical Vein catheter (UVC)	0-7 days	10-14 days
Umbilical Artery catheter (UAC)	< 24 hr	7-10 days

- Contraindications: Abdomen related infections or Hypoperfusions (Omphalitis, NEC)

PEM R | 30 H/O infant w/ RD/Lethargy/Pale/Hypotensive, unsuccessful cannulation, Next = Umbilical vein cath

PEM R | 6 D/O bilious vomit & abdomen distension, Firm/tender, multiple Peripheral IV unsuccessful, which access is contraindicated = Umbilical vein cath

- Arterial line

- Complication:
 - Clot, line not in site
 - Pale limb + Bad waveform
 - Transient Vasospasm (Transient arterial obstruction)
 - Pale limb + Good waveform
 - Tx: Warming of affected area w/ hot pack

PREP EM | 7 Y/O in Fluid refractory shock w/ altered mental status, intubated, sedated and on Norepinephrine drip through femoral line, has radial arterial line in place for BP monitoring, her hand at site of arterial line is pale compared to other but waveform is strong, best next = Apply hot pack to affected area (Not stop Norepinephrine nor heparin drip through arterial line)

Chapter 1: Resus

Disability

Calculations

- **Weight:**
 - Broselow tape
 - ATLS = $(\text{Age Y/O} \times 2) + 10$
 - $< 1 \text{ Y/O} = (\text{Age M/O} \times 0.5) + 4$
 - $< 5 \text{ Y/O} = (\text{Age Y/O} \times 2) + 8$
 - $< 12 \text{ Y/O} = (\text{Age Y/O} \times 3) + 7$
- **LMA Sizes:**
 - $< 5 \text{ kg} = 1$
 - $< 10 \text{ kg} = 1.5$
 - $< 20 \text{ kg} = 2$
 - $< 30 \text{ kg} = 2.5$
 - $< 50 \text{ kg} = 3$
 - $< 70 \text{ kg} = 4$
 - $< 100 \text{ kg} = 5$
- **Laryngoscope Blade:**
 - Preterm = Mil 00
 - Newborn = Mil 0
 - $< 2 \text{ Y/O} = \text{Mil } 1$
 - $< 8 \text{ Y/O} = \text{Mac } 2$
 - $> 8 \text{ Y/O} = \text{Mac } 3$
- **ETT Sizes:**
 - Neonate = $(\text{GA} / 10)$
 - $< 1 \text{ kg or } < 28 \text{ wk} = 2.5$
 - $1-2 \text{ kg or } 28-34 \text{ wk} = 3$
 - $> 2 \text{ kg or } > 34 \text{ wk} = 3.5$
 - $< 1 \text{ Y/O} = 3$ Cuffed or 3.5 Uncuffed
 - $< 2 \text{ Y/O} = 3.5$ Cuffed or 4 Uncuffed
 - $> 2 \text{ Y/O} =$
 - Uncuffed = $(\text{Age} / 4) + 4$
 - Cuffed = $(\text{Age} / 4) + 3.5$
- **NGT/OGT or Foley's Catheter:**
 - Uncuffed ETT Size $\times 2$
- **ETT Depth:**
 - Neonate = $(\text{Wt} + 6)$
 - Uncuffed ETT Size $\times 3 = (\text{Age} / 2) + 12$
- **Chest Tube:**
 - Uncuffed ETT Size $\times 4$
- **Proper ETT Location on CXR**
 - 1.5 cm Above Carina
 - Middle Third of Trachea
 - Between T2-T4
- **Peripheral IV Line (Philadelphia Children Hospital)**
 - $< 1 \text{ M/O} = 24$
 - $< 8 \text{ Y/O} = 24-22$
 - $< 12 \text{ Y/O} = 22$
 - $< 13 \text{ Y/O} = 20$
 - Adult ATLS = 18
- **IO (ATLS Pediatric)**
 - Infants = 18mm
 - Young Child = 15mm

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PEM R | 4 Y/O RF for ETT size = 4.5 mm ETT

PEM R | 8 Y/O for cuffed ETT = 5.5

PEM R | 2 M/O Fever, Cough, RD & Stridor, Found Apneic so intubated w/ uncuffed 3, no chest rise and diminished breath sounds, Next = Re-intubate w/ Cuffed Tube

PEM R | 6 Y/O severe development delay, tracheal stenosis from prolonged intubation as neonate, presents w/ hypoxia, increased work of breaths & depressed mental, CXR reveals dense consolidation, using BVM with high pressure to maintain 90s on 100% FiO₂, which of following best reason to use cuffed ETT = Pt. Will require higher ventilator settings

Promo | 4 Y/O needing intubation, appropriate Tube size = 5 uncuffed (or 4.5 cuffed)

Promo | 4 Y/O Intubated ETT Length from corner of mouth will be = 15 cm

Promo | Family sustained trauma, father died, mother in ICU, have 3 children, 2 months old, what is the correct equipment to prepare = 2 M/O, Miller 1, ETT 3.5, Depth 11, NGT 8 (Not 2 M/O Miller 1, ETT 3.5, Depth 15, NGT 10 or 3 Y/O Macintosh2, ETT 5, Depth 10, NGT 12 or 7 Y/O Macintosh2, ETT 5.5, Depth 16, NGT 16)

Amal | 4 Y/O Best choice for ETT = Cuffed 4.5 (Not Cuffed 5 nor unCuffed 4.5 nor unCuffed 5)

- New Studies: Safety of cuffed ETT in young infants (< 3 M/O & < 5 kg)
 - Uncuffed ETT: Ax w/ increased risk of air leak > impairs effective oxygenation & ventilation (Frequently used in neonates & infants in the past)
 - Cuffed ETT: Ax w/ Decreased need for Tube Exchange/Repeat Laryngoscopy & Re-intubation, Also not Ax w/ increased incidence of post-intubation stridor
 - Higher ventilator settings w/ cuffed = no air leak

Amal | You intubated 4 years old patient, what's the depth of ETT from the corner of the mouth = 15cm

- Every calculation is calculated from uncuffed tube

Final | 14 Y/O Laryngoscope size = 3

Final | Chest tube size 4 years = 20

Final | 4 Y/O boy need intubation. What is the appropriate tube size = 4 cuffed or 5 cuffed or 5.5 cuffed or 6 un-cuffed (unsure)

- GCS & AVPU

Promo | 7 Y/O Eye open to command, oriented to time & place, localizing pain = 13 (Not 14 nor 12)

Promo | 28 M/O GCS calculation, localizing pain, Eye open to pain, Drowsy but responds to questions = 12

Promo x2 | 10 M/O infant in MVA while were in his mother's lap, moving limbs spontaneously, opening eye to pain only, crying inconsolably, GCS = 12

Amal | Which correct matching the AVPU system = P response to painful stimuli (Not A able to ask for something. Nor V able to visually follow you. Nor U you the child is uncooperative)

Amal | 12 Y/O, MVA, in ED sleepy, open eye w/ speech, squeeze hand to command, when asked where are you answers I'm in the ambulance, what is his GCS = 13

Amal | 10 M/O boy struck by car, moving all limbs spontaneously, opening eyes only to pain & screams inconsolably, GCS = 12

Final | 6 M/O Facial & Head trauma, not opening eyes, moaning, draws to pain, GCS = 8

Final | GCS = 13

Final25 | Patient in ED, able to obey command when he asked to squeeze the examiner's fingers and elevate his leg. Open his eye to pain, and when asked where are you he said I'm in the ambulance = 12 (Not 13 nor 14 nor 15)

GLASGOW COMA SCALE				
Eye Opening	< 1 YEAR		> 1 YEAR	
	Spontaneous		Spontaneous	4
	To Verbal Command		To shout	3
	To Painful		To Painful	2
Motor Response	No response		No response	1
	Spontaneous		Obeys Commands	6
	Localizes Pain		Localizes Pain	5
	Withdraws to Pain		Withdraws to Pain	4
	Flexion-Decorticate		Flexion-Decorticate	3
	Extension-Decerebrate		Extension-Decerebrate	2
	No Response		No Response	1
	< 2 YEARS		> 5 YEARS	
Verbal	Smile/Coos Appropriately		Appropriate Words/Phrases	5
	Cries and is Consolable		Inappropriate Words	4
	Persistent Inappropriate crying and/or screaming		Persistent Cries Screams	3
	Grunts, Agitated or Restless		Grunts	2
	No Response		No Response	1

AVPU CLASSIFICATION

A	Alert	15
V	Responds to Voice Stimuli	13
P	Responds to Painful Stimuli	8
U	Unresponsive to All Stimuli	3

Turki's GCS By Hand



Eye: Nothing | Pain | Verbal | Spontaneous
Verbal: Nothing | Grunt/Sounds | Cry/Words | Consolable/Words/Confused | Spontaneous
Motor: Nothing | Extension | Flexion | Withdraw pain | Localize pain | Spontaneous

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- MAP

Final | How to calculate $\text{MAP} = \text{DP} + \frac{1}{3} (\text{SP} - \text{DP})$

Final | $\text{MAP} = \text{DBP} + \frac{1}{3} (\text{SBP} - \text{DBP})$

Medications

- Epinephrine
 - o PALS Epinephrine
 - IV/IO = 1:10000 = 0.1mg/ml = 0.01mg/kg = 0.1ml/kg (Max 1 mg)
 - ETT = 1:1000 = 1mg/ml = 0.1mg/kg = 0.1ml/kg (Max 2.5 mg)
 - o NRP Epinephrine
 - IV/IO = 1:10000 = 0.1mg/ml = 0.01mg/kg = 0.1ml/kg
 - ETT = 1:10000 = 0.1mg/ml = 0.1mg/kg = 1ml/kg
 - o Anaphylaxis Epinephrine
 - IM = 1:1000 = 1mg/ml = 0.01mg/kg = 0.01ml/kg
 - Epi Pen Junior (Green) = < 30 kg = 0.15mg
 - Epi Pen Adult (Yellow) = > 30 kg = 0.30mg
 - o Infusion Epinephrine
 - Infusion = 0.05-1 mcg/kg/min, titrate by 0.02 mcg/kg/min

Promo | Cardiac arrest patient intubated, No IV line & IO Failed, your Epi dose = 1:1000 ETT (Not 1:1000 IM nor 1:10000 ETT)

Promo | Intubated by Paramedics, Impression of Cardiac arrest, Failed IV/IO, Epi to give through ETT = 1:1000 (0.1ml/kg)

Promo | Dose of Epi in IO = 1:10000 (0.1mg/ml)

Promo | Anaphylaxis scenario = Epi 1:1000 IM

Promo | Anaphylaxis, Epi dose in 30kg = 0.3 mg

Promo | Pt. W/ Anaphylactic shock Tx = Epinephrine 0.01 mg/kg

Promo | Child w/ Cardiac arrest, you inserted IO/ETT, Epi dose = 1:10000 0.01mg/kg IO (Not 1:1000 0.01mg/kg ETT)

Amal | 6 M/O, weight 5 kg, cardiac arrest, CPR started by EMS, he is intubated, and has ETT and IO in place. What is the epinephrine dose = 1:10000 0.01 mg/kg IO

- o (IV > IO > ETT)

Amal | 5 Y/O girl, unconscious and asystole, was stuck in car trunk, no pulse, Apneic, you recommend dose of 1:10000 epinephrine, what is recommended dose = 0.01 mg/kg

Amal | Term neonate delivered in car in the way to hospital in ED she has no respiratory effort, cyanosed with decrease perfusion, what is true = Initial Epinephrine dose is 0.35 ml which is 35 micrograms (Not ETT size 2 mm or ETT length 15 cm or IV fluid bolus 100 ml)

Final | Child presented with cardiac arrest you insert IO/ETT, What is the dose of epinephrine = 1:10,000 (0.01mg/kg) IO

Final | IO epinephrine = 0.01 mg/kg 1:10000

Final | ETT epinephrine = 0.1 ml/kg 1:1000 (0.01mg/kg)

- Meds given through ETT: LANE
 - Lidocaine 2-3 mg/kg (repeat 1 mg/kg then infusion after 15min from initial)
 - Atropine 0.04-0.06 mg/kg
 - Naloxone 2x IV dose (IV dose 0.1mg/kg max 2mg)
 - Epinephrine 0.1 mg/kg (1:1000, Max 2.5mg)
- o Dilute 5ml (infants), 10ml (child) in NS, through ETT w/ 5 Positive pressure breaths

Chapter 1: Resus

- **Dopamine**
 - Dopamine doses
 - $< 5 \text{ mcg/kg/min}$ = renal supportive dose
 - $5\text{-}10 \text{ mcg/kg/min}$ = Shock dose for Beta1 > Increase CO
 - $10\text{-}15 \text{ mcg/kg/min}$ = Shock dose for Alpha1 > Increase SVR
 - Side effects: Increase chance of PVCs (w/ higher doses)

- **Atropine**
 - Dose: 0.02 mg/kg (Max 0.5mg)

- **Adenosine**
 - Dose: 0.1 mg/kg (max 6mg) 0.2 mg/kg (max 12mg)
 - Adenosine Contraindications
 - Absolute: in WPW w/ AFib
 - Path: Blocking AV node > AFib conducted rapidly to ventricle via accessory connection > VF > death
 - Relative: Heart transplant
 - Path: due to prolonged sinus pauses, which is denervated from autonomic nervous system. Besides prolonged asystole, Heart is vulnerable to malignant escape rhythms)
 - Starting with one-third the recommended dose, and increasing, if necessary, may mitigate the effect of adenosine on the transplanted heart. Finally, there are rare reports of adenosine causing bronchospasm in asthmatics

Promo | Adenosine MoA = Blocks conduction through AV Node

- **Amiodarone**
 - Dose: 5 mg/kg

Promo | Amiodarone MoA = Decrease Automaticity of heart (Class 3 Anti-arrhythmic that Blocks K channel)

Chapter 1: Resus

Sedation

PSA

- ASA

- PEM Doctor privilege $\leq$ ASA II
- ASA Classification:
 - I = Normal Healthy
 - II = No Functional limitation + Mild Systemic disease | Ex: Mild Asthma, Controlled DM
 - III = Some Functional limitation + Sev. Systemic disease
 - IV = Functional limitation + Sev. Systemic disease constant threat to life
 - V = Moribund not expected to survive w/o Operation
 - VI = Brain Dead

PEM R | Adolescent female Medical Hx DM 1 w/ often skin infections, OSA requiring CPAP at night, Grade 4 Tonsil hypertrophy, came for large fluctuant mass in center of Lt. axilla, ASA level = ASA Class III

PEM R | 17 Y/O for Anterior shoulder dislocation, Moderate obese w/ Asthma & actively wheezing, ASA = III

- Active wheeze makes it III, if no wheeze II

PEM R | 10 Y/O girl PSA still aroused by verbal stimulation further sedation dose given, now aroused by painful stimuli & hypoventilates, sedation level progressed to = Moderate to deep

Promo | ASA which statement true = ASA 2 Mod disease controlled (Mild-Mod)

- ASA Sedation levels

ASA Sedation Levels	Minimal/Anxiolysis	Mod/Sedation	Deep Sedation	General Anesthesia
Responds to	Normal/Verbal	Verbal/Tactile Stimuli	Pain Stimuli	No Stimuli
Airway	Nil	No Intervention	Might Intervention	Need Intervention
Ventilation	Nil	Adequate	Half Inadequate	Full Inadequate
CVS	Nil	Maintained	Maintained	Half Impaired

PEM R | 5 Y/O progressive headache/intermittent Emesis, Neuro suggest emergent MRI needing procedure sedation, given now she has stridor needing oral airway but no desaturation, HR/BP/O₂/EtCO₂ normal, unconscious/difficult to arouse but response to sternal rub, description of current sedation level = Deep Sedation

Final25 | Minimal sedation will respond to = Follow Verbal command (Not Light tactile touch nor Pain nor No response)

Final25 | Patient for moderate sedation what to ask the nurse to prepare in moderate sedation = Advanced airway (Unsure it is Not Nasal canula nor Face mask nor Non-rebreather)

Final25 | Patient having forearm fracture and he is for reduction, Has Moderate Tonsillar hypertrophy w/ Hx of asthma, snoring & had x2 events of sleep apnea, best choice for procedural sedation = Call Anesthesia to be done in controlled environment (Not Ketamine & continue sedation in ED. Nor precedex -Dexmedetomidine-. Nor IN Midaz to prevent IV and intubation risk)

- ASA Fasting

- Clear liquid = 2 hr
- Breast milk = 4 hr
- Light Meal = 6 hr (Infant formula/Non-Human Milk, Light Meal)
- Heavy Meal = 8 hr (Fried/Fatty, Meaty Meals)

Chapter 1: Resus

PEM R | 7 Y/O for non-emergent reduction of fracture under deep sedation, last the child ate plain toast & drank cow's milk before arriving to ED, according to ASA fasting guidelines, how long should wait until can proceed w/ sedation = 6 hr

- Mallampati score

Final | Pt. W/ Asthma & Obstructive sleep apnea, what ASA & Mallampati = ASA 3 MLP 2

Final | Mallampati pic, poor controlled asthma class = ASA 3 + 2 Mallampati

Final | Pic ASA & Mallampati = ASA 3 Mallampati 2

Final | Pt. W/ Asthma & Obstructive sleep apnea, what ASA & Mallampati = ASA 3 MLP 2

- Assessing Pain Scale in Sedation

- o Neonate = CRIES (Crying, Require O2, Increased vital signs, Expression, Sleeplessness -used post OP-)
- o < 6 W/O = NIPS (Neonatal infant Pain Scale -used in ED/ICU/Ward-)
- o 2 M/O - 7 Y/O Non-Verbal = **FLACC** (Face, Legs, Activity, Cry, consolability)
- o 3-7 Y/O Verbal = Wong-Baker FACES
- o > 8 Y/O = Adult pain scale (NRS or VAS)

PEM R | 12 M/O displaced tibia fracture, to assess PSA prior & after = FLACC

Final | Pain scale in children = FLACC

Final25 | 6 M/O irritable, what method to know pain score = FLACC Scale (Not Face nor Visual pain scale nor pain scale)

- Post PSA Safe Discharge

- o Vitally Stable, Return to Baseline LOC, Adequate Head control, Patent Airway, Maintained Muscle tone
- o No Pain, No N/V, Adequate Hydration (Tolerating PO Fluids)

PEM R | 15 M/O laceration repair under 60min procedural sedation, now sitting up unassisted watching movie, best next to do before safely discharge from ED = Give her some oral fluids to drink

PEM R | 7 M/O infant completed PSA for I&D for buttock abscess, 20min later, vitally stable, sleeping & after stimulation still falls back to sleep, best course = Observe till has head control & airway patency

- PSA Complications

- o Respiratory Depression
 - 2 Periods of Risk:
 - First 5-10min from induction
 - During immediate post procedure period when painful stimuli ceased
- o Apnea = 1st BVM (to provide PPV)

PEM R | 8 Y/O undergoing sedation for reduction, sudden apnea, no resp. Effort put oral airway + o2 w/ non-rebreather then no effort still, then jaw thrust w/ non-rebreather w/ self inflating BVM, PPV given w/ adequate chest rise for 2 min then spontaneous respiration, 1st step in resus = BVM Ventilation (Imp for Apnea, Jaw thrust, Oral airway can help)

PEM R | 3 Y/O girl, she is for MRI orbit, needs sedation, what helpful in early detection of adverse event = EtCO2

- o Hypoventilation in EtCO2 (high number) | Hypoxemia in SpO2 (low number)

PEM R | Highest risk for PSA complication = Pierre robin sequence

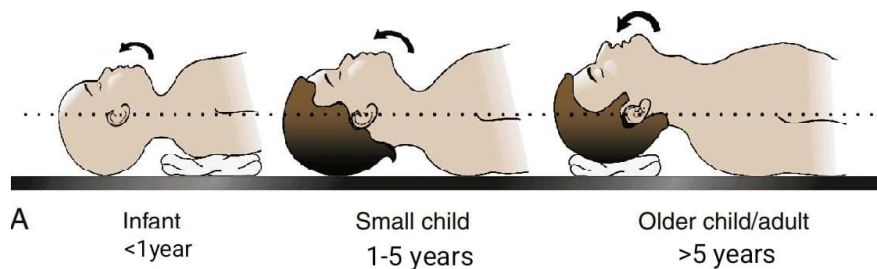
PEM R | 14 Y/O on Risperidone & Clonazepam having fracture needing reduction, PSA used Fenta & Midaz, now apneic, BVM, you decide to reverse the med in order to treat complication, to give = Naloxone alone then discharge in 4hr if stable

- o Flumazenil not given if pt is on chronic Benzo use
- o Naloxone Side effects: HTN, Ventricular tachydysrhythmia, Cardiac arrest, Pulmonary edema, Agitation, N/V

Chapter 1: Resus

RSI

- RSI (7Ps): Preparation > Pre-Oxygenation > Pretreatment > Positioning > Paralysis > Placement of tube > Post care
 - Preparation: SOAP ME (Suction, O₂, Airway, Positioning, Monitor, EtCO₂)
 - Pre-Oxygenation: Ensure 100% SpO₂
 - Pretreatment
 - Atropine: in < 1 Y/O prevent Bradycardia
 - Lidocaine: Blunt gag reflex (Might help in not increasing ICP in Head Trauma)
 - Paralysis
 - Sedatives: Etomidate, Ketamine
 - Paralytics: Succinylcholine, Rocuronium
 - Positioning
 - Sniffing position
 - Criteria:
 - Horizontal Glabella to Chin
 - Open/Wide Neck
 - Horizontal Ear to Suprasternal notch
 - Depending on age, follow the steps, checking after each if the criteria are met
 - Use these steps to Achieve Sniffing position criteria
 - Infant/Toddler (< 5 Y/O) = Shoulder roll
 1. Align
 2. Use Shoulder roll
 3. Try Headrest
 - Older Child (> 5 Y/O) = Headrest
 1. Align
 2. Use Headrest
 3. Try Shoulder roll
 - Placement of tube
 - Post-Intubation care
 - EtO₂ Confirming tube:
 - Best confirmation: EtCO₂, Capnography, CO₂ waveform
 - Other: Chest rise, Pulse O₂, CXR, Tube fogging (least specific)
 - Ventilator settings
 - Sedation infusions
 - Absolute RSI Contraindication:
 - Hx of Allergy to induction drugs
 - Unconscious
 - Difficult Airway



Chapter 1: Resus

PEM R | 15 Y/O in ambulance vomiting & unresponsive in bedroom after school, GCS 6 HR 48 RR 8 SpO2% 82% then 18-20 & SpO2 92%, having gurgling sounds, but good chest movement by assisted ventilation (BVM), best next step = Prepare meds & equipment for RSI

PEM R | 14 M/O triplet 29 weeker, Hx of TOF & SZ, concern of breakthrough SZ, given IN Mida by family then Mida again by EMS & became apneic and needed BMV, trial of Intubation by EMS w/ 3.5 ETT given Fenta/Roc but unsuccessful due to "anterior airway", in ED Temp 37.9 HR 165 RR 20 BP 90/62 SpO2 76%, pt. Diffuse coarse diminished breath sound bilaterally w/ poor chest rise, no secretions, Next step = Initiate 2 person mask ventilation (Pre-Oxygenation)

PEM R | 8 Y/O Status Epi w/ RF, attempt of intubation without success, what to recommend prior to 2nd attempt, to achieve ideal position = place towel under occiput, extend neck (Sniffing position)

Promo | Facial trauma, upper lip laceration planned for intubation give (Incomplete Q) = Oral tube Fenta & Midaz or Nasal tube

Promo | 18 M/O Healthy w/ Head Injury, decided to intubate, medications to use = Atropine, Etomidate, Sux

Promo | 18 M/O Head trauma, RSI = Atropine, Etomidate, Succinylcholine (Not Atropine, Ketamine, Sux)

Promo | Pt. Clenched jaw, you will intubate = Ketamine, Sux (Not Etomidate, Sux nor RSI without Meds)

Promo | RSI for Status Epilepticus = Ketamine (Not Fosphenytoin)

Promo | True consequence of RSI = O2, Atropine, Thiopental, Succinylcholine (RSI steps)

Promo | 6 Y/O w/ Multiple Trauma including Head/Face, you want to intubate, one of the following is an absolute contraindication for RSI = Distorted Facial trauma & Compromised Airway (Difficult airway)

Final x2 | Patient w/ Fever for 3 days, Vomiting & Diarrhea, Severe dehydration What is best for RSI = Etomidate, succinylcholine (Not Ketamine, propofol nor Propofol, rocuronium nor Thiopental, rocuronium)

- This Q asks for RSI, Eto & Sux (although patient febrile) might be the best option
 - Etomidate has good hemodynamics but relative contraindication is w/ Sepsis/Septic shock
- Ketamine, Propofol (although might be good option) but both are sedative agents
 - Propofol will cause hypotension (especially in this dehydrated patient)
 - Ketamine causes hypertension (some say they might equal each other but the Q clearly wants RSI meds)

Final | Patient w/ Hx of Fever for 3 days, Now Vomiting/Diarrhea, Severe dehydration, Best for RSI = Etomidate, Sux (Not septic)

Sedation Medications

- Sedation Meds Contraindications

- Psychosis = Ketamine
- Egg/Soy Allergy = Propofol
- Trapped gas (Pneumothorax) = N2O

- Sedation Meds Side effects (Most common)

- Ketamine = Laryngospasm
- Fentanyl = Face/Jaw/Chest wall Rigidity
- Etomidate = Myoclonic jerks, Adrenal crisis (Avoid in Sepsis/Septic shock)
- Propofol = Hypotension
- Nitric Oxide = Vomiting
- Dexmedetomidine = Low HR, Low BP, Normal RR, Fever
- Midazolam = Paradoxical Agitation (in extreme of ages -infants & elderly)
- Chloral hydrate = Agitation

Chapter 1: Resus

- Cardiomyopathy Sedation

- Dilated Cardiomyopathy = Ketamine
- Hypertrophic Cardiomyopathy = Etomidate

Promo | 4 Y/O w/ Hx of **Dilated Cardiomyopathy** w/ 1 day Fever, difficult to breathe, ill/RD/Decrease mental state/Poor perfusion concerning for shock, decided to ETT as you prepare BP drops to 60/30, given 10 ml/kg IV Crystalloid w/ no change in BP in addition to NM blockers which best med for sedating this pt. For intubation = Ketamine (Not Etomidate nor Mida)

Final | case of Dilated cardiomyopathy, hypotensive what is the best RSI = Ketamine

Final | case of Hypertrophic cardiomyopathy, hypotensive what is the best RSI = Etomidate (No/less strain on heart)

Final | HOCM, Hypotensive about to arrest best = Etomidate (Not Ketamine)

Final | Hypertrophic cardiomyopathy hypotensive for sedation = Etomidate

Final | Dilated cardiomyopathy w/ Low BP need RSI option = Ketamine

- NM Blockers

- Sux [**Good** = Rapid/Short | **Bad** = NM Atrophy/Mitochondrial/Burn/Crush/Rhabdomyo | Elimination = Liver]
 - Contraindication
 - Malignant hyperthermia
 - Neuromuscular diseases (DMD/BMD, SMA, ALS, Muscular dystrophy): Risk indefinite*
 - Guillain-Barré Syndrome
 - Severe Burns (~ >10% BSA): Risk After 5 days* or after 24-48hr** > until healed
 - Crush Injury: Risk After 5 days* > until healed
 - Denervation (stroke, spinal cord injury): Risk After 5 days* > to 6 months
 - Intra-abdominal sepsis: Risk After 5 days* > until infection resolves
 - * as per Rosen | ** as per AccessAnesthesiology
 - Reduce dose: Hypothyroidism, Organophosphate poisoning, Eaton-Lambert Syndrome
 - Increase dose: Myasthenia Gravis (need more dose but lasts longer)
- Cisa [**Good** = Liver/Renal Failure | **Bad** = ? | Elimination = Hoffman]
- Roc [**Good** = Antidote | **Bad** = Long/Malignant Hyperthermia | Elimination = Renal]
 - Rocuronium Antidote = Sugammadex

PEM R | 13 M/O FT doesn't set independently yet, w/ Truncal Ataxia, comes w. 4 days rhinorrhea/cough/lethargy/RD Temp 38.4 HR 155 RR 75 BP 90/55 SpO2 82%, after suctioning/repositioning & non-rebreather still SpO2 88% w/ intermittent apnea, proceeding for RSI, Contraindicated med = Succinylcholine

PEM R | 13 M/O FT, 4 day Hx of Rhinorrhea/Cough/Lethargy/RD, HR 155 RR 75 BP 90/55 SpO2 82% Temp 38.4, doesn't yet set independently & having truncal ataxia, after suction/reposition/application Non-rebreather FM, SpO2 88%, intermittent apnea, team decided RSI, med contraindicated = Sux (Succinylcholine Contraindications -High K > VTach > Death-)

PEM R | 8 M/O lethargy RD, 3 days rhinorrhea, wet cough Hx of **gross motor delay**, RSI established w/ atropine/etomidate/succinylcholine, shortly after intubation pt SpO2 was stable on 90% then abruptly lost, w/ QRS complex wide then HR slows then arrest = Rapid change in serum electrolytes

PEM R | 12 Y/O code blue for RSI, appropriate reason to use Roc rather than Sux = Has progressive gait difficult & wheelchair use

Promo | Intubated pt. On hand ventilation on scene with Rocuronium during transportation O2 tank went out, advice = Reverse Rocuronium w/ Sugammadex

Amal | Succinylcholine is a paralytic agent used frequently in the emergency department. Which of the following statements is true in regards to it = One of its side effects, is the release of histamine (Not Competitive non depolarizing paralytic agent nor not effective in organophosphate toxicity -use lower doses- nor contraindicated in cases of myasthenia gravis -use higher doses-)

Amal | Which of the following is true regarding hyperkalemia in succinylcholine use = Use with caution in those with known hyperkalemia (Not Usually causes severe hyperkalemia shortly in those with burn or trauma or Increases serum potassium more than 0.5 mEq/L or Contraindicated in renal failure patients or It can my occur with neuromuscular blockers agents)

- Sux increases K by around 0.5 mEq/L not more

Chapter 1: Resus

- Ketamine [**Good** = Asthma/HD Unstable | **Bad** = ↑ Secretions/HTN/Laryngospasm]
 - o Sedative/Dissociative/Amnestic/Analgesic/Bronchodilator
 - o Safe for use > 3 M/O
 - o Doses:
 - IV Onset 10-30 sec, Duration of Action 5-15 min
 - IM Onset 4-10 min, Duration of Action 15-30 min
 - Additional doses can be given w/o significant cumulative effects!
 - o Laryngospasm Tx: Open airway w/ Larson pouch > Bagging > Sux > Intubation

PEM R | For PSA given Ketorolac 2 hr ago for analgesia, he is set for ketamine, what appropriate action to perform prior to ketamine = Test BVM & supplement O2

PEM R | 7 Y/O girl wrist deformity, Single agent PSA = Ketamine

PEM R | Adolescent male w/ gluteal mass red/painful for incision & drainage under PSA, best single med = Ketamine

PEM R | 4 Y/O status asthma in RD given Albuterol/Ipratropium/Systemic steroid/Magnesium/Terbutaline, now patient need higher treatment & intubation, med to use = Ketamine

PEM R | (for above Q) pt will stay for awhile till PICU transfer, when is additional dose needed = 5-15min

PEM R | 6 Y/O for I&D, Ketamine IV 1 mg/kg, duration of dissociative effect = 10-15min

PEM R | 7 Y/O has fracture for reduction given ketamine, 2min after having chest wall movement but no aeration upon auscultation, SpO2 97%, which action appropriate now = Perform head tilt jaw thrust

- o Initial step head tilt jaw thrust if not improved then this is Laryngospasm so do BVM

Promo x2 | Known side effect of Ketamine = Laryngospasm

Promo x2 | PSA for closed reduction by Ortho, given Ketamine and after reduction done patient started to have shallow breath & no air entry (Pic of Laryngospasm), what to do = Give smooth continues Positive Pressure (Not Succinylcholine)

Promo | Post Ketamine sedation low O2, retraction w/ no air entry given O2 & changed position but didn't improve, Next = BVM

Promo | 6 Y/O known BA, presenting w/ Trauma, decided to intubate, Best Induction to use = Ketamine

Amal | Your asthmatic patient is deteriorating, you are planning for intubation, which is true = Ketamine is preferred induction agent (Not Vent settings should aim to achieve mild hypocapnia or NM blocking agent increase o2 consumption or Hypotension during ventilation should be managed by vasopressors agents)

Amal | During procedural sedation using Ketamine + midazolam a 10 years old developed stridor and decrease in air entry SpO2 89% not improving w/ O2 FM, Tx = PPV (Not IV sux nor Racemic Epi nor Intubation)

Amal | 4 Y/O, fall on concrete sidewalk, in pain, deformity of 2nd MCP, X-ray posterior dislocation of joint, what med to use for sedation for reduction = Ketamine

Amal | Your asthmatic patient is deteriorating, you are planning for intubation, true = Ketamine is preferred induction agent

Amal | Which of the following RSI meds is not matched with side effect = Ketamine = Bronchospasm

Final | Asthma came severe exacerbation and hypoxia you want to do RSI you give him ketamine then he develops laryngospasm what to do = Bag (Open airway w/ Larson pouch > Bagging > Sux > Intubation)

Final | 8 M/O with Bronchiolitis and there's scattered wheezes and require sedation for laceration = Ketamine (Not Midazolam)

Final | 10 M/O w/ laceration, for procedural sedation she has bronchiolitis, wheezy chest, best agent = Ketamine

Final25 | 8 M/O need procedural sedation for laceration and he had picture of bronchiolitis, to give = Ketamine

- Etomidate [**Good** = Rapid, High ICP/HD Unstable/Status Epileptics | **Bad** = Septic Shock/Adrenal Insufficiency]
 - o Contraindicated in Septic Shock
 - o Side effects: Infants: Decrease Serum cortisol > Risk of Adrenal Insufficiency

PEM R | 8 Y/O fell down several stairs, immobilized in C-Collar/Backboard, has Rt. LL obvious deformity in thigh, GCS 8 HR 155 RR 16 BP 70/40 SpO2 91%, Bolus NS given & for intubation, drug to use = Etomidate

PEM R | 4 Y/O dilated cardiomyopathy, 1 day fever & difficult breath, **Febrile**/ill/RD/Decrease verbal state, intubating, **BP drops 60/30** given 10 ml/kg crystalloid no change, in addition to NM blocker, best meds to sedate = Ketamine (Not Etomidate)

- o Etomidate = not to give in sepsis
- o Propofol/Midazolam = not to give in HD unstable

Chapter 1: Resus

PEM R | 9 Y/O Hx of Pontine Glioma & shunted hydrocephalus, Temp 36.8 HR 75 RR 18 SpO2 98%, BP 116/68, neuro ex rt. Side weakness, rt. Facial hemiparesis, **ataxic gait**, after NS bolus & Zofran had Rt. Sided SZ, repeat VS HR 62 RR 10 SpO2 92% BP 136/88, appropriate Med for intubation = IV Etomidate & Rocuronium (Not IV Ketamine & Rocuronium nor IV Lidocaine & Propofol nor IV Lidocaine & Rocuronium)

Promo | 7 Y/O victim of MVA w/ Head trauma, GCS 7, Medication appropriate in RSI = Etomidate (Not Fentanyl nor Ketamine)

Amal | Etomidate in Septic Shock = Suppress endogenous cortisol production (Not Contraindicated in hypotensive patient)

- **Midazolam** [**Good** = Benzo For Everyone/Status Epileptics | **Bad** = Hypotension]
 - o Reversal is Flumazenil
 - o Side effects: **Paradoxical Agitation**/Excitation w/ Midazolam, resolves within 20min

PEM R | 2 Y/O girl sedation for radio, becomes Apneic & Hypotensive, appropriate reversal agent given, which sedative was given = Midazolam

PEM R | 4 Y/O CAH 21 hydroxylase, 2 day N/V and diarrhea, somnolent, minimal responsive, cyanotic, Temp 37.4 HR 165 RR 50 SpO2 83% BP 80/46, Intubated w/ Fenta/**Midaz**/Roc, **post intubation BP dropped to 65/35**, (XR shows tube in good place), cause of hypotension = IV Midaz

PEM R | 5 Y/O girl facial laceration, appears anxious, for laceration repair, given IV midaz, and after repair awakens uncooperative/agitated/cry inconsolable, HR 150 RR 38 BP 100/80 SpO2 97% on RA, appropriate = Provide supportive care only

PEM R | 17 Y/O known schizophrenia, egg allergy, has Rt. Forearm fracture & NV compromise, & has Rt sided apical 5% pneumothorax, No systemic, IV Fentanyl & unsuccessful reduction attempt, adding which is appropriate = Midazolam IV

Final | Intranasal Midaz, correct = Nasal secretion will affect absorption

Final | Intranasal midazolam = Intranasal secretions can affect absorption

- o Contraindications of Intranasal = Facial trauma or URTI

Final | Child w/ significant head trauma, given midaz sedation for CT brain, after procedure woke up agitated, give = Supportive

Final | Child given midazolam then developed agitation, vitally stable what to do = Supportive

Final | Pt. Received Midazolam then agitated then return to normal = supportive

- **Fentanyl** [**Good** = Opioid | **Bad** = Wooden chest]
 - o Analgesic/Mild Sedative (not used alone), IV/IM/Intranasal
 - Intranasal advantages: Short onset, Fast Absorption, No First-pass metabolism, Less noxious delivery
 - o Side effects: Face/Trunk Rigidity, Common: Facial pruritus/nasal itching
 - Wooden Chest Syndrome (Resp. Depression)
 - Risk: If given rapid infusion of smaller doses or > 15mcg/kg or infant
 - Tx: BVM > Intubate
 - Rare if combined w/ Midaz = Hypotension (less in children)

PEM R | 16 Y/O male, elbow dislocation w/ NV compromise, 20min prior to arrival given 4mg morphine IV, Now you will give IV midaz & Fenta, adjustment to your sedation plan = Give Initial dose fentanyl at 1 mcg/kg

- o Benzo & Opioid = Synergetic effect = Might cause respiratory depression (Apnea)

PEM R | 3 Y/O given PSA then suddenly has chest wall stiffness, unable to ventilate him w/ BVM = Fentanyl

PEM R | 8 Y/O sustained open Fr. EMS calls unable to establish IV line & order for analgesia, pre-hospital pain Management med to give = Intranasal Fentanyl

PEM R | 3 Y/O PSA, using Midaz or Fenta, likely side effect = Facial pruritus

Promo | Agent to cause Face & Truncal rigidity = Fentanyl or Ketamine (Laryngospasm) or Etomidate or Propofol (Low BP)

Amal | Which of the following sedation cause truncal and jaw muscle rigidity = Fentanyl

Final | Child with fracture in pain = IM fentanyl

Final | Which agent causes Face/Truncal rigidity = Fentanyl

Final25 | Trauma case with multiple long bone fracture and abdominal pain or tenderness. "Waddle triad" asking about pain management = IV Fentanyl (Not IV Ketamine nor IV Propofol nor IV Midaz)

Chapter 1: Resus

- Propofol [Good = For Everyone | Bad = Hypotension/Apnea]
 - o Short Sedative, w/ high metabolism/extraction rates by Liver & Kidney
 - o AVOID use in egg allergy
 - o Side effects: Hypotension, Desaturation
 - Apnea (By Airway obstruction), During Induction phase: Central Apnea
 - PRIS (Propofol-Related Infusion Syndrome) due to high dose long term infusion

PEM R | 4 Y/O girl for sedation for emergent MRI, prev. Healthy, NP, family inquire potential risks of propofol, likely to occur during sedation = Desaturation (Not vomiting nor laryngospasm nor airway obstruction (Desat. 1.5 times > Airway obstruction)

PEM R | Adolescent claustrophobic prepped for MRI under deep sedation w/ Propofol anticipated duration 2 hours, so Loading Propofol then continues infusion w/ syringe pump, at which point is the greatest risk for Apnea = Induction phase

PEM R | 17 Y/O male, trips/fall w/ elbow dislocation, EMS give 4mg IV morphine & pain 4/10, PSA infusion doses, decision to utilize continuous propofol, what side effect = Hypotension

PEM R | 17 Y/O shoulder dislocation for PSA, IV morphine by EMS, parent want PSA agent that will prevent/minimize side effects of emesis as previously happened, which sedative appropriate = Propofol

- o Ketofol (Ketamine/Propofol) useful for Analgesia & Sedation

PEM R | 17 Y/O male 3 doses of IV morphine given while waiting for reduction of anterior shoulder dislocation, x2 attempts failed, you gave IV propofol, what Capnography illustrating respiratory complication = Increasing plateau due to hypoventilation causing Hypercarbia

- Chloral Hydrate
 - o Not reliable < 3 Y/O
 - o Onset 10-20 min for 4-8hr
 - o Hypnotic Sedative, PO/Rectal
 - o Side Effects For Hours: Paradoxical Hyperactivity/Excitement, Neuropsychiatric effects (Agitation, Hallucination)

PEM R | 2 Y/O girl has UTI parents insist on sedation to do Urine Cath., patient were agitated throughout procedure then 8hr later father calls to tell you the patient remained hyperactive & agitated, likely medication given = Chloral Hydrate

Final | Chloral hydrate side effect = Long action

- Nitrous Oxide
 - o Sedative/Dissociative/Amnestic, Inhaled Short w/ Protective reflexes intact (Gag/Cough) during sedation
 - o Very high chance of vomiting in Children (PSA 10% in GA 49-60%)
 - o Contraindication: Pneumothorax Bowel obstruction, OM, ciTBI, around pregnant

PEM R | 7 Y/O boy zipper entrapment on penis, ate plate of cake & ice cream 30min ago, procedure will be painful, what med to use = Nitrous Oxide (Not Fentanyl nor Ketamine)

Final | Nitrous side effect = Emesis

Final | Nitric oxide side effect = Emesis

Final | Side effect of Nitro (N2O) = Vomit

Final | Nitric oxide can't cause side effect of = BP instability (but causes N/V)

- Dexmedetomidine
 - o Sedative/Anxiolytic/Analgesic, Selective Alpha 2 Agonist, Inhaled/Intranasal w/ Preserve respiratory drive
 - o Alpha 2 adrenergic, Like Clonidine
 - o Side effect: Low HR, Low BP, N/V, Fever

PEM R | 15 Y/O injured Lt arm during match, w/ palpable anterior shoulder prominence, Hx of intense fear of needles & wouldn't let nurse put IV, Best next medication during procedure = Dexmedetomidine

Chapter 1: Resus

Final | Dexmedetomidine = Normal RR, Low HR & BP

Final | Dexmedetomidine side effect: = Low HR & BP and normal RR

- Codeine Oxide

- Analgesic on Opiate receptor metabolized by Cytochrome P450
- Contraindicated in all < 18 Y/O, Causes Respiratory Depression (Opioidergic effects)
- Side effects: Certain ppl have CYP2D6 duplication gene > Ultra-fast metabolism
> Exaggerated Opioidergic effects

PEM R | 11 Y/O unresponsive/cyanotic at home admitted/intubated to PICU Hx of prior day extraction of several teeth, and medication given post OP, med to cause this = Codeine (Not Lidocaine or Chlorhexidine oral rinse)

- Sucrose

- 25% Sucrose PO, Effective analgesia for < 6 M/O, Given Multiple doses or Continues via Pacifier
NO Side effects

PEM R | 3 W/O for LP to use as best choice for ongoing analgesia during procedure = Sucrose solution Orally

Final | Best analgesia for LP in infant = Sucrose

Turki
Bukhari's
Notes

Chapter 1: Resus

Local Sedation

- Local Anesthesia

Local Anesthesia Doses	Max No Epi	Max w/ Epi
Lidocaine	5 mg/kg	7 mg/kg
Lidocaine 1% (10mg/ml)	0.5 ml/kg	0.7 ml/kg
Lidocaine 2% (20mg/ml)	0.25 ml/kg	0.35 ml/kg
Bupivacaine	2 mg/kg	3 mg/kg
Bupivacaine 0.25% (2.5mg/ml)	0.8 ml/kg	1.2 ml/kg

o Dose Adjustments

- < 6 M/O = Reduce Max dose to 30% less
- Reducing pain of lidocaine infiltration:
 - Warm/buffer lidocaine w/ NaHCO₃
 - Do not let the child see the needle
 - Use Long/Small needle
 - Inject at devitalized tissue, Inject slowly
 - Rub skin around injection site before application, Wait for effect

o Lidocaine Side effects: SZ, Arrhythmia, Transient Neuropathic symptoms

PEM R | 5 Y/O girl 20kg, long laceration on forearm, local anesthesia will be 1% Lidocaine, maximum volume to put in syringe for safe infiltration = 10ml syringe

PEM R | 6 Y/O 20 kg for Lidocaine 1% w/ Epi, max dose = 14mL

PEM R | 18 M/O boy, 12.5 kg having multiple laceration on fingers at right hand, Max volume of 0.25% Bupivacaine without epi (rounded nearest 0.5ml) safe SC infiltration = 10ml

Promo | Giving local anesthesia for suture, weight is 40kg, max to give = 2% 10ml Lidocaine (Not 1% 10ml Lidocaine nor 100mg Bupivacaine nor 100mg lidocaine & epi)

Promo | Max dose of Lidocaine 1% w/ Epi in 20kg = 14ml (should be 10)

Amal | 20 kg child with large laceration in forehead, you wanted to do local anesthesia to repair the wound by using epinephrine 1% + lidocaine, what's the maximum safe dose = 14 ml

Amal | Which of the following is true about high ICP due to Laryngoscopy = Lidocaine IV can blunt ICP response

Final | 7 Y/O cut glass, large laceration max lidocaine 1% w/ epinephrine, weight 20kg = 14 ml

- Local Anesthesia (Lidocaine) Toxicity

- o Path: Local Anesthesia > Sodium channel blocker > CNS/CVS Toxicity
- o Sx: SZ and/or Wide QRS
- o Tx:
 - CVS Toxicity + SZ = Intra-Lipid emulsion (Bolus then Infusion)
 - No CVS Toxicity + SZ = Benzo

PEM R | 4 Y/O Femur Fr., for Regional Fascia-iliac N. Block, after local anesthesia given immediately has self-limited 1min Tonic Clonic SZ w/ Tachycardia, to give = Fat Emulsion (Intra-Lipid)

PEM R | 2 Y/O 12kg, crush Lt long finger w/ laceration to nailbed extending on either side of nailbed, underlying phalanx fracture, ketamine 1mg/kg prepared diluted in NS for IV injection while 10ml Bupivacaine for digital block, now unresponsive w/ wide complex tachycardia & hypotension, IV agent most likely reverse this event = Lipid emulsion 20% 1.5ml/kg

- o Local anesthesia toxicity = CVS toxicity (Wide complex tachycardia) = Lipid emulsion 20% 1.5 ml/kg

Promo | Resident doing sutures for patient laceration under local anesthesia suddenly developed SZ w/ wide QRS complex

Chapter 1: Resus

Tachycardia, How to stop SZ = Intra-Lipid Emulsion (unsure if not: Lorazepam)

Amal | Which of the following drugs should be used for local anesthesia for a child who is allergic to Lidocaine = Procaine

- If Allergy to local anesthesia
- Another drug > different Amides or Esters > Diphenhydramine has local anesthetic effect
- Amides = 2 ii | Esters = 1 i

- Topical Anesthesia

- Types
 - Xylocaine spray 10% Each spray has 10mg (usually 2-3 sprays)
 - (for dental) apply then wait
 - Liposomal Lidocaine 4% Cream or EMLA (2.5% of Lidocaine & Prilocaine)
 - Onset 20-30min
 - For Intact skin (LP, Venipuncture)
 - LET Gel (4% Lidocaine, 0.1% Epi, 0.5% Tetracaine)
 - Disrupted skin (laceration)
- Usage
 - **Intact** skin:
 - < 3 M/O = 4% Liposomal Lidocaine
 - > 3 M/O = EMLA (2.5% of Lidocaine & Prilocaine)
 - **Lacerated** skin:
 - LET Gel
- Complication: Methemoglobinemia

PEM R | 3 yo infant w/ fever indicated for LP father given consent but request to wait 30 min till mother at the child bedside, best next step for analgesia = Apply 4% Liposomal lidocaine cream to Lumber area (intact skin)

PEM R | 4 Y/O 1.5 cm linear non-gaping laceration on forehead w/o bleed, best repair to minimize scarring & pain = Topical LET, Irrigation, Skin Adhesive application (disturbed skin)

PEM R | 4 Y/O Boy, laceration forehead what topical you will give = LET

PEM R | 18 M/O girl Dehydrated & father wants sedation before IV, what will help = Topical Anesthesia

- Regional Cheek & Lip block

- Upper Lip = Infraorbital N. (Trigeminal branch v2 distribution)
- Lower Lip = Mental N. (Trigeminal branch v3 distribution)

PEM R | 8 Y/O family dog bite when she tried to kiss it, family prefer repair without sedation, best analgesia while preserving landmarks for repair = Injection 1% lidocaine in Sulci between lip & gingival along mid-pupillary line of affected side

PEM R | 12 Y/O w/ 3cm laceration of Rt. Cheek, want to do N. Block by lidocaine for repair, where = Midline face below infraorbital ridge

Promo x2 | 5 Y/O, Fell down sustaining laceration on Lower lip, extending to vermilion border, true statement = Mental N. block will provide Regional Anesthesia (Lower lip) or Infraorbital N. Block will provide Regional Anesthesia (Upper lip)

Amal | 5 Y/O boy has lacerated his lower lip involving vermilion boarder in order to repair the laceration sedation is = Mental nerve block

Final | Upper lip laceration involving vermilion border, Nerve block = Infraorbital

Final | Laceration in the middle cheek for repair what is the nerve block = Infraorbital

Final | Cheek Laceration analgesia option = Infraorbital N. Block

Final | Lip laceration = Infraorbital N. Block

Final25 | Upper lip laceration for Infraorbital block proper approach = External skin but aiming infraorbital foramen canal and go deep (Not Directly on the wound nor Intraoral above canine aiming infraorbital and inject submucosal)

Chapter 1: Resus

- Regional Digital Nerve block

- o Palmar side at wrist = Median N. & Ulnar N. | Dorsal side = Superficial Radial N. & Ulnar N.

PEM R | Upper lip laceration, best technique for facial anesthesia = Above canine tooth aiming toward infraorbital foramen on side of injury

Promo | Hand Laceration Picture of (? snuff box) which nerve to block = Radial N. At wrist or Median N. At wrist or Ulnar N.

Promo | cut wound in dorsal hand web space, to do Nerve block for = Radius N.

Final | Pic of Distal phalanx trauma with nail bed injury, how to nerve block = Dorsal and palmar digital block (Not Radial block at wrist nor Local infiltration nor Metacarpal nerve block)

- Regional Foot Nerve block

- o Superficial Peroneal N. = Dorsal
- o Deep Peroneal/ N. = 1st web space
- o Posterior Tibial N. = Planter/Sole
- o Sural N. = Lateral
- o Saphenous N. = Medial

Final | Foot planter laceration, tendon intact, NV intact, regional nerve block = Sural N. (Not Posterior popliteal nor Deep Popliteal)

- o Not a choice but answer is Posterior Tibial N.

Final | Nerve block = Sural nerve

- Regional Wrist Nerve block

- o Median N. = Radial border of Palmaris longus
- o Ulnar N. = Radial border of Flexor Carpi Ulnaris
- o Radial N. = Dorsal at wrist

PEM R | 14 Y/O hand laceration want to do regional nerve block (image targeting palmaris longus) what area injured = Palmar aspect of thumb & index finger (Median N.)

PEM R | 11 Y/O boy 3cm laceration of palmar aspect of 5th digit finger, No FB, moves all digit w/ normal sensation, landmark for anesthesia = Radial border of flexor carpi ulnaris (Ulnar N.)

PEM R | 17 Y/O laceration on Lt hand no NV deficit, regional nerve block (image of laceration at dorsal side of hand) = Radial nerve block at wrist (Radial N.)

Final | Radial nerve block

Final | Hand Laceration = Radial N. Block (?)

Final | Ulnar nerve (wrist flexion and abduction/adduction of fingers)

MEDICAL

Urgent Care

Symptoms based

- Benign paroxysmal positional vertigo
 - o Tx: Diphenhydramine

Promo | 3 Y/O girl, playing in school started to become dizzy then fell on ground for sometime, then LoC then she woke up, No current illness & prev. Healthy, Ex unremarkable, Most likely Dx = Benign paroxysmal vertigo (Not Acute cerebellar ataxia nor Meniere disease or Labyrinthitis)

Amal | 3 Y/O boy being acutely dizzy at playground and suddenly difficulty keeping balance and scared to move, and had LOC, he seems to have improvement in the way to ED, examination were normal, most likely diagnosis is = Benign paroxysmal vertigo

- Repeat Ex

Amal | 3 Y/O boy w/ Fever, mother says Temp 39.5, clear nose secretion, and cough. While you are evaluating him in ER, he is eating ice chips while setting in ED, HR 140, BP 110/60, RR30, pulses strong throughout Coarse breath sounds, cap refill 3-4 seconds in hands, 2 seconds in lower limbs. Best management = Repeat exam while patient is supine and hands are warm

- Fever

Promo | 9 W/O Felt warm by parents otherwise asymptomatic, vitally stable, Next = Discharge w/ F/U (Not Rectal Temp Q4hr)

Promo | 10 D/O, Hx of Fever 39 in ED, Father hurrying & want to go home due to worrying his might get infected from ED, what to do = Full sepsis workup & Abx (Not Partial sepsis & F/U 24hr nor Discharge Pt.)

Promo | Days old, Mother felt baby warm at home but not documented, in ED Vitally stable w/ 37.6 & Feeding well, Next = Discharge after reassurance (Not Full sepsis nor Partial sepsis nor Serial examination in ED for 6hr)

Promo | 9 W/O came w/ Hx of Flu Sx & Temp 38 in ED, Next = Partial sepsis if Low F/U after 24hr (Not Full sepsis nor D/C)

Promo | High risk of Sepsis = WBC 5-15 or looking well or UA > 20 no bacteria or ??? (Incomplete Q)

- o Low Risk: WBC 5-15, ANC < 1.5, UA < 10, Neg. Leukocytes & Nitrites

Promo | 37 M/O Boy appears well w/ Hx of Fever for 1 day, Temp 38.9, No focus of infection by Ex, Next step = Nothing (Not Blood/Urine C/S nor Urinalysis/Urine C/S nor Septic workup & Abx)

Amal | 37 M/O child, well appearing, came to ED with history of fever 38.9 for 1 day, He is well looking, no focus for the fever what should you do to help you reach the Dx = No investigation (Not Urine analysis & culture nor Complete sepsis workup)

- o Febrile without focus = Urinalysis, Dipstick, Urine C/S
 - < 2 Y/O Female
 - < 1 Y/O Male uncircumcised
 - < 6 M/O Male circumcised

Amal | 19 D/O boy w/ RD & RSV positive, Temp 39 RR 60, Best Tx = Full sepsis w/ Abx & Admission (Not Admit for observation nor partial sepsis workup nor full sepsis & admission without starting Abx)

Amal | Which of the following signs and symptoms is most common in children with seasonal influenza = Fever (Not Rhinorrhea)

Amal | 2 W/O baby w/ fever 39 & poor feeding, poor tone, grey skin, Vitals: HR 200 RR 80 SpO2 92%, on oxygen. IV placed, labs taken and urine, which management plan is indicated = Antibiotics then LP (Not LP followed by antibiotics nor Antibiotics and latex nor Antibiotics without LP)

Chapter 2: Medical

- BRUE (Brief Resolved Unexplained Event)

- Definition: $< 1 \text{ Y/O} + \geq 1$ of:
 - Altered level of responsiveness
 - Decrease/Absent Respiration
 - Cyanosis/Pallor (Centrally blue/purple/pale)
 - Hypo/Hypertonia
- Low Risk Criteria = Discharge
 - **< 60 seconds**
 - **> 60 D/O** (for Term)
 - **> 90 D/O** (for Preterm: Gestational age ≥ 32 wks & Postconceptional age/Corrected age ≥ 45 wks)
 - **NO CPR** by medically trained
 - **NO Concern** Hx/Ex
- High Risk (opposite to any of the above) = Admit

PEM R | 25 D/O decreased responsiveness an hour ago, Hx of cough/red face and stopped breath for 30 sec limp, mother picked him up & stimulated the baby then started crying & acting at baseline since incident, Next step = Allow mom to keep Ad lip feeding & admit to hospital for monitoring overnight

PEM R | 65 D/O, 2 episodes of choke/gasp/pale was frightening to mother & grandmother, occurred at night, episode resolved within 30sec after mother blow at infant face, gaining weight on formula feed, good tone, normal skin, normal CVS, abdomen exam, Tx = D/C w/ OPD & CPR training

Promo | BRUE High risk = Age less than 60 days

Table 1. Detailed Definition of the Terms in BRUE¹

Term	Definition/Features
Brief	The event must have lasted < 1 minute.⁷
Resolved	The patient must have returned to their baseline state of health after the event, with normal vital signs and normal appearance.
Unexplained	There is no explanation for a qualifying event after conducting an appropriate history and physical examination. Specifically, it was not consistent with an identifiable medical condition (eg, gastroesophageal reflux, swallow dysfunction, nasal congestion, congenital abnormality, or trauma). In determining the "unexplained" nature of the event, there are many historical and physical examination features that must be considered in the evaluation of a potential BRUE.¹ (See Table 3, page 5.)
Event	- Only central cyanosis and central pallor qualify, with blue, purple, or pale coloration of the face or trunk. Acrocyanosis, perioral cyanosis, and rubor are considered more benign and are excluded. - Only central, mixed, or obstructive causes of absent, decreased, or irregular breathing are included. Clearly identifiable and nonpathological entities such as periodic breathing or breath-holding spells are excluded. - Tone changes associated with crying, choking, or gagging due to reflux or feeding problems, as well as tone changes associated with breath-holding spells, are excluded. Tonic eye deviations, nystagmus, tonic-clonic seizure activity, and infantile spasms are also excluded from qualifying criteria for a BRUE. - Altered responsiveness includes loss of consciousness, mental status changes, lethargy, somnolence, or a postictal phase. If any of these may be due to a breath-holding spell, they are excluded.

Abbreviation: BRUE, brief resolved unexplained event.

- Infantile colic

PEM R | 5 W/O infant FT, no complications, gaining weight/feeding well, over past week becoming fussy & needs to be held all time, infant had no recent fever or sx, true regarding presentation = common for infant to cry > 3 hr a day (infantile colic)

PEM R | 5 W/O, excessive cry for 4hr per day intermittent for last 3 days, no fever/cough/congestion/vomit, no acute change in breast-fed infant, crying during exam, immunized to Hep B, next = Swaddle him & attempt to soothe him w/ pacifier

- Infantile Colic
- Common present 3-6 W/O
- Irritable Inconsolable
 - 1st R/O Corneal abrasion, hair tourniquets, non-accidental trauma, infection, allergy, reflux
 - Before diagnosing as Infantile Colic

Chapter 2: Medical

- Diaper Rash

- Infant LCH = Impetigo like granuloma like seborrheic dermatitis + hyperpigmented papules on trunk
- Diaper bacterial infection = erythema/papules/scaling sparing folds
- Diaper fungal infection = erythema/scaly plaques/satellite papules/pustules non-sparing folds

PEM R | 2 M/O w/ Rash on diaper region, Hx of sensitive skin, which rash is concerning of systemic disease = Exudative papules along anus, impetigo-like lesions, along Inguinal folds, yellow scaly plaques along scalp

- LCH (Langerhans cell histiocytosis)
 - Sx: CSOM + Seborrheic dermatitis + Skull lytic lesion + Central DI
 - Invx: Biopsy/BMA/Skeletal survey
 - Tx: Surgery/Chemo

- Food Colors

- Occult Test
 - Blood stool + Occult False Pos. = Cherries, Horseradish, Turnips, Tomatoes
 - Blood stool + Occult True Neg. = Black licorice, Blue-berries, Spinach, Beets, Bismuth, Iron

PEM R | 10 Y/O 2 episode of red color stool, otherwise normal, PR and get red color stool on your glove, positive for blood, likely reason = Cherries

PEM R | 4 Y/O male, at beet salad/blackberries/blueberries/pasta w/ mushroom, parent saw toilet full of blood, urine dipstick negative = Discharge after providing reassurance

- Lip Licker Cheilitis/Dermatitis

Final | Pic of lip licker eczema around mouth, Tx = Petroleum gel

- Cold Panniculitis

- Path: inflamed subcutaneous tissue fat

Amal | Family doctor referred a child to ED with buccal cellulitis; she ate **popsicle** yesterday. Bilateral erythematous plaque with nodularity, vitally stable, asymptomatic, no ill contact. Ex unremarkable apart from the picture. (Image of child with red cheeks)
Likely = Cold Panniculitis (Not Facial sunburn nor fifth disease nor Preseptal cellulitis nor Buccal cellulitis)

Chapter 2: Medical

Neonatology

Neonatal issues

- ITDM (Infant to diabetic mother)

PEM R | Term Neonate born at home 7hr ago, to obese prime mother w/ no prenatal care, Now BW 4.8 w/ poor suck, lethargic, strong pulse, good color, Labs Na 141 K 4.8 Cl 110 CO2 22 Glucose 23, IV line w/ immediate improvement in appearance & activity, likely cause of hypoglycemia = Maternal Gestational Diabetes

PEM R | Born at home 4hr ago, mother obese, now difficult feed, No respiratory distress, BW 4.9 kg, Na 141 K 4.8 Cl 110 HCO3 22 Glucose 29, after IV line & dextrose immediate improvement in child activity, likely cause of hypoglycemia = Maternal gestational diabetes

- Congenital Diaphragmatic Hernia (CDH)

- o DH may present outside Peri/Neonatal period, Diagnosed by imaging
- o Tx: In NICU = ETT + NGT
 - In ER = Decompression of herniated content by NGT (causes a respiratory relive)
 - In OR = Surgical repair (definitive treatment)

PREP EM | 3 Y/O RD vomited 3 times, diffuse abdomen pain, No fever/diarrhea/congestion/headache, Preterm 29 weeker but no current chronic issue, has Recurrent abdomen pain & vomit several evaluations were negative, Temp 37.5 BP 95/68 HR 126 RR 36 O2 93% RA, Breath sound diminished in Lt. side without wheeze, abdomen decreased bowel sounds but soft, XR shows Lt. GI tract in left lung region, BEST NEXT = NGT

PEM R | 10 D/O RD, HR 190 RR 70 SpO2 93% on RA, decrease breath sound Lt. side, scaphoid abdomen = intubate and NGT

PEM R | 3 D/O ex-full term in resus having RD/grunting, Temp 37.4 HR 170 RR 55 BP 85/50 SpO2 92%, decrease breath on Lt side XR (Diaphragmatic hernia), Next step = Perform ETT

- o Diaphragmatic hernia + RD = ETT | IF NO ETT in options choose = PGS

PEM R | 3 M/O, tachypnea/poor PO, had similar episode before Dx w/ common cold, having vomiting/refuse feed, & Mod RD, XR shows Diaphragmatic hernia = Consult PGS

PEM R | 4 M/O RD & Tachypnea, No Hx of Fever/Cough/Congestion/Vomiting/Choking, Temp 37.4 HR 188 RR 58 BP 104/56 SpO2 87% on RA, using abdomen muscle retraction & nasal flaring, maintains airway w/ decreased breath over Rt hemothorax, on O2 improves to 98%, CXR (lateral view shows bowel), Best next step to stabilize = Place NGT

Promo | Newborn CXR Lt. Diaphragmatic Hernia, Next step = Intubate

Promo | 2 W/O baby, Severe RD, Parent signs DAMA from private hospital, Tachypneic SpO2 88% on 100% FiO2, no improvement, preparing for intubation, once finished connected to MV, Father shows u his XR done before arriving here (showing Diaphragmatic hernia), Important Next step = Insert NGT (Not Repeat XR nor CT nor BVM 100% FiO2)

Promo | Girl, FT, NSVD w/ RD, Ex Tachypneic/Cyanosed/Abdomen scaphoid, Decrease air entry w/ bowel sounds, Dx = CDH

Final | Newborn came to ED after birth in distress, term, fathers show u XR (Bowel in lung) Dx = CDH

Final | Congenital diaphragmatic hernia = Intubation

Final | XR of of Diaphragmatic hernia = CDH

- Anencephalic

- o Anencephaly = no gross brain

PEM R | Newborn severe RD, no prenatal care, CPR w/ PPV by paramedic, HR 65 SpO2 80% while on PPV 100%, having absent cranial vault consistent w/ diagnosis of anencephaly, no murmur, lungs clear, IV access established, next step = Continue CPR but discuss prognosis w/ parent

Chapter 2: Medical

Final | Baby Anencephalic w/ CPR = Continue CPR but discuss prognosis w/ parent

Final | Anencephalic scenario = Continue CPR & discuss prognosis

- Choanal atresia

- Ax w/: CHARGE
- Bilateral Choanal atresia
 - Sx: Neonates are nasal breathers, if they cry they will breath because they will be breathing by mouth
 - Tx: put the smallest oropharyngeal airway (OPA) to keep mouth open
- Unilateral Choanal atresia
 - Sx: During suction/NGT insertion x1 nostril is blocked
 - Tx: Supportive, if in RD might insert NPA on the normal nostril

PEM R | 22 D/O nasal congestion, difficult breath, fussy, struggles w/ feeds, takes 30min to finish formula, slow wt gain, 2 days Hx nasal congestion, having now more trouble breath, RR 54, normal SpO2, high pitched whistle during inspiration, unilateral rhinorrhea, next step = Nasopharyngeal Catheter suction along boot nares

PEM R | 3 D/O 39 weeker, having nasal congestion/cough/trouble feed, while breastfeeding turns blue/stops feed, vitally stable, having slightly dry mucosa, having clear breath sounds, next to confirm, Dx = pass a 6 Fr cath into both nares

Promo | 2 H/O FT nurse noticed Cyanosis & Apnea when she attempted to feed him, O2 dropped to 60, Stimulated then cried & O2 increased to 98%, Next important step = Insert Oropharyngeal Airway -put smallest size to keep mouth open- (Not Insert Nasopharyngeal airway nor intubate & ventilate nor Bronchoscopy evaluation of palate & larynx)

Amal | You called to evaluate baby who is delivered having cyanosis in Respiratory distress on examination the baby is crying, breathing with normal heart rate, when stopped crying he became cyanosed, most effective intervention is = Insert oropharyngeal airway

- Cradle Cap (Seborrheic dermatitis)

PEM R | 4 W/O female infant (pic of scalp seborrheic dermatitis or cradle cap), No fever, irritability, maternal Hx uncomplicated, Next = D/C w/ topical therapy

- Erythema toxicum (2 days - 2 weeks)

PEM R | 6 D/O rash, no fever/vomit/irritable, rash 2 days ago spread on trunk/extremity, C/S delivery, unroofed fluid is sent for analysis found on microscopic = eosinophil

Chapter 2: Medical

Neonatal Eye Disorders

- Dacryostenosis (Naso-lacrimal duct obstruction)

- Onset at 3 wks (free duct system matures), 90% resolve spontaneously in 1st year
- Sx: Unilateral excessive tearing/discharge, crusting
- Ax: Infantile/Congenital glaucoma
(Typical presentation at 3M/O, Also has Excessive tearing, need to be screened)
- Complications: Conjunctivitis, Dacryocystitis, Cellulitis
- Tx: Gentle Lacrimal massage, F/U Optha if persistent
 - Topical Optha Abx IF Conjunctivitis or Purulent discharge or Dacryocystitis
 - Systemic Abx IF Cellulitis

PEM R | 2 W/O Term, NSVD G1P1, has crusty yellow eye discharge w/ tearing since birth, having 2 days eye redness/swell/increase discharge, otherwise normal, (pic of medial eye discharge), no sick contact/trauma/fever/vomit, feeding well, vitally stable, Ex = Naso-Lacrimal duct obstruction

PEM R | 5 w/o eyelid crusting/watery drain of Lt eye, No Fever/Trauma, Yellow crusting Lt eyelashes from medial canthus of eye, Sclera clear, pupil reactive, Tx = Discharge w/ Instructions for lacrimal massage

PEM R | 1 M/O excessive tearing of Lt eye, crusting along eyelid margin, white purulent discharge, No Fever/URTI, No known complications, has thick white discharge on Lt eye without injection, Red reflex present bilateral, Intact extra-ocular movement
Fluorescein Best next = gentle clean & massage of nasolacrimal duct

Final | Neonate with medial epicanthal fold swelling extend to lower medial eyelid w/ Yellowish discharge, Dx = Lacrimal duct obstruction (Not Dacryocystitis nor Dactylitis)

- Dacryocele

- Sx: Small blue mass overlying lacrimal sac
- Complication: Dacryocele > Dacryocystitis > Meningitis
- Tx: Optha urgent (to prevent complication)

PEM R | 2 W/O small mass under eye near nose, noticed 4 days ago, becoming bigger now w/ blue hue, deny fever/purulent drain, acting/feeding well, on Ex small blue palpable mass overlying lacrimal sac of Rt. Eye, most concerning complication of disease = Meningitis

- Dacryocystitis (Infection of Naso-lacrimal duct)

- Sx: Pain, Purulent discharge, Swell, Erythema on Medial aspect of Lower eyelid, Systemic Sx (Fever)
- Complication: Preseptal/Orbital Cellulitis, Fistula formation, Bacteremia, Meningitis, Sinus venous thrombosis
- Invx: Full sepsis w/ Swab of eye
- Tx: IV Abx + Dacryocystorhinostomy (definitive treatment by Optha)
 - Mild = Clindamycin
 - Severe = Vancomycin + 3rd gen Cephalosporin

PEM R | 4 M/O has Hx of Nasolacrimal duct obstruction since birth, has 5x7mm swell on Lt side of nose that is warm/tender/erythema, prior to development had Mild URTI, Temp 38.4 HR 110 RR 188 SpO2 99%, Tx = Ceftriaxone, Admission, Optha consult

Chapter 2: Medical

Neonatal GI Disorders

- NEC (Necrotizing Enterocolitis)
 - o Risk factors: SGA, IUGR, Preterm, Rota virus, Gastroschisis, HSD, CHD (Ductal dependent -CoA, HLHS, AS-, Cyanotic -TOF, TGA, TA-)
 - o Tx: NGT, NPO, IV Abx, IVF
 - Surgery Absolute indication if Pneumon-Peritoneum

PEM R | 14 D/O, 34 weeker, Trisomy 21, in ED w/ Vomit/Abdomen distention & small blood in stool, Abdomen distended moderate w/ cool extremities, IV Labs, C/S, NGT, XR (pneumon-intestinalis), next step = IV Abx (Not CT Abdomen nor Upper GI)

PEM R | 7 Y/O girl Hx of Preterm & NEC, 2 days intermittent abdomen pain & 1 non-bloody non-bilious vomit, No Fever/Trauma, stool regular, vitals stable, diffuse abdomen distension & pain difficult to localize, IV morphine & AXR (air fluid level), Next = NGT

PEM R | 3 w/o vomiting, primarily formula fed 30ml and spitting up for past 2 days, uncomfortable, belly bigger than usual, IUGR at 37weeks, markedly distended abdomen, HR 155 BP 83/60 marked distended abdomen brisk CRT, AXR (Pneumoatosis intestinalis), next = Administer Abx, keep bowel rest & admit

PEM R | 2 W/O, 36 weeker, 2 days vomit/poor PO, non-bloody formula like, abdomen tender to palpitation, CRT 3 sec, XR (show pneumatosis intestinalis, risk factor = Preterm)

Final | Baby w/ CoA post repair w/ Abdomen distention, vomiting & bloody stool Dx = NEC

Final | 2 w/o Abdomen distention, Aortic stenosis, Cortication, = NEC

- HSD (Hirschsprung disease)
 - o Congenital disorder, RET gene mutations, More common in male individuals, Ax w/ Down syndrome
 - o Path: failure of neural crest cells to migrate to the intestine > Absence of ganglion cells in the distal colon, leading to functional obstruction
 - o Sx: failure to pass meconium within the first 48 hours, Bilious vomiting, Abdominal distension, refractory constipation (older children)
 - o Invx: Barium Enema (Initial to r/o Aganglionic Transition zone), Rectal suction biopsy (Diagnostic)
 - o Tx: Surgical resection

PEM R | 4 M/O girl, Hx of constipation w/ distention, having always difficult stooling, w/ rectal stimulation had expulsion of stool, to confirm diagnosis = Suction rectal biopsy

Promo | 2 M/O w/ vomiting, Constipation since birth, Abdomen distention, Rectal Exam causes passage of stool, cause = Aganglionic (Not Bacterial growth nor Lack of parasympathetic)

Final | Baby with vomiting & Hx of 36 hrs didn't pass stool after birth, UGI study done was normal (pic of Hirschsprung) XR, showed gasses abdomen = Barium Enema (unsure of answer)

Final25 | XR Abdomen pwith dilated bowel loop ? Air fluid level, Pt. was having poor oral intake and abdominal distention he passed urine but hx of delayed passing of stool after 36hrs of birth, vitally stable, no fever (hirschsprung scenario i guess) = Barium enema (Not Abdominal CT)

- HSD Complication: HAEC (Hirschsprung Associated Enterocolitis)
 - o Incidence ranging from 24-34%, Hx of surgical repair of Hirschsprung
 - o Sx: Fever + Gastro-enteritis like Sx (Abdomen distention, Explosion diarrhea)
 - o Invx: XR Air fluid level, dilated bowel loops w/ Absence of air in distal colon
 - o Tx: Aggressive hydration, IV Abx, Treatment based on HAEC grade
 - HAEC grade I = maybe managed OPD
 - HAEC grade II = NPO, IV Hydration, Metro + Tazo + Rectal irrigation
 - HAEC grade III = Same as grade II + Surgery (Ileostomy if medical Tx failed)

Chapter 2: Medical

PEM R | 23 M/O girl, explosive diarrhea/abdomen pain, Dx w/ Hirschsprung disease at 3 M/O w/ repair after, now Temp 38.2 HR 155 RR 25 BP 92/52 SpO2 100%, next = Empiric Abx & Admission

PEM R | 13 M/O Fever/Vomit/Diarrhea, No sick contact No Travel, 3 months ago had Hirschsprung disease surgical treatment w/ Abdominoperineal pull through 3 months earlier, Temp 37.9 HR 125 RR 22 BP 100/65, Abdomen tender/distention, CRT immediate, Next step = Begin IVF resus

PEM R | 8 M/O, Febrile/Vomit/Diarrhea for 1 day, Hx of Preterm 36 wk, HSD w/ S/P post abdomen-perineal pull through, XR shows dilated bowel loops w/ air fluid, in addition of surgery consult, Tx = IV Hydration Metronidazole Tazocin, Rectal irrigation

Promo | 4 W/O Girl, Hx of Abdomen distention & constipation & fever for 3 days, no vomit, Ex Abdomen Distention PR exam shows fecal impaction & gush of stool by end of PR, Abdomen XR full gases & dilated loops w/ a scent gases in rectum Next = IV Abx (Not Barium Enema nor LP nor Abdomen US)

Amal | 4 W/O old baby, abdominal distention, diarrhea and fever, high WBC, no vomiting, rectal exam: gush of liquid stool, tenderness abdomen, Abdomen XR, Next step = IV Abx and surgical consult (Not Barium enema nor LP nor CT Abdomen)

Final | 4 W/O girl, presented with history of abdominal distention & constipation and fever for 3 days, with no history of vomiting. On your physical examination her abdomen is distended and PR exam showed fecal impaction with gush of stool at end of your PR exam. Abdominal X-ray showed full gases & dilated loops with absent gases in rectum, Next = Order for IV abx (HAEC -Enterocolitis-, Not Do barium enema nor Do LP nor order Abdomen US)

Final | Previous surgery for Hirschsprung, come w/ distended & tender abdomen, Dx = Enterocolitis

Final | Hirschsprung disease post surgery w/ Abdomen pain & diarrhea, Dx = Enterocolitis

Final | Hirschsprung, Dx post surgery w/ Decreased feeding, Fussy, Abdomen distended = Enterocolitis

Final | 5 M/O w/ Hirschsprung pull through procedure 1 month ago w/ Abdominal distention = Enterocolitis

Umbilical issues

- Patent urachus: complete umbilicus-bladder connection
- Omphalomesenteric fistula = copious discharge
- Omphalitis = erythema around umbilicus
- Umbilical granuloma = nothing of above

- Patent Urachus

Final25 | A neonate with umbilical granuloma seen by a resident and silver nitrate cautery done, but found to be patent urachus what is the possible complications = Urine leakage and infection (Not Enterocolitis nor Rupture of omphalocele nor Umbilical hernia perforation)

- Umbilical Granuloma
 - o Tx: Use alcohol swabs clean well inside & send for OPD for Cautery

PEM R | 30 D/O persistent umbilical mass, Cor separated at day 5 w/ scant bleed, cleaned/cauterized w/ silver nitrate, f/u showed persistent umbilical mass w/ two additional treatment of silver nitrate, Ex 4mm glistening, non-pedunculated, no surrounding erythema no fluctuance, likely Dx = Umbilical granuloma

Amal | 15 D/O neonate with soft granular pink tissue umbilical with serous purulent discharge, no tenderness no induration, no fever, Management = Cauterization with silver nitrate

Chapter 2: Medical

- Omphalitis

- Definition: Infection of the umbilical stump, usually within the first 2 weeks of life
- Organism: Staph. A
- Local Sx: Redness, warmth, swelling, pain around the stump; purulent discharge; discoloration of the cord
- Systemic Sx: Fever, tachycardia, poor feeding, somnolence, jaundice
- Complications: Rapid progression to cellulitis > **Necrotizing fasciitis**
 - Myonecrosis, sepsis (mortality ≈10%)
 - Peritonitis, Liver abscess, Sepsis, Meningitis
- Invx: Full sepsis workup, Microbiology: Polymicrobial (Staphylococcus aureus, Group B & A Streptococcus, & Gram-negative enteric rods)
- Tx: Emergent: Aggressive IV fluids & full sepsis evaluation
 - Ampicillin + Gentamycin +/- Vancomycin (Empiric IV Abx covering Staph, Strep, Gram-negative organisms; add anaerobic coverage (e.g., metronidazole) if severe/invasive.
 - Considerations: Check for immunodeficiency (e.g., leukocyte adhesion deficiency) or urachal anomalies if recurrent or atypical

PEM R | 12 D/O FT having 1 day fussy/jaundice mild, Temp 37.9 HR 160 RR 39 BP 78/54 (pic of redness around umbilical stump),

Management = Obtain full sepsis, give IV Abx, admit

PEM R | 6 D/O rash, umbilical erythema that worsened since yesterday, small amount of purulent discharge from umbilicus, discharged swabbed for C/S Next step = pt. Should receive dose of oxacillin

PEM R | 2 D/O girl, redness of umbilicus, born at home w/ delayed separation of cord from placenta after birth, having redness fussy, low grade fever, full sepsis workup & IV Abx, life-threatening complication = Necrotizing Fasciitis

Chapter 2: Medical

Neurology

Seizures

- Status Epileptics
 - o [Fleisher] Emergent Imaging Indications:
 - Persistent SZ or Status Epi
 - SZ w/ Head trauma
 - Sx of High ICP
 - Persistent Focal Deficit (Todd paresis vs. stroke), or Focal SZ
 - Toxic Appearance

PEM R | 3 W/O infant GTC & eyes deviated to rt., IV access w/ glucose 75 gm/dL, 10min episode, 1st line = Phenobarbital 20mg/kg

Promo x2 | Known SZ on Phenobarb, since 2 days has URTI w/ decrease PO & didn't take usual Phenobarb dose, Presenting w/ Status Epi, Given 2 Lorazepam by EMS, Next to give = Phenobarb 20mg/kg over 30min (Not Keppra nor Phosphenytoin)

Promo | Breakthrough SZ of a known SZ patient, inability to tolerate PO Phenobarb, Next = Give Phenobarb 10mg/kg

Promo | CP w/ SZ on Phenobarbital SZ for > 30min, given x2 Lorazepam over 10min in, Next = Phenob 10mg/kg over 30min

Promo | 7 M/O 1st Generalized Tonic Clonic SZ for 15min, Febrile still seizing, desating 85%, Next step = Open mouth/airway & apply BVM w/ 100% O2 (Not Lorazepam 0.1 nor Keppra 50mg/kg)

Promo | Pt. 1st time tonic Clonic SZ for 15min, Now asymptomatic, labs unremarkable, Next = CT Brain (Not EEG nor MRI Brain)

Promo | Child w/ Multiple episodes of convulsion from young age, came now stable w/ good development, No Surgical/Family/Past Medical Hx, Next = OPD EEG (Not Admit nor Start Meds)

Promo | case of intractable SZ = Pyridoxine

Amal | Preferred anti-convulsion in seizure as **IM** = **Midazolam**

Amal | Which AED can be given IM = Mida (Not Lora nor Diaz nor Thiopental)

Amal | 5 Y/O boy, glaze stairs to right side, chewing movement and Urinated, blinked several times then start to respond but still confused, most appropriate maintenance therapy = Carbamazepine

- o Carbamazepine = Focal SZ (1st line)
- o Ethosuximide = Absence SZ

Amal | 2 Y/O, seizing for 20 minutes and is unresponsive to a dose of 1.5 midazolam. The resident You asked to load a patient with 300 milligrams of phenytoin if given fast, it can cause cardiac side effects, such as hypotension and dysrhythmia. this route is, how fast can you safely administer this medication = 20min

- o Phenobarb Usual rate 30min & the fastest in Phenytoin is 20min (more faster = cardiac issue)

Final | Seizure on phenobarbitone = phenobarbital 10 mg/kg

- o Phenobarbitone 10 mg/kg might not be enough as a dose, better to choose different medication

- Neonatal Seizures
 - o Neonatal seizure > Apnea > Affect brain development & alter neuronal circuitry = Treat aggressively
 - o Sx: Focal jerking movements of both arms spontaneously but un-synchronously.

PEM R | 3 W/O infant w/ abnormal facial & mouth twitch on left followed by arm & leg movement then GTC, IV obtained, glucose/sodium/ionized calcium all normal, after ABCs, appropriate Tx of active seizure = Aggressively treat any witnessed seizure activity w/ anticonvulsants

Amal | You are questioning parents and nurses about seizure in 5 days old baby. Most likely Description of neonatal seizure is = Focal jerking movements of both arms spontaneously but un-synchronously (Not Episodes of Bradycardia with apnea)

Chapter 2: Medical

- Infantile Spasms

- < 1 Y/O, mostly 4-8 M/O, < 10% after 2 Y/O, Diagnosed before 12 months (90% of cases)
- Cause: Cerebral dysgenesis, Genetic/Metabolic, Congenital infections, HIE
- Sx: Semiology: In cluster 20-30, Initial brief contraction (1-2 sec) > longer tonic phase (2-10 sec)
 - Flexion: Sudden flexion of neck, trunk, abdomen, legs
 - Extension: Sudden neck/trunk extension with arm adduction/abduction
 - Mixed flexion-extension
- Ax: West syndrome = Infantile spasm + Developmental regression + Hypsarrhythmia on EEG
 - Tuberous Sclerosis Complex 30%
 - Lennox-Gastaut syndrome
- DDx: Benign myoclonus of infancy: Normal neuro exam, no regression, resolves <2 y
 - Sandifer syndrome: Limb/neck stiffening after feeds (GERD-related)
 - Sleep myoclonus: Repetitive distal limb movements during sleep only
- Invx: EEG (Hypsarrhythmia, High voltage, irregular/random, slow waves over all head regions)
- Tx: Respond within 2 weeks
 - PO prednisone (As initial)
 - IM ACTH (Corticotropin)
 - Side effects: HTN, irritability, infection
 - PO Vigabatrin (For Infantile Spasm w/ TSC)
 - Side effects: permanent visual field deficit

PEM R | 4 M/O abnormal movement increased in frequency over 1 month, occurring when awake, neck extends/arms adduct for 3-4 sec, Past Hx unremarkable, Dx = Infantile spasms

PEM R | 12 M/O actively SZ, mild motor milestone delay, No Fever/illness/trauma, on Ex seizing w/ multiple hypopigmented elliptical spots on arms/trunk, given 2 doses of Lora, Sz stops, CT shows (white spots), Most common type of SZ to this Dx = Infantile spasm

PEM R | 3 M/O vaccinated in ED abnormal behavior, over 3wks had episodes of back arching & stiffening followed by brief cry, sought medical advices diagnosed as GERD, episodes increasing frequency occurring 20-30 times per day for few sec, on Ex Normal & Normal development, Next step = Admit for video EEG & Monitoring

Final | 7 M/O w/ picture of infantile spasm as arching and stiffness was treated as GERD with worsening of symptoms = Admission for EEG and monitoring

- Benign Rolandic Epilepsy (AKA Benign focal epilepsy of Childhood w/ Centrottemporal spikes)

- Onset: 5-10 Y/O, Most children outgrow within 2 years or by puberty
- Sx: Infrequent & During sleep, Early School age, During night or early morning
 - Focal Rhythmic twitch 1 side of Face + Ipsilateral Arm
 - + Post-Ictal Drooling/Chewing (lips numbness) + Can't Speak
- Invx: EEG Bilateral centro-temporal spikes
- Tx: Resolve at 16-18 Y/O, NO AEDs needed

PREP | 7 Y/O Walked into parent bedroom in morning w/ Rt. Cheek, Eye twitching, Drooling, Can't Speak lasted for 3 min, CT Normal, EEG showed Bilateral spikes in Peri-Rolandic regions, has Neuro OPD after 2 weeks, Parent ask about Anticovulsants, Best response = in This Epileptic Syndrome, Anticonvulsants often not needed

Pedz | 4 Y/O, came to clinic, mother claims girl has abnormal movements early morning after she woke up immediately, this is 1st time witnessed, EEG Centro-Temporal spikes = Reassure family that condition is benign will resolve within 2-3 Years

Promo | Centro-Temporal Spikes in EEG, Next = Good prognosis (Benign Rolandic Epilepsy)

Promo | Scenario about Rolandic Epilepsy happens during sleep in morning had numbness then improved, EEG shows Centro-Temporal Spikes, what to tell family = It's benign & good prognosis

Chapter 2: Medical

Promo | 8 Y/O prev. Healthy, This Morning Mother found right-side facial twitching & Tonic-Clonic Rt. Upper extremities for few minutes after awake had difficulty speaking for several minutes, No Provocation (Trauma/Fever/Headache/Diarrhea) Never had SZ before, developmental well, Neuro Ex normal, Most appropriate management = Refer to OPD EEG (Not LP nor Electrolytes)

Amal | 4 Y/O boy had seizure upon awaking from sleep, with fascial grimace, then return to his normal what is the Dx = Benign Rolandic epilepsy (Not Juvenile Myoclonic nor Lennox Gestate nor West Syndrome)

- Juvenile Myoclonic = < 10 Y/O, Clusters, consciousness, drowsy
- Lennox Gestate = Low IQ
- West Syndrome = Infantile spasm

- Febrile Seizure

Promo x2 | 18 M/O Simple Febrile SZ, Hx of Febrile SZ in family, Ex has AOM, Next = Abx & Discharge home

Promo | 2 Y/O Prev. Healthy brought w/ Hx of Fever, when arrived to ED he developed Jerky movement involving Rt. Upper & Lower limbs which resolved spontaneously, most important Next = CT Brain (Not LP nor Neuro Consult nor Blood & Urine C/S)

Amal | 15 M/O w/ abnormal jerky movement of right upper and lower right side with fever, other vitals and physical examination is unremarkable, patient regain his normal status. Next step in management = CT Brain (Not IV Abx nor LP nor Neuro consult)

- 1st Complex Febrile Convulsion because of focal seizure, no lateralization = CT
- Need to be documented so next time no need for CT

Amal | 8 Y/O in ED by Ambulance, was In playground, suddenly stopped playing then bent forward & fell to ground w/ jerky movement, drooled & unresponsive, afterwards confused, her speech was slurred, and she was somewhat combative for 30 min, in ED responding well, She is Febrile w/ normal findings on general & neuro exam, mother says patient is healthy w/ no headaches or recent illness, appropriate next prior to discharging = Educate family about prognosis & safety (Not Obtain STAT EEG nor measure Electrolytes nor LP)

- Febrile seizure is diagnosis of exclusion in this case and she is febrile with a normal examination, SO ... minority present at ages 8-9 (especially if they already had it previously)

Amal | 3 Y/O playing then suddenly having upper and lower jerky limbs then confused then sleepy, Temp 40 degree given acetaminophen Alert interactive, normal Ex, = Educate & discharge (Not carbamazepine nor CT scan of head nor sleep deprived EEG nor LP)

Final | 3 Y/O presented w/ convulsion for 1st time, temperature 40 at home now, Pt looks well playing with parents. What is your action = Reassure and discharge

Neurological disorders

Neuro Symptoms

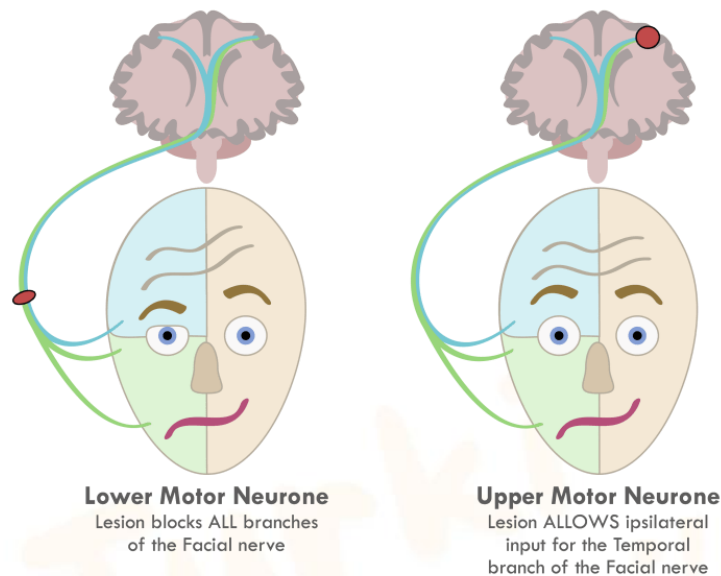
Facial Palsy

- Lyme = Bilateral palsy ± Arthralgia/Fatigue/HB | Borrelia burg. ELISA + Western blot | Tx: Doxy ±IV Ceftra (if CNS)
- Idiopathic (Bell's) = Sudden LMN palsy | ±CT (only if UMN) | Tx: PO steroid
- Ramsay Hunt = Ear vesicles/Otalgia | VZV | Clinical/VZV PCR | Tx: Acyclovir + Steroid
- Miller Fisher = Ophthalmoplegia/Ataxia/Areflexia | Ax w/ GBS, Post C. jejuni/Anti-GQ1b Ab | Tx: IVIG or Plasmaph.

Chapter 2: Medical

Facial Palsy Motor neuron affects

- UMN (upper save upper) = Contralateral paralysis of lower side of face
- LMN = Ipsilateral paralysis of upper & lower side of face



- **Facial Palsy**
 - o Path: Inflammation/Edema of facial nerve > nerve compression > unilateral facial weakness.
 - o **Types by Motor Neuron affected**
 - UMN (upper save upper) = Contralateral paralysis of lower side of face
 - LMN = Ipsilateral paralysis of upper & lower side of face
 - o Dx: Clinical diagnosis
 - o Tx: (improves within weeks to months)
 - Prednisone 1mg/kg (max 60-80mg) for 1 week (if used for more than 10 days needs tapering)
 - Acyclovir (if suspected viral as in severe Ramsay hunt)
 - Artificial tears, night patch, Physical therapy
 - o **Red Flags** (Not Typical Bell's Palsy, r/o other causes)
 - Forehead sparing (Central lesion, Stroke)
 - Other CN deficit or Focal deficit
 - Severe Headache, Neck stiffness, Altered mental state (Meningitis)
 - Bilateral facial palsy (Lyme, GBS, Leukemia)
 - Vesicle in ear (Ramsay hunt)
 - OM/Mastoiditis (images needed to r/o extension or abscess)
 - Hx of Trauma

PEM R | 13 Y/O girl, previously healthy, in ED Lt side face felt weak, 2 days ago had mild weakness Lt face worsened, no weakness in arm/leg, No recent illness or trauma, Ex needed for further evaluation = Normal strength of forehead muscles

PEM R | 13 Y/O to differentiate between peripheral & central cause of weakness = Inability to wrinkle forehead on ipsilateral

PEM R | 8 Y/O week long camping, Nasal congestion/sinus predatory prior to trip & intermittent ear pain but no fever, yesterday when returned had inability to close Lt eye & unable to smile on Lt side, No Tick/insect bite, No alert speech, Non-toxic, on Ex Nasolabial fold flattened & Facial drop, what additional evaluation before completed Tx = Evaluate tympanic

- o Pt. Had Hx of OM before going to Trip then had Facial palsy

Chapter 2: Medical

Headache

- Headache & Vomiting

PEM R | 9 Y/O boy having intermittent vomit for 2 months, active/playful, vomit mostly at morning, Bristol 3 daily, Temp 36.9 HR 102 RR 19 BP 111/63 SpO2 99% on RA, All Ex normal, likely to reveal cause of vomit = CT Brain without IV contrast

Promo | 7 Y/O w/ Morning headache for 5 weeks Ax w/ Projectile vomiting, moody, irritable, Next = CT brain (Not D/C + NSAIDs)

Promo | Headache w/ Tearing of eyes = Migraine headache (Not Cluster)

Promo | Girl w/ Headache & Eye tearing, most likely suffering from = Migraine (Not Cluster nor Tension)

Amal | 12 Y/O male with complaining of headache since morning, location frontal periorbital, vitally stable, has tearing from eye with facial flushing, most likely cause = Migraine (Not Cluster nor Tension nor Vascular)

- Cluster (Episodic, Older age)
- Migraine (Prolong duration, Tearing, Photophobia)
- Tension (Pressure or squeezing)

Amal | 12 Y/O boy, complaining of headache since awaking at morning, frontal periorbital in left side, facial flushing, tearing from left eye. Best present this type of headache = Classic Migraine (Not Vascular nor Cluster nor Tension)

Amal | 12 Y/O Girl, Severe headache for 12hr, Rt. Frontal, not relived by acetaminophen, had previous similar attacks but less severe, Normal optic disc/Other Ex, Neg. meningeal irritation, Next = NSAID (Not CT brain nor LP measure pressure)

Final | Case of headache with tearing of eyes = Migraine headache

Final | Cluster Headache = 100% FiO2

Final25 | 12 Y/O girl complain of headache for 12hrs, right side frontal throbbing, given analgesia but no improvement, she says she had headaches before which responded to analgesia but now the pain is worse & had no pain like this before, Next = CT brain (Unsure if Not Sumatriptan nor Acetazolamide PO nor LP and measure opening pressure)

Ataxia

- Preceded by infection:

- Ataxia + Seizure + Focal lesion + Decrease School Performance = ADEM -Measles, EBV, HSV, Influenza-
- Ataxia + Vomit + D/N = Acute Cerebellar Ataxia -Strep.- (Most common Ataxia in Childhood)
- Ataxia + Ascending paralysis + Absent deep reflex = GBS -CBJ, EBV— (Respiratory Failure)
- Ataxia + Otitis Media + Decrease Hearing/Tinnitus + Vertigo = Labyrinthitis

- Not Preceded by infection:

- Ataxia + Absent deep reflex + D/N + Hypertrophic Heart + DM = Friedreich's Ataxia (AR)
- Ataxia + D/N + IgA Immunodeficiency + Leukemia + Prominent Vessels = Ataxia Telangiectasia (AR)
- Ataxia + Like Friedreich's + Retinitis pigmentosa = Vit E defect (AR)
 - D/N = Dysarthria (Difficult speak due to weak tongue) + Nystagmus
 - ADEM = Acute disseminated Encephalomyelitis
 - GBS = Guillain-Barre Syndrome

Chapter 2: Medical

- Post infectious Acute Cerebellitis (Post infectious Ataxia with ongoing inflammation & Abnormal CSF)
 - o Varicella infection (most common cause) Aseptic meningitis > Ataxia = Post viral cerebellitis

Promo | Case of Viral Cerebellitis, findings = Dysdiadochokinesia (Not 6th N. Palsy)

Amal | 7 Y/O, brought to ED with history of unsteady gait, history of chickenpox 3 wk ago, ataxic gait with normal strength in lower extremities. Most likely other finding = Increase protein and lymphocytes in CSF (Not Acute OM nor Large mass on posterior fossa on head CT nor Absence of ankle reflexes -GBS-)

Final | Viral infection causes ataxia = ? Varicella

- Acute Cerebellar Ataxia (Post infectious Ataxia with normal CSF)

Amal | 3 Y/O boy, suddenly walking funny for 2 days, no trauma, recent cough and rhinorrhea (now resolved), BP 80/50, sits with support unable to stand, nystagmus, CSF normal, Dx = Acute cerebellar ataxia (Not GBS nor BPV -Benign positional vertigo-)

- Ataxia Telangiectasia (AT) = AR + Ataxia + D/N + IgA Immunodeficiency + Leukemia + Prominent Vessels
 - o AR, Genetic defect, 11q.22 ATM gene
 - o Progressive cerebellar Ataxia
 - o Complications: Leukemia (Very High Risk)
 - o Diagnostic clinical criteria:
 - Cerebral Ataxia (Also Nystagmus)
 - Low IgA (80%) Normal CD3
 - High Alpha-1-Fetoprotein
 - o Labs: Diagnosed by clinical features and identifying disabling mutations on both alleles of ATM gene

Pedz | Thin skin w/ vessel prominent over eyelid & ear pinna = Ataxia Telangiectasia or Osler Weber Syndrome

- o Osler Weber Syndrome is a Hereditary hemorrhagic telangiectasia

Pedz | pic of eye w/ vessels (Ataxia telangiectasia), what will find = Chromosomal abnormality (AR)

Pedz | In Ataxia Telangiectasia, true = Low IgA & Normal CD3

Other | 14 Y/O, Truncal/extremity Ataxia, Oculomotor Apraxia, intermittent extremity Dystonia/Chorea, Multiple scleral telangiectasia, Mother state "bloodshot eyes" FM Hx 10 Y/O bother similarly affected, Test to be abnormal = Alpha-fetoprotein

Promo | Pt. W/ Dysarthria, Ataxia, Recurrent Sino-pulmonary infections, shows eye picture (prominent vessels), Dx = AT

Promo | Pt. W/ Cerebellar Ataxia, what will be true = Dysmetria/Dysarthria/Nystagmus (Not Dyskinesia nor CT Brain Calcification)

Stroke, IIH

- Stroke
 - o Types: Ischemic: Cardiac cause (most common cause in children)
 - Hemorrhagic: Vascular cause (in AV malformation), Hematologic (in SCA)
 - o Incidence: Rare ($\approx 2-3/100,000$ children/year) but critical to recognize
 - o Mimickers: Focal seizure/Todd's paralysis, hemiplegic migraine, acute demyelination, hypoglycemia, conversion disorder, illicit drug use
 - o Labs: Brain CT No contrast (Initial to distinguish ischemic vs hemorrhagic stroke)
 - o Tx: Immediate neurology/stroke team consult

PEM R | 15 Y/O Hx of Retinal migraines, in ED w/ 3hrs of garbled speech/confused, arrived from school & shortly became upset but was talking unintelligible, not using arm properly Temp 37.4 HR 115 RR 20 BP 142/95 SpO2 99% on RA, Anxious, cranial nerve intact, 4/5 of Rt. Arm & leg, Next = Obtain PT/PTT & Non-contrast brain CT, notify Neuro

Chapter 2: Medical

Final x2 | 6 Y/O previously healthy came with picture of stroke MRI showed MCA stenosis & basal ganglia infarction What is the cause of stroke = Vascular (Not Metabolic nor Hematological nor Cardiac)

Final25 | MCA stenosis and basal infarct Most common cause of his stroke = Vascular (Not Cardiac)

- Acute ischemic Stroke Post Minor head trauma

- Sx: Brief resolving Sx
 - IF Posterior circulation insult = 4Ds: Dysarthria, Dizziness, Diplopia (VF defect), Dysmetria (Ataxia)
 - IF Vertebral artery dissection = Falling forward to side
- Invx: CBC, Coagulation, MRI/MRV
- Mimickers: SZ w/ Todd paresis, Cerebellitis, Basilar migraine, Intoxication

PEM R | 8 Y/O after head trauma colliding w/ another player while on helmet, immediately after collision had blurry vision/unsteady gait/dysarthria/falling towards left side, all Sx resolved after 1-2 min, had Nausea only but now asymptomatic, HR 60 RR 13 BP 120/60, detailed neuro exam normal, best next = CBC, Coagulation, MRI/MRA

- Acute Hemorrhagic Stroke

- Risk factors: Vascular malformation (AV, Aneurysm, Cavernous malformation), Brain tumor, Coagulation disorder (in this case 2ndry to Leukemia)

PEM R | 8 Y/O girl new Leukemia being transferred w/ Fatigue/Gingival bleed, WBC 800, Hgb 9 PLT 50, prior to transfer having Severe Headache & Altered mental state w/ GCS 9, Brain CT (shows midline shift), Emergent intubation done, in ED arrival has Fixed dilated Lt pupil, Next step = Obtain Emergent NSx Consult

- Stroke like

Amal | 17 Y/O boy brought due to slurred speech over the past last 1 hour, he has unrepaired cyanotic CHD, finding most likely related to his Sx = IDA (Not Polycythemia)

- Stroke-like symptoms associated w/ Anemia (IDA)
- Do VBG to check do Anemia (IDA) or CO or Hypoglycemia or Disturbed electrolytes
- Less iron means less hemoglobin, reducing blood's oxygen-carrying capacity, starving brain (hypoxia)

- CVT (Cerebrospinal Venous Thrombosis)

- Ax: Hypercoagulable disease (SLE, SCA)
- Sx: Headache worsen when lying down or Cough
- Invx: MRI Brain (most sens), CTA (CT normal in 30% of cases), CBC (if < 10 give PRBC)
- Tx: Anticoagulation

PEM R | 8 Y/O girl, SCA w/ 3 days gradual onset of headache worsen when lies down or cough, No Fever/SZ/Head trauma before, at home had GTC SZ for 1 min, now GCS 15, Neuro ex normal, CT brain normal, Next step = MRI & CBC

PEM R | 16 Y/O girl, w/ Hx of SLE w/ acute unremitting headache, generally responds to over the counter meds, Severity 10/10, duration last 3 days, she takes all her meds, on Ex No Alter mental state but headache w/ photophobia and papilledema exam is limited bcz of that, Cranial N. Intact, No Focal deficit, Labs/CT unremarkable, CSF opening mildly elevated, after NSAID/IVF no improvement, next best = MRI Brain

PEM R | 15 Y/O Hx of SLE, Anemia, Asthma, present w/ Chest pain/SOB, on Daily Fluticasone inhaler, Oral contraceptive pill, Naproxen, Hydroxychloroquine, cetirizine, Salbutamol used at home & in ED no improvement, having chest pain not reproducible, CXR (unremarkable only hyper-inflated) Best diagnostic test = CTA

Chapter 2: Medical

- IIH (Idiopathic Intracranial Hypertension)

- Risk factor: Female, Obese
- Types: Primary: No identifiable cause
 - Secondary: Cerebral venous thrombosis, Meningitis, intracranial hemorrhage, space occupying lesion, Hydrocephalus, Hypoparathyroidism, Meds: Tetracyclines, GH, Steroid, cytarabine, Vitamin A Toxicity
- Sx: Headache (96.5% of patients), Visual field deficits (85%), typically preserved visual acuity, Papilledema
- Invx: Neuroimaging (MRI/CT) to rule out structural causes; common MRI finding: posterior scleral flattening
 - Lumbar puncture: High opening pressure ($< 8 \text{ Y/O}$: $>18 \text{ mmH}_2\text{O}$ | $\geq 8 \text{ Y/O}$: $>25 \text{ mmH}_2\text{O}$) confirms Dx
 - Ophthalmologic exam to assess optic nerve involvement
- Tx: STOP offending medications > LP > Acetazolamide (1st line)

PEM R | 15 Y/O girl headache over 2 wks worse in morning, headache slightly relived throughout the day but never disappears, Wt 50th centile, on Doxy for acne for 1 month, No Head trauma/N/V/Photophobia/Phonophobia, Neuro Ex normal, MRI grossly normal, Slight flattening of posterior sclera, Next = Urgent Optha exam, LP, Acetazolamide

PEM R | 10 Y/O 60kg female, in ED w/ Headache for 3 wks, affecting ability to attend school, headache is all over w/ N/V/able to sleep most of the night, 2 wk ago done MRI brain was normal, today complains of blurry vision, Acanthosis on skin, cranial N./deep reflexes/gait/motor all normal, fundi Ex difficult to visualize her peripheral vision grossly intact, Visual acuity 20/80 in both eyes, in addition to urinalysis for glucose check & ketones, next = Perform LP

PEM R | 15 Y/O Girl w/ headache for past 6 months waxed/waned in intensity but generally constant, responding to over the counter Tx, seen by Optha for visual Ex and new glasses which observed changes in optic disc, Tx = Head imaging & LP

Final | Scenario about patient on GH came w/ headache and hypertensive, Pseudotumor Q, treatment after LP = Acetazolamide

Final | Child received growth hormone factor treat signs of pseudo tumor Cerebra = Acetazolamide

Final25 | Patient came w/ left eye blurred vision during examination he has decreased visual acuity no neck pain or other symptoms and disc exam (picture showing many red spots around optic nerve -most likely retinal hemorrhage-) next step = CT Brain (Not PO Acetazolamide nor LP and measure pressure nor PO steroids)

- Optic disc findings may be related to Space occupying lesion or IIH or SAH > Retinal hemorrhage

Neuro-Cutaneous

- NF1 = AD, Cafe(6, $>5\text{mm}$ | $>15\text{mm}$), Axilla Freckle, Fibroma(>2), Eye Lisch(>2), Skeletal bowing, Pseudoarthrosis, Optic Tumor
- NF2 = AD, Schwannoma, SNHL, Cataract
- TSC = AD, Ash leaf, Shagreen, **Angioma/Myomas** in Face/Heart/Lung/Kidney, PKD, GDD
- SWS = Sporadic, SZ, Ipsilateral **Port-wine**, Glaucoma, Angioma (ipsilateral leptomeningeal Angioma)

- Neurofibromatosis

- Lisch nodules: tan colored lesions on iris

PEM R | 10 Y/O girl, decrease vision in Lt eye/Dizziness/fatigue for 2 wks, on Ex Alert/conversant/normal gait/reflexes, Lt cranial N. IV palsy, not able to see disc margins on Fundoscopy, has 3-4 flat lightly pigmented macules on trunk & legs, similar to mother, MRI (shows optic Glioma on chiasm with hydrocephalus), Ax finding = Raised tan colored lesions on iris

Promo | 5 Y/O w/ Axillary freckling & showing pic of Cafe au lait spots, Dx = NF

- Tuberous Sclerosis

PEM R | 15 M/O multiple hypopigmented lesions w/ brief flexion/extension movement in upper body, increase frequency/clustering multiple times throughout day episode lasting for sec w/ post-ictal, sits w/ assistance but cannot crawl/walk, coos but doesn't babble, to establish definitive Dx = MRI brain

Chapter 2: Medical

- STURGE Weber:

- SZ contra-lateral, Tram-track calcification, Ipsi-lateral port-wine stain, Retardation, Glaucoma, Eye abnormality

PEM R | 10 M/O girl, 5 min focal SZ, otherwise baby doing well, not on meds, immunized, having rash on face, Vitally stable, expected to find on Ex = Developmental delay

Neuro-Inflammatory

- Botulism = C. Botulinum | < 1 Y/O + Floppy baby + Constipation + **Descending paralysis** | Stool Toxins | Tx: Support
- GBS = Campylobacter J. | Bulbar signs + **Ascending paralysis** + Absent DTP | CSF High protein, MRI S. **N. root** | Tx: Plasm. or IVIG
- ADEM = Post infection | Decline Cognitive/Behavior + Ataxia + SZ + Focal | MRI B. **Diffuse white matter** | Tx: Steroid ± IVIG
- TM = Post infection | **Sensory level** + Autonomic dysfunction | CSF Pleocytosis, MRI S. **White/Grey** | Tx: Steroids
- Lyme = Borrelia B. | **Travel** > Uni/Bi facial palsy + Erythema Migrans + Brady | ELISA/Western blot | Tx: PO Doxy, IV Ceftra
- TP = RM Tick | **Mountain** > Ataxia + **Ascending paralysis** + Absent DTP | Tx: Remove tick + Admit for observation
- AFM = non-Polio | URTI/Diarrhea > **Motor level** + Urine retention + Absent DTP | MRI S. **Anterior Horn** | Tx: Support ± IVIG

GBS: Guillain Barre Syndrome | MFS: Miller Fischer Syndrome | DTP: Deep tendon reflex | MRI S: MRI Spine

TP: Tick Paralysis | RM: Rocky Mountain | TM: Transverse Myelitis | AFM: Acute Flaccid Paralysis

- Neuro CSF Findings:

- TM/ADEM/AFM = Pleocytosis or elevated IgG
- GBS = High Protein (Cytoalbuminologic dissociation)
- MS/ADEM = Oligoclonal bands
- Neuromyelitis Optica (NMO) = Aquaporin-4 IgG

- MRI Spine Findings:

- TM = Hyperintense T2 | White + Grey Matter | Transverse
- AFM = Hyperintense T2 | Grey Matter | Anterior Horn (H shaped lesion)
- GBS = Enhanced nerve root

- TM (Transverse myelitis)

- Postinfectious complication, Autoimmune, Idiopathic
- Sx: Flaccid weakness, Pain, Dysesthesia (tingling), Paresthesia
 - **Sensory level** (Loss of sensation below L1, 40% not present in TM, GBS has no sensory level)
 - Autonomic dysfunction: bladder/bowel incontinence, weak anal wink, difficulty voiding, constipation
- Ax: ADEM = Transverse myelitis + Encephalopathy = ADEM (complicates w/ TM)
 - Multiple sclerosis, Neuromyelitis Optica, SLE, Sarcoidosis
 - Paraneoplastic syndromes
 - Infections
- Diagnostic:
 - MRI: T2 hyperintense White & Grey Matter (>2 vertebral segments)
 - CSF: pleocytosis, elevated IgG index
- Tx: High-dose intravenous Steroids (Glucocorticoids)
 - Plasma exchange, IVIG, Immunosuppressive medications

Chapter 2: Medical

PEM R | 10 Y/O, boy, 2 days LL weakness & pain as painful tingling, no issue in urination, 3 wks ago had URTI, Vitals normal, not confused or encephalopathic, meninges signs negative, upper extremities 5/5 motor & reflexes 2+, Hip flexion/knee extension/ankle dorsiflexion/plantar flexion 2/5, Absence of Patellar/Achilles reflex, decreased pin-prick & soft sense in anterior superior iliac spine & suprapubic area, unable to walk but normal coordination, what invx to establish Dx = MRI w/ LP

- MG (Myasthenia Gravis)

- Path: Autoimmune
 - Cholinergic crisis: Excess ACh from overmedication > increased weakness + Muscarinic Sx: (salivation, lacrimation, diarrhea, bradycardia, miosis)
 - Myasthenia crisis: Under-treatment or infection > respiratory muscle weakness > Respiratory failure
- Sx: Neck weakness, ptosis, difficulty swallowing
 - Axial weakness, double vision (may be hard for younger children to describe)
 - Weakness is less pronounced in the morning upon awakening & progressively worsens during the day.
- Invx: Edrophonium Sens 80-90% (Tensilon™) to assess improvement of weakness:
 - Symptomatic improvement is immediate but not long-lasting
 - Adverse effects may occur; patient should be monitored
 - Negative Inspiratory forced test < 20-30 = MG
- Avoid: CCB/BB, opioids, magnesium, steroids, contrast, Macrolides
- Tx: Pyridostigmine (first line)
 - Steroids (start low to avoid temporary worsening)
 - Immunosuppressants: Azathioprine, mycophenolate
 - Myasthenic crisis: IVIG or plasmapheresis + respiratory support
 - Cholinergic crisis: Stop pyridostigmine; give atropine if symptomatic
 - Thymectomy in AChR-positive generalized MG or thymoma

PEM R | 9 Y/O girl emigrating from El Salvador w/ 2 wk neck pain, choking/vomiting w/ eating, seems to be fine in morning but then start to have drooling/choking on food then w/ saliva, having muscles weakness, alert but in distress secondary to not being able to swallow saliva, neck flexed & unable to raise independently, pupil equal, extra-ocular movement intact, difficult keeping eye open, helpful to diagnose = Edrophonium test

Final | Myasthenia gravis scenario = IV Edrophonium

Final | Myasthenia gravis, Test = Edrophonium

- Infantile Botulism = HONEY in < 6 M/O ↑ risk of infection (As contains spores i.e. Clostridium botulinum)

- < 1 Y/O (median at ~ 10 W/O), Honey is the risk factor
Dx Clinical + stool toxin assay (toxin neutralization bioassay)
- Organism: Clostridium botulinum
- Sx: Early signs: Constipation (often earliest) Urine retention, poor breastfeeding/feeding difficulty.
 - Profound hypotonia ("floppy baby"), **Descending flaccid paralysis**, possible RD
 - Severity: Paralysis can progress rapidly; ~50% require mechanical ventilation
- Complications: Long term sequela = Paralysis, RF
- Labs: Stool for toxin assay (definitive diagnostic)
 - Nerve conduction studies/EMG (confirm diagnosis & exclude mimics (mitochondrial, SMA1))
- Tx: Supportive care, Respiratory monitoring
 - < 1 Y/O = Human-derived botulism immune globulin (BIG-IV)
 - > 1 Y/O = Equine heptavalent antitoxin (Use in Botulism, Not recommended in infantile botulism)
 - Antibiotics for wounds
 - AVOID Aminoglycosides (causes neuro-muscular blockade)

Chapter 2: Medical

PEM R | 4 M/O having feeding problem & progressive difficult latching, having cross-eyed, & holding him as like holding a wet noodle, and no bowel movement for several days, RR 28 SpO2 98% on RA, reactive ye but sluggish, poor sucking, reflex & hypotonia, which immunoglobulin Tx = Botulinum

PEM R | 4 M/O Prev. Healthy, having RD Temp 37.1 HR 120 RR 12 BP 90/62 SpO2 92%, poor shallow respiration, marked decreased tone in UL & LL, brisk CRT, no rash, saw PCP 1 week ago diagnosed as constipation, given glycerin PR and didn't pass, 3 days ago Mother took him to local ED bcz of decrease PO/Lethargy/Weakness of UL, Now taking blood/urine tests, and after addressing ABCs, which test to Dx = Stool studies

PEM R | 2 M/O poor feeding/constipation for 5 days, poor suck, head lag, decreased tone, bedside glucose normal, Dx = Stool for toxin assay & C/S

PEM R | 6 M/O girl, in ED w/ progressive difficult feeding for 3 days, no longer latching, very limp, awake/very little moving, Temp 37.3 HR 110 RR 32 SpO2 98%, Pupil sluggish, Saliva pooling, no sucking reflex, body tone limp, extremities minimal movement step to reveal Sx = Sending stool samples for further testing

Amal | 12 Y/O girl presents with a three days history of malaise, low grade fever and the double vision with a unilateral ptosis what is the potential finding that supports that is botulism = Acute urinary retention (Not Ascending paralysis -w/ GBS- nor Excessive salivation nor hands and feet numbness)

Final | Baby received honey and causing ptosis and lethargy and intubated what is = Infantile Botulism

Final | infant present with constipation = Botulism

Final | 5 M/O w/ decrease in oral intake, activity, weak cry and tone and hx of constipation Dx = Botulism

Final | Constipation weakness Tx = Infantile botulism

- GBS (Guillain-Barré Syndrome)

- Path: Autoimmune peripheral neuropathy triggered by molecular mimicry after infection
- Triggers: Viral: Campylobacter jejuni (20–30%), CMV, EBV, influenza, HIV
 - Bacterial: Mycoplasma, Haemophiles
- Sx: Rapidly progressive **Ascending flaccid paralysis** (Start: Legs > Upward > Respiratory M. > Cranial N.)
 - **Diminished/Absent deep reflexes**, Early lower limb pain
 - Hypo/Hypertension, Normal Babinski sign, Normal bladder function, Sensory loss is rare
- Ax: Miller Fischer (GBS + Triad OAA: Ophthalmoplegia, Areflexia, Ataxia)
- Complications:
 - Respiratory failure (leads to death)
 - Autonomic instability (Sympathetic + Parasympathetic instability)
- Invx: CSF: High protein 100-150 mg/dL w/ normal WBC < 10 (Cytoalbuminologic dissociation)
 - EMG/NCS: Conduction abnormalities
 - Spine MRI: May show nerve root enhancement
- Tx: Supportive care, IVIG or plasmapheresis in severe cases
 - Close monitor ICU for sever, Plasmapheresis (Main treatment) or IVIG (improves recovery time)
- Recover in 3-4 weeks, complete recovery within 6 months, Permanent sequelae 15%
- AVOID Antihypertensive meds (lead sever hypotensive crisis), No rule for steroids

PEM R | 7 Y/O 1 week Hx of leg pain & difficult walking, his Peds 4 days ago diagnosed him w/ post-viral myositis due to URTI 1 month ago, on Ex feels dizzy, LL strength 2/5 in UL 4/5, Absent Patella/Achilles reflex, CSF analysis = Normal WBC, High Protein

PEM R | 14 Y/O fully vaccinated in ED w/ progressive weakness of legs for 1 week, involved in multiple sports & initially thought to have muscle fatigue however having difficulty walking, thigh pain took Ibuprofen, Temp 37.2 HR 104 RR 26 BP 140/95 SpO2 95%, UL 4/5 & LL 3/5, difficult standing without assistance, unable to elicit deep tendon reflex, no sensory defect, has shallow w/ mild retractions, Invx to diagnose = EMG, CSF, Neurology

Final | Scenario of GBS = LP

Chapter 2: Medical

- Miller Fisher

- Sx: Facial Palsy Ophthalmoplegia, Ataxia, Areflexia
- Ax w/ GBS, Post C. jejuni/Anti-GQ1b Ab
- Tx: IVIG or Plasmaph.

Promo | 5 Y/O w/ Ataxia for 3 days, this morning had Rt. Facial asymmetry, Afebrile w/ no Sx other than difficulty walking, Ex weak knee reflexes, No Ankle reflexes, diagnostic = Lumber Puncture

Promo | Child w/ Facial weakness & lower LL no Reflex, Diagnostic = LP (Miller Fischer Syndrome type of GBS)

Amal | You are evaluating 5 years old girl, with new onset of ataxia since 3 days, mother noticed today facial asymmetry, no history of fever, on examination decrease reflexes and unable to walk, what will be next step to confirm your Dx = LP

Final | Child with facial weakness and lower limbs no reflex, how to diagnose = LP

- Tick paralysis = Hx of Camping +/- Tick, Ataxia, unsteady gait, symmetric ascending paralysis = GBS Mimicker

- Cause: Neurotoxin from Saliva of Rocky Mountain wood Tick (Dermacentor Andersoni)
- Path: Tick attach > Release neurotoxin > Sx hours after tick attach itself and yo to 2-6 days (mostly at head & neck, that is why 80% common in girls)
- Tx: Removal of tick (Sx Resolve within hours)
 - Admit for 2 days to monitor for respiratory distress

PEM R | 9 Y/O female living in mountain, having acute Ataxia for 12hr, followed by bilateral leg/thigh/back pain, Vitals stable, unable to stand or bear weight, Sensory intact, Absent Planter/Patellar reflex, 3/5 power in LL, after MRI of lumber spine, radio tech gives you something fell into bed sheet (Tick), next = Admit for serial examination

PEM R | 2 Y/O camping for 3 days, now cant stand w/ progressive LL weakness, unable to stand without assistance, normal negative Inspiratory force, has normal UL strength & Normal cranial nerves, in CT seen tick on scalp, Next = Remove tick

PEM R | 10 Y/O girl w/ 2 days irritable/restlessness and couldn't walk having 2/5 strength bilateral UL 3/5 LL, difficult taking breath, on Ex Neck engorged tick beneath hairline, Next step = Remove tick w/ forcipes pulling slow & evenly

Promo | 5 Y/O w/ tic in leg, Family own Animals at home, regarding tic removal statement = Remove tick using curve forceps & try to press near to skin & gently pull it (Not apply mineral oil then try to remove gentle w/ gauze)

Amal | 8 Y/O w/ tick impeded in skin, remove by = Grasp loose part of tick & gradually remove it

- Acute Flaccid Myelitis (Flaccid Paralysis)

- < 10 Y/O
- Cause: Paralytic Poliomyelitis, West Nile Virus, Non-polio enterovirus (Coxsackie, Echovirus)
- Path: Viral infection → inflammation of anterior horn cells (spinal gray matter)
- Sx: Recent Viral w/ Diarrhea & Rash > Sudden flaccid paralysis (Motor level) + loss of tone ± CN involvement
 - Absent DTP, Normal sensation, Possible urinary retention
- Diagnostic:
 - MRI: T2 hyperintense Grey Matter (Anterior Horn (H shaped lesion)
 - CSF: pleocytosis, elevated IgG index
 - Nasal swab/Stool PCR
- Tx: Supportive +/- IVIG or Steroids

PEM R | 5 Y/O male, w/ 3 days progressive inability to walk, this morning knees buckled & can't support his weight, recent illness w/ low grade fever/mild diarrhea, No Trauma/Headache/Vomit/Leg pain, Despite eating/drinking well, not urinated in 15hr, Temp 37.8 HR 90 RR 20 BP 100/56, fussy, normal mental, Bilateral LL 2/5, absent reflex, intact sensation, etiology likely to cause Sx = Non-Polio Enterovirus

Chapter 2: Medical

- Anti-NDMA receptor Encephalitis

- Female 80%, Ax w/ Ovarian teratoma (50%)
- Sx: Anxiety, Insomnia, Hallucination, Bizarre behavior, delusions, language problem (mutism)
 - Sx mimic acute psychosis leading to MisDx
 - SZ occur later (if untreated has risk of permanent disability, SZ is unlikely in Schizo)
- Labs: MRI (abnormal 50%), LP (Pleocytosis & High Protein)

PEM R | 17 Y/O in ED after brief Tonic-Clonic SZ at home, 3 wks ago having bizarre behavior/confused, not always oriented to place & time, talks to imaginary people in room, frank hallucination, sleep disturbed, personal hygiene deteriorated, previously healthy normal child, 3 wks ago Tox & ethanol levels negative, visited therapist but said can't work w/ patient, NO Meningismus, Neuro Ex normal except answers inappropriately/giggles/talking to someone else, Next = MRI, CSF, Ovary US

- ADEM

- Post-infectious autoimmune demyelinating disorder, often ~ 2 wks post viral/bacterial illness
- Path: Autoimmune response triggered by infection in genetically predisposed patients
- DDx: Multiple sclerosis, transverse myelitis
- Sx: Headache, meningismus, **visual changes**, **Ataxia**, cognitive/behavioral abnormalities, Alter LoC, SZ 10-50%
- Labs: MRI (Diffuse cerebral white matter), CSF (Pleocytosis, High protein)
- Tx: High-dose corticosteroids (1st line, IV methylprednisolone).
 - IVIG (if steroids fail)
 - Plasma exchange (if no response to steroids/IVIG)
- Prognosis: Most children recover fully within ~6 wks; 60–90% have minimal/no long-term deficits;
 - mortality now very low (<5%)

PEM R | 4 Y/O fully vaccinated, has 4 days progressive lethargy/behavior change, today w/ headache/sleeping most of the day/speech altered last few hours, 2 wks ago had URTI, yesterday had 3 min GTC, Vitals stable, GCS 4/5/3 (12), Neuro Ex limited to cooperation but moving all limbs, after obtaining stat CT brain without contrast, you initiate = IV Methylpred

Antiepileptic Side effects

- Levetiracetam (Keppra) = **Auditory** Hallucination, Aggression
- Carbamazepine (Tegretol) = **Nystagmus**, Rash > SJS, Leukopenia, Hepatotoxicity, Liver Toxicity, Ataxia/Dizziness
- Phenytoin: Hirsutism, Gum hypertrophy
- Valproic acid (Depakine): **Visual** Hallucination High Ammonia, Thrombocytopenia, Hepatotoxicity, Pancreatitis, Hair loss
- Topiramate = Metabolic Acidosis, Glaucoma

PEM R | 7 Y/O w/ Epilepsy present w/ N/V/Abdomen pain, Abdomen soft but has RUQ & Subxiphoid tenderness, Abdomen pain positional & radiating to back, worsening w/ supine & relieved by leaning, mother noticed easily bleed after brushing teeth and has some bruises over the month, Lipase 730 Amylase 365, likely cause = Valproic acid

Promo | Child on Anti-SZ meds, came with Agitation, common Ax = Auditory hallucination (Not Visual hallucination)

Promo | Mother known SZ on Keppra, her child has URTI Sx but breastfeeding good amount, lab withdrawn shows Isolated Neutropenia 300, cause = Viral cause or Keppra induced or Congenital Neutropenia

Promo | Baby w/ Flu Sx Cough, Runny nose, Breast feeding mother taking Keppra, Labs shows ANC 320, cause = Viral

Final | Tegretol toxicity clinical effect = Nystagmus

Final | Signs suggesting Tegretol ingestion = Nystagmus

Final | Child on anti-seizure medication came with agitation, what is the common association = Hearing hallucination = Keppra (Not Visual hallucination = Valproic acid)

Chapter 2: Medical

Cardiology

Congenital Heart Disease

- Murmur
 - TGA = No murmur (Single loud S2)
 - TOF = Harsh ejection systolic
 - Truncus Arteriosus = LLSB = Systolic ejection Click + Single S2
 - CoA = LLSB + LIS = Soft Systolic ejection
 - PDA = LUSB = Continuous machinery murmur
 - Blalock Taussig shunt = LUSB = Continuous machinery murmur
 - VSD = LLSB = Harsh Pansystolic murmur & Holosystolic
 - ASD = LUSB = Systolic ejection Crescendo-Decrescendo + Fixed splitting S2
 - Aortic Stenosis = RUSB = Systolic ejection Crescendo-Decrescendo
 - Pulmonary Stenosis = LUSB = Systolic ejection Crescendo-Decrescendo
 - Still's = LLSB + Loud Supine then Set = Musical/Vibratory (Decreases w/ standing)
 - Mitral Valve prolapse = Apex = Mid-systolic ejection click
 - Tricuspid Regurgitation = LLSB = Holosystolic murmur (increases w/ inspiration)
 - HOCM = LLSB = Harsh systolic ejection (increases w/ standing/Valsalva)

SB = Sternal Border | IS = Intra-Scapular
- CXR Shapes
 - TGA = Egg
 - TAPVR = Snowman or 8
 - Tricuspid Atresia = Apple
 - TOF = Boot
 - CoA = 3 Sign
 - Ebstein = Box
- Pulmonary markings
 - Increase (Plethoric) = TGA, TAPVR, Truncus Arteriosus, VSD (ONLY after 10 W/O), AVSD, CoA w/ HF
 - Decrease (Oligemic) = Pulmonary Atresia/Stenosis/HTN, TOF, Tricuspid atresia, Ebstein Anomaly
- CHD Duct Dependent
 - Right side lesions (Pulmonary Flow Duct Dependent Lt. > Rt.)
 - PS (Critical Pulmonary Stenosis), PA (Pulmonary Atresia), TOF (as Tet), Tricuspid Atresia
 - Sx: Cyanosis
 - Left side lesions (Systemic Flow Duct Dependent Rt. > Lt.)
 - AS (Aortic Stenosis), CoA, HLHS (Hypoplastic left heart syndrome)
 - Sx: Shock
 - Right/Left separate (Duct Dependent mixing)
 - TGA
 - Sx: Cyanosis

Chapter 2: Medical

- CHD Lesions onset

- < 6 H/O (PDA Non-Dependent): **D-TGA**
- < 7-14 D/O (PDA Dependent):
 - Shock = **CoA**, HLHS, Critical Aortic Stenosis
 - Cyanosis = Critical **Pulmonary Stenosis**, Pulmonary Atresia
- > 14 D/O (Pulmonary Vascular Resistant/PDA Dependent):
 - Shock = **VSD**, AVSD, Truncus Arteriosus, Large PDA
 - Cyanosis = TOF, Tricuspid Atresia, TAPVR

Amal | Most common presentation of neonate with obstructive left heart syndrome = Respiratory Distress (HLHS) (Not Murmur nor Decrease pulses at upper and lower extremities)

Amal | 4 W/O with respiratory distress, lethargy and feeding difficulties, vitals: T:37.6 HR:160 RR:48 SAT:74% The least likely differential Dx = Solitary VSD (Not Truncus Arteriosus nor Tricuspid atresia nor Hypoplastic left heart)

- Asks about what is not Cyanotic heart diseases

Amal | Common cyanotic CHD which classically associated with normal ECG and cyanosis in early neonatal period = TGA

Final | 5 D/O Cyanosis, most likely Dx = TGA (Not TOF)

- PGE (Prostaglandin)

- Indication: 1-3 W/O (Ideal first week of live, and Max < 1 M/O) + CHD Known/Suspected + Deterioration
- Dose: 0.05 mcg/kg/min
- PGE Side effects & Management
 - Apnea = Intubation
 - Hyperthermia= Reduce rate (if started on 0.1 go titrate down to 0.05 mcg/kg/min)
 - Hypotension = Fluid
 - Flushing

PEM R | 3 D/O poor feed/diaphoresis/turning blue, Cardio consult reveals TGA, PGE1 infusion 0.1 mcg/kg/min, SpO2 68% improved to 78%, waiting for NICU, ED nurse tells you pt temp now is 38.9, best Tx = Reduce PGE infusion rate

PEM R | 7 D/O, non-bilious vomit, sleepy, difficult breath, persistent cyanosis despite bag valve mask ventilation, shallow breath, dusky, minimal response to IV, Temp 37.1 HR 182 RR 68 BP 66/32 SpO2 81% on 10L on non-rebreather, intubated, cyanosis persist despite 100% FiO2, given isotonic fluid resus, next = Prostaglandin infusion titrated to effect

PEM R | FT Newborn at home 4hr ago G3P3 35 Y/O, APGAR 4 & 7 at 1 and 5, Initial HR 185 RR 50 BP 64/30 SpO2 35% on 100% FiO2, tachypneic without distress, lungs clear bilateral, tachycardic without murmur, liver edge 1cm below costal margin, intubated due to cyanosis, SpO2 improves to 54% on 100% FiO2, ABG Ph 7.12 CO2 32 PaO2 26 BE -6, Next step = PGE 0.05 mcg/kg/min

Promo | 2 D/O Cyanotic, Lethargic, Hypotensive, Systolic Murmur on Lt. side, CXR (? shows Boot shaped heart), Next = PGE

Promo | Lethargic neonate w/ poor activity & diaphoresis while feeding, Hypotensive, No Cyanosis (Incomplete Q)

Promo | Neonate difficulty feeding w/ Diaphoresis, Pale, Lethargic, Femoral pulse weak, Cyanosed, Next = PGE

Promo | Baby w/ Cyanosis, Lethargy & decrease Activity, Next = PGE

Promo | Similar scenario = PGE

Amal | 3 D/O, healthy uncomplicated pregnancy, now difficulty breathing, restlessness, ashen in color, poor tone, weak femoral pulsation, crackles in both lungs field & grade 3 systolic murmur HR:180 RR55 BP:55/32 CXR: Increase vascular markings with fluid fill the fissure, Best = PGE (works also as vasopressor)

Amal | 4 D/O baby, heart rate 186 temperature 37.2 location 48 over non palpable as the blood pressure, capillary refill greater than four seconds, RR 72 no skin rashes, CXR cardiomegaly Which of the following should you administer = Prostaglandin (works on PDA & as vasopressor)

Final | 3 D/O poor feeding, diaphoresis, turning blue, After cardio consultation Echo shows TGA, PGE1 Infusion 1mcg/kg/min, SpO2 68% to 78%, while waiting for PICU, nurse says Temp 38.9 now = Reduce PGE infusion rate

Chapter 2: Medical

- **PDA**
 - o Path: Failure of ductus arteriosus to completely close, Sx depend on its size
 - o Sx: Asymptomatic > FTT, poor feed, tachycardia/tachypnea > HF
 - o Murmur: Continuous Machinery like murmur at LUSB
 - o Invx: Echo
 - o Tx: Conservative, Medical closure (Ibuprofen, Acetaminophen/Indomethacin), Surgical closure
- **Vein of Galen malformation**
 - o Path: creates a massive low-resistance intracranial arteriovenous shunt, causing huge left-to-right flow back to the heart. This leads to high-output cardiac failure with a cranial (fontanel) bruit & bounding pulse
 - o Sx: loud bruit over skull and high-output CHF in neonates

Amal | 36 H/O Term NSVD, RR 80 HR 168, easily palpable pounding pulses in all four extremities. BP 72/30, on Ex A left (hyperdynamic precordium) and a 3/6 systolic ejection murmur at the upper left sternal border & murmur over the anterior fontanel, of the following, the most likely Dx = Left-to-right extracardiac shunting with congestive heart failure (Not Aortic coarctation with congestive heart failure nor Large ventricular septal defect with congestive heart failure)

- **VSD (Ventricular septal defect)**
 - o Typical presentation around 2 M/O, HF presentation depends on VSD size
 - o Ax: Down Syndrome (as Endocardial Cushion defect -AVSD-)
 - o Path: Ventricular shunting Left-Right shunt, could be Mechanical (can self-limit) or Muscular (needs repair)
 - o Sx: FTT, Feeding issue (Sweating/tiring w/ feeds, Poor sucking)
 - o Murmur: Loud harsh holosystolic murmur at LLSB
 - o Complication: Heart Failure, Eisenmenger's syndrome
 - o Invx: Echo (Diagnostic)
 - o Tx: by Cardio if Asymptomatic = observe, Symptomatic = Lasix or Digoxin to decrease after load & reduce HF if not responding surgical option
- **Eisenmenger's syndrome**
 - o Path: Large VSD Lt to Rt Shunt > Rt Ventricular Hypertrophy + Pulmonary HTN/Vasculature/Resistance > Rt to Lt shunt
 - o Sx: Cyanosis, More Exertional dyspnea, Chest pain, Later Clubbing of fingers
 - o Invx: Polycythemia, CXR (Increased Pulmonary Vasculature fibrosed)
 - o Tx: Lung Transplant
- **Typical case: Down syndrome w/ VSD:**
 - o Early VSD (Lt to Rt Shunt) = Comes w/ Feeding issue &
 - o Untreated VSD (Lt to Rt Shunt) = Comes w/ HF
 - o Eisenmenger syndrome (Rt to Lt Shunt) = Comes w/ Cyanosis, HF, Clubbing, Polycythemia

PEM R | 8 W/O FTT, at 2 w/o was doing well but then feeding poorly and clothes wet after feed, birth wt 3.5kg and current 3.7, awake acyanotic, Holosystolic 3/6 murmur at left sternal, femoral pulses 2/2, Dx = VSD

- o VSD = Pan/Holosystolic, FTT, HF, sweating w/ feed, hepatomegaly

Promo | Trisomy 21 came to ED w/ Fatiguability, cause = Eisenmenger Syndrome

Final | 12 W/O w/ Heart failure manifestation, FTT, Murmur and Hepatomegaly = Large VSD

Final | 12 W/O with CHF = Large VSD

Final | Trisomy 21 came to ER with fatiguability what is cause = Eisenmenger syndrome

Final25 | 12 W/O came with poor oral feeding w/ crepitation on lung exam and hepatomegaly (CXR which showed congested lung) what he has = Large VSD (Not Tricuspid atresia nor Severe pulmonary stenosis nor TAPVR)

Chapter 2: Medical

- CoA

PEM R | 3 W/O infant Poor feeding/Tachypnea/Diaphoresis/Pallor/Decreased wet diapers after a viral exposure (febrile cousin with URI). Vitals: T 37.8°C, HR 174, RR 64, BP 78/34, SpO₂ 91% RA. Exam shows scattered lung crackles, hepatomegaly (liver edge 4 cm below costal margin), and weak/difficult-to-palpate lower extremity pulses but no heart murmur, likely Dx = CoA

Promo | 4 W/O in Ed w/ RD SpO₂ 75% RA, which of following NOT included in DDx = CoA (Not Tricuspid Atresia nor Truncus Arteriosus nor TOF)

Amal | 4 W/O lethargic, with difficulty feeding, in respiratory distress, HR 160, RR 58, SpO₂ 74%, cyanotic. Which of the following is least likely of the differential diagnoses = CoA

- Bad CoA presents in 1st week of life | 1 week = Duct depended lesions or Severe CoA | > 4 week = VSD

Amal | 2 W/O FT, infant, Hx of Difficulty breathing during feeding, no cyanosis, HR 140, widely radiating systolic murmur, tachypneic, CXR: Cardiomegaly with pulmonary congestion, most likely has = CoA (Not PDA nor TGA nor VSD -usually present at the age 6 weeks with acute heart failure-)

- TOF

- Most common cyanotic congenital heart disease in childhood
- Path: PROVe (Pulmonary stenosis, RV hypertrophy, Overriding aorta, VSD)
- Invx: Echo, CXR (Boot shaped heart)

- Tet Spell (Cyanotic Spell)

- Path: Infundibular muscle spasm -> Decreased/Absent RVOT (Complete Pulmonary Stenosis) Blood flow -> Rt to Lt shunt -> Hypoxia -> Cyanosis
- Exacerbating factors: Agitation, Crying, Feeding, Defecation, or Exertion
- Sx: Severe Cyanosis, Absent Murmur
- Tx Concept
 - ↓ PVR = O₂, Calming, Sedation (Morphine)
 - ↑ SVR = Knee-chest position, Squat, IV fluids, Vasoconstrictors (Phenylephrine)
 - ↓ RVOT obstruction = Beta blockers (Propranolol)
 - Surgery = Emergent systemic to pulmonary shunt (Blalock taussing shunt)
- Tx: Goal: decrease R-L shunt across the VSD
 - 1st line
 - Apply O₂ (↓ PVR)
 - Knee-Chest position (↑ SVR > reverse to Lt to Rt Shunt)
 - IVF 5-10 ml/kg bolus over 30-60min (↑ RV filling > ↑ Preload)
 - 2nd line (Calm patient)
 - Morphine 0.1 mg/kg/dose (↓ PVR)
 - Alternative: Fentanyl 1ug/kg IV/IM
 - Midazolam 0.2-0.3mg/kg/dose intranasal
 - Ketamine 1 mg/kg/dose (↓ PVR, ↑ BP, ↑ HR)
 - 3rd line
 - Vasoconstrictors
 - Phenylephrine IV/SQ/IM 0.1 mg/kg then infusion 2-10 mcg/kg/min
 - (Uptodate dose: 5-20 mcg/kg/min)
 - Norepinephrine IV 0.1-0.5 mcg/kg/min
 - Beta blockers (↓ RVOT obstruction > ↑ Diastolic filling)
 - Propranolol IV 0.01-0.2 mg/kg
 - Esmolol IV 500 mcg/kg over 1min then infusion 50 mcg/kg/min
 - increase by 50 mcg/kg/min (max 300 mcg/kg/min)
 - If acidotic: Sodium bicarb 1-2mEq/kg – to treat acidosis & encourage
 - Surgery: Blalock taussing shunt
 - (palliative shunt connecting subclavian artery from aorta to pulmonary artery)

Chapter 2: Medical

PEM R | 2 M/O referred due to heart murmur and poor weight gain, mother report peri-oral color change when wakes up, cries/feeds/defecates, on Ex systolic murmur auscultated over 2nd intercostal, sudden = IM Morphine

PEM R | 8 M/O infant girl, Hx Trisomy 21 extreme cyanosis, tactile fever w/ decreased PO & U/O, cardiologist says there is hole in heart, mother mentions turning blue during cry/feed but not scheduled for surgery, Now agitated & out of breath w/ extreme cyanosis, immediate step = Knee chest maneuver

Promo | Case of TOF, Cyanotic baby, Next = Knee Chest position

Promo | Pt. W/ TOF not operated came w/ hypoxia, IVF & morphine given, other Tx = Phenylephrine (Not Dopamine nor Epi)

Promo | 4 M/O blue baby = TOF

Promo | 4 M/O presented to ED with lip cyanosis upon examination you found harsh systolic murmur what is your possible diagnosis = TOF (Not VSD nor TAPVR)

Amal | 4 M/O girl, known TOF. Her mother informs you that she has fever, diarrhea, poor feeding, for the last 24 hours, Ex, you noticed cyanosis of the extremities and perioral area. She is tachypneic, hyperpneic, her HR 180 bpm You auscultated her chest. You could not hear any murmur. Of the following, the most appropriate management strategy is to = Place her in a knee-chest position with oxygen (Not antipyretics for fever nor immediate Echo nor Reassure the mother)

Amal | 3 M/O baby with TOF, brought by mother due to diarrhea, Ex: irritable, cyanosis, HR180. Finding most consistent with Tet spell = Inability to hear murmur (Because of severe shunting during Tet spell)

Final | Scenario of cyanotic spell, k/c of TOF initial action = Knee chest position

- ALCAPA (Anomalous coronary artery from pulmonary artery)

- Presents at 4-6 W/O, or older as CHF
- Sx: Recurrent discomfort & angina
- ECG: Deep Q wave (I, aVL), ST elevation (v3, v4, v5, v6)
- Murmur: Sift Continues murmur, Gallop rhythm

PREP | 8 W/O, Poor PO, Tachypnea, eating less breathing fast, Tired/Sweaty, HR 170-180, BP 75/45 RR 60 Subcostal retraction SpO2 95%, Diffuse crackles, gallop rhythm, 2/6 blowing systolic murmur at apex, liver 3cm below, cool distal + warm central, CXR (Cardiomegaly), ECG (Deep Q wave) = ALCAPA

Pedz | 2 W/O Irritable inconsolable, Systolic murmur on Apical radiates to Lt. Axilla (MVP), cause = ALCAPA

Final | ALCAPA ECG

Sudden Death

- Aortic Stenosis = Systolic murmur RUSB | Exertion Sx
- HCM = Systolic murmur LSB to Neck | Exertion Sx + HF Sx | Inverted T & Prominent Q | Tx: BB, CCB
- Long QT = RW AD NO SNHL, JLN AR YES SNHL | Exertion Sx + Seizure | QTc ≥ 440 | Tx: BB

- Long QT syndrome

- Inherited, Put Pt. At risk of VT and V-Fib, Types:
 - Romano-Ward: AD, NO SNHL
 - Jervell and Lange-Nielsen: AR, YES SNHL (Nielsen = Nelson Peds Book = No Hearing)
- Other causes of prolonged QT interval
 - Meds: Azithromycin, Ondansetron, Chloral hydrate, Tricyclic antidepressant
 - Electrolytes: Low Ca, Low Mg, Low K
- Sx: QTc ≥ 440, Asymptomatic or Presenting:
 - Dizziness/Syncope (w/ exercise, acute emotions, loud auditory stimuli, Hx of watching TV > Collapse)
 - Seizures, Sudden cardiac arrest

Chapter 2: Medical

- Dx usually made Post cardiac arrest or sudden death of family member in young age > ECG screening of family
- Tx: Beta blockers (Propranolol, Nadolol) ↓ heart rate thus ↓ rate of rhythm
 - Restrict from competitive sport & avoid triggers (meds, loud noise, stress situation, dehydration)
 - Pacemaker if drug-induced bradycardia is severe
 - AVOID Azithromycin (Will prolong QT)

PEM R | 8 Y/O gymnastic, collapsed/unconscious 20 sec after drinking electrolyte she felt ready/strong, currently on azithromycin for chronic ear infection, Temp 36.8 HR 68 RR 20 BP 109/68 SpO2 99% RA, she is fit, normal ex, normal labs, (ECG prolong QT) recommendation = Stop taking Azithromycin

Promo | Pt. Playing football under heat of sun, suddenly collapsed, Vitally stable, Temp 37, FM Hx of Sibling died same = Ciliopathy (Incomplete Q) Ciliopathy Ax w/ Joubert (CHD: ASD/VSD/PDA/PS) & Bardot-Biedl (CHD: ASD/LVH/CoA)

Promo | Young patient collapsed while playing football in a sunny afternoon, Temp 37, Reason = Channelopathy cardiac disease (Not Heat stress nor Vasovagal)

Promo | Child w/ chest pain during morning, Family Hx of Cardiac disease, Exam grade 1 murmur, ECG normal = Reassurance & Discharge (Not CXR nor Echo)

Promo | Prolong QT on ECG, and FM Hx of Sudden death, Tx = B Blockers

Final | ECG of prolong QT what is the treatment, with hx of sudden death in the family = Beta Blocker

- Hypertrophic Cardiomyopathy (Most common)

- AD (FM Hx of Father dies at 30s)
- Pth: Asymmetric Lt. Ventricle Hypertrophy > Obstructs LV outflow
- Sx: Exertional Syncope/Palpitation/Chest pain
 - HF Sx: Edema, Hepatomegaly, JVD
 - Systolic Ejection murmur on LSB radiates to neck & worsen w/ Valsalva maneuver
- ECG: **LAD** (LVH w/ septal hypertrophy), Prominent Deep/Narrow Q wave on Inferior/Lateral leads
- CXR: Cardiomegaly & Plethoric lung (Pulmonary venous congestion)
- Complication: VTach > Death (80%)
- Tx: BB (Increase Ventricle compliance + Decrease Outflow obstruction)
 - CCB (Improve diastolic filling, Decrease Heart Contractility > Decrease Outflow obstruction)
 - Do Echo for all siblings
 - AVOID Diuretics/ACEI/Digoxin = Worsen LVOT Obstruction

PEM R | 14 Y/O 2 wk Hx SOB while trying to sleep, activity decreased, he is football star at school, but has trouble running now, Father says child complains of light headedness after last game & feels palpitations during times of rest, today noticed hands/feet swollen & cool to touch, T 36.7 °C HR 114 RR 30 BP 80/50 SpO2 94% on RA, Pale/Mild RD, harsh systolic ejection murmur LSB radiates to neck, Lungs are clear liver edge 3 cm, Extremities 2+ pitting edema, CRT 3, CXR (Cardiomegaly), Emergent therapy = Metoprolol 0.1 mg/kg PO or Furosemide or NS 20 ml/kg

- (HF Sx w/ Exertion Sx & Systolic Murmur = HCM)

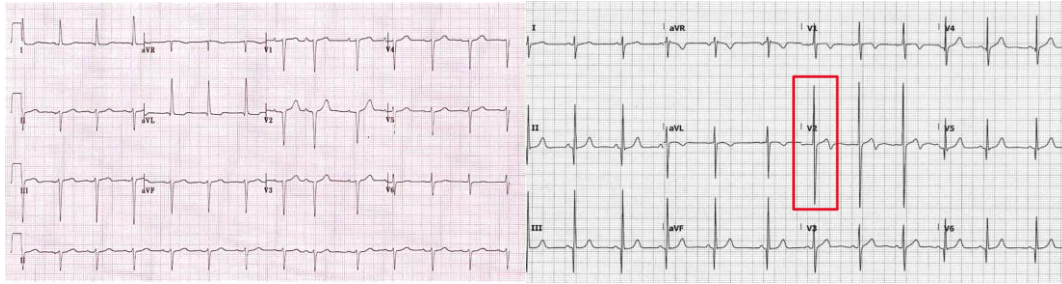
PEM R | 14 Y/O Hx of SOB for 2 weeks while trying to sleep, having decreased activity, known high school team soccer player, now complains of light deafness after last game day before, today has hand/feet swollen & cool to touch, pale, HR 114 RR 30 BP 80/50 Temp 36.7 SpO2 94% on RA, Harsh systolic ejection murmur, lungs clear to auscultation, liver 3cm pitting edema +2, CRT > 3sec, CXR (Cardiomegaly), emergent therapy = Metoprolol 0.1 mg/kg PO

Promo | Child suddenly collapsed, has Lt. Chest pain, Hx of sibling died at same age, ECG (?), Dx = Cardiomyopathy

Final | Case of syncope during exertion with family Hx of cardiac his brother suddenly died at the same age, ECG showed left axis Dx = Cardiomyopathy

Final | ECG left axis = Cardiomyopathy

Chapter 2: Medical



ECG1: LAD (Lead I & Lead aVF) | ECG2: Dagger like wave

- **Aortic Stenosis**
 - o Murmur Harsh Systolic Ejection in Rt. Upper sternal border (↑ Squatting ↓ w/ Valsalva + Standing)

PREP | 14 Y/O, Boy, Night severe chest pain during soccer, pain Sub-sternal sharp sudden, after resting 15min felt better and pain resolved, boy never felt this before, no chest pain reproducible, 3/6 harsh systolic murmur on Rt. Upper sternal border = Refer to Ped Cardiologist and Restrict Exercise (Aortic Stenosis)

Acquired Heart Disease

- **Infective Endocarditis**
 - o Risk factors: CHD, Valvular heart disease, Central venous catheter
 - o Cause: Staph. A., viridians streptococci, CoNS (neonates, catheter)
 - o Duke Criteria (Be Timer)
 - Blood C/S Pos. (> 2 times 12hr apart)
 - Echo Pos
 - Temp > 38
 - Immune phenomenon (Osler/Roth)
 - Microbiology evidence (Pos. C/S not meeting major criteria)
 - Embolic Phenomenon (Arterial emboli, Septic emboli, Conjunctival hemorrhage, Painless skin lesion)
 - Risk factors (Congenital heart condition, IV drugs)
 - o Sx: fever, rash, cough, and myalgias
 - Roth spots, Osler nodes, murmur, Janeway lesions, anemia, nailbed hemorrhages, emboli (FROM JANE), hematuria, proteinuria, RBC casts
 - o Dx: blood culture, echocardiography, Duke criteria
 - o Tx: antibiotics for 4–6 weeks
 - Dental prophylaxis in some cases

PEM R | 16 Y/O, Hx of fever/malaise/fatigue/weakness generalized/muscle aches developed 3 weeks, mother says eyes bloodshot bilateral for 2 days, urine pink tinge, Temp 38.3 HR 100 RR 30 BP 118/78 SpO2 98% on RA, has II/VI systolic ejection murmur over LSB, Lung CTA, no organomegaly, CRT brisk, important next = Blood C/S

PEM R | 16 Y/O female, 1 week Malaise/Cough/Fever, Temp 38.9, Hx 10 days earlier tongue piercings Temp 38.8 HR 128 RR 30 BP 110/68 SpO2 97 on RA, tongue edema/inflamed/palatal petechia, has III/IV blowing systolic murmur over perversion, lung clear, no hepatosplenomegaly, initial test = Blood C/S

Promo | 12 Y/O, 2 Days Fever, Vomiting, Anorexia, Chills, Night Sweats, Last 2hr worsened w/ SOB, Hx of Small VSD following annually w/ Cardio, Temp 38.9 HR 138 RR 24 BP 92/48, SpO2 92%, Tired, Toxic, Clear lung, Harsh blowing III/VI Holosystolic murmur over LSB, No gallop or Friction rub, Spleen tip palpable, Important Test = Blood C/S (Not CBC nor ESR nor CXR)

Final | Infective endocarditis = Blood culture

Chapter 2: Medical

- Myocarditis

- Organisms:
 - Viral: Adenovirus & Enterovirus (Coxsackie B), Parvovirus B19, EBV, CMV, HHV-6
 - Bacterial: Staph. Aureus or Strep. Viridians, Strep. Pneumonia
- Sx: RD + Cardiogenic Shock, Cardiogenic Asthma
 - Tachypnea, retractions, rales, wheeze, S3/S4 gallop, hypotension, hepatomegaly, poor perfusion
- CXR: Cardiomegaly (Infant Heart > 60% | Child Heart > 50%)
- ECG: **Low voltage ECG** (most specific for Myocarditis), T inversion, ST elevation saddle shape
- Invx:
 - Most Important test to reach Dx = 12 Lead ECG
 - Most Important test to reach Dx after ECG = Troponin
 - Initial imaging = CXR (Cardiomegaly > Do Echo)
 - Initial Diagnostic imaging = Echo
 - Most Definitive Diagnostic test = Biopsy (Gold standard)
 - Doubles in Myocarditis = AST (Not specific)
- Tx: diuretics, afterload reduction, inotropes, VADs, ECMO (may be required for severe disease)

PEM R | 17 Y/O, 4 day SOB/palpitation/weakness/chest pain, family think caused by mRNA COVID 19 vaccine taken 5 days ago, now tired, w/ mild RD Temp 38.1 RR 40 HR 130 BP 109/68 SpO₂, Hepatomegaly, Bilateral ankle edema CRT > 4 sec, best to help Dx = Troponin

PEM R | 12 Y/O, recent viral prodrome (nasal congestion, cough, fever 39°C, and roseola exposure) presents w/ chest pain, dyspnea, fatigue, and exercise intolerance. Vitals: T 38°C, HR 130, RR 34, BP 100/73, SpO₂ 90% RA. **Low pitched 3rd heart sound**, breath sounds with intermittent expiratory wheeze, hepatosplenomegaly. ECG demonstrates T-wave inversions and ST elevations, which diagnostic study most useful in determining further management = Echo

PEM R | 12 Y/O girl, 4 days ago Fever 38.3, Myalgia/diarrhea/fatigue/malaise, Sx resolved but tiring continues w/ SOB just walking around house/climbing stairs, Vitally stable but has gallop on Ex but no murmur, liver edge 2.5cm below Rt. Costal, glucose/blood gas/HCT all normal, CXR has enlarged cardiac silhouette & pulmonary vascular congestion, ECG Sinus Tachy, US shows decreased Lt ventricular function, Pathogen = Coxsackievirus B

Promo | 2 Y/O Girl, Asthmatic having RD & Fatigue, parent report recent URTI, Temp 37 HR 160 RR 70 BP 90/60, Dry mucous membranes, Mild intercostal retractions & basal Rales, Liver palpable 3cm below costal margins, pulses weak but palpable in all extremities (XR shows Cardiomegaly)

Amal | 2 Y/O fever, fatigue, loss of appetite and irritability for 3 days, febrile 39 HR 160 RR 40 BP 90/60, dry mucus membrane, mild intercostal retractions, pan holo-systolic murmur, palpable liver, most likely cause = Myocarditis

Amal | 20 M/O, k/c of Asthma, progressive RD, the patient was well until 1 week ago, When he developed URTI with fever, now fever subside o/e: he is breathing fast, looks lethargic, tachypneic, with dry mucus membrane, HR 150, chest is clear on auscultation, liver enlarged 2 cm below costal margin, CNS intact you wanted to start IV fluid, what rate would you choose = 10 ml/kg slow bolus (Not 20 ml/kg fast bolus nor 20 ml/kg slow bolus nor 10 ml/kg fast bolus)

- Heart Failure mnemonic
 - x2 Fast: HR + RR | x2 Big Liver + Heart
- 10ml/kg Slow bolus because heart is failing

Amal | CXR (Cardiomegaly) What's your Dx = Acute myocarditis (Not Pericardial effusion)

- Consider doing Echo to r/o Pericardial effusion

Amal | Regarding the previous patient, what investigation would you do to confirm your Dx = 12 lead ECG

- Low voltage ECG (most specific for Myocarditis)

Final | URTI, Sick, Fever, Tachycardia, **ECG low voltage QRS** = Myocarditis

Final25 | Asthmatic Pt. with URTI symptoms, came tachycardic + tachypneic with hepatomegaly, ECG (Low voltage, Sinus Tachycardia), Dx = Myocarditis (Not Viral pericarditis nor Bacterial pericarditis nor Pericardial effusion)

Chapter 2: Medical

- Pericarditis

- Causes:
 - Viral (Coxsackie A, B, Echovirus, Adenovirus)
 - Bacteria (the common childhood bacteria -Staphylococcus, Strep. Pneumonia-)
 - Histoplasmosis, Coccidioidomycosis (in certain US areas)
 - TB (As chronic)
 - Collagen vascular disease
 - Drugs (Phenytoin -AED-, Hydralazine -Anti-HTN-, Procainamide -Anti arrhythmic-)
 - Chest Trauma/Surgery
- Sx: Pericardial friction rub (in phase w/ heart sounds, Atrial systole, Ventricular systole, Ventricular relaxation)
 - Chest pain (Sharp, Pleuritic, worsen with cough + Inspiration, + Supine position, relived by sitting up)
 - Fever (Sometimes)
- ECG: **ST segment Elevation** (most leads) > ST segment normalization + T wave flat/down
 - PR segment depression (most leads, V5 + V6)
- Echo: Pericardial effusion
- Tx: NSAIDs
 - Abx = IF Bacterial
 - Steroids = IF Collagen vascular cause
 - Dialysis = Uremic pericarditis
 - Pericardiocentesis = IF Tamponade
 - Surgical drain + wash out = IF Purulent effusion
 - Early Pericardiectomy = IF TB pericarditis

PEM R | 17 Y/O girl, having sternal chest pain for several days w/ low grade fever, pain contact & worsened w/ inspiration or lying flat, denies cough/other Sx, taking ibuprofen w/ minimal relief, HR 115 leaning forward on stretcher, has continuous harsh sounds, ECG expected = Widespread ST elevation

PEM R | 14 Y/O cough/congestion/fever for 4 days, urgent care doctor have Amox for throat infection, has sharp Mid-sternal chest pain occurs w/ deep breath/cough/supine, setting up & lean forward improves pain, HR 145 RR 40 BP 98/45 Temp 38.9 SpO2 94%, RD/grating to-and-fro, over Lt sternal border, CRT 3 sec, Best Dx = ECG

Amal | 3 Y/O, Tachypnea, fatigue, less active than usual, O/E: moderate distress HR 190 RR 36 Spo2 98% RA. Fine rales on chest exam, Liver edge palpable, CXR Cardiomegaly with pulmonary edema, most likely causative organism = Coxsackie virus (Not Curateslla or Strep viridans or Atypical mycobacteria)

- Pericardial effusion

- Serous, Purulent or Bloody pericardial effusion pushing parietal pericardium away from heart (by Pericarditis)
- Causes: Same like Pericarditis
- Sx: Muffled heart sound (if large effusion)
- Labs: XR Enlarged cardiac silhouette (Water-bottle heart)
- ECG: Sinus tachycardia with Low voltage QRS
- Echo: Shows pericardial effusion:
- Tx: Same like Pericarditis

- Cardiac Tamponade (Read in Resus)

Pedz | Pericarditis coming w/ shock, cause = Cardiac temponade

Pedz | Pt. W/ Pericarditis, Best way to hear Friction rub = Ask him to take Deep breath and Hold

Pedz | 6 Y/O, URTI 1 week ago, now RD, lethargy, Decreased heart sounds + no friction rub, XR Globular heart, ECG findings anticipated = Low voltage ECG

Pedz | Child w/ Heart failure + Effusion (XR Globe shaped) preceded by Neck swell, what is right = Bacterial cause

- Toxic cardiomyopathy occurs in Corynebacterium Diphtheria

Chapter 2: Medical

Pedz | 5 Y/O, underwent ASD closure 10 days ago, now Febrile/SOB/Poor perfusion HR 140, BP 70/45 engorged neck veins, Echo shows significant pericardial effusion, Tx = Pericardiocentesis (Cardiac tamponade)

Pedz | 6 Y/O, in ED w/ RD, few days after having mild URTI, CXR & Echo (shown), what Characteristic pathology indicates significance when determining the risk of progression to cardiac tamponade = Rate of accumulation of the fluid

Pedz | Child w/ Pericardial effusion on Central line, BP 102/65, during inspiration BP drops to 89/61, sign = Pulsus Paradoxus

Promo | 17 Y/O Hx of T-Cell ALL, finished Tx 3 months ago, now RD/Chest pain/Dyspnea/Lightheadedness, Temp 37 HR 125 RR 35 BP 85/55 SpO2 94% RA, Alert Diaphoretic Moderate RD Muffled Heart Sound, threads peripheral pulses, CXR Widened cardiac silhouette, commonly Ax w/ this new condition = > 10 mmHg drop in BP w/ Inspiration (Pulsus Paradoxus)

Promo | Pericardial effusion = Pericardiocentesis

- Myocardial Infarction/Ischemia

- ECG: Peds Prolonged Q wave, Adult Elevated ST segment
- Causes: Cardiac: Teen Cardiac transplant (might present as STEMI), Kawasaki, ALCAPA
 - Non-Cardiac: Familial hyperlipidemia

Amal | 70 Y/O, DM, collapsed after watching wound suturing, pale, diaphoretic, ECG technician is in the next bed so you asked for ECG, which of the following is most consistent with MI = 3 mm ST elevation in lead V1-V3 with ST depression in AVL and 1

Amal | Most sensitive ECG finding for ischemia in children = Prolonged Q Wave

Final | The most specific ECG signs of ischemia in children = Prolonged QT

Cardiac Surgery

- Post-Pericardiotomy Syndrome

- Febrile illness months post incision of Pericardium/Pleura

Promo | Post cardiac surgery 2 weeks ago, came today Fever/Cough/SOB/Chest pain worsening with inspiration, on Ex Pericardial/Pleural rubbing, Dx = Post-Pericardiotomy Syndrome (Not Pneumonia nor Pleural effusion)

- Cardiac transplant rejection

- Sx can be asymptomatic to congestive heart failure
 - LV dysfunction Sx (Dyspnea with or without exertion, orthopnea, palpitation, syncope)
 - GI Sx
- Invx: Biopsy (definitive), XR increased markings (pulmonary edema), Echo (to show function)

PEM R | 16 Y/O boy known asthma & cardiac transplant 4 years ago due to myocarditis, coming now w/ dyspnea on exertion, no recent illness, uses his meds but skips doses, Ex unremarkable, CXR shows increased interstitial markings, Next = Echo

- Blalock Taussig Obstruction

- Sx: No shunt murmur
- Tx: Emergent Cardiac Surgery

PEM R | 4 M/O Fever/vomit/diarrhea/Decrease PO 4 days, Cyanotic w/ RD, Temp 38.6 HR 168 RR 56 BP 54/32 SpO2 64% on RA, on NC 70%, dusky, **no murmur**/gallop/rubs, diminished lung sounds, you note healed midsternal surgical scar, Hx of Hypoplastic left heart, done BT = Stat Cardio Surgical Consult

PEM R | 3 M/O female, cyanotic, Hx of Hypoplastic Lt heart syndrome, underwent BT shunt a month ago, Hx of fever/vomit/diarrhea for 4 days, poor PO & U/O, having severe RD, cyanosis, Temp 37.5 HR 170 RR 50 BP 58/35 SpO2 68%

Chapter 2: Medical

placed on NC SpO2 70%, no murmur, diminished bilateral breath sounds, healed surgical chest wound without erythema, first step = Emergent Cardio surgery consult

PEM R | 2 M/O, w/ HLHS and Blalock Taussing shunt, arrives w/ fever/vomit/diarrhea/cyanosis for 24hr Temp 38.5 HR 182 RR 62 BP 70/40 SpO2 65% 5L O2, beside 9 hgb, immediately intubated, cardiologist en route for echo, next step = Isotonic saline

PEM R | 2 M/O w/ tricuspid atresia S/P Blalock taussing, coming now w/ fever/vomiting/diarrhea/increasing cyanosis, on aspirin/furosemide/digoxin, cyanosis improves w/ 5L FM, while waiting for cardiologist, nurse notify you HR 104 pulse ozone-tree no longer registering reading, exam finding concerning of impending cardiac arrest = Absence of shunt murmur

Final | Neonatal K/C of Lt Hypoplastic post Blalock Taussing shunt, now came w/ Shock & Fever, what next = IV Bolus (Unsure Not Inotropes or Abx)

- VAD (Ventricle assist device)

o Approach:

- 1st: Check heart flow & Manual BP, Check drive line connection, Check spare batteries
- 2nd: Vitals
 - No Pulse = Normal (as Most VAD are continues flow so no pulse can be palpated)
 - Check Perfusion (Absent/Delayed = Abnormal)
 - Check MAP (≥ 50 mmHg = Normal)
 - Check PETCO2 (≥ 20 mmHg = Normal)
- 3rd: CPR (If No perfusion & MAP < 50 or PETCO2 < 20)

PEM R | 9 Y/O on Heart Ventricular assisted device, coming w/ Fever/Epistaxis, HR 96 RR 20 Temp 38.6, 1st = Ensure heart flow can auscultated & drive line is connected

PEM R | 15 Y/O on VAD came after high speed MVC, appropriate Management = Pt not well perfused + MAP < 50 Start CPR

Other Cardio

Syncope

- Vasovagal Syncope

- o [Fleisher] The precipitating causes for vasovagal syncope include prolonged standing, a crowded and poorly ventilated environment, brisk exercise in a warm environment, severe anxiety, perceived or real pain, and fear. There are three clinical types. In the first, there is marked hypotension (vasodepressor syncope). The second type is characterized by marked bradycardia (cardioinhibitory syncope) and in the third form, there is a combination of hypotension and bradycardia. Some symptoms that herald a syncopal event include feelings of weakness, lightheadedness, blurring of vision, diaphoresis, and nausea.
- o Breath-holding spells, a type of vasovagal syncope, occur in older infants and toddlers and may be triggered by anger, pain, or fear. There are two forms: cyanotic or pallid. In the cyanotic form, the child holds his or her breath, turns cyanotic, and then loses consciousness. In the pallid form, the loss of consciousness occurs before breath-holding. Occasionally the child may have associated tonic or clonic motor activity.

Promo | Vasovagal features = Diaphoresis & Lightheadedness

Final | Which going with vasovagal = Preceded by nausea, lightheadedness

Chapter 2: Medical

- Cardiac Syncope

o Syncope mnemonic "ABCDE Left Right"

- AV block
- Brugada pattern
- QTc prolongation
- Delta waves (Wolff-Parkinson-White)
- Epsilon waves (arrhythmogenic right ventricular cardiomyopathy)
- Left ventricular hypertrophy
- Right ventricular strain

- Palpitation

PEM R | 17 Y/O Hx of heart fluttering like butterfly for 30 sec, no fainting or lightheaded, no past medical Hx, mother concerned as father had massive heart attack, Temp 36.4 HR 88 RR 18 BP 118/67 SpO2 97%, well developed/nourished, no acute distress, no murmur, ECG normal, Next = PCP referral

- Hemangioma

PEM R | 2 FT, vaccinated, doing well & healthy overall except for noisy breath that worse when cry w/ mild Inspiratory stridor and rash since birth at chest that is slowly increasing in size (pic of hemangioma at breast area), which appropriate management = Consult ENT to perform Laryngoscopy (to r/o Hemangioma at airway)

Chest Pain

- Texidor's twinge (Pericardial catch)

- o Definition: Pericardial catch w/ sudden brief sharp pain at rest or during mild exercise
- o Sx: 30sec-3min sudden brief sharp pain at rest or during mild exercise, has hesitation on inspiration
- o Labs: no specific
- o Tx: NSAID (1st line), F/U w/ PCP

PEM R | 13 Y/O no medical Hx for intermittent Lt sided chest pain for 1 year and half, father died of MI, child is thin healthy gamer normal vitals and physical exam, Next = reassurance and D/C

PEM R | 16 Y/O girl, Lt side chest pain, after playing softball, Hx of intermittent chest pain for a year 2-3 times per month, sharp, shooting, worsen w/ deep inspiration, no radiating pain, last a minute and comes at activity/rest, Temp 36.7 HR 68 RR 16 BP 118/76 SpO2 97%, no acute distress cardiac, next step = Give Ibuprofen

- Chest pain

- o Chest pain + Stills murmur = Anxiety related
- o Costochondritis = reproducible chest pain = Ibuprofen

PEM R | 14 Y/O rt side chest pain, occurred in morning worsened 2 days ago, mother concerned has other child CHD father recently died, now no acute distress, Temp 37.8 HR 94 RR 24 BP 104/74 SpO2 98% on RA, wt 40 kg, has I/VI sideline murmur LLSB, normal breath sound, No HSM, ECG normal, Tx helpful = Referral for OPD

Chapter 2: Medical

- **Tietze's syndrome**
 - o Benign painful non-Suppurative localized swell over Costochondral joint

PEM R | 14 Y/O chest pain worsening over 3 weeks, mild viral URTI that resolved, had worsening pain since that time, Left sternal pain that worse w/ deep breath, denies fever, Temp 37 HR 72 RR 14 BP 124/76 SpO2 99% on RA, localized area of tenderness nonsuppurative erythema edema overlying Costochondral junction on Lt sternum, Tx = NSAIDs

Murmur

- **Innocent murmur**
 - o Still's or Innocent murmur = Low pitch mid-systolic at base of heart/axilla
 - o Caused by peripheral pulmonary stenosis

PEM R | 2 W/O infant ordered from PCP for heart murmur & abnormal CXR, feeding well, no fever/cough/diaphoresis/cyanosis/apnea/irritable, normal u/o, well-nourished child HR 144 RR 28 BP 89/54 SpO2 98% Temp 37.6 Low pitch mid-systolic at base of heart/axilla, murmur, no organomegaly, CRT < 2 sec (CXR appear cardiomegaly but the cause is only thymus) = Refer pt back to PMD

PEM R | 3 M/O episode of change face color around mouth before falling asleep 15 sec, breast feed a half hour prior, feeding Q3hr, NSVD, Term, healthy, Temp 36.4 HR 120 RR 28 BP 89/67 SpO2 99% on RA, well nourished, II/VI vibratory murmur LSB, next = Parental reassurance

PEM R | 5 Y/O had murmur on PCP exam, no past Hx, HR 98 RR 24BP 116/86 SpO2 98% Temp 37.6 I/VI continues murmur over Rt. infraclavicular area in low anterior neck lateral to SCM muscle, no organomegaly, CRT < 2 sec, Next step = provide parental reassurance & D/C

- **Hyperdynamic blood flow murmur**
 - o Ax w/ Severe Anemia

PEM R | 13 Y/O chief complaint irregular menses for 4 months, last up to 10 days and used up to 8 d per days, mild lightheadedness, no sexual Hx or previous medical HX, Temp 36.6 HR 118 RR 32 BP 98/68 SpO2 99%, slight pale, has new II/VI systolic ejection murmur LSB, no organomegaly, most likely to benefit in assessing pt = CBC

Chapter 2: Medical

Pulmonology

Upper Respiratory Tract

- Apnea

- Apnea definition
 - No Breath > 20 sec
 - No Breath > 10 sec + Cyanosis (Saturation < 90%) or Bradycardia (HR < 100 bpm)
- Periodic breathing
 - 3 or more respiratory pauses of > 3 sec with < 20 sec normal respiration between the pauses
 - < 10 sec + No color change nor Abnormal movement

PEM R | 12 D/O 35 wk, Apneic, Hx of 10 sec pause in breath but no color change or abnormal movement, noticed this 4-5 times, gaining weight, feeding well, Temp 36.6 HR 148 RR 38 BP 84/40 SpO2 99%, week nourished/developed male, Tx = D/C w/ reassurance

- Stertor

- Nasal obstruction caused by: nasal congestion Adenotonsillar hypertrophy, neuromuscular weakness

PEM R | 4 Y/O having RD w/ transmitted upper airway sounds, best to localize RD to upper airway = Stertor

- Vocal cord dysfunction

- Female more than males
- Sx: Inspiratory stridor, Expiratory wheeze, cough
 - Tingling related to hyperventilation
- Tx: Refractory: Heliox, Inhaled Ipratropium, Topical lidocaine to larynx

PEM R | 16 Y/O asthma, coming w/ chest pain/difficult breath/throat tight/numbness/tingling, Temp 36.4 HR 110 RR 28 BP 112/78 SpO2 100%, she is uncomfortable, having Inspiratory stridor w/ expiratory wheeze, given albuterol/PO steroid with no change, what is the gold standard for correct diagnosis = Direct laryngoscopy

- Chronic Cough

PEM R | 3 Y/O persistent cough, URTI 3 wk ago & nasal congestion/fever/cough, trouble sleeping at night, playful no additive lung sound, normal O2, recommendation w/ discharge to help cough = Honey

- Mallory Weiss syndrome

Promo | Frequent vomiting w/ streaks of blood, NGT inserted & no blood, Dx = Mallory Weiss syndrome (Not GE)

Chapter 2: Medical

- Hemoptysis

- Massive hemoptysis: > 240ml within 24hr or > 100ml within several days
 - Fleisher > 240 cm³
- Ax: CF, SLE w/ Diffuse alveolar hemorrhage life-threatening complication
- Tx: Tranexamic acid no current evidence, Bronchial artery embolization
 - Fluid Resuscitation & PPV
 - If Intubated, Ventilation Settings:
 - High PEEP (Makes a tamponade to the area of bleed + improve oxygenation)
 - Low Tidal Volume (Reduce risk of further lung injury by reducing Inspiratory pressure)

PEM R | 23 Y/O CF 2 weeks worse cough/SOB, this morning small amount tablespoon of blood with cough, Temp 37 HR 85 RR 24 BP 120/74 SpO₂ 88% on RA, CXR chronic changes consistent w/ CF, next = Administer broad spectrum Abx

PEM R | 13 Y/O CF w/ hemoptysis 30min prior to arrival, coughed 70-80ml blood in sink, home pulmonary management including IV Abx not changed & no recent illness, state doing well and not believe needs to be seen, Temp 37.6 HR 96 RR 20 BP 104/68 SpO₂ 99% on RA, has diffuse crackles in bilateral lung field, Next = No new Tx to initiate in ED but admit for close monitoring (if Hemoptysis 30-60 ml is significant)

PEM R | 16 Y/O girl, SOB/Palpitation, seen 2 weeks ago in clinic for fatigue/wt loss/recurrent cough/intermittent hemoptysis, despite negative Monospot test, she was presumptively diagnosed w/ Mononucleosis infection, since then sx continued & worsened today w/ sudden SOB, Temp 36.2 HR 121 RR 34 BP 101/72 SpO₂ 93% on 10L NRB, ill, erythematous rash on both cheeks, crackles & decrease breath sound bilateral, coughs w/ 10ml blood in sputum, underlying disease process = SLE

PEM R | Adolescent girl coming w/ small Hemoptysis, long standing SLE, No fever/congestion, now having cough w/ clot 50-75ml frank blood, pale/tachycardic, SpO₂ 98% while giving O₂ & IV access, you decide to intubate = High PEEP & Low TV

Promo | CF having hemoptysis almost 100ml, desating down to 80%, Tachycardic/Tachypneic, Non-Rebreather Mask applied still desating, Next = Intubate

Promo | Case of CF w/ Hx of large amount of Hemoptysis, desating, what to do = Intubation (Not BVM nor Suction nor Physio)

Upper Respiratory Tract Infections

- Non-ill child, Barky cough > Croup (Parainfluenza) > Steroid, Racemic Epinephrine
- ill child, Apnea, Whoop cough > Pertussis (B. Pertussis) > Abx (Macrolides)
- ill child, Barky cough, Trachea Tenderness > Tracheitis (Staph. Aureus) > Abx (Cefta+Vanco) + intubation
- ill child, Drooling, Tripod position, Thumb sign > Epiglottitis (H. Influenza if unimmunized) > intubation + Abx (Cefta+Vanco)
- ill child, Dysphagia/Muffled voice, Big unilateral tonsil/Push Uvula > Peritonsillar abscess (GAS) > Aspiration + Abx (Clinda)
- ill child, Dysphagia, Stiff/Hyperextended Neck, Wide Pre-Vertebral soft tissue > Retropharyngeal abscess (S. Aureus) > (Clinda)

- Croup

- Croup: Rebound phenomena after 2-3hr

PEM R | 3 Y/O acute cough/fever/rhinorrhea 1 day, seemed well when went to bed but awoke coughing & unable to breath, now awake/alert Temp 38.7 HR 146 RR 28 BP 120/67 SpO₂ 98%, barky cough/audible Inspiratory stridor, using mild accessory muscle after given PO meds/nebs, Tx = If no stridor at rest 3hr later, D/C home

Promo | Child w/ Croup given PO Dexamethasone before 2 days, now came w/ Stridor, Tachypnea, Temp 38, Non-toxic appearance, vitally stable, Next = Racemic Epi & Systemic Steroid (Spasmodic Croup)

Promo | 12 M/O sudden onset noisy breath & barky cough, Inspiratory Stridor/Tachycardia, Suprasternal/Subcostal Retraction, Optimal Tx = Nebs Racemic Epi & PO Dexamethasone

Promo | Ominous sign of croup, impending Resp. Failure is = Drop in LoC

Promo | pt. Given Racemic epi, observation for how long = 4-6hr (Not Send home after 2hr nor Admit for 24hr)

Other | Which treatment decreases need for repeat medical visits for children w/ croup = Glucocorticoids

Chapter 2: Medical

Amal | Corticosteroids for viral croup = May elevate the symptoms and shorten the course of the disease

- Croup, Steroid x1 dose is usually enough

Amal | Comparing child w/ Epiglottitis, in croup can be described as more = Cough (Not drool nor sick nor old age)

Amal | 2 Y/O in ED w/ Rhinorrhea, Fever for 2 days, barking cough, No Hx of Asthma, fully immunized, RR 60, Breath sound decreased bilaterally w/ wheezing & moderate retraction, Patient has inspiratory stridor on rest & extremely irritable, Next = Give racemic epinephrine (Not Ventolin & Atrovent & nebs back to back nor CXR & lateral neck XR nor intubate immediate)

Final | Case of croup high grade fever stridor & moderate retraction at rest what next appropriate Tx = Racemic epi neb

Final | 4 Y/O stridor, (croup) = Racemic epi

- Croup w/ Stridor + RD
 - Initial Tx = Racemic Epi
 - Definitive Tx = Dexa

- Bacterial Tracheitis

- Sx: Toxic looking, Mottling, Inspiratory Stridor, Tracheal tenderness but Can drink/Swallow
- Ax: Pneumonia 50%
- Invx: XR Neck (Narrowing of Trachea, **Jagged/Shaggy appearance**)
- Tx: IV Ceftriaxone or Cefotaxime + Vancomycin (1st line, Cover Staph, Strep, H. Influenza)
 - Adequate airway protection

PEM R | 6 Y/O 5 Days Fever/ Cough Temp 39.5, diagnosed w/ croup days ago given dose of Dexa, Temp 39.1 HR 124 RR 28 BP 101/71 SpO2 94% on RA, listless, ill, lying supine, stridor audible, no wheeze/rales, IV access, Next = Abx & prepare emergent intubation

PEM R | 5 Y/O diagnosed as croup 2 days ago for barky cough given Dexa, now Temp 39.4 worsening cough, ill appearing, Inspiratory stridor, barking cough, SpO2 94% RA, Best Next = Administer IV Ceftriaxone

PEM R | 5 Y/O girl, 4 days ago treated for croup w/ PO Dexa, came back w/ cough/horse voice/inspiratory stridor, ill appearing, in RD/Agitated, maintains normal O2 & not in distress Next step = Obtain soft tissue XR Neck

Promo | 1 Y/O URTI for 5 Days then now High fever w/ worsening symptoms, drooling in distress, Dx = Bacterial Tracheitis

Promo | 2 Y/O w/ Bacterial Tracheitis, Abx to give = Cefotaxime + Clindamycin (In Fleisher Ceftriaxone + Vanco)

Promo | Child w/ Croup came w/ Stridor & Toxic appearance, lying on bed Febrile Tachycardic, Next = Abx & prepare for Intubation

Amal | 18 M/O in ED Hx of Barking cough for last 3 days, started to have high grade fever & difficult breath today w/ Temp 40 RR 55, inspiratory stridor and brassy cough. She appears ill. **Immunization up to date**, Lung Ex reveals decreased breath sounds bilaterally with transmitted upper airway sounds. Anterior neck radiograph shows subglottic narrowing, **ragged trachea** column, Dx = Bacterial tracheitis (Not Epiglottitis nor Acute viral laryngotracheitis nor Retropharyngeal abscess)

Final | Case of sick looking child & 1 week URTI & cough, presented w/ stridor, Dx = Bacterial tracheitis

Final | Bacterial tracheitis taken to OR what Abx: (s. aureus and mixed flora) = Cefotaxime and Clindamycin (if there is Cefto & Vanco maybe the answer)

- Epiglottitis

- Rapidly progressive, 1-8 Y/O
- Cause: Non-Immunized = H. Influenza
 - Immunized = S. Pneumoniae, GAS, Staph. Aureus
- Sx: Sick, Fever, Drooling, Dysphagia, Inspiratory Stridor,
 - Leaning forward & Can't drink/swallow, NO Hoarse/Barky
- Invx: Lateral Soft Tissue XR (Thumb Sign)
- Tx: Emergent OR for Instrumentation (ETT, Examination)
 - Keep Calm, ENT Consult
 - Broad Abx (3rd Gen Cephalosporins + Vancomycin)

Chapter 2: Medical

PEM R | 18 M/O 1 day rapidly progressive drool & RD/High fever, throat hurt him, refusing PO, no Hx of cough, unvaccinated, ill appearing HR 138 RR 38 SpO2 99% on RA Temp 39.6, audible stridor, clear lung, next = Immediately transfer to OR

PEM R | 6 Y/O Prev healthy fully immunized, Hx of 4 days Sore throat/fever/dysphagia, seen at 1st day of illness and Dx as viral, but continues to have fever 39.6 and now refusing eat/drink, in RD Temp 39.4 HR 116 RR 18, ill appearing sitting tripod position, spitting oral secretions, has Inspiratory stridor but lungs clear, most likely organism = Group A beta-hemolytic Strep

PEM R | 3 Y/O girl unvaccinated w/ difficult breath, x1 vomit a day ago, slightly tired, decrease PO for 2 days, several house members have URTI, report holding head in odd position, Tachypnea/Tachycardia, in severe RD/stridor/retractions visible, has hands placed in front of her on stretcher to brace body forward (Tripod position), Next = Transfer to OR for airway management

PEM R | 2 Y/O unvaccinated, 1 day fever & difficult breath, No chock/FB aspiration, Temp 39.6 HR 170 RR 56 BP 106/58 SpO2 91% RA, ill appearing/stridor/drooling, Tripod position, Next = Give blow-by O2 & Transfer to OR

PEM R | 3 Y/O unimmunized abrupt onset of stridor/labored breath, Fever hours ago, sudden struggle to breath, on Ex anxious sitting forward, drooling, Inspiratory stridor, Deep Suprasternal/Intercostal/Subcostal retractions, Temp 40 HR 166 RR 38 SpO2 99%, Next step = Transfer immediately to OR for further Tx

Promo | 18 M/O 1 day progressive drool & RD, High fever w/ Decrease Activity, refusing PO, Unvaccinated, Lethargic/ill Temp 39.6 HR 138 RR 38 SpO2 99%, audible stridor, Lung clear, Moderate retractions, Next = Immediate transfer to OR

Amal | 3 Y/O boy, history of fever, stridor and drooling, anxious looking, what is your initial step in Tx = Minimize agitation until definitive management is done

Amal | 2 Y/O girl, RD, family moved to Riyadh from desert, O/E: looks ill, leaning forward and drooling, what is best next step = Intubation in OR (Not IV ceftriaxone nor IM Dexamethasone nor Racemic epinephrine)

Final | Case of epiglottitis next = Intubation in OR

- Retropharyngeal Abscess

- Lateral XR, More than half of prevertebral body (Fleisher)
 - Normal criteria (PEM Guide):
 - C2 < 7mm
 - C6 < 14mm (< 15 Y/O)
 - C6 < 22mm (> 15 Y/O)
- CT Neck, abnormal:
 - CT scan: > 2.5 cm
- Tx: Unstable = Emergent ENT
 - Stable = XR or CT w/ IV contrast
- Surgery Indications:
 - CT Abscess > 2.5 cm
 - Airway obstruction (due to Abscess Mass effect)
 - Failed Abx after 48hr

PEM R | 3 Y/O girl fully immunized, several days Fever/fussy, having URTI, refusing to eat, having fever/drooling/refusing to move neck, Lateral neck XR shows thickened pre-vertebral space, indication for operative drain = CT Abscess > 2.5cm

PEM R | 7 Y/O 5 Days Fever/Sore throat/Swell of Lt neck Temp 38.7 RR 24, No drooling/stridor/wheeze, Firm 2x2 cm non-fluctuant mass in sub mandible of Lt neck without overlying erythema, Increased pain w/ lateral rotation & flexion, High WBC/ESR/CRP (CT w/ contrast shows Retropharyngeal abscess), Tx = Begin IV Abx & Consult ENT

PEM R | 3 Y/O girl, Neck pain/fever/dysphagia over 3 days, Negative Rapid strep test, Temp 38.6 HR 120 RR 30 BP 105/85 SpO2 97% on RA, she is setting up in bed & refuses to lay flat, w/ stridor & retraction, limited neck ROM especially w/ extension, Next best = Emergent ENT Consult

PEM R | 3 Y/O immunized w/ 4 days Fever 40/irritable/PO refuse, ill appearing drooling, bilateral tender non-Fluctuant submandibular lymphadenopathy, pain w/ neck movement, when turning she turns w/ her head and neck, No stridor No tripodding No Kerning, Diagnostic test = Lateral XR of Neck

Promo | 2 Y/O, painful swallowing, low grade fever, XR show C2 widening, O2 90%, Next step = CT Neck w/ contrast (Not Intubation nor Epi w/ Steroids)

Chapter 2: Medical

Promo | 18 M/O Fever/Neck stiff/Pain Neck/Swell, XR Neck (Retropharyngeal space widening C2 > 7mm | C7 > 14mm), Dx = Retropharyngeal Abscess

Amal | 9 M/O Toxic boy, fever, neck stiffness, swelling and drooling preferred to lay still head hyperextended, crying w/ mild stridor, vaccinated up to date, Dx = Retropharyngeal abscess

- Epiglottitis = Squatting or tripod position, in unvaccinated, No neck swell
- Retropharyngeal abscess = Neck swell, Hyperextended head

Final | Prevertebral space: ? 22

- Lateral XR, Normal criteria (PEM Guide):
 - C2 < 7mm
 - C6 < 14mm (< 15 Y/O)
 - C6 < 22mm (> 15 Y/O)

- Peritonsillar Abscess

- I&D indications:
 - Airway obstruction
 - Enlarge mass
 - Significant comorbid

PEM R | 15 Y/O girl 4 days Sorethroat/fever, 1st day of illness RAST negative, has raspy voice w/ tonsillar swell & uvula deviated to Rt., Tx = Perform I&D (not systemic Abx or systemic steroid)

PEM R | 13 Y/O girl, worsen Lt side throat pain for 3 days, Muffled voice, Trismus, Swollen Erythematous Lt tonsil w/ deviation of uvula to Rt, Dx = Diagnosis is clinical & does not require imaging

PEM R | 16 Y/O w/ 4 days Sore throat & fever, drooling/trismus (image of Peritonsillar abscess), next = Perform I&D

Promo | Pt. W/ Sore throat, how to differentiate between Peritonsillar Abscess & Retropharyngeal Abscess = Uvula Deviation

Amal | 12 Y/O boy, fever severe sore throat, what help differentiate from Epiglottitis = Deviation of uvula

Lower Respiratory Tract

- Costochondritis

Promo | Child w/ Chest pain over ribs = Costochondritis (Not Osteosarcoma nor Chondrosarcoma)

Amal | Which of the following is the common cause of chest pain = Chest wall (Not Pulmonary nor traumatic)

Final | Child with pain over the chest Rib = Osteochondritis (Not Osteosarcoma nor Chondrosarcoma)

Lower Respiratory Tract Infections

Pneumonia XR findings

- Diffuse interstitial infiltrates = Atypical pneumonia
- Bilateral ground glass opacities = Pneumocystis pneumonia (opportunistic infection in immunodeficient)
- Patchy opacity = Multifocal bacteria, viral pneumonia
- Lobar infiltrate = Bacterial pneumonia
- Nodular opacity = TB, Malignancy

Chapter 2: Medical

- Pneumonia
 - o Community Acquired Pneumonia
 - Pneumonia: Risk of Bacteremia is 1%
 - Causes: < 1 M/O = GBS (can be related to Late GBS Sepsis which)
 - > 1 M/O = Strep pneumonia
 - Tx: PO Amoxicillin or PO Augmentin or PO Cefuroxime
 - IV Ampicillin or IV Augmentin or IV Cefuroxime
 - o Complicated Parapneumonic Pneumonia
 - Well appearing = PO high dose Amoxicillin
 - ill appearing = IV Ceftriaxone +/- IV Vancomycin or IV Clindamycin
 - o Atypical Pneumonia
 - Tx: PO Azithromycin
 - o Aspiration Pneumonia
 - Healthy = Observe
 - Infected or Comorbid = Ampicillin/Sulbactam or Clindamycin

PEM R | 14 Y/O girl Fever/cough for 1 week, ill, tired on exam, Temp 39 HR 126 RR 32 BP 118/74 SpO2 86% on RA, CXR shows dense Rt. Lower lobe infiltrate w/ small Rt pleural effusion, Definitive Tx = Ceftriaxone

PEM R | 10 Y/O girl, Fever/congestion/cough/decrease activity/appetite worsen past week, but tolerating fluid well, Temp 38.8 HR 92 RR 22 BP 126/72 SpO2 96%, active/alert, no RD, lung board breath sound w/ crackles on Lt lung without wheeze or retractions, Next = Discharge home w/ PO Abx & PCP F/U

PEM R | 6 Y/O prev. healthy, given Amox for 6 days as CAP, despite good adherence to Abx pt. Still having worsening cough/higher fever, Temp 40 w/ decreased breath sounds & upper right chest w/ dullness to percussion, minimal tachypnea/tachycardia SpO2 90% on 2Lpm NC, Multiplex PCR Positive for Rhinovirus/RSV, CXR upper lobe consolidation w/ small cavitation lesion within, POCUS shows parapneumonic effusion without loculation, as planning for ICU & agree for chest tube, Abx choice = Vancomycin

- o Complicated Pneumonia need full coverage for Strep pneumonia & Staph A. & MRSA

PEM R | 1 Y/O prev. healthy, 5 days Fever/cough/congestion/labored breath, on day 4 of High dose Amox for AOM, Temp 39.5 HR 180 RR 60 BP 94/60 SpO2 93% RA, moderate retractions, Ph 7.36 CO2 35 Base deficit 4, CXR (pleural effusion), Tx = Admit for IV Abx & Thoracentesis

- o Complicated Pneumonia w/ Parapneumonic effusion

PEM R | 12 Y/O low grade fever/cough 2 weeks, cough productive w/ white sputum, Temp 38.4 HR 80 BP 110/75 SpO2 100% on RA, having diffuse Inspiratory Rales CXR (bilateral infiltration w/ thickened bronchial shadows, give Azithromycin treatment if = Empiric without additional tests

Promo | Young patient w/ XR (? Pneumonia) Vitally stable w/ Good PO, Abx = Amoxicillin (Not Ceftriaxone nor Clinda nor Fluroqu.)

Promo | 12 Y/O Hx of Headache, cough, low grade fever, Ex looks well except for wheeze not responding to Bronchodilator, XR shows bilateral infiltration, Dx = Mycoplasma Pneumonia (Not Chlamydia nor Strep. Pneumonia nor Yersinia)

Promo | 10 Y/O, in ED for Cough/Distress, No Fever, Cough not improving on Nebs or Cough Meds, CXR diffuse infiltration Bilateral, most common organism = Mycoplasma Pneumonia

Promo | About MERS, Correct statement = Presentation ranges from mild to severe

Promo | XR (Lobar pneumonia of Rt. Middle lobe), organism = Strep. Pneumonia

Promo | (For above Q) chance getting Positive Blood C/S = 1%

Promo | (For above Q) And of the following least important reason for admission of that patient = High grade Fever (Not Variable Hypoxia nor Compliance concern nor Toxic Appearance)

Amal | 1 Y/O with history of cough, decrease feeding, based on the x ray (lobar pneumonia) finding what is the probability of +ve blood culture = 1%

Amal | (for above Q) **Not an indication** for admission = High grade fever (Not compliance issue nor hypoxia nor pleural effusion)

Amal | Blood c/s usually ordered in pneumonia. What is true regarding is true = Blood c/s are true positive less than 5%

Chapter 2: Medical

Amal | 4 W/O baby girl, fever, cough, T 38.3, RR 60, WBC 18.000 CXR showed dense air space consolidation in the right lower lobe Most common cause of her pneumonia = GBS (Not Strep pneumonia)

Amal | 11 Y/O boy presented to ER with 2 days headache, subjective fever, prior to his visit developed mild cough, macular rash, on examination: there is bilateral infiltration on Xray, he is well looking, other examination within normal, what is the causative organism = Mycoplasma (Not Legionella pneumophila nor Staph aureus nor Strep pneumonia)

- Mycoplasma even if comes with neurological manifestations (Meningismus) and once treated with Macrolide it goes away with the symptoms
- Legionella comes with GI Symptoms

Final | 3 Y/O, w/ cough and runny nose, developed this non tender rash with oral and anal ulcer. What is the causative organism (pic of non-blanching urticaria-petechiae) = Mycoplasma

- Mycoplasma Sx: Urticaria-petechiae, Severe SJS/TEN

Final | 3 Y/O with community acquired pneumonia what is the antibiotics of choice = Amoxicillin (Not Azithromycin)

Final | 4 Y/O w/ community acquired pneumonia = Amoxicillin

Final | Acquired pneumonia = PO Amox

Final | Pneumonia: (If uncomplicated CAP, outpatient) = Amoxicillin 90

Final25 | 2 Y/O with cough and fever, on Ex right side crepitations (case of CAP pneumonia), Abx choice = PO Amoxicillin (Not Ceftriaxone nor Azithromycin)

- Augmentin was not an option in the Answers of this Q

- SCA Pneumonia

PEM R | 15 Y/O Hgb SS, Fever/Cough/SOB, productive yellow sputum, Temp 39 HR 121 RR 32 BP 112/78 SpO2 89% on RA having crackles and w/ 2L NC improves Hypoxemia & tachypnea, Hgb 9.1 Retic 5.8, CXR diffuse bilateral patchy infiltrate, next = PO Azithro & IV Ceftra

Promo | SCA presented with picture of Acute chest syndrome, Febrile what is the next step in management = Start Vancomycin and cefotaxime (Not Simple transfusion nor Exchange transfusion)

- Pneumocystis Pneumonia

- Organism: Fungus Pneumocystis Jirovecii
- Risk: HIV, Immunocompromised or suppressed host
- Sx: Gradual onset of Dyspnea, Non-productive cough, Fever Very hypoxic (Pathognomic although does not look in RD)
- Ax: Pneumothorax
- Invx: ABG, CD4 < 200/mm3, Increased LDH
 - CXR: Diffuse bilateral ground glass opacities (Batwing pattern), CXR is non-diagnostic CT
 - Dx Confirm w/ staining or PCR respiratory specimens (induced sputum or BAL)
- Tx: Bactrim, Add Steroid (Air paO2 < 70 mmHg, A-a ≥ 35 mmHg)

PEM R | 15 Y/O girl, 4 days Fever/dry cough, Hx of liver transplant 4 months ago 2ndry to autoimmune hepatitis, Now RD SpO2 87%, having work of breath & SpO2 improving on O2, radio finding for Pneumocystis pneumonia = Diffuse interstitial infiltrates

Amal | 3 Y/O boy, dyspnea, Tachypnea, fever 38.9C, SpO2 90 in RA. **Nonproductive cough** for 3 days, appeared malnourished, mother said he has a **problem in his immune system**, you provide standard of care, provide him oxygen most likely Dx = PCP (Pneumocystis Carinii Pneumonia)

- Aspiration Pneumonia

- Tx: Complex disease like Neuromuscular = Augmentin or Clindamycin
 - Well normal child = Discharge

Chapter 2: Medical

PEM R | 13 Y/O myotonic dystrophy w/ 2 days cough/nasal congestion, non-bloody non-bilious vomit, RD, SpO2 80%, sleepy, minimally responsive to painful stimuli, Intubated w/ Fenta/Mida/Rocru, Post intubation XR (shows trachea deviated to Rt. Side w/ opacity on Rt. Side), Findings = Aspiration pneumonia

PEM R | 6 Y/O girl, drinking juice at home then began cough/choke for 10min then back to baseline, 6hr after had recurrence of mild cough & felt warm, Temp 37.9 HR 100 BP 100/65 RR 24 SpO2 99% on RA, CXR subtle opacity in Rt upper lobe = D/C home without additional meds

PEM R | 13 Y/O girl, Myotonic dystrophy, 2 days Hx Cough/Nasal congestion/several non-bloody/nonbilious vomit, intubated w/ Fenta/mida/rocuronium, post intubation CXR shows (rt. Side consolidation), likely cause = Aspiration pneumonia

- Pulls toward anomaly = Aspiration pneumonia, Pneumonia
- Pulls away from anomaly = Pneumothorax, Pleural effusion

- Bronchiolitis

PEM R | 4 M/O FT, bronchiolitis case well hydrated no acute distress but board crackles, based on AAP recommendation = Reassure parent testing not warranted & recommend continued supportive care at home

PEM R | 7 M/O w/ 3 days cough/congestion, Moderate RD RR 88 SpO2 88%, suctioned lung field but no change in vitals, diffuse wheeze/rhonchi, Next = **HFNC** or PO Steroid or 3% or Ceftriaxone

PEM R | 3 M/O Cough/Difficult breath w/ difficult breast feed more than 5 min at time, now in RD Temp 37.2 HR 150 RR 66 BP 88/60 SpO2 85% on RA has nasal congestion/tachypnea/intercostal retraction/scattered coats rhonchi, as per AAP, which Tx = Supplemental O2

Promo | Bronchiolitis w/ diffuse rhonchi & wheeze, Sating 85% on 5L FM, Next = HFNC (Not Intubation)

Promo | Picture of Bronchiolitis, cough, runny nose, Vitally stable, Mother fed him in ED & doing fine, repeated vitals normal, Disposition = Discharge home since Saturation normal (Bronchiolitis)

Promo | 40 D/O (? Bronchiolitis) Tachypneic Tachycardic, No Distress, Saturation maintained on RA, taking good feed in ED, sucking good, no choking, given Ventolin once didn't change, Next = Discharge home due to good feeding & saturation (Not Steroid nebs nor admit for apnea nor Start Abx)

Promo | Bronchiolitis, Tachycardic/Tachypnic/Desating, Next = Suction & O2

Promo x2 | Bronchiolitis and Desating to 90%, Best intervention supported by evidence = O2 (Not Salbutamol nor Racemic Epi)

Promo | 3 M/O SOB, Cough, Fever, SpO2 83%, justify Admission = Give O2 (Not Start Abx)

Final | Bronchiolitis approved management = O2

Final | Neb vs 3% NS = Decrease hospitalization (length stay)

Asthma

- Asthma Exacerbation
 - o Asthma ED Full management:
 - Salbutamol w/ Ipratropium Nebs trial
 - Dexamethasone or Prednisolone IV/PO
 - Mg Sulfate over 10-30min
 - Salbutamol Continues Nebs or IV Infusion
 - Epinephrine IM
 - Terbutaline IV
 - Ketamine
 - PPV (Bipap)
 - ETT SIMV

Chapter 2: Medical

PREP EM | 14 Y/O, Severe Persistent asthma, unable to speak full sentence poor air entry w/ diffuse exp. Wheeze, given IV steroids, IV fluids, Continues nebs, after a reassessment not able to speak 1-2 words, still poor movement w/ exp. Wheeze, Temp 37 BP 90/60 HR 140 RR 44 O2 92% on 100% FiO2, Ph 7.20 PCO2 75 PO2 85, BEST Tx & Rational = Pursue more Aggressive Management because this patient is progressing to Resp. Failure which could lead to Cardiac Arrest

PREP EM | 5 Y/O persistent asthma in January w/ acute exacerbation, has no prior ICU, now cough/subjective fever/rhinorrhea 2 days ago, still trouble breath despite albuterol for 4hr since morning, now Temp 38.1 HR 130 RR 28 BP 95/63 SpO2 91%, moderate RD, subcostal retraction, having wheeze & crackles, given inhaled albuterol, Ipratrobium PO steroid, Best next = perform influenza testing (Not peak expiratory flow rate or ABG or CXR)

PEM R | 9 Y/O, severe persistent asthma, coming w/ acute exacerbation, given 4 puffs didn't improve, awake/alert/anxious, Temp 38 HR 115 RR 28 BP 104/62 SpO2 84%, in RD, with wheeze, in addition to steroid next = albuterol w/ Ipratropium

PEM R | 14 Y/O cough/wheeze after hockey practice today, given salbutamol and improved, has Hx of multiple visits to ED past 6 months for wheeze w/ viral illness or after prolonged exercise, Salbutamol 4-5 times per week at nighttime, ED management = Start Inhaled Steroid

PEM R | 7 Y/O girl, asthma in moderate RD, 2 day Hx of cough/runny nose without fever, GCS 14 HR 120 RR 36 BP 96/50 SpO2 90% on RA, on Respi exam moderate subcostal w/ diffuse wheeze given Salbutamol Ipratropium & PO Dexamethasone w/ Ph 7.35 CO2 22 HCO3 22, didn't improve fully, now GCS 12 HR 145 RR 20 BP 95/45 & gas of 7.15 45 20, Next = IV Mg Sulfate

Promo | 2 Y/O w/ 3 weeks cough/wheeze Post URTI presenting w/ Mild exacerbation & bilateral rhonchi & Hyper-Inflated CXR, to give = MDI Ventolin (Not Neb Ventolin nor Pulmo Consultation nor ENT Consultation)

- Mild-Mod = Prefer MDI w/ Spacer (For ED LoS & Tachycardia)
- Severe = Prefer Nebs (Lung deposition better & higher doses needed & limited studies for MDI w/ spacers)

Promo | Suggestive Asthma Hx = Parental Asthma

Promo | 5 Y/O Known BA came w/ SOB/RD received 3 doses of Ventolin PO Steroids with no improvement Next = MgSO4

Final | Asthmatic not improving w/ albuterol in ED, now you want to do before Tx = Peak expiratory (Not CXR)

Final | increase risk of childhood asthma = Parental asthma

- Asthma predictive score:
 - Major: parents with asthma, eczema baby
 - Minor: allergic rhinitis, wheeze w/o cold, eosinophilia

Asthma Meds side effects

- Inhaled Steroids

- Local side effect
 - Dysphonia
 - Oropharyngeal Candidiasis
 - Cough
- Systemic Side effects:
 - Adrenal Suppression, Growth Suppression, Osteoporosis
 - Bruising, Cataracts, Glaucoma

Amal | 10 Y/O boy w/ mild persistent asthma, you decide to initiate low dose inhaled steroid, likely adverse effect = Dysphonia

Final | Side effect of inhaled corticosteroid = Dysphonia

- Terbutaline

- Side effect = Tachy & Dysrhythmia, Hypotension, Hypokalemia, Hyperglycemia,
 - Agitation, dizzy, SZ, chest pain

PEM R | 7 Y/O acute asthma exacerbation on arrival HR 125 RR 50 BP 98/66 SpO2 88%, poor air enhances tight wheeze, deep retractions, given multiple inhaled bronchodilators, systemic steroid, IM Epi, & Mg Sulfate given bolus of IV Terbutaline then infusion 3 mcg/kg/min, remains alert SpO2 96% on non-rebreather mask, what supports decreasing infusion = HR 160 BP 110/80 RR 20 pCO2 30

Chapter 2: Medical

- Adjustment related to HR/RR, pCO₂
- High HR = Decrease dose (to keep as normal per age) | pCO₂ = (keep on 30-35, normal 35-45)
- Heliox
 - Fleisher recommends 70:30 or 80:20

Promo | Scenario about BA & Function/Mechanism of Helix = Acts by lowering resistance to gas flow within airways permitting increase in ventilation

Amal | Severe asthmatic is not responding to Beta agonist and steroid therapy, what is true about Heliox (Helium and Oxygen mixture) = Less dense than air and allowing increase flow and decrease work of breathing

Pneumothorax, Pneumomediastinum, Pleural Effusion, Pulmonary Edema

- Spontaneous pneumothorax
 - Definition: Air in the pleural space without trauma or medical procedure.
 - Sx: Unilateral chest pain, sometimes shoulder pain, Dyspnea of varying severity
 - Imaging: CXR (1st line), CT inconclusive or alternative diagnoses (small occult pneumothorax, PE)
 - Tx: 100% high-flow oxygen via face mask and cardiopulmonary monitoring
 - O₂ accelerates air reabsorption up to sixfold and promotes faster resolution
 - Observation with high-flow O₂ for small, stable pneumothorax.
 - Simple aspiration (needle decompression)
 - Thoracostomy (pigtail catheter or chest tube) if larger or symptomatic
 - Surgical consult if indicated after stabilization.
 - No antibiotics are needed (not an infectious process).
 - Most likely needs admission

PEM R | 17 Y/O Rt. Chest pain, pt was riding in car when pain abruptly started, pain initial sharp non radiating, but now worsened w/ SOB and radiation to rt. Shoulder, Temp 36.7 HR 64 RR 16 BP 138/81 SpO₂ 99%, no other signs other than diminished lung sound but no crackles no wheeze, 1st step = Place on 100% high flow O₂ via mask

PEM R | 16 Y/O girl, TSC, having RD, Temp 36.9 HR 110 RR 30 SpO₂ 85% BP 122/86, dyspneic, diminished breath sound bilateral, CXR (Hyper-inflated lungs, w/ bilateral pneumothoraxes), appropriate next step = Bilateral thoracostomy tube placement

- Indication of Chest tube in Simple/Spontaneous Pneumothorax
- Sx: Dyspnea, Hypoxemia, Severe pain
- Large pneumothorax (Pleural line to apical chest wall > 3cm)

- Spontaneous Pneumomediastinum
 - Self resolving, most common in Tall/thin adolescent male, Ax w/ Asthma
 - Trigger: Asthma, Valsalva, Severe cough, Barotrauma, Forceful vomit, inhalation drugs (Helium), FB
 - Path: Trigger > Alveolar rupture
 - Sx: Pleuritic chest pain, Dyspnea, Dysphagia, SC Emphysema
 - Invx: CXR (outlining of Mediastinum), CT chest (sensitive but not needed)
 - Tx: Conservative (Rest, Avoid Valsalva, Analgesia), Treat underlying cause
 - Supplemental O₂ (if in RD or Desating)
 - AVOID PPV (worsen the case)

PEM R | 15 Y/O, Acute onset neck & chest pain after inhaling helium 4 hours ago during surprise birthday, chest pain radiating to neck worsen w/ deep inspiration, No Hx of Fever/Cough/URTI, Past Hx of Asthma, HR 90 RR 38, BP 120/72 SpO₂ 95% RA, having neck tenderness/swell over SCM muscle bilaterally, XR (shows pneumomediastinum), Next = PO Analgesia

Chapter 2: Medical

PEM R | 14 Y/O Hx of Asthma, Now chest pain/difficult breath, had cough for 2 days using salbutamol BID for temporary relief, RR 24 SpO₂ 97% on RA has good air entry bilateral expiratory wheeze w/ crepitus on upper chest & neck, CXR shows streaks outlining mediastinal structures extending into neck but no pulmonary consolidation/effusion, Given Salbutamol/Ipratropium/Dexa, All Wheeze/RD resolved, Next = Discharge w/ supportive care & asthma Tx

Final | X-ray what is the Dx = Pneumomediastinum

- Pleural Effusion

- Fluid in pleural space, most effusions in Peds are Parapneumonic (infection related)
- Types:
 - Chyle: Lymphatic obstruction > **Milky fluid**
 - High Triglyceride (> 110 mg/dL)
 - Transudate: Imbalance Hydrostatic/Oncotic pressure > **Clear fluid**
 - Low Protein < 0.5, Low LDH < 0.6, Low WBC
 - Cause: HF, CF, Nephrotic syndrome
 - Exudate: Inflammation & increased capillary permeability > **Purulent fluid**
 - Ph < 7.2, High Protein > 0.5, LDH > 0.6, High WBC
 - Cause: Empyema, Collagen vascular disease, Esophageal rupture
- Light criteria (Exudate vs Transudate) Exudate if any :
 - Pleural protein/serum protein > 0.5
 - Pleural LDH/serum LDH > 0.6
 - Pleural LDH > 2/3 ULN of serum LDH
- Invx: CXR, Chest US (Gold standard for Amount/Loculation/pneumonia Sx), CT (if unclear or complication)
 - Diagnostic Thoracentesis
 - Any Ph < 7.2 = Chest tube
 - Thoracentesis indication = extensive causing dyspnea or diagnostic
- Tx: Antibiotics
 - IV Ceftriaxone or Cefotaxime +/- Clindamycin or Vancomycin (For In-Patient Community Acquired)
 - Clinda + Vanco (For Staph + Anaerobes or IF More Sick)
 - For 10 Days (After resolution of Fever), Switch to PO IF Afebrile + No Chest tube for 2-5 Days
 - Chest Tube:
 - Technique: Small size tube (< 14F) with U/S, Above 5th rib Anterior to Axillary line
 - Drain slow 500ml/hr; After initially 10ml/kg do clamp, underwater seal
 - +/- Fibrinolytic Therapy Alteplase (tPA), Streptokinase
 - Surgery or Video-Assisted Thoracoscopic (VAT) Surgery
 - Chest Tube Indications
 - pH < 7.2 (Empiric for empyema)
 - Respiratory compromise
 - Large free-flowing Effusion (> Half hemithorax)
 - Loculated effusion (Use Fibrinolytic if evidence of Fibrinopurulent effusion)
 - Failure to improve after 48–72h of antibiotics
 - Re-accumulation

PEM R | 14 Y/O girl with 6 days cough/fever/Rt chest pain, pain worse with taking big breath pleural friction rub, decreased breath sound at rt base, blood glucose 98 mg/dL, CXR moderate Rt. Side pleural effusion diagnostic thoracentesis Ph 7.1 Pleural glucose 41 mg/dL, best next = Place chest tube

PEM R | 9 Y/O, Hx of VSD, Cough/Fever/poor PO past week, ill tachypnic RR 48 Temp 38.1 HR 121 BP 98/68 SpO₂ 87%, diminished breath sounds in Rt., CXR shows large rt pleural effusion, thoracentesis lab = Pleural protein to serum ratio > 0.5

PEM R | 8 Y/O Hx of Fever/cough for 8 days Previously seen by PMD 5 days & diagnosed w/ clinical pneumonia but No XR done, given High dose Amox but has remained febrile w/ RD, Temp 38.7 HR 120 RR 32, Diagnostic modality = Chest US

Chapter 2: Medical

PEM R | 12 Y/O Fever/RD/Cough for 5 days, desating 92% RR 30 HR 135 BP 100/60, has pneumonia w/ moderate pleural effusion, subsequent imaging shows effusion without loculation, diagnostic thoracentesis non-purulent straw colored fluid, Tx = Placement of 14 Fr Pigtail percutaneous chest tube

PEM R | 14 Y/O CF, for pigtail cath, landmark = Above 5th rib Anterior axillary line

PEM R | 2 M/O girl, known TOF had surgery 1 wk ago repairing defects, 3 days ago discharged and been stable at home, this morning having increased moderate RD, SpO2 90% w/ tachypnea, afebrile, IV access/labs done, CXR shows Lt pleural effusion, started on HFNC, thoracentesis done Cell count 500 cells/L lymphocytes 84%, glucose 8.5 mmol/L, protein 4 g/dL, triglycerides 122 mg/dL, cholesterol 150 mg/dL, pH 7.5, Source of pleural fluid most likely due to what cause = Thoracic duct injury (Not Increased membrane permeability nor Infectious reaction nor Post-operative hemorrhage)

- Pulmonary Edema

- Re-Expansion Pulmonary Edema
 - Path: Complication post chest tube > Re-inflation of collapsed lung w/ Pulmonary edema
 - Tx: XR findings = observe
 - Mild RD = O2
 - Mod RD = PPB w/ PEEP (BiPAP)
 - Refractory = ECMO

PEM R | 12 Y/O girl, 2 days back pain/SOB, mild back pain & Lt side chest pain, Temp 36.8 HR 124 RR 22 BP 132/84 SpO2 100% on RA, initial XR Lt side pneumothorax 12F pigtail Cath w/ immediate cough that resolved, post procedure XR shows re-expansion w/ residual apical pneumothorax, 30min later cough began again & drop SpO2 86% on RA, moderate increased breath CXR (shows pulmonary edema), next = Initiate PPV via BiPAP

Congenital Lung Disease

- CPAM

- Definition: Developmental anomaly of lower respiratory tract, Composed of cystic & adenomatous lung tissue.
- Path: Abnormal lung tissue compresses adjacent normal lung > impaired pulmonary development & function.
- Sx: Large lesions can cause RD in the neonate due to mass effect and mediastinal shift.
- Dx: Perinatal U/S, CXR (Cystic, intraparenchymal lesion (not pleural-based)
 - CPAM = cystic intraparenchymal mass, not along entire lateral lung border.
 - Pneumothorax = air in pleural space w/ lung collapse.
- Tx:
 - Large symptomatic lesions: Surgical lobectomy during the same hospitalization
 - Infected = Abx
 - Pneumothorax = Chest tube by PGS

PEM R | 1 W/O Term persistent tachypnea since birth, has increased work of breath & poor intake of formula, in Severe RD, RR 74 SpO2 96% HR 150 Temp 37.2, grunting subcostal retraction, next = Consult Surgery

- Congenital Lobar Emphysema

- Normal infant at birth then by 6 months will develop Sx
- Sx: RD, Wheeze, Cyanosis

PEM R | 1 M/O previously healthy, over 1-2 wks having cough/periods of heavy breath that worsening w/ episodes of cyanosis, difficult breath, Temp 37.1 HR 170 RR 65 BP 90/60 SpO2 88% on RA, improved to 96% on 1L via NC, Bilateral faint breath sounds, mild retractions, distant heart sound, Pulses +2 CRT +3, CXR (shows mediastinum/cardiac shadow shifted to Rt.), on close inspection pulmonary markings are visible on Lt chest, Next = CT chest

Chapter 2: Medical

- CF (Cystic Fibrosis)

- AR, 2 Y/O, Mutation of CFTR in long arm chromosome 7, Most common 80% Δ F508
- Antenatal Sx: Polyhydramnios (1st Presentation)
- Neonatal Sx: Neonatal jaundice, Delayed meconium, Meconium ileus
- Child Sx:
 - Nasal polyps, FTT
 - Recurrent Respiratory infections (Wheeze, Atelectasis)
 - Early Life = Staphylococcus Aureus (Also H. Influenza and Gram-Neg. like Klebsiella)
 - Late Life = Pseudomonas Aeruginosa (Also Burkholderia, Aspergillus)
 - Complications: Pneumothorax, Pulmonary HTN, Cor Pulmonale, Hemoptysis, Digital Clubbing
 - Pancreatic Insufficiency (Low Pancreatic Enzymes, Low DEAK)
 - Steatorrhea > Diaper Dermatitis + Rectal Prolapse (20%)
 - Pseudo-barter syndrome (Mr. Hypo K/Na/Cl Metabolic Alkalosis, Risk: Exercise + Sweating)
 - Intussusception or Distal Intestinal Obstruction Syndrome (DIOS)
 - C. Diff infection (CF will regularly use Abx = high suspicion of C. Diff if CF + Diarrhea = Do Stool toxin)
- Adolescent Sx: Male Infertility (Bilateral Vas deferents Atresia, Female Low risk)
- Labs: Positive FM Hx, Newborn screen, C14/18
 - Newborn = Immunoreactive Trypsinogen (IRT)
 - Infant = High Sweat chloride (Na + Cl are > 60 mEq/L (Normal is 40 mEq/L))
- Tx:
 - Lung: Bronchodilators, Mucolytics (Dornase Alpha), Chest physiotherapy, Abx, Lung transplant
 - GI: Pancreatic enzymes PERT (To prevent FTT, Average to Start 5000 IU per 1 Kg)
 - Vit. DEAK Replacement: A (Retinol) D (Cholecalciferol) E (alpha Tocopherol) K (Phytonadione)
 - Side effect of High dose PERT (Enzyme replacement therapy) = Fibrosing Colonopathy
 - DIOS: Give Intestinal lavage w/ Hypertonic Saline (GoLYTELY)
 - Give NaCl (to prevent electrolyte imbalance) in:
 - Fever, Vomiting, Diarrhea, Strenuous Activity, Exposure to Heat

PEM R | 14 Y/O girl CF, acute abdomen pain/diarrhea watery for 3 days, 1 day fever, no vomit, no travel, Temp 38.1 HR 120 RR 24 BP 110/80 SpO2 100%, tired non-toxic, diffuse tender abdomen, test to reveal underlying condition = Stool toxin

- Lung Transplantation complications

- Early < 6 M = Dehiscence, Rejection
- Late > 6 M = Bronchial stenosis
- Sx: SOB/Cough, Fever w/ rejection

PEM R | 26 Y/O CF underwent bilateral lung transplant 9 months ago, over 3 weeks having dyspnea, stridor, deteriorate lung function, good compliance to immunosuppressive meds, Vitals normal, but increase work of breath, stridor, NO lower airway findings, CXR unremarkable, etiology = Bronchial stenosis

Chapter 2: Medical

Gastroenterology

Upper GI Disorders

Upper GI Obstructions

Vomiting

- Non-Bilious Vomit + Intermittent Pain + Sausage + Red jelly stool > US Target/Pseudo-kidney = Intussusception | Tx: Air Enema
- Non-Bilious Vomit + Always hungry + Olive > US Donut + 3.14 (Thickness.Length) = Pyloric stenosis | Tx: Pyloromyotomy
- Bilious Vomit + Double Bubble + 0-2 D/O +/- Non-bilious (20%) = Duodenal atresia > Upper GI | Tx: NGT, Fluid, Surgery
- Bilious Vomit + Triple bubble + 2-3 D/O +/- Abdomen Distention = Jejunal atresia > Upper GI | Tx: NGT, Fluid, Surgery
- Bilious Vomit + Single bubble + Infant + Stable = Malrotation without Volvulus > Upper GI | Tx: Elective Ladd
- Bilious Vomit + Single bubble + Infant + Unstable ill/lethargic = Malrotation with Volvulus > Upper GI | Tx: Emergent Ladd
 - Bilious vomiting in 1st week of life = 1st Malrotation (Stable) > 2nd Atresia (Stable) | Volvulus (Unstable)

GI Electrolytes

- Low Cl + Metabolic Alkalosis = Vomiting + Pyloric Stenosis
- High Cl + Metabolic Acidosis = Diarrhea + RTA
- High Urine Cl + Metabolic Alkalosis = Diuretic use + Barter + Gitelman
- Anion gap = $\text{Na} - (\text{Cl} + \text{HCO}_3)$ = Normal Anion gap (4-12), > High Anion gap (>12)
 - o Vomiting = Low Na, Low K, Low Cl, Metabolic Alkalosis, Low H > High HCO_3
 - o Diarrhea = Low Na, Low K, High Cl, Metabolic Acidosis, Low HCO_3 , Low Mg
- Pyloric Stenosis
 - o 3 W/O - 3M/O
 - o Risk: Preterm, Boys, Caucasian, Pos. Family Hx, Exposure to Erythromycin
 - o Sx: Non-Bilious Vomiting prolonged > Hypochloremic Metabolic Alkalosis (Low Cl Low K, Normal Na)
Always hungry, Dehydration
 - o Ex: Olive sign (Palpation of Peristaltic Mobile Pyloric Mass, found in 60-80%)
 - o Invx: U/S: Donut Sign (Thicker > 0.3cm & longer > 1.4cm, Same as Pi = 3.14), XR ~ Single Bubble Sign
 - o Tx: Stabilization by Hydration, Correction of alkalosis then Surgery (Pyloromyotomy) then full oral after surgery
 - Ramstedt pyloromyotomy (Longitudinal incision on the pyloric wall to relief the constrictions)
 - Other option Balloon dilation (Only reserved for ppl who can't undergo surgery)

Pedz | 3 W/O, w/ Non-Bilious Vomit and Hunger after episode, Next image = Abdomen U/S (Donut Sign = Pyloric stenosis)

Pedz | 5 W/O, Girl, Hx of Progressive forceful vomit after each feed and seems hunger after, Ex looks well, risk factor = Preterm

Pedz | 6 W/O, 3 weeks of Intermittent vomiting, lost 300g, Na 147 K 2.9 HCO_3 32 Cl 89, Dx = Hypertrophic Pyloric Stenosis

PEM R | 9 M/O listless intermittently fussy last 24hr w/ non-bloody non-bilious yellowish/milky vomit 6hrs ago, fever resolved last week, CRT delayed, abdomen palpation discomfort, vitally stable, diagnostic test for Dx = Abdomen U/S

- Non-Bilious Vomit + Intermittent Pain/Fussy + US Target sign or Pseudo-kidney = Intussusception
- Non-Bilious Vomit + Always hungry + US Target Width: 3mm Length: 14mm = Pyloric stenosis

PEM R | 3 w/o girl 4 days Hx of frequency vomiting immediately after feed, Non-bloody Non-bilious, hunger with feeds, 2 older sibling had GER as infants, Vitally stable, mild dehydrated, Next = Abdomen US

Chapter 2: Medical

PEM R | 5 W/O vomiting since birth, becoming more forceful last week, and Hematuria after every feed, color milky, still voiding at baseline, vitally stable, electrolyte abnormalities from this condition & IV fluid to start = D5% + 0.45 NS + K 20 mEq/L

PEM R | 6 W/O vomiting/dehydration over 3 weeks, vomit after breast milk, hasn't stool for 2 days, ill/sunken eye/mucus dry/CRT delayed, you send VBG consultative = Ph 7.50 pCO₂ 60 PaO₂ 40 HCO₃ 40

PEM R | 3 W/O male, born without complication, in ED for vomiting started 4 days, slightly distended w/ active bowel sound, expected lab w/ Dx = Na 134 K 2.9 Cl 90 HCO₃ 36

PEM R | Pyloric stenosis, imaging confirms Dx = Pyloric wall thickness > 3mm

PEM R | 5 W/O feeding intolerance, worsening acutely, always been spit up but now uncomfortable and forceful vomit, always appears hungry, Blood gas = Ph 7.49 pCO₂ 55, HCO₃ 28 (Not pH 7.22, PaCO₂ 25, HCO₃ 10 nor pH 7.22, PaCO₂ 55, HCO₃ 21 nor pH 7.47, PaCO₂ 32, HCO₃ 21)

- Pyloric stenosis, M = both up CO₂/HCO₃

PEM R | 7 w/o infant w/ 1 week progressive vomit, shooting out, basic metabolic finding = Na 138 K 3 Cl 88 HCO₃ 30

PEM R | 4 w/o girl 3 days Hx of non-bloody non-bilious worsening vomit, seems hungry = Na 138 K 3.2 Cl 85 HCO₃ 30

Promo x2 | 5 W/O, Picture of Pyloric Stenosis, Next = US (Not Consult Surgery)

Promo | 3 W/O Non-bilious non-bloody vomit, vomiting after every feed & becomes fussier & hungrier, Ex normal except for distention mild w/ active blower sounds, labs expected = Na 134 K 2.9 Cl 90 HCO₃ 36 (Hypochloremic Metabolic Alkalosis)

Promo | 4 W/O w/ 3 days worsening emesis, non-bloody non-bilious & immediately after feeding & seems hungry, NO Fever/Diarrhea, Temp 36.9 HR 170 RR 36 BP 75/50, mild dehydration, no abdomen mass, IV fluid/Electrolytes panel sent, lab supportive of suspected Dx = Na 138 K 3.2 Cl 85 HCO₃ 30

Promo | 3 W/O 4 days increase frequency of vomiting immediately after feed non-bilious non-bloody, seems hungry after feeds, 2 older siblings had GER as infants, no diarrhea/fever, vitally stable mildly dehydrated, Abdomen soft/lax, IVF started, Next = Abdomen U/S

Promo | 3 W/O 10 days projectile frequent vomit, Hypokalemic Alkalosis, Diagnostic = US

Final | Pyloric stenosis = 3mm width & 14mm Length (Pie 3.14)

Final | Pyloric stenosis sizes = >3mm and >14 mm

Final | Pyloric stenosis labs = Alkalosis with hypokalemia

Final25 | 4 W/O came with hx of poor oral intake and non bilious forceful vomiting he is dehydrated his lab showed k 3.5 CL 80 hco₃ 30, Na 135 and ask about how to Dx = US (Not Abdomen XR nor Upper GI Study)

- Atresia Duodenal/Jejunal

- Within days after birth (24-48 H/O)
- Sx: Bilious vomit
- Duodenal Atresia
 - Typical 0-2 D/O, Ax: Trisomy 21 (duodenal atresia)
 - Sx: Non-Bilious vomit (20% of duodenal atresia, obstruction proximal to ampulla of Vater)
 - AXR: Double bubble sign
- Jejunal Atresia
 - Atresia Typical 2-3 D/O
 - Sx: Abdomen distension (more w/ Jejunal/ileal atresia)
 - AXR: Triple bubble sign
- Invx: Abdomen XR (initial), Upper GI contrast (Confirmatory)
- Tx: NGT, Fluids, Surgery

PEM R | 3 D/O FT, born at home, received Vit K, Hep B vaccines past 24hr, coming w/ vomiting & increase frequency, Afebrile, strong suck, Vomit image color green, Dx = Upper GI series

PEM R | 3 D/O FT, vomiting, d/c from hospital yesterday 3.15 kg, HR 160 RR 34 BP 80/40, current weight 3.02 kg, dark green vomit, next step = Obtain an upper GI

PEM R | 1 D/O not tolerating feeds, non bloody but bilious vomit, XR (shows double bubble sign), Likely Dx = Duodenal atresia

Promo | 5 days w/ Bilious vomiting, Next = NGT & UGI Study

Chapter 2: Medical

Promo | 3 Days w/ Bilious vomit & abdomen distention, Initial management = IV & NGT (Not UGI series)

- IF dehydrated = IV & NGT | IF Not = UGI series

Amal | 2 D/O, Persistent bilious vomiting, afebrile w/ mild dehydration, Ex Flat Abd., Dx = Jejunal atresia (Not Mid-gut volvulus)

- D Atresia = Non-bilious to Bilious vomit (Depending if location before or after Vater)
- J Atresia = Bilious vomit
- Malrotation > Volvulus = Sick as surgical abdomen Continues bilious vomit
- Bilious vomiting in first week of life is malrotation without volvulus especially if stable, but in mid gut volvulus Pt. is sick, In this scenario Pt. is stable but no malrotation in choices so jejunal atresia is the correct answer

- Malrotation without Volvulus

- Within 1st year of life
- Malrotation: Congenital rotation of bowel without ischemia
- Sx: HD Stable/Well unless Volvulus develop, Intermittent bilious vomiting, Mild distension, or normal abdomen
- Tx: Ladd procedure (elective if stable)

- Malrotation with Volvulus

- Volvulus: Complicated Malrotation by twisting & ischemia
- Types:
 - Midgut Volvulus (Most common type, Failed of counterclockwise rotation of intestine at 10w G
 - Duodenal obstruction > Superior mesenteric artery twist > Infarction > Necrosis > Blood in stool
 - Ax: Heterotaxy Syndrome = Failure of Normal Embryologic rotation > Midgut Volvulus > Intestinal Malrotation
 - Cecal Volvulus
 - Sigmoid Volvulus
- Ax: CHD, Diaphragmatic hernia, Omphalocele
- Sx: Early Infancy, Bilious Vomit, Abdomen Distension, Abdomen Pain
- Complications: Strangulation > Shock > Necrosis
- Invx: Labs including cross-match
 - XR Upright/Supine
Incomplete = Dilated bowel loops hiding liver | Complete = Air fluid lvl w/ Double-Bubble sign
 - Upper GI Series (Diagnostic, Corkscrew sign)
 - Prenatal US
 - CT & US doppler: **Whirlpool** (superior mesenteric vein on artery clockwise)
- Tx: NGT, NPO
 - HD Stable = Upper GI > Elective Surgery (Ladd procedure)
 - HD Unstable = Emergent Surgery (Ladd procedure)

PEM R | 15 M/O girl ex-full term, tired/irritable, vomit 5 times neon green no blood, normal stooling, not eaten this morning, Vitals stable, uncomfortable, moderate distended w/ active bowel sounds no mass, diagnostic = Upper GI

PEM R | 3 W/O vomit 3hr can't keep anything down, vitally stable except for HR 170, having bilious vomit on linen, imaging = Upper GI contrast w/ small bowel follow through

PEM R | 5 W/O feeding intolerance, worsening over days, fussy, takes 1-2 ounces per feed, bilious vomit, consolable with normal VS, next = upper GI series

PEM R | 2 W/O girl increased cry & 3 days green vomit, BP 60/30 mottled/toxic, crying, occult blood positive, distended/tense/cries, on XR (double bubble), after fluid resus, next step = Exploratory laparotomy

- Midgut volvulus + HD stable = Upper GI
- Midgut volvulus + HD unstable = Exploratory Laparotomy

Promo | 4 Y/O bilious vomit, Abdomen distended & Tympanic, non-specific mild tenderness, Abdomen XR multiple dilated air filled loops w/ air fluid levels, Next = Barium upper GI series w/ small bowel follows through

Chapter 2: Medical

Promo | 6 M/O in ED w/ Bilious vomit 3 times today, Diagnostic = Upper GI Study

Promo | Neonate w/ Bilious vomiting, **lethargic, depressed mental status**, otherwise vitally stable, XR shows dilated bowel loops, Next = Exploration Laparotomy (Not Upper GI series nor NGT nor IVF)

- Unstable due to possibly Malrotation w/ Volvulus

Promo | 2 W/O w/ Acute persistent vomiting, Abdomen distended, Dx = Volvulus

Amal | 5 D/O baby present with bilious vomiting, FT, discharge 48 hours after birth, PE well-nourished baby, absent bowel sounds, X-ray: Paucity bowel gas = Gut Malrotation

Amal | 3 W/O brought by mother with vomiting since today's morning, fussy, crying a lot, bilious vomit seen in assessment, on exam dehydrated, with HR 190 most likely Dx = Volvulus (Not Duodenal atresia nor Intussusception)

Final | 10 days old with greenish vomiting, XR done showed decrease bowel gasses double bubble sign, What is the Next emergency management = IVF and NGT (Not Immediate surgery -put is the definitive Tx-)

Final | 3 M/O came w/ vomiting & decrease feeding, XR showing double bubble, Dx = Malrotation

Final | Baby with greenish vomiting was stable, Dx Diagnosis Gut Malrotation = UGI

Final | scenario of malrotation green emesis = Upper GI study

Final | Bilious vomit Dx = Upper GI study

Final25 | Case of previous non-painful bloody stool and now has intestinal obstruction + whirlpool sign on US and airfluids level on xray probably caused by = Fibrous band connect meckle with umbilicus (unsure if not Intussusception with lead point Meckles nor HSP nor Bowel obstruction due to)

- GERD

Final | Scenario with GERD = Esophagogram

Final | Baby with recurrent coughing, choking, and admission for chest infection next for definitive dx = Esophogram

Upper GI Bleeds

- Upper GI Bleeds

- Bleeding proximal to the ligament of Treitz
- Most common cause: PUD caused by Helicobacter pylori or NSAIDs
- Sx: melena, hematemesis, orthostasis
- Invx: increased BUN to creatinine ratio, anemia
- Tx: fluid resuscitation, PPIs, blood transfusion for hemoglobin < 7 or hemodynamic instability, upper endoscopy within 24 hours

- Esophageal Varices

- Cause: Pulmonary HTN > Portal HTN (here secondary to pulmonary hypertension & right-sided heart failure).
- Sx: Bleeding (often brisk and significant even if bleeding stops before ED arrival), Melena
- Tx: Octreotide IV 1-2 mcg/kg followed 1-2mcg/kg/hr infusion (somatostatin, Prevent further bleed by lower portal venous flow & variceal pressure)
 - PPI
 - Abx (Ceftriaxone)
 - Urgent Endoscopy (Definitive Tx, variceal band ligation)

PEM R | 17 Y/O Pulmonary HTN, presents w/ black tarry stool for 1 day, intermittent abdomen pain, swell of both ankles, Vitally stable, has crackles on lung exam, NGT placed no bright blood, Next step = Octreotide

Final | Liver failure terry black stool = Octreotide

Chapter 2: Medical

Infant upper GI Bleed

- Infant w/ upper GI blood
 - o < 1 M/O = Apt-Downey (Maternal blood from delivery or cracked nipple)
 - o > 1 M/O = Eliminate diet (Cow's milk allergy; should be considered after 2 W/O)
- Apt-Downey test:
 - o Checks infant Blood vomit or Blood streak of Stooling blood streaks are from Infant or Mother
 - o Interpretation:
 - Pink = Fetal blood (HbF)
 - Yellow/Brown = Maternal Blood
 - o Apt-Downey test Indication
 - < 1 M/O (as fetal Hgb decreases after 1month test is no longer valid)
 - +/- Maternal suspicion of swallowed blood after birth
 - +/- Maternal cracked nipple w/ exclusive breast feed

PEM R | 7 D/O mother noticed streaks of blood in daughter stool, no fever/weight gaining/breastfed exclusive, positive occult blood in stool = Apt-Downey test

- Cow's Milk Allergy
 - o FPIES (Food Protein-Induced Enterocolitis Syndrome)
 - o (Allergic Proctocolitis)

PEM R | 5 W/O ex-full term, couple bloody stools past 2 days, exclusive breastfed Q2-3hr, vitally stable, positive occult blood, next = Recommend strict elimination diet for mother

PEM R | 4 W/O FT 3.3kg without complication, exclusive formula fed, spitting up every feed w/ blood in stool for 3 days, continues 6-8 wet diapers & 2-3 soft bowel current 4.4kg, diaper string of blood, Next = Switch him to hydrolyzed formula

PEM R | 12 D/O boy having profuse watery diarrhea non-bloody non-bilious enthused, no fever, exclusive breast fed until started on formula feed 1st time then 6 hours later had x7 vomit x10 stools w/ last one w/ blood, Vitals 37 HR 185 RR 46 BP 65/40 Lethargy, CRT 2-3 sec, Dry mucus, Abdomen Ex within normal & distension, best diagnostic = Oral food challenge (FPIES)

PEM R | 5 w/o Term w/ 3 days Hx of bloody stool, and otherwise normal baby, On Ex no anal fissure, stool diaper yellow/seedy/mucus/blood streak, next = D/C on Dairy & soy free maternal diet & advise family to switch to hydrolyzed formula (Allergic Proctocolitis)

Chapter 2: Medical

Lower GI Disorders

Lower GI Bleeds

- Painless + Chronic Fresh Bleed > Colonoscopy > Removal = Juvenile Polyps (2 - 4 Y/O)
- Painless + Maroon Bloody Stool > Meckle Scan T-99 > Surgery = Meckel diverticulum (2 - 8 Y/O)
- Painful + Vomiting > Jelly Bloody Stool > U/S (Target) > Air Contrast Enema = Intussusception (2 M/O - 5 Y/O)

- Ectopic Mucosa = Meckles Diverticulum (Mucosa = Meckles)
- Peyer's patch = IntussuscePtion

TABLE 33.4

ETIOLOGY OF LOWER GASTROINTESTINAL BLEEDING BASED ON AGE

^a

Neonatal period	Infancy (1 mo–2 yrs)	Preschool age (2–5 yrs)	School age (>5 yrs) and adolescents
Typically well-appearing			
Swallowed maternal blood	Anal fissure	Anal fissure	Anal fissure
Infectious colitis	Infectious colitis	Infectious colitis	Infectious colitis
Allergic colitis	Allergic colitis	Juvenile polyps	Polyps
Hemorrhagic disease	Nonspecific colitis	Intussusception	Inflammatory bowel disease
Duplication of bowel	Juvenile polyps	Henoch–Schönlein purpura	Hemorrhoids
Meckel diverticulum	Intussusception	Meckel diverticulum	Henoch–Schönlein purpura
	Meckel diverticulum		Meckel diverticulum
			Hemolytic uremic syndrome (HUS)
Typically ill-appearing			
Infectious colitis		HUS	Pseudomembranous colitis
Midgut volvulus	Duplication	Inflammatory bowel disease	Ischemic colitis
Hirschsprung disease	HUS	Peptic ulcer	Peptic ulcer
Disseminated coagulopathy	Inflammatory bowel disease	Pseudomembranous enterocolitis	Angiodysplasia
Necrotizing enterocolitis	Pseudomembranous enterocolitis	Ischemic colitis	
Intussusception	Ischemic colitis	Angiodysplasia	
Congestive heart failure	Lymphonodular hyperplasia		
	FPIES		

^a In approximate order of frequency of occurrence.

Promo | 6 M/O bloody stool, Abdomen pain, you are requesting Abdomen XR but your consultant claim XR not helpful in which of the following = Bleeding or Obstruction or Pneumatosis intestinalis is or Perforation

Chapter 2: Medical

- Intussusception = Triad: Intermittent Abdomen pain, Vomit, Bloody stool
 - o 6 M/O – 36 M/O most common cause of obstruction, Peaks 4 & 10 M/O
 - o Sx: Sudden Episodic Cry, Lethargy
 - Sudden Severe Recurrent Abdomen Pain and Distention, Flexion of Knees to Hip
 - o Jelly Bloody Stool, Hematochezia
 - o Ex: Sausage shaped Mass (Rt. upper Hypochondrium during episodes)
 - o Complication: NEC (Stricture develops 2-3 months also as late as 20 months)
 - Avoid Clindamycin as cause post-NEC stricture
 - o Recurrent Intussusception Associations
 - Meckle diverticulum (Most common)
 - Lymphoma, Polyps, Vascular Malformation, Duplication Cyst
 - o Labs: U/S Abdomen (Initial): Target sign, Pseudo-kidney
 - Air-contrast enema -Barium enema- (Diagnostic + Therapeutic)
 - Contraindicated in Bowel obstruction, if unsuccessful do laparotomy
 - o Tx: Bowel rest; D/C all enteral feeds, hydration, NGT for stomach decompression
 - Air/Hydrostatic Enema Saline or Contrast (Successful 80-95%)
 - Recurrence 3-5% within 48hr
 - +/- IV Abx (Vanco + Genta + Metronidazole or Piperacillin-tazobactam)
 - +/- Surgical if intestinal perforation
 - o Higher Risks of Perforation:
 - < 3 M/O or > 5 Y/O
 - > 48hr of Sx
 - Dehydration
 - Hematochezia
 - Small bowel obstruction
 - o Intussusception locations
 - Idiopathic Intussusception = Ileo-Cecal = 1st Air enema, 2nd Surgery
 - HSP Intussusception = Ileo-Ileal = 1st Supportive (mostly resolves), 2nd Surgery (Laparotomy)

PEM R | 10 M/O vomiting now quite, US shows target sign, Next = Order rectal air enema

PEM R | 6 M/O male in ED sudden intermittent fussy/cry x6 episodes of non-bilious, having blood spots, unable to determine abdomen reactive as = Obtain US

PEM R | 5 Y/O 3hrs of Abdomen pain previously healthy till 4 days ago w/ raised rash on legs/buttocks, seen in PCP w/ urinalysis was normal, Now vitally stable, w/ diffuse tenderness without rebound, Acetaminophen for pain, US shows ileo-ileal intussusception, on reevaluation, now resolved, Next = Discharge home w/ supportive care

PEM R | 2 Y/O Lethargy & Altered Mental state, having Abdomen pain & Ax non-bilious vomit, Lethargy, irritable, having difficult/uncooperative abdomen exam, glucose 71 mg/dL, Next = Obtain Abdomen US

Promo | 18 M/O w/ Abdomen Pain according to family when episode happen, he became agitated & crying due to severe pain, on exam non-toxic, decrease intestinal sounds, severe pain when palpate abdomen, no gross blood on stool, Abdomen XR (gas in rectum, normal gas appearance on left but no gasses in right) Likely Dx = Intussusception (Not Constipation nor Volvulus nor appendicitis)

Promo | Baby presented w/ picture of Intussusception Next = US Abdomen (Not Contrast Enema)

- o Next step = US Abdomen | Definitive = Air or Contrast Enema

Promo | 6 M/O Hx of excessive cry & not passing stool for 2 days, no vomiting, Abd. XR Normal, Vitally stable, Ex Normal, planned for discharge when resident went to explain plan to mother, child became abnormal crying more for few min then calmed down, mother said it happened 4 times today, Next = US for Abdomen (Not Discharge)

Promo | 18 M/O girl, several non-bilious vomit 1 hour ago, denies rhinorrhea/fever/cough/fall, crying more than usual, Lethargic/Pale/Weak, IVF given, continues to vomit, XR suggest Intussusception = Intussusception is the most common cause of Intestinal obstruction in Infants between 6-36 M/O

Chapter 2: Medical

Amal | 7 M/O Previously well, 6hr Hx of lethargy, GCS 9 drowsy responsive to stimuli, now vitally stable, detailed Ex normal, given IV Abx prophylaxis, Hx of jerky limbs & up rolling, all investigation normal, next day having fresh blood stain = Abdomen US (Not Blood C/S nor CSF C/S nor Repeat tox screen nor CT abdomen)

- Serious sign for Intussusception is lethargy | late sign jelly bloody stool

Final | 18 M/O w/ vomiting and colicky pain what is the most common cause = Intussusception (Not Inguinal Hernia)

Final | Pt presented with colicky abdominal pain, most common cause of child abdominal obstruction = Intussusception

Final | XR Barium normal w/ multiple air fluid = Air enema

Final | abdomen pain, vomit, constipation, Dx = ?? (Intussusception or Inguinal hernia)

- Meckle Diverticulum

- Most common Congenital GI anomaly causing bleed, Rule of 2
- Path: Acid secreting **Ectopic Mucosa** > ulceration of adjacent ileal mucosa 2 Feet (100cm) from Ileocecal valve
- Sx: 2-8 Y/O, Painless Dark Red/Maroon Stool
 - +/- Abdomen pain, Can Mimic Appendicitis, but with blood per rectum
- Ax: Recurrent Intussusception (Idiopathic, 19% only has known pathological causes)
- Labs: Scintigraphy by Technetium 99 (AKA Meckle Scan, Imaging of Choice), Plain Abd. Radiographs not helpful
- Tx: Surgical excision of symptomatic

PEM R | 18 M/O x2 blood stool today, had x1 bloody streaked stool a week ago, vitally stable, non-toxic, diaper mucoid stools w/ frank blood = Ectopic mucosa

PEM R | 4 Y/O girl, says toilet bowel full of blood w/ stool, stable vitals, Hgb 9.9, gold standard = Tech 99 nuclear scintigraphy

PEM R | 19 M/O girl 2 week intermittent bloody stool, No Fever/Abdomen pain, Non-Tender/distended, Rectal exam positive for bright red blood, mild anemia = Nuclear scintigraphy

Promo | 3 Y/O rectal bleeding, funny abdomen feeling, during rectal exam painless blood, no fissure, Dx = Meckle Diverticulum

Promo | 22 M/O girl, mother concerned painless jelly stool bleeding, No vomit/fever/abdomen pain, calm abdomen soft/lax, stool positive occult, indicated test to confirm Dx = Scintigraphy (Not Abdomen US nor UGI)

Amal | 4 Y/O, with brick colored of blood in underwear, abdominal exam unremarkable, rectal exam showed red fluid which is positive for occult blood test, most likely cause = Meckel's (Not Intussusception nor UC nor Volvulus)

Final | 4 Y/O boy scenario about painless rectal bleeding asking about the next step (meckel's) = Nuclear scintigraphy

Final | 4 Y/O with painless bloody stool and vomiting exam normal = Scintigraphy

- Juvenile Polyps

Amal | 2 Y/O, with blood noted in toilet, looks healthy, exam unremarkable, afebrile, vitally stable, no skin rash, unremarkable abdominal examination, rectal exam there is bright red blood positive for guaiac test with padisable mass, most likely Dx =

Juvenile polyp (Not Intussusception nor Rectal prolapse)

Chapter 2: Medical

Inflammatory GI Disorders

- IBD (Inflammatory bowel disease)

- Ulcerative Colitis
 - Sx: Bloody diarrhea, Crampy abdominal pain, Tenesmus
 - continuous mucosal inflammation, always involving the rectum, absence of perianal involvement (prevalent in Crohn)
 - Extra GI Sx: uveitis, erythema nodosum, peripheral arthritis, sacroiliitis, ankylosing spondylitis, autoimmune hepatitis, airway or pulmonary parenchymal disease
 - Complications: Toxic megacolon, Colon cancer risk
 - Tx: options depend on severity and location of disease (use PUCAI score in pediatrics)
 - Initial treatment or mild disease: 5-ASA oral or rectal (mesalamine or sulfasalazine)
 - As disease progresses or moderate disease: add glucocorticoids (topical, oral)
 - Severe or refractory disease: IV glucocorticoids, consider other immunomodulators (e.g., anti-TNF agents, thiopurines), consider colectomy (curative)

- IBD Complication: Toxic megacolon

- IBD Complication
- Path: Opioid/Diphenhydramine/Anticholinergic/Dextromethorphan > Decrease bowel motility > stasis
- Invx: Assessing Colon dilatation is acceptable by XR or CT
- Toxic Megacolon Criteria: Colon > 6cm
 - + at least 3: Fever, HR > 120, Leukocytosis, Anemia
 - + at least 1: Dehydration, Altered LoC, Electrolyte disturbance, Hypotension
- Tx: Steroid (1st line), Surgery (not 1st line)

PEM R | 14 Y/O boy Crohn's disease, severe abdomen pain/watery diarrhea/fever, generalized abdomen tenderness, active bowel sounds, PR frank blood, on 5-ASA meds, abdomen XR dilated bowel loops, first line = IV Steroid

PEM R | 12 Y/O Fever/fatigue/abdomen pain for 2 days, known Ulcerative colitis from 10 Y/O, on Azathioprine, Temp 38.3 HR 118 RR 18 BP 100/55 Abdomen tenderness/distention/diminished bowel sound likely known to precipitate this condition = Acetaminophen w/ codeine

PEM R | 17 Y/O girl w/ Hx of Ulcerative colitis, Temp 39.5 HR 130 RR 25 BP 88/62 SpO2 95% ill appearing, abdomen distention/rebound tenderness, most concerned complication of IBD = Toxic megacolon

PEM R | (for above Q) IV access established, fluid started, labs WBC 17.2 Hb 11.1 K 3 which study next = Abdomen XR

- Acute pancreatitis alcohol induced

- Sx Triad: Clinical (Epigastric pain) + High Lipase + U/S (stone/inflammation) or CT (suggestive of Pancreatitis)
- Tx: NPO + IV Fluid, Surgery (if Pseudocyst or Necrotic)

PEM R | 16 Y/O sudden abdomen pain, knife-like, vomited 5 times 1 day non-bloody non-bilious, no fever/diarrhea, admit use alcohol, appears moderately uncomfortable w/ generalized abdomen tenderness, HD stable, eye mild icteric, after confirming Dx, which important management for this pt = IV Fluid resus

Chapter 2: Medical

- **Hepatopulmonary syndrome (HPS): Liver failure + Platypnea/Orthodeoxia = Contrast Echo Tx: O2, Liver transplant**
 - o Definition: Hypoxemia w/ chronic liver disease/portal HTN due to intrapulmonary vascular dilatation (IPVD).
 - o Path: ↑ Pulmonary vasodilators (↑ production or ↓ clearance by diseased liver) > Pulmonary capillary dilation or direct arteriovenous connections > ventilation-perfusion mismatch (normal ventilation, ↑ perfusion) > hypoxemia
 - o Sx: Platypnea (Dyspnea worse when upright, improves when lying flat)
 - Orthodeoxia (Low SpO₂ when upright, improves when supine)
 - o Invx: Contrast Echo (bubble study): Bubbles in Lt. heart after 3-8 cardiac cycles = intrapulmonary shunt (vs. 1 cycle in intracardiac shunt)
 - o Tx: O₂ (Improves PaO₂ by increasing alveolar O₂)
 - Definitive treatment: Liver transplantation

PEM R | 16 Y/O Hx of autoimmune hepatitis, coming w/ fatigue/worsening tolerance of exertion for 2 months, having SOB w/ exertion but improves when lying down, she is on her meds, in ED SpO₂ 85% on RA, prior to starting O₂ SpO₂ improves to 92% when she lays down, CXR/CBC/LFT/UA/Pregnancy test all unremarkable, best test to confirm = Contrast Echo

- Gallstones

PEM R | 11 Y/O SCD, Vomit/Abdomen pain 12hr ago, Temp 38.2 HR 116 RR 18 SpO₂ 99% having scleral icterus w/ tenderness in RUQ, WBC 22 AST 214 ALT 331 GGT 144 Total Bili 9.2, which Ex = Murphy sign

PEM R | 17 Y/O girl, abdomen pain/vomit on morning, no fever/diarrhea/dysuria, sharp/constant/radiate to back, worse /w drinking/eating, past medical Hx negative, has scleral icterus, diffuse tender Epigastric abdomen pain likely cause of her Sx = Gallstones

Final | Case of obese girl severe RUQ pain after meals with fever, jaundice, labs showed high amylase... leading cause = gallbladder stones

- o Pancreatitis (High amylase) Ax w/ GB stone

Final | Obese, after breakfast = Stone (Not Cholangitis nor Choledochal cyst)

- o Gall stone= Pain following a meal can happen once in a while or after every meal

- Ascending Cholangitis

- o Majority of cases will get it within 1st 2 years of surgery
- o Organism: Enterococcus
- o Path: Leading to stasis > infection (Ascending Cholangitis)
- o Risk: Post-Kasai Complication: (removal of bile duct + gallbladder)
- o Sx: Charcot triad = RUQ pain + Jaundice + Fever/Chills
 - Cholangitis > Septic Shock
- o Tx: NPO + IVF, IV Abx

PEM R | 14 Y/O girl w/ increasing Acute on chronic abdomen pain for 2 days, vomit non-bilious non-bloody, no diarrhea or recent travel, crunched over in discomfort pain in RUQ, Temp 38.9 HR 130 BP 135/90, US (multiple gall stones), next = Administer Empiric Abx

PEM R | 3 Y/O fever 1 day, Hx of biliary atresia S/P Kasai procedure, no vomit, Rt. Tympanic membrane red/bulge/poor landmarks but clear Lt tympanic membrane, mild tender RUQ, well hydrated, well healed abdomen scar, next = Blood C/S

PEM R | 13 Y/O Hx Hemolytic anemia, presents ED w/ 3 days Hx of RUQ abdomen pain, 39.5, Non bilious non bloody vomit, no diarrhea, HR 130 RR 20 BP 90/50 on Ex RUQ abdomen tenderness w/ Jaundice (XR shows multiple gallstones), Next = Acute Ascending cholangitis

Promo | Neonate w/ Biliary atresia came post repair w/ Fever, high bilirubin, and WBC 15 = Ascending cholangitis (Not Hepatitis)

Final | Neonate after Biliary atresia repair came w/ fever and increase in bilirubin with WBC 15000 = Ascending cholangitis

Chapter 2: Medical

Final25 | 11 Y/O with H/o choledochal cyst removal in infancy came with RUQ pain and fever associated with rigor and chills, Dx = Acute cholangitis (Not Appendicitis nor Hepatitis nor Acute cholecystitis)

- **Post-Kasai Complication:** (removal of bile duct + gallbladder) = Ascending Cholangitis
 - o Majority of cases will get it within 1st 2 years of surgery
 - o Path: Leading to stasis > infection (Ascending Cholangitis)
 - o Organism Enterococcus

PEM R | 3 Y/O fever 1 day, Hx of biliary atresia S/P Kasai procedure, no vomit, Rt. Tympanic membrane red/bulge/poor landmarks but clear Lt tympanic membrane, mild tender RUQ, well hydrated, well healed abdomen scar, next = Blood C/S

- **H. Pylori**
 - o Tx: PPI, Amox, Macrolide

PEM R | 10 Y/O 3 months worsening abdomen pain located in upper abdomen ax w/ nausea/burping, endoscopy a week before & ready positive w/ biopsy, Tx initial = Lansoprazole, Amox, Clarithromycin

- **C. Diff**
 - o Ax: Post antibiotics
 - o Sx: Diarrhea
 - o Tx:
 - Mild = D/C Abx + Supportive
 - Moderate = Stool Toxin
 - Severe = PO Metro or Vanco

PEM R | 5 Y/O w/ diarrhea for 1 week without vomit, Afebrile, normal U/O, currently day 14 of 21 of Augmentin for sinusitis, C. Diff positive, otherwise normal, next step = Stop Augmentin

PEM R | 5 Y/O on Amox for bilateral OM diagnosed by PCP 1 week ago, Now o-in ED w/ Abdomen pain & diarrhea, gradual worsening over 2 days having 3 non-bloody mucoid stools, Temp 37 HR 110 RR 20 BP 100/70, Active/non toxic, mild diffuse abdomen tenderness, otherwise normal, Tx = D/C Amoxicillin & D/C home w/ Supportive therapy

Chapter 2: Medical

Other GI Disorders

Diarrhea

- AGE, Invasive: Bloody diarrhea
 - o Salmonella: contaminated food, reptiles
 - o Shigella: contaminated food, fecal-oral
 - o Campylobacter: contaminated food, pets, animals
 - o Yersinia enterocolitica: contaminated food or water, pets, animals, fecal-oral
 - o Entamoeba histolytica: contaminated food or water, poor sanitation
- AGE, Non-invasive: Vomiting, watery diarrhea
 - o S. aureus, Bacillus cereus: preformed enterotoxin
 - o Viral (norovirus, rotavirus): person to person, cruise ships
 - o Giardia lamblia: camping, flatus, bloating
 - o Clostridium perfringens: preformed enterotoxin, previously cooked meats
 - o Vibrio cholerae: raw or undercooked seafood, explosive diarrhea
- Functional Constipation

PEM R | 2 Y/O girl w/ finishing coming out of her bottom (Image shows rectal prolapse), Ax finding = Functional constipation

PEM R | 13 M/O streak of blood w/ painful defecation for 1 week after transition to cows milk, has 0.5 superficial sugary at 3 o'clock, definitive Tx = Stool softeners

Promo x2 | 8 M/O, Hx of Cow milk allergy, Formula changed by PCP, presenting w/ pain on Ex Anal fissure at 3 o'clock, best definitive Tx = Stool softener (Not Lactose free formula) (Most likely constipation)

Promo | Infant irritable w/ Abdomen distention, on Ex Normal (Constipation w/ Anal fissure scenario) Next = Abdomen XR

Amal | 8 Y/O boy, presented with diffuse crampy abdominal pain started last night, refuse to eat with this abdominal pain, no nausea or fever or vomiting, last bowel movement 2 days ago, looks relatively well, abdominal exam benign, next step = Rectal exam (Not Oral challenge then discharge if tolerated nor Abdomen XR nor Abdomen US)

- o Rectal exam is important in Constipation (If full rectum or polyp or fissure)

Final | Stool softener: ??? Similar question of constipation and the answer was Stool softener

- Rectal Prolapse
 - o Cause: Constipation
 - o Tx: Manual reduction (not to be ulcerated), Teach at home
 - PGS Consult if Unsuccessful reduction

PEM R | 5 Y/O, w/ red mass in rectum, has smeared blood underwear, he is on stool softener for constipation, no surrounding erythema, next = Perform manual reduction

Final | Rectal prolapse = Manual reduction

Chapter 2: Medical

- Jaundice

- Breast milk jaundice no longer recommended to supplement with formula

PEM R | 15 D/O FT, Wt 3.65 kg, no prenatal/postnatal complication, breastfed, 5-6 wet diapers, 3-4 yellow soft stool daily, at day 6 TBS 10mg/dL indirect 0.2 at day 8 TBS 7 mg/dL indirect < 0.1 mg/dL, Vitally stable, wt 3.9kg, good tone, moist mucus, Scleral icterus & upper chest jaundice, next step = reassure and discharge

PEM R | 24 D/O female, FT, gaining weight and breast feed well, concern of stooling, w/ grey color stool, mild jaundice and mild scleral icterus, TSB 8 mg D/L DSB 3 mg/dL, Tx = Admit for further evaluation

- Definition of Conjugated HyperBilirubinemia
 - if TSB > 5 mg/dL = DSB > 20%
 - If TSB < 5 mg/dL = DSB > 1 mg/dL
 - Disposition: Admit > Investigate

Promo | 12 D/O coming to ED for 3rd time due to jaundice, baby looks/feeding well, vitally stable, (bilirubin mentioned but ? Normal) Next = Reassurance & Discharge (Not Repeat Bilirubin nor Repeat after 1 week & FU)

Final | Breast milk jaundice with normal bili level = Reassurance

- Functional Abdomen pain

Amal | 6 Y/O periumbilical abdominal pain for 2 months. Hx of mild constipation that his mother was managing successfully by increasing juice and fiber in his diet. The mother is very frustrated because the boy has been sent home from school frequently due to the complaints of abdominal pain. She reports that he is being evaluated for dyslexia. The pain occasionally occurs on weekends and school vacation breaks. Of the following, Dx = Recurrent functional abdominal pain syndrome (Not school phobia nor factitious abdomen pain)

Chapter 2: Medical

Hematology**RBC****Iron Profile**

- Lead = Low Iron/Ferritin, High Transferrin/TIBC/RDW, High Retics, High Urine Porphyrin | Tx: AVOID or M23DSA
- IDA = Low Iron/Ferritin, High Transferrin/TIBC/RDW, Low Retics, Mentzer index > 13 | Tx: Iron
- ACD = Low Iron/Transferrin/TIBC, High Ferritin, Low Retics, Norm-High Hepcidin | Tx: EPO
- Sideroblast = High Ferritin/Transferrin/TIBC/RDW, Low Retics, Ringed Sideroblast | Tx: Pyridoxine

- Iron Deficiency Anemia
 - o Ax w/ Main Milk feeds
 - o Labs: Serum ferritin < 15 mcg/L + Low Hgb for age

PEM R | 15 M/O evaluation of anemia, Pale, non-toxic, very picky eater & prefer milk bottle to most meal, Low serum iron, labs = Low Retic, Low Ferritin, High TIBC

- Thalassemia

Promo | Thalassemia major w/ Pallor & Splenomegaly & Hgb 5 PLT 70, Normal WBC, Next = PRBC 15 ml/kg over 4hours

Promo | Thalassemia major w/ Hb 5 = Give PRBC over 4hr

Promo | 12 Y/O w/ Thalassemia intermedia w/ Splenectomy at age of 8 Y/O, coming w/ Pneumonia & Tachycardia, give = IV Ceftriaxone & Vancomycin

Other | 13 Y/O B Thalassemia intermedia, in ED for fever for 2 days, visiting from Middle East for summer program, not on meds but required blood transfusion prior to splenectomy at 8 Y/O, now cough, fever w/ postussive vomit & loose stool, looking pale HR 135 RR 32 Temp 38.2 BP 110/75, CRT 4 sec, has mild pharyngeal erythema, CBC & Blood C/S taken, best next = IV Ceftriaxone & Vancomycin (Double coverage for encapsulated organisms for Splenectomy pt.)

- o Staph. A & Malaria & Encapsulated organisms SHiNE SKiS
 - Strep. Pneumonia, H. Influenza, N. Meningitidis, E. Coli
 - Salmonella Typhi, Klebsiella P., Group B Strep.
- o Risk factor: Asplenia
 - Children: Immature antibody production, 6 M/O - 1 Y/O, Breastfeeding reduces the risk
 - Tx: Non-toxic Febrile PO Abx | Febrile toxic = IV Abx Ceftra + Vanco

Final | Thalassemia lethargic hgb 5 = Blood admission

Final | Thalassemia post splenectomy w/ fever = Ceftriaxone and Vancomycin

- o Prone to encapsulated organisms infections

- Macrocytic Anemia

- o B12 = Ileum, Vegan, Low B12, High Homocysteine + Methylmalonic acid, Tx: IV Cobalamin 1mg
- o Folate = Jejunum, Goat Milk, Low Folate, High Homocysteine, Tx: Folic acid 1-5mg OD

PEM R | 2 M/O FT, Pale but doing well, denies any abnormal Sx, raised in a vegan household who is exclusively breastfed, Mother no other medical issue, CBC normal, Hgb 9.2 MCV 104, test = Obtain Vit B12 level

Chapter 2: Medical

Sickle Cell Disease

- SCD Stroke

- Ischemic most common in 2-9 Y/O | Hemorrhagic most common 20-29 Y/O
- Diagnosis: Clinical Sx + CT Brain
 - IF Positive for Hemorrhage = Treat as Hemorrhagic Stroke = NSx + Neuroprotective measures
 - IF Negative for Hemorrhage = Treat as Ischemic Stroke = Exchange
 - Initial is CT unless within 2-4hr of Sx = Do MRI might be sensitive for early ischemic
- Acute CNS crisis or Stroke Tx: Stabilization, Emergent Exchange transfusion
- Prevention: Transcranial Doppler
 - Start at 2 Y/O
 - Elevated Time-averaged mean maximum (TAMM) > 200 cm/sec = Risk of Stroke
 - Tx: Chronic Blood Transfusion (Target HbS < 30% = Decrease Risk of 1st Stroke)

PEM R | 9 Y/O SCD, new onset headache w/ Rt sided facial drop, 3/5 power of Rt. Arm, 4/5 power of Rt. Leg, +2 reflexes, no truncal ataxia, no visual issue, after placing him on O2, labs, stat brain image, which should be done = Perform exchange transfusion

PEM R | 4 Y/O SCD, difficult walking, arm weakness for 6hr, 4/5 of Rt UL, 5/5 Lt, Rt. Facial drop, Next = CT brain

- ACS (Acute Chest Syndrome)

- Clinical Dx: New infiltrate + 1 of 3 (Chest pain, Fever, Hypoxemia, Cough/Tachypnea/Wheeze/Retractions)
- Tx: Abx > O2, IVF, Analgesia > +/- Simple Transfusion +/- Exchange Transfusion
 - Antibiotics:
 - All = Ceftriaxone + Azithromycin
 - Sick = Ceftriaxone + Azithromycin + Vancomycin
 - Antiviral (within 48hr of Influenza Sx)
 - Clindamycin (if allergic to cephalosporins)
 - Indication for simple transfusion (correct to Hb of 10gm/dL):
 - If Hgb Drop > 1-2 g/dL
 - O2 sat < 92% on room air or PO2 < 75mm Hg
 - Progressive disease but not in respiratory failure
 - Drop in Hb level > 1.5 - 2gm/dL below baseline
 - Delay in exchange transfusion
 - Exchange transfusion is often indicated in: (aim HbS < 30% and Hb not > 10 gm/dL)
 - Worsening hypoxemia with O2 sat < 90% despite supplemental O2
 - Progressive disease despite simple transfusion
 - Progressive ACS with High Hb (≥ 9gm/dL)
 - Multi lobe disease (progressive pulmonary infiltrates) and /or pleural effusion
 - History of severe ACS or cardiopulmonary disease

PEM R | 6 Y/O w/ Hgb SS & worsening fever/chest pain/cough/RD, Temp 38./9 HR 160 RR 45 BP 96/62 SpO2 89% on RA Hgb 5.2, decreased from baseline of 8, given O2 & pain control, IV access & confirming Dx w/ CXR, important next = Transfuse pRBCs

PEM R | 3 Y/O Male SCD Fever/Chest pain/Tachypnea, baseline Hgb 8.9 to 9.3, Temp 37.8 HR 120 RR 28 BP 96/50 SpO2 93%, Subcostal retraction & fine crackles in both bases, now Hgb 9, CXR has Cardiomegaly & Rt. Lower lobe infiltrate, after IVF & pain control, Next = Give Ceftra & Azithro

Promo x2 | SCA w/ ACS, Hgb 6, vitally stable, your action = Simple Transfusion + Abx (Not Bolus nor Exchange nor Observe)

Final | SCD with Acute Chest Syndrome = Ceftriaxone & Azithromycin

Final25 | Sickler SS w/ Fever, Cough, CXR infiltration and diarrhea, not improved on oxygen, HGB 7 what is BEST Tx = Packed RBC transfusion (Not Exchange transfusion nor Ceftriaxone and Metronidazole)

Chapter 2: Medical

- Splenic Sequestration

- Info:
 - < 7 Y/O = Common Sequestration
 - > 7 Y/O = Auto Splenectomy but **only Hgb SC can still have it at older age**
- Sx: Acute LUQ pain, Splenomegaly, Anemia, Low grade fever, Hypovolemic shock
- Clinical Dx: Acute drop of Hgb 2 g/dL & Splenomegaly
- Complication: **Auto-transfusion syndrome** (after giving blood might improve the splenic pooling and goes to system circulation > Fluid overload)
- Tx: [Fleisher]
 - IF Mild = Admit & Observe w/ Serial spleen Examination & Hgb Trend
 - IF Mod = PRBC (5-10ml/kg as spleen will release stuck RBCs once sequestration resolves)
 - IF Sev = Exchange transfusion (if severely ill)
 - IF Hypotensive = NS Bolus (5-10 ml/kg (w/ frequent evaluation while awaiting)

PEM R | 23 M/O SCD having fussiness/difficult to console for 24hr, today refusing PO & 1 vomit, Pale/Abdomen distension/Tenderness, Temp 37 HR 195 RR 60 BP 62/48, crucial step in acute management = pRBC

PEM R | 15 Y/O Hgb SC present to ED w/ Abdomen pain, no medical record in hospital, Hgb 10, he is very pale Temp 37.6 HR 125 RR 24 BP 100/70, Ex normal except for LUQ tenderness, in addition to labs, important next = Transfuse pRBC

Promo | Splenic Sequestration, Hgb (? 8), Tx = IV Fluids or Admission & Observe or Blood Transfusion or Repeat CBC 24hr (Incomplete Q)

Promo | SCA presented to ED with History of fever his CBC showed (Normal wbc, low hg, low Platelet) what type of crisis = Splenic sequestration (Not Hemolysis crisis)

PLT

- Glanzmann Thrombasthenia (GT)

- AR, Severe PLT Function Dysfunction, Mutation Glycoprotein IIb/IIIa
- Sx: Normal PLT Size & Morphology + Excessive bleed (Lack of Function)
- Lab: Flow Cytometric Analysis of PLT Glycoprotein (Diagnostic, PLT aggregation)
- GT = Agglutinates to Ristocetin Can't w/ Adenosine dihosphate (ADP) + Epinephrine + Collagen + Thrombin
- Coagulation: High BT, Normal PTT, Normal PT, Normal PLT
- Tx Desmopressin (DDAVP)
 - Bleed = PLT Transfusion
 - Recent PLT Alloimmunization + Bleed
 - Give Recombinant Factor VII (Effective/Safe, may not work for some types of bleeding GI or Intracranial bleed)
 - Normal Factor VII Clotting factor that activates other clotting factors and enhances platelet aggregation
 - rFVIIa bypass PLT + Help form clots at site of bleeding (Given as an injection into vein, Repeated as needed)
 - PLT (IF Life-threatening ONLY, w/ IVIG and Immunosuppressive drugs)

Promo | Glanzmann thrombasthenia what to give in ER = Factor VII (Not Tranexamic acid nor PLT Transfusion)

Promo | Glanzmann thrombasthenia w/ severe Epistaxis, to give in ER = Factor VII (Not Tranexamic acid nor PLT Transfusion)

Chapter 2: Medical

- Bernard Soulier syndrome
 - AR, Severe PLT Function Dysfunction, Mutation Glycoprotein Ib
 - PLT can't bind to vWF (glycoprotein Ib & resultant absence of PLT Ib/IX complex > inability to bind vWF)
 - Labs: Large PLT but normal number
 - BSS = Agglutinates to Adenosine diphosphate (ADP) + Epinephrine + Collagen + Thrombin Can't w/ Ristocetin
 - Coagulation: High BT, Normal PTT, Normal PT, Large PLT

Coagulation

Hemophilia

- Hemophilia
 - X-Recessive, A = Factor VIII (8), B = Factor IX (9)
 - Sx: Easy bruising
 - Muscle and joint hemorrhages/Bleed (Hemarthrosis)
 - Prolonged hemorrhage after trauma or surgery
 - Excessive bleed w/ Circumcision, No mucosal bleed or heavy bleed after minor cut
 - Coagulation: Normal BT, Normal PT, High PTT
 - Tx: Mild = Desmopressin (DDAVP)
 - Mod-Severe = Factor concentrates
 - Early Therapy (Hallmark of hemophilia care)
 - Mild-Moderate bleeding = Desired 35–50%
 - Life-threatening/Major hemorrhages = Desired 100%
 -  Calculation of recombinant factor VIII (FVIII) or recombinant factor IX (FIX):
 - Dose of rFVIII (8) IU = % Desired (rise in FVIII) × Weight (kg) × 0.5
 - Dose of rFIX (9) IU = % Desired (rise in FIX) × Weight (kg) × 1.3
- Hemophilia Complications: (Fleisher)
 - Hematuria
 - Traumatic Hematuria
 - Sx: Post Trauma, Flank tenderness, Hematuria
 - Lab: U/S, CT, MRI (ASAP to r/o subcapsular/Intrarenal bleeding or Obstructive clot in Pelvic-Ureteral junction)
 - Complications: Parenchymal damage, Deterioration of Renal function
 - Tx: Replacement 70-100%
 - Atraumatic/Painless Hematuria
 - Tx: Rest & Hydration
 - Iliopsoas Hemorrhage AKA Retro-Peritoneal Bleed (Emergency)
 - Sx: Lower Abdomen pain
 - Flexing Hip joint & Pain increase w/ Extension, LL Paresthesia (due to Femoral N. Compression)
 - Palpable Mass in deep pelvis
 - Invx: CBC (Check Hgb initial then regular),
 - XR (Loss of psoas shadow), US (Hematoma), **CT Abdomen & Pelvis without Contrast**,
 - Tx: 50-100% initial factor correction & repeated as needed, Amino-caproic acid

Chapter 2: Medical

- CNS Bleed
 - Sx: Head Trauma (Hematoma)
 - Hx Falling downstairs/crib/changing table, hitting head on surface or corner
 - Altered mental state or Focal changes, Vomiting
 - Labs: Brain CT (Negative doesn't r/o concussion)
 - Brain CT Indication:
 - External signs of trauma (e.g., scalp hematoma)
 - Fall down stairs / from crib / changing table
 - Hit head on hard surface
 - Altered mental status, Vomiting
 - Focal neurologic deficit
 - Low threshold w/:
 - Any child with prior intracranial bleed
 - Mild-Moderate Hemophilia who have Sx of lethargy, vomiting, or focal deficits
 - Tx:
 - Observe = Very mild (Light head bump on forehead) + Normal Ex
 - 100% Factor Replacement = Depends on Mechanism, Bleeding Hx, Clinical concerns
 - All major head injuries w/ hemophilia requires immediate evaluation & 100% factor
 - 1 U/kg of factor VIII will increase by 2%
 - F/U = If Persistent symptoms after excluding intracranial bleed

PEM R | 9 D/O Persistent bleeding after circumcision, lab value w/ Dx = PLT N, PT N, PTT Abnormal

PEM R | 13 Y/O male w/ Factor VIII deficiency, coming w/ lower abdomen pain & acute numbness & weakness to Rt. Leg for 3 days, vitally stable, has pain in Rt groin, decrease sensation to Rt. Leg, after IV line & labs, what confirmatory test to diagnose = CT Abdomen/Pelvis without contrast

PEM R | 13 Y/O Factor VIII Deficiency Worsening Lower Abd pain, numbness & weakness of Rt. Leg for 3 days, BP 110/65 HR 125 Temp 36, Rt. Leg flexed at hip, severe pain w/ passive extension, after labs best choice to confirm Dx = CT Abdomen & Pelvis without contrast

PEM R | 8 Y/O male, Severe Hemophilia A, w/ Lower abdomen pain refusing to walk, No Hx of trauma but shooting pain in Rt leg, 1st step in management = Give Factor VIII

PEM R | 5 Y/O girl Hemophilia A, fall while skating and Hit her head, having headache but no vomit, did lose consciousness briefly, sleepy but arousable, has head contusion w/ Lt temporal scalp midline as, CT Brain without contrast (has Lt. subgaleal hematoma but also counter-coupe Subdural minimal bleed) Tx = Factor VIII 100% correction

Promo | Hemophilia patient w/ Severe Abdomen pain and Left leg internally rotated and refuses to move it, Hypotensive, Next step = Factor 8 (Not NS Bolus)

- IF Patient in Shock = Treat as shock, But Factor Replacement should be given within 1 hour

Promo | Hemophilia w/ Gross Hematuria, No trauma, no Infection, vitally stable, Next = Rest and hydration (Not Factor)

Promo | 1 month old baby presented to ED with history of Prolonged post circumcision bleeding, **no Active bleeding now** his CBC showed WBC 10,000 Hg 8 PLT 150 what is the next step = Factor Assay (Not Factor Complex nor Packed RBC)

- Always do Factor Assay to check if this is Hemophilia A or B to then give the specific recombinant

Promo | 2 w/o, Persistent bleeding after circumcision, Next step = Factor Concentrate (Not PRBC nor PLT)

Final | Patient known case of hemophilia, post fall down came with lethargy, he had previous hx of bleeding post circumcision, Next = Give recombinant VIII (Not CT brain or Factor VII)

Final | Pt poly trauma known hemophilia A, Intubated/Sedated, Pupil unequal local hospital physician gave 3% & Hyperventilation, Next = Give Factor

- Hemophilia w/ TBI = First Stabilize > Give factor > CT Brain

Final | Hemophilia A with pain in hip flexion no hx of trauma = Psoas muscle bleeding

Final | Hemophilia 8 abdominal pain = iliopsoas bleeding

Final | Sever hemophilia scenario = Factor 8

Final | Hemophilia A Factor 8, prolonged PTT, Normal PT Hemophilia B Factor 9 (head and surgery 100% and all others 40%)

Final | Hemophilia prolonged PTT = Give factor 8

Chapter 2: Medical

Final25 | Hemophilia A patient with Severe Right lower abdomen pain radiating to leg pain with flexion after trauma in football game what is next step (Qs about iliopsoas hematoma) = Administrator VIII (Not CT abdomen pelvis nor Xray)

Other Coagulation diseases

- Low Large PLT + Normal PT/PTT + High BT = Bernard Soulier Syndrome
- Normal PLT + Normal PT/PTT + High BT = Glanzmann
- Normal PLT + Norm-High PTT, Normal PT + High BT = vWD
- Normal PLT + High PTT, Normal PT + Normal BT = Hemophilia
- Normal PLT + High PT/PTT + Normal BT = Vit. K
 - Extrinsic pathway (1927) = Abnormal PT
 - Intrinsic pathway (Hemophilia 8, 9) = Abnormal PTT
- vWB (Von Willebrand Disease)
 - o AD (typically), Consider genetic counseling and testing for first-degree relatives
 - o Types:
 1. Deficiency of vWF (most common)
 2. Abnormal vWF (several subtypes)
 3. Absence of vWF (rare but most severe)
 - o Sx: increased mucocutaneous bleeding, bleeding from minor cuts, gingival bleeding, epistaxis, heavy menstrual bleeding, postpartum hemorrhage, postprocedural bleeding
 - o Invx: Dx: vWF antigen, ristocetin cofactor activity (platelet-dependent vWF activity), and factor VIII activity
 - aPTT may be prolonged if factor VIII is low
 - Tests assess both amount and function of vWF to determine type and severity
 - o Tx:
 - Desmopressin (DDAVP, For Type 1 & 2, ↑ vWF release & factor VIII from endothelial cells)
 - vWF concentrate / cryoprecipitate (For Severe cases or Type 3)
 - **Recombinant factor VIII**
 - Antifibrinolytics (Tranexamic acid, adjunct in mucosal bleeding)

PEM R | 13 Y/O girl fatigue/dizzy/pale, had menarche 12 months ago, since 6 months having 7-8 days of menses soaking over 10 pads w/ large clots each time, Hx of easy bruising & occasional epistaxis, Mother had blood transfusions after both vaginal deliveries, consistent labs w/ her = Normal PT, Normal PTT

PEM R | 14 Y/O girl severe menorrhagia, had menarche at 12 Y/O, on Ferrous sulfate 1 month ago, Hgb 11 g/dL, CBC normal, consistent labs w/ her = Normal PT, Normal PTT

PEM R | 13 Y/O 1st time menses going on for 10 days, used pads daily, and double overnight, on Ex pale, HR 110 Hgb 8.2 PT/INR/aPTT normal, urine HCG negative, Next = Check von Willebrand panel (prior to starting OCP)

- o vWD level best to obtain prior to hormone therapy

Promo | Patient known case of Von Willebrand disease required resuscitation, has active bleed, factor to give = Factor 8

Promo | 13 Y/O hit truck while riding motorcycle, has Abdominal pain & Hx of vWB disease, blood to order = Factor 8

Amal | 13 Y/O riding motorcycle, hit truck, abdominal pain, has history of Von Willebrand disease, what blood product to order = Factor 8 concentrate (Not PRBC nor Whole blood nor Factor 7)

- o Hemophilia A = Factor recombinant 8
- o Hemophilia B = Factor recombinant 9
- o vWB = Factor 8
- o Vit K = Vit K
- o Glanzmann = Factor 7 then PLT

Chapter 2: Medical

- Vitamin K Deficiency Bleeding (VKDB)

- Types:
 - Early (0-24hr): Cephalohematoma, Intracranial, Intrathoracic, GI
 - Maternal drugs (Anti-TB, Anti-Epileptic, Warfarin)
 - Classic (2-7d): GI, Umbilical, Nasal, Circumcision, Skin
 - Idiopathic, Breastfeeding (low milk intake)
 - Late (2-12w): Intracranial (**Subdural hemorrhage**), Skin, GI
 - Idiopathic, Breastfeeding
 - Cholestasis (due to Biliary atresia, Alpha-antitrypsin, CF)
 - Abx therapy
- Invx: High PT/PTT, US or CT Brain (to r/o intracranial bleed suspect w/ SZ or Abnormal breath/Apnea)
- Tx: Vitamin K
- Home birth + Mother AED = Vit K def = Risk of bleed

PREP | 5 D/O Persistent bleeding circumcision site, possible cause = Maternal Hx of Seizures

PEM R | 5 D/O persistent oozing from circumcision occurred 4 days ago, having steady oozing, questions to ask mother that will reach Dx = Maternal Hx of SZ

PEM R | 15 D/O actively SZ, FT, NSVD, parent are vegan and chose not to undergo routine newborn treatment/vaccinaes, prior onset of SZ, no fever, feeding well, had GTC, brain CT (**Subdural hematoma**), next = Administer Vit K SC

PEM R | 6 D/O in ED w/ Abnormal breathing episode, FT, home birth w/ no complication, Mother on Anti-epileptic for seizure, child is afebrile/limited interactions, Next = Obtain US Brain

- 1st want to assess the pathology by Brain US or CT then Vit K

PEM R | 4 W/O mental state changes, bruising, rectal bleed, Head **CT Subdural hemorrhage**, has Elevated PT/PTT, likely explanation = Vit K deficiency

PEM R | 5 D/O boy, vomiting, GA 35 wk, birthing at local center, sleepy more, breast fed 15min every 2-3hr then vomit it curdled breast milk, 5-6 wet diaper, BP 73/46 HR 162 RR 45 SpO2 99%, fontanelle open but larger than normal Head circumference, has 2/6 Holosystolic murmur, moves all limbs equally, decrease tone diffusely, uncircumcised w/ only 1 palpable testicle in scrotum, test to obtain to identify underlying pathology = CT brain

- Obstructive Hydrocephalus > High ICP
- Birthing centers are not routinely giving Vit K

Promo | 2 w/o delivered at home w/ bruises all over & bleeding from Umbilical stump, Next = Vitamin K

Thrombosis

- DVT (Deep vein thrombosis)

- Risk Factors: Inflammatory disease, smoker, OTC, Malignancy, SCA, Pregnancy

PEM R | 17 Y/O girl, severe Rt lower leg pain while playing soccer, Hx sore/swell of Rt. Calf the night before attributed to muscle strain from running drills/practice, after stretch/message pain tolerable, she had full sprint and an opposing player slide tackle & tipped her over, felt worst muscle cramp in her life, sexually active on contraceptive pills, on Ex Rt. Lower swollen very tender w/ forsakes pedis pulse +1, crying of pain, best to diagnose = Compression DVT

PEM R | 16 Y/O acute left lower leg pain, sexually active & last menstrual period 3 months ago, Ex left lower extremity swollen hip, a cord not palpable, Lt knee extended forced/abrupt dorsiflexion does not worsen pain, test to determine etiology = US

PEM R | 10 Y/O w/ ALL on induction chemo w/ Vincristine, Prednisone, PEG asparaginase, having leg pain & Hx of running into sofa yesterday, No Fever/cough/SOB/Chest pain/Abdomen pain, Vitally stable, has Rt. Lower leg pain w/ swell erythema & warmth of Rt. Calf that walks w/ slight limp, next step = US of leg

- PEG-Asparaginase Side effect = DVT Complication = US Doppler

Chapter 2: Medical

- PE (Pulmonary Embolism)

- Risk factors in young children: Central venous line, ongoing infectious process, CHD
- Risk factors in All ages: Long flights, Long setting, Oral contraceptive pills use

PEM R | 7 Y/O 18kg, male Hx of short bowel syndrome during neonatal period, now on TPN through Broviac Cath., in ED acute onset of pleuritic type chest pain, cough, trouble breath, Temp 36.4 HR 120 RR 34 BP 103/58 SpO2 92% on RA, normal Ex/CXR, important predisposing factor = Presence of central venous cath

PEM R | 19 Y/O w/ chest pain when taking deep breath past 6hr, no Fever/URTI, Temp 36 HR 110 RR 22 BP 110/70 SpO2 96% wt 84kg on Cholecalciferol, escitalopram, resumed estradiol, surgical repair of distal tibia fracture 2 days in wheelchair, Next step = Chest CT (Pulmonary embolism)

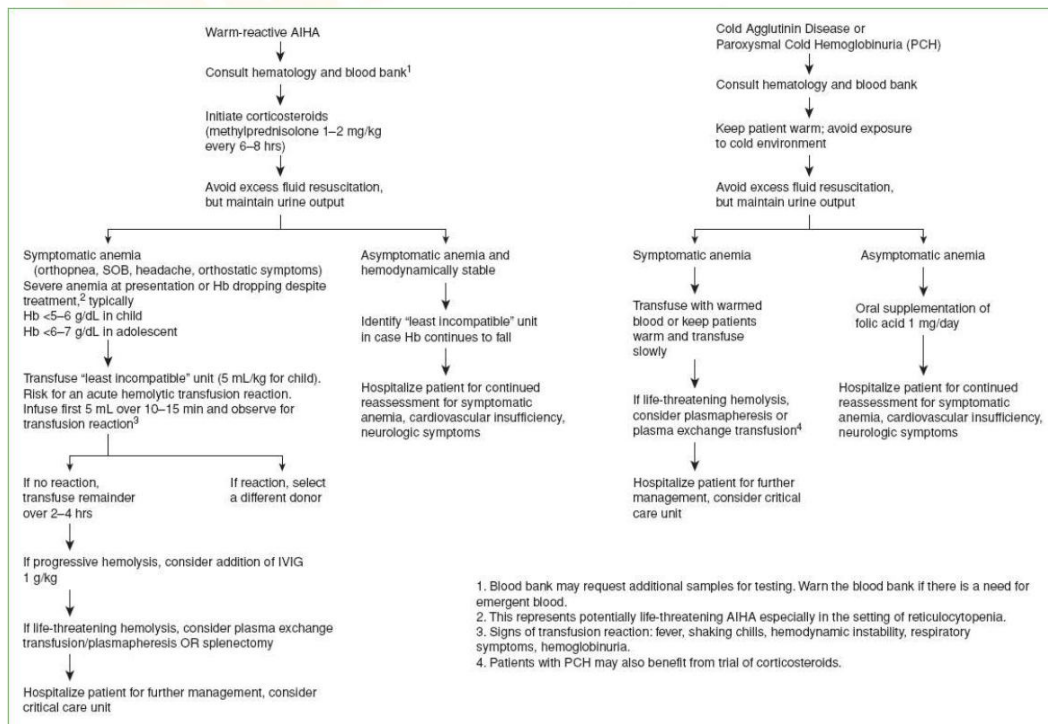
PEM R | 17 Y/O girl, w/ chest pain for 3 days, SOB, worse w/ deep inspiration & laying flat, all started after school trip flight to France, No Fever/Cough, takes ADHD meds, sexually active, on birth control, T 37.2°C HR 119 RR 19 SpO2 91% on RA BP 110/82, well appearing Normal Examination, test best to provide Dx = CTA Chest (Not CXR nor Tc-99m V/Q scan nor Serum beta HCG)

- High risk of pulmonary embolism due to OCP use & Long flight

Autoimmune

Autoimmune Hemolytic Anemia

- Warm AIHA: DAT+, IgG/C3 WARM, SLE/Drugs, Acute/Chronic, Spleen, Steroid Responsive, Splenectomy, Rituximab
- Cold AIHA: DAT+, IgM/C3 COLD, Mycoplasma/EBV, Acute, Liver, Steroid Resistant, Avoid Cold, Rituximab, Self
- PCH: DAT+, IgG D-L COLD, Viral Infection, Acute, Intravascular, Steroid Responsive, Avoid Cold, Self
- PNH: DAT-, NO CD55/CD59 > Complement, Aplastic Anemia, Hematuria Thrombosis, Eculizumab, Anti-coag., Transplant
- Paroxysmal cold
- Paroxysmal nocturnal



Chapter 2: Medical

- Autoimmune Hemolytic Anemia (AIHA)

- Trigger: EBV, Mycoplasma, SLE, Agammaglobulinemia, Methyldopa
- Sx: Pallor, Jaundice, Dark Urine, Splenomegaly
- Lab: Direct Coombs Test Positive (Hallmark of Disease)
 - Profound Normocytic Anemia, High Retics, High WBC
 - PBS Spherocytosis
- [Fleisher] Tx: Admit + Prompt initiation of Tx is necessary & Depend on Degree of anemia & CVS Compromise
 - Corticosteroids (1st line, highly effective w/ manageable side effects)
 - Careful Monitoring/Observation IF Hgb > 6-8 g/dL
 - PRBC 5 ml/kg slowly
 - Indication
 - Symptomatic and:
 - Child = Hgb < 5-6 g/dL
 - Adolescent = Hgb < 6-7 g/dL
 - Technique:
 - infuse 1st 5 ml over 10-15min & observe for reaction
 - Reaction = select different donor
 - No reaction = give reminder over 2-4hr
 - IVIG 1 g/kg (consider if progressive hemolysis despite PRBC transfusion)
 - Plasma Exchange or Plasmapheresis or Splenectomy (IF Severe/Refractory cases)

PEM R | 12 Y/O, Prev. Healthy came to ED progressive fatigue/pallor, dizziness/palpitations when standing, Ex scleral icterus, Hgb 3.2 Total bili 4.7 Elevated LDH & retics, Direct antiglobulin test is positive. Statements correct = Steroid 1st line

Promo | 8 M/O w/ Viral URTI came pallor & labs showing drop in Hgb & High Retics, Important lab to send = Coombs test

Promo | 10 Y/O girl, increasing fatigue for several days after recovering from URTI, Ex Obvious pallor, Mild scleral icterus, Spleen tip palpated 3cm below Lt. costal margin, Hb 5.2 Retic 28% Indirect Bili 2.8 (47.9), WBC, PLT all normal, Additional to lab to order = Direct Coombs test (AIHA)

Amal | 11 Y/O girl, is pale and fatigue had URTI a weeks ago, on examination pale and yellow sclera Hgb:5.3 Retics 25% Total bili 3.1 and wbc normal. Which test would help in Dx = Direct Coombs test

Final | Autoimmune hemolytic anemia = DCT

Final25 | ALL patient with hemolysis and pancytopenia, hypotensive and tachycardic sick and pale, DCT positive, HGB 5 Best next step = Class A PRBC (Not Exchange blood transfusion nor Transfusion Contraindicated nor Delay transfusion until compatible blood available, regardless of his condition)

- Class A PRBC: ABO-compatible, Rh-specific PRBC given urgently, even if crossmatch is incomplete/incompatible
 - Also might mean O negative PRBC

Chapter 2: Medical

DIC, MAS, HLH

- DIC = Coagulation Activation | Ax/ Malignancy, Infection, Trauma | LOW PLT/Fibrinogen | HIGH PT/PTT, FDP, D-Dimer
- MAS = T/Macrophages/Cytokines Activation | Ax/ sJIA | MAS & HLH Same Sx + Labs
- HLH = T/Macrophages/Cytokines Activation | Ax/ Malignancy, Viral Infection | MAS & HLH Same Sx + Labs
 - MAS & HLH Same Sx + Labs
 - o Sx: Fever, Hepatosplenomegaly, Purpura/Bruise, CNS issue
 - o Lab: Cytopenia | HIGH CD25, PT/PTT, AST/ALT, Triglycerides, Ferritin, D-Dimer, LDH | LOW NK cells, Fibrinogen
- DIC
 - o Systemic Thrombo-Hemorrhagic disorder seen in association with well-defined clinical situations (Always a secondary condition) and laboratory evidence of
 1. Procoagulant activation (HIGH PT/PTT, LOW PLT/Fibrinogen)
 2. Fibrinolytic activation (HIGH FDP and D-Dimer)
 3. Inhibitor consumption
 4. Biochemical and clinical evidence of end-organ damage or failure
 - o Labs: Low PLT, Fibrinogen | High PT/PTT, D-Dimer, FDPs
 - o Tx: Acute management
 - pRBC 10-15 ml/kg
 - PLT 10 ml/kg (For Acute bleeds/Pre-OP)
 - FFP (For Acute bleeds)
 - Cryoprecipitate (IF Fibrinogen < 100)
 - IF Fibrinogen > 100 = No need for Cryo but reconsider after FFP
 - Treating underlying condition

PEM R | 4 Y/O Girl, AML w/ Septic shock, after initial stabilization, IVF, Abx, Inotrope & Intubation, HGB 6 PLT 9 PT 24 PTT 80 Fibrinogen 120, blood product to give = pRBC, PLT, cryoprecipitate

Promo x2 | Differentiate between DIC & Liver disease = Factor 8

Promo | Patient w/ EMS sick, vomiting blood, Blood coming from IV line and from everywhere, which is affected = Both clotting & hemostasis (Not Hemostasis nor Clotting nor Fibrinogen)

- o Most likely has DIC
 - Hemostasis = PLT Count/Function
 - Clotting = Coagulation = Hemophilia
 - Both = DIC

Final | DIC pic = Impaired both bleeding and coagulation

- HLH

PEM R | 18 M/O female w/ 3 wks fever/rash/decrease activity, had several urgent care visits over last 3 wks, Tachycardic, Listless, diffuse erythematous maculopapular rash, mild splenomegaly, Blood C/S & EBV titer are negative, Hgb 7 PLT 65 AST 360 ALT 200, additional labs to support disease = Elevated Ferritin

Chapter 2: Medical

- MAS

- Subtype of HLH, mainly comes w/ JIA
- Sx: Fever, HSM (not required for criteria), Purpura/Bruise, CNS issue
- MAS to diagnose need 1 Clinical + 2 Labs
 - Clinical:
 - Fever > 38
 - CNS Dysfunction (Headache, Seizure, Coma)
 - Hepatomegaly
 - Hemorrhage: Purpura/Burising
 - Labs:
 - Hgb < 10, PLT < 100, N < 1
 - High Triglycerides > 265
 - Low Fibrinogen < 150 Leads to Low ESR
 - High Ferritin > 500
 - High AST/ALT
 - Prolonged PT/PTT
 - High LDH, High D-Dimer

Pedz | Child w/ Rheumatoid Arthritis, Macrophages activating syndrome, True = Low Natural killer cells (Profound Low NK cells) or Low CD25 or High Fibrinogen or Low Ferritin

PEM R | 12 Y/O known sJIA w/ Fever for 4 days 39.4, No URTI/GI Sx/Dysuria/Rash/Headache/Myalgia, on Anakinra, on Ex LUQ tenderness, has Low PLT Low Hgb, High Transaminases 4-5, INR milky prolonged, labs to help Dx = High Ferritin

PEM R | 13 Y/O sJIA w/ 8 Days Fever/Malaise, Sore throat 2 wks ago, Weak/ill appearing HR 120 BP 100/54, well presided, normal tachycardia/no meningeal signs, non-tender abdomen, Hepatosplenomegaly, WBC 4.5 Hgb 8.3 PLT 80, concerning lab for serious complication of JIA = Ferritin 650 ng/mL

Promo | JIA Patient, best way to differentiate between JIA disease activity & MAS = Hemophagocytes on Bone marrow (Not High Triglyceride nor Low Fibrinogen)

Chapter 2: Medical

Transfusion Reaction

- All Transfusion Reactions

- IF Fever = Give Antipyretic only | IF Rash = Diphenhydramine | IF Hemolytic = Stop transfusion D

Promo | SCA patient presented with splenic sequestration received PRBC during transfusion he developed fever what to do next time = Give irradiated blood (Not Give Diphenhydramine before transfusion)

Promo | Anaphylaxis post Blood transfusion, to do Next time = Give Diphenhydramine before (also Steroid) (Not Irradiated)

Final | Blood transfusion scenario developed reaction = Stop the infusion

- TACO = Afebrile + RD + Hypertension | Tx: STOP Transfusion, Diuretics
- TRALI = Febrile + RD + Hypotension | Tx: STOP Transfusion

- TRALI (Transfusion related acute lung injury)

- Post transfusion reaction occurs within 6 hr of Transfusion
- Trigger: Any Blood product w/ Plasma (PRBC, FFP, PLT)
- Sx: Acute Hypoxemic Insult within 30min-6hr during Administration of Blood product w/ Plasma
- Labs: CXR Bilateral pulmonary infiltrates
- Tx: Supportive, Resolves within 96 hr

Other | Which of the following statements about the characteristic of Transfusion-related acute lung injury (TRALI) is true = Clinically, it appears as an acute hypoxemic insult

Final | Pt. Receiving blood transfusion, suddenly developed fever up to 40 & Tachypnea, Next = Immediately stop

- Delayed Transfusion Reaction

- Hemolytic non-ABO Within 4-14 days

PEM R | 9 Y/O w/ Leukemia on Maintenance Therapy, Hx 6 days ago receiving chemo induced anemia, for last 24hr having now Fever/Pallor/Fatigue/Low back pain/Scleral icterus, Temp 38 HR 95 BP 110/60, acute presentation = She will have positive DAAT

Chapter 2: Medical

Oncology

Tumors

Abdomen Tumors

- Neuroblastoma

- < 4 Y/O (22 M/O), MYCN, 1st Most common Abdomen Malignancy, 2nd is Wilms
 - Arises from Adrenals and crosses midline
- Sx: Raccoon Eye (Bilateral Periorbital Ecchymosis -Bruising around the Eye-)
 - Lump in Chest & Abdomen (Adrenal Medulla Non-tender huge abdomen mass)
 - Back Pain (Spinal/Paraspinal)
 - Horner syndrome (Unilateral Ptosis, Miosis, Anhidrosis)
 - Osoclonus-Myoclonus Ataxia
 - HTN
- Complication
 - Metastasis: 50% Bone + Bone Marrow, LN, Skin, Liver
 - Spinal cord compression (Read in Oncology Emergency)
- Labs: Pancytopenia, **HVA/VMA** in urine (Catecholamine markers)
 - BMA shows Rosette (Clumb of cells, Khaleyat Alnahal)
 - MIBG Scan (Gold standard, shows metastasis)
- Tx: Surgical, 80% Neurological deficit post removal

PEM R | 4 Y/O persistent cough for last 3 week not responding to bronchodilators, allergy meds, has wheeze on Rt upper lobe despite Nebs, CXR (wide mediastinum), next step = Order urine catecholamines (Anterior mediastinal mass, r/o NB)

PEM R | 2 Y/O girl, 3 wk Hx of non-productive cough, Afebrile, well liking, lungs clear, having faint expiratory wheeze in Rt upper lung field, mild ptosis of Rt. Eyelid, Pupillary exam she is not cooperative, CXR mass Rt. Upper chest, Diagnostic = Urine & Serum Catecholamine

PEM R | 2.5 Y/O girl difficult walking/frequent falls over 4 days, has rapid eye movement from when looking from object to another w/ 3-4 horizontal beats, rapid saccadic conjugate eye movement, equal reactive pupils, unsteady wide gait & unable to take more than few step without falling, CT Head/CBC/Electrolyte/LFT normal, next step to Dx = CT Chest/Abdomen/Pelvis

PEM R | 2 Y/O Girl, fully vaccinated, abnormal eye/leg movement for 1 week no Fever/Recent illness, playful w/ Vitals normal but has frequent multidirectional bilateral eye movement last several seconds & coarse tremors w/ occasional jerk movement of both legs, likely to yield source = CT Chest/Abdomen/Pelvis

PEM R | 22 M/O male ED w/ several weeks of progressive fussy/resisting walking and crawling, Parent notes him to be constipated, on Ex Firm/Non-tender abdomen mass, Neuro Ex reveals decreased strength in LL +1 patellar tendon reflex, likely etiology = Neuroblastoma

Promo | Proptosis, Ataxia, Pic of Neuroblastoma = CT CAP (Chest, Abdomen & Pelvis)

Promo | Case of Ptosis, Anhidrosis (Horner syndrome), Next = CT Head, Chest, Abdomen

- Wilms

- Nephroblastoma & Neuroblastoma comes at < 6 Y/O
- Ax: Beckwith Wiedemann syndrome
- Sx: Abdomen Mass, HTN, Anemia, Hematuria

PEM R | 4 Y/O having abdomen mass, well appear/afebrile, non-tender, firm, moderate size on Rt. Side of abdomen, vitally stable WBC 8.2 HGB 9.4 UA +3 Blood, etiology = Nephroblastoma

Chapter 2: Medical

PEM R | 3 Y/O Abdomen pain/Constipation developed 2 months ago, despite dietary change, fiber supplement, still getting worse & abdomen larger, Temp 37.2 RR 24 HR 110 BP 136/88, Abdomen softened w/ large firm palpable mass in LUQ, CBC normal, Urinalysis has blood, likely etiology = Wilms tumor

PEM R | 3 Y/O male w/ 3 days hematuria, No dysuria/fever, Vitally stable, has Firm Rt. Side abdomen mass w/ CT abdomen (enlarged cystic looking kidney), Dx = Beckwith Wiedemann syndrome (Ax w/ Wilms tumor)

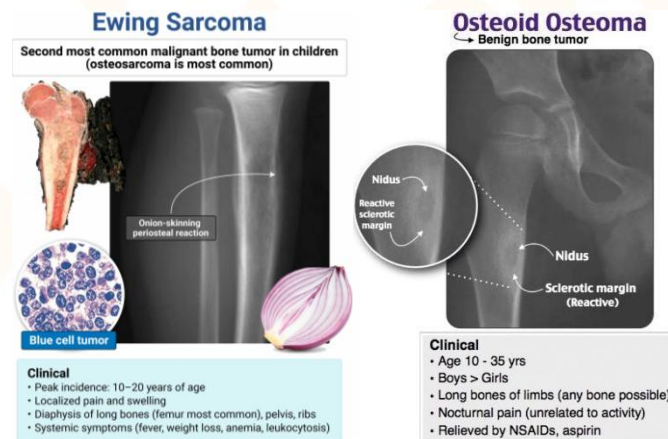
PEM R | 2 Y/O girl w/ swelling in abdomen for past few days, also red colored urine, Afebrile, Vitally stable, having protuberant abdomen w/ palpable mass on Lt side, likely Dx = Wilms

Final | Wilms tumor

Final25 | 5 Y/O previously healthy with recent constipation and abdominal pain, O/E large mass on right upper and right lower, urine dipstick showed trace blood, hypertensive, Dx = Wilms tumor (Not Neuroblastoma nor Hepatoblastoma)

Bone Tumors

- Osteosarcoma = Malignant | **Metaphysis**, Spindle cell | Pain, Hx of Injury | XR Sunburst, Codman | Tx Chemo, Surg.
1st most common, Sites: Distal femur, proximal tibia, proximal humerus, middle & proximal femur
- Ewing Sarcoma = Malignant | **Diaphysis**, Neural Crest | Pain, Fever, Wt Loss | XR Lytic Onion Skin | Tx Chemo, Surgery
2nd most common, Sites: Femur (long bones) & flat bone of pelvis
- Osteochondroma = Benign | **Metaphysis**, Cartilage | Painless | XR Stalk projections | Tx Supportive
- Osteoid Osteoma = Benign | **Meta/Diaphysis** | Pain at night | XR Oval (Nidus + reactive sclerotic Margins) | Tx NSAIDs, Aspirin



PEM R | 17 Y/O Rt. Knee pain for several months, having nighttime pain, after cheerleading practice, about 3 wks ago had swell to Rt. Knee & limp over few days, XR (shows lytic sunburst lesion), appropriate management = Admit for Biopsy

PEM R | 14 Y/O 1 month Rt. Leg pain worsening over last week waking him from sleep, on XR large lytic lesion w/ thin cortex due to cortical destruction in distal right femur, on discharge recommendation = No weight bearing on Rt. Leg

Promo | Pt. Heard a pop in her elbow during activity, Dx = Osteo-Sarcoma or Osteoid Osteoma (Incomplete Q)

Promo | Which is correct about this Dx (XR of Tibia w/ Lytic lesion) = Can present w/ Fr. Or Most of them Benign

- This one more w/ Osteochondroma ?

Promo | Which is correct about this Dx (XR of Tibia w/ Lytic lesion) = Common in Humerus/Femur (Not Most are benign nor painless or can present w/ Fr.)

- Similar to Dr. Amal Q about Unicameral Cyst = Common in Humerus & Femur

Amal | 8 Y/O, fall from swing, came with right leg pain, examination unremarkable, except from limping, which is true about regarding this lesion = The unicameral cyst are the most common in humerus & femur (Not All bone cyst regardless to the type are consider as pre malignant -can be benign-. Nor Anuresmal does not cause pain -pain will be present-. Nor Fracture uncommon unicameral bone cyst -fractures are common-)

- Important to Study these about tumors: Stages, common bones location, ages presentations

Chapter 2: Medical

- Benign mass

Promo | Girl referred to you w/ suspicion of Malignancy, Girl have mass on her back between scapula, mobile not tender no skin changes, intervention = Reassuring that her lesion most likely benign & need F/U

Oncology Emergency

- UMN = Stroke, Spinal cord compression, MS, Brain injury = Hyperactive Reflex, High Tone
- LMN = Radiculopathy/Neuropathy = Hypoactive Reflex, Low Tone
- Dexamethasone for Brain & Spine
 - o Brain Space occupying lesion + ICP Sx = Dexa 1-2 mg/kg Q6hr > NSx
 - o Spinal cord compression + Sx = Dexa 0.25-0.5 mg/kg Q6hr (Max 10mg then 4mg Q6hr) > NSx
- Brain Space Occupying lesions
 - o Tx: ABCDE + ICP measures
 - Dexa 1-2 mg/kg Q6hr (reduces ICP in case of Space occupying lesion)
 - Mannitol or 3% Hypertonic Saline
 - AVOID LP (precipitate rapid ICP change & herniation)

PEM R | 14 Y/O girl new onset SZ, No Hx of previous SZ or Trauma, having 6 weeks headache w/ occasional vomit, family attributing it to stress from school, after giving Keppra patient stops SZ & in Post-ictal w/ spontaneous breath, vitally stable, CT Brain (Mass in Cerebellum? Medulloblastoma), Next step = Dexamethasone

- Spinal Cord Compression
 - o Ax: Neuroblastoma
 - o Sx: Back pain, Radicular pain, Constipation
 - Difficult urination/urine retention, Paresis/Paralysis, Hyperactive Deep tendon reflex
 - o Labs: MRI (best for diagnosis)
 - o Tx: Analgesia, Dexa 0.25-0.5 mg/kg (reduce pain, improve blood flow, improve neuro deficit)

PEM R | 3 Y/O in ED weakness/inability to walk since yesterday & needs to be carried, last few weeks having decreased UO & decreased bowel movement which mom initially attributed to decreased PO, Ex non-toxic, vitally stable, has distended soft abdomen w/ large firm non-tender mass, having bilateral lower LL 1/5 strength, hyperactive deep tendon reflex, Emergent ED Tx = Dexamethasone

Final25 | Known case of Neuroblastoma presented with lower extremity weakness and incontinence with tenderness over lower lumbar spine and pain with flexion of the back = Steroid (Not Surgical and radiation therapy nor CT Spine nor MRI)

- High output CHF
 - o Rapid Hemolytic anemia > High output Congestive HF
 - o Hemolytic Anemia Sx: Dark urine, Jaundice, Pale, Mild Hepatosplenomegaly, High output cardiac murmur
 - o CHF Sx: JVD (specific finding of High output CHF), Hepatomegaly, Edema
 - o Tx: pRBC (Emergent)

PEM R | 6 Y/O male w/ Jaundice for 3 days that is progressing, and fatigue, vitally stable, has Scleral icterus & mild HSM, Hgb 5 & High Retic & Post DAAT, which finding is concerning = Jugular venous distension

Chapter 2: Medical

- Mediastinal mass

- Causes: Intrinsic: vascular thrombosis (After cath. Introduction), intravascular tumor thrombosis (Wilms, lymphoma)
 - Extrinsic: Anterior mediastinal tumors (Hodgkin > Non-Hodgkin > Germ cell > Thyroid > Thymoma)
- SVC Syndrome Sx:
 - Altered LoC
 - Swelling, plethora, Cyanosis Face/Neck/Upper extremities
 - Suffusion of the conjunctiva
 - Engorgement of collateral veins
- Superior mediastinal syndrome Sx:
 - Altered LoC, Syncope
 - Cough/Dyspnea/Orthopnea, Wheeze/Stridor (worse on supine), Hoarseness/Dysphagia
 - Chest pain

PEM R | 4 Y/O, Persistent cough for 3 weeks, not responded to bronchodilators/allergy medication/Abx, No Fever, week appearing, dry non-productive cough, wheeze Rt. Upper lobe persists despite Nebs XR (shows mediastinal mass), Next step to order for pt. = Urine catecholamines or IV Abx or IV Dexamethasone or Sputum C/S (Majority of NB Ant. Mass present < 5 Y/O)

Promo | CXR wide mediastinum, Hx of cough for 3 weeks, Dx = Hodgkin's Lymphoma -Ant.- (Not Neuroblastoma -Post.- nor Germ cell tumor)

- Hyperleukocytosis

- Invx: WBC > 100 (Diagnostic)
 - Hyperleukocytosis > 100K in AML, > 300K ALL
- Complication: Leukostasis (Sludging of leukemic blast)
 - Sx: RD, Neuro Sx (Headache, Visual changes, Altered mental state)
- Tx: IVF Bolus, Leukapheresis, Allopurinol
 - Asymptomatic = Fluids
 - Symptomatic (CNS/Resp) = Leukapheresis

PEM R | 5 Y/O female, possible leukemia, Ex Afebrile/Pale/Headache, vitally stable, WBC 140 Hgb 8 PLT 60, Next = IVF Bolus

Final | Pt. W/ WBC 300K, Hgb 6, PLT 50, Next = Maintenance fluid (bcz patient is asymptomatic)

- 1st IVF Boluses then Leukapheresis (if symptomatic w/ coagulopathy)

Final | Child w/ Leukemia WBC 150K ... = Double maintenance IVF (If CNS Involvement Leukapheresis)

Final | Scenario with wbc 300000 low PLT low HGB = IVF main (Not Leukapheresis nor transfuse blood nor transfuse platelets)

- Tumor Lysis

- C-UPP: Hypocalcemia, Hyperuricemia, Hyperkalemia, Hyperphosphatemia

PEM R | 5 Y/O case of Tumor lysis, lab = Hyperkalemia, Hyperphosphatemia, Hypocalcemia, Hyperuricemia

PEM R | 5 Y/O case of Tumor lysis syndrome, labs = K 6.5mEq/L Po4 7.5mg/dL Uric acid 8.5mg/dL Ca 4.2mg/dL

Final | 5 Y/O, presented with hx of fatigue and pallor last 4 weeks, on exam there is lymphadenopathy and hepatosplenomegaly, what to expect to see in the lab: (tumor lysis lab finding (No calcium at choices) = High Phosphorus, High Urea, High K

Final | Tumor lysis syndrome = CUPP (Low Ca, High Uric/K/Po4)

Chapter 2: Medical

- Febrile Neutropenia

- Mild < 1500, Moderate < 1000, Severe < 500
- Tx: Monotherapy (initial): Cefepime (4th gen = Anti Pseudomonas)

PEM R | 6 Y/O ALL on Maintenance w/ Fever, Chemo 3 days ago had decrease energy & appetite, denies URTI/Abdomen pain/Vomit/Rash, on Ex ill Temp 38.1 HR 174 RR 43 BP 92/63, PIV & labs & bolus done, ANC 0.82, Abx = Cefepime

PEM R | 8 Y/O, male standard risk ALL undergoing chemo, having Fever/body aches, has central line, having Alopecia w/ Mucositis, central line erythema, Temp 38.7 WBC 5 N 4% L 70%, E 5%, PLT 20, HCT 22%, Next = Give Cefepime

Promo | 13 Y/O ALL, Fever, Neutropenia ANC 200, Choice of Abx = Cefepime (Not Ceftazidime & Genta nor Tazo & Genta nor Mero)

Amal | 5 Y/O with ALL, last chemotherapy 10 days ago, presented to ED with history of fever, WBC: and ANC 1500, what will be appropriate Abx = Ceftriaxone (Not Cefepime + Amikacin nor Tazocin + Amikacin)

- No neutropenia, and patient is well looking so single antibiotic and discharge home
If patient sick looking or Febrile Neutropenia start Cefepime
- Bacteremia = Ceftriaxone
- Bacteremia + Febrile Neutropenia = Cefepime

- Typhlitis

- Specific type of NEC
- Ax: Neutropenic w/ ALL (almost exclusive)
- Sx: Mimic appendicitis
- Labs: XR shows paucity of air (low air/gas in GI tract), ileus, thickened bowel, or air in bowel wall (pneumatosis)
- Tx: IVF, Pain control
 - Broad Abx: Cefepime (Anti-pseudomonas) + Metro
 - Surgery: uncontrolled coag, sepsis, perforation

PEM R | 7 Y/O in maintenance ALL therapy, now Fever/Abdomen pain/vomit/ill Temp 39.4 having diffuse tender RLQ, ANC 0.7, XR (showing air paucity), correct statement regarding diagnosis = Serial Abdomen XR

PEM R | 6 Y/O Acute Myeloid Leukemia, last received Chemo 2 wks ago, now Fever/Abdomen pain, Temp 38.4 HR 130 RR 24 BP 102/60, on Ex mild ill, RLQ moderate abdomen distension & diffuse tenderness, Neutrophil 0.1 PLT 65, XR thickened loops of bowel along w/ air in bowel wall near RLQ but no free air, Next step = Give Cefepime & Metronidazole

Chapter 2: Medical

Nephrology**Nephrotic/Nephritic****Nephrotic**

- Nephrotic syndrome = LEAP: Lipids ↑, Edema, Albumin ↓, Proteinuria
 - Path: underlying mechanism is increased glomerular permeability, leading to loss of proteins such as albumin, antithrombin, protein S, and plasminogen
 - Sx: Edema, proteinuria, hypoalbuminemia, hyperlipidemia, and often hypertension
 - Labs: Renal (biopsy can help distinguish nephritic from nephrotic causes but is not emergent)
 - CT abdomen/pelvis (stone protocol) is used if nephrolithiasis is suspected, though dependent edema is not typical of stones
 - CT angiogram with contrast may be used if renal vein thrombosis is suspected and contrast is tolerated, but ultrasound is less invasive
 - Tx: Steroids (Main Tx Fleisher: Any Nephrotic HD Stable, start 2mg/kg or 60 mg/m² & Nephro consult w/ OPD)
 - Steroid Criteria:
 - 1-10 Y/O
 - No Renal insufficiency, No Macroscopic Hematuria, No Sx of Systemic disease, No HTN
 - Normal C3
 - Steroid Doses:
 - Induction: Prednisone 2 mg/kg/day x 6 wks then 1.5 mg/kg every other day x 6 wks
 - Relapse: Prednisone 2 mg/kg/day until proteinuria resolves for ≥ 3 consecutive days
 - F/U of Weight, BP, Response to therapy
 - IF Infection Abx should cover S. Pneumoniae & Gram Neg.

Promo | Early sign of Nephrotic syndrome = Edema (Not Proteinuria)

- Fleisher: Periorbital edema is often the initial finding and may be misdiagnosed as signs of allergy

- Nephrotic Complications
 - Relapse, Bone disease, CKD
 - Prolonged Steroid therapy: Growth restriction & Cataract
 - Infections, Edema, Thrombosis (Discussed down)
- Nephrotic Complications: Infections
 - Due to Immunoglobulin deficiency Due to loss of IgG + Important complement co-factors in urine
 - Organism: Strep. Pneumoniae (50%) + Gram Neg. (E. Coli & Others) Also H. Influenza
 - Sx: Primary Peritonitis (2-6%), Also Cellulitis, Sinusitis, Pneumonia
 - Tx: All Nephrotic Need Pneumococcal vaccine + Treat infections accordingly

Final | Nephrotic scenario; Came with abdominal distension and fever, what is the most common organism causing overwhelming sepsis = S. Pneumoniae

Final | Nephrotic syndrome, Ascites = Strep pneumonia

Final | Nephrotic sepsis organism = Strep pneumonia

Chapter 2: Medical

- Nephrotic Complication: Edema

- Arterial Under filling
 - Pth: Low Albumin > Low Oncotic pressure > Arterial under filling
 - Invx: Albumin level & GFR (Both can give estimate of Intravascular volume status)
 - Tx: Mild = Albumin 20-25% 0.5-1 g/kg over 4hr
 - Severe = Admit
 - Albumin 20-25% 0.5-1 g/kg over 4hr
 - x1-2 Furosemide 0.5-1 mg/kg/dose
- Primary Na Retention
 - Tx: Furosemide 0.5-1 mg/kg/dose
- Albumin Administration:
 - Hypotensive regardless of how low the albumin is = Intravascular depleted = Give Fluid Bolus
 - Normotensive, Albumin indications 20%:
 - Respiratory Distress due to Anasarca
 - Scrotal/Vulvar Edema
 - Serum albumin <1.5 gm/dl
 - Edema not improved after diuretics
 - <10% used in in a volume deficit alone
 - >10% used if oncotic deficit exists (mostly in whom have Fluid and Na restricted)

Pedz | Nephrotic Syndrome, on Steroid has Abdomen distension & pain, Ascetic tapping showed WBC = Peritonitis

PEM R | 6 Y/O male, swelling noticeable over 1 week, having eye/scrotum swell, Afebrile/No recent illness, vitally stable, Na 135 K 3.9 Cl 108 HCO₃ 21 Glucose 86 Urea 10 Cr 0.3 Albumin 2.4, Urinalysis +3 Protein, you consult Nephro by phone = **Discharge on**

PO Steroid

Promo | 2 Y/O w/ Eye puffiness & Proteinuria, Low Albumin, Hypotensive, Next = NS Bolus (Not 20% Albumin)

Promo | Nephrotic Syndrome, Stable w/ Puffiness & Scrotal edema, what to give = Albumin & Lasix (Not PO Steroid & Discharge)

Promo | Child developed generalized swell continues to worsen came in ED having Periorbital edema & scrotal swell, his albumin is 15, Tx = Albumin 20% (Not Albumin 5% nor Discharge with no Tx nor Increase Prednisolone dose)

Final | 6 Y/O, Nephrotic syndrome, hypotensive, what to do = Bolus of NS

- Nephrotic Complication Thrombosis (Hyper-coagulable state)

- Loss of natural anti-coagulants
- Causes: Decreased (due to urinary losses): Protein S, C | Anti-thrombin III, Plasminogen
 - Increased: PLT activation | Fibrinogen (inhibits plasminogen activation)
- Presentations:
 - Pulmonary embolism
 - Deep vein thrombosis
 - Renal vein thrombosis (Acute flank pain + Hematuria + US Doppler)
- Invx: Doppler US (Kidney, Limb, etc.), Angiography (For kidney)

Pedz | Nephrotic syndrome w/ DVT, underlying cause = Decrease protein S

Pedz | Known Nephrotic on steroid, Bilateral lower swell, Rt. Leg swell, Doppler showed DVT positive = Decreased Protein S

Pedz | Nephrotic syndrome, Relapse given steroid, mother called for Dark urine + Abdomen pain, Dx = Renal vein thrombosis

Pedz | 6 Y/O, Girl, Nephrotic syndrome on Tx, came to ED for Abdomen pain & Hematuria, Sx = Renal vein thrombosis

Pedz | Pt. Discovered to be HTN, has Abdomen bruit, Doppler U/S decreased perfusion to one kidney, Next = Angiography of renal vessels w/ Central venous renin measurement (Renal vein thrombosis)

PEM R | 7 Y/O 1 week facial puffiness w/ new unilateral back pain 1 day prior, Temp 36.7 HR 101 BP 129/85 RR 15 SpO₂ 99% on RA, has Peri-orbital/Abdominal/Scrotal Edema w/ Rt. Side flank tenderness, UA Proteinuria/Hematuria, Na 131 K 4 Cl 98 Urea 20 Cr 0.4 Albumin 2.5 Phos 6, Next best = Renal US w/ Doppler

Chapter 2: Medical

PEM R | 12 Y/O Nephrotic syndrome not improving w/ steroid, Acute flank pain gross hematuria, BP 128/74, scrotal/lower edema, abdomen full non tender w/ positive fluid wave, Dx = Renal vein thrombosis

Nephritic

- LN: Adolescent Girl, Nephritis + SLE, Low C3, Low C4, Pos. ANA, Pos. Anti-dsDNA, Pancytopenia, Tx Steroid, Immunsup.
- PIGN: URTI/Skin + Weeks > Nephritis, Low C3, Pos. Anti-DNase B, Tx Supportive + Abx
- IgA V: URTI > Purpura/Rash/Abdomen Pain/Arthralgia +/- IgA Nephritis, Tx Supportive
- IgA N: URTI + Days > Nephritis (2nd attack), Normal C3, Biopsy IgA in Mesangium, Tx ACE, Fish oil, Steroid, Immunsup.
- Anti-GBM: Nephritis > ESRD, Hematuria, Normal C3, Biopsy Crescent + IgG & C3 Deposit, Tx Steroid, Immunsup.
- Good Pasture: Pulmonary Hemoptysis + Anti-GBM Hematuria Tx Plasmapheresis
- MPGN: URTI > Nephritis > Nephrotic, Low C3 Persistent, Low C4, Biopsy Complement in Mesangium, Tx Steroid

- C3 Normal = IgA Nephropathy/Vasculitis, RPGN, Wagner, Polyarteritis Nodosa, Hypersensitive vasculitis
- C3 Low = SLE, MPGN, PIGN
- C4 Low = SLE, MPGN

- PIGN (Post infectious glomerulonephritis)
 - o Sx: Edema/HTN
 - o Tx: Supportive, IF HTN give Hydralazine or CCB

PEM R | 8 Y/O Gross hematuria/peripheral edema/HTN, No Hx of illness/rash/FM Hx of autoimmune, UA Hematuria/Proteinuria/Red cell cast, Cr 1 Normal Electrolyte, Low C3 Normal C4, Dx = PIGN

- MPGN (Membranoproliferative glomerulonephritis)

PEM R | 14 Y/O Dark colored urine, Mild LL swell, treated w/ Abx for finger infection last month, BP 132/88 has LL edema, which lab result most concerning for long term prognosis = Decreased C3 & C4

- IgA Nephropathy
 - o Sx: Hematuria
 - o Tx: ACE, Steroids, Immunosuppression

Promo | 7 Y/O Boy, 2 days Post cold infection, having recurrent painless gross hematuria, positive protein = IgA Nephropathy

Promo | Child w/ Hematuria & Flu Sx had similar episode before, Dx = IgA Nephropathy

Chapter 2: Medical

Renal issues

Renal Insult

- AKI
 - o Pre-Renal = AGE, Hemorrhage, Sepsis, HF = Fluids
 - o Intra-Renal = Nephritis, Acute tubular necrosis, Acute interstitial nephritis = Lasix (for edema)
 - o Post-Renal = Obstruction

PEM R | 5 Y/O boy, ill/palpable purple rash on LL, Abdomen pain/Arthralgia, having 3 days progressive facial/abdomen/LL swell & 1 day difficult breath, UO decreased to 1 void in past 24hr, gained 3kg since last visit, Temp 36.7 HR 124 BP 120/87 RR 28 SpO2 93% on RA, CXR bilateral pulmonary edema, Cr 3.8, initial management = 1 mg/kg IV furosemide (HSP Nephritis w/ Edema)

- Rhabdomyolysis
 - o SCA has highest risk for Exertional Rhabdomyolysis (Due to Micro-vessels, Obstructions > Ischemia)
 - o CK r/o muscle injury > Exertional Rhabdomyolysis
 - o Path: High Myoglobin High CK, Electrolyte imbalance > AKI > UA: Granular casts No RBC
 - o Complication: AKI
 - o Labs: High CK, High Electrolytes (CUPP: Low Ca High Uric/Phos/Potas)
 - UA: Granular casts No RBC (in case of AKI)

PEM R | 18 Y/O bilateral arm pain right worse than left working out w/ friends contest and did 150 push ups, PCP disclosed him w/ strain, now 3 days Later having Rt. Arm pain, mild swell, which lab to Dx = CK

PEM R | 16 Y/O in summer football practice 2 times per day, endorses severe lower LL muscle pain/weakness, UO low, Urine rust colored, Temp 37.7 HR 96 BP 128/76 RR 20 SpO2 98% on RA, dipstick +3 blood, POC Glucose 88, further test support lead Dx = Microscopic urinalysis w/ presence of granular casts & no evidence of RBC

PEM R | 10 Y/O male 35kg, brought w/ pain Arms/Legs, Cough, Rhinorrhea, Sorethroat for 4 days which resolving, now having severe myalgia of arms/legs, Fever, Dark red/brown color, Temp 39.8 HR 132 RR 22 BP 100/64, tired/dry/CRT 3 sec, UA +3 blood, 0-5 WBC/hpf 0-5 RBC/hpf w/ no casts, Initial Tx = Administer 700ml NS bolus

Promo | Rhabdomyolysis most sensitive test = CPK

Amal | Most sensitive lab study for rhabdomyolysis = Serum CK

- Hemodialysis
 - o RRT Indication:
 - Fluid overload (pulmonary edema, severe edema, respiratory distress)
 - Refractory Hyperkalemia (Acidosis <7.1 or persistent hyperkalemia despite therapy)
 - Severe Acidosis (not responding to Medical therapy)
 - Severe Uremia w/ pericarditis, altered mental status, or encephalopathy.
 - o Tx: Initial medical therapy can be attempted for Hyperkalemia & Acidosis before starting RRT
 - Creatinine level alone is not an indication for RRT
 - Single episodes of low urine output do not automatically warrant RRT; trends and severity matter

PEM R | 7 Y/O progressive bilateral LL swell/facial swell/fatigue after being treated for skin infection 1 month ago, urinated once in 24hr, Temp 36.6 HR 120 BP 135/76 RR 28 SpO2 90% on RA tachypneic w/ retractions/crackles bilateral, pitting edema in LL, Na 132 K 5.9 Cl 92 HCO3 18 Urea 40 Cr 2.8 Glucose 76 Ph 7.28 Urine +2 Protein +2 Blood, finding conveying for RRT = Fluid overload

Chapter 2: Medical

- Renal Transplant
 - o Renal Transplant Complications:
 - Graft dysfunction (High creatinine, diagnosed by renal biopsy)
 - Hypertension
 - Infection (bacterial, viral CMV/EBV)
 - Anemia
 - Urologic complications (obstruction, urinary leak)
 - o Post-Renal Transplant + CMV Infection
 - CMV infection
 - Sx: Fever, abdominal pain, elevated liver enzymes, leukopenia, thrombocytopenia
 - o Graft Dysfunction (Acute Rejection)
 - Causes:
 - Vascular thrombosis
 - Urologic complications (obstruction, leak)
 - Calcineurin inhibitor (CNI) toxicity (e.g., tacrolimus)
 - Medication non-compliance (Check Tacrolimus level for CNI toxicity or non-compliance)
 - Infection (CMV, EBV)
 - Sx: Fever, High Creatinine
 - Labs: UA, US w/ Doppler (detect UTI or vascular thrombosis)

PEM R | 12 Y/O girl, Post OR 23 days living donor kidney transplant, 24hr diffuse abdomen pain & fatigue, This morning New Fever/non-bloody non-bilious vomit, no missed doses of her home meds (Tacrolimus, Lisinopril), Temp 38.2 HR 128 BP 131/81 RR 20 SpO2 97% RA, Abdomen soft/tender all quadrant, Mental state & perfusion appropriate, Labs WBC 3.1 Hgb 10 PLT 120 Na 132 K 4.8 Cl 99 Urea 28 Cr 1.2 Glucose 87 ALT 450 AST 398 Bili 0.6 Phos 5, Dx test suspected acute rejection = Viral studies

- o Fever + elevated Cr + elevated LFTs → think infection (CMV/EBV)
- o Graft dysfunction alone, CNI toxicity, or urologic issues → usually no LFT elevation

Renal Infection

- Spontaneous Bacterial Peritonitis
 - o Causes: Nephrotic Syndrome, Liver Failure
 - o Sx: (Peritoneal inflammation signs):
 - Rebound tenderness (also percussion tenderness)
 - Guarding, Avoid motion/keeps hip flexed
 - Distended abdomen & decreased/absent bowel sound
 - o Neonate Sx: Abdomen tender + Peritoneal signs + Vomit = Suspect NEC
 - o Paracentesis:
 - SBP Indication for Diagnostic/Therapeutic
 - Ascetic tap: WBC > 500, Neutrophil > 250, on Peritoneal dialysis Neutrophil 50

PEM R | 4 Y/O male, worsening abdomen pain ax w/ fever/vomiting over last 2 days no past medical Hx but recent began meds for allergy due to eyes puffiness, now periorbital swell, abdomen distension, generalize tender/rebound, Temp 38.8 HR 112 RR 24 BP 104/67 Urinalysis +3 Protein, 0-5 WBC/hpf 0-5 RBC/hpf, WBC 21 w/ left shift, Next = Diagnostic Paracentesis

- Pyelonephritis: Fever/Chills, Flank pain + **No Hematuria** | Tx: Abx
- Renal Abscess: Fever/Chills, Back/Flank Pain + UTI/Pyelonephritis not improving w/ Abx | CT w/ contrast | Tx: IV Abx
- Renal stone: No Fever/Chills, Flank pain + YES Hematuria | 1st US 2nd CT No contrast | Tx: NSAID, Tamsulosin
- Infected stone = Fever/Chills, Flank pain + YES Hematuria | Tx: Urology decompression, IV Abx

Chapter 2: Medical

- Pyelonephritis

- Pyelonephritis IV Abx Indications:
 - < 2 M/O
 - Toxic appearance
 - Anorexia & Vomiting
 - Immunocompromised
 - Urinary tract obstruction risk
 - Resistant organisms (ESBL Klebsiella/E. coli)
- Complication: Renal Abscess or Perinephric Abscess (UT > Pyelonephritis > Abscess)
 - Cause: Staph A. (Most common)
 - Invx: CT Abdomen/Pavlis w/ IV Contrast

PEM R | 7 Y/O grade II VUR Hx of UTI 5 days ago received Cefalexin and C/S sensitive to Abx, despite that Temp 39 today, and has increasing nausea & back pain, definitive diagnostic = CT abdomen/pelvis w/ IV contrast

PEM R | 11 Y/O girl, grade III VUR, persistent fever, diagnosed w/ UTI four days ago and on cefixime, but despite it patient continues to have fever 39.5 malaise and back pain, Urine C/S > 100K Staph. A, which would provide definitive diagnosis = CT Abdomen/Pelvis w/ IV Contrast

Renal Stone

- Renal Stone

- Labs: US (initial, **Specific** but not Sensitive does not show if < 5mm)
 - CT helical without contrast (**Sensitive**, contrast difficult to assess when been voided)
 - XR (finding of stone is highly specific if seen as Appendicolith or Urolithiasis)
- Tx: Mostly treated as outpatient, NSAIDs & Narcotics, Fluid hydration
 - Tamsulosin (Alpha-blocker may help stone passage but are not formally approved for children)
 - Renal stone Urology Indications:
 - Complete Urinary obstruction
 - Stone > 0.5 cm
 - Intractable pain (no improvement w/ analgesia)
 - Decreased kidney function
 - Infected Renal stone
 - Failure of conservative

PEM R | 4 Y/O girl in ED 2 days intermittent abdomen pain/dysuria/urgency, pain constant/severe & 1 episode of vomiting this morning, appears uncomfortable w/ remarkable Rt. Flank tenderness to palpation, urinalysis blood +3, most definitive next step in Dx = Obtain CT Abdomen/Pelvis without contrast (not US of bilateral kidneys or flat radiograph of abdomen)

PEM R | 14 Y/O Lt flank pain & urgency, denies fever/trauma, urine dipstick +3 blood only, highest sensitivity to diagnose = CT without IV contrast

PEM R | 14 Y/O 24hr Lt flank pain/nausea, vomited once 8 hr ago, pain 10/10, improves to 2/10 after PO oxycodone, HR 85 RR 20 BP 110/65 imaging shows 0.4 cm stone in Lt distal ureter without dilatation of renal collecting system, disposition = Discharge to home w/ analgesia & urine straining

PEM R | 7 Y/O girl acute Lt flank pain Ax w/ N/V, pain radiating to Lt lower quadrant, no Fever/diarrhea/constipation, cries of pain & holding Lt side w/ tenderness of Lt flank, UA No nitrates or Leukocytes but +2 blood, Analgesia & Hydration given, to confirm = CT without IV contrast

PEM R | 13 Y/O in ED w/ Abdomen pain/vomiting, no diarrhea or sick contact, Temp 38.1 HR 100 BP 110/70, mild diffuse abdomen tenderness without guarding/rebound, hurts when lies on his on his Lt side & examiner passively extend thigh, US appendix not visualized, Next step = Abdomen/pelvis CT

Final | Abdomen renal stone, what Dx & Best modality to Dx = Renal stone, CT without contrast

Chapter 2: Medical

Final | teenage girl with abdominal pain = CT without contrast (stone)

Final | Scenario of stones (mostly in kidney) = CT renal without contrast

Final x2 | Abdomen trauma w/ Abdomen pain urine showing Hematuria, NO WBC Dx stone = CT no contrast

Final25 | Patient with flank pain and hematuria +3 RBC , what is the diagnostic test (kidney stone) = CT Abdomen and Pelvis without contrast (Not CT with contrast nor AXR nor US)

- Infected Renal Stone

- Nephrolithiasis w/ Urosepsis = UTI w/ Obstruction!
- Labs: US (initial) then CT without contrast
- Tx: Urology Consult for Decompression & Drain + IV Abx + IV Hydration

PEM R | 13 Y/O girl, 3 days colicky flank pain/hematuria/fever, has Suprapubic & Lt side costovertebral tenderness, UA Pos. Leukocyte esterase, Nitrates, blood, bacteria, Electrolyte/Cr normal, best next = US Renal

PEM R | 16 Y/O acute Lt flank pain radiate to LLQ pain, no fever/dysuria/constipation/trauma, vitally stable, moving around during exam trying to get comfortable has mild Lt Costo-vertebral angle & abdomen tenderness, initial test = US may be specific but not sensitive

PEM R | (follow up of Q above) after evaluation/management in ED D/C home for OPD, returned 2 days later w/ frequent vomit non-bloody non-bilious, Temp 39.1 HR 150 RR 22 BP 95/45, has significant Costo-vertebral angle tenderness, Tx = Emergent consult by urology

PEM R | 9 Y/O girl known asthma, presents w/ 3 days Rt. Flank pain worsened this time, 1 week ago had Hematuria, No trauma,, initially managed at home w/ ibuprofen, today having fever, tired appearing no distress Temp 38.7 RR 22 H4 105 BP 105/68, SpO2 99%, Pain 8/10, given PO analgesia and improved, UA having +3 blood +3 Leukocyte esterase, Gross hematuria, 100-200 WBC/hpf, Renal US shows 8mm Rt sided ureteral stone dilatation of proximal ureter & renal collecting system, next = Admission IV Abx & Ureteral stent

PEM R | 6 Y/O 2 days vomiting/Lt side flank pain, vomited 4 times today, UA +3 nitrites +3 blood WBC > 100, US shows stone dilatation, Next = Consult surgery emergently

Chapter 2: Medical

Hypertension

- Hypertension

- HTN Urgency: Stage 2 HTN + NO Organ Damage or Life-threatening Sx
- HTN Emergency: Stage 2 HTN + YES Organ Damage or Life-threatening Sx
- Etiology:
 - Primary (Essential, Post-Pubertal): Aged > 6 Y/O, Family Hx, Overweight or Obese
 - Secondary (Pre-Pubertal) Most common in Pediatrics (75-85% of HTN)
 - Renal or Reno-vascular disease
 - Cardiac, Oncology, Iatrogenic, Endocrine
- Routine BP Check:
 - Child > 3 Y/O = Routine BP Monitor
 - High Risk < 3 Y/O = Routine BP Monitor, Risk:
 - Preterm or < 32 GA, Small of GA or VLBW, Hx of Umbilical artery Cath.
- Approach:
 - Elevated HTN = Refer to Primary OPD
 - Stage 1 = Labs, consider US if < 6 Y/O
 - Labs normal = OPD
 - Labs abnormal = Admit + US
 - Stage 2 = Admit
- Management:
 - Non-Pharma: Life style modification + Diet Salt restriction
 - Pharma (Indication in HTN Emergency: Headache, Diplopia, End organ Damage)
 - Confirm cuff, Assess Sx of Organ DMG, assess etiology, 2 IV line in case BP dropped rapidly
 - > 1 Y/O + HTN Emergency/Urgency = IV Labetalol (1st line)
 - < 1 Y/O or Asthma + HTN Urgency = IV Hydralazine or Nicardipine
 - < 1 Y/O or Asthma + HTN Emergency = IV Nicardipine (2nd line)
 - Sodium Nitroprusside (Rapidly acting)
 - IF w/ Renal failure = Diuretics or Hemodialysis
 - IF w/ Toxicity (Cocaine, Amphetamine) = Benzo, Phentolamine
 - IF w/ Pheochromocytoma or Pseudoephedrine = Phentolamine (A blocker) or Phenoxybenzamine or Sodium Nitroprusside
- CT Brain Indication in HTN Emergency prior to Anti HTN therapy: Altered Mental State, SZ, Papilledema
 - General role in HTN Emergency: do Invx prior to Anti HTN, Bcz in Intracranial mass/Bleed/Stroke > decrease CPP & giving Anti HTN therapy would decrease it more > worsening Cerebral ischemia
- Anti HTN meds Indication in pediatrics:
 - Symptomatic HTN
 - Stage 2 HTN without modifiable risk factor
 - HTN w/ comorbid (DM 1/2 or CKD)
 - Persistent HTN despite non-pharma measures
- Anti HTN precautions
 - Labetalol (BB): Avoid in Asthma/CHF/HB/Pheochromocytoma, also masks hypoglycemia
 - Nicardipine (CCB) = use if Nitroprusside or Labetalol is contraindicated, may cause high ICP
 - Sodium Nitroprusside = Good in CHF, Risk of Cyanide toxicity esp w/ renal function
 - Phentolamine = for Catecholamine excess (Pheochromocytoma, Cocaine after Benzo)
 - Phenochromocytoma + BB > Worsen BP
 - Hydralazine = Old, Hypotension

Chapter 2: Medical

PEM R | 13 Y/O waxing/weaning level of consciousness, No Hx of Fever/vomit/diarrhea, Diagnosed Takayasu Arteriosus and being monitored for progression of renal stenosis, now 2 days ago having worsening headache, LL pitting edema/crackles, Pulmonary auscultation gallop, Temp 37.1 HR 108 BP 168/124 RR 20 SpO2 94% on RA, IV access immediately obtained, best next = CT Head (Not IV Labetalol)

PEM R | 16 Y/O Hx of Lupus Nephritis, Asthma, having severe headache/blurry vision/confusion, using albuterol inhaler for wheeze for last 2 days, BP 205/140, most appropriate med = Nicardipine (CCB)

PEM R | 13 Y/O previously healthy, in ED by EMS from summer football practice, he was riding bike then suddenly felt Severe headache/confusion/diaphoresis/trouble finding words to describe how to feel/sleepy, Temp 37.7 RR 18 BP 165/98, CT Head (Brain hemorrhage w/ shifting?), Best next step = 10mg IV labetalol

- IF HR not mentioned assume normal (No Cushing) + Sx of herniation + High BP = Tx HTN Emergency
- High ICP vs HTN Emergency
 - High ICP = Cushing triad, Herniation Sx (Decorticate/Decerebrate, 6th N. Palsy, Incontinence, Vomit)
 - HTN Emergency = High BP + End organ damage (CNS Sx, etc..)

Promo | 5 Y/O, CKD, BP 180/100 with Headache, Next step = Labetalol (Not Amlodipine nor Hydralazine)

Promo | 5 Y/O Previously healthy, has Headache, Sweating. On Ex Hyperpigmented lesions (Cafe Au Lait spots), BP 170/105, Meds to give = Phenoxybenzamine (Alpha blocker, Not Hydralazine nor Propranolol)

- Pheochromocytoma, NF1 Ax w/ HTN Due to Renal artery stenosis

Promo | Adolescent boy presented to ED with hallucination, aggressive behavioral trying to bite himself, CT brain showed posterior cerebral edema, his vitals showed high BP what is the reason for his encephalopathy = HTN encephalopathy (Not Global HIE nor HSV encephalitis)

- This is PRES (Posterior Reversible Encephalopathy Syndrome)

Amal | 6 Y/O no medical Hx, gross hematuria had fever and sore throat 1.5 week ago, on Ex appears ill but not in distress, BP 160/55 periorbital edema, no murmur or gallop, ASO 500 WBC 16 UA 300 protein, Low Complement C3 10 (> 30) C4 13 (8-14) management = PO Nifedipine (Not IV Furosemide nor PO Spironolactone nor Arterial BP for monitoring nor no urgent Tx but observe)

- This is HTN Urgency in PSGN

Final | Hypertensive emergency in CKD = Labetalol

- HTN urgency = Labetalol
- HTN Emergency: CNS= nicardipine

Acid/Alkaline disorders

- Blood gas
 - Anion gap = $Na - (Cl + HCO_3)$ = Normal Anion gap (4-12), > High Anion gap (>12)
 - Low AG = HARD UP | High AG = CAT MUDPLES | Normal AG = RTA, Diarrhea
- Gases in AGE:
 - Vomiting = Low Na, Low K, Low Cl, Metabolic Alkalosis, Low H > High HCO_3
 - Diarrhea = Low Na, Low K, High Cl, Metabolic Acidosis, Low HCO_3 , Low Mg
 - Examples
 - Low Cl + Metabolic Alkalosis in Vomiting + Pyloric Stenosis
 - High Cl + Metabolic Acidosis in Diarrhea + RTA
 - High Urine Cl + Metabolic Alkalosis in Diuretic use + Barter + Gitelman

Chapter 2: Medical

- Metabolic disorders
 - o Metabolic Alkalosis
 - Causes: NAGMA = HARD UP | HAGMA = MUD PILES
 - Chronic diuretic use = High H & K excretion (furosemide as barter syndrome)
 - Vomiting = GI H loss
 - Bicarb administration
 - o Metabolic Acidosis
 - Causes: Chronic lung disease = Respiratory acidosis
 - Diarrhea = GI HCO₃ loss
 - AKI, Sepsis

PEM R | 6 M/O former 25 weeker w/ chronic lung disease & Short bowel syndrome due to NEC, now Congestion/noisy breath/fussy, Ph 7.48 pCO₂ 48 pO₂ 90, which factor most likely to explain = Chronic diuretic therapy

Promo | What can have normal AG = GE (Not Methanol Toxicity nor Aspirin Toxicity nor DKA)

- Renal Tubular Acidosis [Normal Anion gap Metabolic Acidosis + Hyperchloremia]

- $\downarrow$ K + Urine Ph > 5.5 + HCO₃ < 10 = Type 1 = Cause : Ampho B = Lead : $\uparrow$ Ca in Urine > Renal Stones
 - $\downarrow$ K + Urine Ph < 5.5 + HCO₃ 12-20 = Type 2 = Cause : Fanconi Syndrome = Lead : $\downarrow$ Po₄ Rickets
 - $\uparrow$ K + Urine Ph < 5.5 + HCO₃ > 17 = Type 4 = Cause : $\downarrow$ Adrenal = Lead : Hyperkalemia (Arrhythmia)
- $\square$ Urine Anion gap = (Urine Na + Urine K) - Urine Cl

Chronic Diarrhea = Neg. Urine anion gap | RTA = Pos. Urine Anion gap

PREP | 2 M/O, Diarrhea/Low PO, Diarrhea for last month, mother concerned about weight 3.7kg Length 54cm (5th centile), Labs Creat 26.5 Urea 14.3 Na 135 K 1.9 Cl 110 HCO₃ 14 Urine Na 100 Urinary Anion gap -44, Discuss Chronic diarrhea vs Renal tubular acidosis, most likely to distinguish = Urine Anion gap

PEM R | 3 Y/O boy, poor growth/decrease appetite, nontoxic but small for age Temp 37.1 HR 128 BP 87/58 RR 20 SpO₂ 98%, Initial labs Ph 7.28 Na 136 K 3 Cl 117 HCO₃ 10 Urea 15 Cr 0.3, additional lab to diagnose = Urine Ph

PEM R | 7 M/O Male w/ recurrent vomit & concern for dehydration and quite full diaper but NO Fever or Diarrhea, Wt 6.2 and 1 month ago was 6.3, labs Na 136 K 2.9 Cl 116 HCO₃ 13 Glucose 76 Urea 10 Cr 0.2 Urinalysis Ph 7.5 SG 1.015, Dx = RTA

- o Renal tubular acidosis = Urine Ph > 7.5

Chapter 2: Medical

Electrolytes

- Low Mg or Low K or Low Ca > PVC > Torsades de pointes
- Low Mg or Low Ca Sx: Carpo-pedal spasm, Tremor, NM excitability

Calcium

- Hypo ca = QTc Prolongation
- HyPeR Ca = PR Prolongation
- Hypocalcemia
 - o Ax: Disgorge = CATCH 22
 - o Sx: Tetany, Muscle cramp, lethargy, Trousseau (BP cuff spasm), Chvostek (Facial contraction)
 - o ECG: Prolong QTc > Torsade de point (Hypocalcemia, HypoMagnesemia, HypoKalemia)
 - o Labs: < 8.5 mg/dL
 - o Tx: IV Ca Gluconate Indication: Ca < 7.5 mg/dL or Low Ca w/ Sx (Tetany, SZ, Prolong QTc)
 - o Hungry bone syndrome
 - Profound Hypocalcemia
 - Cause: Parathyroidectomy > Sudden PTH > Bone takes Ca/Po4/Mg > Hypocalcemia
 - Prolong Sun exposure w/ Vit D deficiency: Sudden High Vit D > Bone takes Ca/Po4/Mg > Hypocalcemia

PEM R | 3 W/O FT, w/ complicated pregnancy w/ Maternal DM, present w/ Vomit/Fussy/Lethargy, Brady, BP 52/28, Anterior fontanelle flat, has hyperreflexia & tremor, w/ attempt at blood pressure Rt. Hand contractions, POC Glucose 125, AED given for SZ but it continued, next = Ca Gluconate, Mg Sulfate

PEM R | 2 W/O boys, in ED for SZ, was undergoing evaluation of heart murmur, ECG 2 weeks ago had prolonged QTc, has OPD for Cardio/Echo tomorrow, supportive measures given, CXR tech says no Thymus, Test to know cause of SZ = Serum Ca

PEM R | 6 M/O in ED w/ SZ, family just returned from 1 wk vacation from south Florida, has been jittery, exclusive breast feed, eating well, Glucose 82 Vitally stable, having GTC of all limbs, Patellar reflex weak, IV line, labs done, Meds to give while waiting = Ca Gluconate (South Florida know for hot weather)

PEM R | 2 Y/O w/ DiGeorge lethargy, complains of leg pain for several days, while taking BP having wrist flexes, meds to give = 10% Ca Gluconate 1ml/kg

PEM R | 12 Y/O ESRD having peaked T wave on ECG, 1st meds = 10% Ca gluconate

PEM R | 13 Y/O girl Fever/Tachy/Hypotension/CRT delayed in 4 days progressive RLQ pain, Hx/Ex Perioral paresthesia & painful muscle spasm of Rt. Hand, thumb adducted/wrist flexed, ECG prolonged QTc but no T wave peaked, after resus fluid & Abx, Tx indicated for electrolyte optimization = Calcium gluconate IV

Amal | To be sent with liver disease receives a transfusion of citrate blood at the rate of a greater than one mL per kilo per minute, what complication would you expect = prolonged QT interval (due to hypo-Ca)

Amal | In RESUS of children what will indicate use of calcium = Suspected Hypocalcemia (Not Prolonged arrest nor Refractory Ventricular fibrillation nor Refractory Ventricular tachycardia)

Chapter 2: Medical

- Hypercalcemia

- Cause: Supplement (Ca, Vit D), Lithium, Malignancy, Subcutaneous fat necrosis (in neonates)
 - Hyperparathyroidism (Groans: Abdomen pain, Bones: Bone pain, Stones: kidney)
- Sx: Lethargy, Poor feed, Hypotonia, Severe Demineralization
- ECG: PR prolonged, QTc short w/ No peaked T wave
- Labs: Ca > 14 mg/dL
- Tx: Stop Ca source (Ca supplements, Vit D, Thiazides)
 1. IV Fluids bolus (Volume expansion)
 2. Calcitonin (Onset 4-6hr, Bone resorption stopper)
 3. +/- Bisphosphonate (24-48hr used w/ Calcitonin, Bone resorption stopper, Ax w/ Jaw osteonecrosis)
 4. Lasix (After rehydration to Inhibit Ca reabsorption, judicious use to prevent overload w/ RF or CHF Pt.)
 5. Dialysis (Renal failure, Ca > 4.5, refractory Hypercalcemia)
- AVOID Thiazide

PEM R | 3 D/O Term born at home SVD to G3P3, in Ed w/ Hx Lethargy/Poor feed 1 day before, initially was well, Vitally stable but ill appearing/sunken fontanelle/poor skin turgor/hypotonia, tidal CO₂ has apneic pauses which put on Bag mask ventilation, fluids/abx given, ECG shows prolonged PR, CXR profound bone demineralization & loss of well-defined cortical margins, labs calls you for critical value in addition to fluids, Tx = Calcitonin

PEM R | 4 Y/O female w/ primary Hyperparathyroidism, now in ED progressive weakness/fatigue/irritability/decrease LoC, IV placed NS 20 bolus given, Next = IV furosemide (No Calcitonin in options)

Final | Hyperparathyroidism Tx = IV Lasix (for Hypercalcemia)

Final | Hyperparathyroid (High Ca, Low PO₄) = IV furosemide

Potassium

- Hyperkalemia

- Definition of Hyperkalemia: Child K > 5.5, Infant K > 6
- Definition of Emergent Hyperkalemia requiring treatment: K > 7-7.5 or/and ECG Changes (Wide QRS, Loss of P wave, Peaked T wave -as per Fleisher isolated peaked T wave doesn't indicate Tx in mild)
- Tx: Therapeutic management:
 - Dextrose + Insulin (main therapeutic & action onset within 15min)
 - Salbutamol (action of onset within 20min)
 - Cardiac stabilizer: ECG Changes, K > 7-7.5:
 - Ca gluconate
 - Calcium Contraindicated w/ Digoxin (as inhibits sodium & potassium activated adenosine triphosphate pump during repolarization)

PEM R | 2 Y/O Girl, HF w/ dehydration, tired on arrival, tolerating daily meds including ACEI/Spironolactone, Tachy, Tachy mucous membrane Labs Na 149 K 7.1 Cl 92 Urea 48 Cr 3.2 ECG Peaked T wave & wide QRS, immediate therapeutic intervention = 0.1 u/kg IV Insulin w/ 0.5 g/kg IV dextrose

Promo | 8 M/O Infant w/ Lethargy RD, having 3 days Rhinorrhea, wet cough, Past Hx **gross motor delay** without clear etiology, Temp 38.8 HR 122 RR 65 BP 88/50 SpO₂ 86%, Copious secretions Oral/Nasal w/ Severe retraction, diffuse crackles/rhonchi/wheeze, CRT brisk, No improvement despite suctioning & Non-Rebreather so BVM initiated after 3 min SpO₂ 94%, RSI initiated w/ Atropine, Etomidate & **Succinylcholine**, shortly after meds SpO₂ which was stable low 90% became LOST, with Wide QRS Complex & Slow HR then Arrested, Most likely explanation = Rapid change in Serum Electrolytes

- Succinylcholine W/ MSK Dystrophy > High Potassium > VT > VFib > Asystole

Amal | 4 Y/O presented to the ED with a history of vomiting and diarrhea You started him saline and kcl 40 repeated potassium level and it came to be 8.5 What is the initial step in the management of this patient = Start IV calcium gluconate

Final | 5 Y/O w/ unknown ingestion he was drowsy ECG showed peak T wave (No Albuterol in the choices) = Calcium gluconate (Not Insulin nor NaHCO₃ nor calcium resonium)

Chapter 2: Medical

- Hypokalemia

- Severe Hypokalemia < 2.5 = mandates bolus of potassium 0.5-1 mmol/kg

PEM R | 16 Y/O female, weakness/palpitation/dizziness w/ eating disorder & admitting taking laxatives regularly, likely finding = ECG w/ u waves

- Correct Electrolyte Calculations

- Corrected K = Measured K - $(0.6 \times (\text{Measured Ph} - 7.4)) / 0.1$
 - K is reduced by 0.6 for every 0.1 reduction of Ph
- Corrected Na = Measured Na + $1.6 \times (\text{Glucose} - 100) / 100$
 - Na is reduced by ~0.6 mEq/L. Every 0.1 drop in pH increases serum K

Amal | Correct statement about these lab Na 136, K 4.1, HCO₃ 12, Glucose 600, Ph 7.1 = Corrected K is 2.3 (Not Corrected K is 5.9 nor Corrected Na is 126 nor Corrected Na is 152)

Sodium

- Hyponatremia

- Carbamazepine = SIADH
- Hyponatremia Seizure
 - 1st give 3% (till reaching Na 120) > IF still Seizing = Give Phosphenytoin (stops ADH release)

PEM R | 14 Y/O girl, Hx of Epilepsy on carbamazepine, in ED weakness/fatigue/sleepy but arousable, vitally stable, Euvolemic, now had GTC, her O₂/Ventilation supported, given 0.1 mg/kg Lora x2 without cessation of SZ, as preparing for next lab calls critical Na 116 = 3% Hypertonic Saline

PEM R | 10 Y/O girl, known SLE, coming w/ Alter Mental state & lethargy, finished prolonged course of steroid for worsening flare, now ill/vomiting/diarrhea/listless Temp 36.8 HR 142 BP 105/65 RR 22 SpO₂ 98% on RA, Glucose 110, Ph 7.3 CO₂ 42 HCO₃ 23 Na 118 K 5.5 Cl 97, Urea 40 Cr 0.8, Suddenly start to seize, next = 3ml/kg of 3% Hypertonic saline IV

Promo | 2 Y/O, Status Epi, given Lorazepam didn't improve, VBG Na 118, Next = Correct by 3% up to 125 (Not correct by 3% up to 135)

Promo | 6 M/O boy in ED w/ Rt. Focal SZ, ABG (on blow by) Ph 7.24 PCO₂ 54 PO₂ 122 Na 112 K 4.5, After securing airway & obtaining IV access, Intervention to be done to stop SZ = 4 cc/kg 3% Saline IV (Not 10 cc/kg 3% Saline IV nor 1/2 NS nor NS)

Final | 6 M/O in ED w/ Rt. Focal SZ, on blowby O₂, Stat ABG & Electrolytes Ph 7.24 pCO₂ 54 pO₂ 122 Na 112 K 4.5, after securing airway & IV access, intervention to stop SZ = 4ml/kg 3% Saline IV

- Hypernatremia

PEM R | 3 Y/O 15kg, complex medical Hx of 2 days Fever/Diarrhea/Vomit, but Brian tolerating G-tube, Sleepy but arousable Temp 38.5 HR 160 RR 34 BP 98/50 SpO₂ 95%, CRT 3 sec, given 20 ml/kg bolus, had some improvement, Serum Na 174, appropriate choice IV fluid for Tx = D5 0.45 NS at 75 ml/hr

- Rapid Corrections complications:

- Rapid correction of Hyp_Onatremic dehydration = Central p_Ontine Myelinolysis (ODS) = LOSS OF BRAIN CELL WATER
 - Rapid correction of Hyp_Enatremic dehydration = Cerebral Edema > Subarachnoid hemorrhage > Seizure
- Extra: ODS = Osmotic demyelination syndrome

Chapter 2: Medical

PEM R | 7 Y/O transferred to ED was treated w/ Pneumonia & poor PO w/ Ampicillin & Azithromycin & IVF, labs before transfer was Na 120 Serum Osm 266 Urine Osm 800, normal renal function/glucose, overly rapid correction = Central pontine myelinolysis

Magnesium

- Hypomagnesemia
 - o Immunosuppressive meds (Mycophenolate, Tacrolimus) + Pt. Having diarrhea (Loss of Mg & K)

PEM R | 9 Y/O Hx of renal transplant coming w/ 3 days diarrhea, recent exposure to school classmates w/ diarrhea, having intermittent cramps in hands/feet, PO liquid intake & urine output, IV access, having now occasional premature ventricular complex on Cardiopulmonary monitor, which electrolyte abnormality in labs = Hypomagnesemia

Water Imbalance

- High U/O + Low Serum Osm + Low Urine Osm + Hypervolemic = Water Intoxication
- High U/O + Serum High Na/Serum High Osm + Urine Low Na/Urine Low Osm > Hypernatremic Dehydration = DI
- High U/O + Serum Low Na/Serum Low Osm + Urine High Na/Urine High Osm > Hyponatremic Dehydration = CSW
- Low U/O + Serum Low Na/Serum Low Osm + Urine High Na/Urine High Osm > Hyponatremic Dehydration = SIADH

Also seen in Hypothyroidism, Adrenal insufficiency, AKI

☒ Serum Osmolality Calculation: $(\text{Na mmol/L} \times 2) + (\text{BUN mg/dL} / 2.8) + (\text{Glucose mg/dL} / 18)$

Normal Value = 275-295 mOsm/Kg

- SIADH
 - o Path: Hypervolemic Hyponatremia
 - o Cause: Post Pituitary (Brain tumor) surgery > SIADH
 - Stress (Post-Surgery, Trauma)
 - Pulmonary (Pneumonia, CF, Asthma)
 - Hormonal (Hypothyroid, Adrenal insuff)
 - Meds (SSR, Carbamazepine, Cyclophosphamide, NSAIDs)
 - o Tx: Fluid restriction + Insensible loss replacement (Low rate of NS)
 - Lasix (bcz will reduce urine osmolality)

PEM R | 6 Y/O boy, 2 days cough/fever, taking PO well/normal U/O, Temp 39 HR 110 RR 24 BP 100/70 SpO2 93%, non-toxic, having Rales in Lt chest, CXR (Parapneumonic effusion) Labs 128 Cl 101 K 4.5 HCO3 20 Urea 26 Cr 1.1 Glucose 98, next = Fluid restriction to 800 mL/m2

PEM R | 5 Y/O Post OR day 7 from Transsphenoidal pituitary tumor resection, on Day 6 discharge uneventful post-OR, now having nausea, headache, fatigue for 24hr but no fever, now Na 123 K 3.4 Cl 85 Urea 15 Cr 0.3 Glucose 86, Urine Osm & urine Na are high, initial therapy lead to acute worsening of condition = Isotonic fluid bolus

PEM R | 6 Y/O recent resection of brain tumor, now generalized weakness, UO decreased since discharge 5 days ago, wt 30kg more than 2 kg since discharge, has strong peripheral pulse, brisk CRT, Labs Na 125 K 4.2 Cl 95 CO2 24 Urea 12 Cr 0.1 Glucose 94, IV fluid to give = NS 20 ml/hr

Chapter 2: Medical

- Diabetes Insipidus

- Central DI: Causes: Primary (Rare): AD DI, Wolfram Syndrome, Septo-Optic Dysplasia
 - Tumor (Craniopharyngioma, Optic Glioma, Germinoma)
 - Trauma, Infection, Langerhans cell Histiocytosis, Sarcoidosis, Encephalitis, TB, Idiopathic)
- Nephrogenic DI: Causes: Primary: X-recessive (Affecting male, +/- females) or AD
 - PKD, CKD, Uretral obstruction, Sjogren syndrome, SCA, Psychogenic, Renal, Electrolyte, DM, Meds)
 - Electrolytes imbalance (Ca High, Mg Low, K Low), Drugs
 - Lithium (Most known to cause Nephrogenic DI), Demeclocycline, Cisplatin Ampho B, Loop diuretics
- Sx: Polyuria, Polydipsia, Poor feeding, Irritability, FFT, Intermittent Fever, High Serum Na, High Serum Osm
- Differentiating between Central & Nephrogenic DI
 - ADH
 - Central = Low ADH
 - Nephrogenic = High ADH+ Renal ADH receptors Resistance/Deficiency
 - Water deprivation test + Desmopressin (DDAVP)
 - Water deprivation + Desmopressin = YES changes (↓ Serum Osm + ↑ Urine Osm) = Central DI
 - Water deprivation + Desmopressin = NO changes = Nephrogenic DI
 - DON'T DO IT in Dehydrated patient
- Invx:
 - Serum Osmolality > 300 mOsm/kg, Serum Na High
 - Urine Osmolality < 300 mOsm/kg, Pale/Colorless Urine
 - Urine Specific Gravity < 1.005
 - IF Urine Specific Gravity < 1.005 + Urine Osm < 200 mOsm/kg = DI (Hallmark finding)
 - IF Serum Osm < 270 mOsm/kg + Urine Osm > 600 mOsm/kg = NO DI
 - IF Serum Osm LOW + Large/Very Dilute urine = Suggest Primary Polydipsia
- Central DI Tx:
 - Give Desmopressin 0.05-0.10 mg PO or 5-10 ug Nasal
 - Water Intake Not more than 1 L/m²/day
 - Need Intact Thirst center = Water available to Pt. to drink OR put on Daily free water goal
 - Avoid Water intoxication by monitoring urine output
- Nephrogenic DI Tx:
 - D/C Offending Drug
 - Give Thiazide diuretics (Reduce urine output)
 - Combine w/ Amiloride (Useful in Lithium induced Nephrogenic DI)
 - Combine w/ Indomethacin (Prostaglandin synthesis inhibitor)

PEM R | 15 Y/O boy Lithium & Fluoxetine for bipolar for many years, in ED worsening Mania, well appearing, has new Nocturia, labs Na 153 K 4.5 Cl 113 HCO₃ 22 BUN 22 Cr 0.76 Glucose 85, urine dip without glucose/protein/blood/leukocyte/nitrate, Next = Check Urine & Serum Osmolality (Nephrogenic DI)

PEM R | 5 Y/O Polyuria/Polydipsia, well appearing, mild dehydration, dried mucous membrane, Temp 36.8 HR 122 RR 22 BP 90/55 SpO₂ 100%, No Hx of Trauma/Fever/Vomit, Labs Ph 7.35/39/24, Normal CBC, Na 159 K 4.6 Cl 112 HCO₃ 23 BUN 18 Cr 0.4 Glucose 86, UA SG 1.002 urine Osm 247 mOsm/L Serum Osm 356 mOsm/L, next = Brain MRI (Central DI)

PEM R | 7 Y/O Lethargy/Worse over days, drinks water all time/wakes up 2-3 times at night to use bathroom, Tachy/Dry mucous/Decrease skin turgor/sunken eye, Na 161 K 4.5 Cl 102 HCO₃ 26 Urea 22 Cr 0.7 Glucose 89, Hx item help determine etiology of disease = Hx of recent head trauma

PEM R | 12 Y/O female in ED feeling tired all the time, Polyuria/Polydipsia, mother is worried of diabetes, having dry mucous membrane, decrease skin turgor, sunken eye, Na 159 K 4.5 Cl 102 HCO₃ 26 Urea 22 Cr 0.7 Glucose 89, Labs to obtain next = Urine Osm

Chapter 2: Medical

Hydration

- Maintenance

○ AAP 2018 Maintenance Fluids 28 D/O to 18 Y/O:

- Isotonic fluids: Sodium 135–145 mEq/L.
- Avoid hypotonic fluids ($\frac{1}{2}$ or $\frac{1}{4}$ NS) as they increase risk of hyponatremia
- Exclusions:
 - Neurosurgical disorders, Cardiac, hepatic, or renal disease
 - Cancer, Diabetes insipidus, Severe diarrhea, or burns
 - Neonates <28 days or in NICU | Adolescents >18 years

○ Admitted patient on IVF at risk of Hyponatremia due to Increased AVP release > impairs free water excretion

- AVP (arginine vasopressin) increases w/: Illness, Stress, Infection, Meds

PEM R | 7 W/O Fever/Non-bilious vomit/fussy, Tachy, CRT 3 sec, given 20 ml/kg NS bolus, improved, Na 136 K 4.1 Cl 98 Urea 17 Cr 0.2 Glucose 88, wt 6 kg, what maintenance IV fluid = D5NS at 24 ml/hr

PEM R | 11 Y/O 40kg Pneumonia & increase work of breath in ICU on BiPAP, assuming pt is currently euvolemic w/ adequate UO, appropriate choice = D5 NS w/ 20 mEq KCL per liter at 80 ml/hr

- Dehydration calculation

- < 1 Y/O = 5%, 10%, 15%
- > 1 Y/O = 3%, 6%, 9%

Amal | 18 M/O, 2 days vomiting with decrease oral intake, mother reports reduced number of wet diapers prior to onset of diarrhea, you estimate 5% dehydration, most likely additional examination findings = Tachycardia (Not Bounding pulses nor Delayed cap refill nor Hypotension)

- Formula

- Formula w/ high concentration = High serum Na, High urine OSM, High urine Na
- Formula w/ high water = Low serum Na, Low urine OSM, Low urine Na

PEM R | 6 w/o increased fussiness/lethargy, mother transition from breastmilk to formula 7 days ago, has decreased wet diaper for 48hr, no fever/infectious Sx/vomiting/diarrhea, w/ detailed Hx found formula have been mixed reaching high concentrated preparation Temp 36.8 HR 168 BP 74/50 RR 22 SpO2 98%, labs findings = High serum Na High urine OSM High urine Na

- Dehydration (AGE?)

PEM R | 18 M/O non-bloody non-bilious diarrhea/vomit for 3 days, after visiting local pool, having one wt diaper in 24hr & refusing PO at home, Fever/decrease energy, Temp 37.7 HR 157 RR 25 BP 80/52, dry, CRT 4-5, compared to previous visit weight 2kg loss, accurate for dehydration = Weight loss (Best way to measure degree of deficit)

PEM R | 3 Y/O girl, acute non bilious non bloody vomiting over few hours, had 2 episodes of diarrhea, alert, Temp 37 HR 115 RR 20 BP 98/65, lips slightly dry, tongue moist, CRT 2, abdomen soft & non-tender, Next = Administer ORS

PEM R | 20 M/O 2 days non-bloody diarrhea, preceded by 1 day vomit non-bloody/bilious, solid intake diminished but takes clear liquids, no recent travel, soft/non-tender, tolerated watery, D/C instructions = ORS

Chapter 2: Medical

- Overfeeding

Final | 6 W/O, exclusive breastfeeding, came w/ vomiting following almost every feed, birth weight 3.5kg and current weight 4.5 kg, well looking, not dehydrated & normal Ex what to do = Reassurance & feeding education (Not US abdomen nor RFT and IVF)

Final | Baby with recurrent vomiting pt stable and weight is increasing = Reassurances & give feeding instruction

- If worsening vomiting and cough during feeding next step should be Upper GI Study to rule out TEF

Renal Medications Side effects

- Renal Side effects

- Lasix = H ion & K excretion, HCO₃ absorption = Metabolic alkalosis Low K Low Cl High HCO₃
- ACE (Lisinopril), NSAID, Digoxin = High K

PEM R | 12 Y/O Girl CHD, has poor PO w/ Fever, No Abdomen pain/Chest pain/SOB/Swell, Daily meds

Lisinopril/Aspirin/Digoxin/Furosemide, has Na 131 K 2.9 C; 88 HCO₃ 35 Urea 30 Cr 0.8 Glucose 85, Meds likely to cause = Furosemide

Chapter 2: Medical

Endocrine

Glucose

Diabetes Mellitus, HHS

- DKA

o Fast Fluid calculation

	< 15 kg	16-40 kg	> 40kg	
MOH	5 ml/kg/hr	4 ml/kg/hr	3 ml/kg/hr	
	5-15 kg	10-20 kg	20-40 kg	> 40kg
Trekk	6.5 ml/kg/hr	6 ml/kg/hr	5 ml/kg/hr	4 ml/kg/hr (max 500ml)

o Insulin

▪ IV Infusion

- < 5 Y/O = 0.05 unit/kg/hr
- > 5 Y/O = 0.1 unit/kg/hr

▪ IM Injection (Hourly IV infusion is standard but if unavailable can use IM injections)

- 0.1 unit/kg/hr

PEM R | 6 Y/O Type 1 DM in ED several non-bloody non-bilious vomit for 1 day, Blood sugar 540, Vitals normal, Tired/Pale, expected lab = Ph 7.05 CO2 6 AG 32

PEM R | 8 Y/O girl wt loss & frequent urination, wt 25 kg appears tired/alert/answering questions, Tachy, intact pulses, has fast deep breath vitals stable, given 250ml bolus over 1hr, lab waiting, VBG Ph 7.19 HCO3 9 Glucose > 600, Next = Insulin infusion

PEM R | 12 Y/O, transferred to your hospital, new DM Type 1 on arrival Alert/oriented Vitally stable, wt 50kg, CRT 3 sec, deep respiration, rest exam normal, Na 130 K 4.1 Cl 102 HCO3 8 BUN 20 Cr 0.7 Glucose 720, urinalysis ketones, given initial bolus 500cc, now fluid to start = 0.45 NS 175 ml/hr + 40 mEq/L KCL + Insulin 5 u/hr

Promo | Pt. Came w/ Hyperglycemia/Ketones in Urine, received 2 liter of IVF after that insulin infusion started, Abdomen pain/distention/vomiting, Ph Normal HCO3 20 (out of DKA) but K 1.9, Next step = Stop Insulin & Treat cause (Not Continue Insulin w/ 0.9 NS nor Add D10% to insulin nor Add D5% to insulin)

Amal | 5 Y/O, in ED, DKA, initial glucose 500, DKA protocol initiated, which is a normal saline, followed by insulin and Potassium, Q1 hourly dextrose check. After three hours, you check the glucose and it was 200 mg, Next = Add 5% dextrose to the current daily fluids (Not continue NS but decrease insulin infusion rate more stop IV insulin)

- o 200-250 = D5%
- o < 150 = D10%

Final | Teenager w/ type 2 DM = Fluids

Chapter 2: Medical

- DKA Cerebral Edema

- Tx: 3%, Mannitol
- Risk factors of DKA Cerebral edema:
 - < 5 Y/O (Fleisher < 3 Y/O)
 - Low initial PCO₂
 - Treated w/ bicarbonate
 - Slow increase in serum Na w/ therapy
 - High initial serum BUN
 - New-onset DM
- Diagnosis of DKA Cerebral Edema
 - Diagnostic Criteria:
 - Abnormal motor or verbal response to pain
 - Decorticate or decerebrate posture
 - Cranial nerve palsy (III, IV, VI)
 - Abnormal respiration (Cheyne-Stokes, apnea, tachypnea)
 - Major Criteria (2 major):
 - Altered level of consciousness
 - Heart rate deceleration
 - Incontinence
 - Minor Criteria (1 major + 2 minor)
 - Vomiting
 - Headache
 - Lethargy (not easily arousable)
 - Diastolic BP > 90 mmHg
 - Age < 5 years

PEM R | 13 Y/O girl w/ T1DM in ED w/ Altered Mental state/Confused/Unable to answer Q/Tachy/Deep respiration, gag reflex intact, Abdomen pain yesterday w/ several vomit, urine Incontinence, this morning difficult to arouse, no Fever, after imitating fluid & insulin drip, next step = IV Mannitol

PEM R | 12 Y/O male transferred to you new onset DKA, prior to transport given 2 NS boluses, NaHCO₃ 1 mEq/kg, now in ED difficult to arouse & urinated on himself Temp 37 HR 60 RR 26 BP 130/90 SpO₂ 98% on RA, intact gag, normal pupil, having deep respi, glucose 5min ago 350, to do next = 3% saline bolus

Promo | 2 Y/O in DKA w/ labs Moderate DKA (Ph < 7.2 HCO₃ < 10) Most important risk factor = Age

Promo | 2 Y/O in DKA Ph 7 HCO₃ 10, What high risk = Age

Promo | Important risk factor = Age

Promo | Pt. Came lethargic, Vomiting, Abdomen pain, Blood gas showing (Metabolic Acidosis with Glucose 300), Dx = DKA

Other | 9 Y/O w/ DKA after fluids & insulin, glucose was 600 now 301 mg/dL at her 2nd hr of management, having headache, confusion, agitation, appropriate next step in management = IV Mannitol (Not IV dextrose nor IV Steroids)

Amal | 9 Y/O old presents to the ED with polyuria polydipsia with the vitals of HR 143 BP 124/74 saturating 95% RR30. lab studies show serum sodium at 130 potassium 5 chloride 96 bicarb 5 and a blood glucose of 41 mmol. ABG pH 6.9, 5 bicarb. PCO₂ 40, 40ml two of hundreds intravenous bolus of normal saline 40ml/kg administered over continuous infusion of regular insulin and maintenance deficits replacement for 36 hours later. The patient became confused, agitated, they've developed a decreased level of consciousness. Which is the next most appropriate immediate step is = Mannitol 0.5-1 gram IV bolus STAT

- HHS

- Sx: Severe Hyperglycemia > 600 mg/dL, With NO Ketones or Acidosis
 - Hyperosmolality (high sodium), Dehydration, Mental status change
 - Occurs w/ DM Type 2 + Tigger: Antipsychotic Meds (Risperidone), Infections
- Tx: Isotonic saline (first step, Large volumes, Boluses may be repeated to restore circulatory support)
 - Insulin (at lower doses 0.025-0.05 units/kg/hr)

Chapter 2: Medical

PEM R | 16 Y/O ill/confused Temp 36.5 HR 122 RR 16 BP 121/79 SpO2 100%, Obese, dry mucus, Prolonged CRT, Decrease skin turgor, Labs WBC 7.2 Na 158 K 5.4 CO2 18 Urea 42 Cr 1.4 Glucose 752 mg/dL, Serum Osm 362 Ph 7.34 Glucosuria +3, absent urine ketones, CRP/PCT normal, ECG Tachy, best first = IV fluid resus

PEM R | 17 Y/O obese male, confused/agitation/ill for 2 days w/ stomach flu, having Polydipsia/Polyuria, initial labs Na 138 K 4.1 Cl 101 HCO3 22 Urea 42 Cr 1.7 Glucose 925, UA positive for glucose but neg. For ketones, next = Administer 1000ml IV

Other glucose issues

- PCOS
 - o PCOS + Insulin resistance (Acanthosis Nigricans)

PEM R | 16 Y/O obese female, vaginal bleed, irregular menses, & very heavy, last period 4 months ago, denies sexual activity, Vitals normal, having severe acne, coarse facial hair above lips/chin/back of neck, urine HCG neg., blood test next = Glucose

- Hypoglycemia
 - o Fleisher for Hypoglycemia = 2.5 ml/kg of D10%
 - o Any Glucose < 2.5 mmol/dL in neonate = **Need IV Glucose**
 - o Max by peripheral line is D12-15 then needs Central line
 - o In Qs Always choose Route then concentration

PEM R | 2 Y/O Wt 15kg in ED due decrease energy in 2 days w/ vomit, diarrhea, decrease diaper, cant keep down anything, easily arousable, tachy, CRT 3 sec, hyperactive bowel sounds, bedside glucose 44 mg/dL, Next = 37.5 ml D10NS via push

PEM R | 3 Y/O vomiting/diarrhea for 3 days followed by several watery non bloody diarrhea, decrease PO intake, now lethargic/more irritable, appears tired but arouses w/ touch, Glucose 42 mg/dL, Na 139 K 4.2 Cl 111 CO2 19, Next = Give Dextrose containing IV fluid

Promo | Called to attended delivery, Lethargic/Apneic/Hypothermic, Nurse withdraws one small blood sample, Highest priority to send = Glucose (Not CBC & Blood C/S nor VBG) Most important lab that needs Emergent treatment if Low)

Promo | AGE sick looking, what to check = Glucose

Promo | Pt in ED w/ Hypoglycemia, Hypotension, after IVF Tx options = NS 20ml/kg & D10% 5ml/kg

Promo | Neonate w/ ketotic hypoglycemia & acidosis management = Stop protein & admit for increase glucose & fluid

Promo | 4kg Neonate w/ Lethargy, Blood sugar 1.6 mmol/L, Most appropriate fluid to start = 10ml D10% (Not 20ml D10%)

Amal | 3 W/O w/ vomiting and diarrhea, hypoglycemic, his weight is 4 kg. What is IV fluid solution of choice = 10ml D10 (2.5 ml x 4 kg) (Not 20ml D10)

Amal | 4kg 37weeks infant to 29 Y/O GDM, C/S due to fetal distress, APGAR 4&7, Lethargic glucose undetected, Next = D10% 2ml/kg (Not Dextrose water by mouth nor Glucagon 1-2 mg IV/IM)

Chapter 2: Medical

Adrenal

- Adrenal Crisis = Low Cortisol + Low Aldosterone | Severe Vomit + Hypotension + Low Glucose, Low Na, Low Cl, High K
 - o DDx: Adrenal Hemorrhage or Adrenal insufficiency or CAH + Trigger
 - o Trigger: Stress (illness or Surgery or Excess Heat), Trauma
 - Abrupt Steroid D/C
 - Drugs (Morphine, Laxatives, Insulin, Thyroid hormone)
 - o Sx: Severe Vomiting, Abdominal Pain, Hypotension, LOC
 - o Neonates tolerate Hyperkalemia better than children/adults & often asymptomatic at 12 mEq/L
 - o Labs: Metabolic acidosis, Low Glucose, Low Na, Low Cl, High K, High Ca
 - CAH High 17-OHP (in CAH 21 Hydroxylase deficiency leads to an elevation of 17 Hydroxyprogesterone)
 - Low Baseline Cortisol & Aldosterone levels
 - o Tx: In stress situations normal adrenal gland output is 100 mg/m² of bovine serum albumin in 24hr
 - Emergent treatment needed (Quick & Aggressive)
 - Give IV Bolus 0.9 NS = Restore volume deficit + Correct Hypotension
 - Give IV Bolus Hydrocortisone 1-2 mg/kg or 50mg/m² (Infants = 25mg | Children 50-100 mg)
 - o Then Maintenance fluid of D5%+0.9 NS + Give IV 50-100mg/m² divided 3-4 times a day until Crisis gone
 - o Once out of Crisis > Taper down Hydrocortisone by 6-8 mg/m²/day
 - o Change IV to PO if Pt. Tolerating PO
 - o Higher doses required in stress (Surgery, Infection)
 - Hydrocortisone + Cortisone = Mineralocorticoid effect
 - Prednisone + Dexamethasone = NO Mineralocorticoid effect
 - ACTH Deficiency or Familial glucocorticoids Def. = NO Need for Aldosterone replacement
 - AVOID Hyperkalemia Management (except arrhythmia give Ca Gluconate (to protect heart)
 - IF Infection Give Abx immediately
 - Consult Endocrine

PEM R | 5 D/O female, vomiting/listless/irritable/fussy/clitoromegaly, having GTC not improving despite weight appropriate IV Lorazepam, Labs = Na 118 K 7.1 Cl 98 HCO₃ 25

PEM R | 11 D/O Lethargy/Poor feed/Sleepy, born at home, No fever but Temp 35.8 HR 170 RR 56 SpO₂ 99% BP 60/30, Lethargic/Pale/Sunken Fontanelle, dry mucus, CRT 4, has small phallus w/ Hypospadias, Glucose 40 Na 123 K 7.1, in addition to glucose & volume what next = Hydrocortisone

PEM R | 18 D/O girl, Dx as CAH in newborn screen, mild dehydrated, not regained birth wt, Labs Na 121 K 7.3 HCO₃ 17 Glucose 73, ECG sinus tachy, IV challenging but 24g inserted in Rt. Antecubital fossa, Next = Isotonic fluid bolus

PEM R | 1 w/o infant born at home, lethargic/vomiting for 3 days w/ poor PO but good U/O, vitally stable, genital Ex (Ambiguous genitalia), study should be obtained next = Basic metabolic panel

PEM R | 7 D/O SZ upon arrival having bilateral upper & lower jerking, glucose 30, seizure stopped after D10 via IO line, post ictal, enlarged clitoris & labia, labs Na 127 K 6.5 Cl 101 HCO₃ 18 Urea 14 Cr 0.7 glucose 82, next = Hydrocortisone 50 mg/m² IV

PEM R | 3 W/O, Lethargy/Vomiting for 3 days, now active as usual Glucose 70 Temp 36.5 HR 140 RR 32 BP 82/50, on Ex quite thin, labs 129 K 6.8 Cl 101 HCO₃ 20 Urea 14 Cr 0.7 Glucose 62 in addition to electrolyte management, confirmatory test to send = 17 Hydroxyprogesterone level

PEM R | 16 Y/O female, in ED Fatigue/Poor sleep/Anxiety/losing weight, having dyspnea on exertion, palpitation, Temp 38.5 HR 135 RR 16 BP 170/90 SpO₂ 100% on RA, remarkable for bilateral Proptosis, Anterior/midline neck mass, resting tremor in both hands, based on likely Dx, meds to give = Propranolol

PEM R | 15 Y/O poor controlled asthma on Salbutamol 3-4 times per week, inhaled fluticasone 250mcg BID, PCP doctor doubled dose of inhaled steroid every time she has exacerbation, over last 6 month 3-4 times a month, 2 days Hx of N/V/Anorexia, Temp 37.5 HR 140 RR 32 BP 85/65 SpO₂ 99%, glucose 46 mg/dL, next step = Stress dose Hydrocortisone

Chapter 2: Medical

PEM R | 1 M/O female, lethargic not feeding well, vomiting for days, Temp 35.6 HR 195 RR 55 BP 60/30 on Ex CRT > 3 sec benign abdomen & enlarged clitoris w/ tissues & partially fused labia majors, labs consistent w/ his condition = Low Na High K Low HCO3 Low Glucose

PEM R | 3 W/O male, HR 203 RR 72 BP 56 Temp 36.5, SpO2 80%, sleepy, recurrent vomit, secured airway, IO line, SpO2 now 99%, labs Ph 7 HCO 6 Na 122 K 7.6 Glucose 48, next = Hydrocortisone

Promo x3 | 7 Y/O Relapsing Leukemia underwent BMT & developed GVHD then started on Steroid & tapered down & stopped last week, currently Hypotensive in ED, Likely labs to be found = Low Na (Signs of Adrenal Crisis due to exogenous steroid)

Promo | Neonate w/ Low N High K, Pic of CAH w/ Viral illness, Next = Hydrocortisone

Promo | Baby lethargic, Decrease PO, Low Na High K but normal ECG, 20ml/kg NS Bolus given, Next = Hydrocortisone

Promo | Sign of Adrenal Crisis = Metabolic Acidosis

Promo | Asthma on Fluticasone inhaler daily for 3 months, w/ good compliance, had hypotension not responding to volume inotropes, Next = Hydrocortisone IV (Adrenal crisis due to chronic Steroid use)

Promo | 3 D/O female, decreased Activity, vomiting most feeds in last 24hr, has significant dehydration, Clitoromegaly, Na 126 K 6.2 CO2 11 Glucose 62, after resus w/ bolus IVF, Next step in Tx = Hydrocortisone (Not Kayexalate nor D10% nor Broad Abx)

Amal | 2 W/O, lethargy and vomiting, Na 121 K 7 Glucose 40, Urea and Cr are normal, Dx = CAH (Not IBEM nor GE nor Pyloric stenosis)

Amal | 30 D/O with history of vomiting and decrease activity, dehydration & hyper-pigmented genitalia, vitals :T:37.4 RR:35 BP:40/20 HR:190 lab finding will be abnormal= Hyponatremia

Final | Baby with Convulsion & Hypoglycemia given D10 bolus then SZ has stopped in lab show Na 127 K 6.8 w/ acidosis what to give = Hydrocortisone 50 mg/m2

Final | Neonate w/ High K & Low Na, Tx = Hydrocortisone

Chapter 2: Medical

Thyroid

- Graves = Thyrotropin receptor Antibodies > Hyperthyroidism, Low TSH, Tx: Methimazole, Propranolol (Beta blocker)
- Hashimoto = Thyroid Peroxidase Antibodies > Hypothyroidism, High TSH, Tx: Levothyroxine
- CHT = Thyroid Dysgenesis or Dyshormonogenesis > Hypothyroidism, High TSH, Tx: Levothyroxine

- Thyroid Storm

- Pth: Exogenous or Endogenous Hyperthyroidism > Adrenergic system > Hyper-Metabolism
- Triggers: Current Infection Like Strep., Trauma, Subtotal Thyroidectomy
- Ax: Adrenal insufficiency
- Thyroid storm Criteria:
 - High T3 and/or T4 + ≥ 1 CNS Sx + ≥ 1 General Sx (Fever, Tachycardia, GI)
 - Or 3 of 4: Fever, GI, CHF, Tachycardia
- Thyroid Storm Sx:
 - CNS: Restlessness, Delirium, Psychosis, Lethargy, Somnolence, Coma
 - Fever ≥ 38
 - Tachycardia
 - CHF: Pulmonary Edema, Rales, Cardiogenic Shock (High output Failure)
 - GI: N/V, Diarrhea, High Bilirubin
- Hyperthyroidism Sx: Heat intolerance, Palpitation, Wt. Loss, Tachycardia, Anxiety, Hyper-Reflexia
 - Difference between Hyperthyroid state vs Thyroid Storm = Fever ≥ 41
- Labs: Thyroid panel (TSH, T3, T4), U/E, CXR, ECG
- Tx: **BB > Methimazole > Iodine > Steroid**
(Lowering Metabolic rate & Reducing Cardiac Workload + Controlling Thyroid hormone production)
 - Thyroid storm
 - Lower Metabolism (Blocks peripheral Hormone effects as they are mediated by Adrenergic System): Propranolol 10 mcg/kg over 10-15 min (ECG/Cardiac Monitoring) then Maintenance Neonates 0.5 mg/kg/dose Q6hr 10-40 mg Child Q6hr
 - Lower Temp (doubles as a mean to reduce metabolic rate): Paracetamol, Wetting/Cooling blanket (AVOID Aspirin will worsen the storm)
 - Hydration (Fever/Hyper-Metabolism > Fluid loss)
 - Steroids (Prevent Conversion of T4 to T3 + Inhibit Thyroid hormone release + Treat Adrenal insufficiency): Dexamethasone 0.2 mg/kg or Hydrocortisone 5 mg/kg
 - Broad Abx (Consider as Thyrotoxicosis Ax w/ Pneumococcal Bacteremia)
 - Hyperthyroidism
 - Block Hormone Synthesis: Methimazole 0.5-0.7 mg/kg/day Q8hr (AVOID Propylthiouracil ax w/ Liver failure in Pediatric)
 - Block Hormone Release: Lugosi Iodide 3-5 drops Q8hr for 3-5 days or Sodium iodide 125-250 mg/kg IV over 24hr
- Thyroid Storm Tx Questions
 - Thyroid Storm using Exogenous T4 (Levothyroxine) = BB Propranolol
 - Thyroid Storm with Endogenous T3 (Thyrotoxicosis) = BB Propranolol + Steroids

Rosh | 18 Y/O presenting w/ Fever Confusion, Weight loss, Palpitations, Temp 38.2 HR 140 BP 143/93 RR 24 SpO2 95%, Glucose 118 mg/dL, Ex Thin Girl Alert & Oriented w/ Regular Fast HR & Brisk Reflexes, Roommate tells that she is taking Levothyroxine in attempt to lose weight, Tx should be initiated in addition to D/C the medication = Beta-Blocker

Chapter 2: Medical

PEM R | 12 Y/O girl w/ Hyperthyroidism, in ED w/ Fever, No localize Sx, No sick contact, ill spraying Temp 41.4 HR 148 RR 18 BP 132/78 SpO2 99%, Treated w/ IVF/Abx, Labs WBC/Chemistries Normal, PCT Low, TSH Low, ECG Sinus Tachy, Next = Propranolol

PEM R | 17 Y/O girl increased irritability/cries easily/fatigue/feels hot/wt loss, Temp 37 HR 85 RR 18 BP 120/80, upper eyelid retraction & fine tremor (protruding eye in image), after confirming Dx, meds to give = Methimazole

- Neonatal Thyrotoxicosis

- Cause: Transplacental passage of maternal thyroid-stimulating immunoglobulin (TSI), usually from Graves'
- Sx: Tachycardia, Exophthalmos, $\pm$ CHF (Congestive heart failure)
- Labs: Clinical suspicion + labs showing low TSH, High T3/T4
- Tx: Start antithyroid therapy based on history/exam

PEM R | 6 D/O Boy, fussy/tachy/poor wt gain, Term unremarkable pregnancy aside from well-controlled maternal Graves, BW 2.5kg now 1.9kg, Awake/Alert Temp 37.4 HR 202 RR 76 BP 94/58 SpO2 94% on Ex has Exophthalmos, Mild Cardiomegaly, Pulmonary edema Echo normal except for congestive HF, most likely to Dx = Serum studies evaluation

- Congenital Hypothyroidism

- Causes: Thyroid Dysgenesis (Sporadic, Lack or incomplete dev. of Thyroid, Most common cause of CHT)
 - Thyroid Dysmorphogenesis (AR, Abnormal Thyroid Function, Can present w/ Goiter)
 - Maternal Hashimoto doesn't cause Congenital Hypothyroidism
- Sx: Prolonged jaundice
 - Large anterior fontanelle, Open posterior fontanelle, Umbilical hernia
 - Goiter (More w/ Thyroid Dysmorphogenesis but not Dysgenesis)
 - Weak cry, Low activity level, Poor feeding, Constipation, Dry/Mottled Skin, Developmental delay, Poor growth
- Typical Facial features of Untreated congenital hypothyroidism:
 - Coarse facial features, Eye Myxedema, Large Tongue, Broad flattened nasal bridge
- Labs: Low T4 High TSH
- Tx: Start Levothyroxine (10-15 mcg/kg) in infant after 2 weeks of age
 - IF NBS of TSH High ($> 40\text{mIU/L}$) then Start Levothyroxine immediately

PREP | 5 D/O, Girl, 40 weeker, BW 3.5kg, Mother took Levothyroxine for Hashimoto (Irrelevant), Mild jaundice, Reducible umbilical hernia, Child TSH > 200 repeated TSH > 520 T4 0.5 (Low) = Thyroid dysgenesis = CHT

PEM R | 5 W/O infant in ED for abnormal labs, having persistent jaundice/poor feed, high TSH & low Total & free T4 as well as Hyperbilirubinemia, on Ex = Umbilical hernia

PEM R | 12 Y/O fatigue/exhausted all time/not gaining weight/dry/hair loss/weight gain, Sx consistent to Dx = Constipation

- Hypothyroidism

- Typical scenario Question: Village w/ Iodine deficiency $>$ Endemic Goiter $>$ Low T4 $>$ High TSH

PEM R | 8 Y/O emigrated from South Sudan adopting mother saw her having bump in anterior neck and also in Africa adults & children having the same, on Ex anterior midline 5x7 cm nodular mass, labs expect = High TSH Low T4

Chapter 2: Medical

- Pediatric Thyroid Nodules

- Prevalence: ~0.05–2% in children, Most are benign, but work-up is needed to exclude malignancy
- Guidelines (ATA): Fine-needle aspiration (FNA): Recommended for all nodules ≥1 cm.
 - Nuclear thyroid scan: Only if TSH is low to evaluate for a benign hyperfunctioning nodule

PEM R | 16 Y/O w/ bump in neck noticed few days ago, No pain or other Sx, on Ex mass in Lt inferior pole of thyroid, US shows 1.5 cm hyper echoic nodule, aside from taking TSH, next step = Refer to surgery FNA

- Pheochromocytoma Triad: Headache, Tachycardia, Diaphoresis

- Sx (Almost like sympathomimetic): HTN (BP to roof), Tachycardic, Headache, Sweating, Chest pain
- Ax: NF1
 - MEN (Multiple endocrine Neoplasia)
 - Thyroid Medullary Cancer (Multiple Endocrine Neoplasia Type 2, AD):
 - MEN 2A: Medullary cancer + Pheochromocytoma + Hyperparathyroidism
 - Labs: High Calcitonin (in Thyroid Medullary cancers), High Calcium (in MEN2A),
 - MEN 2B: Medullary cancer + Pheochromocytoma + Mucosal Neuroma
 - Sx: Tall/Thin + GI & Mucosal Neuroma/Full lips + Joint laxity + Constipation/Diarrhea
 - Labs: High Calcitonin (in Thyroid Medullary cancers)
- Labs: Urine catecholamines & urine fractionated metanephrine (to confirm Dx)
- CT or MRI (for anatomic localization of tumor)
- Pheochromocytoma Complications:
 - HTN Tx: IV Phentolamine or Sodium Nitroprusside
 - AVOID Labetalol (BB) use in Pheochromocytoma, Cocaine, Amphetamine:
 - Blocks Beta receptors > Unopposed Alpha arenergic effect > Increase BP, MI

PEM R | 12 Y/O Girl, NF1, w/ intermittent headache, feeling heart racing/flushed, HR 104 RR 22 BP 13/85 SpO2 100%, conversant/well appearing, Repeated BP similar results, teams consulted for admission, while staying, next lab = MRI Abdomen/Pelvis

PEM R | 8 Y/O recent diagnosed w/ Pheochromocytoma, planned for admission, in ED w/ Hypertensive crisis BP 155/90 w/ Headache & chest pain, given wt appropriate IV labetalol, what is the anticipated effect of above = Worsening HTN

PEM R | 16 Y/O chest pain/palpitation/SOB states episodes started past several months thinks that he lost weight, denies drug use, having sweat/tremor HR 140 RR 18 BP 180/96, urine drug screen, received propranolol and BP increases to 205/105, which to confirm Dx = Urine catecholamines

Chapter 2: Medical

Bone

Rickets								
	Ca	Po4	PTH	25OHD	Calcitriol	ALP	U. Ca	
• Ca Def. = Nutritional Low Calcium	L	L	H	N	H	?	L	Tx: Ca
• VDD = Nutritional Low Vit. D	L-N	L-N	H	L	L-N-H	H	L-N	Tx: Vit. D
• VDDR1 = 1AlphaH Def. > No Calcitriol	L	L-N	H	N	Very L	H	L	Tx: Calcitriol
• VDDR2 = Calcitriol Receptor Resistant	L-N	L-N	H	N	Very H	H	L	Tx: Ca
• HPP = Bad bone Mineralization	N-H	N-H	L-N	N	?	L	?	Tx: ?
• PHP = PTH Resistant	L	H	H	N	N	N	?	Tx: Ca + Vit. D
• CKD = 1AlphaH Low Activity	L-N	H	Very H	N	L	H	?	Tx: Ca + Po4 Binders
• XLH = Proximal tubule Def.	N	L	N-H	N	L-N	H	L	Tx: Po4 + Calcitriol
• Fanconi = RTA Type 2	N	L	N	N	N	N	?	Tx: Po4

◦ **Calcipenic Rickets** | **Phosphopenic Rickets**
 ◦ 25OHD = 25 Hydroxycholecalciferol | Calcitriol = 1,25 Dihydroxycholecalciferol | 1AlphaH: 1 Alpha Hydroxylase
 ◦ VDD Vit. D Deficiency | VDDR1: Type 1 Dependent | VDDR2: Type 2 Dependent | XLH: X-Linked Hypophosphatemic
 ◦ HPP: Hypophosphatasia | PHP: Pseudohypoparathyroidism

- Rickets

PEM R | 14 M/O girl, Rt wrist injury after fall, appears well, NV intact, no obvious tenderness, XR (shows skeletal demineralization w/ frayed irregular biopic of Metaphysis) Tx based on XR = Vitamin Supplementation

Promo | 3 Y/O w/ evidence of rickets, most radiological changes of rickets in kids < 3 Y/O appear in = Knee XR (Not Wrist AP XR nor CXR nor Wrist lateral XR)

Amal | Regarding rickets, which of the following is the best single test showing risk in patient younger than 3 years = XR Knee

- Rickets XR:
 - ≤ 3 Y/O AP Knee (End of femur/tibia cupping & frying)
 - ≥ 3 Y/O AP Wrist (Wide wrist)

Amal | 9 M/O, exclusively breastfed baby, presented with a seizure. CXR obtained to rule out aspiration pneumonia revealed rickets-like changes of the ribs. Of the following, the most likely serum laboratory findings are = Low calcium, Low phosphorus

- Nutritional Vit D Deficiency

Gonads

Breast issues

- Enlarged breast

PEM R | 16 Y/O boy concern of breast cancer like grandmother, both breasts enlarged over past several months, denies illicit drugs & meds, slightly enlarged breast 4cm, no galactorrhea, normal size genitalia, Tanner 4, next = Provide reassurance only

- Anterior pituitary mass

- High Prolactin > Galactorrhea

PEM R | 16 Y/O female presents directly from radio after MRI (shows mass in optic chiasm) referred due to Headache & menstrual abnormalities for several months, which Sx construct w/ Dx = Galactorrhea

Chapter 2: Medical

- Neonatal Enlarged Breast
 - o Physical Breast hypertrophy will secrete milky colostrum

Final | Neonate bilateral breast swelling milk plus vaginal bleeding = Normal physiology

Final | 19 D/O girl with bilateral breast swelling, no discharge or redness = Reassurance

- Mastitis
 - o Most common in 1st 3 weeks of life, in Girls, in Term, usually Unilateral infection
 - o Cause: S. Aureus (Most common), GBS, E. coli, and Salmonella
 - o Sx: Unilateral painful erythema w/ induration of breast bud, Absent Fever (even in bacteremia children)
 - o Invx: Blood C/S Neg. (Usually & Drainage C/S Positive but not done anymore)
 - U/S (to r/o abscess formation)
 - o Tx: Full sepsis workup + Empiric Abx
 - Nafcillin (for coverage of GAS, GBS), Gentamicin, Vancomycin (IF high MRSA prevalence)
 - I&D (debatable practice, IF local fluctuance, w/ attention to avoiding injury to developing breast bud)
 - Standard precaution unless draining lesion then contact precaution

PEM R | 6 W/O concerned while showering child noticed breast swell new, tolerating feed, growing, no fever, most concerning = erythema of region w/ tenderness (Mastitis)

PEM R | 5 w/o left breast redness and swell, no fever, cry but consolable, erythematous, no discharge, Next = Admit IV Abx

Promo | 6 W/O Boy, w/ Rt. Breast swell, Erythema, Tenderness, No discharge, Tx = IV Abx as inpatient (Not reassure & apply warm compress nor Local Abx)

Amal | 3 W/O old girl with unilateral breast swelling, slight redness, and tenderness, afebrile. Most appropriate management = Admit for IV Antibiotics

- Fibroadenoma (Mammary duct ectasia)
 - o Sx: Rt or Lt upper side of breast, painful or painless
Adolescent Relation w/ menstrual periods w/ peaks of inflammation might have green/bloody discharge
 - o Tx: Supportive, NSAIDs (for pain & inflammation)

Promo | 14 Y/O came bcz of Rt. Breast pain which started recently, She started her Menarche this year, she is in her period for last 4 days, Right breast tenderness w/ greenish discharge when squeezed, Next step = Ibuprofen & Reassure (Not Warm compress & Reassure nor Ibuprofen & reassurance nor Mammography nor Surgical consult) | 2012 Answered: Warm & Ibuprofen

Amal | 14 Y/O w/ Rt. Breast nodular mass on outer quadrant w/ greenish brown discharge from nipple = Reassurance discharge with Ibuprofen (Not Reassurance discharge with warm compressor)

Final | 14 Y/O came w/ Breast mass in LUQ 2x2, No other Sx, Ex No skin change or discharge, Next = F/U in ED in few days for US reassurance if normal (Not Do LH, FSH, AFP nor f/u in ED in few days for US reassurance if normal nor Do further investigation as its risk at this age)

Final | Teenager with breast mass no discharge or other symptoms = U/S in ER or in few days and if normal discharge (unsure of answer, but no other answers provided)

Chapter 2: Medical

Immunology

Immunodeficiency

- Immunity types
 - o Innate
 - Neutrophils, Eosinophils, Basophils
 - Macrophages, Dendritic cell, Mast cell
 - Natural killer cell
 - Complement proteins
 - o Adaptive
 - B Cell (Humoral)
 - T Cell (Cellular)
- Immunodeficiency types manifestations
 - o T cell = Viral infections + Opportunistic infections = DiGeorge
 - o B cell = Sinopulmonary
 - o Combined T & B = FTT + Oral thrush + Diarrhea
 - o Phagocytes = Skin/Organ Abscess
 - o Complement = Overwhelming sepsis & Neisseria infections

PEM R | 3 Y/O Fever/cough, has Hx of OM/Sinusitis w/ once admission for pneumonia, he is well developed/nourished, now Temp 38.9 HR 120 RR 16 BP 92/68 SpO2 99%, purulent nasal discharge w/ Rales in Rt. Lung base, which underlying condition = B cell deficiency

- Immunodeficiency Red Flags if Any 2 in 1 year = Suspect PI:
 - o > 4 Ear infections, > 2 Serious Sinus infections, > 2 Months of Abx
 - o Recurrent deep skin + Organ Abscess
 - o Persistent PO Thrush or Fungal skin infection
 - o Need of IV Abx to clear infection
 - o > 2 Pneumonias, Septicemia, Meningitis Repeated Invasive infections
 - o FTT, FM Hx of PI

Chapter 2: Medical

- DiGeorge

- Path: 22q11.2 Deletion syndrome (DiGeorge syndrome + Velocardiofacial syndrome) or CATCH 22
 - Varies presentation: From isolated Psychiatric > Abnormal Learning > Sever Congenital Heart > SCID
 - Partial T-Cell defect (Most common, immune defect improves w/ time)
 - Severe SCID Like (Complete Absence of Thymus > Severe T-Cell defect > Severe B-Cell defect)
- Ax: DiGeorge can Overlap w/ Fetal Alcohol syndrome, Retinoic acid embryopathy
 - Infants w/ CHARGE may have DiGeorge
- Presentation (CATCH 22):
 - Cardiac Anomalies (VTAT): Truncus Arteriosus > TOF > interrupted Aortic Arch > VSD >
 - Abnormal Facies Low set ears, Short Philtrum (lip/nose distance), Hypertelorism (distant eyes), Micrognathia
 - Thymus hypoplasia (immunodeficient -Defect in T Cells- > Frequent infections -Candidiasis-)
 - Cleft palate/Lip
 - Hypoparathyroid/Hypocalcemia -Congenital Hypoparathyroidism-, Short stature
 - Behavioral problems
 - Majority have Hypotonia in infancy and Learning disabilities, with nonverbal learning disability in 66% of patients and 20-30% having mental retardation
- Complications:
 - SCID like > GVHD: Extreme T-Cell defect > B-cell defect = SCID like > Risk of Graft-VS-Host Disease
 - GVHD Due to Maternal derived cells in infant circulation
 - Can happen from non-irradiated blood products
- Invx: Diagnosis: Low CD3+ T Cell + Characteristic features
 - FISH (Fluorescence in situ hybridization) Diagnostic shows Micro-Deletion
 - Hyperdization or Amplification Helps if FISH Neg.
- Tx: Calcium Replacement
 - IVIG = Helpful if Antibody production is poor
 - CHD Correction, Thymus Transplant (Reserved for Complete DiGeorge syndrome)
 - Hemato-Poietic cell Transplant = From HLA-identical donor without T-cell depletion

PEM R | 5 D/O FT irritable/twitching, HR 156 BP 78/54 Na 135 K 4.4 Cl 110 CO2 18 Glucose 58 Ionized Ca 0.05 mmol/L additional to lead to Dx = Decrease elimination silhouette on CXR

- CGD (Chronic Granulomatous Disease)

- X-Recessive, more common than AR (1/3)
- Path: NADPH Defect > Neutrophils issue w/ respiratory burst ≠ generate Hydrogen Peroxide or Hydroxyl radicals (Superoxide) ≠ kill Phagocytosed organisms
- Organisms:
 - Aspergillus (75%), Staphylococcus (30-50%), Fungi (20%)
 - Gram Neg. (30%): Burkholderia, Serratia M., Nocardia, BCG, Salmonella, Pseudomonas, Enterobacter
- Sx: Males, Skin Abscess, Deep Lung/LN/GI Abscess
- Labs: Oxidative Burst test (NOBI), Nitroblue Tetrazolium Blue
 - DHR (Dihydrorhodamine oxidation 123 the new test)
- Tx: Prophylactic Abx, IFN-Gamma, BMT

PEM R | 2 Y/O Cervical adenitis & abscess previously x2 episodes required drainage & IV abx w/ C/S positive of S. Aureus, Admitted as infant w/ Liver abscess, Admitted 3 months ago w/ Osteomyelitis & Blood C/S of Aspergillus, his pediatrician did CBC w/ Diff & IgG/IgA/IgM/IgE all normal, Test to confirm = Neutrophils oxidative burst index (NOBI)

Chapter 2: Medical

- SCID (Severe combined Immunodeficiency disease)

- Path: T & B cell deficiency, 1/50000 live births
- Types: X-Linked; IL-2 Receptor Gamma Defect (IL2G 50%)
 - Recombination Activating Gene deficiency (RAG 30%)
 - Adenosine Deaminase deficiency (ADA 20%)
- Sx: Overwhelming sepsis, Chronic lung infections, Eczematous like skin lesions, Diarrhea, FTT
- Complications:
 - Risk of Every Infection
 - Candidiasis of Mouth, Esophagus, Skin
 - Persistent Rotavirus
 - Persistent RSV > Giant Cell Pneumonia
 - PJP (Most Common, P. Jirovecii P., w/ T cell deficit (Severe CD4 lymphocyte) Such in SCID/HIV
 - CMV Pneumonias
 - Life Attenuated Virus Vaccine > Fatal (DO NOT GIVE)
 - Non-Irradiated blood > Causes GVHD -First Few Months of Life- (GIVE IRRADIATED)
- Invx: NBS (Newborn screen) of TREC (T cell receptor excision circle) IF Pos.
 - > Do Lymphocyte Subset for age by Flow Cytometry IF Low > Confirms Primary Immunodeficiency
 - CXR Absent Thymus Shadow
- Tx: IF Primary immunodeficiency > Start Prophylactic Abx (Bactrim + Fluconazole)

PEM R | 4 M/O male poor wt gain, wt 3200 g 39 wk born to G1P1 mother, admitted to hospital for fever 1 M/O w/ negative sepsis, poor wt gain on 3rd centile, seen 3 times in PCP last 2months for watery diarrhea negative stool, Temp 38.4 HR 140 RR 30 BP 90/62 SpO2 99%, awake having thrush on oropharynx, WBC 16 Hgb 11 PLT 375 N 80% L 2% Mono 15% 3% Eosinophil, concerned about = SCID

PEM R | 4 M/O Fever/Cough for 3 days, interrupted aortic arch, cleft palate failure to thrive, persistent diarrhea, multiple thrush. Has low set ears, bulbous nasal tip and thin upper lip, this syndrome will have = Lymphopenia

- Wiskott Aldrich syndrome (EXIT)

- X-Recessive, (EXIT = Eczema, X-linked, Immunodeficient, Thrombocytopenia -Bleeding after circumcision-)
 - Genetic Defect in Xp11.22 Affecting gene codes for WASP (Wiskott-Aldrich syndrome protein gene)
 - Both T & B Cell affected, T Proliferation in response to mitogens & antigens are decreased & worsen w/ time
- Sx: First Year of Life Severe Bleeding + Sinopulmonary infections + Severe Atopic dermatitis
 - Eczema (Complicated by Staph. Skin infection)
 - Recurrent Infections
 - Encapsulated Bacteria (Pneumococci > Frequent Otitis media, Sinusitis, Pneumonia, Sepsis, Meningitis)
 - Pneumocystis Jirovecii Pneumonia, Herpes, CMV, Molluscum contagiosum virus
 - Thrombocytopenia
 - Bleeding after Circumcision, Bloody Diarrhea, Recurrent Epistaxis
- Complication: B-Cell Lymphoma, Leukemia (Risk is more in adolescence and early adulthood)
- Invx: Low Small PLT (Diagnostic; ITP has Large PLT)
 - Immunoglobulins Low IgM, Normal IgG, High IgA, High IgE
 - Low T-Lymphocyte Microvilli under electron microscopic examination.
- Tx: HSCT (from an HLA-matched donor)
 - Prophylactic Abx Amoxicillin or Bactrim (Help prevent infections)
 - Splenectomy (Effective improving PLT count when HSCT is not possible)
 - Splenectomy worsens humoral deficit problem + high risk of encapsulated organism infection

Chapter 2: Medical

PEM R | 4 M/O diffuse petechiae & 1 episode of hematemesis, Hx of pneumonia at 2 M/O IV Abx, on Topical steroid for eczema, recent blood work showed IgG normal, IgM Low, IgE High, PLT 50, what immunodeficiency you concerned about = Wiskott Aldrich Syndrome

PEM R | 2 Y/O w/ Hx of Eczema, recurrent OM & 2 previous pneumonia, Now rash for 1 day, vitally stable, having usual eczema, note scattered petechiae over trunk/back/extremities w/ ecchymosis of LL, likely complication leading to death in this disease = Intracranial bleeding

- Job disease (Hyper IgE)

- o FATE = Facies (coarse), Abscess (Cold/Staph), Teeth (retained primary) E (Eczema/IgE/Eosinophilia)

PEM R | 8 Y/O, Fever/cough 2 days extensive past Hx of Recurrent OM/Sinusitis/Skin infection/Pneumonia/Osteopenia & several Fracture, Vitally stable, having frontal bossing/broad nasal base/soft tissue thickened face/ears along 2 rows of teeth, decreased Lt sounds of base, CXR Lt lower lobe pneumonia + pleural effusion, syndrome will have = Increased Serum IgE

Turki
Bukhari's
Notes

Chapter 2: Medical

Allergy

- Hereditary Angioedema (HAE)

- AD, Defect in C1 inhibitor (C1-INH) + Low C4 , Diagnosed before 20 Y/O (Adolescences)
- Types:
 - Type 1 (80-85%) = Low C4 (Substrate of C1 esterase) + Low C1 inhibitor level + Bad C1 inhibitor Function
 - Type 2 = Low C4 + Normal C1 Inhibitor + Bad C1 inhibitor Function
- Sx: Onset Anytime Before 20 Y/O, Recurrent Angio-Edema with Non-Pruritic Rash !
 - Stress & Trauma triggers it, Resolves within 5 Days
 - Edema (Lip/Eyelids/GI/Genitalia), Consider HAE if Sudden onset of Abdomen pain + Extremity swelling
 - Laryngeal Edema (Leads to Respiratory Arrest; Most Life threatening complication)
 - GI: Recurrent Colicky pain, Vomiting, Diarrhea
 - FM Hx of Angioedema or Hx of Single episode of Unexplained Laryngeal edema
- Complication: Laryngeal Edema > Respiratory Arrest
- Invx:
 - Type 1 (85%) = Low C4 (Substrate of C1 esterase) + Low C1 inhibitor level + Bad C1 inhibitor Function
 - Type 2 = Low C4 + Normal C1 Inhibitor + Bad C1 inhibitor Function
- Tx: Maintenance/Prophylaxis: Danazol (Attenuated androgen) or Tranexamic acid
 - Acute Attack: Purified Human C1 inhibitor
 - or FFP
 - or Ecallantide (Plasma kallikrein inhibitor)
 - or icatibant (Bradykinin receptor inhibitors)
 - Airway compromise = Intubate w/ support (difficult airway)

PEM R | 10 Y/O girl w/ sudden onset of hoarse voice/dysphagia/swell of face/lips/tongue, felt tingling/irritation in face few hours earlier & swell developed after 2-3hr, has No SOB/Abdomen pain, Last year had episode of tongue swell After visiting dentist, after IM epi no improvement, in ED given IV C1 esterase inhibitor (C1-INH) initially improved then develops dyspnea/stridor/drooling, next = ETT

PEM R | 8 Y/O male w/ facial swell appeared 6hr ago, Hx 1 year ago upper lip swell that resolved, now mother gave Diphen and didn't improve, in ED he has edema all over non-pruritic, given icatibant then during observation developed stridor & RR 20, next = Perform ETT

- Allergic reaction management

PEM R | 18 M/O w/ pruritic rash, started on abdomen that spread to trunk/upper back and rash keeps changing as per mother, denies Fever/difficult breath/vomit/diarrhea/pain, Playful/non toxic, Next = PO Diphenhydramine

Chapter 2: Medical

- Urticaria

- Commonest Acute = Viral Infection
- Commonest Chronic (> 6 wks) = idiopathic

Challenger | 8 Y/O Girl in ED for rash began 4 days ago, had identical rash several times over past few months, rash comes & goes, red, raised, pruritic, no respiratory distress, as you discharge pt., you tell parent likely cause = Food or drugs (Not Cigarette smoke nor soap or detergent nor poison ivy or poison oak nor Pollen)

Final | Most Common cause of recurrent Urticaria = Drug/Food (Not Viral nor Pollen)

- DILEMMA Q, MD Challenger answer is Food or drugs & also previous exams they answered Drugs and food, Fleisher: Most common causes of Urticaria are infection, insect bites, drugs and food
Most say Viral infection is most common so it's the answer

Final | Urticaria = Food and drug (Not Pollen nor Insect bite)

URTICARIA/WHEELS

Urticaria is often encountered in the pediatric population, occurring in 2% to 3% of all children. In most cases, no cause is identified. A small number of cases are caused by allergic reactions from the ingestion of drugs or foods (e.g., nuts, eggs, shellfish). Urticaria also follows viral (e.g., Epstein-Barr virus, hepatitis), bacterial (streptococcal), or parasitic infections. Physical factors, including dermographism, cholinergic stimulation (induced by heat, exercise, and emotional tension), cold (acquired and familial), and solar exposure, can induce urticaria. Finally, urticaria may be caused by factors producing a vasculitis or other autoimmune phenomena (particularly thyroid diseases) and substances causing degranulation of mast cells (e.g., radiocontrast material). Episodes of urticaria lasting less than 6 weeks are termed *transient* or *acute*. The most common causes of urticaria are infection, insect bites, drugs, and foods. Chronic urticaria is defined as that which lasts for more than 6 weeks. No cause is found in 90% of children. These cases include the physical urticarias or urticarial vasculitis. The lesion itself follows vasodilation and leakage of fluid and red blood cells from involved vessels. The vascular damage can be caused by mediators such as histamine complement and immune complexes. IgE can attach to and cause degranulation of mast cells in sensitized individuals, with resulting histamine release.

Serum Sickness, Serum like SS, DRESS

- Abx = SS
- AED = DRESS = ONLY Single Mucosa (Mouth)
- AED = SJS = ALL Mucosa

- SS: 1-2 wk | Penicillin/Cefaclor/Bactrim | Fever + Urticaria + Arthralgia | Low C3/C4

- SSLR: 1 wk | Abx/NSAID | Fever + urticaria + arthralgia | Normal labs

- DRESS: 2-6 wk | Sulfa/AED/Allopurinol/NSAID | Fever + Mouth + Morbilliform Pruritic rash | Eosinophilia + AST/ALT

- SJS/TEN: 1-3 wk | Sulfa/AED/Allopurinol | Fever + All Mucosa + Necrosis + Dusky red lesions, + Nikolsky

- SSLR (Serum Sickness Like Reaction)

- Info: Timing: 7–10 days after drug, Looks like serum sickness but NOT immune-complex mediated
- **Trigger**: Antibiotics (most commonly cefaclor, amoxicillin, NSAIDs)
- Sx: Fever, Urticarial/targetoid rash (often persistent rather than transient hives)
 - Arthralgia, No renal involvement
- Invx: Complement levels **NORMAL**

Chapter 2: Medical

- SS (Serum Sickness)

- Info: Type 3 Hypersensitivity 7-14 Days Results from the injection of heterologous or Foreign protein or Serum
 - Doesn't require prior exposure (can occur on initial exposure)
 - Reaction to Non-protein drugs = Clinically similar to Serum sickness reactions
- Path: Immune complex causes vascular injury and influx of neutrophils and eventual tissue injury or death
- **Trigger**: Abx: Cefaclor, Penicillin and Bactrim, Stings from Hymenoptera (Bees, wasps, some ants)
- Sx: May take 6-12 Days (Up to 3 weeks) & IF Hx of Previous then quick reaction 1-3 Days Post-exposure
 - Fever/malaise, Headaches, Myalgias, Blurred vision
 - Dyspnea/wheezing
 - Skin rash: Urticarial (92%) and/or seriginous
 - Anterior > Lower trunk or periumbilical or axillary regions, spreads to the back, upper trunk, and extremities
 - Arthritis (Metacarpophalangeal & Knee joints, usually symmetrical)
 - Edema Face/Neck
 - Renal issues (Proteinuria, Microscopic hematuria, and oliguria)
 - GI issues
 - Lymphadenopathy
 - Neurologic issues (Peripheral Neuropathy)
- Invx: During Attack High ESR/CRP, Low PLT, Low C3/C4
- Tx: Stop the offending agent
 - NSAIDs can help for fever and muscle/bone pain
 - Diphenhydramine or hydroxyzine will help to relieve urticaria and itching
 - Prednisone 1-2 mg/kg/day can be given if other interventions are not helpful

PEM R | 5 Y/O rash & multiple lumps on neck, Temp 38.5 HR 110 RR 36 BP 96/55 SpO2 99% RA, diagnosed 7 days ago w/ OM, started on Cefaclor which improved initial sx of ear pain & fever, on assessment has morbilliform rash on palms/sole w/ no mucosal involvement, diffuse LN, Arthralgia of knee bilateral, No friction rub ECG normal, counsel family to prevent recurrence = Avoid beta-Lactam Abx until seen b Allergist

PEM R | 4 Y/O prev. healthy girl, having 2 days low grade fever/rash/joint pain, on day 9 out of 10 of Cefdinir for UTI, now Alert non toxic Temp 38.2 other vitals normal, having bilateral elbow/wrist swell w faint urticaria on trunk/extremities, Tx = Give NSAIDs & Diphenhydramine

PEM R | 5 Y/O Male, given antivenin after being bite by (pic of black widow), child returns 3 days later having Arthralgia & tags, potential complication of his course & presence = Serum sickness from antivenin

Final | Serum sickness after Amox, Tx = Stop offending & supportive management

- DRESS (Drug Reaction with Eosinophilia and Systemic Symptoms)

- Info: Type 4, Onset: 2-8 weeks after starting a high-risk drug, Drug reaction w/ systemic symptoms
- **Trigger**: NSAIDs, Sulfonamides, AEDs (carbamazepine, lamotrigine, phenytoin, phenobarbital) Minocycline, Lithium, Fluoxetine, allopurinol
- Sx: Pruritic Morbilliform
 - Hepatosplenomegaly + Jaundice (High AST/ALT)
 - High Temp (Fever) + LN + Facial edema + Arthralgia
- Complication: Interstitial nephritis > Renal failure, Pneumonitis, Thyroiditis, Myocarditis
- Invx: High WBC w/ **Eosinophilia**, atypical lymphocytes, High AST/ALT
 - Multiorgan involvement: liver (High LFTs/hepatomegaly), kidney, lung, heart, brain
- Tx: Immediate STOP offending drug
 - Supportive care (fluids, electrolytes, monitoring)
 - Systemic corticosteroids if severe organ involvement

Chapter 2: Medical

PEM R | 5 Y/O Trisomy 21 & Epilepsy presents w/ Fever/Rash/Abdomen pain, PCP saw her 2 days ago having fever diagnosed as viral exanthem, 3 wks ago started on Carbamazepine after she was having breakthrough Sz on Valproic acid which had been taking for more than 1 year, Temp 39 HR 120 RR 20 BP 110/75 ill appearing uncomfortable, w/ red morbilliform rash on face/upper limb/chest w/ confluence area, non-tender Submandibular LN, Periorbital edema without conjunctival injection or oral lesions, RUQ tender w/ liver 4cm, CBC expected = Eosinophilia

PEM R | 8 Y/O girl diffuse maculopapular rash & fever, Hx of SZ on Carbamazepine for past 3 weeks, now Temp 38.8 HR 115 RR 40 BP 105/70 SpO2 98%, having Diffuse morbilliform rash started as maculopapular then purpura over LL w/ diffuse Target lesions over face/trunk, no mucosal Involvement, labs = Eosinophilia

PEM R | 6 Y/O w/ SZ on Carbamazepine 1 month ago, rash for 5 days started morbilliform now involving half of body surface area, also has 3 days Fever/Malaise/Abdomen pain Temp 38.2 HR 120 RR 18 BP 100/73 SpO2 95% on RA, rash was sacks intraoral vesicles but no intraocular or intravaginal, having facial edema, jaundice, hepatomegaly, LN, which likely Dx = DRESS

- **Poison ivy dermatitis**
 - o Delayed hypersensitivity
 - o Tx: Mild = Topical steroid, Severe = Systemic steroid

PEM R | 10 Y/O male w/ intense pruritic rash over face/trunk/arm after camping trip yesterday vitally stable, but cannot stop scratching, erythematous plaques & scattered vesicles in linear distribution, Tx will likely improve recovery time = Topical steroid

Drug Reactions

- **Known Drug Reaction**
 - o SJS (Multiforme + Mucosal Involvement) or Anaphylaxis or Serum sickness or AGEP = Consider High Risk
 - Don't give the drug
 - o Mild Allergic reaction = Low Risk
 - Give Abx and observe for 1hr

PEM R | 5 Y/O male Temp 38.2 HR 115 RR 40 BP 98/45 SpO2 95% on RA, 5 Days of fever/runny nose/cough/tired, having non-toxic w/ mild subcostal retractions & diffuse crackles on Rt. Chest, CXR confirms pneumonia, family report reaction to Amox, what reactions will be low risk = Maculopapular rash developed on day 5 of Amox & resolves within 1-2 days after stopping Abx

PEM R | 5 Y/O w/ 4 days Fever/cough, mild increased in breath on 1 Lpm O2, CXR showing lobar pneumonia w/ no effusion, on O2 & IV Abx, mother mentions having penicillin rash, what estimated risk of allergic reaction of ceftriaxone = < 1%

- **Reye Syndrome**
 - o Influenza + Aspirin (from use for Kawasaki)
 - o Sx: Liver abnormality + Acute Encephalopathy
 - o Tx: Supportive + ICU

PEM R | 7 Y/O unwell, body aches, fever, for 3 days diagnosed as influenza on Oseltamivir and family denies antipyretic us recently, feeling worse increasingly today, Hx of Kawasaki and admission 1 month ago, ill/moan to painful stimuli, abdomen soft and lax w/ liver edge 4cm below costal, skin icteric, Temp 38.4 HR 150 RR 30 BP 125/80 SpO2 100%, you performed resus measures and admit to ICU, predispose to her developing this = Anti-PLT meds (High dose aspirin)

PEM R | 4 Y/O on daily aspirin diagnosed w/ Kawasaki 2 wks ago, now in ED in January coming w/ Fever 40/Cough/Body aches for 24hr, multiple members have the same, Best Next step = Tamiflu

- o Possible prevention of Influenza viral load progression to prevent Reye syndrome

Promo | 15 Y/O in ED w/ Fever/Vomiting/Altered LoC, Since 2 days Fever/Chills/Sweats/Myalgia/Dry Cough/Persistent non-bloody non-bilious vomit, Dx w/ Influenza by rapid test, given Anti-viral/Anti-pyretics, past Hx Abdomen Migraine, in ED Temp

Chapter 2: Medical

39.2 HR 114 RR 34 BP 100/70 SpO2 99% Lethargic but responsive to painful stimuli, in comprehensive words, spontaneous eye opening, Ph 7.28 PCO2 32 PO2 46 HCO3 16.9, Lactate 76 mg/dL & 8.5 mmol/L, Ammonia 477 ug/dL, LFT/Cr/Urea Normal, CRP/ESR not elevated, has Influenza B, CT head concerning for Cerebral Edema but no mass effect, Best Next = Begin Therapy w/ Sodium Phenylacetate & Sodium Benzoate IV (Ammonul) (Not Additional boluses nor Central line for HD)

- Contrast Reaction

Amal | 3 Y/O girl scheduled for Contrast study with history of flushing after contrast, best way to prevent future contrast reaction is = Provide antihistamine and steroid (Not IV bolus before contrast nor contrast agent w/ lower iodine concentration)

- Premedication bcz known to have allergy

- Vancomycin Reaction

- Path: If vancomycin given fast will cause histamine release and red man syndrome
- Tx: Increase duration of infusion +/- antihistamine

Promo | Pt. received Vancomycin, one of your residents asks about Red Man Syndrome, it is well known ax to Vanco due to = Histamine release (Not Endotoxin release nor Cytokines release)

Amal | Regarding vancomycin and its associated side effects and about Red man syndrome, most appropriate about this condition = Related to histamine release (Not Related to endotoxin nor related to catecholamine nor related to cytokines)

- Wrong IM Epinephrine injected in finger

- Path: Epi Injection at finger triggers > Vasco > Ischemia > Pain
- Tx: Warm compress, Vasodilator
 - Topical Nitroglycerin
 - SC at injection area: Phentolamine or Terbutaline

PEM R | 9 Y/O male injected finger w/ own Epi Auto-injector, in ED warm soaks & topical nitroglycerin cream but pain & ischemia worsen, meds injection locally = Phentolamine

Transplant issues

- Post transplant Lymphoproliferative disorder (PTLD) = Immunosuppressed transplant + EBV = High LDH/Uric
 - Definition: Proliferation of plasmacytes or lymphoid cells in immunosuppressed transplant patients
 - Often EBV-driven (majority are EBV positive, but EBV-negative cases occur)
 - Invx: High LDH & High Uric acid (markers of high cell turnover)

PEM R | 7 Y/O renal transplant, in ED for Fever/chills/night sweats/decreased appetite for 10 days, extensive infection workup done in PCP without anything, PCP suspected Post transplant lymphoproliferative disorder (PTLD), aside from EBV levels, what lab supports diagnosis = Hyperuricemia

Chapter 2: Medical

Liver Transplant

- Compensated shock

PEM R | 17 girl liver transplant 7 years ago, in ED 1 day dysuria/fatigue on her meds, Temp 38.2 HR 145 RR 18 BP 118/65, Ex unremarkable, most important next = IV bolus

- Stopped meds

- o Transplanted Immunosuppressed + Stopped Steroid = Adrenal crisis > Hypotension without Tachycardia
- o Most organ transplants given steroids along w/ other immunosuppressive meds
- o Sx: Abdomen pain, Vomit, diarrhea, Fatigue
- o Tx: Bolus, Hydrocortisone, Vasopressors

PEM R | 16 Y/O girl liver transplant 6 months ago, coming w/ Vomit/diarrhea/abdomen pain for 48hr also increased sleepiness & 3 symbiosis episodes, her medications stopped 5 days ago due to no insurance, Temp 36.3 HR 72 RR 16 BP 89/56, moderate distress, generalized tenderness of abdomen, Lab underway, NS bolus, meds while workup = Hydrocortisone

- Obstruction

- o Bright Yellow (Bilirubin) or Green (Biliverdin) vomit = concern of small bowel obstruction

PEM R | 4 Y/O Hx Liver transplant at 18 M/O, Abdomen pain/distention/vomiting for 24hr, vomit intractable, initially food and now highlighter yellow, No fever/diarrhea, UO decreased, abdomen diffuse tender, no jaundice, after IV bolus, next = Flat/Upright Abdomen XR

- Portal vein thrombosis > Splenomegaly + Low PLT + Abdomen pain

PEM R | 2 Y/O 6 wks post liver transplant, having abdomen pain/decreased PO for 2 days but no fever, and UO normal & stool normal, no jaundice, Cardiac/Respi Ex normal, having LUQ tenderness w/ spleen tip 5cm below Lt costa margin, Normal transaminases/electrolyte/bilirubin, Mild thrombocytopenia, image to diagnose = Abdomen US w/ doppler

Renal Transplant

- Complication: Infection

- o Renal transplant + Simple UTI = Cefdinir PO
- o Renal transplant + Complicated UTI = Tazocin IV

PEM R | 14 Y/O girl, Renal transplant at 4 Y/O, now w/ Dysuria for 2 days, Afebrile, no tenderness, Urinalysis Leukocyte esterase & nitrates, C/S pending, Tx = Cefdinir

- Acute renal rejection

Sx: Post transplant 3 months (1-6 months), Fever, HTN

- GVHD = post bone marrow transplant

Sx: Rash palm/sole, Abdomen pain, High LFT

- Rejection = Fever, Tenderness on graft, Function deterioration (High labs or HTN)

- Infection = Fever, High WBC

Chapter 2: Medical

- Acute Graft vs host disease (GVHD) = Recent Transplant w/ Rash Palms/Soles + Abdomen pain + High LFT
 - o Clinical diagnosis & Histology
 - o Path: Donor T-lymphocytes attack recipient tissues after hematopoietic stem cell transplant (most common) or solid organ transplant (esp. intestinal)
 - o Sx: Pruritic Erythematous rash Palms/Soles (most frequent, often first sign), Abdomen pain
 - o Invx: High LFT (Bili & Transaminases)
 - Skin/Gut biopsy (definitive diagnostic)
 - o Tx: immunosuppression (e.g., corticosteroids); not treated with antibiotics or topical steroids alone

PEM R | 3 Y/O girl Hx of short for syndrome on TPN underwent small bowel/liver transplant 6 wks ago, since discharge doing well till 1 week ago, diffuse itchy rash for 2 days, on Ex Erythematous papule on trunk/extremity of palm/sole, Vs normal, management of rash = Skin biopsy

- Acute renal rejection
 - o Post renal rejection
 - o Sx: Post transplant 3 months (1-6 months), Fever, HTN

Final | Post renal transplant 3 months back, present w/ fever & skin rash, he was hypertensive, renal function high BUN and Creatinine was 150, most likely the cause = Acute Renal Rejection (Not GVHD or Acute glomerulonephritis)

- Post-Renal Transplant + CMV Infection
 - o CMV infection
 - o Sx: Fever, abdominal pain, elevated liver enzymes, leukopenia, thrombocytopenia
 - o Common Renal Transplant Complications:
 - Graft dysfunction → ↑ serum creatinine, diagnosed by renal biopsy
 - Hypertension
 - Infection (bacterial, viral – CMV, EBV-)
 - Anemia
 - Urologic complications (obstruction, urinary leak)
 - o Causes of Acute Rejection / Graft Dysfunction:
 - Vascular thrombosis
 - Urologic complications (obstruction, leak)
 - Calcineurin inhibitor (CNI) toxicity (e.g., tacrolimus)
 - Medication non-compliance
 - Infection (CMV, EBV)
 - o Evaluation / Diagnostic Clues:
 - Urinalysis / Renal ultrasound with Doppler: detect UTI or vascular thrombosis
 - These may cause fever or ↑ creatinine but not elevated liver enzymes
 - Tacrolimus level: checks for CNI toxicity or non-compliance
 - Would not explain fever or liver enzyme elevation
 - o Fever + elevated Cr + elevated LFTs → think infection (CMV/EBV)
 - o Graft dysfunction alone, CNI toxicity, or urologic issues → usually no LFT elevation

PEM R | 12 Y/O girl, Post OR 23 days living donor kidney transplant, 24hr diffuse abdomen pain & fatigue, This morning New Fever/non-bloody non-bilious vomit, no missed doses of her home meds (Tacrolimus, Lisinopril), Temp 38.2 HR 128 BP 131/81 RR 20 SpO2 97% RA, Abdomen soft/tender all quadrant, Mental state & perfusion appropriate, Labs WBC 3.1 Hgb 10 PLT 120 Na 132 K 4.8 Cl 99 Urea 28 Cr 1.2 Glucose 87 ALT 450 AST 398 Bili 0.6 Phos 5, Diagnostic test suspected acute rejection = Viral studies

Chapter 2: Medical

Metabolic/Genetic**Metabolic**

- Acidemia

Promo | Case of propionic Acidemia, suitable fluids (Incomplete Q) = D10 + 1/2 NS 1.5 Maintenance

Promo | Case of propionic Acidemia, came w/ Acidosis given bolus, Regimen of IVF = D10% NS + NaHCO₃ + KCL 40meq

Promo x3 | 1 Year Known case of Metabolic disorder presented with Metabolic crisis what type of fluid = D10% 0.45 NS (Not D10% 0.9NS nor Sodium bicarb)

Promo | Methylmalonic Acidemia Case, coming w/ Crisis, Normoglycemic & you will give sugar why = Stop Catabolic process

Promo | 10 days newborn with poor feeding and hypoglycemia his VBG showed Metabolic acidosis what you will order to confirm diagnosis = Plasma Amino Acid (Not Lactate nor Urine ketone nor Ammonia)

Amal | 2 Y/O MMA, nausea, vomiting, lethargy, Glucose 3.2. Why to give higher IV glucose in IV fluid = Reverse catabolism

- If became hyperglycemic, start insulin, but never stop the D10

Amal | 6 years old boy PPA, abdominal pain and vomiting, what is first marker of impending metabolic crisis = Compensated metabolic acidosis (Not High ammonia nor Low carnitine nor Hyperglycemia)

Final | Metabolic hypoglycemia = Give glucose to eliminate protein

Final | Which going with metabolic crisis: (If scenario as organic aciduria) A. metabolic acidosis Urea Cycle defect: High ammonia

Final | 5 D/O lethargic Hx his brother die = CBC, ammonia, dextrose admission

Final | Baby with lethargy and decrease feeding, other child died with no clear cause what's required lab to make Dx = Ammonia

- Right Answer could be: Plasma Amino Acid as confirmatory

Final | 5 M/O with lethargic & acidosis and +ve history of sister neonatal death, lab to do = Ammonia or Urine for reducing substance or Lactate (unsure)

- Maple Syrup disease

Promo | 7 D/O Term uncomplicated, Now progressive listless/vomiting/poor feed, had brief SZ No Fever, HR 170 RR 40 SpO₂ 99%, Ex normal except listless/hypotonia/decrease responsiveness, IV Fluids, Full sepsis workup & Lactate/Ammonia/Urine & Serum organic acids, Glucose 40 mg/dL, given IV Glucose, obtaining urine cath. smelt burnt sugar, Dx = Maple Syrup disease

Promo | Case of MSUD, Fluid type = D10% NS

Promo | 10 D/O poor feeding, FM Hx of child death at age of 6 Months, Tx = Ammonia, Sugar, Blood gas, D10% IVF

- Urea Cycle Defect

- Hemodialysis Indication (Fleisher):
 - 300 (in urea cycle defect)
 - Altered LoC
 - Refractory to therapy

Promo | Case of Metabolic crisis, Ammonia 700, Started on D10+0.45 NS, Next = Arginine or Sodium Bicarbonate (Incomplete A)

- IF wrote Sodium Benzoate (anti-dote for Urea cycle defect) or Dialysis

Final | Ammonia 700 next = Hemodialysis

Final | Infant w/ UCD (Normal blood gas) has ammonia 400 started on arginine & repeated ammonia is 900 next = Hemodialysis

Final | Baby with high ammonia was 400 given arginine 4 hr later repeated was 900 = Hemodialysis

Final25 | Pt. known case of urea cycle defect w/ high Ammonia 750, given IV arginine & sodium benzoate then started on D10% but getting worse, Next = Hemodialysis

Chapter 2: Medical

- Urine reducing substance = W/ Galactosemia, Fructokinase Deficiency, Lactose intolerance in stool
- Galactosemia
 - o AR, Newborn [0-1 W/O] drinks Milk > ↓ Glucose/Jaundice/SZ + Hepatosplenomegaly + Cataract + FTT + E. Coli
 - o Sx: Present post milk feed after few days of birth
 - Hypoglycemia, Vomiting/Diarrhea/Lethargy
 - Jaundice, Hepatosplenomegaly, FTT
 - Cataract
 - UTI: E. Coli
 - o Invx: Urine Reducing substance Positive, Low GALT in RBC, High Galactose-1-Phosphate Uridyltransferase
 - o Tx: Restriction Diet of Lactose + Galactose, Soy based formula

PEM R | 4 W/O vomiting for 2 days not interested in feed, lethargic, scleral icterus, Temp 38 HR 143 RR 45 SpO2 99 on RA, Na 137 K 4.2 Cl 110 Total bili 10 direct 6, UA positive for reducing substances & Leukocytes, No glucose/protein, Ex finding = Cloudy cornea

PEM R | 2 W/O Fever/Lethargy, Small size, slight jaundice, cataract, Positive newborn screen, in ED labs normal, full sepsis workup done due to fever, organism = E. Coli

PEM R | 3 W/O, not interested in feeds for 1 day, having scleral icterus, Temp 37.9 HR 162 RR 44 SpO2 99%, Na 136 K 4.2 Cl 108 Total bili 10.8 direct 7.3, UA positive for reducing substance & leukocytes, Ex = Cloudy cornea

PEM R | 1 M/O infant vomit/lethargy small size 5th centile, jaundice, cloudy cornea, Temp 38.2 HR 180 full sepsis done, organism = E. Coli

Final | Neonate w/ Cataract, Hypoglycemia, common organism = E. Coli

Final | Baby w/ jaundice, FTT, Cataract, hepatomegaly, Dx = Galactosemia

Final | Galactosemia = E.Coli

- FOAD

PEM R | 4 D/O poor feed, intermittent vomit, lethargy, no fever/diarrhea, Hx of sibling died as sudden infant death, now HR 160 RR 42 BP 78/40 Temp 37 SpO2 9%, WBC 10 CRP 0.2 HGB 16 PLT 350 Glucose 48, Ph 7.2 pCO2 30 BE 11 HCO3 12 Ammonia 80 = FOAD

Genetic

- Wilson = Depression, Kayser, Neck Stiffness, Chorea, Dysarthria, High LFT
 - o AR defect in copper transport → copper accumulation in liver, brain, cornea
 - o Sx by age: Children: Usually hepatic (hepatitis, liver failure).
 - o Teens/Adults: More often neurologic (dysarthria, dystonia, tremor) ± psychiatric (depression, irritability)
 - o Kayser–Fleischer rings (brown corneal deposits)
 - o in ~50% with liver disease, ~98% with neuropsychiatric disease
 - o Labs: High LFT Low PLT thrombocytopenia)

PEM R | 16 Y/O depression/irritable, progress over year, past few week episodes of strange speech & neck stiffness, no illicit drug use or meds, no medical FM Hx, has episodes of torticollis & slow speech, affect flat, all exam normal except for High Aminotransferases & thrombocytopenia likely cause = Wilson disease

Chapter 2: Medical

Rheumatology

Autoimmune Purpura

- | | |
|--|--------------------|
| - Recent Infection (E. Coli) > Purpuric rash + AKI + Bloody diarrhea + Low PLT + MAHA | Support = HUS |
| - Recent infection (Varicella) > Purpuric rash + Bleeding/Chemosi + Low Large PLT | IVIG/Steroid = ITP |
| - Recent infection > Purpuric Rash + CNS + AKI + Anemia w/ Schistocytes + Low PLT | Plasmaph = TTP |
| - Recent infection > Purpuric rash + Abdomen Pain + Arthritis No effusion + Normal PLT + HSP Nephritis | Support = HSP |
| - Recent infection > Purpuric rash + Bone Pain Nocturnal + Migratory Arthritis + Pancytopenia | Further Inx = ALL |

- ITP = Low Large PLT
- HUS (Triad) = MAHA, Low PLT, AKI
- TTP (Pentad) = Fever, CNS, Anemia w/ Schistocytes, Low PLT, AKI

- - Low Small PLT = WAS
- - Low Normal PLT + Normal PT/PTT + Normal BT + YES Schistocytes = TTP
- - Low Large PLT + Normal PT/PTT + High BT + NO Schistocytes = ITP

- TTP (Thrombotic Thrombocytopenic Purpura)
 - o Pentad = Fever, Anemia w/ Schistocytes, Thrombocytopenia, CNS, AKI
 - o Path: ADAMTS13 Dysfunction > Small blood clots + Damage of RBC
 - o Sx: Fever, Anemia (MAHA), Seizure, Renal dysfunction
 - o Invx: LOW ADAMTS13, Low PLT, MAHA (Microangiopathic Hemolytic Anemia)
 - High Retics, High Megakaryocytes
 - PBS Schistocytes (Fragmented RBC)
 - o Tx: Urgent Plasma Exchange

Pedz | 5 Y/O, came to ED w/ Convulsion, WBC 8.9 PLT 45 HGB 10, PT/PTT Normal, PBS (Schistocytes), Dx = TTP

PEM R | 1st year oncall hematologist calling for 17 Y/O, that has the Classic finding TTP, which are = Fever, MAHA, Neuro, Renal, Thrombocytopenia

Chapter 2: Medical

- ITP

- Sx: Post Viral Purpuric Rash + Low PLT
- Tx: Target PLT 20-30
 - PLT Transfusion: IF PLT < 20 + Bleed or PLT < 10
 - No Bleed + YES Cutaneous bleed = Observe
 - Non-life threatening + YES Mucosal bleed = Prednisone
 - AVOID NSAIDs
- After viral infection, Ax also with post Varicella Infection or Vaccine, Damage of PLT
- Sx: Post Infection, Bleeding, Purpura Petechiae, Chemosis (Eyelid Swelling & conjunctiva)
- Invx: Low Large PLT, Normal PT/PTT, High BT
 - BMA/Biopsy (IF Abnormal WBC or unexplained anemia + Hx & Ex suggest BM failure or malignancy)
- Tx:
 - PLT > 30 & NO Bleed/OP/Head Trauma = Reassurance and NO treatment
 - PLT < 30 or YES Bleed/OP/Head Trauma =
 - 1st line: Steroid (Prednisone/Prednisolone) 2mg/kg BID x5 Days
 - 1st line: IVIG 1 g/kg 1-2 doses
 - Benefit: Fast rise of PLT, Steroid sparing | Side effect: Hypersensitivity, Headache
 - 2nd line: Anti-D IG 50 mcg/kg (If Blood Rh-Pos., next dose depend on Hgb response)
 - AVOID if HCT low in bleeding or Autoimmune hemolysis
 - 3rd line: PLT Transfusion
 - AVOID PLT transfusion (ONLY if life-threatening bleeding)
 - AVOID NSAIDs/Aspirin (Increase risk of head injury bleed)
 - Splenectomy, Indication:
 - ≥ 4 Y/O + Severe Chronic ITP (> 1 Year) + Sx Not easily controlled w/ Tx
 - Life-threatening hemorrhage (Intracranial) w/ acute ITP, IF PLT can't be corrected rapid w/ transfusion or IVIG
- ITP & Intracranial Bleed [Fleisher approach]
 - (ciTBI Sx: GCS < 14, Altered LoC, Palpable Skull Fr, Basilar skull Fr, Concern Mechanism/Ex)
 - (Sx: Scalp hematoma, Hx of LoC, Severe Mechanism, Headache, Vomit, not acting normal per parent)
 - Obtain CBC & Hema Consult then:
 - YES ciTBI Sx > CT = Pos.
 - PLT < 50 = IVIG 1g/kg + Methylpred 2mg/kg + PLT 10ml/kg + NSx + Splenectomy (Consider)
 - PLT > 50 = Standard care
 - YES ciTBI Sx > CT = Neg. = Standard care (IF persisted Sx = Concussion)
 - NO ciTBI Sx > YES Sx + PLT < 50 = CT
 - NO ciTBI Sx > YES Sx + PLT > 50 = Standard care
 - NO ciTBI Sx > NO Sx + PLT < 30 = Longer Observation vs CT + Hema Consult
 - NO ciTBI Sx > NO Sx + PLT > 30 = Standard care
- Maternal ITP Transferred to Neonatal ITP
 - Path: Maternal Antibody targeting surface antigen in Maternal + Neonatal PLT > Low PLT in Both
 - Tx: IVIG
- Perinatal Thrombocytopenia
 - Causes:
 - Productive (Genetic BM Failure or Congenital Amegakaryocytic)
 - Consumptive (DIC)
 - Destructive (Allo-Antibodies)

PREP | 2 D/O, in NICU w/ Petechiae, NSVD, Mother had Postpartum Hemorrhage with PLT 15, 1 month ago her CBC was normal, Newborn CBC WBC 12.5 HGB 18.2 PLT 12, Most appropriate next step = GIVE IVIG

PREP | 16 M/O, Normal Child received MMR 2 weeks ago, Now Petechial rash/Nose bleed + LOW PLT 3 only = Give IVIG 1g/kg

Chapter 2: Medical

PREP | 2 M/O, Boy, w/ Rash, noted while giving bath, had epistaxis 2 days ago lasted 7 minutes but normally 3-5 min, has bruise on forehead from getting table last night, picky eater 30oz cow milk daylight, Had URTI 2 weeks ago, has Blanching rash/bruise on buttock and bilateral shins, WBC 7.8 N 40% L 55%, Hgb 9.7 MCV 71 PLT 3, Best Tx = IVIG

Pedz | PLT < 60 and everything else is normal except if there is bleeding then ↓ Hgb ↑ Retics

Pedz | Post 1 week of URTI, Now Chemosis, Severe gum bleed, NO Hepatosplenomegaly or LN, PLT 5, Next = IVIG

Pedz | Child w/ URTI + Petechial rash, CBC Low PLT, BM Biopsy Large PLT, Tx = IVIG

PEM R | 7 Y/O healthy 1 week worsening rash, well appearing, diffuse petechia & scattered purpura, WBC 9 HGB 12 PLT 32, true regarding management of this pt = Spontaneous recovery occurs within 6 months

Promo | Pt. w/ ITP & Intracranial Hemorrhage, to give = **PLT w/ IVIG** (Has life-threatening indication to give PLT)

Promo | 8 Y/O Hx of Ecchymosis, petechiae in hand legs, CBC low PLT 10, Peripheral blood smear Large PLT, Tx options = IVIG (Not PLT nor Steroids)

- HUS (Hemolytic Uremic Syndrome): Triad: MAHA, Low PLT, AKI

- Most common 2-5 Y/O, Mortality < 5%, Types:
 - Typical HUS (Diarrhea HUS)
 - Atypical HUS (Non-Diarrhea HUS): Has Gene mutation in N-terminal portion of Factor H
- Cause: E. Coli O157:H7 or Shiga toxins or Shigella Dysenteries Serotype 1 or Strep. Pneumonia or SLE
- Sx: Microangiopathic Hemolytic anemia + Thrombocytopenia + AKI, Hx of Eating outside
- Complication: Typical HUS: Dialysis, SZ, Coma | Atypical HUS: Recurrent disease After Transplantation
- Labs: High Creatinine, High Urea
 - High LDH
 - Low PLT (~40,000), PT/APTT Normal (In DIC PT/APTT Prolonged)
 - Peripheral Smear Schistocytes, Low/Absent PLT
 - Stool C/S for E. Coli O157:H7
- Tx: Management of Typical HUS:
 - Hydration (Maintain renal perfusion), Adequate nutrition, Treat Electrolyte imbalance
 - Control HTN, Monitor (Hgb, PLT, Renal Function)
 - Dialysis Early dialysis is optimal (More than 50%, For 2 weeks)
 - AVOID Abx & Anti-motility agents
- Management of Atypical HUS:
 - Give C5 Blockers (Eculizumab)
 - Chronic Plasma Exchange
- Signs of Poor Prognosis:
 - Anuria > 2 weeks
 - Initial Neutrophils > 20,000 cells/μL
 - Coma on admission
 - Atypical forms of the disease

PEM R | 4 Y/O Hx of bloody diarrhea, new onset Fever/Lethargy/Vomiting, No urine for 24hr on Ex ill Temp 39 HR 178 RR 40 BP 125/80 Pale/diffuse abdomen tenderness, WBC 14 Hgb 7.2 PLT 42 w/ schistocytes on smear, Urea 43 Cr 1.6, lab = Neg. Coombs

PEM R | 5 Y/O pale/lethargy, Bloody diarrhea/Severe Abdomen pain/Decrease UO for 48hr, on Ex Scleral icterus/Petechiae on Chest/Extremities, Labs likely = Hgb Low, PLT Low, Cr High, Haptoglobin Low, Coagulation Normal

PEM R | 4 Y/O Pale/Periorbital swell, decreased UO/activity, 2 wks ago Fever/bloody diarrhea improved without intervention, now Pale/symmetric periorbital edema, CRT 3-4 sec, Temp 36.8 HR 134 RR 20 BP 128/80 Na 130 K 5.8 Cl 102 CO2 12 Urea 36 Cr 0.9 Hgb 8 PLT 62, initial Tx = NS 20 ml/kg over 1 hour (HUS w/ Compensated Shock)

Promo | case of AGE, Stool C/S shows E. Coli, after days came w/ bloody stool, Edema, lab request = CBC & RFT (HUS)

Promo | Diarrhea & SZ, how to diagnose = Stool C/S (could be Dysentery caused by Shigella)

Final | Scenario child with Hx of contact to sick people came with Hypertension/Edema/Decreased urine output, Labs Hb 6 Retics 4% LDH 6 High Cr, Low PLT and BUN, What is the Dx = HUS (Not PSGN nor ITP nor TTP)

Chapter 2: Medical

HSP

- **HSP (Henoch Schönlein Purpura, IgA Vasculitis) = Tetrad:** Arthritis/Arthralgia, Purpura, Abdomen pain, Nephritis
 - Mean age 4 Y/O, and 75% < 7 Y/O, most common Vasculitis in Peds, Clinically diagnosed, < 12 Y/O, Self limiting
 - Path: Immune-mediated Leukocytoclastic vasculitis: Neutrophil infiltrate, IgA, small IgG and C3
 - Causes: URTI (50%): Bacteria (Sterpt. Pyogenes), Virus (EBV, Varicella, CMV, Parvovirus, HBV)
 - Drugs (penicillin, cephalosporins, thiazides diuretics)
 - Sx: Small Bleeding in Skin, GI, Renal, Large Joints
 - Maculopapular progress to Petechial purpuric rash (100%, in Pressure bearing areas, lower extremities and buttocks -can occur in face+ears in younger-) lasting 4d-4w
 - Arthritis/Arthralgia (75%): Transit in large joints (NO JOINT Effusion, Full ROM, Bilateral Knee)
 - GI manifest (All): Abdomen pain, vomit, occult bleeding is common, hematemesis less common
 - Other manifest: Orchitis, pulmonary hemorrhage
 - Renal manifest (HSP Nephritis): -Full recovery 90%, can have ESRD 20%-
 - Asymptomatic Hematuria -Gross 20%- , Mild Proteinuria, Acute nephritis (HTN, Edema, High Cr -10% cases-)
 - Complications: HSP Nephritis (IgA Nephritis), Intussusception (Ileo-ileal)
 - Labs: High WBC & ESR & IgA | Normal Plt & Coagulation
 - Urine analysis (Next step, Microscopic Hematuria, F/U UA if Diagnosis made)
 - U/S (helpful for abdominal involvement cause early in illness they might have bleed, shows gallbladder Hydrops, 2nd duodenum portion echogenicity)
 - Tx: Supportive
 - No skin Tx unless severe give Steroids, NSAID for pain but avoid if renal or GI diseases present

Pedz | HSP rash, underlying pathology = Leukocytoclastic Vasculitis

Pedz | Skin rash, Abdomen pain, Ankle pain, (pic of purpura on legs), correct = Skin biopsy confirms Vasculitis

Pedz | Which is true in the condition and pathology findings = HSP and leukocytoclastic vasculitis

Pedz | F/U of patient with IgA Vasculitis (HSP) after discharge, True = Urinalysis & BP measurement should be done weekly after Dx for 1 month then every 2 weeks then monthly and lastly every 3 month for one year from acute illness

Pedz | Which is true in the condition and pathology findings = HSP and leukocytoclastic vasculitis

PEM R | 4 Y/O girl limp, Rt. Ankle pain/swell for 1 day, unable to ambulate raised purple-hue rash which extends to buttocks down extensor surface of both LL, No vomit/diarrhea/fever, Temp 37 HR 105 BP 85/50, Best next workup = **Urinalysis**

PEM R | 3 Y/O male w/ Rash/Joint pain, 4 days ago bilateral knee swell, rash red chitchats in legs now in buttocks also, No Fever/Vomit/diarrhea/ill contact recent travel tick bite, Vitally stable, CBC/U/E/Urinalysis all normal, most concerning & warrant immediate evaluation = Episodes of severe abdominal pain & vomit

PEM R | 8 Y/O boy sudden onset sever abdomen pain for few hours, several days ago parent noticed rash on legs/genitalia/buttocks and bilateral knee pain which improving except for abdomen pain w/ 3 episodes of non-bloody, rectal occult negative, rash pic, most likely complication = Bowel obstruction

Amal | 9 Y/O girl, complaining of joint pain and rash, increasing pain, multiple joints, non-ambulating, rash pinkish maculopapular rash progress to petechial rash below waist line, major complication of her illness = Bowel perforation

- HSP Intussusception = Ileo -leal
- Idiopathic Intussusception = Ileo-cecal

Chapter 2: Medical

- HSP Nephritis (IgA Nephritis)

- Can develop up to 6 months post HSP, Main source of morbidity, Nephritis occurs in 20–50% of patients
- > 20% ESRD (8-12 Weeks post joint + Abdominal involvement)
- Invx:
 - F/U UA for 3-6 months after HSP Diagnosis, Obtain BP & UA each visit
 - Abnormal UA or BP = Serum Creatinine and nephrology consult.
 - Normal UA & BP = primary care follow-up for repeat UA and BP in 1 week
 - Renal Biopsy (if severe renal disease shows large number of crescent)
 - Renal Biopsy Indication in HSP:
 - Nephrotic range proteinuria
 - Nephritic: HTN, Macroscopic Hematuria, Impaired Renal function, Oliguria
- Tx: Supportive care is mainstay
 - NSAIDs (for pain control if kidneys normal).
 - Steroids: (Not routine +/- for Severe pain to reduce inflammation)
 - IV steroids Indication in HSP Nephritis:
 - Severe kidney involvement
 - Proteinuria ≥ 1 g/day
 - High Creatinine
 - Crescentic GN on biopsy
 - +/- Cyclophosphamide or Azathioprine

Pedz | Swelling on Fever + Wrist, Blue dots on Lower limbs + Mild Abdomen pain, No Ascites or Periorbital swell, Ax w/ = Microscopic Hematuria (HSP Nephritis)

Pedz | Abdomen pain + Buttock rash (HSP), Most common association = Hematuria (HSP Nephritis)

Other | 6 Y/O girl, 2 weeks Hx of Lower limb Purpuric rash at lower extremities and buttocks, BP was normal, Lower limb edema, ESR 30, CRP 25 Albumin 20 Urinalysis showed protein to creatinine ratio of 300mg/mmol, ANA & ANCA Neg., Next = Admit for renal biopsy and immunosuppressive medications (IF there is Nephrotic range Proteinuria in HSP)

PEM R | 5 Y/O girl Joint pain Salmon-colored macular rash progressed to purpura on lower extremity & lower back & mild abdomen pain, decrease PO, UO normal, next = Urinalysis (to r/o IgA Nephritis)

Promo | Picture of HSP, commonly found in examination & labs = Microscopic Hematuria (Not Macroscopic Hematuria)

Promo | 7 Y/O Palpable Purpura & Petechiae on legs/buttocks, complains of Abdomen pain, you know that = Most common presentation includes Arthralgia & Microscopic Hematuria (HSP)

Vasculitis

- Kawasaki = Fever (5 Days), Bilateral Conjunctivitis, Strawberry tongue, Rash, Erythema > Desquam., Cervical LN (>1.5)
- MIS-C = < 21 Y/O, ill Child + Fever (1-3 Days) + High Labs + > 2 Organs, No other DDx, Recent COVID-19 (4 weeks)
- SF = Fever, Strawberry tongue, Rash + Desquamation, Cervical LN Tender > Amoxicillin Prevent RF given < 9 Days
- RF = Fever, Recent GAS, Jones CCENA (Carditis, Chorea, Erythema M., Nodules, Arthritis), High WBC/CRP/ESR
 - SF: Scarlet Fever | RF: Rheumatic Fever
- Kawasaki = Coronary Pathogenic = Coronary artery aneurysm
- MIS-C = Myocardial Pathogenic = Cardiogenic shock

Chapter 2: Medical

- Kawasaki

- Info: Typical age < 5 Y/O
- **Kawasaki Complete, Criteria:** Fever ≥ 5 days + ≥ 4 of 5 clinical features: (CREAM)
 - Conjunctivitis Bilateral (non-exudative)
 - Rash Polymorphous (non-vesicular, non-bullous)
 - Edema/Erythema at Peripheral extremity, Late periungual desquamation
 - Adenopathy Cervical LN ≥ 1 , > 1.5 cm (usually unilateral)
 - Mucosa changes (strawberry tongue, cracked/peeled lips, erythema)
- **Kawasaki Incomplete:** 2-3 of criteria + Strong clinical suspicion or Infant w/ Fever ≥ 7 days w/ No Explanation
 - CRP < 3 mg/dL & ESR < 40 mm/hr = unlikely KD
 - CRP ≥ 3 mg/dL or ESR ≥ 40 mm/hr = Assess Labs
 - Labs < 3 & Negative Echo = unlikely KD
 - Labs ≥ 3 or Positive Echo = Incomplete KD
 - Labs: Hgb Low for age, PLT $\geq 450,000$ (especially in subacute phase), WBC $\geq 15,000$
 - Albumin ≤ 3 g/dL, Elevated ALT
 - Sterile pyuria ≥ 10 WBC/hpf (from urethra, may be absent if catheterized specimen use)
- Complication: Coronary artery aneurysm (more w/ young patients)
- Tx: IVIG, Aspirin
 - Serial Echo, Cardiology F/U
- **IVIG Resistant Kawasaki**
 - Recurrent/Persistent Fever 36hr - 7 days from initial IVIG
 - Tx: Give another IVIG dose

PEM R | 4 Y/O Hx 6 days high fever/ daily unremitting, erythema blanching rash on torso after fever started, non-purulent conjunctivitis for 2 days, cracked erythema, HR 140 RR 40 BP 118/68 SpO2 98% on RA, Temp 38.9, to detect long term = Echo

PEM R | 4 Y/O, having Mouth sores/pain/drinking less, mother felt him hot for last week, in ED Temp 38.9 HR 130 RR 25 BP 95/60 on Ex irritable, bilateral Conjunctivitis, crackled/bleeding lip, swelling of hand/feet, WBC 16.5 HGB 10 PLT 640 CRP 4.2 ESR 54 Na 141 K 4.8 Cl 101 HCO3 24 Ca 9.1 Urea 20 Cr 0.8 Glucose 89 AST 80 ALT 85 Albumin 2.8, correct diagnosis made, Tx initiated, you counsel family that further Tx might be necessary in 10-20%, further indicated Tx = Recurrent fever within 7 days

PEM R | 5 Y/O concern of Kawasaki, have fever for 6 days having papular rash started at same time of fever, Fussy/decreased PO intake/Mucus dry/Lips cracked, No Hand/foot changes or Conjunctivitis, Respiratory panel negative, you suspect incomplete Kawasaki, what lab supports it = CRP 4.0

PEM R | 4 Y/O male, Fever 6 days, Fussy/rash, Temp 39.4 HR 130 RR 20 BP 100/70, diffuse blanching erythema Maculopapular rash to trunk/groin/red lips, ocular (image of conjunctivitis), WBC 21 PLT 450 ESR 80 CRP 4.5, Rapid strep negative, 20 wbc/hpf & negative nitrites, most common complication = Coronary artery dilatation

Promo | 3 Y/O w/ Fever 6 days, cracked lips, normal tongue, skin rash all over trunk, Perianal peeling, CBC shows Leukocytosis, Normal Hgb & Normal PLT, Dx = Scarlet fever (unsure because incomplete Q, but not Atypical Kawasaki)

Promo | Kawasaki scenario they asked about how we prevent Coronary aneurysm = Give IVIG and aspirin within 10 days of symptom (Not Give Aspirin and IVIG once patient meet the criteria regardless ECHO finding)

Final | Scenario of child with fever for 5 days, skin rash and peeling what are the lab, findings = Low albumin Low Hb and high ESR (Not High albumin, Low Hb and High ESR nor High albumin, high Hb, high ESR)

Final | Kawasaki = IVIG and steroids within 10 days (I think answer IVIG within 10 days and aspirin)

Final | Kawasaki Ax lab = High ESR

Chapter 2: Medical

- MIS-C

- Sx: < 21 Y/O, Recent COVID exposure (4 weeks)
 - Fever 1-3 Days
 - > 2 Organ involvement
 - High inflammatory labs (Leukocytosis, High CRP/ESR)
- Forms/Stages:
 - Mild = COVID Sx (GI, Sore throat)
 - Mod. = Kawasaki like + Coronary features
 - Sev. = Cardiogenic Shock
- Complications: Ventricular dysfunction w/ Cardiogenic Shock (more w/ older age)
- Invx: Do COVID PCR, Do Echo (to r/o Coronary involvement)
- Tx: Steroids and IVIG

PEM R | 9 Y/O Girl, 5 days high fever/cracked red tongue/swollen hand & feet blanching erythema maculopapular rash, difficult to sleep bcz SOB, poor oral, complains N/V/Abdomen pain, 2cm Cervical LN, sister Pos. COVID, ill Temp 40.9 HR 138 RR 32 BP 100/56 SpO2 94% RA, mild diffuse wheeze, non-distended abdomen, liver 2cm below costal, +2 pitting edema in bilateral ankles, CRT 3sec, Best test = Echo

PEM R | 8 Y/O having Cardiogenic shock w/ Hx 6 days fever/conjunctival injection/rash/abdomen pain, having Anemia/Thrombocytopenia/High WBC w/ Neutrophils, CRP/ESR/AST/ALT High, SARS-COV-2 PCR Negative, Echo shows Rt. coronary artery aneurysm, strongly suggests MIS-C rather than Kawasaki = Cardiogenic shock

Final | MIS-C = Pneumonia

Final | Mother with pneumonia, child w/ systemic illness = Multi system inflammatory

SLE, JIA, JDM

SLE

- SLE

- Sx: Criteria depends (ACR or SLICC, both need 4, in SLICC at least 1 in Clinical & 1 in Immuno)
 - CNS: Chorea, SZ
 - Cutaneous: Malar rash, Discoid rash, Photosensitive rash, Mucosal Ulcer, Alopecia
 - Serositis, Nephritis
 - MSK: Arthritis, Morning stiffness, Jaccoud Arthropathy, Avascular Necrosis
 - Hema: Anemia, Pancytopenia, Thrombosis
 - Cardiac: Pericarditis, Myocarditis
- Labs: Sensitive: ANA (98-99%)
 - Specific: Anti-dsDNA, Anti-Smith (Positive Both together 97-99%)
 - Low C3, Low C4, In more severe Low C2/C4/Other complement
 - CNS: Serum Anti-Ribosomal P antibodies, CSF Anti-Neuronal antibodies
- Tx: Low dose Aspirin, Steroid, Hydroxychloroquine, Belimumab
 - Hydroxychloroquine Side Effect Retinal toxicity (Screen 1-2 Times Yearly)

PEM R | 13 Y/O w/ subjective fever/malaise over last month w/ facial rash (butterfly rash), complains also from aphthous ulcers & joint pain, labs supportive = Decreased C3

PEM R | 14 Y/O known SLE, coming w/ Fever for 3 days, also Orthostatic dizziness for last 2-3 hrs, on Daily Mycophenolate & Prednisone, Now Temp 38.2 HR 130 RR 18 BP 85/43, Pale/Diaphoretic/Tachycardic/CRT prolonged, after Labs, x1 IV Bolus & Broad spectrum Abx, minimal improvement in perfusion, next = Hydrocortisone

- Prolonged steroid use in SLE (or any Rheuma disease) w/ Sepsis/Septic Shock = Needs stress dose of Steroids

Chapter 2: Medical

PEM R | 15 Y/O female, Rheuma consult for acute non-traumatic Lt knee pain/swell 1 week ago, ANA positive 1:256, intermittent joint pain for several weeks, dark urine, Afebrile but swollen painfully Lt knee w/ red rash butterfly on face, single best test to Diagnose = Anti-Double strand DNA antibody test

Promo | 8 Y/O SLE, w/ Chest Pain, what will find on Ex (Incomplete) = Muffled heart sounds or

- Lupus Nephritis

- Mostly Adolescent Female, 20% of SLE begins in Childhood, 60-75% of Children w/ SLE have Lupus Nephritis
 - SLE in Children Present Mostly Active Nephritis (Unlike adults present w/ joint pain, Rash)
- Path: Immune Complex Mediated Kidney injury, 6 Classes:
 - I - Minimal Mesangial (Class I)
 - II - Mild Mesangial Proliferation w/ Deposits
 - III - Focal Proliferation
 - IV - Diffuse Proliferation (Most Aggressive, w/ Intense Treatment)
 - V - Membranous
 - VI - Advances Sclerosing / Fibrosis
- Sx: Ranges from Asymptomatic Microscopic Hematuria To Rapid progressive Glomerulonephritis
 - Renal: HTN, Hematuria, Proteinuria, Azotemia (Reduced Renal Function)
 - Extra-Renal: Anemia, Arthritis, Malar Rash, Serositis, Cerebritis, Coagulopathy
- Labs: Low C3, Low C4, Pos. ANA, Pos. Anti dsDNA, Renal Biopsy (Definitive Diagnosis)
- Tx: Class 4 Tx includes Prednisone, Cyclophosphamide or Mycophenolate Mofetil or less common Azathioprine
- Prognosis Directly affects both Morbidity/Mortality
 - SLE w/ no Renal involvement or w/ Nephritis But Short steroid course = better outcome
 - SLE w/ Nephritis But Needing Immunosuppressive course = Poorer outcome (Infections Major factor)

Pedz | 14 Y/O, 1 Month Hx of Fatigue and since 1 week having low grade fever, bilateral knee pain, chest pain w/ inspiration, No RD breath sound finished on Rt. Lung base, BP 130/80, Urinalysis +3 Hematuria +3 Proteinuria, which lab is most appropriate next step confirming Dx = Antinuclear antibody (Next step, ANA) or ANCA or Kidney biopsy (Diagnostic)

Pedz | 11 Y/O, Girl, Prev. healthy, 2 month Hx of Intermittent fever, MSK weakness, Photosensitive, facial rashes. But No other constitutional Sx, HR 120 BP 140/85 T 38.7, Unable to get up from bed, Tenderness over proximal leg & arm muscle, WBC 3.2 x10⁹, Hb 10 g/L., PLT 120x10⁹, ANA 1:1280 (Neg.), CPK 2200, Anti-ds DNA 1:650, C3 0.2 g/L (0.8-1.7), C4 0.04 g/L. (0.14-0.44), Urine analysis RBC 130/HPF (<5/HPF) and Protein to creatinine ratio 250m/mmol, appropriate in this child management = Renal biopsy (SLE, to stage Lupus nephritis)

Promo | 10 Y/O Girl w/ SZ, Slightly high Creatinine, Hypertensive, Hematuria, Dx (Incomplete Q) = Lupus Nephritis

Promo | Child w/ Hematuria, HTN & SZ, had URTI before, UA RBC Casts & Dysmorphic RBC & Protein, Dx = Lupus Nephritis

- Neonatal Lupus

- 83% of mothers w/ Lupus don't have the Sx at time of delivery
- Info: Maternal auto-antibodies cross placenta
- Risk factors: Mother w/ SLE or Mother w/ Sjogren Syndrome
 - Previous Pregnancy w/ NL
 - Risk Next: 1st baby risk 1-5% | 2nd baby risk 15-20%
- Sx: Discoid/Periorbital erythema, 3rd degree H block
 - Low PLT, Low Neutrophils, High AST/ALT
- Labs: Positive Anti Ro + Anti-La
- Tx: Pacemaker

PEM R | 4 D/O no known medical Hx, has Annular Erythematous face rash, mother didn't have any prenatal care, family denies Cough/Fever/vomit/diarrhea, HR 70, labs supportive of Dx = ECG w/ complete HB

Chapter 2: Medical

PEM R | 5 D/O w/ HR 60, after exam no distress but bradycardia, ECG shows (Complete HB), Cardio & admission done, likely cause for this finding is = Maternal diagnosis of Sjogren Syndrome

JIA

- sJIA = 2 Y/O, Both, Arthritis/Quotidian Fever/Salamon rash/Hepatosplenomegaly/LN/Serositis/MAS | ANA Neg.
- oJIA = 1-3 Y/O, Girls, <4 or ≥5 AFTER 6 Months/Uveitis/TMJ | ANA Pos.
- poJIA RF- = 1-3 & 9-14 Y/O, Girls, ≥5 IN 6 months Arthritis Asymmetric MCP/PIP/Uveitis | ANA Pos, RF Neg, Anti-CCP Neg.
- poJIA RF+ = Teenage, Girls, ≥5 IN 6 months Erosive Arthritis Symmetric | ANA Neg., RF Pos., Anti-CCP Pos.
- psJIA = 2-3 & 10 Y/O, Girls, Arthritis Asymmetric DIP/Psoriasis/Uveitis/Dactylitis/Nail | ANA Pos. + HLAB27 Pos.
- ERAs JIA = Teenage, Boys, Familial 10-20%, Enthesitis /Arthritis Lower limb/Back, Uveitis | HLAB27 Pos.

- sJIA (Systemic Juvenile idiopathic Arthritis)
 - o Quotidian fever

PEM R | 4 Y/O 2 wks fever spiking 39 daily resolves without antipyretics, father says child often walks as robot during playtime, on Ex diffuse LN, palpable liver, no joint swell/warmth, urinalysis normal, CBC = Leukocytosis

- Serositis
 - o Pericardial, Pleural effusion
 - o Ax w/ Rheuma disease (JIA, SLE)
 - o Sx: Chest pain, Fever, Pericardial rub, ST elevation
 - Pericardial effusion ECG: Diffuse ST elevation
 - Pericarditis ECG (Diffuse ST elevation w/ PR depression & PR elevation in aVR (reciprocal change))
 - o Tx: IV Steroids, Drain effusion (IF Tamponade)

PEM R | 14 Y/O Hx of JIA presents w/ Chest pain for 3 days, worse when lying supine & better when leans forward, no difficult breath, has distant heart sounds, ECG low voltage w/ diffuse mild elevated ST, CXr enlarged cardiac silhouette, Echo shows moderate Pericarditis effusion but normal function & no tamponade, Next = IV Steroid

PEM R | 12 Y/O girl, diagnosed w/ SLE having Chest pain sharp anterior, worsening over past several days, SOB, pain improves when sits upright & leans forward, denies cough/recent illness, Temp 37.9 HR 125 RR 28 BP 116/68 SpO2 99% on RA, Lungs clear, pericardial rub, ECG (ST elevation) following additional = Pericardial effusion

PEM R | 15 Y/O, 4 wks Hx of episodic Lt chest pain occurs several times per day worse w/ deep inspiration Ax w/ SOB when lying down, Low grade fever intermittent for several months, increased facial acne/diffuse myalgia, decrease PO/Wt. Loss, Temp 38.1 HR 112 BP 134/90, clear lung, non-tender cervical LN, no murmur no organomegaly, Rash on face (pic of malar rash), WBC 4 Hgb 9 PLT 120, further finding = Low voltage QRS on ECG

Chapter 2: Medical

JDM

- JDM (Juvenile Dermatomyositis)
 - Info: Connective tissue disease, Girls > Boys
 - Path: Autoimmune activation of T + B Cells > Vasculitis of small vessels of skeletal muscles
 - Sx: Rash + Proximal Muscle weakness
 - Rash (Heliotrope, Gottron, Poikilodermal rash)
 - Proximal Muscle weakness, Difficult Combing hair, Gower's Sign (Difficult getting out of chair)
 - Arthralgia (65% Oligo, 30% Poly)
 - Fever + Raynaud phenomenon
 - Complications: (Risk factors: Inadequate steroid therapy or delay for > 4 months)
 - Skin Ulceration -Rare-
 - Dystrophic Calcinosis of skin (33%, Calcinosis cutis)
 - Lipodystrophy -Late- (Insulin resistance, Hyperlipidemia)
 - Aspiration Pneumonia (risk due to Velopalatine muscle weakness)
 - Invx: High CPK (1st), High Aldolase, LDH, ALT, AST, Proximal joints MRI (2nd)
 - Tx: Steroid (Prednisone)
 - Diagnostic Criteria: (x3 Definitive Dx OR x2 Probable Dx)
 - Heliotrope rash (Periorbital Edema + Cheeks rash | Shoulder + Back rash | Poikilodermal rash) or Gottron papules
 - Proximal Muscle weakness -Symmetric- (Gowers sign, diff. Grooming, problem swallow) In severe cases > distal
 - Muscle enzymes (High CPK, Aldolase, LDH, ALT, AST)
 - Electromyography (EMG) abnormalities (Increased insertional activity, fibrillation potentials, sharp waves and decreased duration and amplitude of action potential)
 - Muscle biopsy abnormalities

PEM R | 6 Y/O boy, Red-purple discoloration around eyelid parent don't remember for how long, No Fever/Swell, discoloration is on joints of hands, difficult getting up from seated & uses hands to push thigh to help himself up, lab helpful = Aldolase

PEM R | 9 Y/O Hx of JVD, w/ Fever/worsening cough, had cough for few months diagnosed as asthma on salbutamol, cough improved until yesterday when it worsened and 38.9, frequent cough/crackles/wheeze, next = CXR

PEM R | 8 Y/O male dermatomyositis for cough that was intermittent for several months, seen in urgent twice last 2 months disclosed w/ pneumonia in addition has voice nasal tone, spitting oral secretions, likely complication = Aspiration pneumonia

PEM R | 9 Y/O having generalized weakness & fatigue for 2 days, having rash after going to outside, (pic of gatttron papules on knuckles) having proximal muscle weakness, helpful test to confirm diagnosis = Aldolase, AST, ALT

AS, Sarcoidosis, Behcet, Scleroderma, Raynaud, FMF

- AS = Uveitis + Enthesitis + Arthritis > Spondyloarthropathy | HLA-B27
- Sarcoidosis = Uveitis + SZ + Arthritis + Hilar LN, Lytic Bone Lesion | High ESR/Proteinemia | Tx: Steroids, MTX
- Behcet = Uveitis + Buccal Aphthous + Genital Ulcer | Pathergy test | Tx Steroids, Azathioprine

- Diseases associated with HLA-B27 (PAIR):
 - Psoriatic arthritis, Ankylosing spondylitis, Inflammatory bowel disease, Reactive arthritis

Chapter 2: Medical

- AS (Ankylosing Spondylitis)

- Risk factors: male sex, age < 40 years
- Ax: Uveitis, aortitis, IBD, psoriasis, apical pulmonary fibrosis
- Sx: low back pain that is most severe at night and morning stiffness that improves with exercise
 - limited spinal mobility, decreased lumbar lordosis
- Invx: increased ESR, positive HLA-B27
 - XR: squared vertebral bodies, multiple vertebral fusions (bamboo spine)
- Tx: NSAIDs, physical therapy, TNF-alpha blockers

PEM R | 16 Y/O girl, w/ pain in external genitalia for 24hr, has sores around area, denies trauma & dysuria but when urine touches the sores it is painful, no sexual activity, frequent oral aphthae, and shallow genital ulcers w/ erythematous base, Tx = Topical Triamcinolone

- Sarcoidosis

- Sx: Fever, Fatigue, SZ
 - Dry Cough, Chest pain
 - Joint pain/Swell, Erythema nodosum
- Complications: Lytic bony lesion, Uveitis, Bilateral hilar LN
- Invx: High Eosinophilia, High ESR, Hyperproteinemia, High ACE, High Ca in Blood & Urine,
 - Fiberoptic bronchoscope (Diagnostic) Biopsy Non-caseating granuloma
 - Lymph Biopsy: Non-caseating epithelioid granuloma
- Tx: Steroids, Methotrexate

PEM R | 12 Y/O 3wk multiple Sx Fever/Malaise/Weight loss, dry cough/SOB, blurry vision for 1 week, diffuse crackles, vitally stable, Cervical/Axilla LN, Uveitis, High ESR, Hyper-Eosinophilia on CBC, CXR bilateral hilar Adenopathy w/ diffuse parenchymal infiltrate, Dx = LN biopsy

PEM R | 16 Y/O girl, w/ 2 wks fatigue/dyspnea on exertion & rash, there No Rhinorrhea/cough/orthopnea, Rash Anterior legs erythematous flesh colored nodules, tender to touch, has Cervical shotty LN, Labs of CBC/U/E/UA/HCG unremarkable, CXR shows (Bilateral hilar lymphadenopathy infiltration), Dx = Sarcoidosis

- Behcet disease

- Inflammation all over body
- Sx: Triad:
 - Recurrent Painful Oral Ulcers (Buccal Aphthous)
 - Recurrent Painful Genital Ulcers
 - Inflammatory Eye Disease (Blindness, Uveitis)
- Invx: Pathergy skin test (Local skin reaction -Red papule/pustule/ulcer- 1-2 Days after needle insertion)
- Tx: Steroids, Azathioprine, Colchicine
 - Oral/Genital Ulcer = Topical Triamcinolone

Chapter 2: Medical

- Scleroderma
 - Scleroderma Mild to Systemic sclerosis (SS)
 - CREST Sx: Calcinosis, Raynaud, Esophageal dysfunction, Sclerodactyly, Telangiectasia
- Scleroderma Complications:
 - Myocardial fibrosis > Cardiomyopathy
 - Sx: Exertional dyspnea, orthopnea, angina pectoris, distant heart sounds, gallop rhythm, arrhythmias
 - Invx: CXR, EKG, Echo, gated nuclear-ventricular scans
 - Tx: Digoxin, diuretics, antiarrhythmics
 - Pulmonary interstitial fibrosis
 - Sx: Cough, dyspnea, dry crackles, cor pulmonale
 - Invx: CXR, EKG, pulmonary function tests (including CO diffusion), high-resolution CT, bronchoalveolar lavage, lung biopsy
 - Tx: Corticosteroids, oxygen, bronchodilators, treatment of right-sided heart failure
 - Pulmonary hypertension
 - Path: Pulmonary artery fibrosis
 - Sx: Acute dyspnea, Fixed splitting 2nd heart sound
 - Invx: CXR normal/increased reticulation, Spirometry (shows restrictive pattern)
 - right-sided heart catheterization, lung biopsy
 - Tx: Corticosteroids, CCB, ACE inhibitors, direct pulmonary artery installation of vasodilators
 - Scleroderma renal crisis
 - Sx: Severe headache, blurred vision, retinopathy, CHF, SZ, malignant HTN
 - Invx: Electrolytes, BUN, creatinine, plasma renin activity
 - Tx: Captopril and other ACE inhibitors, minoxidil & other vasodilators, BB, diuretics, dialysis; in refractory cases, nephrectomy
 - Dry Gangrene
 - Sx: Constant Pain, **loss of sensation** in distal digits, trophic changes
 - Invx: Cryoglobulins, doppler flow studies
 - Tx: Topical vasodilators (**Nitroglycerin**)
 - Digital/Regional Block (Sympathetic ganglionic blockade)
 - Prostaglandin E₁ infusion
 - Esophagitis
 - Sx: Retrosternal pain, pyrosis, melena
 - Invx: CBC, barium swallow, esophageal pH probe, and manometry
 - Tx: Antacids/cimetidine, surgical manipulation for chronic unremitting complaints

PEM R | 17 Y/O girl Hx of long standing Scleroderma, having exercise decreased tolerance for last months, SOB improving w/ rest, intermittent dry cough but no fever, helpful test to know etiology = Spirometry

PEM R | 17 Y/O Female w/ Scleroderma lost follow up for 3 years, Severe dyspnea for last few days, in ED Tachypneic/Tachycardic, SpO₂ 92% on RA, after placing on O₂ & monitor, has wide & fixed splitting 2nd heart sound, which complication do you suspect = Pulmonary HTN

- Raynaud Phenomenon = reversible + Intermittent Pain + **Intact Sensation** = Rewarming > CCB/Sildenafil > Nitroglycerin
- Dry Gangrene = irreversible + Constant Pain + **Loss of Sensation** + Scleroderma = Nitroglycerin > PGE

Chapter 2: Medical

- Raynaud Phenomenon (RF)

- Sx: Russian flag (White > Blue > Red), Intermittent Pain (During attacks)
- Tx:
 - Rewarming
 - Reduce attack frequency
 - CCB (use at home help mitigate further attacks)
 - Sildenafil (can be used to reduce attack frequency -vasodilatory effect-)
- Tx depending on case:
 - IF Severe/Refractory:
 - Vasodilators: Local or systemic (e.g., PGE or prostacyclin analogs)
 - Topical nitroglycerin can improve local perfusion
 - Digital nerve block for pain relief (use lidocaine WITHOUT epinephrine)
 - IF Paronychia (on same ischemic finger) = IV Abx if improved go for PO or Topical
 - IF Impending gangrene w/ Scleroderma = Nitroglycerin > PGE
 - IF Hydrofluoric Acid = Calcium Gluconate gel
- AVOID
 - Epinephrine in local anesthesia (worsens vasoconstriction)
 - IV fluid bolus (does not improve perfusion -problem is vasospasm, not volume-)
 - Nitrates + sildenafil (PDE inhibitor, risk of severe hypotension)
 - Cigarette, OCPs (cause Hypercoagulable state > risk of thrombosis)

PEM R | 16 Y/O boy Hx of Raynaud phenomenon & frequent ischemic attacks on Daily Sildenafil, in ED w/ ischemic middle & ring finger of Lt hand, submerging hand in warm water & whole body warm but wasn't effective now in pain, having pale & cool digits, Next step = IV Epoprostenol (PGI2)

PEM R | 14 Y/O Hx of Raynaud phenomenon, on Rt Index/Ring finger w/ Hx of frequent attacks, tried immersing it in warm water, on Ex Paronychia on Index, After I&D what Tx for this infection = IV Abx

PEM R | on a cold morning w/ Oc, 18 Y/O girl w/ Scleroderma, in ED extreme pain to her hands while waiting for bus, index/ring finger on both hands became painful & white sharply demarcated area of confused, after rewarming hands, fingers begin to blush & perfuse, recommended to avoid in future = Cigarette smoking

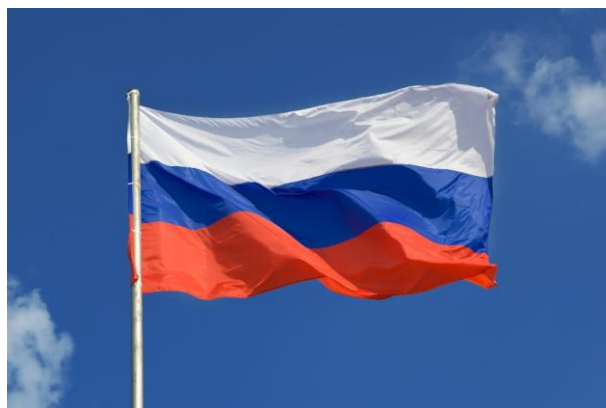
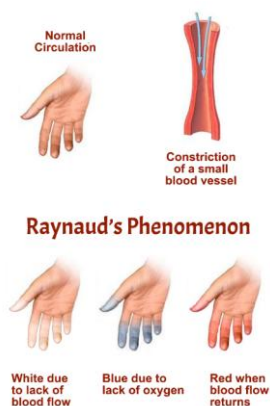
Other | 14 Y/O female with scleroderma comes to the ED with pain in both hands. Upon exam you find her hands to be pale, exquisitely tender, with a **loss of sensation** in the distal tips, There are no signs of infection. Which of the following is the most appropriate initial treatment = Apply nitroglycerin paste to the hands (Not Consult surgery for amputation nor Start high dose intra-arterial vasodilators nor Apply warm compresses to the hands nor Administer an oral calcium channel blocker)

- Dry gangrene (Hint known Scleroderma)

Final | Scleroderma Pt., came w/ pain & pale tips of finger w/ delay CRT 3-4 sec, immediate Management = Nitroglycerin or Warm compress (Depend on Q, Not Infiltration vasodilator nor Plastic consult for amputation)

Final | Raynaud phenomena w/ Loss of sensitivity & pallor = Warm (unsure, I think answer is Nitroglycerin)

Final | Ca gluconate gel (Raynaud phenomena) and Hydrofluoric acid



Chapter 2: Medical

- Polyarteritis Nodosa

PEM R | 8 Y/O 1 month Hx of Fever/Malaise/Abdomen pain/Rash, UA proteinosis, BP 138/88, Lacy rash, diffuse abdomen tenderness, initial Tx = Corticosteroid

- FMF = AR, Recurrent on/off Fever 1-3 Days + Abdomen Pain + High AST/ALT + Erysipelas rash | Tx Colchicine
- MHT = AD, Procedure + Trigger (Anesthesia/NM Blocker) > Sudden Deterioration + Fever | Tx: D/C Trigger + Dantrolene

- Familial Mediterranean Fever

- Info: AR, AKA Familial Paroxysmal Polyserositis/Familial recurrent Polyserositis
 - In Armenians, Turks, Levantine Arabs, and Sephardic Jews
 - Diagnosis based on Clinical Pattern + Family Hx + Response to Colchicine
- Path: MEFVJ in chromosome 16 Mutation > Produce Pyrin (AKA Marenostin; protein)
 - > Responsible for the regulation of PMN inflammatory response & Interaction w/ TNF/IL-1/Other Cytokines
 - Some have only 1 MEFV gene or none, prompting researchers to invx. other possible loci or mediators for this
- Sx: Before 10 Y/O
 - Recurrent Cyclic Fever Lasting Hours- 5 Days
 - Can 3-5 days Every month or Several times a year for another patient
 - Severe Abdomen Pain
 - Erysipelas Like Rash in Ankle
 - Pleuritis, Pericarditis
 - Scrotal Swelling
 - Arthritis/Arthralgia, Myalgia
- Complication: Amyloidosis (High concern in untreated individuals)
- Invx: During Acute Attacks ONLY: High WBC, High ESR, High CRP, High Fibrinogen
 - Diagnostic test: Genetic Study (> 50% of Pt., but not all gene defects have been identified)
- Tx: Colchicine Daily (Treats Acute attacks, Prevents Future attacks & Development of Amyloidosis)
 - Side effect: Diarrhea, Bone Marrow Suppression (particularly if renal disease is present)
 - Colchicine Prevents Amyloidosis in all patients & Prevents attacks in 65% of patients with FMF
 - Increasing dose to 2 mg/day BID Prevents attacks in 95% of Pt.
 - IL-1 Targeted Meds (Being used to treat Pt. W/ Refractory Disease To Colchicine)

Pedz | 4 Y/O, Girl, came to hospital w/ Recurrent Fever today 3rd day of Fever cycle, has Abdomen pain, 3rd time this year w/ similar illness, on Ex (Pic of Leg red rash -Erysipelas like-), Next = Start Colchicine

Pedz | Boy, Recent Abdomen pain, Fever, High AST/ALT = Familial Mediterranean Fever or Cyclic Neutropenia (Incomplete Q)

Pedz | Child w/ on & off Fever, Abdomen pain, High Liver Enzymes, No specific cause found, Dx = Mediterranean Fever

Pedz | 3 Y/O, boy w/ recurrent episodes of Fever and Severe abdominal pain that lasts 1-3 days for one year duration, Sometimes these episodes associated with erythematous tender skin rash at dorsum of the foot (erysipelas like rash), What is the most likely Dx = FMF or Hyper ID periodic fever syndrome (fever duration attack 3-7 Days)

Promo | Picture of Appendicitis, Labs/US Normal appendix, pt. Still symptomatic Dx = FMF

Chapter 2: Medical

Arthritis

- Septic Arthritis = Kocher (Non-Wt bearing, Fever > 38.5, WBC > 15, ESR > 40, CRP > 2.5)
- Rheumatic Fever = > 10 Days | CCENA (Carditis 60%, Chorea, E Marginatum, S Nodule, Arthritis) | Tx: NSAIDs Respond well
- Reactive Arthritis = < 10 Days | Arthritis + Conjunctivitis + Urethritis, Carditis 6% | Tx: NSAIDs Respond not well
- Transient Synovitis = ~3 Days | Arthritis + NO Fever

- Rheumatic Fever

- Path: Post-Group A β -hemolytic streptococcal pharyngitis (autoimmune cross-reactivity)
- Jones Criteria:
 - Major: (CCENA)
 - Carditis (MR w/ Apical Systolic or Pansystolic 3/6 Murmur -most common-, AR 2nd)
 - Sydenham Chorea (5-10%) -with Mono joint involvement is enough to diagnose for RF- (most specific of strep. > RF)
 - Sudden 4-6 wks (up to 6 months) after strep pharyngitis.
 - non-stereotypic tics and chorea, emotional lability, inattentiveness
 - Erythema Marginatum (1%) (Pink-Red macula with clear area in center, Becomes notable by warm exposure)
 - Subcutaneous Nodules (<1%)
 - Migratory Painful Poly-Arthritis (Heals without deformity then transfer to other joint)
 - Mono-Arthritis is a Major Criteria in Mod-High Risk Population
 - Minor:
 - Arthralgia, Fever, $\uparrow$ Acute phase reactants (WBC, ESR, CRP)
 - Prolonged PR (> 0.2) or QT interval, Past Hx of Rheumatic fever
- Post URTI 14-21 Days > Rheumatic Fever, Evidence of ASO Titer, Pos. Throat C/S of GAS or RAST
- Once Confirmed or Suspected Rheumatic Fever do Echo w/ Doppler (Damage of Pericardium/Myocardium/Mitral valve)
- Labs: ASO, Echo (shows Mitral/Aortic Involvement)
 - Diagnosed solely on acute chorea (Modified Jones criteria)
- Prevention:
 - IF suspect GAS Pharyngitis Give PO Penicillin for 10 days within 9 days of onset Even if C/S negative for GAS
 - GAS pharyngitis such as peritonsillar abscess or cervical adenitis, Starting Abx is effective in preventing Acute RF
- Tx: Treatment Course Penicillin
 - IM PCN G Benzathine: < 27kg 600,000 units | > 27kg 1.2 Million units
 - PO PCN V: <27kg 250mg BID or TID for 10 days | > 27kg 500mg BID or TID for 10 days
 - PO Erythromycin: for 10 days
- Post Treatment Prophylaxis
 - IF No Carditis: Penicillin for 5 Years
 - IF Carditis: Penicillin for 10 Years or until 40 Y/O
 - Aspirin (Mild Carditis) = 80-100mg/kg/day minimum 6 weeks tapering over 2-4 week
 - Steroids (for Mod-Sev Carditis) = Prednisone 2mg/kg/day
 - IF Arthritis:
 - NSAIDs (Rebound unusual small joint Involvement if taken and stopped inappropriately)
 - Aspirin 80-100mg/kg/day minimum 6 weeks tapering over 2-4 week
 - IF Chorea: Benzodiazepines or Haloperidol (for Chorea)

Chapter 2: Medical

PEM R | 7 Y/O girl in ED after multiple visit to hospitals over last week, Last 10 Days having worsening Sx of random jerky twitch of face/arms/legs/clumsy gait, began on Lt & now bilateral, progressed to difficulty feeding herself & unable to write in school, Sx resolve in her sleep, in school inattentive & crying, CBC & Non-Contrast CT normal, school & all sibling had URTI 6 weeks ago, mother gave homeopathic remedy, Dx = ASO titers & Echo

PEM R | 8 Y/O, Girl, fever/body aches, mother was upset as PCP not taking concern seriously, 2 wks prior had Sore throat PCP said viral infection, having elbow/join pains, having II/VI systolic murmur, has organomegaly, swell/warm & decreased motion of knee/ankle, Next = Obtain ASO

PEM R | 9 Y/O girl, no known allergy, in ED w/ Fever/SOB for several days, recent immigration from Fiji 1 month ago, 2 wks ago developed Sore throat which improved, now Fever/Fatigue/Dyspnea, Temp 38.5 HR 130 RR 38 BP 90/50 SpO2 96% on RA, Rales both lungs & high pitched 2/6 blowing systolic murmur on apex, Rt. Ankle & wrist tender/warm /mild swell, next step = Obtain Echo

PEM R | 8 Y/O having joint pain w/ swell for 2 weeks, had it in knees/elbows/shoulders, Hx of viral illness w/ Sore throat/Fever several weeks ago, Now No Respi/GI Sx, but warm swollen knee joints, to confirm Dx = Pansystolic apical cardiac murmur

PEM R | 8 Y/O girl, Indiana without any travel Hx, Joint pain/Fever for 2 days, 3 weeks prior had febrile illness w/ sore throat didn't seek medical care & resolved in 3 days, Now Temp 39.1 HR 120 RR 20 BP 110/70, Moderate ill w/ well defined non pruritic erythema w/ serpiginous borders on Eric-MCH & inner thigh w/ swollen warm erythema on knee, ECG = Prolong PR

Final | Scenario about chorea, describes abnormal movement affecting writing, disappears during sleep, Dx = ASO titer & ECG

- Rheumatic Fever: CCENA (Chorea, Carditis, EM, Nodules, Arthritis)
- Sydenham chorea: Involuntary movement worse w/ activity/stress & decrease w/ rest, disappears during sleep

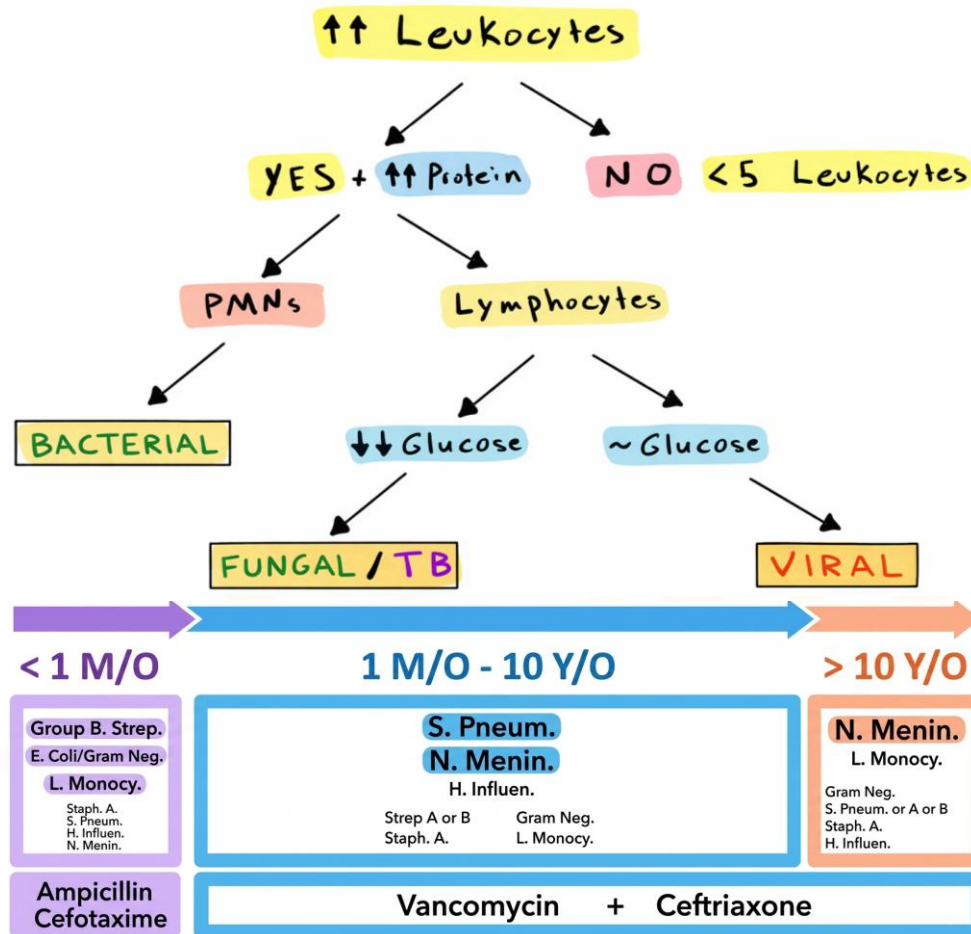
Final25 | 6 Y/O healthy presented with multiple visits to different hospitals, with abnormal unilateral movement. Now progressed to be bilateral, with dysphagia and difficult writing in school. The symptoms resolve during sleeping, Labs and CT normal, next step = ASO, Echo (Not EEG nor Lumber puncture C/S)

Chapter 2: Medical

Infectious Disease

Disease based

CNS Infections



- Meningitis

o CSF Findings:

- Viral = Lymphocytes WBC 10–500 | Normal/High protein | Normal glucose
- Bacterial = Neutrophils WBC 1,000–5,000 | High protein | Low glucose
- TB = Lymphocytes WBC 100-500 | High protein | very Low glucose
- Fungal = Lymphocytes WBC 50–500 | High protein | Low glucose

o Complication:

- Viral: No sequelae
- Bacterial: SNHL (Especially w/ H. Influenza) > Seizure

o Organisms & Abx

- Gram-positive lancet-shaped diplococci = Strep pneumoniae = Cefotaxime or Ceftriaxone
- Gram-positive cocci in chains = Group B Strep (S. agalactiae) = Cefotaxime or Ceftriaxone
- Gram-positive small rods/coccobacilli = L. monocytogenes = Ampicillin or Bactrim or Mero
- Gram-negative bacilli = E. Coli = Cefotaxime or Ceftriaxone or Mero
- Gram-negative diplococci = Neisseria meningitidis = Cefotaxime or Ceftriaxone
- Gram-negative coccobacilli = H. influenzae
 - Beta lactam Pos = Ampicillin or Ceftio or Ceftra
 - Beta lactam Neg = Ceftio or Cefepime or Mero

Chapter 2: Medical

PEM R | 8 Y/O unvaccinated, having fever/severe headache/phophobia, Temp 39.4 HR 125 RR 24 BP 110/60 Ill, Blood sugar 80, CSF cloudy, opening pressure 30cm, WBC 2500/hpf N 84% L 10%, CSF glucose 25 mg/dL protein 100 mg/dL, Gram positive cocci in pairs/chains, IV Tx = Ceftriaxone & Vancomycin

PEM R | 10 Y/O vaccinated, having listlessness/fever/headache/neck pain for 2 days, has blood sugar 105, LP CSF WBC 500 N 11% L 70% RBC, glucose 70, protein 55, Gram stain negative, True = Full recovery without significant sequelae

Promo | Child presented with Fever, irritability upon Ex you noticed Blanchable rash, his CSF (wbc 570, Neutrophil 40%, high protein, normal Glucose) what lab test further to confirm Dx = CSF PCR Assay (Not CSF bacterial culture nor CSF viral serology)

Promo | 5 M/O w/ Meningitis, appropriate Abx = Cefotaxime + Vancomycin

Amal | 5 M/O infant, irritable febrile, refuses formula, not active, bulging fontanelle, high WBC, CSF: wbc 500, high protein and high glucose, C/S Gram positive Diplococci, What antibiotic to start = Vancomycin + Ceftriaxone

- Meningitis Abx < 1 M/O = Ampicillin + Cefotaxime | > 1 M/O = Ampicillin + Ceftriaxone
- IF Gram positive Diplococci always Ceftriaxone or Cefotaxime
- Indication of Adding Vancomycin = Sick, VP shunt, Immunocompromised

- Meningococemia, Triad: Sudden High Fever | Hemorrhagic rash (DIC) | Bacteremia (Shock)

- Path: N. Meningitidis > Adrenal hemorrhage (Sx: Hypotension>Shock, Rash) = Meningococemia
- Ax: Terminal Complement defect, Congenital immune defect, Functional asplenia (All invasive meningococcal)
- Triad: Sudden High Fever | Hemorrhagic rash (DIC) | Bacteremia (Shock), Types:
 - WFS -Few hours- (Waterhouse-Friedrichsen Syndrome) [Life threatening]
 - Sx: Adrenal hemorrhage > Shock
 - High fever, Red Rash, Weakness, Vomiting, Severe headache
 - Chronic -Weeks to Month-
 - Fever, Muscle, Joint pain and Rash ALL ON & OFF + maybe ↑ Spleen
- Tx: Ceftriaxone (Covers N. Meningitidis)
- Purpura Fulminans
 - Cause: Neisseria Meningitidis (Most common), Strep, Staph, Varicella,
 - Ax: Meningococemia (15-25%)
 - Sx: DIC + Skin thrombi > Skin necrosis > Gangrenous necrosis involving SC, Muscle, Bone
 - Tx: AVOID blisters unroofing (as increase risk of 2ndry infection), Instead: Isolation, IV fluids, Blood C/S, Systemic Empiric Abx, Topical skin care

Promo | Meningitis case brought by EMS, C/S Grew Gram Neg. Diplococci, Hx of contact w/ students in class, mom, brothers, who will get Prophylactic Abx = All Contact within 2 days before and 1 day after Abx started

Promo | Child w/ fever seen in private hospital, transfer to you w/ non-blanchable petechiae in lower abdomen, Next = Isolation & LP w/ Abx (Not D/C w/ PO Abx nor Blood C/S Abx)

Amal | 14 M/O old irritable but nontoxic boy present with fever 40 and URTI, urticaria lesion and non-blanching petechia on lower abdomen, you sent for labs Next step = Immediate respiratory isolation with antibiotic and full septic work up

- Peripheral petechia = no worries (? Viral)
- Any petechiae from nipple line or below = Meningococemia until proven otherwise
- Order prophylaxis for family & all team

Final | Child have fever seen in private hospital and transfer to you there non blanchable petechial in the lower abdomen what to do = Isolation & LP & Antibiotics

Final25 | 4 D/O born at home no prenatal care mother has PROM, patient came lethargic and hypoactive and bulging anterior fontanelle (Septic) which organism = Strep agalactiae meningitis (Not Strep pyogen meningitis nor Staphylococcus aureus nor E coli meningitis)

Chapter 2: Medical

- Brain Abscess

- Brain abscess occur between 4-8 Y/O
- Transmission:
 - Contagious (Sinusitis, VPS infection, Dental infection)
 - Hematogenous (CHD)
- Organisms: Gram Positive organisms dominate Brain Abscess, Strep. Pneumonia dominates Meningitis),
 - Neonatal Sepsis/Meningitis w/ these organisms have high chance of Brain Abscess: Citrobacter species (including C koseri), Serratia marcescens, Proteus mirabilis, Cronobacter sakazakii
- Sx: Fever, Headache at side of Abscess, Seizures, Focal deficit
- Invx: CT, MRI w/ Contrast, LP (High protein, Pos. Only in 10%)
- Tx: Empirical Cefotaxime/Ceftriaxone + Vancomycin + Metronidazole

PEM R | 12 Y/O girl had SZ given intranasal Midaz by EMS, known CKD w/ baseline Cr 1.2, recently having headache/nasal congestion/fever/tooth pain, last week, on day of SZ had photophobia, now somnolent & minimal response to pain, Febrile Hypotensive & stiff neck, Ceftriaxone ordered, what other best Tx = Metronidazole & Vancomycin

- Complication: Tooth Infection > Abscess spread > Meningitis w/ Intracranial Abscess

- Pott Puffy Tumor (Subperiosteal abscess)

- Osteomyelitis or Subperiosteal abscess
- Ax: Frontal sinusitis
- Complications: Brain Abscess/Empyema, Venous Sinus Thrombosis (as a post Sequelae treatment)
- Invx: Brain MRI w/ contrast (Gold standard)
- Tx: Surgical drain
 - Broad Abx 4-6 wks (Clindamycin)

PEM R | 10 Y/O 1 week Hx of bump on forehead, initially thought to be insect bite, given Amox for 3 days however increasing in pain/size/tenderness also has Hx of nasal congestion 1 month ago w/ occasional headache, denies fever/vision change/vomit, most common risk factor ax w/ this Dx = Sinusitis

PEM R | 14 Y/O girl came w/ aunt concern of mass on head increasing in size for 1 week, had chronic sinus congestion w/ 1 prior surgery of deviated septum at 12 Y/O, on fluticasone PRN, having low grade occasional mild/low grade fever/headache, has 7cm mass on Forehead soft/mild tender/erythema, = Subperiosteal abscess

PEM R | 11 Y/O Headache for days, treaded for subperiosteal abscess, including surgery/abx, f/u w/ NSx in OPD, used migraine meds for headache w/ mild Sx improvement but occasional vomit, CT brain without contrast post OP was reviewed at OPD, No Focal deficits Afebrile, no meningismus/neck pain, scalp wound clean/dry/intact, sequela strongly w/ this pt = Venous Sinus Thrombosis (In Q they did CT Brain without contrast, patient needs CTV or MRV to diagnose it)

PEM R | 14 Y/O Female, Headache/Fever/Forehead Swell, Nasal congestion/Fever/Frontal headache for 2 weeks, developed swell on Forehead over few days, Temp 39.2 HR 135 BP 110/48, awake/oriented, has 2x2 cm firm non Fluctuant tender swell, negative Kerning/Brudzinski, CT IV contrast (shows subperiosteal abscess & intracranial epidural abscess) = Urgent Surgical consult & Admit for IV Abx

PEM R | 10 Y/O 2 weeks worsening nasal congestion, thick nasal discharge/cough/headache/Fever/Lethargy/Photophobia for 3 days, Now ill appearing, having swollen nasal mucosa, tenderness of frontal sinus w/ swell Forehead, which is now worse/swelling more, Best imaging Dx = MRI Brain w/ Contrast

- Osteomyelitis w/ Subperiosteal abscess (Potts puffy)
- Ax: Sinusitis (Frontal)
- Complication: Brain Abscess/Empyema

Chapter 2: Medical

- Discitis

- Typical < 10 Y/O, Infection or Inflammation of intervertebral disc space or adjacent vertebral endplates
- Organism: Staph. Aureus
- Sx: Sudden onset of back pain & refusal to walk
- Gradual Limp, Refusal of Walk/Sit upright
 - Poorly localized Back/Hip/Abdomen pain
- NO Trauma, Fever Absent (25% present only)
Radicular Sx (pain, numbness, and weakness)
- Invx: MRI (Best to differentiate discitis from vertebral osteomyelitis)
 - Bone scan (Most sensitive early test)
 - XR (usually normal but may show in 2-3 wks narrow intervertebral disc space)
 - ESR/CRP Mild elevation
- o Tx: IV Abx (Ceftra + Clinda or Nafcillin), Self limiting, Rest

PEM R | 5 Y/O boy, w/ limp & back pain for several weeks, Antalgic gait, Now unable to walk, No Hx of Fall or Trauma, or weight loss, has Low grade fever 37.8 but other vitals normal, lower back stiff/painful w/ forward flexion & diffuse lower spine tenderness, Full range of motion on Hips/knees/ankles, WBC 12 ESR 60 CRP 40, imaging study = MRI lumbar spine w/ IV contrast

PEM R | 6 Y/O developmental delay female, w/ back pain 2 weeks worse w/ spine flexion, 6 days limp, vague tenderness lower thoracic spine to sacrum, decreased ROM of back, Neuro ex baseline, AP/Lateral XR of spine normal, Diagnostic = Bone scan

PEM R | 4 Y/O boy, having Low grade fever, back pain, decrease activity, has tender lumbar spine & refuse touching toes, has ESR 30 mm/hr, Lumbar XR has narrowing intervertebral space L3-4, MRI show inflammation of disc at L3-4 interspace, Abx should cover = Staph A. & Kingella Kingae

- Spinal Epidural Abscess

- o Organism: Staph. A. (Most common)
- o Risks: DM, IV drug use, recent back surgery, immunodeficiency, endocarditis, bacteremia
- o Sx: Fever Back spine pain, Neuro deficits
- o Invx: High ESR or CRP, MRI (Diagnostic)
- o Tx: IV antibiotics, spine surgery consultation for drainage
 - AVOID steroid in drug abuse related abscess
- o Typical Scenario:
 - DM + Back pain + Fever + Neuro deficit (paresthesia) = Spinal Epidural abscess (Staph A.)
 - Heroin drug abuser + Back pain = Spinal Epidural abscess
- o Back pain Red flags (TUNA FISH):
 - Trauma
 - Unexplained weight loss
 - Neurological Sx
 - Age > 50
 - Fever
 - IV drugs user
 - Steroid use
 - Hx of Cancer

PEM R | 14 Y/O diabetic w/ tactile fever/pain radiating to Lt leg w/ tingling sensation in Lt foot, Temp 38 HR 96 RR 16 BP 116/76 mild tenderness to palpation of midline lumbar spine, Normal strength/sensation/good sphincter tone/gait, WBC 18 CRP 6.5 ESR 90, Next = Order MRI of spine

PEM R | 16 Y/O male, previously healthy, having Lumbar back pain w/ Fever for 7 days, now having shooting both legs pain, admits using IV heroin occasional, Temp 38.2 HR 95 RR 20 BP 110/70 SpO2 99% on RA, tender L4-L5 without erythema/swell, positive straight leg raise test, No weakness, XR lumbar unremarkable, WBC 14.5 N 80% ESR 70, Next step = MRI of spine w/ IV contrast

Chapter 2: Medical

Neck Infections

- Lymphadenitis

- Acute: *S. aureus*, *S. pyogenes*, oral anaerobes (recent dental procedure), tularemia (papular lesion)
- Subacute/chronic: mycobacterial, fungal, *B. henselae*
- Invx: US or CT
- Tx: $\pm$ Abx depending on severity & Ax Sx (if febrile, ill might require
 - Surgical drainage or excisional biopsy if no response
- Acute unilateral Cervical lymphadenitis w/ Fever & ill appearing require IV Abx,
- Checking for dental carries/abscess would change abx choice

PEM R | 4 Y/O girl w/ Fever/Neck swell for 3 days, refusing to move neck 2ndry to pain, swell over Rt. Side of neck under chin in 1 day, Febrile/ill w/ 3cm tender large fluctuant mass, soft/mobile/erythema, while determining ideal course of Tx, what would guide Abx choice = Exam of Oropharynx

PEM R | 3 Y/O girl, progressive swelling/redness/tenderness, to Rt. Neck for 3-4 days, having low grade fever, but eating/drinking normally, on Ex 4cm edema/erythema/tenderness/warmth at Rt. Anterolateral cervical neck aspect, unremarkable others, Next step = Obtain US of neck soft tissue

- NTM (Non-Tuberculous Mycobacterium)

- < 5 Y/O (mostly), Chronic > 2-4 weeks Unilateral or Submandibular Lymphadenitis, Not improving on Abx
- Sx: Asymptomatic despite Non-tender 2-4cm Paper like Thinning of overlying skin Violaceous/Purple
- Invx: PPD & CXR (1st step to distinguish from TB, NTM will be negative)
 - Culture of excision (Definitive)
- Tx: ENT OPD (for Surgical excision, AVOID I&D)
 - Abx (clarithromycin + ethambutol or rifampin
Considered if excision is incomplete or recurrent disease, or patients where surgery is not feasible
 - Anti TB not effective

PEM R | 4 Y/O male in ED in Miami, having Lt submandibular neck mass noticed 1 month ago, treated w/ oral Cephalexin & warm compress without improvement, remains fever free & no change in weight, has 2cm tender deep purple discoloration thinning of skin, Next = Obtain CXR & PPD

PEM R | 5 Y/O worsening Lt side neck swell over 3 wks, give Augmentin without improvement, has 2cm swell below Lt mandible w/ overlying purple discoloration & thinning of skin, likely organism = Atypical mycobacteria

- Ludwig's Angina (Slam dunk couch Ghassan's Angina)

- High Risk w/ Dental Carries
- Organisms: **Staph. Aureus, Streptococcus (both most common causes)**
- Path: Infection Swell of Sublingual, Submandibular, Submental space originating from Dental infection
- Sx: Sick looking, Poor dental hygiene, Dysphagia, Odynophagia, Trismus,
 - Edema of upper midline neck, Edema of floor of mouth under tongue
 - RD, stridor, difficult managing secretions, cyanosis
- Tx: IV Abx + Emergent ENT (for airway management, Always assume difficult airway, needs OR)

PEM R | 17 Y/O male w/ intraoral pain, mandibular swell for 5 days, noisy breath Temp 39 BP 118/76, having stridor, halitosis poor dentition, Bleeding hyperemic gingiva, Edema of upper neck, swell of floor of mouth under tongue, imminent Tx = Respiratory compromise

Promo | 14 Y/O Girl, Hx of dental caries presents w/ progressive swelling of neck (pic of swell/redness), She has had progressive trismus, pain, and dysphagia; she is listless on your examination, Temp 39.2 C HR 142, RR 20 BP 118/78, her airway is patent,

Chapter 2: Medical

and she has no RD, Posterior pharynx Partially visible without Exudate/Erythema, Besides mild caries, there is no evidence of gingival hypertrophy or swelling, tongue appears elevated, & induration on floor of the mouth. As the ED physician, likely Dx = Ludwig's angina (Not Salivary gland abscess nor Retropharyngeal abscess nor Angioneurotic edema)

Promo | Ludwig Angina, which true = Need Abx (Not Can spread to neck soft tissue nor caused by Staph. Aureus & anaerobes)

Final | Scenario of Ludwig angina which of the following is true = Need Abx (Not It can spread to neck soft tissue or Cause by staph A. and anaerobe)

- Can be caused by Strep & Staph

Final | 5 Y/O w/ fever, tooth pain and dental caries, w/ submental & submandibular lymph node w/ limited of mouth opening = IV Abx and admission (Not Abx F/U with dental in 24 hrs nor Discharge)

Final | Case of dental caries came submandibular swelling = Admission with IV Abx and call oral surgery

Final | Dental caries, Abscess (Ludwig Angina) = IV Abx & Admission

Final25 | Dental Caries in Left mandible with palpable swelling and fluctuance surrounding teeth, not able to open mouth fully = Admit with IV Abx and oral surgery (Not I&D tooth abscess & discharge w/ F/U of oral surgery nor warm compress, oral antiseptic and F/U Dental in 3-5 days)

- Lemierre's Syndrome

- Recent Head/Neck infection (Peritonsillar abscess, etc..) > Internal jugular vein Thrombophlebitis + Sepsis
- Organism: Fusobacterium Necrophorum, Streptococcus
- Risk factors: Complication of peritonsillar abscess, pharyngitis, dental infection
- Sx: high fever, rigors, toxic-appearing, neck swelling and tenderness
- Complication: Persistent bacteremia, septic pulmonary emboli
- Invx: CT of neck, Blood C/S
- Tx: Prolong Empiric Abx

PEM R | 15 Y/O fatigue/fever/pleuritic chest pain w/ Lt side neck mass, having 2 weeks Hx of Fever/sore throat & given 10 days PO Amox without improvement, Temp 39.4 HR 130 RR 24 BP 90/50 SpO2 94% on RA, ill appearing w/ trismus, fullness of Lt soft palate w/ uvular deviation, 2x3 cm tender submandibular, neck mass, Delayed CRT, thirdly pulses, CXR Rt sided nodular opacity w/ moderate sized pleural effusion, US shows **non-compressible jugular vein**, Next = Give IVF & IV Abx

- Deep Neck Abscess

- Neck Mass Approach:
 - Sick/toxic = Admit
 - Fever + LNs = Abx & recheck 36-48h
 - Single node, well = Observe 4w
 - Malignancy (Multiple LNs 2cm or > 2 weeks) = Workup (Labs + US/CT+c)

PEM R | 3 Y/O Febrile 39.5 & neck mass increased in size over 3 days, Hx of URTI 1 wk ago given PO Amox, No Hx of Travel/trauma/exposure to cats, having persistent cough, now on Ex Firm/warm/tender mass (pic redness on mass), Best diagnostic = Neck CT w/ contrast

- Rt. Side iliopsoas Abscess

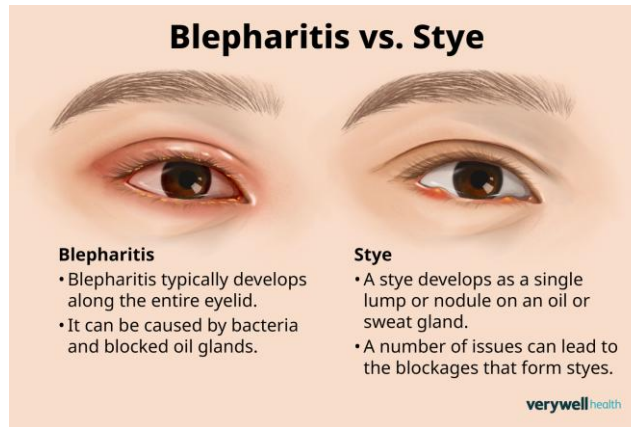
PEM R | 5 Y/O girl, Temp 39.6 HR 130 RR 22 BP 105/70, Ill Apear, w/ RLQ tenderness & worse w/ passive movement of hip, CT w/ IV contrast (Swollen on iliopsoas muscle) organism = Staph A.

Chapter 2: Medical

Optha Infections

- Blepharitis

Amal | Blepharitis is inflammation of what part = Eyelid (Not Cornea nor Choroid nor Sub conjunctiva)



- Hordeolum (Stye)

- Hordeola & chalazions are due to inflammation & infection of glands in eyelid
- Cause of Infection: Staph. Aureus
- Hordeola:
 - Types: External (Stye) = Inflammation of Hair follicle of Eyelash & adjacent glands of Zeus or Moll)
 - Internal = Inflammation/Infection of Meibomian gland
 - Sx: **Painful**, Erythema, Edema (Mostly Posterior)
 - Complication: Abscess (Overtime & localized Posteriorly on Conjunctival surface of eyelid)
 - External H = Drains on lid margin | Internal H = Drains on Conjunctival Surface
- Chalazion:
 - Obstruction of Sebaceous gland > Inflammation > Chronic Lipogranulomatous Inflammation
 - Sx: **Painless** Nodule (Posterior on Conjunctival Surface (common) or Anterior on Epidermal Surface)
 - Complication: Seborrhea, Facial Rosacea, Chronic Belpharitis
 - Chelazion = Drains on Epidermal/Conjuctival Surface
- Tx: Conservative: (Resolve in 1 week)
 - Warm compress (QDS 10-20min)
 - Eyelash scrubs (Cotton w/ diluted baby shampoo)
 - +/- Topical Abx (BID after eyelash scrub)
 - Systemic Abx (Erythromycin PO) & Optha Consult (If Failed conservative Tx)
 - PGS (IF affecting vision)

PREP EM | 7 Y/O Persistent swelling of R. upper eyelid w/ 4 wk Hx of diffuse swell/redness of mid-upper eyelid, No drainage/fever/vision changes, has been performing eyelash scrubs, applying warm compresses, & bacitracin ointment but no improvement, on Ex Firm tender 5mm nodule in middle of R. Upper eyelid, 3mm from lid margin w/o edema but w/ slight overlying erythema, BEST Next = Erythromycin orally

PEM R | 2 Y/O 4 month Hx of red bump on Rt eyelid increasing in size last 2 wks, had 6 wks trial of warm compress BID & completed Cephalexin course, no improvement, mother concern of vision, (Pic of big stye), Best next = Refer for surgery

PEM R | 10 Y/O girl, swell of Rt. Upper eyelid for 2 weeks used over the counter eye drops not improving, had previously similar swell of Lt upper eyelid, not painful (image of stye in middle), , Tx = Discharge & recommend frequent warm compress

- Hordeola = Hurt = Warm > Abx
- Chalazion = Warm unless affecting vision > Optha surgery

Promo | Case of Stye, what to do = Warm compression & Scraped

Chapter 2: Medical

Promo | 11 Y/O boy in ED w/ painful swell on his Lt. eyelid, no other systemic complaint, and no fever (pic of sty), Next = eyelash scrub with baby shampoo with warm compressors

Amal | year old boy presented to the ED with a painful swelling on his left eye (pic of sty) There is no other systemic complaint and no fever. what is your next approach = Eyelash scrub with baby shampoo with warm compressors

Final | Case of sty what to do = Warm compression and scrapping (Not Abx)



- Conjunctivitis

Promo | Girl wakes up w/ Bilateral eye redness but no discharge, prescribe for her = Antihistamine (Bilateral Viral/Allergy)

Amal | 13 Y/O, complaining of red painful eyes, tearing, lid swelling, itchy, no discharge, management = Topical antihistamine (Not Topical Abx nor Topical steroid nor Ophthalmology referral)

- Tetracaine, Cyclopentolate = Only Hospital
- Antihistamine, Abx, NSAIDs drops (in older) or systemic NSAIDs (in young) = Hospital + Home
- For Optha: Steroid = Optha

- Neonatal Conjunctivitis (Ophthalmia Neonatorum)

- Gonococcal 3-5 | 5hlamydia 5-14
- Chemical (silver nitrate): 12–24 hr after birth, mild, resolves by 48 hr
 - Tx: Supportive
- Gonococcal: 2-5 days, copious purulent discharge, eyelid edema
 - Complication: Corneal ulcer/perforation)
 - Tx: Admit + Full sepsis + IV Abx + topical antibiotics & irrigation
- Chlamydial: 5-14 days, mild–severe palpebral conjunctivitis
 - Complication: Chlamydial pneumonia
 - Tx: PO Azithromycin (topical drops only for debris, Risk of Pyloric stenosis, watch for Sx)
- HSV: variable, may have skin lesions
 - Diagnosis: Gram stain & culture; Giemsa or DFA for chlamydia
 - Tx: Admit + Full sepsis + IV Abx (Tx any Neonatal purulent conjunctivitis as Gonococcal)
 - IF Positive HSV then Acyclovir

PEM R | 9 D/O eye discharge & eyelid swell, both eyes for 2 days, getting worse, NSVD but no prenatal care, on Ex Purulent discharge/crusting, Pupils round/reactive sclera injected & pseudomembrane noted, gram stain negative, but Eye/Blood/CSF C/S sent, Tx = Admit for IV cefotaxime & PO Azithro

PEM R | 5 D/O FT girl, 2 days swell & discharge for 2 days, No prenatal care, No lethargy or irritability, Afebrile, has swollen eyelid & profuse green discharge both eyes w/ injected conjunctivae, Tx = Administer Ceftriaxone & Admit to hospital

- Ceftriaxone can be given, AVOID in: Preterm, Hyperbilirubinemia, w/ Calcium containing IV fluids

Chapter 2: Medical

- Chlamydia Trachomatis

- Chlamydia Conjunctivitis > Chlamydia Pneumonia
- Pneumonia Sx: Staccato cough (short/sharp burst of cough w/ difficult of breath)
- Tx: Azithromycin (Macrolide Ax w/ Pyloric stenosis -Sx: Vomiting-)

PEM R | 4 W/O 4 days Cough/nasal congestion, No fever/drinking well, report bursts of short coughs together, Hx of Conjunctivitis 2 weeks ago, recommend Tx for this pathogen in 1st two weeks of life Ax w/ = Pyloric stenosis

PEM R | 40 D/O, treated 2 weeks of age w/ topical Optha ointment for conjunctivitis, now cough for 10 days, likely organism = C. Trachomatis

PEM R | 11 D/O FT, Mild eyelid swell w/ watery discharge sticky adherent to conjunctiva & somewhat friable w/ occasional bloody discharge, gram stain & c/s of eye is negative, since then resolved, Now in ED 2 weeks later, complication due Abx = Vomiting

PEM R | 2 M/O foster infant w/ cough, poor sleep due to persistent cough, short/sharp cough in bursts followed with difficult breath, having intermittent eye discharge w/ occasional eye swell, next = Nasopharyngeal swab to isolate for cause of infection w/ CXR or Start Azithromycin to prevent further spread illness & admit for observation

- 5hlamydia 5-14 | Gonococcal 3-5 | IF < 6 M/O Suspected/confirmed pertussis = Admit

Promo | 9 D/O, Purulent Conjunctivitis, topical erythromycin prophylaxis given in nursery, likely cause = Chlamydia Trachomatis

Final | 40 D/O, Neonate, Purulent eye discharges, repetitive cough w/ Posttussive, vomiting, No fever, Normal S1 S2, Lungs fine crepitations bilateral, Dx = Chlamydia

Final | Bilateral Purulent Eye discharge in 7 days old what is the organism = Chlamydia

- Periorbital Cellulitis

- Tx: Augmentin
 - Trauma/Insect = Augmentin + Clindamycin

PEM R | 3 Y/O grandmother worsening Rt. Eye swell, seen for insect bite in Rt. Eyelid given bacitracin, continued swell/redness/pain occurred since, on Ex Swollen periorbital but can open eye, No proptosis, No Extraocular eye movement, Pupil reactive, Purulent drain in corner of Rt. Eye & crusting lashes, PO Meds = Augmentin + Clindamycin

- Orbital Cellulitis

- Sx: Proptosis, Periorbital edema
- Tx: IV Abx + Optha consult
- Optha consult indication (Orbital Cellulitis suspicion):
 - Age > 9 Y/O
 - Proptosis
 - Extra-Ocular movements Restriction
 - High IOP
- Surgical Drain Indications:
 - Abscess > 10mm
 - Affecting vision
 - Intracranial extension
 - Not improving w/ Abx after 24-48hr

PEM R | 4 Y/O Girl w/ Lt eye worsening swell/redness for 4 days and fever for 2 days, No trauma/injury, 3 wks ago had URTI, Now Temp 37.9 non toxic interactive, has tenderness on Lt eye w/ pain on movement, Next = CT w/ contrast

PEM R | 8 Y/O male w/ Lt Periorbital swell & Proptosis eye w/ chemosis, CT (Lt orbital cellulitis finding), what predictive of pt. Needing surgical intervention = Restriction of Extra-Ocular movement

PEM R | 9 Y/O boy Lt painful eyelid swell 2 days, No trauma, but subjective fever, on Ex erythema on Lt Eyelid, tenderness, Intact extraocular movement but pain with eye movement, WBC High, Suspicious of Orbital cellulitis = Pain w/ eye movement

Chapter 2: Medical

PEM R | 15 Y/O boy, rt. Eyelid swell, having rt. Side headache & pain around rt. Eye for 5 days, yesterday swelling/pain w/ movement of rt eye Temp 40, denies trauma/vision changes, on Ex Periorbital edema/tenderness/proptosis of Rt. Eye, CRP 13.3, CT of face w/ IV contrast done, which most indicative of surgical drain = Size of abscess

PEM R | 7 Y/O male, Hx of recurrent skin abscess, Now comes w/ 1 day Lt periorbital swell/erythema, during 1st visit given PO Cephalexin & Discharged w/ Dx Preseptal cellulitis secondary to infected insect bite, overnight temp 39.5 periorbital swell, no eye opening, worse pain, Temp 39.3, irritable/warm/swell/tender, Proptosis, Best = CT scan of Orbit/Sinus w/ IV contrast

Promo | Pt. W/ eye swelling, increased w/ time, can't examine due to difficulty to open eye, Next test = CT (w/ Contrast)

Amal | The most common cause of orbital cellulitis = Sinus infection (Not Dental infection)

- Sinus infection > Orbital Cellulitis
- Dental infection > Ludwig Angina

Amal | 11 Y/O girl with fever, periorbital swelling, decreased vision and pain with EOM, is diagnostic study of choice = Orbit CT

Final | 11 Y/O girl, w/ Fever/Periorbital swell/Decreased vision/Pain w/ EOM, Diagnostic of choice = Orbital CT

- UV Keratitis or Photokeratitis

- Path: Snowboarding or Wakeboarding + UV light > Corneal epithelium damage > slough off
- Cause: Environmental (Sun, sand, snow, water)
- Invx: Fluorescein (Punctate epithelial staining of cornea)
- Tx: similar to corneal abrasion
 - Topical Abx, PO Analgesia, Artificial tears

PEM R | 17 Y/O in Florida, now eye pain and blurry vision for several hours, were wakeboarding on nearby lake, No eye trauma, having light sensitivity & excessive tearing in both eyes w/ bilateral conjunctival injection & chemosis, Fluorescein (pic of small corneal abrasions), Next = Topical Abx, PO Analgesia, Artificial tears

- Contact lens Keratitis

- Cause: Pseudomonas
- Tx: Urgent Optha
 - Topical Moxifloxacin hourly 1st 24-48hr (4th gen Fluoroquinolone)
- Risk of contact lens:
 - Infectious keratitis (Pseudomonas, Gram Neg.)
 - Cornea abrasion
 - Corneal ulcer

PEM R | 17 Y/O girl, red eyes painful for 24hr & photophobia, using new colored contacts wearing it constantly, and not cleaning it correctly, most common cause = Pseudomonas

PEM R | 17 Y/O Rt eye pain/redness 2 days ago, worsening, normally wears contact lens, blurry vision complains on Rt. Eye, on Ex injected conjunctiva of Rt. Eye w/ Photophobia, No fever, has small spot on cornea w/ Fluorescein, Tx = Optha consult

- Contact lens Stuck

PEM R | 17 Y/O girl has contact lens stuck on Rt. Eye, she wears soft contact lens & fallen asleep on couch while wearing them, upon waking were irritating her & remove Lt but rt. stuck on cornea, on Ex cant see contact lens on visual inspection, Best way to proceed = Sweep it—upper hormones w/ moistened cotton swab

Chapter 2: Medical

ENT Infections

- Otoscopic criteria for AOM

1. Presence of a middle ear effusion + inflammation (bulging, red or yellow tympanic membrane with loss of bony landmarks or presence of an air-fluid level)
2. OR Acute perforation of TM (may see perforation or pus in the external canal)
 - Tympanic membrane (TM) erythema can be seen with fever or a viral illness but the TM will not be bulging
 - CAUTION: Patients with cochlear implants who are diagnosed with AOM should be discussed with ENT
 - Patients who are immunocompromised should be followed carefully for appropriate clinical resolution

TABLE 118.1**OPTIONS FOR THE TREATMENT OF ACUTE OTITIS MEDIA (AAP/AAFP) GUIDELINES**

Child age	Severe disease ^a	Mild or moderate disease ^b
Younger than 6 mo	Antibiotics	Antibiotics
6 mo–2 yrs	Antibiotics	Antibiotics or observation
2 yrs or older	Antibiotics	Antibiotics or observation

^a Severe disease: fever >39°C and/or moderate to severe otalgia.^b Nonsevere illness: fever <39°C and/or mild otalgia.

- AOM

- Most often infant (3-6 M/O) or young child
- Most common bacteria isolated include *H. influenzae* (nontypable), *S. pneumoniae*, and *M. catarrhalis* (there is decreased incidence of *S. pneumoniae* due to PCV13 vaccination)
- Sx: Ear pain, middle ear effusion + signs of infection or inflammation (fever, otorrhea, pus)
 - Erythema, bulge and decreased mobility of TM, purulent fluid
- Complications:
 - Mastoiditis (Pain and/or swelling over mastoid bone, often w/ outward deviation of pinna)
 - Petrous bone inflammation (Unilateral Facial N. palsy -CN VII- and/or diplopia on lateral gaze -CN VI-)
 - Sinus Venous thrombosis or Meningitis (Lethargy, irritability, persistent/severe headache CN Palsy)

- AOM Tx (Trek): Mild Sx (80% will resolve over 24-72hr, as mostly viral)

- AOM Tx: Observe without Abx for 24-48hr if:
 - Mildly ill (Alert, Responsive, Pain and/or Fever responding well to Analgesia/Antipyretics)
 - + Symptomatic < 48hr
 - + > 6 M/O
- AOM Tx: Give Abx w/ Any of the following:
 - 3-6 M/O
 - Significant Sx Despite Analgesia/Antipyretics (high fever, difficulty sleeping, severe pain, poor feeding)
 - Sx for more than 48hr
 - Acutely perforated TM
 - Bilateral AOM < 2 Y/O
- AOM Abx Therapy:
 - Uncomplicated = Amoxicillin 90 mg/kg/day PO BID for 10 days (< 2 Y/O) or 5 days (>2 Y/O)
 - Perforated = Amoxicillin 90 mg/kg/day PO BID for 10 days (All ages) + Take C/S
 - Penicillin allergic = Cefuroxime or Macrolide
 - Refractory = Augmentin 60 mg/kg/day BID for 10 days or Ceftriaxone 50 mg/kg/day for 3 days (Refractory = Tx Failure/Recurrence: Persistent pain and/or fever after 48hr or AOM in past 30 days)

Chapter 2: Medical

PEM R | 4 Y/O Female w/ persistent Lt ear pain/fever 39 after given high dose of Amox for AOM, on Ex Lt TM opacified/bulging w/ mild erythema, Tx = Augmentin for 7 days

PEM R | 27 M/O w/ 3 days Fever/URTI/Lt Ear tugging w/ purulent drainage, Tympanic membrane w/ perforation, Tx = PO Abx for 10 days

PEM R | 12 M/O prev healthy having Temp 38.4 for 1 day, denies fussy/ear pulling, No allergy, comfortable, has bilateral bulging tympanic membrane, parent comfortable not starting Abx & follows w/ PCP, according to AAP best Tx = Amox

Promo | 2 Y/O Girl High dose Amoxicillin (80mg/kg/d) for AOM, in ED crying of pain, persistent fever but no ear drainage, knowing epidemiology of persistent Otitis media, Best Abx = Augmentin

Amal | 4 M/O, pulling his ear, febrile 39.2, O/E Signs of OM, management = Start Oral Antibiotics (Not CBC, Blood c/s, IM Cefotaxime nor CBC, Blood c/s, oral antibiotics)

- Otitis Externa (OE)

- Definition: Inflammation/infection of external auditory canal, sometimes extending to the pinna or tympanic in other words Otorrhea w/ pain on movement of Pinna/tragus, without systemic symptoms
- Organism: Pseudomonas aeruginosa (most common), Staph. A
- Sx: Ear pain (otalgia) worsens w/ manipulation of auricle or tragus
 - Pruritus, Otorrhea (purulent or serosanguineous)
 - Hearing loss (Conductive)
- Risk Factors:
 - Swimming / water exposure (Swimmer's ear, Severe type of OE)
 - Trauma from cotton buds, scratching, hearing aids, or earplugs
 - Removal of protective cerumen (due to micro abrasions > allow bacterial entry)
- Complications:
 - Conductive hearing loss, Otitis media, Cellulitis (extension beyond canal), Perichondritis, Parotitis
 - Facial nerve paralysis (rare but serious)
 - Malignant (Necrotizing) otitis externa
 - Severe, invasive infection of external canal + skull base
 - Risk: Immunocompromised (e.g., diabetes, HIV)
 - Organism: Pseudomonas aeruginosa (almost always)
 - Complication: Cranial neuropathies, Osteomyelitis
- Malignant OE = Immunocompromised (DM) + Severe persistent ear pain w/ granulation tissue in canal

PEM R | 16 Y/O girl swimmer w/ severe Rt. Ear pain, worsening past few days w/ swell/drainage from ear, No URTI, on Ex non-toxic, ear canal swollen/erythematous, Tympanic membrane cannot be visualized, large purulent material in canal, severe tenderness w/ movement of tragus, has periauricular erythema & periauricular enlargement w/ Cervical nodes, in addition to pain control & wick placement, Tx = PO Cipro & Otic Neomycin-Polymyxin B-Hydrocortisone

PEM R | 14 Y/O competitive swimmer w/ worsening Lt ear pain/drainage, pain w/ Lt ear manipulation, external ear canal has erythema/swollen/filled white debris, which is severe/potentially fatal complication of this = Malignant OM

- CSOM (Chronic Suppurative Otitis Media)

- CSOM: painless otorrhea from a previously ruptured TM or myringotomy tube
- Chronic effusion: TM usually retracted, dull or amber-colored and no new ear pain

Amal | 4 Y/O Hx recurrent OM, now has cough & rhinorrhea, mother mentioned that he speak 2 words & asks for hearing assessment, Ex Rt. tympanic membrane shows white sac like shiny greasy & foul smell = Cholesteatoma

Final | 6 Y/O boy with history of recurrent ear infection, poor hearing came for ENT evaluation, O/E tympanic membrane showed white sack w/ yellowish discharge, what is your Dx = Cholesteatoma

Chapter 2: Medical

- Mastoiditis

- Organism: Strep pneumonia, Strep Pyogenes, Fusobacterium Necrophorum, H. Influenza, Staph. A.
- Ax: preceding acute otitis media (Most commonly complication)
- Sx: fever, Otagia, Retro Auricular Swell/Tenderness
 - Erythema and protrusion of the external ear
- Complication: Meningitis > Abscess, Hearing loss
- Invx: clinical, CT Mastoid bone (confirm diagnosis)
- Tx: Admission & IV Abx (Ceftriaxone, Clindamycin)
 - Non-recurrent AOM > Mastoiditis = IV Vancomycin
 - Recurrent AOM/Failed Multiple Abx > Mastoiditis = IV Vancomycin + Anti-Pseudomonas Cefepime or Tazocin

PEM R | 4 Y/O girl, fever/jaw pain/irritable for 2 days, had URTI w/ ear pain 5 days ago started on Amox for OM, still having persistent fever 39, with x2 vomit, Now Temp 39.1 HR 150 RR 24 SpO2 99%, appears tired but cooperative, bulging tympanic membrane filled w/ purulent yellow fluid, (image show swelling peri & post auricular), known complication of this disease = Dural Sinus Thrombosis

PEM R | 16 M/O girl w/ recent Dx of AOM, parent saying gotten worsen 8 days into a 10 days Augmentin, Temp 39.3 HR 130 RR 24 tympanic red/bulging, Face asymmetric in that Rt. Pinna seems more anterior than Lt pinna, tender/erythema behind right ear, Abx important = Tazocin (Not Ceftriaxone or Clindamycin or Vancomycin)

PEM R | 18 M/O female Hx of Otitis media for 3 days w/ Fever & Lt ear swell, Temp 39 tenderness over bony prominence behind ear, likely diagnosis = Otitis media w/ Mastoiditis

PEM R | 6 Y/O Lt ear swell, 1 week prior Dx w/ Bilateral OM on Amox, having 3 days increasing Lt ear pain & headache, Temp 39.4 HR 110 RR 20 BP 115/70, having bulging/red Rt. Tympanic membrane & unable to visualize Lt tympanic membrane due to copious discharge, has marked tenderness over Lt retroauricular area, CT (image of abscess on Lt side), in US what most common complication of this = Subperiosteal Abscess

- USA = Subperiosteal abscess | Worldwide = Sigmoid sinus thrombosis

PEM R | 18 M/O girl, ED worsening fussiness, Rt. Ear pain, given high dose Amox for AOM, parent reports continued fever & new protrusion of Rt. Ear, on Ex Opacified bulging rt TM w/ erythema/swell behind Rt. Ear which true regarding Dx = Complication include Meningitis

PEM R | 8 Y/O girl, having Rt. Ear pain for 5 days mother decided to do watchful waiting rather than Rt. Ear sided pain/fever (image shows swell behind ear) = Obtain CT of Mastoid bone

Promo | Complication of Mastoiditis = Meningitis (Not Hearing loss nor Vision loss)

Promo | 3 Y/O Male, in ED w/ Fever, Treated for AOM 4 days back w/ Amoxicillin w/ poor compliance, now persistent fever, on Ex (Pic of Mastoiditis), likely Dx = Mastoiditis (Not Cellulitis nor Cervical LN nor Otitis Externa)

Amal | 6 Y/O in ED w/ Rt. OM & displacement of his right pinna inferiorly and anteriorly. There is some erythema and tenderness in the post-auricular area, likely Dx = Acute mastoiditis (Not Peri auricular cellulitis nor Severe Right OM nor Parotitis)

Amal | 5 Y/O girl has Rt ear pain for 1 week treated with oral antibiotic but pain continues with fever no systemic manifestation, local examination (image of swell behind ear), most likely Dx = Mastoiditis

Amal | (for above Q) What is the Expected complication = Meningitis

Final x2 | Complication of Mastoiditis = Meningitis

Final | Case of Post OM came w/ Swelling & 6th nerve palsy & redness behind ear, Dx = Mastoiditis

- Mastoiditis > Dural sinus thrombosis
- Cellulitis around nose/eye > Cavernous sinus thrombosis

Chapter 2: Medical

- Perichondritis & Chondritis

- Organism: P. Aeruginosa 95%
- Risk: Piercing, Minor trauma w/ DM, Post drain of Auricular Hematoma
- Sx: Pain/Swell/Redness
- Complication: Abscess
- Tx: Ciprofloxacin, 4th gen Cephalosporin (Cover Pseudomonas & Staph. A)
 - IF Abscess ENT Drainage

PEM R | 8 Y/O Pain/Swell of Rt. Pinna after recent piercing, warm/erythematous/fluctuant mass on Rt pinna around earring, true Dx = Complication include cartilage necrosis

PEM R | 13 Y/O Diabetic w/ Rt. Ear pain/swell on swimming team, having pain few days, blood sugar within normal, well appearing, with normal vitals, Mild erythema of canal, Tx = Give PO Ciprofloxacin & arrange close F/U

PEM R | 16 Y/O Girl, erythema/swelling/drainage at site of ear piercing, was done 2 days ago, not febrile, after removal of piercing note purulent discharge, erythema, Next step = Start on PO quinolone & arrange for close F/U

- Needs Pseudomonas coverage

- Sinusitis

- Sx: Pain/Pressure on Forehead or Cheeks
- Dx: Clinical
- Complications:
 - Orbital, Periorbital Cellulitis, Orbital Subperiosteal abscess
 - Septic Cavernous sinus thrombosis, Meningitis, Epidural/Subdural abscess, Brain abscess
 - Osteomyelitis w/ Subperiosteal abscess (Potts puffy)

PEM R | 12 Y/O male, nasal congestion for 2 weeks ax w/ thick green nasal discharge, keeping him at night, headache, fever 39 for 3 days, Hx of Reflux & Asthma, cough persists despite salbutamol, appear tired but not toxic, tenderness along frontal & maxillary sinus when palpated, appropriate to confirm Dx = Clinical findings

PEM R | 12 Y/O frontal headache after getting off plane, Hx of seasonal allergy on cetirizine regularly, No RD, Normal tympanic membranes, SpO2 98%, Tenderness over frontal area w/ palpation, no nasal drainage, clear lungs, Neuro no student, Next = Administer Oxymetazoline nasal spray (Allergic Sinusitis)

Promo | 6 Y/O w/ headache & Hx of previous prolonged cold symptoms, Mother now noticed his eyes looks slightly plugging, most likely complication of = Sinusitis (Not Allergic Rhinitis)

Promo | Most common cause of referring pain to ear = Trigeminal N. Irritation (will cause Referred ear pain)

Amal | 9 Y/O boy, Ear pain, rhinorrhea, no fever, normal otoscopy, most common non-otogenic cause of ear pain = Sinusitis (Not TMJ dysfunction nor Bell's palsy nor Otitis externa)

Final | 9 Y/O old boy w/ ear pain, rhinorrhea for weeks, no fever, Ear Normal, common cause of non otogenic pain = Sinusitis

- TMJ > Headache
- Sinusitis > Referred ear pain
- Labyrinthitis & Aspirin = Tinnitus

Chapter 2: Medical

- Parotitis

- Sx: Swelling obscuring mandible
- Viral: Coxsackie, Echo, EBV, Influenza, Mumps, HIV
 - If immunized less likely Mumps
- Bacterial: Staph. A. (Severe pain to touch, erythema, purulent drainage)
- Sx: Hx of Flu > Swelling of superior angle of mandible
- Invx: US (to confirm, enlarged heterogenous structure w/ many round hypoechoic foci)
- Tx: Viral = Warm compress, Analgesia, Sialagogues
 - Bacterial = PO Clindamycin

PEM R | 12 Y/O immunized w/ worsening Rt. Sided jaw swelling for 2 days, on Ex. Firm/Mild tender swollen Lower Rt. Jaw & pre-auricular area, obscuring angle of mandible, w/ overlying erythema/warmth, etiology = Coxsackie

PEM R | 5 Y/O girl, acute onset of Lt sided facial swell/pain, Recently had Fever/congestion/body aches w/ rapid flu positive, Today No fever, but Facial swell/pain on Lt Masseter muscle superior to angle of mandible, has a small filling noted on Lt lower molar w/ no gum pain or erythema, No Pus on stenson duct, US shows enlarged heterogenous structure w/ many round hypoechoic foci, Tx = Discharge w/ warm compress, analgesia, sialagogues

PEM R | 8 Y/O 3 days Rt. Side jaw swell/pain, complains pain w/ eating but no difficult swallow/breath, No Fever/Trauma, Immunized, has swollen/tender over angle of mandible, no carries, you suspect parotitis, imaging to confirm = US

- Acute Pharyngitis

- Centor Criteria
 - 1 = Age 3-14
 - 1 = Temp > 38
 - 1 = Absence of Cough/Rhinorrhea/Hoarseness/Oral Ulcer
 - 1 = Swollen/Tender Cervical LN
 - 1 = Tonsillar Exudate/Swell
- Tx:
 - < 2 = Nothing
 - 2-3 = RADT + C/S
 - > 4 = Abx

PEM R | 7 Y/O Headache/cough, having nasal congestion 1 week ago, worsened in past 3 days & now thick nasal discharge, Fever & persistent daytime cough, Next = Abx w/ Augmentin

Promo | Pt. Came w/ Cough, Lymphadenopathy, Ex Exudate, no fever, Rapid antigen test negative, Next = Do nothing (Not Do swab w/ no Abx nor Do swab w/ Abx)

Amal | 5 Y/O, Temp 39 and bad sore throat for two days, no runny nose or cough is history of intermittent epigastric pain, but no vomiting. You did the throat exam (image of follicular Tonsilitis), So you took a throat swab for culture and sensitivity. What's your next plan of treatment = Oral penicillin v k 50 milligram per kilo per day 14 days (Not Await the culture results and treat according. Nor No antibiotics as a viral cause is the most common cause. Nor Oral azithromycin 10 milligram per kilo per day for three days)

- x1 dose Penicillin G 1,200,000 unit IM once for adult = 10 days Oral Penicillin V
- x1 dose Penicillin G 600,000 unit IM once for Peds = 10 days Oral Penicillin V
- Allergic to penicillin then Azithromycin

Final | RAT negative centor criteria (age 3-14, no cough, fever, LN.. <2 none, 2-3 rat and c/s, 4rx)

Chapter 2: Medical

Dental Infection

- Dental Abscess

- Tx: PO Augmentin or Clindamycin
 - IV Clindamycin (IF Ill looking, extensive, rapid progressing)
 - Dental extraction of teeth (to relief abscess)

PEM R | 10 Y/O girl, Lt sided facial swelling & pain for 3 days, worsened, No Fever No difficult breath/swallow, on Ex (image of cheek swell), CT face shows odontogenic infection Lt primary maxilla canine tooth Ax peri-apical abscess w/ widespread Lt facial cellulitis, Most Tx = Consult oral surgery for emergent extraction of infected tooth, I&D of abscess

PEM R | 5 Y/O Lt sided facial swell worsened over past day, had been complaining of typeface for 1 week, hasn't had time to see dentist, on Ex Red/warm/swollen, Not toxic, has mild swell Lt mandibular region w/ erythema/warm/tender/edema of Buccal mucosa, Tx = Clindamycin PO & OPD Dental

Final25 | Poor dental with unilateral swelling, fluctuating mass next to the molar not improved after NSAID and worsening next step = Urgent Dental referral and IV Abx (Not Oral Augmentin nor IV Abx nor I&D in ER with dental follow up in 24 hours)

- Alveolar Osteitis (Dry socket)

- 1-3 days Post extraction deep dry socket
- Sx: Dry Deep socket & bone (sometimes visualized)
- Tx: Analgesia, Dental/OMF referral for extraction of irritant debris or packing

PEM R | 17 Y/O Rt. Lower mouth pain, Hx of all 4 wisdom teeth extraction 3 days, pain was controlled till yesterday worse pain on extraction site, on Ex no bleed or discharge but on all wisdom teeth sites had pink formed blood clots in sockets except for Rt. Lower which has deep socket w/ no clot or active bleed or drainage, Pain medication & surgery consult, Diagnosis = Alveolar osteitis

- Necrotizing ulcerative gingivitis (Trench mouth or Vincent Angina)

- Sx: Mouth ulcer w/ Hx of chewing Tobacco use
- Tx: Penicillin, Augmentin, Clindamycin

PEM R | 15 Y/O male chewing tobacco for 5 years, having mouth pain for 2 days Temp 38.1 HR 80 RR 16 BP 115/80 diffuse hyperemic & bleed gums w/ gum loss appear punched out w/ halitosis, in addition to dentist & oral hygiene, what Abx = Penicillin

Chapter 2: Medical

MSK Infections

- Septic Arthritis

- Organism: **Staph A. (most common)**, GBS (< 3 M/O)
H. Influenza B (comes in unvaccinated but still less common), Gram negative (Neonatal period)
- Sx: Fever, Joint pain w/ Decreased ROM
- Kocher: x1 = 3%, x2 = 40%, x3 = 93%, x4 = 99%
 - Non bear weight
 - Temp > 38.5
 - ESR > 40
 - WBC > 12
- Invx: Arthrocentesis (Area Supra lateral (preferred) & Supra medial)
 - Dx: WBCs > 50,000/μL (Diagnostic) w/ > 75% PMNs
 - Increase Sensitivity: WBCs > 25,000/μL
- Tx: IV Abx, Joint drainage, Ortho consult
 - < 2 M/O (Cover: GBS, Gram Neg. Bacilli) = Cefotaxime & Vancomycin
 - 2 M/O – 5 Y/O (Cover Staph. A., Strep pneumoniae, GAS, Kingella kingae) = Clindamycin
 - +/- Ceftra (if ill or K. Kingae or Neg. For gram positive cocci)
 - > 5 Y/O (Cover Staph. A., Strep pneumoniae, Neisseria gonorrhoeae) = Clindamycin + Ceftriaxone

PEM R | 3 Y/O Rt. Leg pain for 3 days inability to bear weight for 1 day, Febrile 38.5, No swell/bruise/skin abnormality, slow range of hip, moderate pain & refuse to bear weight on Rt. Leg, WBC 11 ESR 30, probability by Kocher = 40%

PEM R | 4 Y/O boy, fever/difficult walking for 2 days, URTI w/ fever 1 week that resolved, since yesterday has been fussy, Temp 39 HR 160 RR 24 BP 88/60 ill looking, Rt. Leg flexed abducted & external rotation, refuse any movement to Rt. Lower limb, Labs taken, image to confirm = Hip US

PEM R | 4 Y/O Lt Hip/Fever 2 days, on Ex laying on attendee w/ Lt hip flexed & externally rotated, Decreased ROM Lt hip due to pain & refuse stand/walk, Hip XR Lt hip effusion, Next = Order CBC, Blood C/S, CRP, ESR

PEM R | 7 Y/O boy prev healthy vaccinated, painful Rt. Knee denies trauma Temp 38.6 HR 100 RR 20 BP 100/60, Warm/swell/red of Rt. Knee w/ extreme pain w/ ROM & unable to walk, has Lab High CRP/ESR/WBC, C/S of joint fluid show = Staph. A.

PEM R | 8 Y/O girl, Red painful Rt. Knee, 39.3 unable to bear weight, High WBC/ESR/CRP, what landmarks = A & C (Area Supra lateral (preferred) & Supra medial)

PEM R | 12 M/O girl, progressive worsening of Lt hip pain/fever for 3 days, No Hx trauma/skin lesion or other Sx, Temp 39 HR 160 RR 32 BP 110/60 uncomfortable/crying, Holding Lt hip flexed/abducted/externally rotated, screams w/ movement of Lt hip, WBC 22 CRP 105 ESR 80, XR normal, US moderate Lt hip effusion, Best to confirm = Aspiration of effusion

PEM R | 6 Y/O Male w/ increasing Lt knee pain/Swell for 3 days, well appearing, decreased ROM, Temp 38.1, Arthrocentesis shows high WBC in synovial fluid, culture pending, Empiric Abx = Clindamycin

Promo | 15 M/O Rt. Knee swell/Fever/Refuse to walk, Redness/Limited ROM of Rt. Knee, XR widening of joint space w/ soft tissue swell, best statement describes etiology & Abx = Staph. Aureus, IV Vancomycin

Promo | 2 Y/O Septic arthritis scenario Knee swell/redness/tenderness, previously healthy & up to date vaccination, causative organism = Staph. Aureus (Not Strep. Pneumoniae)

Promo | 2 Y/O presented with history of acute hip pain with refusal to bear weight and fever (Septic Arthritis scenario) which of the following investigations is most likely showed abnormalities in next 2 hr = C-reactive protein (Not Pelvic x ray nor Blood C/S)

Promo x2 | 11 M/O boy, has Osteomyelitis involving Metaphysical area of bone is at increased risk of developing septic arthritis in ipsilateral joint due to organism spread to joint space by traversing blood vessels extending from Metaphysis to Epiphysis, Age these vessels disappear thereby reducing risk of both Osteomyelitis & Septic Arthritis = 1 Y/O

Amal | Risk of septic arthritis in a case of osteomyelitis due to spread through vessels, what time these vessels disappear = 1 Y/O

Amal | Febrile toddler w/ swollen, erythematous Lt knee, cries when touched or moved, XR show significant soft tissue swelling and widening of the joint space, but no bony abnormalities are noticed, ESR 60, causative organism in this patient = Staphylococcus aureus (Not H. Influenza B -if not vaccinated maybe- nor GAS nor Strep pneumonia)

Chapter 2: Medical

Final | Osteomyelitis can spread to the joint space up to age of = 1 Y/O

Final | Septic arthritis which to more abnormal in next 2 hr = ? CRP

Final | 1 M/O had Hx of trauma 1 week ago during exam is irritable w/ moving upper limb (he has Pseudo paralysis) XR normal what to do = Admission for investigation (Not referred to ortho nor discharge and F/U after 1 week)

- Infant Pseudoparalysis + Hx of Trauma = Septic Arthritis or Osteomyelitis

Final25 | Febrile, WBC >15K, high CRP and ESR, US pic (shows Hip effusion ? septic arthritis) what to do = Urgent Aspiration under guided us before Abx (Unsure if not Abx IV immediately and aspiration tomorrow. Nor NSAID and discharge. Nor MRI to differentiate septic form reactive)

- Joint Aspiration (Arthrocentesis)

Amal | Which of the following techniques of joint aspiration is correct = Elbow, lateral elbow in the center of the triangle formed by head of radius, lateral epicondyle, and olecranon process

Joint	Approach	Key Landmarks			
Shoulder	Posterior approach	- Posterior tip of acromion - Humeral head	Knee	Parapatellar approach	- Tibial plateau - Midpoint of medial or lateral patella
				Suprapatellar approach	- Superomedial or superolateral border of patella - Suprapatellar bursa
	Anterior approach	- Coracoid process - Humeral head		Infrapatellar approach	- Inferior border of patella - Patellar tendon
Elbow	Lateral/radial approach	- Olecranon process - Lateral epicondyle - Head of radius	Ankle	Anterolateral approach	- Ankle joint line - Lateral malleolus - Extensor digitorum longus (EDL) tendon
	Posterolateral approach			Anteromedial approach	- Ankle joint line - Medial malleolus - Extensor hallucis longus tendon - Tibialis anterior tendon
Wrist	Dorsal approach	- Lister's tubercle on distal radius - Extensor pollicis longus tendon	MCP/MTP/IP	Dorsal approach	- Extensor tendon - Appropriate joint space

- Osteomyelitis

- Contiguous spread: post-traumatic, postsurgical, ulcerative wounds
- Hematogenous spread: children, vertebral disease, sickle cell disease
- Most common organism
 - General: **Staphylococcus Aureus**
 - Sickle cell: Staph. Aureus, Salmonella
 - < 4 Y/O + No culture growth: Kingella kingae
 - < 3 M/O: GBS (Streptococcus agalactiae)
 - Cat or dog bites: Pasteurella multocida
 - Vertebral: S. aureus
 - Post-traumatic: polymicrobial
 - Postsurgical: S. aureus, S. epidermidis
- Complication: DVT
- Invx: Diagnosis
 - X-ray: Early Lytic/Sclerotic findings & Late After 10-14 days Bony destruction & Periosteal reaction
 - MRI or other imaging (e.g., CT, bone scan) may be needed to confirm the diagnosis
- Tx: long-term antibiotics, IV Ceftra + Vanco (for MRSA)

Chapter 2: Medical

PEM R | 10 Y/O having 2 week progressive Rt. Hip pain, no trauma, had fever prior to hip pain, now localized tenderness over Rt. Hip w/ decreased ROM due to pain (XR shows: Neck of femur radio-lucent area), True regarding this = Deep vein thrombosis is well described complication

PEM R | 8 Y/O girl w/ 2 week Hx of Fever/Worse Lt foot pain after sustaining penetrating injury nail to foot wearing sneakers & MRI shows Lt distal 2nd metatarsal osteomyelitis w/ abscess, IV Abx = Tazocin

PEM R | 12 Y/O male w/ intermittent fever for 4 days, Rt. LL pain worse in 2 days & knee swell for 1 day, No Trauma on Ex non toxic, Focal tenderness of Proximal Rt. Tibia w/ joint effusion of knee, having a limp, has High WBC/CRP/ESR, (MRI showing Osteomyelitis), Next = Immediate IV Abx

PEM R | 5 Y/O Rt. Heel pain for 10 days, No trauma, took Cephalexin for Impetigo lesions on Rt foot, over last days having tactile fever/heel pain, refuse to bear weight since yesterday, Focal tenderness over Rt. Calcaneus, No swell/Fluctuance, XR No bony issue, Best imaging = MRI of Rt. Foot

- Osteomyelitis of Rt. Calcaneus, Risk skin infection > Osteomyelitis

Promo | 3 Weeks w/ Osteomyelitis, organism = Staph (Most common of all pathogens in all ages)

Final | 3 W/O w/ osteomyelitis what is organism = Staph (unsure, Not GBS nor strep)

Final | Osteomyelitis = IV antibiotics +/- surgical debridement

- Flexor Tenosynovitis (Hand Emergency)

- Cause: Human Bite (Hand Emergency)
- Kanavel Tetrad: Tenderness on tendon sheath, Flexed posture w/ finger at rest, pain w/ passive extension of digit, fusiform swelling of finger
- Prevention: Copious irrigation
 - Careful assessment of deep structures (joints, tendons, foreign body -teeth fragment-)
 - AVOID bite closure, except on face b/c of cosmeses
 - Abx (to cover Oral flora)
 - Augmentin (Choice, Covers Aerobic, Anaerobic, Eikenella corrodens)
 - Clindamycin (if Allergic to Augmentin) + Tazocin (to cover Eikenella corrodens)
- Tx: Drainage in OR (Requires copious irrigation, debridement along affected tendon sheaths)

PEM R | 8 Y/O Rt. Middle finger pain & swell w/ Hx 5 days ago pet chinchilla bite him on palmar aspect of finger, within 2-3 days having redness/swell to finger, given Clinda PO in urgent care, but over last 48hr having worsening of swell, No Fever/Other joint pain, Has Rt. Middle finger moderate swell & partially flexed w/ Marked pain w/ passive extension, worse over MCP, Best step = Surgical intervention by Pediatric Ortho

Promo | Scenario about toxic Synovitis = ?? Transfer Synovitis

- Transient Synovitis

- Peak 3-10 Y/O, Self limited non-pyogenic inflammation of synovial of unknown cause mostly Post URTI
- Sx: NO FEVER, Joint Swell, Internal/External Hip/Groin Pain/Tenderness
 - Referred to medial thigh or knee, Limping + Refuse to walk
- Invx: ESR, WBC Normal, U/S (Joint widening)
 - Dx of Exclusion (after Hx/Ex/Labs/XR AP + Frog leg)
- Tx: NSAIDs

PEM R | 4 Y/O male, Rt. Hip pain 3 days & limp for 2 days, **No Fever**/Trauma, No focal tenderness or bilateral LL, has Antalgic gait & bearing more wt on Lt compared to Rt. Lower extremity, Next = Obtaining bilateral hip XR

- R/O Perthes then if negative assume Transient Synovitis and give NSAIDs

PEM R | 5 Y/O girl worsening Rt. Side limp for several days, No Hx of trauma, had URTI several wks ago, **No fever**, vitally stable, no tenderness or swell having discomfort of gentle internal/external rotation of Rt hip, antalgic gait, POCUS rt hip has visualize small effusion, WBC 10.5 CRP 2 ESR 30, Next = Ibuprofen & Discharge

Final | Child w/ limping he has had **low grade fever** & URTI, exam show fixed hip flexed with internal rotation lab normal = Reassurance and discharge (unsure if not hip us)

Chapter 2: Medical

Skin Infections

- Cellulitis

- Uncomplicated cellulitis without abscess = GAS (most common) = Amox or Augmentin or 1st gen cephalixin (cover MSSA)

PEM R | 10 Y/O girl prev. Healthy in ED 1 day after discharge as Lt lower leg cellulitis, given 3 doses cephalixin without difficulty, she is been afebrile but cellulitis worsening & ankle swollen more w/ pain & painful bearing weight, erythema spread on distal margins of line drawn by previous admission, US ankle (normal), Next = Discharge home to continue cephalixin

- Cellulitis, Abx didn't give it effect yet as needs 48-72hr

PEM R | 2 Y/O large abscess to buttocks, 4cm fluctuant w/ surrounding 3cm circumferential ring of induration/warm/erythema, after I&D & PO Abx, Best choice = Clindamycin (Cellulitis w/ Abscess)

PEM R | 6 Y/O girl, prev. healthy, rash on forearm, No Hx of skin/soft tissue infections in family, she is Afebrile non toxic, 3cm warm/erythema/tenderness on Volar spawned of Lt forearm w/ Mild shotty axilla LN, Bedside US show increased Echogenicity of SC tissue w/ hyper-echoic fat lockers separated by hypoechoic fluid filled areas (Cobblestoning), Abx = Penicillin

Promo | Arm redness, hotness but no fluctuance, vitally stable (pic of cellulitis) Next = PO Abx (Not US nor Reassure & D/C)

- Impetigo

- Impetigo honey crusts Non bullae = Strep. Pyogenes | Impetigo honey crusts flaccid bullae = Staph A.

- Non-Bullous Impetigo

- Organism: Staph A., Strep. Pyogenes

- Bullous Impetigo

- Organism: **S. aureus** (bullous form due to exfoliative toxin A and B), MSSA, MRSA
- Clinical diagnosis, Common in infants and young children; highly contagious but limited to the skin.
- Path: Exfoliative toxins from S. aureus target desmoglein-1 > intraepidermal splitting & bullae formation
Direct contact or autoinoculation from other infected sites
- Child Sx: Bullea Face/Trunk/Diaper/Limbs
(Fragile, flaccid bullae rupture easily > leave erosions w/ honey crusts)
 - Afebrile, well appearing, regional LN
- Infant Sx: Staphylococcal Pustulosis (Infants type) w/ widespread bullea lesions
- Invx: C/S or gram stain
- Tx: Mild localized = Mupirocin 2% ointment TID 5-7 days
 - Widespread = PO Clindamycin (1st choice, Covers MSSA/MRSA)
 - Systemic = IV Vancomycin or Clinda
- Admission:
 - Toxic/systemically ill appearance
 - Extensive skin involvement
 - Concern for staphylococcal scalded skin syndrome (SSSS)
 - Neonate (<2 weeks) or immunocompromised infant

PEM R | 9 W/O FT, C-Section, Varicella immunized mother, having localized rash in Rt. Axilla, Afebrile, feeding well, no change in sleep, Temp 37.1 HR 140 RR 40 BP 94/48, Taznack prep negative, gram stain of fluid in blisters show Gram positive cocci in cluster, C/S sent, Tx = PO Clindamycin & D/C w/ close OPD

PEM R | 18 M/O w/ 10 day Hx of rash of face (in nose) cheeks/chin similar lesions, large blister which drain & become crusty & don't heal, No Fever, No other Sx, Tx = Topical Mupirocin

Promo | Statement correct (pic of Impitigo ? 2014 Q79) = Local Abx for uncomplicated cases is enough (Clinda used for PO)

Amal | 5 Y/O boy present with (the picture) Which of the following is accurate regarding this skin infection = Topical antibiotics is the treatment of choice for uncomplicated localized Impetigo (Impetigo possible 1-3 weeks gets PSGN)

Chapter 2: Medical

- Necrotizing Fasciitis

- Hallmark Necrotizing fasciitis = Fever, Rapid progressive painful firm edema w/ little overlying skin erythema
- Types: Polymicrobial, Monomicrobial, Sea water
- Tx: Surgical debridement

PREP EM | 12 Y/O in Ed Hx of falling and scrapped her leg 2 days ago w/ Lt. leg pain & erythema, had some drainage and went to PHC and given PO Abx, then visited ED w/ Temp 38.5 HR 120 BP 100/62 RR 20 SpO2 98, on Ex PHC physican drawn line on erythema site 1 hour ago and now it is past the line, she has pain on slight touch, unable to walk, CRT delayed, sensation intact, Abx fluid resus analgesia initiated, BEST Next = Emergency surgical consult

PREP EM | 5 Y/O arm swell, pain, developed chicken pox after chicken pox party 3 weeks ago, no new lesions for past 2 days, but today High fever, swell/faint tenderness/crusted lesion of Lt arm, fever persisted, painful swell, Temp 40.8 HR 173 RR 32 BP 73/42 SpO2 96% RA, CRT 4 sec, listless, marked edema ill defined faint erythema w/ tender papule around given broad Abx, Best next = Consult surgical specialist

PEM R | 6 Y/O immunodeficiency Lt lateral neck pain, skin breakdown discoloration area below mandible extending posteriorly towards ear, crepitus of soft tissue, now Temp 38.2 HR 140 RR 20 BP 70/30 SpO2 100% on RA, best Tx = IVF Resus & broad IV Abx

Promo | 5 Y/O Erythema Rt. Arm w/ induration started on Abx after 2 days came to ED no improvement, erythema extended to forearm & shoulder, severe pain when you touch area, Next step = Call surgery for debridement (Not Switch Abx -Nec Fasciitis)

- DDx Cellulitis, Erythema Nodosum, Nec Fasciitis (especially if severe pain)

Promo | Young Pt. Has severe thigh pain, 4 days ago had Laceration above knee, no current redness or swelling, when trying to examine she screams of severe pain, Temp 40, Tachycardic, Borderline Hypotensive, Next Action = Antibiotics & Surgical Debridement (Not MRI nor Reassurance & Analgesia)

Final | Forearm abrasion 4 days came with erythema induration = ? US (Similar question, dx NEC fasciitis and the answer is surgical debridement)

- Erythema nodosum

Final | 5 Y/O with history of URTI came with painful rash on lower leg involving anterior shins of tibia, (erythema nodosum pic), Dx = Erythema nodosum (Not multiform or Migrans)

Final | Picture of Erythema Nodosum = Ibuprofen

Final | Pharyngitis the rash in the anterior shins no other symptoms = Ibuprofen

- Viral Myositis

Amal | 4 Y/O difficulty walking, only standing on tip of toes or crawling he had URTI 1 week ago with fever, Ex looking well, bilateral lower limb pain, calf muscle tenderness to palpation, no clonus, most appropriate initial diagnostic procedure is = Serum CK (Not ANA nor LP nor MRI Spine)

Final | Calf muscle pain, high CK viral Myositis, Associated w/ which virus = Influenza B

Chapter 2: Medical

GI Infections

- Diarrhea

PEM R | 17 Y/O girl, Diarrhea/Abdomen cramping since 8 days after traveling to South America, denies N/V, she is tired but non toxic or dehydrated, denies using meds, what would indicate need for stool study = Bloody/Mucous containing stool

- Traveler's diarrhea 4-14 days

Promo | 2 Y/O w/ AGE, reviewing Hx 20 other kids in daycare have same illness, following them after 1 wk all of them improved, Most likely Organism = Adenovirus (Not Rotavirus nor Coxsackievirus nor Staph. Infection)

Amal | 6 Y/O a 24-hour history of clear, watery diarrhea She developed fever in the past 12 hours and She has complained of stomach ache and stool mix with blood, and it seems to go away when she has a bowel movement, but no vomiting. She has a history of sickle cell disease, but this is not similar to some of our previous episodes of abdominal pain she used to have the most likely reason for lower GI bleeding is infectious. What etiology would be most likely = Shigella -Bloody + Tenesmus: pain will go away after passing stool- (Not Campylobacter nor B. Clostridium nor Salmonella -goes w/ SCA usually-)

Amal | An outbreak happened at nursery, you are examining child 1 out of 8 of total 20 baby in a classroom, who presented to ER with vomiting, diarrhea, fever for 2-3 days, the patient recovers after 1 week, what's the most likely causative organism = Adenovirus (Not Enterovirus nor Rhinovirus nor Rota virus)

- Sporadic = Enterovirus
- Outbreak in school = Adenovirus
- Rota comes below < 2 Y/O

Final | Case of diarrhea improved with solid food again with liquid and attend day care = Adenovirus (unsure if not: Rotavirus)

Final | 8 M/O, daycare with AGE, organism = Adenovirus

Final | Zinc in Tx of AGE =

- In low outcome area: Malnourished children > 6 M/O + ≤ duration of diarrhea

- Spontaneous Bacterial Peritonitis

- Causes: Nephrotic Syndrome, Liver Failure
- Sx: (Peritoneal inflammation signs)
 - Rebound tenderness (also percussion tenderness)
 - Guarding, Avoid motion/keeps hip flexed
 - Distended abdomen & decreased/absent bowel sound
- Neonate Sx: Abdomen tender + Peritoneal signs + Vomit = Suspect NEC
- Tx: Paracentesis: SBP Indication for Diagnostic/Therapeutic
 - Ascetic tap: WBC > 500, Neutrophil > 250, on Peritoneal dialysis Neutrophil 50
 - +/- Local vanco
- Nephrotic Syndrome + Peritoneal Sx = SBP = Paracentesis

PEM R | 14 Y/O Hx of nephrotic syndrome in ED w/ 2 days Fever/Abdomen pain/vomit no diarrhea, Temp 39 guarding/diffuse/tenderness, WBC 26 82% neutrophil, Next = Perform Paracentesis

GU Infections

- UTI

Promo | 2 Y/O Girl w/ Fever 39 for 3 days w/ No other findings, Next step = Urine Analysis & Culture

Promo | Specific Lab for UTI = Nitrite

Promo x2 | 2 M/O came with picture of Bronchiolitis, dipstick WBC 4 RBC 4 Nitrite Positive, what is the Dx = Gram negative UTI (Not Viral hemorrhagic cystitis)

Chapter 2: Medical

Promo | Which considered positive Urine C/S = Suprapubic sample 500 E. Coli (Not Urine bag sample > 100,000 E. Coli in 3 M/O nor Suprapubic sample Staph Epidermidis nor Cath growth 1000)

Promo | 2 M/O boy, w/ high grade fever but looking well, most common infection = UTI

Amal | Most accurate statement for UTI = Combination of Leukocyte & Nitrates in dipstick is both Sensitive & Specific for UTI

Amal | Healthy 7 weeks, fever 40, test to show source of infection = Cath urine sample

- Highest infection at that age UTI
- ≥ 2 M/O (≥ 60 D/O) can give PO Abx for UTI
 - PO Cefixime (1st choice)
 - PO Augmentin

Amal | 9 Y/O in ED w/ 3 days Hx of red urine, no previous similar episodes, no history of trauma, fever, skin infection, or throat infection RBC is 300 hpf no cast, +1 protein, what should be ordered initially = Urine C/S

- Common cause of hematuria (Gross & Microscopic) is UTI

Amal | 7 Y/O girl 1 day Fever 38.9, Hx of previous encephalopathy, seizure disorder, recurrent UTI, on continuous intermittent Cath, meds include Bactrim prophylaxis, Ventolin & Atrovent, Urinalysis > 100 WBC, positive LE & nitrates, Best PO empiric Abx till C/S result = Ciprofloxacin (Not Amoxicillin nor Bactrim nor Nitrofurantoin)

- Fit for > 7 Y/O because risk of urosepsis
- Use of prophylactic Abx as therapeutic is considered a last option so it does not get resistant then it cant be given as prophylaxis anymore

Final25 | Case of UTI, Nitrite positive Leukocyte +2, Correct statement = The result is 80-90% sensitive (Not 98-100% sensitive nor 70-80% sensitive)

Test	Sensitivity	Specificity
White blood cells (micro)	74%	86%
Leukocyte esterase (dip)	79%	87%
Nitrite (dip)	49%	98%
Either leukocyte esterase-positive or nitrite-positive (dip)	88%	79%
Both leukocyte esterase-positive and nitrite-positive (dip)	45%	98%
Gram stain (micro)	91%	96%

Routine STI Screening:

- Boy & Boy = Annual = Chlamydia T., N. Gonorrhea + HIV + Syphilis
- Boy & Girl = Annual = Chlamydia T., N. Gonorrhea + HIV
- Girl = Annual = HPV (Starts at 21-25 Y/O)

Vaginal Discharges

- Purulent, Boy-Boy = Chlamydia Trachomatis > Doxycycline
- Green, Sexual Assault = Neisseria Gonorrhea > Ceftriaxone
- Yellow-Green, Malodorous = Trichomonas Vaginalis > Metronidazole
- White-Grey, Fishy (Amine) = Gardnerella Vaginalis (Bacterial Vaginosis) > Metronidazole (x5 vaginal x7 PO)
- White, Odorless, Thick = Candida Vulvovaginitis > Miconazole

Genitalia ulcers

- Genital Painful ulcer + Pos. LN = Chlamydia Trachomatis (Lympho-granuloma venereum)
- Genital Painful ulcer + Neg. LN = HSV
- Genital Painless ulcer + = Syphilis
- Genital Painless Warts (Cauliflower) + Mouth = HPV (Condyloma Acuminata)

Chapter 2: Medical

- STI (Sexually Transmitted Infection)

- Invx: NAAT (r/o Neisseria Gonorrhea/Chlamydia Trachomatis)
 - Dark-Field Exam (r/o Syphilis)
- Sexually assaulted Guidelines:
 - Laboratory testing (NAAT, etc)
 - Hep. B vaccine (if not already immunized)
 - HPV for age 9 - 26 Y/O (if not vaccinated yet, considered up to 45 Y/O)
 - Levonorgestrel
 - Discussion HIV post exposure prophylaxis
 - Empiric Prophylactic Antibiotic to cover
 - Ceftriaxone = Neisseria gonorrhoeae
 - Azithromycin = Chlamydia trachomatis
 - Metronidazole = Trichomonas vaginalis

PEM R | 10 Y/O Girl, mother vaginal discharge, mother suspect. Sexual abuse by 21 Y/O male cousin visited 1 week ago, child reported to mother for him touching her private parts, not had menarche, no vaginal bleed/abrasion/laceration/ecchymosis, has scant/thin/grey/clear vaginal discharge at introitus, Next = Test for Bacterial Vaginosis/Gonorrhea/Chlamydia/Trichomoniasis

PEM R | 17 Y/O girl w/ 3 days vaginal spotting, had positive Gonorrhea, Trichomoniasis, vaginal spotting resolved, Tx = IM Ceftriaxone, PO Azithromycin, PO Metronidazole

Final25 | 12 Y/O, victim of sexual abuse came to emergency after examination and sample taken what Prophylactic antibiotic = Ceftriaxone and Azithromycin (Not Ceftriaxone and doxycycline nor Doxycycline nor Metronidazole)

- Bacterial Vaginitis

- Risk: STI, Poor hygiene
- Sx: malodorous vaginal discharge
- Organism: Gardnerella Vaginalis
- Amsel Criteria 3 out of 4: (White Fishy > 4.5 Clue cells)
 - White/Grey watery discharge, (Amine odor)
 - Fishy/Malodorous vaginal discharge before/after Pos. whiff test after KOH (10% Potassium hydroxide)
 - Acidic Vaginal Ph > 4.5
 - 20% clue cells on wet mount
- Tx: **Metronidazole 500 mg PO twice daily for 7 days**
 - or Metronidazole gel 0.75% (5 g) PV daily for 5 days
 - or Clindamycin cream 2% (5 g) PV at bedtime for 7 days
 - **Partner = No need to treat**

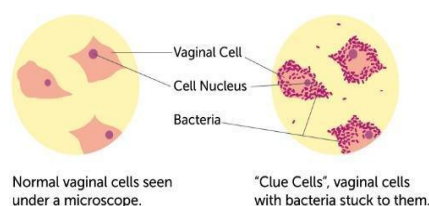
PEM R | 18 Y/O girl, foul grey vaginal discharge w/ irritation over 1 week, active sexual, using ring birth control, last menstrual 2 weeks prior, whitish discharge, Wet prep 30% clue cells, Ph 5.5, has neg. whiff test w/ KOH, meds = Metronidazole BID for 7 days

PEM R | 5 Y/O girl having dysuria but no itching or discharge or bleed, no Hx of UTI, UA negative, no sick contact, on Ex (image of redness of all vaginal area), Next = About detergents, bubble baths, irritant

- Bubble bath = causes irritation, vulvovaginitis
- Pinworm = mis-interrupted in pre-schoolers = as dysuria | in older = itching

Final | Bacterial Vaginosis Dx (Clue white vaginal discharge), Tx = Metronidazole

Final | Teenage girl with foul smell white discharge from vagina microscope showed, Clue cells = Bacterial vaginosis



Chapter 2: Medical

- Trichomoniasis Vaginitis

- Causal organism: Trichomonas vaginalis
- Sx: Asymptomatic (> 50%), Abnormal-smelling discharge, pruritus, dysuria in sexually active person
 - Frothy, green or yellow discharge, petechiae on cervical mucosa (strawberry cervix)
- Dx: NAAT most sensitive
 - Wet mount: flagellated, motile, pear-shaped organism
 - Elevated vaginal pH (usually > 5)
- Tx: Metronidazole 500 mg PO twice daily for 7 days (preferred)
 - or Tinidazole 2 g PO single dose
 - Partner = Treat, Refrain from sexual activity until 7 days after last antibiotic dose

PEM R | 17 Y/O girl w/ boyfriend 17 Y/O having burning/purulent vaginal discharge, bad odor for 2 days, having dyspareunia after intercourse, yesterday done UA & Pregnancy test was negative for chlamydia & gonorrhea, on Ex Erythema of vaginal mucosa w/ puncture cervical hemorrhage, frothy green-yellow discharge, and best test = NAAT

Neonatal Infections

- Congenital HSV

- Neonatal HSV most common at 1st 3 w/o
- Sx: Localized skin/eye/mouth or Localized CNS w/ Fever & alter LoC or Disseminated
- Invx: HSV PCR (diagnostic), ALT (early sign of disseminated disease)

PEM R | 10 D/O boy having rash/clear drain from Lt eye, Temp 34.5, vesicular lesions on face/chest/inner lip, conjunctival injection w/ clear discharge on Lt eye, sleepy doesn't arouse easily, For Hypothermic neonate Full sepsis w/ LP, what is the most helpful to determine disseminated infection = ALT

PEM R | 10 D/O, rash on scalp (vesicular rash with honey crust), spread along scalp, eating well, sleeps well, no fever or cold Sx, parent state baby had small scratch from scalp monitor at birth near site of rash, next = obtain IV access & perform full sepsis workup

- Congenital syphilis

- (THRFT KID: Tibial destruction, HSM, Rhinitis, Feet Scales>Hutch. teeth, Keratitis Interstitial, Deafness)
- Organism: Treponema Pallidum
- Early Type, Sx: Within 2 Y/O, Sx waiting 3rd-8th week
 - Syphilis Rhinitis (green)
 - Marasmic Syphilis (wrinkled pot bellied old man)
 - Copper Colored Eruptions in Feet (Vesicular/Bilious/Scales)
 - Hepatosplenomegaly
 - Bilateral destruction of Medial tibial metaphysis
 - Other: Saddle nose, frontal bossing, Cluttons joints (painless swell of joint)
- Late Type Sx: Hutchinson triad: Hutchinson teeth + Interstitial keratitis +8th CN Deafness
- Tx: IV Aqueous Penicillin G 10-14 days

PEM R | 2 M/O Afebrile, had rash on trunk & limbs 2 weeks ago and rhinorrhea for 1 month, Temp 37.4 HR 150 RR 30 BP 98/56, Rash (image of sole of foot rash), has hepatosplenomegaly, Next = Blood test & LP

Chapter 2: Medical

- Neonatal GBS

Final | Baby with pic of early sepsis what the cause = GBS (*Streptococcus agalactiae*)

Final | 5 D/O w/ Sepsis = GBS (GBS Early sepsis & CONS Late sepsis)

Device infections

- CLABSI

- Risk of Cath Associated bloodstream infection: < 3 Y/O, Low weight, TPN dependent
- Organisms: Staph epidermidis (CoNS), Enterococci, Staph A., Klebsiella, Enterobacter, Pseudomonas
- Tx: Ceftra (Empiric)
 - Cefepime (4th gen, for Pseudomonas)
 - Vancomycin (for MRSA)
- CLABSI Indication of Removal:
 - IF Staph. A or Candida or Mycobacteria
 - IF Septic Shock
 - IF ≥ 72hr No improvement on appropriate Abx

PEM R | 7 Y/O boy on central line for TPN, now Febrile Temp 38.3 HR 160 RR 20 BP Normal, has Lt OM, management = C/S of central/peripheral site + CBC + Abx

Tick infections

- Lyme = *Borrelia B.* | Trip > Uni/Bi facial palsy + Erythema Migrans + Brady | ELISA/Western blot | Tx: PO Doxy, IV Ceftra
- RMF = *Rickettsia R.* | Trip > Purpuric Rash wrist>palm/ankle>sole + GI Sx | Low PLT/Na, High LFT | Tx: PO Doxy

- Lyme disease

- Organism = *Borrelia burgdorferi* infection from tick bite.
- Sx: Hx travel to an endemic area, Sudden, rapidly progressive unilateral/bilateral facial paralysis,
 - Erythema Migrans (bullseye)
 - Early Sx: CN VII palsy bilateral (bell's palsy mimicker), Arthralgia, fatigue, myalgia
 - Bradycardia due to 3rd Heart block
 - Meningitis (Disseminated)
- Invx: Two-tier serology (ELISA screening followed by confirmatory Western blot)
- Tx: No meningitis/encephalitis: < 8 Y/O PO Amoxicillin for 28 days | > 8 Y/O PO Doxycycline for 28 days
 - CNS/Severe Carditis: IV Ceftriaxone for 14-28 days or Cefotaxime or Penicillin
 - AVOID Steroids (unlike idiopathic Bell's palsy)

PEM R | 6 Y/O rt side facial paralysis, 3 wks ago seen by PCP for Rt knee pain/fatigue/generalize muscle pain, 1 month ago spent 3 weeks at grandparents in Pennsylvania, currently unable to raise Rt. Eyebrow & close Rt. Eye, No Nuchal rigidity, equal strength in all limbs w/ reflexes preserved, best next = PO Doxy & Serology

PEM R | 11 Y/O fully immunized male, headache/fatigue for 7 days, 1 day facial weakness, returned from summer at farm, began school 2 wks ago, 10 days ago in PCP had rash treated w/ antifungal cream, rash never fully went away but started to fade, Vitals stable, appears tired/headache/mild pain w/ flexion of neck, Peripheral facial nerve palsy on Rt, Cranial N. Normal, no ataxia, normal strength/sensory, next = Perform LP & Admit for IV Cefotaxime

Chapter 2: Medical

PEM R | 10 Y/O boy, few weeks ago went to Boy Scout camping trip, Now Vitally stable but swollen tender knee w/ Full ROM no warm/erythema, having Lyme, PO Abx = Doxycycline 28 days

PEM R | 13 Y/O boy 3 days MSK pain & rash, numerous circular lesions w/ central clearance, on Abdomen then spread to upper chest/back/legs over 2 days, reporting diffuse joint & muscle ache, painful Rt. Call when walking & tender when squeezed, Rt. Knee slight swell, No URTI/Fever/Neuro changes, Hx of hunting trip & eating deer they killed, CRP 19.2 but all labs normal, Test Final Tx plan = ECG

PEM R | 6 Y/O boy w/ swollen Lt knee, worsening over 3 days, walking w/ a limp, No Trauma/Fever/Rash/or swell in other area, had camping 6 month ago in woods during summer but doesn't recall any bites/stings, No recent URTI, vitally stable, Lt knee w/ large swelling & mild tenderness to palpation, has limitation of Terminal flexion, alternative manifestation of this disease = Meningitis

PEM R | 12 Y/O Female, increasing pain/swell Lt knee over 2 days, able to bear weight on Lt leg, walks w/ limp, recently returned from 4 weeks summer camp, recalls having body aches, large circular rash on Lt lower leg 1 month ago, Tx = Doxy PO for 1 month

- Rocky Mountain fever

- Organism: Rickettsia rickettsiae infection, transmitted via Dermacentor ticks (dog or wood tick) **Not contagious**
- Sx: Fever, headache, myalgia, and GI Sx (nausea, vomiting, abdominal pain)
 - Rash 2-5 days after Fever starting on **wrists > palms & ankles > soles**, & centrally (trunk)
 - Rumpel-Leede Phenomenon (Petechia formation after BP cuff application)
- Invx: **Low PLT, Low Na, High LFT**
 - Serology IFA (confirmatory but takes days-weeks)
- Tx: Abx **Doxycycline (even if < 8 Y/O) BID 2.2 mg/kg/dose** (max 100) for 5-7 days or till pt Afebrile for 3 days
 - Chloramphenicol (for severe doxycycline allergy), but less effective and associated w/ higher mortality
- Prognosis: Early therapy (<5 days of illness) markedly reduces mortality (<5%)
 - Delayed treatment (>5 days) increases fatality rates significantly

PEM R | 15 Y/O Girl, 3 days Fever/N/V/Abdomen pain, has myalgia/severe headache for 2 days, this morning rash hand/feet & spreading, no one else ill in family, recent return from mountain hike, Temp 38.5 HR 130 RR 30 BP 90/60, ill appearing, diffuse abdomen tenderness without guarding, after labs, important reason for presumptive Tx = Decrease mortality has been shown to be Ax w/ early treatment

PEM R | 12 Y/O male, 1 week ago returned from camping, now 4 days Fever/headache/malaise, having red spots on wrist/ankle, on Ex ill febrile, tachycardic, petechiae/purpura on arms/legs/palms/soles, what Lab support diagnosis = Low PLT & Low Na

PEM R | 5 Y/O in July having fever/myalgia/headache 5 days ago, 7 days prior to Sx having tick bite while camping in Missouri, Looks ill appearing w/ Bilateral conjunctival injection, Dx test taken, Empiric Abx = Doxycycline

PEM R | 5 Y/O Girl w/ Fever/Petechial rash/GTC seizure, Temp 39.2 HR 110 RR 18 BP 74/62 SpO2 99%, glucose 80 mg/dL, Hx of camping 4 days ago had 10 ticks removed from various parts of body by burning them off, on Ex Petechial rash/Severe Headache/Meningismus/Photophobia/Disoriented, No SZ anymore, Next = Give Doxy 2.2 mg/kg IV

- Dengue fever

- Sx: Breaking bone fever + Low PLT (Purpura, Epistaxis, GI bleed)
- Complication: Shock
- Tx: Supportive (Self limiting)
- Dengue, Ebola, West valley = Fever + Hemorrhage

Final | Febrile illness (Dengue fever) Tx = Supportive Tx

Chapter 2: Medical

Bacteria

Group A Streptococcus

Promo | organism confirm respond to penicillin = group A strept

Amal | Which organism confirmly responds to penicillin = Group A strep

- **Scarlet Fever**
 - o Organism: Streptococcus pyogenes (group A beta-hemolytic Streptococcus)
 - o Sx: sandpaper rash, strawberry tongue, circumoral pallor, Pastia lines (petechiae in skinfolds)
 - o Complications: Poststreptococcal glomerulonephritis, Rheumatic fever
 - o Tx: Penicillin

PEM R | 5 Y/O girl w/ 3 days of fever 39, Sore throat/Malaise, after 2 days developed rash on neck & extremities, this morning complaining mild abdomen pain/vomit/diarrhea, up to date immunization, no known allergy, Temp 38.4 HR 98 RR 28 BP 102/60, Tx = Give PO Penicillin

- **GAS Toxic Shock Syndrome**
 - o [PEM Guide] Diagnostic Criteria:
 - GAS Pos. C/S (Blood, CSF, Pleura, Infected Fascia/Muscle, Biopsy)
 - + Hypotension
 - + ≥ 2
 - AKI
 - Coagulopathy (Thrombocytopenia, DIC)
 - Liver (High Transaminases, High Bilirubin)
 - Pulmonary (ARDS)
 - Skin (Erythematous macular rash +/- Desquamation, Soft tissue Necrosis: Nec Fasciitis/Myositis, Gangrene)

PEM R | 17 Y/O girl, w/ fever/lethargy/rash for 4 days, HR 39.5 HR 156 RR 36 BP 89/42, has pharyngeal erythema, strawberry tongue, rash diffuse, blanching erythema, non-vesicular, O2, IV fluid bolus w/ improving in her mental status, VS, GU exam shows tampon, removed, IV Tx = Clindamycin

Promo | Pt. In ED w/ Vital instability w/ Tachycardia, Hypotensive, AKI, Thrombocytopenia, B C/S Streptococcus, other findings you will see in this Pt. = Skin Necrosis (Not Arthritis or Erythema Marginatum)

Other | 3 Y/O girl, is brought to the ED for fever and vomiting for 3 day. This morning, she became very weak and difficult to wake. Her parents report a red, **swollen scrape on her knee from a fall 5 days ago**. On ER she is BP is 72 ,CRT 2 HR 175 RR is 34 Temp is 39 initial labs showed WBC 3,200, Lactate: 5.8 mmol/L, CRP of 43, Platelet is 88, BUN 8, Creatinine 1.2 mg/dL($\approx 106 \mu\text{mol/L}$), mildly elevated AST & ALT Blood culture pending, what other finding you will see = Skin necrosis (Not A. Arthralgia nor Erythema marginatum nor Splinter hemorrhage)

Chapter 2: Medical

Staphylococcus

- SSSS (Staphylococcal Scalded Skin Syndrome)
 - o Newborn - 6 Y/O
 - o Path: Staph. A remote release of Exfoliating Toxins A & B > Desquamative Dermatitis
 - o Sx: Fever, irritability, tender **Sunburn** like erythema, rapidly progressive erythroderma, flaccid bullae **positive Nikolsky sign**, and peeling/desquamation
 - Rash evolution:
 - Early: diffuse sandpaper erythema
 - Next: large, fragile bullae (cultures often sterile -toxin-mediated-)
 - Later: sheet-like desquamation, especially at flexures and around mouth/eyes
 - o Complications: Dehydration, Superinfection due to skin loss
 - o Invx: C/S of Primary infection: Conjunctiva (if has drainage) or Nares or Blood (< 5% of cases)
 - C/S of blisters will be sterile
 - o Tx: Give Clindamycin (Lowers toxins production)
 - + Nafcillin (If MSSA) or Vancomycin (If MRSA)

PEM R | 2 Y/O Rash/Fussy/Fever, Hx 3 days fever, 2 days pink rash appears in areas of covered by cloths, now w/ blisters/erythema/diffuse blanching & sloughing of skin, Purulent Conjunctivitis, Diagnostic = C/S of Conjunctival drainage

PEM R | 3 W/O diffuse red skin rash, irritable, yellow discharge from eyes/nose, Temp 38.4 HR 180 RR 46 BP 90/48, C/S Empiric abx = Vancomycin & Cefotaxime

Promo | Fever, decrease PO, Abdomen pain for 3 days, Stable not dehydrated, Ex found Redness all over Abdomen wall, swelling, Scaling, Tenderness, Tx = IV Abx (SSSS, Not NS Fluid Bolus)

Final | 3 W/O came w/ fever 39 & skin rash, Full sepsis workup done, (image of neonate w/ crusty yellow lesions), Abx to start = Vancomycin, Cefotaxime

Tuberculosis

- TB (Tuberculosis)
 - o Mycobacterium tuberculosis
 - o Risk factors: HIV, emigration from an endemic area, immunosuppression, malnutrition
 - o Types:
 - Primary TB: Usually asymptomatic, Invx: Hilar LN/Ghon focus
 - Latent TB: Asymptomatic, Invx: Positive TST/IGRA
 - Screening: TST (tuberculin skin test) or IGRA (interferon-gamma release assay)
 - Reactivation TB (adolescents)
 - Sx: fever, night sweats, weight loss, productive cough, hemoptysis
 - Dx: x3 AFB sputum smears + AFB C/S (gold standard)
 - o Miliary TB: Disseminated disease (Multiorgan, Meningitis)
 - o Invx:
 - Primary CXR = CXR: often normal, hilar adenopathy, Ghon focus
 - Latent/Reactivation CXR = upper lobe infiltrates, apical cavitary lesions
 - Miliary CXR = Scattered tiny nodules all over lung (Miliary pattern)
 - CSF TB = CSF WBC 100-500 w/ Lymphocyte predominance & very high protein & very low glucose

PEM R | 4 y/O boy fever/cough for 5 days, Temp 38.2 mild nuchal rigidity, minimal photophobia, Non-toxic, LP done, CSF WBC 122 diff 12% Neutrophils, 65% Lymphs, 23% monocytes, Protein 450 glucose 4, Serum Glucose 82 mg/dL, occasional cough, CXR (all over infiltrates Miliary TB), most likely Hx = Aunt w/ chronic cough living w/ family

Final | ?? PPD and Chest Xray

Chapter 2: Medical

- BCGitis

Amal | 6 M/O the baby presented the ED with this swelling, on systematic exam nothing, no palpable LN what is the best treatment for this condition (image of Fluctuance mass of BCGitis) = Observe

- If opened give clean well & might give topical Abx just no infection enters
- Immunocompromised or reactive LN = ID > INH

Gram negative

- Shigella

- Pre-pubertal = Enterocolitis (bloody diarrhea) ± Shigella Vaginitis (yellow/white ± blood), Tx: Azithro or Bactrim
- Post-pubertal = Enterocolitis (Bloody diarrhea)
- Tx: Empiric Shigella indication:
 - Immunocompromised
 - Documented or Suspected Bacteremia (High WBC, Hypothermia/Hyperthermia)
 - Requiring admission
 - Attending day-care, live-in nursing home or similar

PEM R | 3 Y/O 2 day, Hx of yellow vaginal discharge, Fever/crampy abdomen pain/diarrhea w/ blood streaks 3 days ago not complaining of dysuria or Pretoria, has bloody tinged yellow vaginal discharge on GU ex, most likely sx = Shigella

PEM R | (follow up of Q above) appropriate next step for Tx = Obtain vaginal bacterial C/S & begin Tx w/ PO Azithro

PEM R | 3 Y/O vaginal discharge w/ white vaginal discharge for 3 days, fever at first day only 39.5, on Ex very red inflamed vulvar mucosa, Tx = Azithromycin PO for 5 days

PEM R | 2 Y/O 1 day Fever/bloody diarrhea Temp 38.3 HR 140 RR 28 BP 90/60, Alert/active/well hydrated, Pathogen from stool C/S would require Antimicrobial = Shigella

PEM R | 7 Y/O girl, brought by mother for concern of sexual abuse, having painful lesions on vagina w/ small blood tinged/white discharge, just started new school, having diarrhea for 2 days, No Fever/Abdomen pain/Vomiting/Rash, has shallow ulcer on Labia majora, Tx = Obtain Vaginal & stool bacterial C/S

Final | Vaginal white discharge with blood stool and had Hx of fever what Tx = Bactrim (Not Metronidazole)

- Shigella Vaginitis, Right Answer: Oral Azithromycin for 5 days
 - if no Azithromycin choose Bactrim
- Bacterial Vaginosis (Hint clue cells) = Metronidazole

Final | Diarrhea then seizing = Shigella stool culture

- Salmonella non-Typhi invasive disease

- Risk: < 3 M/O, Immunodeficient (Malignant neoplasm, Hemoglobinopathies, HIV), Chronic GI disease
- Tx: x1 IV Ceftriaxone or PO Azithromycin + Follow up of C/S

- ? Enteric Salmonella Typhi

- Sx: Fever, Headache, Malaise, Salmon-colored rash, Bradycardia

PEM R | 2 M/O girl, trip overseas 5 days ago w/ diarrhea, small amount of blood mixed w/ watery stool, parent have similar sx, vitally & clinically stable, stool C/S shows Salmonella Non-typhi, Next step = Administer IV Ceftriaxone 1 dose & D/C

PEM R | 4 Y/O girl, 10 days Fever/Abdomen pain, Non-bloody diarrhea, occasional headache w/ salmon-colored patch scattered all over, Temp 39 HR 80 RR 30 BP 90/65, Ill appearing but non toxic, lungs clear, Tx = PO Azithromycin

Amal | Which of the following patients with diarrhea and positive stool c/s for salmonella requires Tx = 3 months infant seen in ED 3 nights before (Not 14 months with diarrhea and mild dehydration nor 4 years old with sickle cell trait nor 10 years old who's his diarrhea has decreased)

- Always treat Salmonella in < 3 M/O or Sickle cell anemia (Immunocompromised)

Chapter 2: Medical

- Syphilis
 - o Treponema pallidum
 - o Neuro syphilis = Penicillin G 10-14 days

Final | 13 Y/O w/ Hx of painless ulcer on his penis and now presented with rash on his hand what to give (pic) (syphilis) = Penicillin G IV (Not Ceftriaxone nor Azithromycin nor Ciprofloxacin)

Final25 | Picture of syphilis rash on palms with hx of penile painless ulcer, Tx = Penicillin G one dose (Not Azithromycin)

Fungal

- Tinea Capitis
 - o Etiology: Most commonly Microsporum spp. and Trichophyton tonsurans.
 - o Sx: Scaling patches of alopecia, "Black dots" from broken hairs, Diffuse scaling with minimal hair loss (alopecia)
 - Other sites: Can involve any hair-bearing area (eyebrows, beard)
 - Kerion: acute, boggy inflammatory plaque
 - o Suspect if Nonresponsive seborrheic/atopic dermatitis w/ black dots, occipital adenopathy, worsening after topical steroids.
 - o Tx: **PO Griseofulvin**, Terbinafine, Itraconazole
 - < 2 Y/O = PO Fluconazole may be used
 - > 2 Y/O Griseofulvin: 4–8 weeks
 - > 4 Y/O Terbinafine: 2–6 weeks
 - Kerion: Add prednisone (to systemic antifungal (Griseofulvin) to reduce inflammatory swelling)
 - o Systemic management is needed but Topicals alone (clotrimazole, allylamine) may help only if hairs are fine, but are generally inadequate as monotherapy

PEM R | 3 Y/O scalp swell progressive over 1 week, 3x3 cm boggy mass w/ thick yellow scale & alopecia, mass red & tender, Tx = Selenium Sulfide shampoo & Griseofulvin

Promo | Child after 2 weeks from tinea with no scaling = Reassure & D/C (Not Shift to PO nor Continue Tx)

Promo | Resistant tinea on Tx, Ex child looks well has 2 lesions of raised margins & clear center w/ NO SCALING, Action = D/C the local treatment & reassure the family (BCZ clinically not resistant & in recovery stage)

Amal | Which of the following is true about this condition = Posterior Cervical adenopathy is common complaint (Not Topical antifungal Therapy is effective nor Antibiotics required when pustular Crayon develops nor It requires maximum of 2 weeks therapy)

Final | Tinea capitis, swelling, increasing pain = Griseofulvin

Final | Slide with tinea capitis, what is the treatment = Griseofulvin

Final | Pic of Tinea capitis = Griseofulvin

Final25 | Tinea capitis came with scalp mass (Kerion pic) = Griseofulvin

- Tinea Corporis
 - o Healed Tinea Corporis = No Edge or Minimally raised, Center Clear, NO Scaling = Scar will take long time to go
 - o Not Healed Tinea Corporis = Raised edge, Center affected, Scaling

Amal | 4 Y/O w/ tinea corporis in dorsum of his right hand. For many weeks. He has been treated with topical anti mycotic without no improve on exam. His alert while appearing as Turing shaped lesions on his right hand, the edge are very minimally raised and the center is clear. No scaling, Mother says there is no improvement which of the following is your recommendation = No further treatment is recommended or required in this case

Final | Child came after 2 wk from tinea with no scaling = Reassurance and D/C (Not continue Tx or shift to oral)

Chapter 2: Medical

- Pityriasis Alba
 - o Harmless skin condition
 - o Risk factor: Atopic dermatitis
 - o Tx: Moisturizing emollient (Self-limiting)

Amal | 2 Y/O known w/ Atopic dermatitis, brought 2 months ago, hypopigmented macules/patches on cheeks = Pityriasis alba

- o Common in summer after sun tanning will appear (he might been having it for long time)

Parasite

- Malaria
 - Invx: Rapid antigen test (Rapid & Sensitive 85-95%), Thick/Thin smear (Confirmatory, Thick more sensitive)

PEM R | 2 Y/O midnight high fever/diarrhea/malaise a week after returning from family trip in Tanzania, Temp 40.4, Conjunctival pallor, moderate dehydration, tachycardia, fatigue, Neuro Ex normal but bit sleepy, most important test to r/o Dx worried about = Rapid antigen test

PEM R | 10 Y/O boy, Fever/Chill/Cough/Headache/Myalgia, 8 days ago returned from Nigeria, Having Temp 40.3 HR 134 BP 100/70, Diaphoretic/Pale, WBC 18 HGB 9 PLT 98 Bili 6.2 Conjugated Bili 2, Next = Thick/Thin blood smear

Amal | 3 Y/O came from Sudan 2 wk ago, in ED w/ fever for 3 days, N/V/Cough/Diarrhea, Best test = Malaria blood smear

- Scabies = Scratch marks Umbilicated lesions, Genital area, Digits, +/- FM Hx = Permethrin
 - o Sx: Papular rash w/ Hx of Family having similar rash
 - Infants = General rash + /Palms/Soles + Scrotum/Penis
 - Adolescent/Children = Rash At Flexural areas (Fingers/Toes), Sparing Face
 - o Dx: Visualization by Skin scraping
 - o Tx: Topical Permethrin 2% for scalp | 1% for body
 - Use from Head below in infants
 - Use from Neck below in children
 - Apply Topical Permethrin all over body then leave it for 12hr then wash, repeat 1 week after if still
 - Clean All clothes/bed sheets w/ warm water wash

PEM R | 10 Y/O living in group home w/ extreme pruritic papulo-vesicular rash all over body sparing face, prominent between fingers/toes, Multiple excoriations, specific way to confirm = Visualization from skin scraping

Promo | 6 M/O girl having scabies, Most effective med = Permethrin (Elamite)

Promo | Child Dx w/ Scabies started on Lindane 4 days ago, still has itching & mother thinks meds not working, Action = Reassure, cut nails w/ calamine lotion (Not Apply lindane from neck to foot w/ calamine lotion)

Amal | Mother brings twin 5 Y/O scratching feet and rubbing hands, red lines ondors of foot but no signs of cellulitis, family doctor diagnosed scabies and prescribed Lindane lotion, Next = Reassurance, trim nails and calamine lotion

- o Lindane 8-12hrs then shower
- o If came saying failed meds then Trim nails, calamine lotion

Amal | 6 Y/O boy comes to ED with history of skin rash and itchiness on his penis which present for several weeks, (image shows lesions on thigh) most appropriate management is = Permethrin (Not Penicillin or Surgical excision)

- o Diagnosis is Scabies, umbilicated lesions and scratch marks in the inner thighs, duration long period
- o If Balanitis and Balanoposthitis shorter period, usually associated with erythema and discharge

Chapter 2: Medical

- Enterobius Vermicularis

- Enteroviruses Vermicularis (Pinworm)
- Sx: Nighttime Scratching bottom, then touching & contaminating toys/beddings/toilet seats (Feco-Oral)
- Invx: Tape test
- Tx: 2 doses PO 2 weeks apart
 - Pyrantel Pamoate 11mg/kg
 - Albendazole 400mg/kg
 - Mebendazole 100mg/kg

PEM R | 3 Y/O female 1 week Hx of Perianal & vaginal itching, multiple excoriation around anus, no vaginal discharge or rash, Best Tx = PO Albendazole

PEM R | 3 Y/O girl awaking in middle of night screaming of pain without obvious source, No recent URTI, Normal Ex except for excoriations on inner thigh & vulva, Dx = Perianal tape test

PEM R | 2 Y/O girl, vaginal/anal itching worse at night, Tx = Mebendazole

Promo | 3 Y/O found worm in stool, Anal itching upon waking up from sleep, Best Tx = Mebendazole (Vermicularis)

Amal | 7 Y/O boy presented with history of tinny worm in stool with 3 days history of anal itchy at night, Tx = Mebendazole PO

Amal | 3 Y/O girl, complaining of dysuria for few days, no fever, looks well, vitally stable, erythema on perineal area. Which one of the following complaints will be misinterpret as dysuria = Pinworms (Not Labial adhesions nor Bubble bath nor SJS)

- Bubble bath = causes irritation, vulvovaginitis
- Pinworm = mis-interrupted in pre-schoolers = as dysuria | in older = itching

Final | Pinworm = Use mebendazole

Final | Mebendazole (pin worms)

Final25 | Child with rectal prolapse which of the following is a risk factor = Pinworm infection (Not Prematurity at 33week nor GERD nor HSP)

- Cutaneous Larva Migrans

PEM R | 13 Y/O vacation in Caribbean, having rash on feet for 1 week, intense pruritic spreading, No Fever/blister/joint swell/sick contact, given Topical hydrocortisone but no improvement Tx = PO Ivermectin

- Cryptosporidium + Renal transplant

PEM R | 14 Y/O Renal transplant 3 years ago, 15 Days watery non-bloody diarrhea & 3 lb weight loss, after visited water park you suspect cryptosporidium infection, correct diagnostic fecal test = Direct immunofluorescent antibody

Viral

PEM R | 10 Y/O girl, 2hr pruritic rash scattered in face/trunk/extremities, no trouble breath/swallow, no similar previous episodes, apart from nasal congestion for 3 days & rash on face, but well looking Vitally stable, etiology = Viral infection

- Roseola Infantum (6th disease)

PEM R | 9 M/O Fever for 3 days, Now Afebrile & started to have rash, well appearing, when considering discharge, important ED Management = Reassurance of parents

Promo | 2 Y/O High grade fever for 3 days Dx as OM given Amoxicillin & fever subsided then developed rash on Next day = Roseola (6th disease, typical Fever then stops then rash) or Amoxicillin allergy (Comes if used with EBV) or Measles

Chapter 2: Medical

Promo | 18 M/O Fever 3 days ago, now Maculopapular rash appeared after Fever subsided, Dx = Roseola infantum | Most likely complication = Febrile Seizure

Amal | 9 M/O girl, presented to ED with irritability & fever, fever gone 2 days ago then she developed maculopapular rash mainly in the trunk, most likely cause = Herpes 6 virus (Not Parvovirus nor Coxsackie A nor Coxsackie B)

Amal | 3 Y/O girl this is the second visit as presented first with 4 days ago with history of fever, today she has skin rash and fever resolved, what is the most common complication is this case = Febrile SZ

- Varicella (Chicken pox)

- Sx: Viral prodrome & maculopapular rash
 - Clear vesicles on an erythematous base (dew drop on a rose petal), crops of lesions in multiple stages
- Complications:
 - Bacterial skin infection (Most severe, common cause of hospitalization in Peds)
 - Organism: Staph. Aureus
 - Manifestation: Cellulitis, Myositis, **Necrotizing Fasciitis**, Toxic Shock Syndrome
 - Pneumonia (Most common cause of hospitalization in Adults)
 - Encephalitis
- Tx: Healthy No Risk = Observation
 - For Healthy w/ Risk = PO Acyclovir or Valacyclovir
(Risk of Moderate-Severe varicella: > 12 Y/O or Unvaccinated or on Steroid)
 - For Healthy w/ Severe systemic/Immunocompromised = IV Acyclovir

Rosh | 4 Y/O unimmunized in ED w/ (pic of rash in back), has Fever/Sore throat/decreased activity for 24hr, pruritic rash, which most common complication requiring hospitalization = Bacterial skin infection

PEM R | 13 Y/O unvaccinated w/ Hx of Asthma & daily steroid, 1 day Fever 38.5, having 2 days rash of itching Maculopapular lesions/vesicles which opened, No Hx of ill exposure/hiking/traveling/camping, (grouped vesicles image), Tx = PO Valacyclovir

Final | Case varicella picture of NEC fasciitis = Surgical Consult

Final | Pt. On Chemotherapy, came w/ skin rash in back = Varicella (unsure, not Candida infection nor Steroid induced acne)

Final | ALL on prednisolone present with back rash (Rash pic on back) = Varicella (Not Steroids Induced acne nor Candida)

Final25 | ALL on prednisolone present with back rash (Rash pic on back), no fever, bacterial and fungal cultures are negative = Varicella (Not Steroids Induced acne nor Candida)

- In previous exams they choose Varicella, but the answer could be Steroids induced acne

- Herpes zoster

- Tx: PO Acyclovir or IV Acyclovir (if immunocompromised)
- Vesicles on tip of nose = Hutchinson sign = affecting the eye Trigeminal ciliary nerve = Optha consult

PEM R | 11 Y/O w/ 3 days Eye pain/Headache, w/ 1 day Rash Pruritus, NO vision change/Fever/eye trauma, known IBD on Methotrexate/Azathioprine, on Ex (pic of vesicles on dermatome sites), Tx = Admit for IV Acyclovir

Amal | 13 Y/O presented w/ rash for first time, what is true = Lesions last 4-5 weeks preceded by pain along dermatomes by 1 week (Not In children it occurs almost exclusively in immune compromised patients. Nor It occurs exclusively in those who had varicella vaccine. Nor Post therapeutic neuralgia only occurs in immune compromised individuals)

- Diagnosis is Post therapeutic neuralgia (Shingles) - Caused by herpes zoster

- Coxsackie

- Coxsackie A = Hand foot mouth, Herpangina
- Coxsackie B = Myocarditis, Meningitis
- Onychomadesis (Nail shedding): Hand foot mouth disease sequela

Chapter 2: Medical

PEM R | 2 Y/O 3 days Hx fever/decrease solid/liquid for 24hr but no drooling/neck pain/vomit/diarrhea, well appearing (pic of oropharynx showing posterior ulcer), next = Discharge w/ supportive care

PEM R | 3 Y/O fingernails falling off, well appearing, Hx of febrile illness w/ rash 1 month ago, most likely pathogen = Coxsackievirus

Promo | Child Hx of Throat pain drooling, No SOB, Normal vital signs, mouth Ex (shows lesions posterior soft palate) = Herpangina (Not Herpetic lesion)

Promo | Rash causative organism (Pic of Red, Raised, Painful rash on hands) = Coxsackie A (Not Coxsackie B)

Amal | 5 Y/O boy, ill looking came with fever for 2 days, came with decrease activity, ulcer on the tongue and soft palate, no gingival involvement, with rash in the hand = Cox A

Final | Immunocompromised on chemotherapy came with rash in post oropharynx picture of throat looks like herpangina, what is the causative, organism = Coxsackie virus A16 (Not Varicella)

Final | Patient present with this rash most likely the causative organism is: (Hand Foot Mouth Disease) = Coxsackie A

Final25 | Patient having anterior mouth orifice vesicles, (Case of Herpetic Gingivostomatitis), Tx = Local analgesia (Not Acyclovir)

- HSV

o HSV 1

- Sx: Gingivostomatitis (Primary = Oral mucosa, Recurrent = Outer lip)
 - Herpetic Whitlow (painful fingers looks like impetigo)
 - Erythema Multiform (Target like)
 - **Eczema Herpeticum** (Ax w/ Eczema/Atopic dermatitis)
 - Herpetic keratitis (corneal ulcer, Fluorescein dendritic pattern, Hutchinson's -nose tip lesion-)
 - HSV Encephalitis
 - o Sx: Fever, Seizures, Confusion, Altered LoC
 - o Focal SZ (Eye deviation + brief unresponsiveness)
 - o Invx: CT low density temporal lobe lesion (hypodensity)
 - HSV Nephritis (can be Ax w/ Kidney transplant)
- Invx: Tazneck test (not done anymore), Blood C/S, PCR
- HSV Encephalitis:
 - o EEG Temporal waves
 - o MRI/CT (Temporal enhancement lesion)
 - o LP for HSV PCR on CSF (Pleocytosis, High L, Hemorrhagic CSF less)
- Tx: All Types: Acyclovir and IV if Immunosuppressed Pt.
 - Resistant to Acyclovir: Foscarnet (Also don't bother using Ganciclovir also resistant)
 - Gingivostomatitis Tx:
 - o Hydration, Analgesia
 - o Magic Mouthwash (Maalox/Benadryl w/ or w/o Lidocaine, Gurgling or Topical w/ cotton swab)
 - o If w/ Lidocaine Max 3 mg/kg/dose Q3hr (Limited for School aged)
 - o Acyclovir (benefit during prodromal phase, considered if severe at early course)
 - HSV Keratitis Tx: PO/Topical Acyclovir, AVOID Topical steroids

o HSV 2

- Sexually transmitted infection, HSV2 75% of Genital herpes, HSV1 25% + Asymptomatic

PEM R | 3 Y/O mouth sores, Fever for 4 days, Yesterday refused to drink/eat, slight drool, awake/slight tired, has vesicles over rt corner of mouth, has red/swollen gingiva w/ multiple yellow ulcers on palate/buccal mucosa/tongue, No skin lesions, Dx = Herpetic Gingivostomatitis

PEM R | 15 M/O girl worsening rash on Betamethasone but no improvement, now rash changed in morphology of monomorphic vesicular rash punched out & having fever (pic of eczema herpeticum), Tx = Acyclovir 15mg/kg

Chapter 2: Medical

PEM R | 5 Y/O in Ed for localized rash, allergic to peanuts/egg & moderate asthma, unvaccinated, Temp 38.4, mild-moderate malaise, has slightly tender umbilicated pruritic lesion w/ erythematous base on Rt. Flank & inner aspect of Rt. Upper arm, likely risk factor = Eczema

PEM R | 16 Y/O girl, w/ Red/Painful eye over 3 days, No Fever/URTI, on Ex Alert/Mild distress due to eye pain, has healing scabbed lesion on Rt. Lower lip, having scleral injection near limbus w/ pupils reactive to light, test to Dx = Fluorescein Ex

PEM R | 2 Y/O persistent conjunctivitis, for 1-3 weeks, after taking 2nd course of abx drops had no improvement, came for 3rd ED visit on Ex injection of Rt. Eye, minimal ax swell, no discharge, has scabbed over lesion on Rt. Side of tip of nose, fluorescent dye show dendritic pattern on cornea, Tx = Urgent Optha

Promo | Gingivostomatitis, AVOID = Oxycodone oral (Side effects Resp. Depression & Constipation)

Promo | 2 Y/O persistent Conjunctivitis for 1-2 weeks, 3rd ED visit & currently on 2nd course of Abx drops no improvement, Ex Injection of Rt. Eye w/ minimal Ax swell, No discharge, scabbed over lesion on Rt. Side of tip of nose, Fluorescein stain reveals dendritic pattern across cornea, Tx = Urgent Optha Evaluation (Herpetic Keratitis)

Promo x2 | Rash most likely causative organism (pic of finger/hand Herpetic Whitlow), Tx = PO/Topical Acyclovir

Promo | 3 Y/O w/ Runny nose, Afebrile, Ex unremarkable apart from (pic of small blisters on finger) Dx = Herpetic Whitlow

Amal | 11 M/O male has mild runny nose, no fever (pic rash on finger/hand), Dx = Herpetic whitlow

Amal | (for above Q) Tx = Acyclovir topical/po (Not Amoxicillin po nor Curate / Cryotherapy nor Topical ketoconazole)

Amal | 10 Y/O, Confusion, febrile, eyes glazed over and deviate to right Unresponsive for moments then sleep, CT showed low density in right temporal lobe, Tx = IV Acyclovir (Not IV Cefazoline nor IV Dexamethasone nor Emergent EEG)

- Even if choices had ceftriaxone, priority is Acyclovir

Final25 | Patient w/ anterior mouth orifice vesicles, (Herpetic Gingivostomatitis) management = Acyclovir (Not Local analgesia)

Final25 | Hx of Corneal abrasion given Abx, came now w/ Dendritic ocular abrasion, Next step = Urgent Optha assessment (Not Acyclovir nor Steroid nor Another topical abx)

- EBV

- Invx: Monospot not sensitive in < 5 Y/O

PEM R | 3 Y/O girl w/ 3 days fever/unexplained hepatitis, well appearing without jaundice, but Temp 38.6, Cervical LN bilateral, Normal CVS, Abdomen vague tenderness w/ deep palpation & mild hepatomegaly, WBC 8.7 37% N 44% L 12% M 4% E, ALT 410 AST 358, Hepatitis A/B/C/D/E serology all neg for acute infection, Rapid resp PCR neg, Monospot neg, Diagnostic = EBV serology

Final | Tx with amoxicillin = ? Erythema multiform (in Infectious mononucleosis)

- Measles

- Most common complication = OM
- Most common complication mortality = Pneumonia
- Most common complication Late = SSPE (subacute sclerosing panencephalitis)
- Risks: unvaccinated young child
- Contagious: 3 days before > Rash Appears > 4 days after
- Sx: high fever, cough, conjunctivitis, coryza
 - red spots with blue or white center on buccal mucosa (Koplik spots)
 - maculopapular rash (starts on Head > spreads toward Feet)
- Dx: made clinically, but nasopharyngeal PCR can be used for definitive diagnosis
- Tx: Supportive
 - Vitamin A (measles depletes stores, WHO + AAP recommend it for all children; Severe Sx or < 2 Y/O)

PEM R | 15 M/O boy, Fever/Rash, due to COVID he is behind in vaccinations, Hx of 5 days Fever then 2 days rhinorrhea/exudative conjunctivitis, Cough/Tachypnea, in urgent care diagnosed w/ AOM due to red eardrum, Now developed Maculopapular rash (face/trunk), Febrile 39.9 SpO2 85% on RA, w/ extreme irritable, diffuse coarse lungs, WBC 6.2 7% bands, 69% N 19% L, Liver/kidney/electrolyte panel all normal except for Na 133 AST 75, to help decrease risk of severe complication from illness as part of his acute = Vitamin supplements

Chapter 2: Medical

PEM R | 14 M/O unvaccinated 3 days Fever/cough/conjunctivas, lacy maculopapular rash, white spots on Buccal mucosa, ill appearing but medically stable & candidate for D/C, parents ask for possible complications years after resolution = Progressive neurological deterioration

Promo | 3 Y/O, brought w/ Fever, Photophobia, Apathy, Skin rash on face that spread to all body in day 4, correct statement = Disease is Contagious 3 days before & 4 days after Rash appears

Amal | 6 Y/O girl with fever cough and photophobia, developed red popular rash on face then spread to the trunk and extremities 3 days later, what is true = contagious prior 3 days before and 4 days after the skin rash (Not pathognomic buccal mucosa appears at 4th day of fever nor pneumonia the most common secondary bacterial complication nor child may benefit from a course of systemic steroid)

- Parvovirus (5th disease)

Promo | Parvo virus complication = Aplastic anemia (Not Hydrops Fetalis)

Final | Picture of Parvo virus what are the complication = Aplastic anemia

- Croup = Barky cough
- Pertussis = Staccato cough (rapids coughs) > Whooping (deep breath intake)
- Rhinovirus = Frequent cough (w/ hoarse voice)

- Rhinovirus

Amal | 5 Y/O girl, 1 week history of coughing, wheezing and chest tightness. Her parents report steroids Hx for 2-3 times per year, On Ex Coughing frequently, Spo2 96% T 37.3 RR 20, bilateral expiratory wheezes, most likely cause = Rhinovirus (Excessive cough pathogenic with Rhinovirus) (Not Influenza nor Coronavirus nor RSV)

- Parechovirus
 - o Fever, Rash, Diarrhea, Sepsis

PEM R | 19 D/O prev healthy girl presents w/ fever, irritability, poor feeding, abdominal tenderness, diffuse rash, pallor, lethargy, full fontanelle, delayed capillary refill, mottling, Born at home, mother has genital HSV, no erythromycin, received vitamin K, UA normal except high specific gravity (1.044), CBC: WBC 5.3, normal Hb, ↑ monocytes (34%), CSF: 6 cells, normal glucose/protein, no organisms, Which virus likely = Parechovirus

- Molluscum contagiosum
 - o Common in childhood, can also occur in healthy adults
 - o Organism = Pox virus, Spread through direct skin-to-skin contact or fomites
 - o Sx: Small, skin-colored papules, sometimes associated with pruritus or inflammation
 - Multiple waxy, **Dome-shaped Umbilicated Papules**
 - o Tx: Self-limiting 6-12 months, Supportive
 - After > 12 months consider removal by Tretinoin cream, Cryotherapy, Currety or laser

Amal | 7 M/O previously presented to the ED by his mom with a complaint of the skin rash over the test and lift the axilla area For three days, the lesions are increasing in number two is to have similar lesions in other house content. No fever is feeding well. It's very active, and he doesn't have any other systemic complaint (image of Molluscum) Dx = Molluscum contagiosum

Final | (pic of small dimples) = Molluscum contagiosum

Chapter 2: Medical

- COVID

PEM R | 4 Y/O Hx of Fever/Runny nose/Barky cough, but now afebrile w/ normal Ex & set for discharge, has Family Hx of same illness but 3 have not regained sense of smell & 1 died, which lab is likely in this child = Normal CRP

Final | COVID 19 = work and high precaution swab if symptomatic (???)

- Influenza

Final | Oseltamivir Indication = Influenza Positive swab w/ High Risk complications

Final25 | Oseltamivir indication = Positive influenza swab w/ High Risk to complications

- Hepatitis B

- HBV Serology:

- ☒ HB s + ☒ Anti HB s + ☒ Anti HB c + ☒ Anti HB c IgM = No exposure
 - ☒ HB s + ☒ Anti HB s + ☒ Anti HB c + ☒ Anti HB c IgM = Immune by vaccine
 - ☒ HB s + ☒ Anti HB s + ☒ Anti HB c + ☒ Anti HB c IgM = Immune by infection
 - ☒ HB s + ☒ Anti HB s + ☒ Anti HB c + ☒ Anti HB c IgM = Acute
 - ☒ HB s + ☒ Anti HB s + ☒ Anti HB c + ☒ Anti HB c IgM = Chronic
 - ☒ HB s + ☒ Anti HB s + ☒ Anti HB c + ☒ Anti HB c IgM = Resolving disease
- IF Surface Antigen = Current Infection
 IF Core Antibody = Infected
 IF Surface Antibody = Immunized

PEM R | 5 Y/O Fever/Vomit/Jaundice ALT 1576 AST 1852 Total Bili 8.6 direct 4.2, Immunity due to Hep B Vaccine = HBsAg Neg Anti-HBc Neg. Anti-HBs Pos.

Amal | Nurse had needle stick injury while accessing CVC of oncology patient, HIV and hepatitis C serology taken, what additional labs need to be taken = Hepatitis B (Not CMV nor Hep A nor Varicella)

- HIV

- Transmission: No concern for needle related HIV transmission especially if without blood

PEM R | 6 Y/O found insulin needle & struck it into 3 Y/O healthy sister, had it cleaned by soap/water, now no visible dried/fresh blood at needle tip or hub, family concerned for HIV = Reassurance

Final | 4 M/O w/ mother HIV = High LDH (Similar Q in MD Challenger)

Vaccines

- Pertussis

- Sx: Infant will have Apnea
 - Adolescent will have Weight loss (due to vomit)
- Return to school
 - 5 days after antibiotic (Azithromycin 5 days regimen = 5 days then return)
 - Without antibiotic 21 days

Chapter 2: Medical

PEM R | 14 Y/O & 5 w/o w/ cough, & household having similar Sx for 14 days, recently treated w/ 5 days course of Abx, most complications in both respectively = Apnea & Weight loss

Promo | 2 Y/O attending day care brought w/ Hx of Prolonged paroxysmal cough, you treated him w/ appropriate Abx, parent ask when can return to day care, response = 5 Days (Pertussis)

Amal | 4 M/O boy with fever documented 38.9 C, persistent cough, nasal discharge for 1 week diagnosed as pertussis, asked when to retained back to school after starting antibiotics = 5 days

Final | Pertussis vomiting petechia, caused by = Capillary force leak (Also might have rectal prolapse)

- Diphtheria

- Cats works as reservoir of the organism
- Cardiac toxicity within 2 weeks, highest morbidity

Promo | Child came back from Siri Lanka, Vaccine status unknown, clinical pic of Diphtheria (White Pseudomembranous throat exam), Tx = Active immunization w/ Abx (Admit & Abx & Vaccine) or Active Immunization w/ IG

Amal | 6 Y/O immigrant from Afghanistan, complains of severe sore the foul breath is neck swollen and has hoarseness of the voice. examination reveals fever to keep the anterior cervical adenopathy and once this gray adherent pharyngeal membrane white blood count is 12,000 with left shift, chest radiograph demonstrates cardiomegaly the patient has no previous history of medical problems. Which of the following is the accurate statement = Domestic pets as cats may act as a reservoir for human infection

Amal | 6 years old girl immigrant from Siri Lanka, sore-throat, low grade fever and gray pseudomembrane on oral exam (Diphtheria), management includes antitoxin Plus = Active immunization and antibiotics

- Unvaccinated exposed = Vaccine + Immunoglobulin
- Unvaccinated diseased = Vaccine + Abx

- Tetanus

- Vaccination x5 Doses (2, 4, 6, 18 M/O & Preschool)
 - < 7 Y/O = DTap | 7-10 Y/O = Tdap | ≥ 11 Y/O = Td (if immunized) or Tdap (if unimmunized)
- Post-Exposure wound Tx:
 - Give Ciprofloxacin (For Pseudomonas) + Review then give Tetanus
 - Ciprofloxacin (Fluroquinolones, is to cover P. Aeruginosa)
 - Tetanus Vaccine/IG to cover Tetanus
- Tetanus Post-Exposure Wound Prophylaxis within 72hr:
 - < 3 Doses or Unknown
 - Clean = Vaccine
 - Dirty = Vaccine + IG
 - > 3 Doses
 - Clean + ≥ 10 Years = Vaccine
 - Dirty + ≥ 5 Years = Vaccine
- Dirty wound examples:
 - Contaminated w/ Soil, Dirt, Saliva, feces
 - Burn or Frostbite
 - Puncture wound or Crush injuries
 - No cleaning for > 6hr or Necrotic wound

PEM R | 6 Y/O male, hand injury riding escalator in parking lot, had missing digit, immunized till 18 M/O, Best choice for tetanus prophylaxis = DTap

PEM R | 6 Y/O unvaccinated came after cut while barefoot in park, wound has dirt/debris, Prophylaxis = DTaP & TIG

Chapter 2: Medical

PEM R | 8 Y/O boy previously healthy, 8% full thickness burn, on Hands/Arms, Management done, he is up to date vaccines was at 15 M/O, Next = Tdap

PEM R | 4 Y/O 2nd degree hot water burn to chest, immunized for 2 & 4 months of age, recommend = DTaP & TIG

PEM R | 2 Y/O unvaccinated walking barefoot and having now dirty wound, Immunoprophylaxis = DTaP & TIG

Promo | 12 Y/O Boy arm wound after fall bicycle, last vaccine at 6 Y/O, after wound care you will give = Tetanus vaccine (Not Discharge w/ F/U nor Tetanus IG nor Tetanus Vaccine/IG)

Amal | 8 Y/O old boy, no previous immunization had puncture wound to foot, tetanus prophylaxis = Td Vaccine w/ IG

Amal | 15 Y/O boy MVA, immunizations history is not available, has open fracture of tibia, tetanus prophylaxis = TIG + Tdap (Not TIG + Td nor TIG + DTaP)

- Td (booster dose) > 11 Y/O & previously immunized
- Tdap > 7 Y/O & previously unimmunized
- DTaP < 7 Y/O

Final | 7 Y/O up to date vaccination came w/ Laceration on Lower leg after falling on rusty fence, what to give = Nothing

Final | 6 Y/O fully vaccinated dirty wound = No need for anything

- Rabies

- Organism: Rabies virus
- Affected Animals: Bats, Raccoons, Foxes, Coyotes, Stray Dogs, Stray Cats, , Woodchucks, Skunks
 - Non-Provoked Dog bite = High risk , Provoked Dog bite = Low risk
- Transmission: Bite
- Sx (Can be seen on Animal/Human): Acute Encephalitic illness, Agitation, Hypersalivation, Hydrophobia, Paralytic illness
- Labs: Rabies (Nigri bodies on fluorescent microscope)
- Tx: Augmentin or Ampicillin-Sulbactam (For Other organisms), Rabies Vaccine
- Rabies Post-Exposure Vaccine and Immunoglobulins (x4 Doses At 0, 3, 7, 14)
 - Immunocompromised or Bite in Hand/Feet/Genital = GIVE Prophylaxis
 - Dog not available + can't be captured > Assume Rabid = GIVE Prophylaxis
 - Dog available + non-rabid > Observe dog for 10 days for irritability, IF Pos. = GIVE Prophylaxis
 - Dog available + rabid > Killed + Head Fluorescent microscopy for Nigri bodies = GIVE Prophylaxis

PREP | 6 Y/O, Vaccinated, unknown dog bite during camping 90min back, on Ex Multiple puncture wound >20 on Rt. Shoulder, perfusion fine, IVF/Analgesia/Surgical consult done, Next Tx = Rabies vaccine + Rabies IG + IV Ampicillin-Sulbactam

PREP | 12 Y/O, Bats in room, falling sustaining abrasion to arm and legs, doesn't feel he was bitten by bat, Tdap given 6 months ago, best post-exposure prophylaxis = Rabies vaccine + IG

PEM R | Animal control called as family found wild animal w/ contact w/ one of children, brought to ED concerned for rabies, animal not high risk for rabies = Squirrel

PEM R | 7 Y/O girl assessing possible exposure to rabies = Scratched by bat found injured in local park

Other | 5 Y/O visiting cousins, brought to ED bitten on hand by Rat, provoked & witnessed 6hr ago, parents captured the rat, although no Hx of being bitten by other animals, parents mentioned, Few bats in bar & rabbits/squirrels/ferrets/coyotes/raccoons/deer, Immunization up to date, has 1cm laceration on Lt dorsum of hand no evidence of infection, Tx = Administer prophylactic Abx or Active immunization Td/Tdap or Observe rat for 10 days or passive immunization Rabies IG

- When rabies is suspected in domesticated animals, observing the animal for signs of illness may be indicated to guide use of immunoprophylaxis, but there is no need to observe the rat that bit this boy for signs of rabies.
- Rabies in small rodents (squirrels, hamsters, guinea pigs, gerbils, chipmunks, rats, and mice) and lagomorphs (rabbits and hares) is rare and bites, therefore, do not require prophylaxis.
- Postexposure prophylaxis also may be indicated in certain situations, such as unprovoked bites from domesticated pets, unknown or incomplete history of exposure (eg, a bat in a room of a sleeping person or previously unattended child), and inability to observe the animal after exposure (wild rabies). Postexposure prophylaxis should begin as soon as possible ideally within 24 hours).

Promo | Anti-rabies Indication = Toddler w/ Bat contact in same room w/ no evidence of bite (Not Horse bite nor Raccoon bite)

Chapter 2: Medical

Precautions

Immunocompromised & Vaccines

- Immunocompromised Varicella
 - o Tx: VZIG if exposure within 96hr from exposure (or 10 days ?!)
 - o Acyclovir if they have disease
 - o Vaccine contraindicated due to live attenuated

PEM R | 14 Y/O Non-Hodgkin Lymphoma on Chemo, had varicella exposure 72hr, immunity unknown, no fever, indicated = VZIG

PEM R | 3 Y/O Cardiac transplant, seen for exposure of shingles, grandmother living at home having vesicular painful rash at Rt. Arm for five days diagnosed as shingles, Tx = VZIG

- Immunocompromised + Exposure to Measles = IVIG (bcz no specific Measles IG)

PEM R | 9 Y/O boy undergoing Chemo for ALL, sibling 5 m/o w/ Cough/Coryza/Conjunctivitis (3Cs of Measles), rash, this 9 Y/O has been fully vaccinated 1 month prior to ALL diagnosis, he is asymptomatic, what to give = Give IVIG

- Immunocompromised Toxoplasmosis
 - o Immunodeficient + Cat exposure = Risk of Toxoplasmosis
 - Sx: Fever + multiple organ Involvement
 - Labs: PCR Blood (for Immunodeficient) Serum IgG/IgM (for immunocompetent)

PEM R | 16 Y/O boy in ED w/ 2 days Fever/Chills, Hx of liver transplant at 6 months of age due to biliary atresia, on immunosuppressive meds, done workup unremarkable, CXR, UA, CBC, LFT, Respiratory viral panel all normal, Hx of exposure to neighbor cat for 2 weeks, to evaluate cause = Blood PCR

- Immunocompromised Influenza
 - o All immunodeficient should take Influenza vaccine
 - o Immunodeficient + Influenza exposure
 - Asymptomatic = Give Oseltamivir Daily for 7 days within 48hr
 - Symptomatic = Give Oseltamivir BID for 5 days

PEM R | 8 Y/O Hx of Heart transplant 4 year, now having influenza exposure from cousin having cough/congestion/rhinorrhea and was Pos. For influenza, Now Pt. Asymptomatic, still did not take flu season, Best = Oseltamivir Daily for 7 days

Return

- Hep A return to school
 - o Hep A commonly Ax in day care

PEM R | 11 M/O girl Fever/Fussy/Vomiting/Diarrhea for 6 days, Today having yellow eyes, Hx of attending day care w/ classmates the same, Temp 38.5 HR 145 RR 20 BP 88/60, tachy mucous membrane having scleral icterus w/ liver

Chapter 2: Medical

edge > 3cm below costal, Labs has High AST, High Bili, Viral study pending, improves supportive care = Should not return to day care until cleared by health department

- EBV return to sport
 - o EBV > Splenomegaly > easy rupture w/ sports

PEM R | 17 Y/O prev healthy, 7 days sorethroat/malaise/low grade fever, Temp 38.2 HR 106 RR 16 BP 112/68 tired male w/ mistrial exudative pharyngitis & enlarged submandible/posterior cervical LN, moderate splenomegaly, to minimize risk of serious complication = Avoidance of contact sport

Turki
Bukhari's
Notes

SURGICAL

Neurosurgery

VP Shunt

- VP Shunt Complications
 - Risk Factors: Recent Insertion or Revision
 - Types (Rule of 2):
 - 2 days postoperatively: surgical complications (proximal shunt disconnection, valve obstruction)
 - 2 months postoperatively: shunt infections
 - 2 years postoperatively: shunt malfunction (distal cath obstruction, fracture, migration, disconnect)
 - Sx: Headache, Vomiting, Lethargy, change in behavior, Irritability, Altered LoC
 - Bulging fontanelle, Fluctuance at insertion site, Sunset Eyes, Pupils Changes
 - Papilledema, Cushing triad, CN Palsy
 - Clonus (Toes goes up), Hyper-Reflexia
 - Invx: CT Brain w/o Contrast & Shunt Series
 - Tx: NSx Revision, Shunt tapping
 - **Complication: Infection (Hallmark: Fever, Headache, Meningeal signs, Erythema/Swell of shunt site)**
 - VP shunt infection Post revision 90% risk of infection 2wks-2months from the procedure
 - Within 2 months = Related to Surgery/Revision of shunt from skin flora contamination
 - Staph. Epidermidis, Staph. Aureus
 - After 6 months = Related to distal end of shunt contamination/hematogenous spread
 - Streptococcus species
 - Gram Neg. (E. Coli, Enterococcus, H. Influenza)
 - Anaerobes
 - Invx: CT Brain w/o Contrast & Shunt Series + Full sepsis workup including VPS CSF C/S
 - Tx: Empiric Abx, NSx
 - **Complication: VP shunt Obstruction**
 - Types: Proximal Shunt Obstruction, Distal Shunt Obstruction
 - Causes: Debris, Fibrosis, Infection, Migration of tip
 - Sx: Altered mental status
 - Invx: CT Brain w/o Contrast & Shunt Series
 - Tx: NSx, Shunt tapping (Diagnostic, best by NSx)
 - Normal ICP 12 cm H₂O (+/- 2cm)
 - Opening pressure ≥ 20 = Distal obstruction (90%)
 - Low pressure = Proximal obstruction)
 - Technique:
 - Under sterile procedure, use 25g butterfly needle connected w/ 3-way stopcock & manometer
 - Insert perpendicular through skin till pop felt, keep stopcock open for manometer measure
 - Slow withdrawal of fluid till pressure < 15 mmHg
 - **Complication: VP shunt Overdrain (Hallmark: Positional Vomit)**
 - Complication: Subdural Hematoma
 - Invx: CT Brain w/o Contrast & Shunt Series
 - **Complication: Subdural Hematoma**
 - Path: Sudden pressure drop > Stretching of Bridging veins > Subdural Hematoma

Chapter 3: Surgical

○ Complication: VP Shunt Pseudocyst

- Rare complication Post Insertion or Revision, Late over 1 year
- Pth: Inflammation/Adhesion > Fluid collection at the tip of distal cath. inside fibrous tissue
- Sx: Abdomen Distention/Pain/Mass + Neuro Sx
 - NO High ICP Sx NO Fever NEG. CSF C/S
 - Liver type: RUQ Pain, Post-prandial pain + High Transaminases
- Invx: U/S (1st) then CT
- Tx: NSx Consult (LP & Shunt tapping by NSx)

PREP EM | 4 Y/O VPS for Hydrocephalus, has Headache/Lethargy for 1 day No Fever/Vomit, had similar Sx 4 months ago before last revision, All Vitals/Ex Normal, most appropriate diagnostic test = CT Brain w/o Contrast

PEM R | 15 Y/O w/ programmable VP shunt placed 1 month ago, now having vomiting/headache, seen in different city hospital 8 days ago for vomiting also and thought to be food poisoning bcz all group had the same, MRI showed normal ventricle & symptoms resolved w/ anti-emetics, Now having vomiting/headache since 2 days, abdomen soft & lax no tenderness, no fever, neuro exam normal, has no pronator drift but cannot stand still & wanders slightly off course while walking, w/ mild past pointing on finger-to-nose testing, You obtain head CT shows enlarged ventricles w/ concern for shunt malfunction, likely cause of the malfunction = Shunt discontinuity (Not Pseudocyst in his abdomen nor Recent MRI nor Recent travel)

PEM R | 18 M/O w/ VP shunt, decreased energy & lethargy for 18 hours, No fever/sick contacts vitally stable, On Ex listless w/ spontaneous eye opening dilated & sluggish pupils, abdomen is distended but soft, CT brain without contrast shows enlarged ventricles, likely cause of abdominal distention = Abdominal pseudocyst (Not Bacterial peritoneal infection)

PEM R | 6 Y/O w/ VP placed at 1 M/O, now headache/fever 39.1, improves w/ acetaminophen, on Ex Afebrile, conversant but uncomfortable w/ slow head movements, has no abdominal pain or vomiting. CT brain shows improved hydrocephalus compared to post-operative CT 1 month ago when shunt was revised for a distal breakage, best next = Perform CSF analysis and treat with IV antibiotics (Not Obtain blood cultures and treat with IV antibiotics nor Order MRI brain to evaluate for shunt malfunction nor Provide migraine medications and arrange neurology follow up)

PEM R | 6 Y/O, girl w/ VP shunt for hydrocephalus revised 2 wks ago, Now Headache/Fever for 2 days Temp 39, No swelling/erythema No Abdomen pain/tenderness, Rt tympanic membrane mild erythema Brain CT shows no changes from post OR, appropriate course of action = Analyze CSF from VP shunt

PEM R | 6 Y/O VPS w/ Acute Severe Abdomen Pain, denying Headache/Vomit/Lethargy/Photophobia/Neck Stiffness, Abdomen tender w/ distention, Bowel sound present & passing flatus (not-obstructed), shunt never revised nor infected, Investigation to establish Dx = Abdomen U/S (to r/o Pseudocyst)

PEM R | 8 Y/O Non-verbal on VP shunt, crying/febrile/vomiting, appears bent over & grasping her abdomen, Temp 38.1 HR 130, No Hx of UTI, never had shunt revision & shunt placed when was born, Which Hx factor or Lab would accurately help diagnose pseudocyst = US Abdomen

PEM R | 14 Y/O VP shunt hydrocephalus revised 15 months ago, having Abdomen pain for 3 days Non-bilious Non-bloody Vomit, No Anorexia/Headache/Diarrhea, has abdomen moderate generalized tenderness, etiology cause = Abdomen US

PEM R | 11 Y/O on VP shunt coming w/ Alter mental state, HR 45 BP 160/90, several hours to transport, you intubated/mannitol given, now going to do Shunt reservoir tapping, correct statement = CSF flow is good means distal obstruction

- VP shunt tapping Opening pressure ≥ 25 = Distal Shunt obstructing (90%)

PEM R | 12 Y/O ID male, known SZ & VP shunt for hydrocephalus, in ED w/ Headache/Not acting right/slower than usual, VP shunt revision 4 years ago, Awake/Alert, No focality on Neuro exam, Brain CT dilated ventricles compared to 2 years ago, Next = Obtain XR shunt series

PEM R | 12 Y/O GDD w/ VP shunt, had 4 revisions last one 6 months ago, coming now w/ Altered mental state, however parent state that he is not much different from baseline & vitally stable, Next = Send for CT Head & Shunt series

PEM R | 7 Y/O girl w/ programmable VP shunt, w/ sudden onset of headache, No Fever/Vomit/Neck stiffness/Abdomen pain, shunt setting increased 1 week ago, likely cause of headache = Subdural Hematoma

PEM R | 12 Y/O boy on VP comes in community hospital very sleepy/vomiting for 24hr, HR 65 RR 16 BP 150/75, GCS 10, pupil Rt. Sluggish/Dilated more than Lt., NSx in other hospital 1hr by air, must be done immediately = Intubate, gentle hyperventilation to pCO₂ 30-35 mmHg & Tap the shunt

Chapter 3: Surgical

- VP malfunction Unstable for transport: VP Shunt obstruction + Low GCS

Promo | 6 Y/O on VPS for hydrocephalus revised 2 weeks ago, now Frontal headache/Fever 39 for 2 days, mild rhinorrhea for several days, No Vomit/Abd pain/Otalgia, No erythema or swell on shunt site, Neg. Meninges signs & No Abdomen tenderness, has mild Rt. Tympanic erythema w/ serous fluid not bulging, CT brain negative, Appropriate action = Analyzing CSF obtained from VPS (r/o Shunt infection-) (Not D/C w/ NSx F/U nor High dose Amox for 10 days)

Amal | 9 M/O, VP shunt 9 weeks ago, fever and vomiting, what is true = VP shunt infections occur in first 6 months (Not Shunts infection mostly due to Gram Negative organism nor Absence of lethargy and decrease activity rules out shunt infection nor CT scans need to be ordered)

Amal | Which is most worrying of shunt obstruction = Cushing triad (Not Bulging fontanelle nor headache nor vomiting)

Amal | Most common VP shunt complication = Obstruction (Not Peritonitis nor Bacteremia nor Pseudocyst)

Final25 | VP shunt Pt. w/ Pic of dilated ventricles on CT brain & increasing hydrocephalus, No fever = NSx Consultation

- Unstable VP Shunt

Amal | 18 M/O girl, T=37.2 HR 40 RR 26 BP 138/70, Pupils 5 mm sluggish reactive, not responsive, Shunt reservoir palpable, Neurosurgeon is not available Immediate action = Aspirate CSF from proximal shunt valve (Not Aspirate CSF from burr hole nor Shunt series and CT scan of brain)

- If this available then aspirate from proximal valve first even before giving Hypertonic saline

Other Neurosurgery issues

- Hydrocephalus

- Types:
 - Obstructive Communicating (Impaired absorption > Ventricle dilation)
 - Obstructive non-communicating (blockage > Ventricle dilation)
- Early presentation:
 - Wide Fontanelles > Fails to close at appropriate time > Macrocephaly
 - High ICP Sx: Irritability, Lethargy, Vomiting
- Late presentation:
 - Parinaud syndrome: Downward eye (sun-setting), Lid retractions, convergence retraction nystagmus
 - Cushing Sx: Bradycardia, Apnea (Late Sx & Poor prognostic)

PEM R | 3 M/O FT, past Hx of GBS diagnosed at 10 days of life, mother noted anterior fontanelle bulge, acting to baseline CT brain (very wide dilated ventricles) = Wide fontanelle

- Parinaud Syndrome (Dorsal midbrain Syndrome)

- Cause: Hydrocephalus, Pineal tumors
- Sx (CLUES):
 - Convergence Retraction Nystagmus
 - Light near dissociation
 - Upgaze paralysis (Sunset eye)
 - Eyelid retraction
 - Skew deviation

Final | Child w/ Hx of treated E. Coli 4 months ago, in ED w/ Sunset eye, Converge nystagmus, Now Afebrile Dx = Parinaud

Final | Child treated from meningitis 4 months back came with sign of 6 nerve palsy = Parinaud syndrome

Chapter 3: Surgical

- Brain AV Malformation (AVM)

- Most dangerous cerebrovascular malformation
- Risk of Hemorrhagic stroke
- Sx: SZ, Headache, Focal deficits, intracranial hemorrhage
- Invx: CT, MRI, CTA, MRA
- Tx: endovascular embolization, excision, radiosurgery

Final | Marfan syndrome teenager with progressive headache and neck pain = CT Brain (unsure if not CTA nor MRI)

- Risk Aneurysm of Subarachnoid hemorrhage due to AV Malformation
- MarfAn = MalformAtion AV = SubarAchnoid Hemorrhage

- Cord Compression

- Cauda Equina syndrome

- Info: Acute neurologic emergency
- Cause: Trauma (Hyperflexion injury), Disc herniation, Epidural hematoma
- Risk factor: vWB
- Path: compression of lumbosacral (L2–S5) nerve roots > Sensory loss, Dysfunction Bladder/Bowel
- Sx: Severe back pain, Leg tingling/weakness, urinary retention w/ overflow incontinence
 - Decreased rectal tone, Saddle anesthesia, gait difficulty, decreased rectal tone.
- Complications: Permanent bladder dysfunction, LL paralysis, chronic neuropathic pain, sexual dysfunction.
- Invx: Post void residual (PVR) volume > 400 mL (strongly suggestive)
 - MRI lumbar spine (Gold standard) (detects hematoma, disc extrusion, ligamentous injury).
 - XR often normal, CT spine if fracture suspected but insufficient for CES.
- Tx: Emergent NSx Consult (for Urgent decompression within hours)

- Pneumocephalus

- Types:
 - Post craniotomy: if air not completely evacuated before bone flap replaced
 - Post Basilar skull fracture: air from Sinuses
- Complication:
 - Tension pneumocephalus (Enlarging air > mass effect/midline shift)
 - CSF Leak (indicates tear in dura,
- Tx: Simple Pneumocephalus = Non-rebreather mask 100%
 - Tension pneumocephalus = Emergent NSx
 - CSF Leak = Conservative till 10-14 days if not improving Surgical intervention
 - Abx not required unless Sx of CSF infection develops

Final x2 | Post craniotomy came with lethargy & headache, CT Brain done & showed collection of fluid & air (going with pneumocephalus) what to do next = Non-rebreather 100% FiO2 & Neurosurgery (Not IV Dexta or Hyperosmolar therapy or LP)

Final | Post craniotomy with CT showed hypo-density and midline shift, next = (I think Answer was not provided, But Not Hyperosmolar therapy with mannitol & hypertonic saline nor IV Dexta or LP)

Chapter 3: Surgical

Ophthalmology

Optha Trauma

- Normal IOP 10-20 mmHg
- Ruptured Globe
 - o Definition: Disruption of Sclera or Corneal integrity by Penetrating/Blunt Trauma
 - o Sx: Tear drop pupil or Hyphemia
 - o Invx: CT Orbit
 - o Pre-Hospital Tx: Avoid any interventions, Eye Shield
 - o In-Hospital Tx: Eye Shield (not patch), Avoid direct pressure, Calm child, Bed 30 degree
 - Medications Analgesia/Anti-Emetic, Sedation, Anti-emetic, Tetanus, IV Abx
 - Emergent Optha Consult
 - o AVOID Fluorescein Eye drops (Contraindicated, dye enters Ant. Chamber Increasing risk of Infection & Vision)
 - Contraindicated in: Rupture globe, Recent Eye Surgery, Severe Eye Infection, Contact lens, Allergy

PEM R | 4 Y/O w/ Rt. Eye pain after tripping & falling on drawer in kitchen, having clear eye discharge, having intact extra-ocular movement, but very Hyperemic tear drop shaped pupil, Next = Emergent Optha evaluation

PEM R | 12 Y/O boy w/ Rt eye injury by pocketknife, has blurry vision & eye pain, best visual acuity is hand motion at 5 feet, (image of pupil teardrop ?), Next step = eye shield

PEM R | 14 Y/O girl, Lt eye pain hit eye w/ toy train, on Ex large Subconjunctival hemorrhage irregularly shaped pupil w/ paradoxical constriction, intraocular 12 mmHg, Fluorescein 3x0.5 mm linear uptake, definitely warrants immediate Optha = Eccentric shaped pupil (Teardrop)

- o Rupture globe = Teardrop points to area of injury

PEM R | 14 Y/O Lt eye pain being hit in eye w/ toy BB gun after shooting soda cans, on Ex (image of eye showing part of can embedded on eye), Next = Apply eye shield

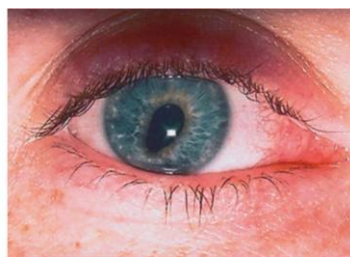
- o Penetrating eye trauma

Final | Patient eye trauma (Pic tear drop pupil), Next = Eye shield

Final25 | Ocular trauma w/ Pic of tear-drop), asks about management = Analgesia, antiemetics, Rigid shield and ophthalmology (Not Exam the eye)



Open globe: 360 subconjunctival bleed



Open globe: Tear drop sign

- Spontaneous Hyphema
 - o Risk: SCA
 - o Tx: Elevate head, Eye shield
 - Cyclopentolate (Anticholinergic > paralysis of ciliary muscles > analgesia)
 - Topical steroid (Stops re-bleed, DON'T give PO to avoid systemic side effects)

PEM R | 7 Y/O SCA brought w/ red eye, teacher noticed blood in Lt eye after complaining of eye pain after math test, No trauma or recent illness, GCS 15 on Ex having layer of red blood cells 50% on Anterior chamber of Lt eye, IOP 18 mmHg = Anticholinergic eye drop (Cyclopentolate)

Chapter 3: Surgical

- Hyphema
 - o Definition: Blood in Anterior chamber of Eye > Increase IOP
 - o Grades: 1 = 25% = < 1/3
 - 2 = 50% = < 1/2
 - 3 = 75% = < 1 (or Total)
 - 4 = 100% = Total (8 ball)
 - o Sx: Pain, Blurring of vision
 - o Tx: Analgesia/Anti-emetic, Eye drops, +/- Eye shield
 - AVOID Aspirin/NSAIDs (risk of rebleed)
 - R/O Emergency: Bed Rest w/ 45 degree elevation, Emergent Optha then Admit for All
 - Prevent 2ndry bleed: AMICAR, Antifibrinolytic, Tranexamic acid
- Urgent Optha then OPD for Low Risk
 - o No Hematology comorbid
 - o No other concomitant injuries
 - o Minimal pain
 - o Visual Acuity better than 20/80
 - o Small hyphema w/ layering below pupil
- Emergent Optha Consult Indication:
 - o Severe pain, Total Hyphema
 - o Known Hemoglobinopathy (Sickle cell disease/trait, Hemophilia)
 - o Concern of High IOP (or Persistent elevation despite Tx)
 - o Visual acuity < 20/200 (Significant vision deterioration)
 - o Clot persist for 7 days

PEM R | 9 Y/O Rt. Eye hit by golf ball, having eye pain, photophobia, blurry vision, Mild lid swell ecchymosis, No Periorbital swell or tenderness, opening both eyes, (image of traumatic hyphema), Next = Place eye Shield

Promo | When to do Emergent Optha consultation if pt. Unable to open eye = Hyphema

Promo x3 | Baseball player sustained trauma to Rt. Eye exam shows Hyphema reaching lower border of iris, other exam normal, your action = Admit, 45 head up, observation (Not Arrange Optha F/U nor Local Abx nor Apply soft eye patch)

- o Don't use Sux for intubation as it releases K and K is released with trauma within 24hr

Amal | 10 Y/O, stuck in her left eye by baseball, no LOC no vomiting, On Ex: Swelling inperiorbital area, EOM intact, optic disc margin are sharp, Hyphemia up to lower 3rd of pupil, vision decrease in affected eye, Which of the following is next step in management = Admit for bed rest with elevation of bed 45 degrees (Not Apply antibiotic ointment nor Outpatient Ophthalmology F/U nor Cover the eye with patch and hard cover)

- o Risk of rebleed within 24hr, Monitor IOP
- o Cataract risk late in age especially if rebleeds

Final | Case of Trauma in Sofa w/ good Neuro Ex but has bruising around ear & hyphema in ear, Next = CT Brain

Final | Baseball player trauma to Rt. Eye, Ex shows Hyphema reaching lower border of iris, other Ex normal, Tx = Admit to hospital 45 head up, observation

Final | ? Hyphemia (Traumatic Hyphemia always for admission)

Table 10. Hyphema Quantification

Grade	Percentage of Anterior Chamber	Illustration	Frequency of Macroscopic Hyphemas ² (%)	Visual Prognosis of 20/50 or Better ^{14,15} (%)
Grade 4	Fills entirety of the anterior chamber		8	25-50
Grade 3	1/2 to nearly entire anterior chamber		14	25-50
Grade 2	Between 1/3 and 1/2 of anterior chamber		20	65-70
Grade 1	Less than 1/3 of anterior chamber		58	75-90
Microscopic (based on the SUN working group consensus for uveitis) ¹⁶	1+ cell = 6-15 cells/HPF (1 x 1 mm slit beam) 2+ cell = 16-25 cells 3+ cell = 26-50 cells 4+ cell = >50 cells			75-90

Chapter 3: Surgical

- Corneal Abrasion

- Path: Disruption of Corneal Epithelium
- Causes: Trauma, Infection, Contact lens
- Sx: Photophobia, Tearing, Foreign body sensation, resisting eye opening
- Dx: Fluorescein eye drop, Slit lamp
- Complications: Retained FB > Multiple abrasions, Corneal Ulcers, Infections
- Tx: Topical anesthesia applied at hospital prior to inspection
 - Mydriatic drops (Cyclopentolate, has some analgesic effect by relieving ciliary spasm related pain)
 - Topical Abx (Mainstay of Tx, Prevents Infection)
 - Artificial tears
 - F/U Optha: Large abrasion, Involving Visual axis, Pain/Redness persisting 2-3 days

PEM R | 6 Y/O girl Lt eye pain after playing in park, having tearing/blurred vision/inability to open eye, topical anes given & able to open eye shows injected conjunctiva and w/ fluorescein has multiple linear vertical lines at center of cornea, Next = Evert eyelid & inspect for FB

PEM R | 8 Y/O injured Lt eye after running to tree, has 20/20 Rt. Eye 20/70 Lt eye, Fluorescein shows (corneal abrasion), true = Mydriatic drops prescription (Not

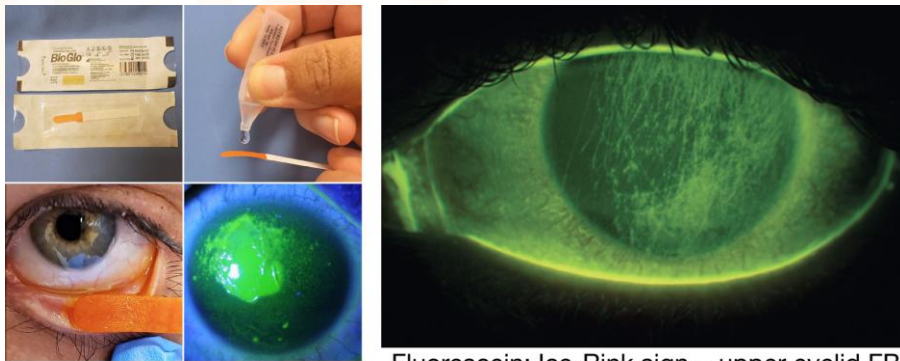
Promo | 18 M/O Rt. Eye pain w/ injection, Fluorescein dye applied shows (Corneal abrasion) Next step = Topical Abx (Not Eye patch 72hr nor Tetracaine eye drop

Promo | Hx of Trauma while playing w/ other kids came w/ eye pain, after fluorescent dye on eye shows (up & down pattern of Corneal abrasion), Best Tx = Remove foreign body (Not Local Anesthesia & Abx nor Cycloplegia & Abx nor Local Abx & Eye shield & Discharge)

Amal | Which of the following is the most common eye injury = Corneal abrasion

Final | Pic of corneal abrasion and sever pain what med can decrease the pain = Mydriatic drops (Cyclopentolate)

Final | Corneal abrasion, how to ease the pain = Mydriatic drop



Fluorescein: Ice-Rink sign = upper eyelid FB

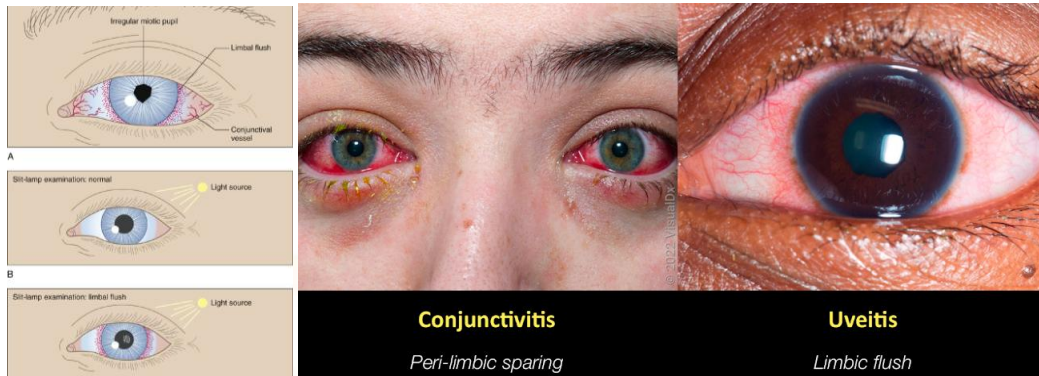
Chapter 3: Surgical

- Traumatic Iritis (Anterior uveitis)

- Sx: Photophobia 24-72hr (Hallmark sign), **Red Ciliary flush in eye**, Decrease visual acuity
- Invx: Slit lamp (diagnostic, shows cells & flares in Anterior chamber)
- Tx: Topical Analgesia, Mydriatic drops

PEM R | 10 Y/O boy Lt eye pain, blurred vision, Photophobia, Lt eye injury yesterday seen by PCP no corneal abrasion given Topical Abx, on Ex Visual acuity Rt. 20/20 Lt. 20/70, Lt eye Perilimbal conjunctival injection, pupils round 2mm in diameter but sluggish reaction to light which worsen pain, Extraocular movement normal, IOP 12, Tx = Apply cycloplegic

Amal | Young man with history of punished at eye 2 days ago. Which of the following is supportive more of isolated traumatic iritis without other associated injuries = Cells and flares in Anterior chamber (Not Hyphema or Cells and flares in Anterior chamber -Uveitis- or Cloudy Cornea -glaucoma- or Irregular pupil -globe rupture-)



- Chemical Ocular Burn

- Cause: Detergents (Alkali)
- Sx: Redness, Photophobia, Conjunctival swell
- Tx: Asymptomatic + Hx Low amount = Consider No Lavage
 - Symptomatic [Decontaminate, Irrigate till 20min/2L or Ph 6.5-7.5)
 - Immediate decontamination
 - Irrigation For 20min or 2L (1L NS irrigation by Morgan Lens or infusion w/ max flow rate medial to lateral)
 - After irrigation check Ph Goal: 6.5-7.5 or equal between both eyes (Check Ocular Ph every 15-30min)
 - Optha Consult after

PEM R | 22 M/O playing in kitchen, found near dishwasher detergent pods, seen on face/eyes, dad wipes it off, child crying/eye closed, limited eye exam pupil reactive, Next = remove all contaminated cloth & irrigate

PEM R | 12 M/O w/ Leukocoria, test to diagnose = MRI of brain & orbit

PEM R | 6 Y/O splashed household bleach on Lt eye, mother rinse it and came to ED, on Ex redness/tearing of Lt eye, Rt. Eye normal, best indication to stop irrigation = Ph comparable to unaffected eye

PEM R | 12 M/O crying w/ Rt eye pain after splashed drain chemical, Next step to anesthetize affected eye & irrigate w/ NS = Until Ph after irrigation is 6.5-7.5

PEM R | 17 Y/O girl having ocular caustic chemical injury w/ eye Ph 12, after irrigation w/ normal saline using Morgan lens w/ 5 L of NS, still worsening eye pain & now having corneal clouding, which circumstance require immediate Optha treatment = Eye Ph continues to measure 12 despite irrigation

PEM R | 2 Y/O boy w/ bilateral eye pain after liquid pool cleaner, having difficult eye open w/ conjunctival injection bilateral, pupil reactive bilateral, true = Fornices should be everted & thoroughly irrigated

Final | Scenario about optimum Ocular irrigation = Morgan lens 1-2 Liter

Chapter 3: Surgical

- Eyelid Laceration

- Medial Eyelid laceration Possible complication of Nasolacrimal duct damage
- Indication of Optha repair in eye injury
 - Eyelid full thickness, Eyelid margin (> 1mm)
 - Full thickness penetration to Orbital septum or tarsal plate
 - Lacrimal duct laceration
 - Globe injury
 - Ptosis (concern of levator muscle injury)
 - Complex laceration
- Emergent Optha Consult:
 - Severe pain, Total/Traumatic Hyphema
 - Known Hemoglobinopathy (Sickle cell disease/trait, Hemophilia)
 - Concern of High IOP (or Persistent elevation despite Tx)
 - Visual acuity < 20/200

PEM R | 16 Y/O Lt eye injury, oblique laceration of Lower eyelid (image of medial lower eyelid laceration), able to open eye, pupil round & reactive, normal vision, Next = Consult Optha

PEM R | 5 Y/O Rt. Eye pain after sibling scratched Rt eye w/ sharp plastic toy, bleed from lower eyelid now stopped, No blurry vision, No abrasion on Fluorescein, No tenderness/swell, on Ex (image of medial canthus of eye laceration), Tx = Consult Optha for repair

Promo | 2cm Laceration w/ flap after fall on edge of Supra-Orbital reaching eyebrow, what to do = Repair & Abx or 2ndry intention (Incomplete Q) Face laceration repair for osmotic

Promo | Supra-Orbital 2cm laceration w/ no active bleed = Irrigation w/ 8 gauge cannula (or 19 or 22 or 30, Incomplete Q)

Final | Pic of eyelid laceration = Optha consultation

Final | Eye laceration = Optha consult

Other Optha issues

- Retinoblastoma

- Rare after > 2 Y/O, RB1, chromosome 13p14, 40% hereditary w/ 90% penetrance
- Most common primary malignant intraocular tumor of childhood, rare after 2 Y/O
- 30% Hereditary, and most Hereditary Retinoblastoma have increased risk developing Osteosarcoma
- Sx: Leukocoria (White Pupillary reflex, Bilateral 20-30%), Strabismus, Pain if w/ Glaucoma
- Invx: Optha exam under GA shows White retinal mass
 - Ocular orbital U/S, MRI (AVOID CT not to induce 2nd cancers due to radiation)
- Tx: Urgent Optha Consult
 - Unilateral Enucleation, Bilateral Chemo

PEM R | 18 Y/O having vision problems increasing trouble seeing on Lt side, Ex (white reflex Lt eye), otherwise healthy, Tx = Consult Optha

PEM R | 2 M/O referred for Leukocoria, on Ex only absent red reflex US eye (shows something ?), statement correct = Most cases are unilateral

Chapter 3: Surgical

- Infantile Glaucoma

- Present in 1st few years of life
- Sx: Excessive Tear, Photophobia, Blepharospasm (twitching/blinking eyes), Corneal Edema, Corneal Clouding
- Complication: Vision loss
- Tx: Surgical correction

PEM R | 6 M/O watery eyes, recently started daycare, having twitching/blinking eyes, mother thought related to bright light, No Fever/trauma, sclera clear, cornea slightly clouded, pupils reactive, Fluorescein normal, Best Tx = Surgical correction

PEM R | 11 M/O in ED w/ excessive Rt. Eye tearing, No redness/discharge/fever/trauma, appears closing eye tightly as if in pain, happy interactive, on Ex Rt. Eye larger than Lt, clear tears, Rt. Cornea cloudy, Best definitive = Surgical intervention

ENT

Tracheostomy tube

- Tracheostomy tube Complications

- Tracheoinnominate artery Fistula or Thyroid ima artery Fistula
 - Unusual, peak incidence within 1st 3 wk of insertion up to 18 months
 - Sx: Bleed Minor > Massive, Delayed Bleed
 - Diagnosis: Bleed $\geq$ 10 mL
 - Tx: Hyperinflate balloon w/ Trach partially withdrawn to occlude further bleed
 - IF Hyperinflation didn't stop bleed use ETT w/ cuff distal to trach stoma to prevent bleed entering airway then Consult ENT immediately
- Tracheostomy Obstruction
 - Tx:
 - 1st = Suction > Ventilate through tube
 - 2nd = Remove > Cannulate stoma w/ Smaller Tracheostomy or ETT
 - 3rd = Ventilate through Mouth (Ambu-bagging) or Cannulate from Mouth (consider as difficult airway and consult)
 - If Q had fresh tracheostomy within 1 month then call ENT

PEM R | 8 Y/O w/ development delay w/ Trach tube, placed 3 wks ago requiring vent at night, suddenly develops profuse bleed at trach tube site after being suctioned in ED, next step = Hyperinflate Trach cuff balloon to occlude bleed

PEM R | 4 Y/O Hx of Extreme preterm 26wk on Tach used for suctioning of secretions & O2 at night, now in ED having new congestion & increased Trach secretions, suddenly alarm for saturation 55% & cyanotic, 1st thing after donning PPE = Check O2 connected properly & Pulse ox attached correctly

PEM R | 3 Y/O complex medical Hx w/ Tracheostomy in place, EMS brought him w/ severe RD, bilateral rhonchi sounds, next best = attempt to suction tracheostomy tube (DOPE)

Final | Patient on tracheostomy, has URTI sx, while in ED, she suddenly desat, fair air entry, suctioning done, and ambu-bagging, no improvement, Next = replace trach immediately with smaller ETT (Not oral endotracheal intubation or Call ENT)

Final25 | Pt. on Tracheostomy with heavy secretion and they did suction and gave oxygen w/ BVM ventilation with no improvement what next = Change with smaller size ETT (Not Oral Intubation with cuffed ETT nor Oropharyngeal airway nor Connect to continuous suction)

Chapter 3: Surgical

ENT Mass

- Central neck mass + Moves w/ tongue protrusion + appear w/ infection = Thyroglossal cyst | Tx: Warm/Abx, Excision (definite)
- Lateral neck mass + on SCM + appear w/ infection = Branchial cleft cyst | Tx: Abx, Excision (definite)
- Lateral Neck mass + behind SCM + Transilluminates + appear w/ cry = Cystic Hygroma

- Thyroglossal duct cyst

- o Most common congenital cyst
- o Sx: Moves w/ tongue protrusion
- o Tx: Warm compress & PO Clindamycin (1st line)
 - IV Abx if PO unsuccessful or unable to tolerate PO
 - Surgical excision (Definitive)

PEM R | 6 Y/O w/ Neck swell after several days cough/congestion, Tender/Anterior midline mass w/ overlying warmth & erythema which moves w/ tongue protrusion, true regarding Dx = Definitive Tx is Surgical excision

PEM R | 13 Y/O girl, swell of Anterior neck for 1 week, preceding URTI resolved, on Ex palpable 1cm smooth mass in midline neck warm tender, moves w/ protruding tongue, no fluctuant no active drainage, Next = PO Clindamycin

Final | Pediatric with neck mass and move with tongue protrusion and with swallowing next step (Thyroglossal cyst. Picture) = US (Not Abx -only if has pus discharge or infected- nor Fine needle aspiration nor TFT)

- Branchial cleft cyst

- o Sx: on SCM mass, Painful, red
- o Invx: US (thin walled anechoic fluid filled cyst)
- o Tx: PO Abx
 - Surgical Excision (Definitive after treatment of infection, to prevent recurrence)

PEM R | 14 Y/O worsening swell of Rt. Side of neck past week, Fluctuant mass at angle of mandible, Anterior to SCM muscle tender to palpate/warm w/ central pit & no active drainage, best next = US of the mass

PEM R | 9 M/O boy having intermittent draining of lateral aspect of neck since birth, last few days became painful/swollen, on Ex draining actively from Anterior border of SCM, tender to touch, surrounding skin erythematous, Dx = Infect Branchial cleft sinus or cyst

- Cystic Hygroma

- o Lymphangioma, Macrocytic lymphatic malformation
- o Location: Neck (most common): Posterior triangle of neck, behind SCM
 - Other sites: Axilla, Groin, Popliteal fossa, Chest/Abdomen wall
- o Sx: Appear w/ Valsalva/Crying/Cough

PEM R | 15 M/O girl, worsening painless swell of posterior neck after episode of crying, on Ex compressible mobile mass posterior to Lt SCM which Transilluminates, Dx = Cystic Hygroma

Chapter 3: Surgical

- Post Tonsillectomy complications

o Post Tonsillectomy Hemorrhage

- Total tonsillectomy risk 3-5%, Partial tonsillectomy risk 1%
- Primary < 24hr (due to high vascularity of tonsil)
- Secondary (Delayed) > 7-10 Days (Related to healing & eschar tissue sloughing)
- Invx: CBC, Coagulation
- Tx: Stop bleeding, Hydration, ENT Consult

PEM R | 7 Y/O Adeno-tonsillectomy now having spits up blood clots while brushing teeth, has blood clot on Rt. Tonsillar fossa w/ no active bleed & whitish-gray coating Lt tonsillar bed, Next = Place IV & CBC/Coagulation

- Ranula

- o Uncommon (~0.2/1000 people), most often in children & young adults.
- o Path: caused by mucus extravasation from the sublingual salivary gland.
- o Sx: Painless, fluctuant swelling on the floor of mouth
 - 3-6 weeks w/ rapid enlargement,
 - May spontaneously rupture or resorb, often fluctuates in size.
- o Tx: First-line: Observation up to 5 months for spontaneous resolution.
 - If persistent/recurrent: Surgical excision of the ranula and the affected salivary gland is definitive.
 - Other options: corticosteroid injection or cryotherapy.
 - Not indicated: Incision & drainage, aspiration, or antibiotics (not infectious)

PEM R | 8 Y/O w/ Hx of mass growing at rt side of tongue, fluctuant, non tender, without bleed/discharge, No Cervical LN, Next step = D/C w/ OR F/U

- Posterior Oropharyngeal mass

PEM R | 15 Y/O w/ 2 months intermittent pain/fever Sx improved after course of Amox 6 weeks prior then returned afterwards, past week increased throat/difficult swallow/muffle voice, have been on Augmentin for 3 days w/ no improvement, Ex Oropharynx w/ small/movable/non-tender cervical Adenopathy (pic of mass behind tonsil) = Obtain CT Maxillofacial

- Laryngomalacia

- o Loudest sound at 4-8 M/O, Resolves at 15-18 M/O (~1-2 Y/O)
- o Sx: Inspiratory stridor (more in supine position)

PEM R | 4 M/O FT, Noisy breathing soon after birth, recently more prominent, more when laying on back, well appearing on Ex, occasional Inspiratory stridor when placed in supine, next step = Provide reassurance to family

PEM R | 3 M/O primary doctor says floppy airway but will grow out of it, symptoms misdiagnosed floppy airway = infant takes longer to get through feeding due to difficult breath

Chapter 3: Surgical

ENT Trauma

Nose Trauma

- Epistaxis

PEM R | 2 Y/O vomiting with blood, previously healthy, threw up cloth (pic of blood in cloth), no abdomen pain or bloody stool, PR normal, next = examine nares

PEM R | 10 Y/O 2hr epistaxis, not stopped despite continues compression/topical vasoconstrictors, cautery, profuse bleed on Kiesselbach's plexus, now Pale HR 178 BP 76/44, Next step = Rapid of isotonic fluid

- Nasal Septal Hematoma

PEM R | 13 Y/O girl w/ septal hematoma, next = I&D then packing

PEM R | 17 Y/O male w/ nasal pain/congestion, hit face while skateboarding, had initial epistaxis, on Ex dark blue/red swell of nasal septum, next = Incision & drain w/ nasal packing

PEM R | 15 Y/O boy, punched in face during fight in school, ecchymosis/swelling along nasal bridge, some dried blood in bilateral nares swell Rt. Nasal septum, Next step = I&D

PEM R | 11 Y/O fall face into grass, No LoC No Vomiting, injury 1hr ago, Mild Swell nose, dripping epistaxis, blue swell within Rt. Nare along nasal septum, Epistaxis improves but swelling along septum unchanged, you counsel father that no need for CT head but needs = ENT Consult for swelling within nasal septum

PEM R | 11 Y/O boy w/ nose injury hitting pole, No LoC/Vomit, has bleed in nose stopped after pressure for 15min, on Ex no nose deformity or epistaxis, but small hematoma on nasal septum, Tx = Drain hematoma

Promo | Trauma on Nose, brought concerned of Nose fracture, child complaint of narrowing of his nostril, Ex (Pic of Septal hematoma), Tx = Incision & Drainage

Promo | Child fell on face, which can happen = Septal Hematoma

Final | Child fall on his face which one of the following can cause = Septal hematoma

- Nasal laceration

PEM R | 5 Y/O boy in front yard was attacked by next door dog, multiple facial lacerations w/ deep 3cm to rt cheek involving Rt. Nostril rim, which should consider while repair = Layered closure of nasal laceration is indicated

Chapter 3: Surgical

Ear Trauma

- Auricular hematoma
 - o Post Trauma
 - o Risk: Contact sport
 - o Complication: Cartilage destruction
 - Cauliflower ear (external ear permanent swell/deformity, Prevent by draining within 48-72hr)
 - Perichondritis (Prevention: Abx Augmentin for 7 days)
 - o Tx: Needle aspiration if < 2cm | I& if > 2cm
 - Ear N. Block, Thorough Irrigation, Drain Hematoma, Apply pressure dressing for 72 hrs
 - < 7 Days = I&D (Best Time to drain within 72hr)
 - > 7 Days = ENT
 - Abx:
 - < 18 Y/O = Augmentin for 7 Days
 - > 18 Y/O = Levofloxacin for 7 days
 - F/U Daily for 5-7 Days for reassessment, dressing change (To prevent re-accumulation)
Return for sports after 7-10 days
 - IF Perichondritis: Admit & IV Abx (Vanco + Ceftazidime)

PEM R | 14 Y/O Boy, in ED w/ Rt. Ear after wrestling match, having ecchymosis & Fluctuance mass on Rt. Outer ear, No LoC or Vomiting, Dx = Cartilage destruction with long deformity

PEM R | Adolescent hit ear with swollen earlobe, complication = Cauliflower ear

PEM R | 14 Y/O wrestler presenting w/ Rt. Ear pain after a blunt trauma to Rt. Outer ear, no LoC or Vomiting, parents concerned about swelling of outer ear, Alert & Neuro examination normal, coming 4hr after injury, Rt. Auricular hematoma, Patent ear canal & no Hemotympanum, Performed Auricular block w/ 1% Lidocaine w/ Epi, & Drain hematoma, When to return to sports = Pressure dressing & Augmentin for 7 days w/ Daily F/U, return after 7 days if Hematoma didn't re-accumulate

PEM R | 15 Y/O trip & fall hitting Lt ear, w/ swell of ear, tympanic normal, has 2cm swell & discoloration in ear lobes, Next Drain swelling & apply pressure dressing

PEM R | 15 Y/O pain of Lt ear after hit in hockey, No LoC, Swollen ear, ear canal & membrane normal, Tx = Aspiration

Promo | Cauliflower Hematoma in Ear, Tx = Needle Aspiration & Pressure

Promo | 15 Y/O Boy, pain to Lt ear while playing ice hockey another player stick hit him in Lt. ear No LoC, having swelling of Lt. ear pinna (in picture) compared to Rt. Ear, his ear canal & tympanic membrane are normal, Tx important = Aspiration

Amal | 13 Y/O presented to the ED two hours after a blow delivered to one ear during a fight. The ear is swollen and painful. On physical exam, you have a 2-centimeter diameter area of bruising and fluctuance along the upper aspect of the ear pinna anterior. Of the following, the most appropriate next step in the management of this patient is = Evacuate the hematoma with needle and syringe (Not Arrange ENT clinic in 1-2 days nor apply pressure dressing constantly on ear)

- o Evacuate Needle & syringe > pressure dressing

Amal | 11 Y/O trauma to ear This is a swollen hematoma deck (pic of Cauliflower ear) = I&D

Final | Your management (ear hematoma) = Drain

Final25 | Ear lobe post auricular hematoma post drainage came now with pain and erythema and swelling + fluctuation suspected abscess next step = ENT referral for admission, drainage and IV Abx (Not Abx and discharge nor I&D and discharge)

Chapter 3: Surgical

- Ear Cartilage Laceration

- Complication: Perichondritis
- Tx: Ear cartilage primary repair better than delayed, Ear skin can use adhesive
 - Absorbable suture (Needs primary closure in ED)
 - Abx Clindamycin (High risk of Infection if cartilage exposed)
 - F/U within 24hr(Risk of Peri-Chondritis -Fever/Erythema/Pus/Tender Pienna- Needs ENT Consult + IV Abx)

PEM R | 16 Y/O Girl w/ ear pain & laceration after friend ripped her ear pierce during fight, irregular deep laceration of ear helix w/ exposed cartilage, No pus or erythema, wound hemostatic, Tx = Repair w/ Absorbable & D/C on Clinda w/ F/U within 24hr

PEM R | 18 Y/O girl, short after altercation in which earring placed in helix of Lt ear was ripped out, on Ex laceration extending down to cartilage of auricle, Local block & irrigation done, Next = Single layers closure w/ appropriate approximation

PEM R | 16 Y/O girl w/ ear pain, ear laceration by ripping piercing during fight, has irregular deep laceration of ear helix w/ exposed cartilage, management = Repair w/ absorbable suture & D/C on Clindamycin w/ Peds F/U within 24hr

- Tympanic Membrane Perforation

- IF < 25% of tympanic membrane surface rupture = 90% will heal spontaneous
- Path: Perforation of Tympanic membrane by Foreign body, infection, Blast, High barometric pressure
Most commonly: Pars tensa
- Sx: Pain, Decreased hearing, bleeding
- Tx: keep ear dry, analgesics, Otic Antibiotics for contaminated injuries (90% heal in a few months)
- ENT F/U in 1 month

PEM R | 14 M/O very active, having cough/rhinorrhea for 1 week, No RD, has cerumen in bilateral ear canal, and he is moving a lot & during cleaning it had rupture of tympanic membrane, counsel = Otic Abx drops for 7 days then Peds F/U 4 weeks

PEM R | 9 Y/O Rt. Ear injury after inserting wooden stick into rt ear canal w/ bleeding/pain after, has small tympanic membrane perforation, no longer painful, Next = Ciprofloxacin/Dexa Otic drops

Chapter 3: Surgical

Dental & OMF

Dental

- Types:

- Concussion
- Luxation: Subluxation Lateral
- Displacement: Intrusion, Extrusion
- Avulsion (Keep in Hanks>Milk>Cheek>Saline>Water + Emergent Re-Implant)
- Fracture: Classified as ELLIS

- Loose tooth

Promo | 11 Y/O Post Trauma tooth loos but no intrusion or fracture, Tx = Soft diet & NSIAD (Not D/C w/ F/U Dental 24hr nor Urgent Dental (If permanent teeth with Extrusion and Mobility needs Emergent Dental)

Promo | 15 Y/O fall on his mouth Trauma, now having a mobile Tooth but non-displaced = Urgent follow up with Dentist within 24 h (Not Soft diet and follow up with Dentist in 1-2 weeks)

- Dental extrusion > 3mm need re-implant w/ splint

PEM R | 12 Y/O struck by golf club, lip laceration, tooth pain, (image of extrusion of central incisor), nothing else, given analgesia, Tx = Consultation of Dentistry for immediate treatment

PEM R | 9 Y/O girl teeth almost out, management w/ discharging of Dental F/U = Reposition & splinting to tooth

PREP EM | 13 Y/O dental injury Pic (shows teeth extrusion), no tenderness on palpation, next = Repositioning & Dental Splint

- Dental splint (Periodontal past splints) in ED then to be evaluated by Dentist within 24hr
- Primary teeth or mildly subluxed teeth NOT Splinted

- Tooth Avulsion

- Primary Teeth
 - Conservative/Reassurance
- Permanent Teeth
 - Tx At home: Keep in Hanks > Milk > Cheek > Saline > Water + Emergent Re-Implant
 - Tx: At hospital: re-implant within 60 min (Preferable within 15-30 min)
 - Technique: Irrigate without scrubbing for 10 sec then re-insert tooth

PEM R | 12 Y/O fell off bike hitting curb landed on face w/ immediate pain/bleed per mouth, found 2 teeth on side walk wrapped in towel, EMS brought him to ED in 15min, Dentist will come to ED in 30min, best to preserve teeth = re-implant teeth

PEM R | 4 Y/O boy tripped while running knocked out tooth, no vomit/drool, gum bleed stopped, tooth found, Next = Discharge home w/ pain control & close Dental F/U (Primary teeth)

PEM R | 12 Y/O drove into a parked vehicle hitting face, patent airway, and all normal, has Lt upper central incisor (image shows extrusion of teeth), Tx = Reposition tooth & place splint in ED

PEM R | 16 Y/O playing basketball has avulsed upper central investor, tooth put in cup w/ saliva, in ED, next = Immediately attempt to re-implant tooth

PEM R | 14 Y/O hockey player had loss of Rt. Lateral incisor, came with teeth in milk from injury 15min ago, Next = Rinse tooth w/ saline & insert into socket

PEM R | 15 Y/O avulsed central front incisors 30min ago, Next = Attempt to re-insert tooth

- Irrigate without scrubbing for 10 sec then re-insert tooth

Chapter 3: Surgical

PEM R | 13 Y/O male, knocked out teeth, can't re-implant due to gingival implant, Next = Handle by crown & place milk

Promo | 12 Y/O boy after fight his tooth hit the ground, best way to save tooth = Keep in Pt. Cheek (Not Water nor Wet gauze)

Promo | 14 Y/O Hockey player lost Rt. Lateral incisor after collision on ice, brought tooth with him in milk container, 15min prior to arrival, Tx involve which steps = Rinse tooth w/ Saline & insert into Socket

Promo | 13 Y/O Child had trauma on face, Avulsion of Permanent teeth, Next = Re-implant ASAP

Amal | you are in your car in street on your way to the hospital, you saw 13 Y/O boy after fight on inspection of his mouth, you find sever pain & profuse bleeding with missing tooth, his friend found his teeth & ran to you, Which of the following method is appropriate to transport the tooth = Ask him to keep it inside his mouth near the cheek

- Best transport = Hanks > Milk > Salvia (Inside Cheek) or Saline
- Permanent teeth or Age w/ NO Risk for Aspiration (> 5 Y/O) = Between cheek & Gum

Amal | 8 Y/O knocked his teeth while playing in the playground, mother brought after with an Avulsed tooth, what is the least desirable medium for transport = Water (Not Hank solution nor Milk nor Saliva)

Amal | 4 Y/O old girl fell and injured lower incisors, 15 minutes ago. avulsed and has minimal soft tissue swelling, father has the teeth intact in his hand, next step = Reassurance (Not Place in Hanks solution until dental arrive and re-insert it nor Placement of tooth in socket by ED nor Dental consultation)

Final | 12 Y/O tooth fell, best way to save tooth = Keep in patient cheek

Final | Tooth Avulsion = re-insert (if permanent teeth)

Final25 | 13 Y/O, Came with an extracted tooth parents got the tooth and kept in milk, the incident was 15 minutes ago What to do next = Rinse in saline and insert in pocket (Not Scrub in saline and re-insert nor Call dental urgently nor Keep on milk and dental tomorrow)

- Dental Fracture

- Types Enamel > Dentin > Pulp
 - Ellis 1 = No Pain = OPD Dental (for aesthetic repair)
 - Ellis 2 = Pain w/ Cold/Hot = Dressing + 24-48hr OPD Dental
 - Ellis 3 = Pain w/ Touch, Bleed from core = Emergent Dental
 - Ellis 3 Requires Dental assessment:
 - Primary teeth = Semi Urgent for Extraction (to reduce pain & risk of infection)
 - Permanent teeth = Emergent for Repair

PEM R | 9 Y/O girl tripped while running struck mouth on edge of steps, found fragment of frontal teeth, (image of intrusion of teeth w/ Ellis), jumps from pain when central portion of Rt. Upper incisor is touched, No laxity on tooth, Next = Administer analgesia & Emergent dental Consult

PEM R | 13 Y/O riding skateboard hit face on concrete was wearing helmet, broke tooth w/ fragment in cement, complains of tooth sensitivity but not loose, no malocclusion, Next = Discharge home w/ soft diet, pain control, dental F/U

PEM R | 2 Y/O boy is brought to the ED after tripping and hitting his mouth on a railing 1 hour ago. He has been crying, and the mother saw blood from his upper mouth. You localize the injury to the following site, In addition to reassurance and oral analgesics, what is the most appropriate management for this patient's injury = Urgent dental evaluation for extraction

- For primary teeth Urgent dental FU necessary for to minimize pain and reduce the risk of infection
- For permanent teeth, immediate dental pulpal treatment in ED is required to preserve tooth viability

Challenger | 2 Y/O boy tripping & hitting mouth 1hr ago, has blood from upper mouth (Image tooth pulp exposed), oral analgesia given, Tx = Emergent dental evaluation for extraction (Not splinting nor Discharge w/ F/U as needed in 1 week)

Amal | 9 Y/O Fell 8 hours ago, pain of lower central incisor w/ lower half of tooth visibly fractured & avulsed w/ bleeding from central core of tooth, no dental tools, given analgesic & she feels better, Best Tx = Emergent dental consult to see immediately

Final | 4 Y/O w/ dental fracture with pulp exposed (Ellis 3) next step = Immediate referral to Dental (Not Referral after 24 hrs)

Final | Dental Fracture w/ Pulp exposure in 4 Y/O boy = Immediately call dental (Not Urgent F/U w/ Dental in 24hr)

Final | 4 Y/O with Dental Fr & Pulp exposed = Dental Now (Not Pain control or follow up tomorrow)

Final | 9 Y/O. boy sustained trauma to mouth 8 h. back. Had fracture avulsion of lower central incisor, O/E there is bleeding from center of tooth. Best action = Immediate dental referral

Chapter 3: Surgical

OMF

- Tongue Laceration

- Tx: Use absorbable suture deep into musculature during surface repair
- Indications of tongue repair:
 - > 2cm, Large flap, through & through, active bleed, at edge (tip/lateral border)

PEM R | 4 Y/O bleeding profusely Tongue laceration (image of attempt to repair under ketamine, most Tx = Place chromic gut sutures deep into musculature)

PEM R | 6 Y/O boy running tripped & fell, hit face on sofa No LoC, persistent bleed from mouth & laceration of tongue tip, teeth intact, on Ex (edge laceration of tongue) = Repair Laceration

PEM R | 5 Y/O boy, tongue laceration 2hr ago, bleed profuse initially but now slowed, no other injuries, which support treatment without repair = 1cm in length 1cm in depth in midline (1x1 cm in midline is ok)

Amal | 9 Y/O injury to tongue due to fall, systematic review Unremarkable, Tx = Reassurance as no surgical intervention needed

Final | Patient had tongue trauma (central located laceration). Your management = Reassure

- Penetrating Palate Injury

- 1-5 Y/O most common w/ running w/ sharp object
- Complications:
 - Vascular injury
 - Thrombus formation, Dissecting/Pseudoaneurysm
 - Delayed pandemics stroke, Massive hemorrhage
 - Infections
 - Parapharyngeal/Retropharyngeal abscess> Mediastinitis
 - Risk: W/ Deep puncture wounds
 - Sx: Neck Stiffness, drooling, fever
 - Retained foreign bodies
 - Thrombosis/Dissection of ICA
(Internal carotid artery, Most severe > Cerebral infarction middle carotid artery)
- Tx:
 - IF **Central** Hard/Soft Palate or Small, Clear margin, Midline = No Vascular injury = D/C w/ Soft diet
 - IF **Lateral** Soft palate/Tonsils fossa or Deep, Lateral = YES Vascular injury (Carotid sheath) = Neck CTA
 - IF Posterior pharyngeal = YES Vascular injury > Hematoma, Infection

PEM R | 4 Y/O bleed from mouth, was running w/ toothbrush then fell and bleed started from mouth and cut to palate (image of hard palate laceration), Tx = Discharge w/ supportive care

PEM R | 2 Y/O Girl, Dental injury, while running and fell w/ playpen on mouth edge, No LoC, Bleed stopped, Next Tx = Discharge home w/ close dental F/U

PEM R | 9 Y/O Running & fall w/ stick in mouth, bleed a lot initially, vitally stable, has 1.5 cm laceration (image penetration of lateral side of inside the mouth) increased risk of = Injury to Carotid artery

PEM R | 4 Y/O girl w/ puncture wound in mouth w/ popsicle stick, has 1cm puncture wound w/ large hematoma on Rt. Posterior-lateral aspect of soft palate, No active bleed, Next = Obtain Neck CTA

Promo | Picture of Trauma to soft palate, Next course of action = Obtain Neck CT Angiogram

Promo | Boy fell w/ Lateral palate injury = Neck CT Angio

Promo | Pt. Playing w/ pen and hit the soft palate = CT Angio (Not Suture or Discharge)

- Most soft palate injuries will heal spontaneously (AVOID suturing unless Large flap nor Exploration for FB)

Final | Pt was playing with pen and it hit his palate (Pic) = CT Angio

- Most of palate injuries heal spontaneously, avoid temptation to close unless large flap or you need to explore for foreign body or through and through, need full neurological exam & F/U up to rule out carotid artery injury.

Final | Soft palate trauma = CT Angio of neck

Chapter 3: Surgical

Final | Mouth injury in the lateral side, child w/ oropharynx pic, most likely complication = Carotid artery injury

Final | Child running with stick lateral wall injury = Carotid artery

- TMJ (Temporomandibular Joint) Dislocation

- Cause: Excessive mouth opening (Yawning, Laughing, Eating, Singing, Dental procedures, Trauma, Seizures)
- Path: mandibular condyle (normally behind the articular eminence) > moves anteriorly during extreme mouth opening > becomes trapped in front of the articular eminence, unable to return
- Sx: Hx of Trauma or opened mouth then click, Preauricular Swell, Can't open mouth (Locked Jaw)
- Dx: Clinical mostly, Imaging if Trauma/Unclear
- Tx: Reduction:
 - Least invasive (Syringe technique):
 - Place 5–10 mL syringe between upper and lower molars on one side
 - Ask patient to bite down and roll it forward and backward.
 - This allows spontaneous reduction
 - If not reduced on the other side → repeat on that side.
 - Intraoral technique (most common):
 - Place thumbs inside mouth on lower molars, fingers outside along the jaw
 - Apply downward and posterior pressure on the mandible.
 - Sedation or anxiolysis may be needed.
 - Extraoral technique:
 - Palpate coronoid process over the cheek
 - On one side: Thumb: over the malar eminence, Fingers: over the mandibular angle
 - On the opposite side: Thumb: over coronoid process, Fingers: behind mastoid process
 - Apply: Anterior pull on the mandibular angle, Posterior push on the coronoid process
 - Usually, once one side reduces, the other side follows spontaneously
 - Post-reduction care: Avoid wide mouth opening for a short period, may use soft diet & jaw support temporarily

PEM R | 15 Y/O, punched in jaw, now complains difficult to open mouth & teeth no aligned correctly when attempting to bite, swell along Rt. preauricular area w/ ecchymosis no deformity on mandible, imaging shows Rt. Condyle displaced Anteriorly without any Fr. Of mandible, Tx = Sedation & Downward then Posterior Traction

PEM R | 12 Y/O previously healthy, having bilateral jaw pain & unable to close Mouth after yawned & felt pop, Bilateral TMJ dislocation, reduction to do, placing thumb over face while palpating = The coronoid process of mandible

PEM R | 17 Y/O girl, sudden decreased jaw movement after yawned, which reduction technique need PSA = Intraoral reduction

PEM R | 18 Y/O acute jaw pain after yawning in class, unable to close mouth, in addition to giving pain meds, next step = Apply downward & posterior traction to lower jaw

Promo | 12 Y/O girl brought to ED after she couldn't close her mouth after yawning & felt a pop, Ex fixed open mouth, Next = Sedation & Close reduction

Amal | 12 Y/O girl, complaining of right ear ache for 1 week, no fever, exam unremarkable, on examination both ears are normal. mother reports that her daughter grinds her teeth at night, you suspect TMJ dysfunction, what historical finding would be more in favor of TMJ dysfunction is = Headache

Amal | 10 Y/O girl, inability to close mouth after yawning, mouth fixed in open position, next step = Sedation/close reduction

- Mandible Fracture

PEM R | 13 Y/O girl, punched on chin/mouth, trouble opening mouth completely & refuse to bite down completely, has fracture through enamel & dentin in 3 of lower incisor teeth, has ecchymosis on floor of mouth w/ 2cm non-gaping laceration in middle of tongue = CT of Mandible

Chapter 3: Surgical

General Surgery

Gastrostomy tube

- GT (Gastrostomy tube) Complications:
 - o Peritonitis, Abdomen wall infection
 - o Gastric outlet obstruction
 - o Pull out
 - GT site maturity approximately 4 weeks
 - Pull out depend on when it was inserted
 - > 6 weeks = Replace it with same size
 - o < 4-6hrs = Replace
 - o > 4-6hrs = Dilate then Replace
 - < 6 weeks = Call PGS for replacement in OR (risk of false tract)
 - Pull out window of replacement 4-6 hours, if after it often requires dilation
 - Gradual dilation w/ Hagar dilator or Foley's cath stepping up the size till reaching old size
 - o Buried bumper syndrome
 - Rare, serious, Late month-years from insertion
 - Path: Embedment/Sticking of GT internal flange (bumper) into Gastric Mucosa/Wall
 - Sx: Leakage/Blockage, Difficulty manipulating bumper, Difficult infuse feeds
 - Labs: Endoscopy or CT (to diagnose)
 - Tx: Surgical removal
 - o Redness/Leakage
 - Check Correct position, Ballon inflation
 - Put guaze barrier
 - Use Liquid Sucralfate or Mg Hydroxide around exit site (For irritation)
 - Use Silver nitrate (for Granulation tissue)
 - o Overfilling GT ballon can lead to gastric outlet obstruction

PREP EM | 6 Y/O girl, in ED bcz of vomiting, yesterday GT fell out and mother replaced it at home, was doing well till end of continues feeding at night when started to have abdomen distention, now GT site no erythema, no guarding/tenderness, but uncomfortable due to abdomen distention, Most likely cause = Gastric outlet obstruction

PEM R | 2 Y/O Development delay on GT inserted 3 months ago, pulled out 5 hours ago, Next = Obtain same size & replace immediately

PEM R | 5 Y/O Developmental delay on GT tube placed years ago, coming extremely irritable/crying but Afebrile w/ Normal Urine/Stool output & can't explain area of pain, finding concerning buried bumper syndrome = Pain with manipulation of GT

PEM R | 5 Y/O girl exclusive GT feed, brought form leakage/redness, which is not the Tx of her = Replace w/ larger one

PEM R | 11 M/O on GT placed 4 wks ago, was displaced 1 hour ago, next feed 3hr ago, parent call to ask what to do = Put old tube in stoma & come to ED for PGS/GI Replacement

PEM R | 2 Y/O toddler dislodged GT tube placed at 1 M/O, size 12 French w/ 1.5cm g tube ballon broke 5hr ago, attempt replace by GT tube same size, next = Insert 10 F foley cath into stoma

PEM R | 5 Y/O GT F14 1.2cm, placed 3 months ago, dislodged and unable to pass similar size = Attempt pass 8 F foley cath

Amal | If Gastrostomy Tube is clogged, what of the following can be used to clear it = Cola

Final | CP patient on gastrostomy tube, tube was out at night and mother inserted it back came and inflate the balloon with bilious vomiting, Dx = gastric outlet obstruction

Final | GT put by mother vomiting, & abdomen distention, no sign of peritonitis = Outlet GI obstruction

Final | Child with GT blocked what to do = Coca-Cola

Chapter 3: Surgical

- GJ
 - o GJ & vomiting = Stop feed > IVF + Imaging

PEM R | 2 Y/O Developmental delay w/ Hx of Aspiration pneumonia & FTT on GJ tube for feeds/meds that came out 2hr ago, currently a Foley cath is keeping stoma open, next = Consult radiology to find out if & when tube can be replaced

PEM R | 5 Y/O non-verbal boy on VP, Trach, GJ tube for feed, in ED for Irritability/Vomit, vitally stable, no focal findings, best approach = Hold feedings, start IVF & obtain GJ tube study

- Cecostomy tube

PEM R | 9 Y/O boy w/ displaced cecostomy tube, what is this tube = Saline is instilled into it on schedule to irrigate bowel in Pt w/ chronic constipation

Appendicitis

- Acute Appendicitis
 - o Ax: Fecalith
 - o Sx: Fever, N/V, Anorexia, Pain migrating from periumbilical area to RLQ
 - Rebound tenderness, guarding, psoas sign (RLQ pain on extension of right hip)
 - Obturator sign (RLQ pain on internal rotation of flexed right hip)
 - Rovsing sign (RLQ pain when the LLQ is palpated)
 - o Invx: US (pediatric or pregnant patients), CT (Definitive diagnostic)
MRI (pregnant patients with nondiagnostic ultrasound)
 - o Child/Female Tx:
 - NPO, IVF, Analgesia, Labs
 - US
 - Surgery
 - o Adolescent Tx:
 - High probable Acute Appendicitis or Suspected Peri-Appendix Abscess:
 - NPO, IVF, Analgesia, Labs
 - 1st: Consult Surgery
 - Equivocal Appendicitis
 - NPO, IVF, Analgesia, Labs
 - 1st: US
 - Consult Surgery

PEM R | 11 Y/O 1 day Hx RLQ pain started in periumbilical region 2 days ago migrated to RLQ, having N/V but no diarrhea, Temp 38.4 HR 100, focal point tenderness in RLQ w/ guarding but no rebound, WBC 18 65% segments 30% Lymphocytes, Next = Obtaining surgical consultation

PEM R | 9 Y/O boy, w/ 36hr worsening peri-umbilical abdomen pain, w/ N/V, Wt 29 Temp 37.8 HR 115 RR 15 BP 96/65 having tenderness of RLQ & pain w/ jumping up & down, imaging to obtain = US RLQ of Abdomen

PEM R | 16 Y/O girl, w/ RLQ pain/vomit/tactile fever, Temp 38.9 HR 120 BP 90/60 Tender RLQ w/ rebound/guarding, Pelvic exam has Rt. Adnexal tenderness but no mass, US appendix normal 4mm, Beta HCG negative, Next = Pelvic US

- o Ovarian torsion = Do Pelvic US
- o Appendicitis US = > 6mm

Rosh | Most common finding under 5 Y/O, w/ Acute Appendicitis = Rebound tenderness (Not Abdomen distention nor diarrhea nor RLQ tenderness)

Rosh | Most common finding in school-aged children w/ Acute Appendicitis = RLQ Tenderness

Chapter 3: Surgical

Promo | Case of Appendicitis & Hypotensive, Next = IV Bolus (Not Surgical Consult nor US Abdomen)

Promo | 2 Y/O Boy lethargic/Altered Mental state, Abdomen pain throughout day Ax w/ numerous non-bilious vomiting, Abdomen difficult to evaluate as pt. Uncooperative, VS normal, Glucose 71 mg/dL, Next = US Abdomen (r/o Appendicitis)

Promo | Scenario of Appendicitis, w/ pic of Abdomen XR finding (? Fecolith), percentage to detect this finding = 10%

Promo | 14 Y/O girl, menstruation w/ severe RLQ pain w/ tenderness & rebound tenderness, Next step to reach Dx = US

Amal | What is the most common physical finding in a patient with appendicitis = Localized tenderness (Not Positive Psoas sign nor Guarding nor Positive Rovsign's sign nor Positive Obturator sign)

Amal | Which case can have **Appendicitis Perforation** prior to Dx of Acute appendicitis = Toddler (Not DM)

Amal | 3 findings that are highly predictive of appendicitis = RLQ pain, rigidity, migration of Periumbilical pain to RLQ

Amal | 13 Y/O, 2 days abdominal pain, worsens with movement, she started menstrual 1 day ago, rebound tenderness.

(Appendicitis). Definitive diagnosis by = CT abdomen (Not CBC nor UA & C/S nor Graded compression Abdomen US)

- If needed Can give morphine before going for graded compression abdomen US (which is a specific technique to displace bowel to better visualize the appendix) use lowest dose 0.05 bcz it will never mask peritonitis signs and will not affect inflammatory process but will relieve the pain

Final | 6 Y/O came w/ Lower lung pain, Fever, N/V, Abdomen pain for 2 days, Likely Dx = Perforated Appendicitis

Final | 13 Y/O w/ Sudden abdominal pain, exam tenderness in lower abdomen mainly in rt side, no fever or diarrhea, lab WBC 10, Dx = Pelvis US

Final | Child with abdominal pain, fever, diarrhea, exam post rebound, WBC high = Call surgery (Perforated Appendix)

Final | presentation of appendicitis = ?

- Guarding Non-specific pain: Toddlers
- Localized pain: Older children

Final | Appendicitis scenario = Call surgery

- Post Appendectomy complication

- Abscess collection (rare but occur 5%)
- Tx: Ceftra or Cipro + Metro or Tazo

PEM R | 10 Y/O 2 days abdomen pain/fever 38.5, no vomit, stool regular, Temp 38 HR 110 RR 25 BP 120/90 SpO2 100%, localized pain to RLQ from healing scar from appendectomy 3 wk ago, Abdomen U/S (shows abscess) = CT Abdomen/Pelvis

PEM R | 9 Y/O girl abdomen pain/poor appetite, had complicated appendectomy 4 days ago, Now Temp 39.2 HR 115 RR 18 BP 94/60 Diffuse abdomen tenderness, guarding CT Abdomen/Pelvis shows 2.1x3.4 cm Intra-abdomen abscess, Surgical consult, Abx to give = Tazocin 100 mg/kg IV

- Recent abdomen surgery > Intestinal Adhesions > Small bowel obstruction
- Early within 24hr-48hr | Late within months-years

PEM R | 13 Y/O Abdomen pain/vomit for 1 day. Hx 3 weeks earlier laparoscopic appendectomy, no unable to tolerate per mouth, no fever/diarrhea/trauma HR 140 RR 26 BP 105/65 Temp 37.2, has obvious discomfort w/ abdomen distension & tenderness, XR shows (distended bowel), next = Insert NGT

Chapter 3: Surgical

Hernia

- Umbilical hernia
 - o Rarely incarcerates
 - o Tx: Resolves spontaneously in 1-3 years of age, if persists then surgical repair to be done

- Inguinal Hernia
 - o Reducible 70-80%
 - o Reduction methods:
 - Reduction w/ Morphine & Trendelenburg position
 - Bimanual milking (Steady pressure on hernia to direct the contents laterally as they need to first traverse through the external inguinal ring and then the more lateral internal ring)
 - o Manual reduction Contraindicated w/ Strangulation Sx:
 - Severe pain
 - Bilious emesis
 - Blood in Stool
 - Signs of peritonitis
 - Redness/Edema overlying affected side of scrotum

- Inguinal Hernia: Incarcerated
 - o Girls & Preterm have increased risk of incarcerated, Infants (60% before age of 1 Y/O)
 - o Sx: Mass stuck but reducible, Infant girls: small/firm/minimal mobile
 - o Invx: US (differentiate hydrocele, ovary, intestine)
 - o Tx: Reduction within 2hr (as if left will increase risk of becoming Strangulated)
 - Male = 1st Manual reduce 5-10min > 2nd Surgery
 - Female = 1st Manual reduce 5-10min > 2nd US Pelvis (r/o Ovary Hernia/bowel) > 3rd Surgery
(If manual reduction fails, it usually means the ovary or bowel is stuck & surgical consultation for OP indicated. A study of 71 girls with a painful, non-reducible inguinal mass showed that 82% had an ovary inside the hernia sac)

PEM R | 6 M/O Male w/ groin swell, family report intermittent Rt. Groin swell since 1st few weeks of life, today persisted for 3hr & being fussy w/ Vomiting twice HR 120 BP 90/50, Ex Firm/Tender/Slightly erythematous swell over Rt. Inguinal area extending to scrotum, both testis palpable within scrotum, 1st step = Attempt manual reduction in the ED (Not Obtain a CT scan of the abdomen/pelvis or Give ondansetron and then PO trial or Consult surgery for emergent repair)

PEM R | 5 M/O, Infant w/ new scrotal swell seen while giving him bath, larger than Lt., fussy but consolable w/ firm mass in Rt. Hemiscrotum extending to groin no discoloration, infant cries when palpating area, testicles palpable w/ normal size, Next = Provide IV morphine and place in Trendelenburg position

PEM R | (for above Q), after initial intervention mass unchanged, accurate direction of Tx = Apply bimanual Pressure along Inguinal canal using distal hand to "milk" contents of incarcerated bowel

PEM R | 5 M/O fussy for 4hrs difficult to console, vitally stable HR 160, has firm/smooth/tender mass in Rt. Scrotum distinct from testicle, sausage shaped mass palpable above scrotum, Next = Manual reduction

PEM R | 6 W/O increased cry for 4 hours, rectal Temp 37.1, fussy but consolable had x1 non bilious vomit, soft & tender abdomen (pic of inguinal hernia), Next best = Morphine IV & steady pressure to area

PEM R | 6 M/O constipation/fussy, started solid food recently w/ change in stool consistency, no blood in stool & 2 times per day, on Ex has large bulge in Inguinal hernia, Next = Apply gentle pressure to Hernia sac

PEM R | 7 M/O male, worsening swelling in groin area, resolve when sleep but now for past 6hr persisted, mass firm & painful, Next = Manual reduction at bedside

Chapter 3: Surgical

Challenger | 2 M/O Inguinal mass, bulge in Rt. Inguinal area for 1 week, crying more, on Ex normal female vitally stable, normal genitalia, small oval rt. Inguinal mass mildly tender no erythema, next = Obtain US

Promo | 6 M/O Lt sided abdomen mass extending to scrotum Ax w/ one-time non-bilious vomit, Ex Soft lax Abdomen no tenderness or color change on mass, Next = IV Morphine & Steady pressure (trial of reduction)

Promo | 6 M/O infant irritable crying w/ non-reducible Inguinal mass, true about condition = (Incomplete A) Common in girls than boys & content over not bowel nor need reduction in ED then admission

Final | Preterm w/ frequent crying/vomiting few times, Testis in scrotum, Rt. Inguinal erythema/tender, Next = Sedate & manually reduce it

Final | Hernia = Sedation + Reduction

Final | Scenario of inguinal hernia = Sedate and reduction

Final | Obstructed hernia = Morphine and steady pressure

- Inguinal Hernia: Strangulated

- o Sx: Abd. Pain, Vomiting, Discoloration, Sx of Acute abdomen, or Gangrenous Bowel
- o Tx: Emergent Surgery Consult

PEM R | 12 W/O girl, ex 34 wk, fussy/groin swell this morning, on Ex labia majora Firm/Erythema/tender/swell, Next step = OR

Final25 | 2 Y/O who have umbilical hernia came to ER mother complaining of vomiting and crying and the swelling cant be reduced for the last 6 hours. abdominal exam very tender and erythematous. X ray showed dilated small bowel loops and air fluid level, next step = OR (Not Abdominal XR nor Abdominal US nor Repeat Forceful reduction with Sedation)

Other Surgical issues

- Compartment syndrome

- o Info: Most commonly caused by tibia fracture
- o Most common sites: forearm, lower leg
- o Sx: 6 P's: Pain out of proportion, Pallor, poikilothermia, Paresthesia, Paralysis, Pulseless
- o 3As: Agitation, Anxiety, Analgesia requirement increased
- o Complication: Hand Contracture due to ischemia
Helpful during assessment of Non-Verbal or Autistic children
- o Invx: if delta pressure < 30 mm Hg (diastolic pressure - direct pressure)
- o Tx: fasciotomy

PEM R | 15 Y/O had Lt. knee pain after twisting it playing soccer as he neared snap, unable to bear weight & lateral portion of leg is painful, Swelling of Lt knee laterally extending to 1/3 of leg, extremely Tender, screams w/ passive manipulation, Next = Consult Surgery for Emergent Operative management

PEM R | 15 Y/O male after colliding w/ parked car while riding bicycle downhill at high speed, No LoC/Head Trauma/Vomiting/Abdomen pain, only Painful/Swollen 1cm over anterior mid-shin area, XR (Oblique Fr), despite morphine still having swell/pain w/ passive plantar flexion, next = Measure compartment pressure

PEM R | 15 Y/O boy w/ Acute Lt knee pain, state he twisted knee and heard a snap, lateral portion of leg is painful, extremely tender & screams w/ passive manipulation, Next = Consult Surgery for Emergent OR

PEM R | 8 Y/O Autistic boy transferred w/ Rt. Distal tibia/fibula fracture underwent closed reduction/splint in community ED 4hr earlier given morphine and sent to you for Ortho 1 hr ago, On arrival child agitated/crying, has well perfused warm Rt. Foot, most appropriate = Remove splint & evaluate his injured leg

PEM R | 16 Y/O male w/ Rt arm pain/swell after 10kg weight crushed Rt. Forearm 1 hr ago, has tingling sensation of Rt hand, on Ex Rt. Forearm extreme swelling & tense, XR No Fracture but soft tissue swell of forearm, without urgent therapy what complication likely = Rt. Hand contracture

Chapter 3: Surgical

PEM R | 17 Y/O male playing, collided w/ other player, have swell/tenderness of shin/calf not tense w/ palpation, strong dorsalis pulse, initially pain well controlled w/ IV morphine but then 20min later has increasing pain, wiggling rise, and pain w/ passive extension = Measure compartment pressure

Promo | Pt. Had tibial Fr. Applied cast then after 12hr presented w/ Severe pain, intact toe movements & color, Dx = Acute compartment syndrome

Promo | 10 Y/O Soccer player sustained Tibia/Fibula Fr. On Lt. leg yesterday, placed on long leg posterior splint in ED, Mother calls for worsening pain at his lower leg for 4hrs not improving on Acetaminophen w/ codeine & loosening of the splint, also he no longer can move toes on Lt. foot & they look white, True statement = Measurement of Muscle compartment pressure is Diagnostic tool of choice

Amal | 10 Y/O soccer player, sustained left tibia fracture, placed of full splint complaining of LL pain over past few hours, can't move toes, toes look white. Which is true = Measurement of intra-compartment pressure is diagnostic (Not Absences of distal pulses is early sign -Late sign-. Nor Elevation affected limb likely relief symptoms -usually no improvement!-. Nor Lack of tenseness of affected limb can rule out diagnosis)

- Compartment Syndrome earliest sign pain out of proportion

- Imperforate Anus

Promo | Picture of Imperforate anus, asking finding = Imperforate Anus (Not Hydrocele nor Omphalocele)

- Buttock mass

PEM R | 15 Y/O increase pain around buttocks, has general fullness in her gluteal area increasing in size w/ intermittent serosanguinous discharge & palpate 2B-BM fluctuate mass w/ mild erythema in lumbosacral region, next = I&D

- Perianal abscess

- Perianal abscess, Refer to GI to r/o IBD especially in < 2 years

PEM R | 17 Y/O boy pain on sitting, w/ several weeks abdomen pain/diarrhea, 4 days increasing pain in rectum, having large fluctuant swell in superior rectum purulent material expressed, I&D along w/ oral Abx, Tx = Sub-specialist referral

Chapter 3: Surgical

Urology

Male GU

Testicle issues

▲ Boys Pain

- Pre-Pubertal boy + Pain for days + Pos. Crem. reflex + Pos. Prehn = Epididymitis + post-viral infection > Nothing
- Post-Pubertal boy + Pain for days + Pos. Crem. reflex + Pos. Prehn = Epididymitis + STI > Ceftra + Doxy
- + Sudden pain + No Crem. reflex + Horizontal lie = Testicular torsion > Emergent Surgery
- + Gradual pain + No Crem. reflex + Blue dot = Torsion of Appendix Testis > Emergent Surgery

- Common testicle sign

- Absent Cremasteric reflex = Testicular torsion = Doppler decrease flow
- Blue dot sign = Appendix testicle torsion
- Prehn sign = Epididymitis = Doppler increase flow

- Testicular Torsion

- Sx: Horizontal lie, Absent cremasteric reflex, High riding, Hard, Swollen
- US: Decrease/Absent Flow doppler
- TWIST Score (RANSH):
 - 1 = Riding High Testicle
 - 1 = Absent Cremasteric Reflex
 - 1 = N/V
 - 2 = Swelling Testicle
 - 2 = Hard Testicle
 - 0-2 = Low: Nothing
 - 3-4 = Mod: US Doppler
 - 5-7 = High: Surgery
 - Tx: Surgical repair to restore flow within 4-6hr leads to 90% testicle Salvage & > 48hr very low
 - Manual: Open book
 - Technique: Testicle torsion external rotation from 360-720 degree until pain stops
 - if increasing pain = unsuccessful (might be wrong twisting) = twist the other way
 - Indication:
 - Surgical: Emergent Urology Consult
- Intermittent testicular torsion (Torsion>Detorsion)
 - Brief (minutes) episodes of sudden testicle pain w/ N/V
 - Tx: Semi-urgent Urology Consult

PEM R | 4 Y/O boy w/ RLQ Abdomen pain/vomiting, but No Fever/diarrhea, on Ex only RLQ tenderness/guarding, Next step = perform GU exam

PEM R | 14 Y/O 2hr Lt scrotal severe pain & vomiting, which sign most concerning for emergent intervention = Absent ipsilateral cremasteric reflex

PEM R | 14 Y/O 5hr of Rt sided testicle pain, abrupt since morning, vomited once, unable to elicit cremasteric reflex on Rt, Lt testicle burns, Next = Call oncall Urology for immediate operative exploration

PEM R | 16 Y/O, male, scrotal pain, 5 hours Lt sided scrotal pain w/ N/V, Lt testis horizontal lie, swollen & very tender, abnormal gait, you have a urologist Next = Call Urologist for OR

Chapter 3: Surgical

PEM R | 11 Y/O 3 episodes Lt testicle pain w/ Nausea, lasts for 10min then resolved, another episode today, on Ex burns, US doppler negative, what you expect the surgeon to discuss w/ parent = Require semi-urgent surgery

PEM R | 2 W/O boy, increased fussy since 2hr of diaper change, inconsolable now, known happy baby, in ED having Rt testicle red/swell overlying scrotal skin, next = Operative management

PEM R | working at low resource & PGS 12 hr away, 13 Y/O w/ Lt side scrotal pain/swell, acute onset worsened few hours ago, vomited twice, best next = External outward rotation of Lt testicle 360 degree

PEM R | 15 Y/O w/ persistent Rt testicular pain/nausea 3 hr Rt. High riding swollen tender abnormal lie, most critical step = Immediate surgical consult

PEM R | 11 Y/O boy, Slow/wide gait 5hr ago, Lt side scrotal pain/swell & worsened, Horizontal lie w/ absent cremasteric, No trauma, Uro will come in 2hr, Next = Manual rotation of affected testicle Medial to Lateral

Promo | 13 Y/O Severe Acute Lt. Testicle pain w/ Vomiting, on Ex Swollen testes w/ Absent Cremasteric reflex, Next = Urgent Urology Consult (Not US Doppler)

Promo | 2 M/O excessive cry, normal exam apart from scrotum swell & erythema, No hernia, Next = Doppler US

Promo | 15 Y/O persistent Rt. Testicle pain, Nausea for 3hr, began during gym class No Trauma, Rt. Testis High riding, Swollen & tender w/ Abnormal lie, critical Next step = Immediate surgical Consult or Stat Testicle U/S w/ Doppler

Promo | 14 Y/O 2hr after football game w/ Acute Tender/Swollen/High riding Testicle, Immediate action = Immediate Urology Consult (Not Doppler U/S nor Try De-torsion manually)

Amal | 16 Y/O male presented with sudden severe scrotal pain after soccer game several hours ago, on examination, tender and swelling in the right scrotum, right testis is higher than left and not mobile, next step = Immediate urology referral (Not Arrange Doppler for right testis)

- IF No Urology = Detorsion 180 > 180 = 360

Final | 13 Y/O came w/ scrotal pain for 2 days, absent cremasteric reflex, scrotal US, showed absent flow, Next = Urgent Urology

Final | Working in a low resource clinical setting where the nearest access to pediatric operative services is more than 12 hours away. A 13 Y/O boy presents with 12 hours of left sided scrotal pain and swelling. His symptoms began with the acute onset of scrotal pain upon awakening that has worsened over the past few hours. The patient has vomited twice. On exam patient has a swollen left testicle with a horizontal lie, What is the next best step in this patient's management = External (outward) rotation of the left testicle 360 degrees (Not Transfer patient or Internal rotation)

Final | Testicular torsion = Call surgery

Final | open book decoration from medial to lateral

- Appendage Torsion

- Common age group prepubertal (7-12 Y/O)
- Sx: Blue dot sign (21-30%)

Promo | Pt. W/ Testicular pain, Ex no tenderness, there is black dot on testis, Dx = Appendage torsion (Not Testicular torsion)

Amal | true regarding about torsion of appendix testis = Rarely requires surgical intervention if diagnosed with certainty (Not blue dot sign is almost always present or occurs most commonly in adolescence and young adults or most common in left side)

Amal | 9 Y/O boy has testicular pain for 2 to 3 days, normal cremasteric reflex, epididymis is posterior and non-tender, most likely Dx = Torsed testicular appendage (Not Varicocele or Epididymitis)

- Normal epididymis location = Posterior in testis
- Normal testis orientation = Vertical lie

- Epididymitis or Epididymo-Orchitis

- Sx: Scrotal pain, Swelling, Dysuria, Vertical lie (normal lie)
 - Cremasteric Reflex Normal (stroking upper thigh elevates ipsilateral Testis)
 - Prehn's Sign Positive (Relieve w/ scrotal Elevation)
- Tx: Post Viral infection = Observation + Analgesia (NSAIDs)
 - > 8 Y/O or Post pubertal or Positive UA = IM Ceftriaxone + PO Doxycycline

Chapter 3: Surgical

PEM R | 8 Y/O Rt. Scrotal pain/swell for 1 day, denies trauma/fever/dysuria, swell of rt. Hemiscrotum w/ overlying erythema testis has vertical lie w/ intact cremasteric reflex & enlarged compared to Lt, Urinalysis normal, US doppler normal but large epididymis, next = Discharge home on NSAIDs & scrotal elevation

PEM R | 8 Y/O 2 days ago scrotal pain, No Fever/N/V/Trauma/Dysuria, Hx of URTI/Diarrhea few days ago, now mild swollen tender w/ vertical lie = Increased flow by color doppler to Rt. Testicle

PEM R | 8 Y/O w/ 1 day Lt testicle pain worsened this morning, No Fever/Vomit, tender Lt testicle, both testicles have vertical lie, unable to elicit cremasteric reflex bilaterally, US hyperemic w/ doppler, UA normal, Next = Discharge w/ supportive care

- UA Negative = No Abx | UA Positive = Abx

PEM R | 6 Y/O boy scrotal pain/swell, x1 day pain but no fever or dysuria, (pic red), Ex most reassuring of medical rather surgical management is = Symmetric bilateral cremasteric reflexes

Amal | 10 Y/O boy, presented with right side testicular pain for 1-day, tender swollen scrotum, most common cause for acute scrotal swelling at this age is = Epididymitis (Not Varicocele nor HSP nor Hernia)

Final | 10 Y/O, came with testicular pain for 6 hrs, nausea and Vomiting, US Doppler of scrotum showing high flow, Dx = Epididymorchitis (not Testicular torsion or testicular fracture)

Final | US testicles increase flow = Epididymorchitis

Final | 12 Y/O came to ED w/ Lt scrotal pain since 6hr, x2 vomit, on Ex moderate tenderness/erythema/swell on Lt testis, US doppler (x2 images w/ doppler, has Hyperemic vessels) = Epididymorchitis

Final25 | 12 Y/O came to ER with hx of left scrotal pain since 6 hrs, 2 times vomiting, on exam moderate tenderness, erythema and swelling on left testis, US Doppler done (2 images one with Doppler high flow & the other without) What is your Dx = Epididymorchitis (Not Appendix torsion nor Testicular torsion)

- Cryptorchidism (Undescended testis)

- Failure of testis decent, Preterm (9-30%), Infants (3-6%)
Usually descend within 2-3 M/O, if didn't after 4 M/O it might never go down
- Complications: Inguinal hernia (90% Have Patent processus Vaginalis), Testicular Torsion (Most Common, 10 Folds), Malignancy (Late, 10%, Seminoma), Bilateral untreated cryptorchidism will have 100% infertility
- Tx: Operate within 6-18 M/O (in Qs choose 12 M/O)

Pedz | Risk of malignancy for Undescended testis | Surgery between 6-12 Months of age

Pedz | 4 Y/O, Unilateral Undescended testicle, U/S Pelvis showing testicle in pelvis, Next = Refer for Orchiopexy

Pedz | Most complication of Undescended testis = Torsion (if asked most common) Malignancy (If asked serious complication)

Pedz | 1 Y/O, Undescended testis, Next step = Urgent exploratory laboratory

PEM R | 6 M/O in ED concerned for intussusception w/ 5 vomit & difficult to console, vitally stable, US abdomen negative for intussusception, having Rt testicle non palpable and 1cm Inguinal mass sliding w/ palpitation, given antiemetic and tolerated PO, what next = Discharge w/ Urology follow up

Final | what is the safe time to fix undescended testis with low risk complication = 12 months

Final | Surgery for undescending testis = 12 M/O (not 6 or 18 or 24)

- Testicle Tumor = Firm, painless

- 15-35 Y/O
- Sx: Firm, painless mass
- Invx: CBC, Chemistry, LFT/RFT, Uric acid
 - U/S Scrotal
 - High Tumor markers: B HCG & Alpha-fetoprotein, LDH

PEM R | 17 Y/O boy, 2 months of increasing Lt scrotal swell, no trauma/pain/difficult to urinate, exam enlargement of left testicle, firm but painless to palpation, Next = Scrotal US

PEM R | (follow up of Q above) which labs in addition to CBC, most useful = B-HCG, Alpha-fetoprotein

Chapter 3: Surgical

PEM R | 16 Y/O male, evaluated by third year medical student for Lt hip pain after accident of skateboarding, large/firm/painless without ecchymosis, additional finding = Elevated serum gonadotropin & Alpha fetoprotein

PEM R | 17 Y/O in ED w/ Rt side scrotal pain since 2 weeks persistent, no Fever/Dysuria, diagnosed as epididymitis, given Abx but no improvement, on Ex Firm/tender mass on superior pole of testicle, additional finding = High Alpha fetoprotein level

- Varicocele

- Info: Collection of dilated tortuous veins
- Sx: **Bag of Worms**, sense of fullness
- **Simple Varicocele = Fullness during standing**
 - Dx: Clinical, Grade I appears w/ Valsalva, Grade II w/ inspection
 - Tx: Conservative
 - OR (if bilateral or atrophy)
- **Complicated Varicocele = Fullness during supine**
 - Cause: Vascular obstruction due to Abdomen mass or Thrombus in Renal artery or IVC
 - Dx: US Doppler of abdomen
 - Tx: Urology referral

PEM R | 13 Y/O w/ discomfort of scrotum started 3 wks ago, gradually worsening No Trauma/Fever, has Lt scrotum fullness feels like bag of worms, fullness persists when moves from standing to supine, bilateral testicle palpated and normal, Next step = Doppler US of Abdomen

- Scrotal Hydrocele

- Congenital Hydrocele = Resolves in 12 months
- Acquired hydrocele = Do not Resolve spontaneously & should be evaluated for possible elective Surgery
- Invx: Transillumination
- Tx: Resolves by 18 M/O
 - Persisted after 24 M/O = PGS Referral for Repair

PEM R | 2 Y/O Lt. Hemiscrotum swell, noticed mild intermittent swell over several weeks tonight was significant, patient doing well no other Sx, on Ex tense Lt. hemiscrotal swell, Cremasteric reflex intact, difficult to assess size of testis due to swell but no discoloration, US (shows fluid around testis) Next = F/U w/ Surgeon for Elective repair

PEM R | 6 M/O scrotal swell, feeding well without fever or vomit, swollen non-tender without skin discoloration, testes bilaterally palpable, additional findings would you expect = His Lt Hemi-Scrotum Transilluminates

Chapter 3: Surgical

Phallus issues

- Phallus inflammation
 - Can't urinate + Ballon = Phimosis = Gentle return (reduction) at home + Steroid, Consider Circumcision
 - Can't urinate + Glans Swell/Discolor = Paraphimosis = Manual reduction + Analgesia, Consider Urology
 - Urology Indication:
 - Phimosis + Complete retention = Emergent
 - Phimosis + Affected urination function (dysuria, initiation) = OPD
 - Paraphimosis + Failed manual reduction
 - UTI, Balanoposthitis, Balantitis
 - Xerotica obliterans Atopic Dermatitis Scarring → Meatal stenosis
- Phimosis
 - Definition: Can't RETRACT Foreskin
 - Types: Physiological: Newborn/Infants | Pathological: Inflammation/infection/Trauma > Scarring
 - Normal Retraction of Foreskin
 - Most By 5-6 Y/O
 - 50% By 10 Y/O
 - 99% By 17 Y/O
 - Sx: Abnormal Void, Transient Ballooning, Painful erection urine Retention
 - Difficult Retraction, Fibrous Ring
 - Complications: Recurrent Balanoposthitis (Inflamed Pre-tipzi orifice Erythema/Swell/Discharge)
 - Tx: Encourage Family to Retract it gently during Baths
 - **Betamethasone** 0.05% for 4 wks (90% resolution of Sx w/ only Steroids)
 - Consider Circumcision
 - Urology Consult (if Risk of Paraphimosis, UTI, Balanoposthitis, Balanitis, xerotica obliterans, Atopic Dermatitis, Scarring > Meatal stenosis)

PEM R | 5 Y/O pain when urinates, after he voids his foreskin swollen like there is fluid trapped under it, leaks out of tip irritated, (image shows inflamed) = D/C home w/ topical betamethasone cream 0.05% & gentle gradual retraction

PEM R | 2 Y/O boy in ED for pain w/ urination, hesitant to urinate, having full diaper with urine, having distention of foreskin, on exam tight non-retractable penile foreskin, surrounded w/ white fibrotic tissue, Next = D/C w/ Topical steroid cream

PEM R | 3 Y/O uncircumcised male, difficult urinating, has ballooning of foreskin ax w/ pain w/ urination, on Ex non-erythematic prepuce cannot retract to reveal urethra meatus distal prepuce thickened, most appropriate next = Topical steroid to opening of foreskin

Promo | 5 Y/O in ED w/ pain when urinating, foreskin looks swollen & fluid trapped under Eventually urine leaks out, but the tip of his penis sometimes looks red and irritated, on Ex on No swelling/erythema/discharge on penis When attempting to retract the foreskin (pic of inability to retract foreskin) Next = D/C w/ topical betamethasone cream 0.05% & gentle gradual retraction

Final | 3 Y/O uncircumcised with ballooning while urinating, what is the most likely Dx = Phimosis (Not Paraphimosis nor Balanoposthitis)

Final | Balloon with urination = Phimosis

Final | Balloon during urination = Phimosis

Chapter 3: Surgical

- Paraphimosis

- Definition: Can't RETURN Foreskin
- Tx: Manual reduction:
 - Constant circumferential pressure to decrease swell & allow manual reduction
 - Sugar water (D50) can directly be applied on top to help reduce edema then give a trial
 - Analgesia
- Urology Consult (if failed)

PEM R | 6 Y/O male in ED w/ penile pain began the night before, Parent noticed swelling around glans this morning as he was getting dressed, become increasingly more painful. He denies dysuria or penile drainage, never had any surgeries on Ex (Entrapped foreskin) Next step = Apply direct, circumferential pressure to the prepuce and glans (1st step + Analgesia > Uro)

PEM R | 18 M/O uncircumcised boy, penile pain/red/swell for 1 day, No trauma/discharge/bleed, Next = manual reduction

PEM R | 10 M/O uncircumcised male in ED excessive cry, cared by 13 Y/O sister, enjoyed his bath and then awoke crying couple hours after being put to bed (pic of Paraphimosis), next = Attempt manual reduction

PEM R | 6 Y/O in ED penile pain began the night before, parent noticed swelling around glans as he was getting dressed, becoming more painful, denies dysuria/penile drainage, never had surgeries, (on Ex Paraphimosis), Next = Apply direct circumferential pressure to prepuce & glans (if failed > urology)

PEM R | 4 Y/O uncircumcised w/ pain w/ urination for past several months, having trouble initiating then few min after finishing he will have wet pants, now he is Afebrile, never had UTI, Urinalysis normal, Ex confirms diagnosis, you counsel parent he requires = An OPD evaluation by surgery

PEM R | 16 M/O fussy after bath, irritable, red/tender penis, Next = Manual reduction

PEM R | 3 Y/O uncircumcised (image of Paraphimosis), Next = Manual reduction

Promo x2 | Picture of Paraphimosis, Next = Manual reduction

Promo | Came to ED w/ band behind glans penis, what to do = Analgesia & manual compression or Circumcision

Amal | 12 Y/O, difficulty passing urine, no trauma, no fever, in pain, edematous blue congested glans, with tight swollen collar of tissue seen. there is no tourniquet by foreign body, Dx = Paraphimosis

Amal | 2 Y/O boy, uncircumcised (pic of swollen glans) came to ED, best Tx = Manual reduction (Not Emergency circumcision nor Foleys catheter before any manipulation nor Use of forceps to dilate and pull forward)

Final | Paraphimosis = Manual reduction

Final | Pt came to ER with band behind the glans what to do = Analgesia and manual reduction

Final | Child presented acutely with this (pic of paraphimosis) your appropriate action = Reduce it manually

Final | Paraphimosis = Manual reduction

Final | Paraphimosis Tx = Manual reduction

- Balanitis: Inflamed Glans (head of penis)
- Balanoposthitis: Inflamed Glans + Foreskin

- Tx:
 - Uncomplicated: Hygiene + Topical Abx & Antifungal 3-5 Days
 - Complicated or Refractory: PO Abx

PEM R | 3 Y/O uncircumcised for 1 week redness/pain, no fever but has dysuria & refuse to urinate, 5 days ago in PCP given hygiene instructions w/ topical abx, now worsened (image of Balanoposthitis), Tx = Begin PO Cephalexin if cellulitis or refractory to topical management

Promo | 6 M/O Pic of (red mild swell of tip of penis), Dx = Balanitis | Tx = Warm soaks & Topical Abx

Promo | Recurrent Balanoposthitis usually seen in = DM

Amal | 7 Y/O boy with recurrent candida Balanoposthitis, what should be suspected = DM

- DM type 1 boys more than girls are very prone to have candida UTI even before diagnosis of DM

Amal | 11 M/O in ED irritable for 3 days, no fever (pic red mild swell of tip of penis) Dx = Balanoposthitis

Amal | (For above Q) Tx: warm water/saline soaks and PO Abx

Chapter 3: Surgical

- Priapism

- Types:
 - Low flow (ischemic) = Painful/Soft glans = Hypoxic/Acidotic = SCA/Anti-psych meds
 - High flow (non-ischemic) = Painless/Hard glans = US doppler normal-high flow = Trauma/Neurogenic
- Ax: SCA
- Sx: Prolonged painful erection, 10% Needs rapid intervention (prevent damage)
- Tx:
 - < 4hr = Hydration + Pain control
 - > 4hr = Aspiration & Irrigation of Corpora Cavernosa (By Consult Urology + Hematology)
 - Sterile technique
 - Local anesthesia: Lidocaine superficial at 10 & 2 o'clock
 - Aspiration & Irrigation: Phenylephrine Intercavernosal (10-20 g or 19-21 g) at 10 & 2 o'clock
 - Blood aspirated & saline irrigation introduced while monitoring degree of firmness

PREP EM | 10 Y/O SCA w/ painful erection for 8hr, Hgb & HCT normal, everything done (fluids/morphine) and after 1 hour still penis continues to be fully erect and the patient complains of increased pain, Best Next = Aspirate his corpora cavernosa

PEM R | 15 Y/O male Hgb SS, Painful erection for 3hr, Vitally stable, Initial backbone = IVF & Pain control

PEM R | 16 Y/O male chronic folic acid/Hydroxyurea w/ more than 4 hr painful erection no trauma, findings expected w/ this priapism = Ph 7.25 CO2 60 O2 30 on corpus cavernosum aspiration

PEM R | 6 Y/O SCA w/ 2hr penile erection, difficult urination, no dysuria, 1st time happened, initial step while awaiting urology = IV hydration w/ 20ml/kg bolus

PEM R | 8 Y/O boy SCD w/ Priapism, sx started 4hr ago, Hx of similar event but never this long, IV placed, Analgesia given, Uro consulted for procedure, what structure to do irrigation & aspiration = Corpus Cavernosum

PEM R | 15 Y/O SCD w/ priapism for 6hr, Pain 10/10, IV fluid & IV morphine without improvement, Next = Aspiration & Irrigation of Corpus Cavernosum

PEM R | 4 Y/O uncircumcised, swell of glans penis, needs regional penile nerve block = 10 & 2

Promo | 15 Y/O SCA having Penile erection for 6hr w/ pain 10/10, IV fluids, IV Morphine given without improvements, Next step = Aspiration & Irrigation of Corpus Cavernosum

Promo | SCA w/ Priapism, to do = IV & Analgesia (< 4hr = Hydration/Analgesia, > 4hr = Corpus Cavernosum Aspir/Irriga)

Promo | 14 Y/O SCA w/ prolonged Painful Erection, Tx = Infiltration (w/ Aspiration, Not IVF & Analgesia or PRBC or Exchange)

Final | 14 Y/O boy SCA w/ prolonged painful erection, Next = Infiltration

Final | SCA with priapism what to do = IV and analgesia

- < 4 hours Hydration and analgesic
- > 4 hours corpus cavernosum irrigation

Final25 | SCA with priapism, sustained painful erection for 3 hour initial next step = IV hydration and analgesia (Not Aspiration of Corpus cavernosa)

- PUV (Posterior Urethral Valves) = US > Cath > Urology > MCUG to r/o VUR

- Path: Mucosa obstructing Urethra at prostatic level
- Sx: Suprapubic mass (bladder distension), Dribbling urine stream, Frequent UTI
- Invx: VCUG or Urethroscope

Pedz | Neonate FT, Hx of Oligohydramnios + High Creat and Urea + Bilateral Hydronephrosis = Posterior Urethral valve

Pedz | Infant w/ Decreased Urination + VCUG (shows dilated proximal urethra with constriction after) = PUV

PEM R | 3 W/O infant RD over 3 days, no fever, poor feed since birth despite robust milk supply & infrequent wet diaper, Wt same as birth Wt, infant received home visit from midwife and newborn screen was normal, vitally stable despite Tachycardia, Alert, normal pulses, no retractions & lung clear on auscultation, distended abdomen w/ firm mass in suprapubic area, GU exam normal, initial image to diagnostic = Renal & bladder US

PEM R | (follow up of Q above) first step in Management = Insert urethral cath into bladder

Chapter 3: Surgical

Final | 3 D/O, Home delivery w/ No F/U, came today w/ Abdominal distention, Dehydration, Inability to pass urine, Palpable bladder, Dx = PUV

Final | Baby not urinate with perinatal US baby w/ Hydronephrosis & mother uterus shows oligohydramnios, baby after delivery during exam had suprapubic mass what's the suspected Dx = PUV

Amal | 10 Y/O You are evaluating a boy who has intermittent urinary incontinence. Voiding cystourethrogram detected a urethral stricture. Of the following, the most likely cause of this urethral stricture is = Trauma (Not chronic infections or congenital narrowing)

Final | 2 D/O neonate came with inability to pass urine, antenatal US showed ?polyhydramnios, in exam palpable bladder, Dx = PUV (if Oligohydramnios, will lead to enlarged bladder, palpable bladder) or PUJ obstruction (will lead to Hydronephrosis, No palpable bladder) or Hydronephrosis (Unsure)

- **UPJ (Ureteropelvic junction obstruction)**
 - o Neonatal + Antenatal Hydronephrosis
 - o Sx: Pain, Hematuria, Urosepsis, FTT, Palpable mass
- **VUR (Vesicoureteral Reflux)**
 - o Risk of Pyelonephritis and UTI
 - o High grade VUR + Recurrent UTI + Bladder/Bowel Dysfunction + Obstructive Uropathy = Needs Abx prophylaxis
 - o VUR Prophylaxis Indication:
 - Recurrent VUR
 - VUR Grade ≥ 3
 - Any VUR Grade in Non-toilet trained
 - o Prophylaxis
 - < 2 M/O = Amoxicillin, Cephalexin
 - ≥ 2 M/O = Bactrim (Contraindication: G6PD)
 - IF Breakthrough infection while on Bactrim can upgrade to Nitrofurantoin
- **Micropenis**
 - o Stretched penile length from Pubis to Tip of penis < 2.5 cm
 - o Causes: Deficiency of gonadotropin secretion during the last two trimesters
 - Testosterone insensitivity
 - Kallmann syndrome, Prader-Willi syndrome
 - Panhypopituitarism, Midline defect
 - o Tx: Testosterone may be beneficial in selected cases
- **Circumcision**
 - o UTI x10-15 in Uncircumcised infants (Primarily in 1st 6 months of age but still risk till 5 Y/O)
 - o Contraindication: Hypospadias (should not be circumcised until correction is done)
- **Hypospadias**
 - o Urethral opening underside of phallus
 - o Ax: WAGR (Wilms, Aniridia, GU, ID)
 - Denys-Drash syndrome (genitourinary malformations and susceptibility to WT)
 - Smith-Lemli-Opitz syndrome (malformations of the heart, lungs, kidneys, gastrointestinal tract, GU).
 - o Tx: Repair at 6-12 M/O

Chapter 3: Surgical

Female GU

▲ Girls Pain

- Primary Dysmenorrhea = Painful Menses without pelvic pathology, Starts 1-3 Years Post Menarche
- Midcycle pain = 1-2 weeks before onset of menses, Unilateral Min-Hr Sharp, Cramping, Switches sides each month
- Ovarian torsion = Sudden Unilateral, Severe, Intermittent Pain Ax: N/V
- Pelvic inflammatory disease = Multiple sexual partners, Hx prior STI, Hx Sexual abuse, Hx IUD use
- Ectopic pregnancy = Ex: Abnormal vaginal bleed, Adnexal mass, Hypotension, Hx of PID or IUD use

Specific GU issues

- Ovarian Torsion

- Definition: twisting of ovary, fallopian tube, or a paraovarian mass
- Risk: Ovarian Mass > 5cm, Reproductive age, Pregnancy, Ovulation induction, Prior torsion
- Sx: sudden onset of unilateral (right > left) abdominal & pelvic pain
- Laboratory abnormalities are often absent, leukocytosis may be present with necrosis
- Invx: Pelvic U/S
 - Findings:
 - Enlarged heterogeneous ovarian mass
 - Peripheralization of the follicles may be present
 - Whirlpool sign
 - Pelvic/Douglas fluid
 - Absent ovarian flow
 - Premenarche girls will have normal Ovary
After menarche, ovarian cyst likely to develop, which increases risk of torsion
- Tx: Laparoscopic detorsion (Definitive diagnostic & therapeutic) ± cystectomy

PEM R | 14 Y/O, lower abdomen pain, sudden 6hr ago, varies in severity, vomited 3 times, No Fever/diarrhea, No Sexual activity, or vaginal discharge, vitally stable, Diffuse lower abdomen tenderness, greater on right than left, WBC 10 urine hCG negative, UA no hematuria, Dx = US of pelvis

PEM R | 10 Y/O Premenarche girl, w/ diffuse abdomen pain for 36hr, N/V vomited 6 times, on Ex normal Vitals, RLQ abdomen pain without peritoneal signs, US appendix negative, Urine pregnancy/NAAT negative, Pelvic US strongly suggest = Normal adnexal appearance

PEM R | 15 Y/O girl, appendectomy at 9 Y/O, acute RLW pain for 3hr w/ multiple non-bilious non-bloody vomit, Vitally stable, having tenderness in RLQ, XR 2 view is normal no evidence of obstruction, Lactate & WBC normal, Urine pregnancy test negative, Next = Pelvis US

Promo | 16 Y/O Girl RLQ pain, Vomiting, Tactile Fever, Temp 37.9 HR 120 RR 20 BP 90/60, uncomfortable on palpating tender RLQ w/ rebound & guarding, Rt. Adnexal tenderness (ovarian area), No mass, Labs & Appendix US Normal appendix 4mm, Beta HCG Negative, Next step = Obtain US Pelvis (Not CT Abdomen nor Upright/Flat Abdomen XR nor D/C)

Amal | Sudden pain to the right leg, lower RLQ, vomiting 4 times, Last menstruation one week, Tenderness in RLQ, Neg. Urine and pregnancy, Next step = 3D Doppler US (Not CT nor Serial Ex nor Labs)

Final | Ovarian torsion = US pelvic

Chapter 3: Surgical

- Herniated Ovary

- Female Inguinal hernia = trial of reduction, if failed U/S before trying again = Likely to be Herniated Ovary
- Herniated ovary 60% occurs < 1 Y/O

PEM R | 6 M/O mass in groin, crying past 2 hrs, family **unable to reduce**, firm/mild edema, not discolored, after morphine you still unable to reduce, next = U/S

PEM R | 3 W/O Female, FT, no complication, gaining well, sleeps well, has groin swell for 1 day, minimal mobile 1cm on Rt. Inguinal region, swelling most likely due to which = Herniated ovary

- Ovarian Cyst

- Sx: Sudden Abdomen pain, Vomit
- Complication: Hemorrhagic Cyst
- Invx: Ultrasound
- Tx: Management by ObGyn
 - Simple or Non-ruptured Cyst = Discharge
 - Simple Cyst > 5 cm + Asymptomatic = Observation
 - Simple Cyst > 5 cm + Symptomatic = OCP 2-4 weeks then US (check regression) > OPD Cystectomy
 - Hemorrhagic Cyst + HD Stable = Admit for Observation
 - Hemorrhagic Cyst + HD Unstable = OR
 - Large (6-12cm) or Symptomatic or Ruptured Cyst = OR
- Indication of Excision:
 - > 5cm
 - Ovarian torsion
 - Persistent cyst despite medical therapy
 - Complex cyst
 - Suspected malignancy

PEM R | 17 Y/O girl w/ Rt. Side abdomen pain for 1 day, now shoulder & RLQ pain, having sexual activity w/ single partner, Temp 37.3 HR 100 RR 24 BP 110/70 SpO2 99%, WBC 11.2 Hgb 9.2 PLT 275 ANC 4500, US 8cm heterogenous thin walled Rt. Ovarian cyst w/ hyperechoic fluid in Douglas/Morison/LUQ, best next = Admission for observation

PEM R | 13 Y/O female, Rt. Lower abdomen pain, began 4 wks ago but worsened over past 2 days, No fever/diarrhea/vomiting, vitally stable, US 8.3x6x6cm Rt side follicular ovarian cyst, Rt. Ovary normal arterial/venous flow, after hydrocodone had near resolution of pain, appropriate management = Referral for OPD cystectomy

PEM R | 16 Y/O mother worried of US Lt ovarian simple follicular cyst 4cm, PCP given her monophasic combination estrogen/progestin oral contraceptive, Beta HCG, LDH, UA all normal, mother worried about this cyst, Next = Repeat US in 2-4 weeks

PEM R | 13 Y/O worsening intermittent pain of Rt. Lower abdomen pain, N/V for 36hr, No Fever/dysuria/urinary frequency/vaginal discharge, having irregular periods, Vitally stable, having thickening darkening of skin at nap of neck w/ rebound RLQ tenderness, BHCG & UA negative, Pelvic US showing Rt ovary 5.5cm, Lt ovary 3cm, appendix not visualized, Next step = Consult surgery (No OCP then US & No OPD Cystectomy in the options)

- Vagina Foreign body

- Sx: Thick secretions, small blood
- Complication: Vaginitis
- Tx: Examine to determine cause (Knee-Chest position)
 - Vaginal irrigation w/ Warm saline (used to flush out the foreign body)

PEM R | 4 Y/O girl, concern for sexual abuse, Hx of 1 month foul smelling vaginal discharge, on Ex mild erythema around introitus & yellow, Tx = Perform internal vagina exam under anesthesia

Chapter 3: Surgical

PEM R | 8 Y/O girl in ED for itching vagina w/ discharge for 4 weeks, seen 3 weeks ago in PCP and general Vulvovaginal hygiene, girl wears cotton underwear & front-to-back wiping, XR of Pelvis no FB & given Tx of Pinworms, having some blood spots in underwear & discharge purulent w/ bad odor, erythema of vulva/excoriation near labia majora, Sx likely = Retrained toilet paper

PEM R | (for above Q), best management = Vaginal irrigation w/ warm saline

PEM R | 4 Y/O girl, w/ white/yellow vaginal discharge on underwear for 1 week, foul smelling, No Fever/Abdomen pain/Difficult void, Initial best option to exam patient = Placing pt in Knee-Chest position

Final25 | Scenario about girl young with whitish vaginal discharge white genital mass seen by mother, foul vaginal discharge on the swap with erythema = Examination of vagina under anesthesia (Not Broad spectrum Abx)

Female Genitalia Mass

- Posterior introitus fissure = Vaginal Abuse
- Anterior to introitus mass + Purple/Red color ± Bleed = Urethra Prolapse | Tx: Topical Estrogen 2 wks
- Introitus mass + White color + 2-3 W/O = Imperforate hymen
- Introitus mass + Blue color + Pubertal + Amenorrhea = Hematocolpos | Tx: Surgical
- Medial to introitus mass = Bartholin Cyst | Tx: Sitz bath/warm compress & if recurrent/infected = Abx

- Hymen imperforation
 - o Typical 2-3 W/O, most common obstructive genital tract disorder in female
 - o Sx: Introitus White mass (Represents maternal estrogen effects + accumulated vaginal secretions)
 - o Tx: Surgical repair & removal of obstructing material

PEM R | 1 M/O enlarging lump in her perineal area for 2 weeks, born 39 weeker without complication, feeding/weight gaining, Ex white bulging membrane between her labia minora over introitus, cause = Imperforate hymen

- Hematocolpos
 - o Info: Accumulation of menstrual fluid in Female reproductive tract
 - o Path: Puberty > Menstruation > Menstrual fluid accumulation > Pain, Bulging, Mass effect, Infection
 - o Types:
 - Hydrometrocolpos = Fluid in Uterus
 - Hematometroclopous = Fluid in Vagina + Uterus
 - Hematocolpos = Fluid in Vagina
 - o Sx: 10-14 Y/O
 - Primary amenorrhea (Absence of menstruation despite normal secondary sexual characteristics).
 - Cyclic Lower Abdominal/Pelvic Pain (due to trapped blood)
 - Blueish-Purplish Bulging hymenal membrane on perineal examination (goes w/ Imperforate Hymen)
 - o Ax: Mass Effect: Urinary retention, Constipation (in severe cases due to compression effects), Infection
 - o Invx: US (Fluid filled, distended vagina or uterus)
 - o Tx: Surgical Consult (for surgical incision, drain and repair)

Pedz | Female + Delayed puberty, complaining of Abdomen pain lasting few days every month, Ex Tanner stage 5, Suprapubic mass, Dx = Hematocolpos

PEM R | 13 Y/O girl 5 days Hx of lower abdomen pain, had non-bilious vomit, no dysuria/urgency, no sexual activity, tender both lower quadrants & suprapubic area, (image bulging blue mass), Next step = Surgical Incision & Drain

PEM R | 15 Y/O acute chronic constipation, having difficult void, 2 days severe cramping midline lower abdomen pain & hard stool, only had drips of urine in 24hr, well appearing, premenarchal, well appearing w/ suprapubic tenderness/fullness, bedside US shows distended bladder, urine cath for urinalysis & bladder decompression done (pic of purple protruding mass from vagina) Next = Obtain US of pelvic organs

Chapter 3: Surgical

Promo | 14 Y/O girl, acute exacerbation of recurrent lower abdomen pain w/ suprapubic tenderness, no hx of menstruation, mother got menses at 12 Y/O, correct = Bullish plunging mass though vaginal intro by examination (Hematocolpos)

Promo | 14 Y/O girl having intermittent lower abdomen pain for past year, never had menstrual bleeding, sexual maturity rating 5 for both breast and pubic hair, most likely finding in Ex = Bluish mass coming from Uterus

Amal | 13 Y/O girl, 2 wk with low abdominal pain, dysuria and urgency, no menses yet, has palpable mass in genitalia, she is tanner stage 5. What is the most common finding in exam = Blueish bulge in vaginal interiors

Final | A 14 yo girl has Hx of constipation and Multiple UTI what you will see in exam = Protruding hymen

Final | 14 Y/O girl with abdominal pain recurrent, not yet menstruating, lower abdominal mass on exam what you'll find = Imperforate hymen

- Female Urethral prolapse

- Sx: Donut-shaped Purple/Red mass extruding from Above/Anterior to Introitus (urethra) Friable, Erythematous
- Invx: Urine Cath (Diagnostic if in doubt)
- Tx: AVOID Reduction
 - Sitz bath + Topical estrogen cream bid for 2 weeks BID

PEM R | 6 Y/O girl in ED w/ dried blood in underwear for past 2 days, she is Afebrile, Tanner stage I, parents worried she was molested, no abuse on Ex cheerful, soft/annular red doughnut mass anterior to introitus, Next = Topical estrogen for 2 wks

PEM R | 4 Y/O girl referred due to blood in underwear & mass in vagina area, mother denies Fever/Vomit/Urinary Sx/Trauma, known to have constipation, on Ex mass seen (mass anterior to introitus), Tx = Prescribe topical estrogen

PEM R | 4 Y/O girl w/ vaginal bleed over 3 days, having protrusion from vagina, no fever/dysuria/vomiting, having constipation, on Ex Red donut-like mass anterior to vaginal introitus, test to confirm = Transurethral catheter

Promo | 5 Y/O girl w/ blood in underwear, painless, Ex "Urethral prolapse" Initial Tx in w/ sits bath = Topical estrogen cream

Promo | 5 Y/O girl brought to ED for blood noted in underwear, Parents concerned that she is having menstrual period, on Ex (closed Labia minora & protruded urethra ? 2012 Q33) Best Tx = Topical estrogen sits bath or Manual reduction of tissue or Topical Hydrocortisone or Biopsy

Amal | 5 Y/O girl with complain of blood in underwear, painless, on examination you see as the picture. Initial treatment in addition to sits bath = Topical estrogen cream (Not Immediate manual reduction nor Topical steroid nor Silver nitrate cauterization)

- Urethral prolapse = Topical estrogen + Sitz bath
- Rectal prolapse = manual reduction + Referral

Final | 2 Y/O girl presented w/ history of blood in the underwear mother worried & investigation for sexual abuse what is your Dx (picture of purple mass above introitus) = Urethral prolapse

Final | (for above Q) Tx = Topical Estrogen

- Labial Adhesion

- Most common in 1-2 Y/O, 2% in 3-6 M/O, rarely found in neonates
- Path: inflammation of labia minora > heal together partial/full fusion > covering Vagina
- Causes: Inflammation/Irritation Exposure to irritants like fabric softener residue, perfumed soaps, or bits of stool; or a prolonged exposure to damp (as in wet diapers) all can cause irritation of the area. The lack of estrogen (which is normal before puberty) probably plays a role in this process.
- Sx: Asymptomatic incidentally found or w/ Difficulty Urinating or Irritation or Recurrent UTI
- Tx: AVOID Manual attempt to separate labia (Marsupialization)
 - Pre-Pubertal & Asymptomatic & NO UTI = Observe (80% resolve by age of 1 Y/O)
 - Post-Pubertal or Symptomatic or YES UTI = Treat
 - Topical Estrogen cream (1st line, Premarin) BID for 2-8 wks (at point of midline fusion)
 - Topical Betamethasone (2nd line)
 - Surgery (if Persistent)
 - Complication of Tx: Hyperpigmentation, Breast budding, Vaginal bleeding, Precocious puberty

Chapter 3: Surgical

PEM R | 18 M/O while obtaining urinalysis w/ cath, nurse noted fusion of lower labia minora, other than 2 days fever/vomit, Urinalysis unremarkable, Hx/Ex consistent viral infection, Next step for management of labial adhesions = D/C & Reassurance

PEM R | 2 Y/O female lower labia minora fused, best next = D/C after reassuring

PEM R | 2 Y/O 3rd Febrile UTI, diagnosed w/ labial adhesions, given estrogen cream for weeks then steroid cream for 6 weeks daily, no changes significantly, best choice to treat = Referral to specialist for surgical deputation

Promo | 1 Y/O Female chief complaint of Fever, you order Urinalysis/Urine C/S by Cath., Nurse informs you that she is unable to catheterize the infant, (Pic of adhesion of vagina), Tx = Estrogen Cream BID for 2 weeks

Amal | 2 years old with history of dysuria and frequency, she is afebrile and non toxic based on pic, Tx = Estrogen cream

Final | 4 Y/O girl, mother noticed while changing for her thin labial adhesion, child is asymptomatic, regarding the appropriate management, what it true about it = Topical Premarin to 2 weeks is the treatment (Not Resolve by adolescent even if symptomatic nor Dexamethasone is best treatment nor Manual separation)

- Resolve by adolescent even if symptomatic, usually we treat if symptomatic

Final | Labial adhesion, asymptomatic = Reassurance (Not Estrogen topical)

Final25 | Labial adhesion asymptomatic Tx = Premarin BID cream or Will resolve in a symptomatic in Puberty or Betamethasone

- Almost sure that the answer is Premarin as the Q had a trick (regardless follow the Tx guide above)

- Bartholin gland cyst

- Sx: Swell medial side to introitus, No Redness, No Systemic Sx
- Complication: Bartholin gland abscess (Sx: Redness, Tenderness, Systemic Sx)
- Tx: Sitz bath/warm compress
 - Abx (if recurrent Bartholin abscess w/ cellulitis -erythema or Systemic Sx-)
 - Bartholin gland abscess Tx: I&D w/ word cath placement to prevent relapse

PEM R | 17 Y/O concerned of swell in vaginal last several days, slight pain on area, no discharge or redness or color change on skin overlying swelling, having 2cm swelling at 8 o'clock medially protruding into introitus, No overlying erythema, minimal tender on palpation, Tx = Sitz bath and/or warm compress

PEM R | 17 Y/O girl w/ severe vaginal pain for 24hr sexually active, on Ex vitally stable, has prominent 4cm skin swell at 5 o'clock in her left labia majora erythema/tender, planned for OPD, most important action = Fistulization or Marsupialization of lesion (Means I&D + Word cath.)

PEM R | 17 Y/O acute GU pain, 2 days pain/swelling to Lt labia majora, prior to sx was small/painless swell, has sexual activity, vitally stable, Tender Fluctuant swollen inferior Lt labia majora, Next = I&D & Placement of Word Cath.

Final | Bartholin cyst, Asking about Dx & Tx = ?

Final | Pic of = Bartholin gland drain

Menstrual issues

- Menstrual Ax pain

- Mittelschmerz
 - Benign Mid-Menstrual cycle (Pre-Ovulatory) pain 1-2 weeks (at day 14) before onset of menses
 - Sx: One-sided pain minutes-hours Sharp, cramping, distinctive
 - May switch sides from month to month or one episode to another, through menstruation
- Primary Dysmenorrhea
 - Info: Menstrual cramps come after 1-3 years of menarche
 - Sx: Pain starts w/ menstrual period, without pelvic pathology
 - Tx: NSAIDs (1st), Combined Oral Contraceptive (2nd)

Chapter 3: Surgical

PEM R | 13 Y/O girl w/ pelvic pain always starting w/ menstrual output, for last 4 months, no sexual activity, No Dysuria/Vaginal discharge, Pelvic US normal, PCP given Naproxen and worked for a while but now not anymore, Next = Monophasic Oral contraceptive - Estradiol/Norethindrone

PEM R | 15 Y/O female, having Abdomen pain/N/V/Headache w/ menses, 2 day of menses doubled pain, BHCG negative, UA large blood, +1 protein, in addition to analgesia, what meds to give upon discharge = Naproxen sodium

Promo | 13 Y/O girl w/ Severe Crampy Mid-Umbilical Abdomen pain, No Fever & has good appetite, has her cycle for 1 year & last one finished 2 weeks ago, Mother says her own cycle started at age of 11 Y/O, Dx = **Mittelschmerz** (Not Dysmenorrhea or Appendicitis or Ovarian Torsion)

Amal | 13 Y/O girl with severe crampy low mid abdominal pain for 12 hours, last menstruation 2 weeks ago, menarche 1 year ago, all other examination. Dx = Mittelschmerz (Not Appendicitis nor Dysmenorrhea nor Ovarian cyst)

- Mittelschmerz (Mid-cycle pain)
- benign pre-ovulatory lower abdominal pain that occurs mid-cycle (usually day 14), Might mimic Appendicitis
- Sx: Lower abdomen pain w/ +/- minimal red spots

Final | 13 Y/O girl with severe crampy low mid abdominal pain for 12 hours, last menstruation 2 weeks ago, menarche 1 year ago, all other examination, Dx = Mittelschmerz

Final25 | Girl with sudden onset severe left lower abdomen pain, no rebound but tenderness, vitally stable, last period 2 weeks ago Dx = Abnormal uterine bleeding (Not Ovarian torsion nor PID nor Mittelschmerz)

Final25 | Female with prolonged bleeding 8 days or so and her cycle usually 21 days came with suprapubic pain or tenderness = Abnormal uterine bleed due to anovulatory cycle (Not Ovarian torsion nor PID nor Appendicitis)

- Dysfunctional uterine bleeding

- Sx: uterine bleeding that is abnormal in volume, frequency, duration, or regularity in a nonpregnant female
- Etiology: Anovulatory cycles (most common), related to immaturity of hypothalamus-pituitary-ovarian axis
 - PCOS, Endometriosis, Thyroid dysfunction, Pregnancy, Infection (PID)
 - Medications (antipsychotics, corticosteroids)
 - Hypothalamic dysfunction (stress, acute weight loss, exercise, underweight)
- Invx: Diagnostic tests: pregnancy test, CBC, TSH, STI screen, +/- prolactin
 - Consider workup for bleeding disorder if heavy bleeding since menarche or refractory heavy menses
 - Transvaginal ultrasound (1st line)
- Tx: hormonal therapy, iron supplementation

Promo | Girl w/ Menstruation for 21 days = Uterine Dysfunction

Final | Girl with menstruation for 21 days = Dysfunctional Uterine Bleeding

Final | Teenage girl with Prolonged vaginal bleeding name the disease = Dysfunctional uterine bleeding

Final | Female w/ massive bleeding more than 10 days post menstruation = Uterine bleeding dysfunction

Final25 | Female with prolonged bleeding 8 days or so and her cycle usually 21 days came with suprapubic pain or tenderness = Abnormal uterine bleed due to anovulatory cycle (Not ovarian torsion nor PID nor Appendicitis)

- Primary Amenorrhea

- Gonadal dysgenesis: Non-Functioning ovary (no estrogen production)
- Ax: Turner syndrome (has nonfunctioning Ovary & Uterus)
- Invx: High FSH/LH, U/S (normal Uterus)

PEM R | 15 Y/O, mother concerned menstrual cycle, has short stature, webbed neck, no breast development, Ancillary test to Primary amenorrhea = High FSH, Uterus on US

PEM R | 15 Y/O girl never had menstruation, denies vaginal discharge or issue in voiding, No Headache/vision issue/Abdomen pain/acne/rash/sexually active, Tanner 4, normal external genital Ex, BHCG negative, helpful confirm Dx = Transabdominal US

Chapter 3: Surgical

- Menorrhagia

- Invx: CBC
- Tx: If Mild anemia = Iron
 - If Mod-Sev Bleed = Monophasic combined OCP BID until bleed stops

PEM R | 14 Y/O w/ menarche 1 year ago, having heavier than normal vaginal bleed w/ menses for last several weeks, usually 5 pads now 6-7 per day, irregular cycle every 3-4 weeks, NO Clots/SOB/Dizzy/Syncope/Sexual activity, Hgb 11.8, NAAT & pregnancy test negative, vitally stable & normal Ex, Tx = Ferrous sulfate PO

PEM R | 16 Y/O girl, heavy vaginal bleed for 3 months having 8-10 pads days w/ blood clots, having dizziness upon standing this past month, Hx of sexual activity, Ex normal, BHCG & UA negative, next step = Obtain CBC

PEM R | 14 Y/O, menarche 1.5 years ago, presents w/ syncope at school, reports heavy vaginal bleed changes large pads every 2-3hr for 7-8 days, irregular periods every 2-4 weeks, Hgb 10, assuming all appropriate testing are negative, what OCP you will give Monophasic combined OCP BID until bleeding stops

Female GU Inflammation

- Pelvic Inflammatory Disease (PID)

- Risk factors: < 25 Y/O, Hx of STI, Multiple sexual partners or unprotected intercourse
- Organism: Polymicrobial, N. Gonorrhea, C. Trachomatis, Mycoplasma genitalium
- Sx: Cervical motion tenderness on bimanual examination (Chandelier sign)
 - Uterine tenderness, Adnexal tenderness
 - Fever, Cervical Mucopurulent discharge
- Minimal diagnostic criteria:
 - Cervical motion tenderness (specific)
 - or Uterine tenderness
 - or Adnexal tenderness
- Additional diagnostic criteria: (Fever, Discharge, Inflammatory markers, WBC in vagina secretion, STI)
 - Oral Temp > 38.3°C (however, fever may be present in as few as 14% of patients)
 - Muco-Purulent cervical discharge (Yellow-Green)
 - High ESR, High CRP
 - High WBC on microscopy of vaginal secretions (> 1 WBC per epithelial cell)
 - Proven cervical infection w/ Chlamydia trachomatis or Neisseria gonorrhoeae
- Invx: NAAT (initial to rule in STI), Endometrial biopsy (Definitive diagnosis)
Transvaginal U/S (to r/o pregnancy or TOA abscess), Laparoscopy
- Tx: Outpatient = IM Ceftriaxone + PO Doxycycline BID 14 days +/- Metronidazole BID x14 days
 - Inpatient = IV Cefotetan or Cefoxitin + Doxycycline
 - If Allergic = IV Clindamycin + Gentamicin

- PID admission indications:

- Pregnancy
- Immunosuppression
- Tubo-Ovarian Abscess or pelvic abscess
- Presence of IUD
- Severe vomiting
- SIRS/sepsis
- Failed outpatient management

- PID Complication: TOA (Tubo-Ovarian Abscess)

- Adnexal mass + Negative Beta HCG = Abscess
- Invx: Transvaginal US (study of choice)

Chapter 3: Surgical

PEM R | 17 Y/O girl w/ 2 previous STI, having 2 days Bilateral lower quadrant abdomen tenderness, Having Fever/Chills/Nausea/Dysuria, Temp 38.3 HR 108 RR 18 BP 112/78, Foul smelling non bloody vaginal discharge, cervical motion tenderness, palpable Lt adnexal mass, urine pregnancy test negative, Diagnostic = Transabdominal/Transvaginal pelvic US

PEM R | 15 Y/O, sexually active girl, having Fever/Bilateral lower abdomen pain & vaginal discharge, Cervical motion tenderness on bimanual examination, has purulent discharge, Pelvic US waiting, Ancillary test to help = Chlamydia Trachomatis on Urine NAAT

PEM R | 18 Y/O sexually active female, having foul smelling vagina, Low grade fever, has mucopurulent discharge w/ cervical os & cervical tenderness, pregnancy test negative, Tx = Ceftriaxone IM & Doxycycline PO

Obstetrics

- **1st Trimester bleed**
 - Cause: Normal pregnancy (implantation bleed), Ectopic, Abortion
 - Sx: Bleed in 1st trimester (< 20 wks GA)
 - Invx (Beta HCG > Ultrasound > Examination):
 - Beta HCG: to rule in pregnancy Viable/Non-Viable, Intra/Extra uterine
 - Doubles within 48hr = Intra-uterine or Viable pregnancy (normally in 1st 6-7 GA)
 - Not Doubling within 48hr = Extra-uterine or Non-Viable Intra-uterine pregnancy
 - Rapid decline = Extra-uterine
 - Slow decline = Non-Viable Intra-uterine pregnancy
 - US: to rule in pregnancy Intra/Extra
 - Transvaginal US (do if B-HCG >1500) | Transabdominal US (do if B-HCG > 4000)
 - Gestational sac without yolk sac = Indetermined
 - Gestational sac with yolk sac = viable Intra-uterine pregnancy (definitive sign)
 - Examination:
 - Hx of Blood in 1st trimester = Possible Abortion (do exam)
 - Abortion types (Intra-uterine)
 - Cervix closed, pregnancy may still continue = Threatened abortion
 - Cervix dilated, miscarriage cannot be stopped = Inevitable abortion
 - Partial expulsion of products = Incomplete abortion
 - Abortion + Infection = Septic Abortion
 - Tx:
 - **Indetermined:** Beta HCG & US inconclusive now
 - Tx: Repeat Beta HCG & US
 - **Ectopic pregnancy:** Pregnancy extra uterine
 - Unstable Tx: Treat as ABCDE (x2 large IV, CBC, Cross match) + Emergent ObGyn
 - Stable Tx: ObGyn +/- Methotrexate (stops growth & ends pregnancy) or Surgery
 - **Abortion:** Viable vs Non-Viable intra uterine pregnancy
 - ObGyn Consult
 - Misoprostol (induces contractions for expulsion of pregnancy tissue)
 - D&C (dilation and curettage)
 - Abx (if Septic abortion)

PEM R | 17 Y/O girl, want to know if she is pregnant, menstrual period 5 week and had slight vaginal bleed less than usual, on Ex generalized lower abdomen tenderness, cervical os closed, only small blood in vagina, B HCG every 48 hr 2000 > 3000 > 3500, US shows No embryo/gestational/yolk sac, Best Tx = Repeat US (not methotrexate)

Chapter 3: Surgical

PEM R | 18 Y/O girl panic having vaginal bleed, abdominal cramping, 10 weeks pregnant No Fever/lightheadedness/dyspnea/syncope, intrauterine pregnancy positive 2 weeks ago by US, vitally stable, on Ex Cervical OS w/ Visible fetal product, US absence of embryo w/ heartbeat, Next step = Administer Vaginal Misoprostol

PEM R | 17 Y/O girl chills 1 day Abdomen pain & vaginal bleed 2 days, foul smell, last menstrual 6 weeks ago, had Positive BHCG 7 days ago, aunt gave her unknown med to induce abortion, Temp 38.8 HR 124 BP 108/72 RR 16, has mild lower abdomen tenderness to palpation, next = Administer IV Abx & NS

PEM R | 19 Y/O G1P0 22 weeks pregnant, restrained in minor rear end accident, arrives by EMS, has no abdomen pain/contractions, urine sample small amount of blood, vitally stable, Next = Assess Fetal HR by Doppler or Bedside US

PEM R | 17 Y/O vaginal spotting, No Abdomen pain/Vaginal discharge/Dysuria, last menstrual period 1 month ago, BHCG positive, Pelvic US shows intrauterine shows gestational sac without yolk sac, no fetal HS, BHCG 2147, Next = Referral to OPD OB F/U for BHCG in 2 days

- **Pre-Eclampsia** = 20 GA – 6wks postpartum + HTN + Urine protein
- **Eclampsia** = 20 GA – 6wks postpartum + HTN + Urine protein + Seizure
 - o Sx: New onset HTN, Headache, Visual disturbance
 - o Complication: HELLP (Hemolysis, Elevated LFT, Low PLT)
 - o Tx: Pregnancy > 34 wk = Emergency Delivery
 - Eclampsia (Seizure) Tx & Prophylaxis = MgS 6g then 2g
 - Monitor MgS Side effect: Hyporeflexia, Respiratory depression, Bradycardia
 - High BP = IV Hydralazine or IV Labetalol or PO Nifedipine

PEM R | 17 Y/O Obese previously healthy coming w/ 2 days bitemporal headache, nausea, not improving w/ over the counter pain meds, No sexual activity, last menstrual period 6 months ago, BP 165/98, Mild pitting edema on ankle, abdomen tenderness to palpation in. Epigastric without peritoneal signs, Pregnancy test positive, +4 Protein, MgS given, BP 175/100, still having headache/blurry vision, Next = Labetalol IV

- **IUD (Intrauterine device)**
 - o IUD Displacement
 - Tx: Ex string seen = Remove
 - Ex string not seen = US Pelvis (to check for Displacement)

PEM R | 19 Y/O Girl, 1 week worsening bilateral Lower abdomen pain, Ax w/ Minimal vaginal bleed, no dysuria, having a copper IUD placed 8 months ago, on Ex can't find IUD, having no cervical motion tenderness, UA negative, Pregnancy negative, Gonorrhea-chlamydia-Trichomoniasis test pending, Next = US Pelvis

- **Ectopic Pregnancy**

Final25 | 15 Y/O girl with missed periods for 3 months has gradually left abdominal pain and vaginal bleeding today, she thinks it is her menses No rebound *vitally unstable hypotensive and tachycardic = Ectopic pregnancy (Not appendicitis nor ovarian torsion)

Chapter 3: Surgical

General GU

- Urine Retention

- Acute urinary retention: retention > 12hr
- Causes: Neurological problems, Functional withholding
 - UTI, Constipation, Drug side effect, Obstruction, Inflammation
- Tx: Treat underlying cause

PEM R | 11 M/O girl, fussy, no U/O for 24hr, No Fever/vomit/diarrhea, had normal PO intake until 2hr ago while no longer be consoled, Abdomen distention in lower abdomen, external genitalia normal, US shows 80 ml of urine in bladder, next = Perform urethral cath to drain bladder

PEM R | 3 Y/O male w/ urine retention, had not urinate in 12hr, circumcised, has stooling every 2-3 days and became less frequent over past month, well appearing, normal vital signs, distention & mild tenderness of Suprapubic region, US of GU confirms distended bladder, next step = Administration of bisacodyl enema

PEM R | 9 Y/O unable to urinate for 16hr, No other Sx, stooling normal Vitally stable, obstruction series shows normal bowel gas without evidence of retained stool, bladder had 400cc, when inserting cath. He yields the full volume of urine, Urinalysis & GU US are normal, Next = Obtain MRI of spine

- Benign Infant diaper blood

- < 1 week = Urate crystals (Pink/Yellow color in diaper)
- 2-3 week = Estrogen lvl drop (Evidence of blood in Perineum)

PEM R | 2 W/O FT, blood in diaper over last 2 days, no other sx, normal urine/stool, except for small amount of dried blood in perineum, next step = D/C after reassurance

Challenger | 6 W/O in ED w/ blood in diaper 3-4 times over 3 days, GU exam normal, infant normal, diaper has pink tinted urine, based on this, you = Reassure her that this is normal (Not Urinalysis & C/S nor Urinalysis, C/S, BUN, Creatinine)

- Urate crystals

- < 1 W/O
- Sx: Pink/Red drops on diaper
- Invx: NO RBC in Urine dipstick/urinalysis
 - This is the only time to take bagged urine dipstick/urinalysis
 - As if taken by cath it will have Microscopic RBC due to minor injury

PEM R | 1 W/O FT, red discolored urine, noticed 3hrs ago, patient otherwise normal (pic of diaper with red/pink color), Next = Reassure parents w/ no further treatment

Final | 10 Days diaper rash & blood in diaper = Reassurance

- Congenital Urology issues

PEM R | 10 Y/O boy w/ Vesicostomy in ED has red/moist/protrusion of surgical site, Hx straining while having bowel motion 1 hr ago, site was flat but now pink donut protrusion but no pain/vomit/fever, next = Attempt to reduce energy in of bladder with non-latex gloves since large % of Peds w/ Uro malformation has Latex Sensitivity/Allergy

Chapter 3: Surgical

Procedures

Foreign Body

GI Foreign Body

- GI Foreign Body Fleisher Algorithm
 - Esophagus FB
 - Observe (<24 hrs)
 - Round, non-sharp objects
 - Remove
 - Symptomatic
 - Button battery
 - Sharp objects
 - Multiple magnets
 - Long objects (>6 cm)
 - Large objects (>2.5 cm)
 - Stomach or Lower GI Tract FB:
 - Observe
 - Asymptomatic
 - x1 button battery if patient ≥ 5 Y/O or size < 20 mm
 - x1 magnet
 - Remove
 - Symptomatic
 - x1 button battery if patient < 5 Y/O & size ≥ 20 mm
 - ≥ 1 button battery or magnet
 - ≥ 1 co-ingestion w/ battery
 - Sharp objects
 - Long objects (>6 cm)
 - Large objects (>2.5 cm)
 - No Foreign Body Seen on Radiograph
 - Consider endoscopy if symptomatic to evaluate for non-radiopaque foreign body
 - FB Duration
 - How long to keep FB in Esophagus
 - Button battery = 2hr
 - How long to keep FB in GI
 - x1 coin or x1 magnet = up to 2 weeks
 - x1 button battery <20 mm = 10–14 days
 - x1 button battery >20 mm = 2 days
 - x1 sharp object = 2-3 days
 - Easy to remember:
 - 2 hrs = Battery in Esophagus
 - 2 days = x1 > 20mm battery or x1 sharp
 - 2 wks = x1 coin or x1 magnet or x1 < 20mm battery
 - If FB > 2 days didn't go beyond stomach = consider removal
 - Thoracic inlet = Most common Esophageal FB location

Chapter 3: Surgical

- GI Button Battery Foreign Body

- Mostly < 4 Y/O, 20mm Lithium 92% of Serious/Fatal ingestion
- Complications Pre Removal:
 - Direct Pressure Necrosis
 - External electrolytic current > Liquefaction Necrosis
 - Material leak > Caustic injury
- Complications Post Removal:
 - Tracheo-Esophageal Fistula, Esophageal Stricture, Perforation, Mediastinitis, Vocal cord paralysis
 - Aorto-Esophageal Fistula (Most common cause of death)
- XR: AP/Lateral Circular Halo, Double rim, Step off, Trick:
 - Esophageal circular object Face in AP & Lateral in Lateral
 - Tracheal circular object Lateral in AP & Face in Lateral
- Tx:
 - Esophagus:
 - Endoscopic removal within 2hr
 - Reduce caustic injury
 - < 1 Y/O PO Sucralfate 10ml Q10min
 - > 1 Y/O PO Honey 5-10ml Q5min x6
 - Stomach or Beyond:
 - 5 Y/O + < 20mm = Observation, Repeat XR 10-14 days > Endoscopy if didn't pass stomach
 - > 5 Y/O + > 20mm = Observation, Repeat XR 2 days > Endoscopy if didn't pass stomach
 - < 5 Y/O & > 20mm = Endoscopic removal within 24-48hr

PREP | 4 Y/O, 30min post swallow shiny thing, RR 20 O2 98, CXR (circular w/ halo), Best Next = Endoscopic removal

Pedz | Indication to Remove Disc battery = Lithium (Not Aluminum)

PEM R | 10 M/O arrives asymptomatic and well after 1hr ingestion of (Pic of Button battery) XR shows in Esophagus, Immediate next step in ED = Administration of Sucralfate

PEM R | 15 M/O choking XR shows holo circular FB on esophagus, Next step = Consult specialist for immediate removal

PEM R | 3 Y/O swallowing shiny small Foreign body yesterday, having moderate tender to palpate Epigastric & LUQ on XR (halo button battery on stomach), Next step = Obtain GI Consult

PEM R | 1 Y/O ingested in esophagus XR (holo-sign battery) which confers lower risk of this ingestion = Ingestion < 2hr prior to presentation

PEM R | 5 Y/O button battery asymptomatic stable, has it on Thoracotomy inlet = Emergent endoscopic removal

Promo | 3 Y/O choked on disc battery, XR battery in stomach = Parental reassurance & home observation (Not Laparotomy if battery still in small bowel at 48hr nor Ipecac to induce expulsion of battery)

Amal | 3 Y/O present with choked with disc battery. Xray showed battery in stomach. What will be your next step in management = Parents Reassurance and home observation

- And should be removed if exceed 2 weeks

Amal | Teenage girl got upset after argument, ingested button battery at 2:00 am, after 2 hours XR shows battery in mid esophagus, appropriate management = Urgent ENT consultation for removal then psychiatry evaluation

Amal | 3 Y/O boy healthy, button battery ingestion 15 min ago, in Esophagus, asymptomatic, Tx = Immediate Endoscopy

- Button batter in esophagus window 2hr

Final | 3 Y/O child witnessed of button battery ingestion by his parents, brought to ER few hours later, asymptomatic, and vitally stable, Abdominal Xray showed: 2 batteries in the stomach size 15 mm, next step = Endoscopy removal immediately (Not Discharge or Repeat abdominal X-ray after 4 day -New guidelines-)

Final | 3 Y/O old with button battery in the stomach, asymptomatic on XR The diameter is 20 mm, next step = Immediate endoscopic removal

Final | 9 Y/O w/ XR showing Double layer battery = Discharge (depend on question & choices)

Final | Battery in stomach = Discharge & 4 days follow up (if Asymptomatic)

Chapter 3: Surgical

- **GI Magnet Foreign Body**
 - o Esophagus/Stomach = GI Endoscopy
 - o Intestine = PGS

PEM R | 8 Y/O autism, swallowed high power magnet (XR shows multiple) = Obtain emergent surgical consult & admit

PEM R | 2 Y/O girl, ingesting magnet no cough/gagging, asymptomatic, XR shows 1 magnet in small bowel, Next = Reassure parent & discharge

- **Other GI Foreign Body**

PEM R | 4 Y/O coughing/gagging after playing w/ coin, vomited twice w/ drooling, no RD, XR (coin in proximal esophagus), Next = Obtain Lateral XR chest

PEM R | 4 Y/O boy, swallow coin 1 hr ago, no distress, no drool, (XR coin in upper esophagus), True = Coin is lodged in most common location (Thoracic inlet = Most common Esophageal FB location)

PEM R | 9 M/O found playing coin, XR (shows coin in pylorus), Next step = Reassurance & Discharge

PEM R | 11 Y/O Hx of autism, ingestion of nail, in XR (nail in stomach) = GI consultation for endoscopy removal

Promo | Food impaction, stable, what to do = AP & Lateral CXR

Promo | 7 Y/O Boy, Hx of choking during eat & swallow big piece of sausage, feel food stuck in esophagus, drooling but comfortable, XR shows dilated esophagus, Action = Endoscopy (Not Glucagon IV nor Admit 24hr observe)

Promo | 5 Y/O in ED Pic of XR w/ pin 6-8cm pin in stomach, Anxious family, Next step = Urgent Endoscopy

Amal | 5 Y/O 1 day ingestion, XR shows (screw in Stomach/Intestine), asymptomatic, plan = Urgent Endoscopic removal

Amal | 2 Y/O playing with coin and x ray showed coin in the stomach what to do next = nothing further needed (Not Endoscopy nor parent stool examination nor serial xrays)

Amal | Child came to ED with history of choking, stable, asked for neck XR (shows coin in esophagus) = Endoscopy

Amal | A child with coin ingestion at level of aortic arch since 12 hours, unable to swallow solids but fine with fluids, no respiratory difficulty, next step = Arrange for endoscopic removal (Not Perform water soluble imaging followed by extraction by foleys catheter or Extrication by foleys catheter followed by contrast study or observe at home)

Amal | 5 Y/O 1 day ago ingested: see abdominal XR (image of sharp object) he is asymptomatic other examination unremarkable, Tx = Urgent endoscopic removal

- o Sharp + Long ≥ 6 cm

Final | Abdominal XR showed coin in the stomach

Airway tract Foreign Body

- **Airway Foreign Body**
 - o Sx: Sudden/persistent cough, persistent focal wheeze, asymmetric decrease breath sounds
 - Complete obstruction can lead to respiratory distress and arrest
 - o Invx: CXR (ball-valve effect: air trapping distal to FB during exhalation causing unilateral hyperinflation)
 - Bronchoscope (Definitive diagnostic, as CT might not show it)
- **Upper Airway Foreign Body**
 - o Complete FB obstruction:
 - < 1 Y/O Back blows/Chest compression x5 | > 1 Y/O Heimlich maneuver
 - IF Failed = Direct Laryngoscope w/ Magill forceps to visual and remove FB
 - IF Failed + Above Vocal cord = Cricothyrotomy (< 12 Y/O Needle, > 12 Y/O Surgical)
 - IF Failed + Below Vocal cord = EET Right mainstem intubation > pull back ETT then position pt. Rt side
 - o Partial FB obstruction:
 - Rigid Bronchoscopy in OR

Chapter 3: Surgical

PEM R | 2 Y/O choking/difficult breath while eating hot dog then cried/cough w/ RR 50 SpO2 93% on RA, Stridor/Labored breath, diminished breath sounds bilateral, FB removal = Rigid Bronchoscopy in OR

Challenger | 12 M/O aspiration of marble, ETT intubation visualized marble above vocal cords unable to remove it w/ forceps or suction, cyanotic SpO2 40% HR 60, BVM lead to minimal chest rise & no audible breath, back blows & CPR unsuccessful in dislodging FB, next = Perform Needle cricothyrotomy (Not Surgical cricothyrotomy nor BVM w/ LMA nor attempt FB removal)

Promo | 3 Y/O in ED w/ Acute onset of cough difficult breath while playing w/ brother, during evaluation he is in RD, Next step = Call ENT & minimal Handling (unsure, Not Order for CXR AP & Lateral nor one dose Racemic Epi nor Diphenhydramine IM)

Final | FB Aspiration, arrested, Next step = Direct Laryngoscope (unsure if Not: Cricothyrotomy)

Final | FB Aspiration hypoxia, No Chest rise Tx = Cricothyrotomy

- During direct intubation push FB to Rt. Bronchus > If failed = Cricothyrotomy

Final | Scenario of FB aspiration = Rigid bronchoscopy

Final | XR shows air trapping (suspect FB in respiratory tract), Action = Rigid bronchoscope

Final | 5 Y/O known CP w/ choking of plastic piece 30min ago, continuously coughing but good air entry, bilateral wheeze no sx of increase work of breath, Next = Allow her to continue coughing

Final | FB inhalation = Direct bronchoscope (Rigid)

- Lower Airway Foreign Body

- Hx of FB warrants Bronchoscopy (Therapeutic/Diagnostic)

PEM R | 3 Y/O, persistent cough for 2 days started after eating popcorn while watching movie, Vitals and clinically stable w/ equal bilateral breath sound, CXR nothing, next = Endoscopy

PEM R | 17 M/O male, cough started yesterday after playing at home w/ initial gagging then croupy type cough, Vital/clinical stable except for repetitive cough (CXR hyper-inflated left lung), Next = Obtain consultation for Bronchoscopy

PEM R | 18 M/O w/ 1 month wheeze started after Viral URTI, seen in ED given Salbutamol & Dexamethasone & discharged but wheeze not improved, no cyanosis/wt loss/vomit/diarrhea, No Hx of family Atopy, CXR normal, having only Rt. Side expiratory wheeze, diagnostic test = Bronchoscopy

PEM R | 5 Y/O w/ autism said to his mother he swallowed pen cap, asymptomatic yesterday, today Sore throat/Abdomen discomfort w/ slight cough, on Ex Vitals stable but uncooperative XR (has cap on Lt main bronchus), Next = Admit Bronchoscopy

PEM R | 16 M/O was playing w/ older sister toys & sudden gagging/cough/turned blue, mother did back blows & returned to normal but no FB seen out & had drool, Now RA vitally and clinically stable no drool no RD no wheeze, 2 view XR normal, Next = Bronchoscopy

PEM R | 15 M/O coughing/gagging after playing w/ plastic beads, in ED stopped gagging but still coughing, No RD & had diminished air entry on Rt. Lung, RR 24 SpO2 96% on RA, Tx = Bronchoscopy

Promo | 3 Y/O, witnessed by Mother swallowing screw, started to cough & severe stridor, Next = Urgent rigid Bronchoscopy

Promo | Patient present after choking w/ nuts, Vitals/Clinically stable, XR (Rt. Lung dark) = Rigid Bronchoscopy

Promo | 2 Y/O in ED, seen choking on his toys, Active/playful, has no wheezing, Next = ENT Consult for rigid Bronchoscopy

Amal | Child w/ FB in trachea, Removal instrument of choice = Rigid Bronchoscopy (Not Flexible bronchoscope nor Foley cath)

Amal | 2 Y/O, choking in waiting room in ED while eating peanut (Image of hyperinflated left lung) Next step = Rigid Bronchoscopy

Amal | 18 M/O old boy, presented to Ed with history of choking by his plastic toys, witness by his mother, examination is unremarkable, O2 sat 98%. What's next in management = Urgent referral to ENT for rigid bronchoscopy

- Any witnessed aspiration = Need ENT scope

Amal | 8 M/O, sudden wheezing, abrupt cough almost continuous, no fever, looks well, no stridor, most likely Dx = Foreign body aspiration (Not Anaphylaxis nor Asthma)

Final | Scenario of FB ingestion w/ Hyperinflation of Left lung in XR, Next = Bronchoscopy

Final | 2 Y/O sudden cough = Bronchoscopy

Chapter 3: Surgical

Other Body Foreign body

- Ear Foreign body
 - o Other in Ear FB
 - Alligator forceps = Easily visible
 - Katz = Round object

PEM R | 4 Y/O girl w/ foreign body on Rt. Nose w/ nasal drainage for past week, Next = Attempt removal w/ Alligator

Amal | 2 Y/O who has a bead in the ear adjacent to the tympanic membrane and surrounded by cerumen How we're going to remove it = Irrigate the ear & dislodge it out (Not Attempt to scope it with removal nor Use gauge 18 needle to dislodge it out nor Use an alligator forceps to grab it)

Amal | A boy came with bleeding from ear, metallic body in ear canal since 1 day. Which looks like button battery, next step = Immediate ENT consult for removal

- o Indication of ENT in ear FB close to tympanic membrane or battery

Final | Metal FB in ear near TM = Call ENT

Final | FB in ear with adjacent TM = Call ENT

- Ear Insect Foreign body
 - o Sx: Feel of something inside ear, pain, Vertigo/Nystagmus (If insect touches tympanic membrane > irritation)
 - o Tx: Technique:
 - Use Lidocaine (Best, Kills + Anesthetize area) Mineral oil or Olive oil or Alcohol
 - Use 18 g catheter to push it, Leave it for > 5 min
 - Remove by suction (avoiding breaking it into pieces)

PEM R | 5 Y/O Girl, screaming in ED, feels like something is crawling inside her ear, otherwise healthy, extremely anxious, but you can visualize a cockroach within Rt. ear canal, Best Next = Flush Ear canal w/ viscous lidocaine & remove insect in 5 minutes with suction

PEM R | 10 Y/O Lt ear pain after insect got in it, Tx = Mineral oil

Promo | 3 Y/O irritable, pointing to his ear that he is hearing noise inside, action to examine = Lidocaine spray (unsure if spray is enough, Not Sedation & irrigation nor Painkiller then examine nor Try to remove by forceps)

Amal | 12 Y/O girl has insect in the left ear, presented with pain, and irritation and buzzing noise at the same effected ear, what is your initial step in management = Lidocaine solution in effected ear

- o If it touches tympanic membrane > pt. irritation & nystagmus happens

Final | Insect in ear = Mineral oil

Final | Live insect in ear = Mineral oil

- Nasal Foreign body
 - o Alligator forcipes = Anterior + non-occlusive compressible objects
 - o Positive pressure (Mother's Kiss) = Occlusive + Round
 - o Ballon catheter or Suction = Posterior + Smooth + Round

PEM R | 6 Y/O boy slid on an old wooden bench, has posterior thigh injury w/ 1cm laceration on posterior thigh distal to buttocks, has 5cm linear induration just 1cm distal to laceration, unable to visualize FB through wound opening, Tx to minimize complication = Extend laceration & remove FB under direct visualization

PEM R | 16 Y/O police used electrical weapon to subdue him, having normal rhythm during transfer, HR 76 RR 20 BP 112/76, electrical weapon dart embedded in skin Lt anterior thigh w/ nearby puncture wound, Tx = Inject w/ local anesthetic, pull projectile from entry site, enlarging puncture wound as needed

PEM R | 2 Y/O girl, 1 week nasal congestion in absence of fever/cough, unilateral foul smelling purulent rhinorrhea, Next = Examine further w/ nasal speculum

PEM R | 3 Y/O Nasal FB (visible on image), Next = Extract w/ hook or Alligator forceps

Chapter 3: Surgical

PEM R | 4 Y/O prev. Healthy, having periorbital erythema/swell for 2 days, Ax w/ fever, having Chemosis/Proptosis of Rt. Eye w/ Periorbital erythema/edema & tender to pick, having difficult eye open/moving, also Rt. Nare foul smell & discharge, XR Lateral circular FB double ring in nose, you take Blood C/S & Labs, Next = Consult ENT & Optha

- Button battery > Liquefaction necrosis within 6hr
- Pt. Has button battery & suspected Orbital cellulitis

PEM R | 2 Y/O FB in Rt. Nose, piece of cotton, no drainage/blood, remove by = Alligator forceps

Final | FB in nose Tx = ENT

- **Nail Foreign body**
 - with Shoes = Pseudomonas
 - without Shoes = Staph/Strep

PEM R | 5 Y/O Rt. Foot injury, running barefoot in backyard w/ sudden pain thought to be as bee sting, on Ex small puncture wound on anterior sole noticed by parents & over several days having erythema/tenderness which in PCP given PO cephalexin bcz on XR had nothing, foot worsen with erythema spread, tactile fever, Redness/tenderness over planter aspect w/ scant purulent fluid from Puncture wound, Next = POCUS

Wound Care

- **Indication of Laceration Abx:**
 - Over joint
 - Hand & feet
 - Immunocompromised (DM, Renal, CF, SCA, etc.)
 - Bite wounds
- **Complicated sutures**

PEM R | 8 Y/O girl fell on playground sustained V shaped laceration to forearm, after irrigation/pain control & assess o-NS any prophylactic & infection needs, best repair of tissue flap = Modified horizontal mattress stitch (corner stitch)

Promo | During suturing had a gap (dog ear), action to achieve best result = Ear dog correction or V-Y suturing

Amal | 7 Y/O, sustained cut to his leg from glass, clean gaping V (in other Q Y shaped) shape laceration, not actively bleeding, NV intact, best way to suture = Half buried horizontal mattress sutures

- **Scalp Laceration**

Promo | Regarding Scalp injury, correct = Injury involving deep layer galea aponeurotica need many layer closure by sub specialists to avoid complications (Not doesn't cause significant bleed nor scalp contain 6 layers)

Amal | Which of the following statements is the correct regarding scalp injury = 3rd layer must be closed by cutaneous or subcutaneous sutures (Not No significant cosmetic injury even if improper closure nor Scalp hematoma cannot cause hypotension nor Scalp consists of 6 layers of deferent tissue layers -5 layers-)

Final | statements correct regarding scalp injury = 3rd layer must be closed by cutaneous or subcutaneous sutures (Not no significant cosmetic injury even if improper closure. Nor Scalp hematoma cannot cause hypotension. Nor Scalp consists of 6 different layers)

Chapter 3: Surgical

- Forehead Laceration

- Common in early childhood, Falls on objects, Mostly simple
- Ex Head & Neck carefully, rarely associated w/ Skull Fr. But Facial & Intracranial injuries shouldn't be ruled out
- Types: Superficial transverse (favorable outcome) = Simple or Continues Cuticular Suture 6-0 Absorbable
 - Deep transverse (Fascia/Frontalis M./Periosteum) = Layered 5-0 Absorbable (Monocryl/Coated Vicryl/Gut)
 - Deep buried = Vicryl
 - Superficial = Gut fast Absorbable or Non-absorbable with intention of removal 5 days
- Complication if Deep repair not done:
 - Loss of Frontalis muscle function (Eyebrow elevation)
 - Vertical (more visible scar bcz traverse skin tension lines)
 - Complex (Stellate from windshield impact, Tissue loss 2ndr to bites) = Plastic Surgery Consult

PEM R | 5 Y/O accidental hit on face, Ex curvilinear wound over eyebrow gaping/oozing blood when not covered, best way for wound healing/minimize scarring = 5.0 Vicryl buried deep + 5.0 Fast absorbing gut dermal closure

Promo | 10 Y/O w/ Curvilinear laceration over Lt. eyebrow, Tx w/ minimizing risk of scarring & wound breakdown = 5-0 Polyglactin 910 (Vicryl, Ethicon) buried dermal suture followed by 6-0 nylon percutaneous sutures

Amal | 6 Y/O boy, fall from swing, hit forehead, 2 cm laceration in forehead involving, eyebrow = Clean the wound with saline with gauge 19 cath and 35 ml syringe (Not Daily application of topical Abx after suturing or Scrub wound with providing or Shave eyebrow)

- Tissue adhesive

- Use: Linear laceration < 5cm no gaping, Easily opposable, No tissue loss, No wound tension

PEM R | 4 Y/O w/ 1.5 cm non gaping laceration of Forehead without active bleed, best method of repair minimizing scarring & pain & sedation to safely complete procedure = Topical LET irrigate & apply skin adhesive

Promo | Contraindication of tissue adhesive = Over joints or Scalp or Hand

Amal | What is true regarding tissue adhesive = Cosmetic results are equivalent to sutured wound

- Irrigation

Promo | 10 Y/O in ED w/ Highly contaminated wound on thigh, Best way to irrigate = High pressure 35cc syringe w/ 19 gauge needle (Not Low pressure 10cc syringe 18 gauge needle, Iodine solution nor Bag of NS by gravity)

Amal | 12 Y/O boy has grossly contaminated wound in his thigh, effective irrigation = Normal Saline 35ml, 19G needle

- 35ml w/ 19g
- Tap water 5-8 psi
- 50-100ml per each cm

- Trauma Joint Capsule

- Saline load test checking viability of joint capsule fluid will come out
Not done anymore so do CT

PEM R | 11 Y/O boy running in dark striking lateral aspect of left knee, has 2cm laceration lateral to patella overlying lateral Condyle of distal femur, No FB, gap 5mm w/ knee extended, Tx of wound = Saline load test followed by irrigation & suture closure if negative

Chapter 3: Surgical

Finger/Nail

- Nail bed Amputation

- Tx: Irrigation, Suture 5-0 or 6-0 Absorbable (typically chromic gut)

PEM R | 2 Y/O girl, having. You of mid-nail bed amputation, bleed stopped, can't find finger, nearest hand specialist 5hr away, Tx = Rongeur protruding bone & placing suture to achieve soft tissue coverage

Promo | Partial amputation involving nail bed, true about management = Irrigation (Incomplete Q)

- Amputated finger

- Finger Salvage transport:

Wrapping finger in sterile gauze soaked in saline then in plastic bag with 1:1 Ice & Water Mix

PEM R | 15 Y/O amputated Lt index finger between interphalangeal joint, best salvaging part by = Wrapped in saline moistened gauze in plastic bag on ice water mixture

PEM R | 3 Y/O in Rural ED, outstretched left hand having laceration (image of laceration at PIP joint on palmer side of index), prior to Penrose drain, CRT brisk, steady non pulsatile flow of blood from wound, appropriate treatment = Explore after digital block, irrigate aggressively, suture laceration, refer to surgeon if indicated

PEM R | 13 Y/O rt. Handed boy amputated rt. Thumb proximal aspect of proximal phalanx, transporting = Wrapped in saline moistened gauze in plastic bag floating on water ice mixture

- Subungual hematoma

- Collection of blood under nail plate
- Tx: Trephination + Finger XR (to r/o Tuft Fr.) > Finger Splint
- **Trephination:**
 - Indication: > 50% Nail Hematoma or Very Painful Hematoma
 - Technique: Use Digital nerve block N. Block then apply hot needle and make hole for it to escape
 - Complications: Infection, Bleeding

PEM R | 4 Y/O finger caught at door w/ painful hematoma under nail < 45%, XR normal, Tx = Nail Trephination at center of hematoma

PEM R | 12 Y/O Boy, struck Lt thumb w/ hammer having subungual hematoma w/ mild elevation of proximal two-third of nail plate & incapacitating pain, Hematoma doesn't extend beyond nail plate, Tx = Trephination of nail

Promo x2 | Subungual hematoma = Trephination

Promo | Finger trauma with Subungual hematoma more 50%, XR no fracture, what is your action = Trephination

Promo | 8 Y/O Hx of Trauma door closed on his fingers (Pic subungual hematoma) Tx = Trephination

- Felon

- Painful infection of the Distal Finger Deep Pulp (digital pad)
- Organism: Bacteria, Staph. A (Mostly)
- Path: occurs in closed compartments of fingertip > tense swelling, throbbing pain, risk of necrosis if untreated
- Complication: Osteomyelitis, Septic Arthritis, Flexor Tenosynovitis
- Tx: Longitudinal incision in greatest fluctuance

PEM R | 15 Y/O Very painful/swollen/erythematous distal while 2nd finger, on Ex finger pad tender central area w/ yellow Fluctuant, if not treated what likely complication = Osteomyelitis of distal phalanx

PEM R | 8 Y/O w/ pain/swell of distal aspect of Lt 3rd finger and wooden splinter removed by mother 5 days ago, on Exhas Tense Swelling of Pulp of distal phalanx No obvious FB, Next = Incision & drainage w/ wound exploration

Chapter 3: Surgical

- Paronychia
 - o Soft tissue infection of nail fold
 - o Ax: Nail biting/picking
 - o Acute (Bacteria/Painful/Swollen), Chronic (irritants, Fungal)
 - o Tx: Insert blade between nail & eponychium

PEM R | 9 Y/O Rt. Thumb swell w/ green drain around nail fold (Felon Image), Next = Longitudinal incision in greatest fluctuance

Promo | Pic of Paronychia, & in middle red/swollen & has fever, Statement correct = Easily treated by ED Physician (Not Systemic Abx nor Need OPD referral)

Amal | What's the correct regarding this condition = It can be easily treated by Emergency physician

- o 18g has a cutting knife edge like Scalpel size 11 using it as a cutting knife rather than puncture
- o Extensive cellulitis or infection = Abx
- o Tuft + Nail Hematoma = Call plastic

Amal | 10 Y/O girl, pain/swelling of her index finger, No Fever No Trauma, (pic of Paronychia) Tx = Incision & Drainage

Specific Procedures

- LP (Lumber Puncture)
 - o LP = Peds L3-L4 | Adult L2-L3
 - o Complications:
 - Contamination of CSF w/ blood (from epidural venous plexus)
 - Local pain w/ referred limp
 - Headache (Uncommon < 10 Y/O)
 - Apnea/Hypoventilation by Positioning
 - Bleed Spinal Cord/Spinal Epidural/Subdural Hematoma
 - Infection
 - Subarachnoid epidermoid tumor formation
 - Ocular muscle palsy (transient)
 - Epidural CSF leak (ranging from asymptomatic to cauda equina syndrome)
 - Brainstem herniation (in presence of a mass effect or noncommunicating hydrocephalus)

Promo | Neonate Most common Complications of LP = Traumatic Tap or Headache or Low back pain (unsure about answer)

Promo | Pt. W/ fever, decided to do Full sepsis workup including LP, resident asks regarding parent attending procedure, answer = Most parent prefer attending if it invasive or Most parent interfere w/ procedure

Amal | The Ideal lumber space for LP = L3-L4

Final | LP complication = Local pain (headache, infection, bleeding, spinal hematoma...)

- Fish Hook injury
 - o Tx: Advance hook then Cut base

PEM R | 8 Y/O while fishing (pic of fish hook on lip), appropriate = Advance hook through intact skin, cut off barb w/ wire cutter & withdraw base of hook

PEM R | 8 Y/O went fishing, & fishhook stuck in helix of Rt. Ear, what technique of removal you will use & what Tx of cartilage you will do = Remove w/ using Push-through technique, Irrigate wound & D/C w/ Clindamycin & F/U 1-2 days

Chapter 3: Surgical

- Hair Tourniquet

- Tx: Fine-tipped forceps w/ thin probe inserted proximal under hair then unwind or cut the hair
- Visualized Hair = Unwrap > Depilatory cream (3-10min then wash w/ soap & warm water) > Incision
AVOID Depilatory cream in Inflamed/broken/Lacerated skin
- Visualized fibers = Unwrap > Incision
- Visualized fibers + Inflamed/Broken skin = Unwrap > Incision
- Not visualized fibers or multiple attempts not successful or epithelized =
N. Block then incision Perpendicular over hair (Finger/Toe 3 & 9 o'clock | Penis 4 & 8 o'clock)

PEM R | Pic of hair tourniquet asking about likely cause = Foreign body

PEM R | 3 W/O infant fussy foot (pic of hair tourniquet), effective Tx = Apply Depilatory agent

PEM R | 9 M/O having Swelling/Redness on toe w/ hair tourniquet = Attempt unwrapping the fibers

PEM R | 1 M/O girl, hair tourniquets Tx = Depilatory agent

Promo | Fussy 2 M/O, Exam unremarkable, little toe swelling, Dx = Hair Tourniquet

Promo | 2 month w/ excessive cry for 48hr on Ex found little toe swelling = Hair Tourniquet

Promo | Infant w/ Hair tourniquet & intact skin = Apply thin layer of ?

Final | 9 M/O w/ fussiness, on exam (Hair FB) next = Apply hair removal cream for 5 min

Final | Baby w/ Hair tourniquet but superficial what to do = Depilatory hair removal cream

Final | Toe tourniquet Tx = Depilatory cream

- Tick Removal

- Remove by curved forceps

Amal | 8 Y/O girl with tick impeded in her skin, how to remove it = Grasp the loose part of the tick and gradually remove it

TRAUMA

General Trauma

ATLS

- ATLS Approach

PEM R | 5 Y/O bicycle hit by car thrown 10 feet, C-Collar applied, anxious/crying, HR 115 RR 25 BP 100/60 SpO2 97% GCS 15, having midline intact airway equal bilateral air entry, +2 femoral artery, 2ndry survey boggy frontal hematoma, chest/abdomen diffuse tenderness/ecchymosis, Now HR 140 RR 35 BP 78/55 SpO2 89%, Tx = Repeat Primary survey

PEM R | 2 Y/O in ED after multiple bilious vomit, parent share joint custody & was w/ his father when fell off couch, No Fever, HR 200 RR 20 BP 100/60, Epigastric region tenderness/distention, ecchymosis Abdomen/Chest/Back, Tx = Infuse NS bolus

- By ATLS protocol Compensated shock presentation, given fluid then takes labs

Promo | Trauma patient stable vital signs, during primary survey patient became Hypotensive, Next step = Transfuse PRBC (Not Transfer to OR nor Repeat Primary survey again ABC nor CT scan)

- In general, always if new issue Repeat Survey, then intervene when problem identified

Promo | FAST likely to be helpful in which scenario = Unstable Pt. Who cant go for CT (Not Stable pt. W/ Abdomen bruise nor Pt. W/ high Liver enzymes nor Stable pt. Suspected to have Abdomen injury)

Promo | MVA came to ED complaining of Back pain, Next = Backboard & Ex him (Not Backboard to CT or Wheel chair to CT)

Promo | 12 Y/O extracted from MVA, after stabilization of Airway & circulation, noticed thigh laceration w/ large amount of bleeding, Best Next = Direct Pressure (Not Tourniquet proximal to bleed)

Amal | 7 Y/O fell down through a glass window, bleeding profusely from seven cm wound of his left of his medial side of his right thigh. What's your immediate management of this wound = Direct pressure on the wound (Not Application of tonic nor Irrigation and debridement nor Packing wound with gauze)

- Direct pressure > Tourniquet 30min > Packing

Amal | True statements in regards to log roll the mover in case of trauma = The backboard has not been shown to prevent injuries in cases of the presence of an unstable vertebral fracture (Not Fast controlled turning of the patient to each side to assess the dependent part of the supine trauma patient. Nor It concentrates on the back of the head, neck, back, buttocks exam, and it may include the rectal exam Should have PR-. Nor Should be done by at least five people, One stimulates head and neck Three Persons turn the patient, and one, two exams -4 persons-)

- Backboard examination:
 - 4 persons
 - Needs Rectal Exam, which checks: Tone, feel of sharp edges, blood, No need to check prostate
 - Backboard not shown to prevents injuries in unstable vertebral fracture
 - Pressure ulcer within 2hr

Amal | 10 Y/O boy, involved in MVA, conscious GCS 13, agitated, large amount of blood in clothes HR 130 BP 55/45 RR 30 Spo2 98% RA. Initial step of management = x2 large bores IV line and fluid (Not Activate trauma team to take him to OR nor Tetanus toxoid and Antibiotics nor RSI)

- Trauma code activation = More x1 system, more than x1 causality, No enough # of man power

Final | Child involved in MVA came to ER but he was complaining of Back pain what to do = Backboard and examine him

Final | Bleeding after lower limb laceration = Direct pressure on the wound side

Final | MVA w/ shock initial step = Provide oxygen & adequate breathing (Not Isotonic bolus nor Non crossed & matched blood)

Final25 | Best intervention for arrested pediatric blunt trauma patient = Oxygenation and ventilation (unsure if not: Early compression. Not High epinephrine dose nor CPR only if shockable rhyth)

Chapter 4: Trauma

- Trauma Prevalence & Differences

- Info: Blunt trauma Common mechanism 80–90% of trauma
 - MVA 50% of all childhood deaths, Fall 25-30%, Drowning 10-15%, Burns 5-10%
 - Boys twice more than Girls
- Risk factors in Trauma:
 - 0-5 Y/O Falls (Large head) & Non-Accidental Trauma
 - 5-12 Y/O Accidental Trauma (MVA, Pedestrian, Bicyclist, Unrestrained passenger)
 - 13-19 Y/O Risk-taking behaviors & Homicide/Suicide
- Difference between Peds vs Adult Trauma
 - Head/Neck
 - Large head (Higher Morbidity/Mortality)
 - Withstands Blunt trauma but Susceptible to Axonal shearing & Edema (Due to Brain Higher white to Grey ratio)
 - Young Peds Short/Fat Neck (Difficult to evaluate neck veins or Tracheal position)
 - Airway: Larynx Cephalad & Anterior
 - Epiglottis tilted 45° + floppy (Manipulation & Visualization Difficult)
 - Narrowest portion = Cricoid cartilage
(Cricoid + Loose columnar epithelium limit size of ETT the reason why uncuffed is used)
 - Thorax: Blunt force Greater transmission to underlying tissue
 - Diaphragm muscles more Stretchable & more used in Young Children (Belly breathers)
 - Mediastinum very Mobile
(Mediastinum & Abdomen organ are subject to sudden/wide excursions that lead to Tension Pneumothorax)
 - Abdomen: Organs exposed at lower Ribs/Muscles as Diaphragm inserted horizontally till 12 Y/O
 - Small forces can cause Serious Internal injury
 - MSK: Less protective Muscles & Subcutaneous tissue
 - Greater Flexibility/Resilience of Skeleton
 - Always consider internal injury (as external forces transmitted to internal deeper structures)
 - Growth plate injuries (Epi-Phy-Meta are the weak points)
 - Ligaments stronger than Growth plates
 - Physical examination is more sensitive than Radiographs in Growth plate & Long bones Fr.

PEM R | 19 Y/O mother w/ 3 Y/O daughter in restrained Multi-car MVA, what clinical findings comparing 3 Y/O to her Mother = Tension pneumothorax

- Due to mobile Mediastinal structures = Trauma to chest > No fracture > Pneumothorax

Promo | Difference between adult & Peds Trauma = Troponin more accurate for myocardial contusion in Peds or Mediastinum fixed or small head (All wrong A)

Promo | Trauma, difference between Adult vs Peds = Flexible mediastinum or Rare rib Fr. In Peds or Lung Contusion rare in Peds or Small head in Peds (unsure)

Promo | When child experience multiple trauma, most common site injury is to = Head (Not Abdomen nor Chest nor Extremity)

Promo | 10 Y/O w/ MVA had Rt. Chest bruises, difference between adult & Peds = Tension Pneumothorax common than Rib Fr. (Not Pulmonary contusions uncommon nor Mediastinum fixed)

Promo | Children more prone for Blunt Abdomen injury than adults bcz = Children have weak Abdomen muscle

Amal | Children are more vulnerable to Abdomen injury by Blunt trauma more than Adult, because = Weak abdomen muscle (Not Compact torso nor Smaller AP diameter nor Large viscera and less fat -have same fat-)

Final | Case of child w/ Trauma w/ his mother what commonly the child will present w/ = Tension pneumothorax

Final | 19 Y/O Mother with 3 Y/O child MVA = Pneumothorax (Not internal hemorrhage)

Final | Mother and child in MVA what is the difference in injury = Pneumothorax

Final | Child experiences multiple trauma, most common site of injury = Head

Chapter 4: Trauma

- Gunshot wound (GSW)

Promo | 15 Y/O gunshot wound to Anterior RUQ after Ex only one Penetrating wound, Chest clear, Abdomen diffuse tender without rebound or guarding, HR 120 RR 23 BP 130/85, XR Abdomen didn't reveal the bullet, in attempting to map bullet course, Next = Obtain Plain XR of Chest (Not CT of Abdomen/Pelvis nor Bedside US nor Diagnostic Peritoneal Lavage -DPL-)

- Prophylactic Abx in Trauma

- Abx of choice:
 - Cefazolin (for most)
 - Levofloxacin (for Open globe as Fluoroquinolones only class to penetrate the vitreous)
 - Augmentin (for bites)
- Indications
 - Penetrating Brain injury
 - Penetrating Joint
 - Basilar Skull fracture if persistent CSF leak (> 7 Days)
 - Open Skull fracture
 - Open Fractures (within 1hr of ED visit)
 - Open globe
 - Complex Lacerations
 - Bites (All cat bites, Clenched fist bites, High risk dog bites)
- Not indicated
 - Burn (in Early burn care)
 - Frostbite

PEM R | 7 Y/O girl domestic dispute struck head by metal dart protruding Rt. Side of head on CT brain has penetration of Rt parietal skull by dart w/ small hematoma & no midline shift, immunization up to date, NSx will come shortly, Next = IV Cefazolin

- Penetrating injury to head needs prophylactic Abx

Amal | 3 Y/O boy in ED brought by ambulance after he was involved in MVA. Upon arrival to ED HR 180 RR 45 BP 70/42 saturation 94%, you immediately notice that he has open left tibia fracture, You secure the airway, you put him on oxygen mask, what is the most appropriate next step = Give NS (not given IV Cefazolin & Tetanus or Apply splint or Immediate ortho)

Amal | 11 Y/O, massive trauma after MVA, GCS 3, Facial bruises and blood from mouth, nose and ears, large bruises across chest, abdomen & pelvis, bright red blood from urethral meatus & deformed left femur, Intubation & IV insertion done, next step = Administer Tetanus toxoid (Not Abx for contaminated wound or Upright XR or MRI head or Urine cath for monitoring output)

- Tetanus vaccine should be given within 4hr of presentation

- Airbag Injuries

- Life-Threatening
 - Closed Head trauma
 - Cervical spine injury
- Less severe
 - Abrasions Face/Neck/Chest, Minor Burns to Upper Limbs
 - Blunt Ocular trauma, Chemical Keratitis

Final | 7 Y/O front seated passenger, unrestrained, airbag deployed, most likely to be injured = Cervical Injury

- Pediatric Trauma Score

Final | Pediatric Trauma Score = -1

Chapter 4: Trauma

- Helmet Removal

- Prehospital Management (EMS): Keep Helmet unless airway compromise
 - Full-faced helmet should only be removed if injured rider is not able to breathe & helmet is preventing access to airway. In all other circumstances the helmet should remain in place w/ chin strap undone
- Hospital (ED): Use 2 Person Removal
 - 2 Person Helmet Removal Technique:
 - 1st person manually restricts movement of cervical spine
 - 2nd person expand helmet laterally then removes it from above, ensuring it clears nose/occiput
 - After the helmet is removed, 1st person supports weight of the patient's head and 2nd person takes over restriction of cervical spine motion

Final | Helmet removal = Only in RD

Final25 | Bike rider with helmet on victim of MVC, with neck pain and unable to move the legs, Vitally stable, what to do with the helmet = Remove by 2 person inline technique (Unsure if not Keep the helmet till imaging done. Nor Remove the helmet only if patient is hemodynamically unstable. Nor Cut the helmet in scene)

▶ HELMET REMOVAL

STEP 1. One person stabilizes the patient's head and neck by placing one hand on either side of the helmet with the fingers on the patient's mandible. This position prevents slippage if the strap is loose.

STEP 2. The second person cuts or loosens the helmet strap at the D-rings.

STEP 3. The second person then places one hand on the mandible at the angle, positioning the thumb on one side and the fingers on the other. The other hand applies pressure from under the head at the occipital region. This maneuver transfers the responsibility for restricting cervical motion to the second person.

STEP 4. The first person then expands the helmet laterally to clear the ears and carefully removes the helmet. If the helmet has a face cover, remove this device first. If the helmet

provides full facial coverage, the patient's nose will impede helmet removal. To clear the nose, tilt the helmet backward and raise it over the patient's nose.

STEP 5. During this process, the second person must restrict cervical spine motion from below to prevent head tilt.

STEP 6. After removing the helmet, continue restriction of cervical spine motion from above, apply a cervical collar.

STEP 7. If attempts to remove the helmet result in pain and paresthesia, remove the helmet with a cast cutter. Also use a cast cutter to remove the helmet if there is evidence of a cervical spine injury on x-ray film or by examination. Stabilize the head and neck during this procedure; this is accomplished by dividing the helmet in the coronal plane through the ears. The outer, rigid layer is removed easily, and the inside layer is then incised and removed anteriorly. Maintaining neutral alignment of the head and neck, remove the posterior portions of the helmet.

- Peripheral vascular hard & soft signs

- Hard signs:
 - Pulsatile hemorrhage, Expanding hematoma
 - Absent distal pulse, Palpable thrill, Audible bruit
- Soft signs:
 - Hx of significant scene hemorrhage, non-expanding hematoma
 - Diminished pulse, Limb Nerve deficit
 - Bony injury or Proximate penetrating wound

Amal | 8 Y/O girl, struck by car, vitals normal, alert and interactive, multiple injuries include parietal area, lip laceration, distal forearm, and metacarpal joint, what is true = Pulsating hematoma in distal forearm requires urgent exploration (Not Application of tissue adhesive is appropriate over metacarpal joint nor Laceration of lips can be repaired by tissue adhesive)

Chapter 4: Trauma

Brain & Skull Trauma

Brain Trauma

Minor Brain Trauma

- mTBI (Minor Traumatic Brain Injury)
 - o Head injury Causes Prevalence
 - Infants/Toddlers = Fall
 - Children (School) = Sports & MVA
 - All subject to Sequelae of Abuse

PEM R | 15 Y/O boy, fall & struck head on rock, no LoC but decreased hearing in Lt ear, Awake/Alert, Temporal scalp hematoma, Reactive pupil, Neuro normal, Next = CT Brain/Temporal bones

Promo | 4 Y/O, Most common cause of Head Trauma = Fall

Amal | 18 M/O who is brought to the ED for evaluation after a brief episode of tonic clonic extremity movements immediately after spankings in the grocery store. The child reported he screamed then became limp, on ground & then exhibited unusual movements. The episode lasted for one minute and occurred about 30 minutes ago. So the toddler now is interactive, appears healthy has normal vital signs. The most likely Dx = Breath holding spell

- o Class C evidence is impact seizure could be breath holding related ?

- PECARN Pediatric Head Trauma CT Brain (High risk for ciTBI 4.4% | 0.9 Low risk for ciTBI < 0.05)

PECARN Pediatric Head CT	CT Head (ciTBI Risk 4.4%)	Observe (ciTBI Risk 0.9%)	Discharge (ciTBI Risk < 0.05%)
< 2 Y/O	AMS* GCS < 15 Palpable skull Fr.	LoC > 5 Sec Non-Frontal Hematoma Not acting normal Severe mechanism** (Fall > 1m/3ft)	None of previous
> 2 Y/O	AMS* GCS < 15 Signs of Basilar skull Fr.	Hx of LoC Hx of Vomit Severe Headache Severe mechanism** (Fall > 1.5m/5ft)	None of previous

- o *AMS: Agitation, Somnolence, Slow response, Repetitive questions
- o **Severe mechanism: MVA w/ Ejection, rollover, passenger death; pedestrian or bicyclist without helmet struck by MV; head struck by a high-impact object
- o Definition of TBI on CT (any of the following satisfy definition):
Intracranial hemorrhage or contusion, Cerebral edema, Traumatic infarction, diffuse axonal injury, shearing injury, Sigmoid sinus thrombosis, Midline shift of intracranial contents or signs of brain herniation, Diastasis of the skull, Pneumocephalus, Skull fracture depressed by at least the width of the table of the skull

PREP EM | 23 M/O fall of 4 foot high wall, hit head on ground, LoC for 4 sec, vomited twice, but now acting normal GCS 15, vitally stable, no palpable fracture, moderate size frontal hematoma, Highest risk factor for ciTBI = height of the fall (Not area of swelling nor duration of loss of consciousness nor presence of vomiting)

PEM R | 3 Y/O girl playing on porch & fell on concrete steps, immediate cry w/ lump in head 15 min ago and vomited once, has 3cm Rt. Parietal hematoma without palpable deformity, family desire to avoid unnecessary testing, Next = Observe in ED

PEM R | 15 M/O boy, fell on tile, no witness, fussy/vomited 3 times, has Large Parietal scalp hematoma, CT shows Lt parietal linear non-depressed skull fracture without intracranial bleed, Next = Discharge from ED after PO challenge

Chapter 4: Trauma

PEM R | 15 M/O 45 min ago fell off 4 feet to floor, cried 25min but no LoC, acting well/smiling, has 2cm forehead swell without underlying deformity, based on PECARN what suggest to observe in ED = Fall from 4 feet

Promo | According to PECARN which is high risk for CT Brain = 12 Y/O w/ Headache & Vomit (Not 18 M/O < 3 feet GCS 15/15 No vomit/normal behavior/forehead laceration nor 3 Y/O w/ Frontal Hematoma & no other Sx)

Promo | 3 Y/O girl, fell from 4 stairs w/ no LoC, paused for 1 seconds after fall but no Abnormal movements, in ED awake w/ good interaction, Hematoma at Occipital area, Next = Keep for Observation (Not CT Brain nor D/C w/ Head Trauma instructions)

Promo | 3 Y/O girl fell from 3 feet on concrete ground, vomited once but no LoC or SZ, Ex Awake/well/not in pain/no laceration/hematoma, Action = Keep for observation (Not CT brain nor NSx or Discharge)

Promo | 4 Y/O Fell from roof on ground at swimming pool, paramedic report LoC at scene, Ex normal apart from Scalp hematoma, Most ominous sign of Head injury = Persistent vomiting (Not Drowsiness nor Irritability nor LoC at scene)

Amal | 4 Y/O fell of a ladder, 3 m height, landed on floor, came after 4 hours to ED, regard close head injury, which of the following is the most ominous = Frequent vomiting (Not Amnesia of event nor LOC at scene nor Presence drowsiness)

- ≥ 2 vomits without provocation can be considered as frequent

Amal | 3 Y/O fall, not indication for brain CT = LOC initially (Not CSF rhinorrhea nor confusion/irritability nor vomit 4hr after)

Amal | Regarding of children younger than two years of age with minor head trauma, which of the following is the most sensitive clinical predictor of intracranial injury = Vomiting (Not Depressed mental status or Scalp hematoma or Irritability)

Amal | 3 Y/O, presented to ER after 3 hours after fall down from 3 feet height tree on the head, Patient had brief LOC and vomiting once, On examination: unremarkable, Next step = Discharge home with head trauma instruction (Not AED administered prophylactically nor CT brain due to LOC nor plain XR of the skull)

Final | 3 Y/O girl fall from 3 feet on concrete ground, had vomiting once but no LOC or seizure on examination awake looks well not in pain not pale no laceration or hematoma your action = Discharge with head trauma instructions (Not CT or Observation)

- As per PECARN it is observation as > 2 Y/O but had Hx of vomiting

Final | 5 Y/O w/ fall down 2 hours ago with Hx of LOC and once vomiting and headache, now patient is asymptomatic and clinically stable, what to do = Observation 2-4 hours (Not CT)

Final | 2 Y/O fell down = Observe 2-4 hr

Final | Head trauma pt. W/ LoC for 1 sec, can't recall event, Indication of serious TBI = Presenting to ED w/ GCS 14/15

Final | Fall down with hematoma and crying = CT brain

Final | 5 Y/O fall with 10 sec LOC + amnesia + stable = Observe (Not D/C)

Table 3. Clinical Decision Rules for Risk Stratification of Children With Minor Head Injury

	PECARN <2 Years	PECARN ≥2 Years	CHALICE	CATCH
Historical Variables				
Loss of consciousness	≥5 sec	Any	>5 min	
Vomiting		Any	≥3 episodes	
Headache		Severe		Worsening
Acting abnormally to parents	Any			
Amnesia			>5 min	
Seizure			Any	
Concern for NAT			Any	
Severe mechanism ^a	Any	Any	Any	Any
Physical Exam Variables				
Abnormal mental status	Any	Any	Drowsy	Irritable
Skull fracture	Any	Basilar	Penetrating, Depressed, or Basilar	Open, Depressed, or Basilar
GCS Score	<15	<15	≤14 ^b	<15 at 2 hours
Neurologic deficit			Any	
Scalp hematoma	Non-frontal		>5 cm if <1 year ^c	Large, Boggy

Chapter 4: Trauma

- Concussion
 - o Biomechanical forces > Neuropsychiatry deficit
 - Clinically diagnosed, no need for CT
 - o Sx: Altered LoC, Amnesia, Confusion
 - NO Neuro lateralization/Focality signs which present w/ Subdural/Epidural/Intracerebral
 - o Tx: Generally Supportive
 - o Concussion Grades (Not anymore used):

Concussion grading scale	Grade 1 (Mild TBI)	Grade 2 (Mod TBI)	Grade 3 (Sev TBI)
Post Trauma Amnesia	< 24hr	24hr-7days	>7 days
LoC	0-30min	30-24hr	>24hr
Imaging	Normal	Minor findings	Significant findings
Symptoms	Headache, Dizzy, Nausea Headaches Dizziness Nausea Memory loss Difficulty focusing Sensitivity to light or noise Mild confusion Fatigue Irritability Sleep disturbances	Amnesia + Slurred speech Ringing in the ears (tinnitus) Momentary amnesia More pronounced irritability Loss of balance or coordination Slurred speech Longer-lasting memory problems Moderate confusion Longer-lasting fatigue Difficulty with complex tasks	Difficult focus + Loss of coordination & motor skills Amnesia lasting 24 hours or more Visual disturbances (seeing stars or double vision) Frequent vomiting Severe headache Profound confusion Prolonged fatigue Inability to stay awake or arousable

- SCAT (Sideline Concussion Assessment Tool) Red Flags:
 - o SZ, LoC, Deteriorating consciousness
 - o Severe/increasing Headache, Double Vision, Neck pain/Tenderness, Vomiting
 - o Weak/Tingling UL or LL, Increase restless/agitation/combativeness

PEM R | 12 Y/O girl persistent headache/nausea/dizziness, after earlier today collision head to head w/ another player, initially saw bright lights but didn't lose consciousness, had once vomit, slow to answer, also balance difficulty w/ tandem heel-toe walk, otherwise neuro normal, Next = Ondansetron & Acetaminophen in ED (Not Administer the Sport Concussion Assessment Tool Version 5 -SCAT 5- in the ED nor Provide clearance to return to basketball after 24 hours of physical rest nor Refer for outpatient MRI prior to sports clearance)

Promo | Post Concussion return to play, he is stable = after NSx clearance by 3 days-2weeks (Not After Asymptomatic by 8 weeks nor Coach clearance by one week)

Promo | 12 Y/O boy presented after MVA, was on Backboard/C-Collar, feeling drowsy, **Slurred speech**, GCS 14/15, what do you think = Mild concussion (Not Epidural hematoma nor Subdural Hematoma nor Bridging veins Hemorrhage)

Amal | 13 Y/O MVA, restrained, he is immobilized, ABC stable on C-Collar, **Slurred speech**, GCS 14, somewhat **confused**, doesn't recall a head trauma, most likely cause of these findings = Minor concussion (Not Epidural hematoma nor intracerebral hemorrhage nor Subdural hematoma)

Amal | 6 Y/O girl fell from first floor window presented to ED with the following Vitals :T:37.2 HR:110 BP:85/58 SpO2:98% ,ABC stable Which of the following is not indication for brain CT = LoC Initially (Not Confusion or Vomit after 4hr)

- o Initial LoC most of it due to breath holding
- o Vomiting especially later after trauma more sensitive for serious injuries

Amal | (for above Q) Patient started to have significant noisy breathing and less reactive, Next step = Assess patency of airway

Amal | (for above Q) CT brain normal then discharge with diagnosis of grade 3 concussion, upon follow up he is having poor performance at school most likely explained by = Neuropsychiatry deficit

Amal | 3 Y/O head trauma CT normal, d/c as grade 3 concussion, F/U having poor performance at school, cause = Neuropsychiatry deficit (due to concussion)

Final | Scenario of the patient present after trauma now he is doing well, apart from GCS 14/15 & **slurred speech** what do you think = Mild concussion (Not Epidural hematoma nor Subdural hematoma)

Final | Brain concussion = (if Q about return to play then answer is: after NSx clearance by 3 days-2weeks, Not After Asymptomatic by 8 weeks nor Coach clearance by one week)

Chapter 4: Trauma

Major Brain Trauma

- **ciTBI (Clinically important Traumatic Brain Injury)**
 - **CPP = MAP - ICP**
 - Intracranial Pressure
 - Keep < 20
 - Cerebral Perfusion Pressure (CPP)
 - Keep 40-50 (< 5 Y/O)
 - Keep > 50 (5-17 Y/O)
 - Keep 60-70 (Adult)
 - High ICP Sx:
 - Decrease in GCS more than 2 from baseline
 - New loss of pupil reactivity
 - New focal motor deficit
 - Cushing's triad: Hypertension (Wide Pulse Pressure), Bradycardia, Irregular breathing
 - Tx: IF Sx of High ICP (without ICP monitoring) or ICP >20 mmHg for >5 min or Rapidly rising ICP:
 - EVD inserted: Drain CSF from EVD for 2-5 minutes then assess ICP
 - Intubated: Sedate by bolus sedation, analgesia, and muscle relaxant (do not allow moving/ coughing)
 - Not Intubated: RSI > Intubate
 - Hyperventilation temporarily to PaCO₂ 30-35
 - Start hyperosmolar therapy:
 - NaCl 3% 5-10 ml/kg over 5-10 mins Q2-6h PRN (Hold if serum osmolality >360 mmol/L)
 - Mannitol 0.5-1 g/kg over 20 minutes Q2-6h PRN (Hold if Serum osmolality >320 mmol/L)
 - Be cautious with Diuretic effect and hypovolemia
 - Insert Urine Catheter For I/O Balance

PEM R | 6 Y/O boy, previously healthy, has Acute Headache/Altered mental state, within minutes having diffuse headache, drowsy, slurring words, upon ED arrival having withdrawn to painful stimuli, Rt pupil 7 and non-reactive Lt 3mm, Sluggish reactive, HR 70 BP 130/90 RR 12 irregular, Next step = Perform RSI

- 1st ABCDE = RSI > Elevate 30 degree > Hypertonic/Mannitol

PEM R | 15 Y/O fall from roof of house on Lt side of head, during 1hr ago, had LoC for 10-15 min, Temp 37.4 HR 80 RR 16 BP 125/90 SpO₂ 98%, Answering Qs, having headache only, went for CT brain (shows Epidural hematoma), now difficult to arouse, after RSI, Next = Elevate head of bed 30 degree

PEM R | 11 Y/O boy, 2hr after falling off 3 meter tree, GCS 5 Temp 37 HR 38 BP 178/110 RR 10, SpO₂ 89%, has 7cm swell over Rt. Parietal scalp, Rt. Pupil 5mm Lt Pupil 3mm, while preparing to intubate, you also prepare = IV Mannitol

PEM R | 16 Y/O Boy EMS brought him unrestrained front passenger, had LoC in scene, HR 150 RR 12 BP 110/70 SpO₂ 100%, CT Shows (Epidural hematoma) after CT more progressive difficult to arouse = Give IV Levetiracetam 60 mg/kg (Not Administer IV dexamethasone after intubation scan nor initiate active cooling with core body temperature 34-35 °C nor Hyperventilate with goal PaCO₂ 15-20 mmHg after intubation)

Challenger | 18 Y/O boy dropped in ED entrance w/ gunshot wound to head, multiple entrance wounds in fronto-parietal scalp, & multiple old scars on chest wall & arm that appear to be the result of penetrating trauma, has multiple gang-related tattoos. His GCS is currently 9. You intubate him, maintaining C-Spine, CT (shows multiple bullet fragments and loss of gray-white differentiation resulting from diffuse cerebral edema), while in CT pt worsening, what new findings likely seen = Bradycardia (Not Reactive pupil nor Hypotension nor Loss bowel/bladder control nor Increased respiratory drive)

Promo | 23 M/O sudden unsteady gait, Early morning headache, projectile vomit, in EMS RR 50, explanation of Tachypnea = High ICP (due to space occupying lesion, Not dehydration nor Ax w/ Viral illness nor Anxiety)

Promo | 3 Y/O Victim of MVA w/ Head Trauma, BP 94/60 HR 120 RR 32 SpO₂ 95% RA, which more associated w/ High ICP = 6th CN Palsy (Not Raccoon eye nor Pulsatile Anterior fontanelle)

- ICP/IIH/Meningitis > 6th CN Palsy = Lateral Recti Affected

Chapter 4: Trauma

Promo | In Traumatic Brain injury, what type of Autonomic dysfunction = Low HR (Not High BP nor Low BP nor Low Temp)

- Similar to MD Challenger Q above
- If asking about Impending herniation = Bradycardia
- If asking about Cushing triad unsure but previous Promo answer was High BP

Promo | Trauma w/ High ICP what high risk for 2nd injury = Hypotension (Not Hypoxia nor Hyperthermia nor Hypothermia)

Promo | Case of Trauma w/ High ICP, why to Tx = To prevent Herniation

Promo | Head injury, you contacted NSx, they will ask for what kind of Radiology request = CT w/o Contrast

Amal | Which of the following will induce **Cerebral vasoconstriction** = **Hypocapnia**, hyperoxia (Not Hypocapnia Hypoxia)

Amal | Regarding TBI with cerebral edema, **hypercarbia** should be avoided because = Developing **Cerebral vasodilation**

- Cerebral **Vasoconstriction** = **Hypocapnia**, Hyperoxia
- Cerebral **Vasodilation** = **Hypercapnia**, Hypoxia

Amal | 6 M/O boy, head trauma, irritability, HR 132 RR 35 BP 91/63 Temp normal SpO2 94% on Room air, What features on his Ex will raise concern of Intracranial Hypertension = 6th Nerve Palsy (Not JVD or Fontanelle pulsation or Raccoon eyes)

Amal | Which formula is correctly regarding CNS physiology = CPP=MAP-ICP

Amal | Which of the following is most urgent step in initial management of head injury = Airway protection and management

Amal | 13 Y/O is transported by the EMS after a diving is unresponsive with dilated pupils bilaterally, and he's actually an end tidal co2 connected is what is the optimal end tidal CO2 for this boy. While waiting CT = 30 (Not 20 nor 40 nor 50)

Final | case of post diving injury, came to ER unresponsive with bilateral dilated pupils, intubated, what is the initial end tidal Co2 while doing CT brain = 30 or 35 (Not 20 nor 15 nor 40)

- Fleisher 30-35 | Current recommendation 35-40

Final | Most urgent step in initial management of head injury = Airway protection and management

Final | Trauma w/ Low GCS & Resp depression, 2ndry to = Head injury

Final | Case of trauma w/ Low GCS what causes Tachypnea = Neurological injury

- 6th CN palsy = High ICP
- 3rd CN compression = Uncal herniation = ipsilateral dilated pupils
- 2nd CN traumatic neuropathy = Afferent neuropathy

Brain Herniation

- | | | |
|---|-----------------------|--|
| - Subfalcine = Midline Falx Cerebri | Common Peds Focal Tr. | Uni Motor Deficit LL + Bladder incontinence + Speech issue |
| - Central = Temporal > Tentorium | Lethal | Bi Dilated Pupils + Downward gaze |
| - Uncal = Supratentorial > Infratentorial | BS>MB>CNIII | Ipsi Dilated Pupil + Contra Hemiparesis |
| - Foramen Magnum = Pos. fossa > FM | SC/BS/M | Early LoC + Late RF/Flaccid Paralysis |

SC = Spinal Cord, M = Medulla, MB = Midbrain, BS = Brainstem, Tr = Trauma

Ipsilateral, Contralateral, Unilateral, Bilateral

Promo | After MVA child has dilated Rt. Eye, common with which herniation = Transtentorial (same side, Uncal > 3rd N. palsy)

Promo | Rt. Sided uncal herniation will cause = Rt. Non-reactive pupil w/ Lt. Hemiparesis

Promo | 4 Y/O victim of MVA w/ Severe Head Trauma, initial GCS 3, Signs of Uncal herniation you will find = Ipsilateral pupil dilatation (Not Ipsilateral pupil constriction or Ipsilateral weakness or Contralateral pupil dilatation)

Promo | Multiple trauma boy w/ unequal pupils & irregular breath, cause = 3rd N. Palsy due to Uncal Herniation (Not Direct Optic N. Injury or 6th N. Palsy)

Amal | Patient with Right sided epidural hematoma with **tentorial** herniation will have = Ipsilateral dilated pupil

Amal | known case of brain tumor presented with altered mental status, which of the following finding indicated Uncal herniation = Ipsilateral pupils' dilatation

Chapter 4: Trauma

Amal | 9 Y/O old, trauma, after 1 hour c/o headache and unresponsive, HR 60, RR 16, BP 170/110. Extremity extended with decreased tone, **pupils unequal gaze with limitation to left**. Most likely Dx = Uncal herniation (Not Diffuse axonal injury or Subarachnoid hemorrhage or Subdural hematoma)

Amal | 10 Y/O child, struck on forehead, GCS 3, large hematoma on head, after securing airway, exam revealed **unilateral dilated pupil that doesn't react to light**. What the cause of this finding = 3rd cranial compression due to uncal herniation (Not Carotid sheath injury with sympathetic nerve injury nor direct ocular trauma with optic nerve injury nor 6th cranial nerve injury)

Final | Child after MVA with rt eye dilated what is common herniation = Transtentorial

- Uncal = Transtentorial = Pupils dilated same side, cause 3rd nerve palsy

Final | MVA with left eye dilated pupil and collapse what is the Dx = Uncal herniation

Final | Rt. Sided Uncal herniation causes = Rt. Non-reactive pupil w/ Lt. Hemiparesis

Final | Boy multiple trauma his pupils not equal, Irregular breathing. What is the cause of unequal pupils = 3rd nerve palsy due to Uncal herniation (6th nerve palsy (Cushing early sign, cant look laterally))

Cranial bleeds

- Epidural = Middle Meningeal artery | Convex | SZ + LoC/Lucid Interval Tx: Immediate evacuation
- Subdural = Bridging veins | Crescentic | SZ + Lethargy Tx: Observe/NSx
- Subarachnoid = Artery Aneurysm | Curvilinear | SZ + Headache + Photophobia + Focal/Global Neuro Defect, Tx: Observe/NSx

PEM R | 9 Y/O girl skateboarding without helmet, 2 min LoC, woken up w/ slowed response, but answering Qs, headache x3 vomits, becoming more somnolent & intubated, Dx = Epidural hematoma (Lucid interval)

Amal | Which of the following is a correct statement regarding epidural hematoma = Usually, the middle meningeal artery lead is the commonest (Epidural E=M = MCA | Subdural has highest mortality)

Amal | 6 Y/O boy presented with stupor, he is afebrile, respond to deep painful stimuli, vitals: T:37.2 HR:125 BP:100/58 pupils midsize and reactive what's of the following least likely to cause his alter mental status = Pontine bleed (Not Hypoglycemia nor Intoxication nor Post ictal status)

- Hypoglycemia, Intoxication, Post-ictal
- Pontine bleed (pinpoint pupil) might present with unequal pupil

Final | Case scenario about epidural hematoma = RSI

Final | Regarding previous scenario what is the diagnosis = Epidural hematoma

Final | Lucid period 2hr later w/ Brain herniation = Epidural hematoma

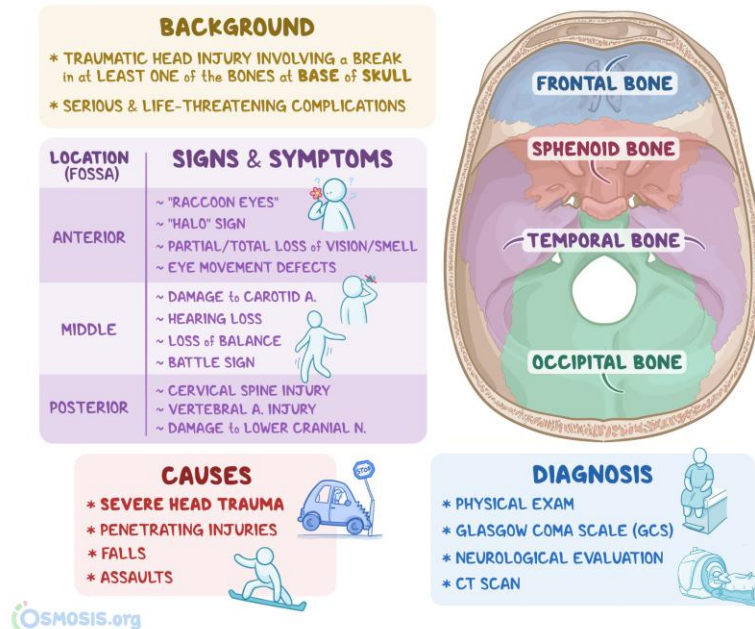
Skull Trauma

Skull Fractures

- Skull fractures types:
 - Linear = Most common
 - Diastatic = skull fracture across suture line
 - Depressed = inner table of skull displaced more than thickness of entire bone
 - Compound = Fr. communicating w/ laceration
 - Comminuted
 - Basilar skull = Fr. of anterior skull base causing Dural laceration & CSF leak

Chapter 4: Trauma

- Skull fractures that need NSx:
 - o Complicated Basilar
 - o Open skull
 - o Fracture w/ Intracranial injury
 - o Will not heal due to Dural injury (Diastatic $\geq 3\text{mm}$, Burst, Depressed $\geq 1\text{cm}$)



- Basilar Skull Fracture
 - o Definition: Fracture involving skull base bones with risk of CSF leak, cranial nerve injury, or sinus involvement
 - o Most common fracture is Petrous portion of Temporal bone
 - o Sx: Battle sign, Raccoon eyes, Hemotympanum, CSF otorrhea/rhinorrhea
 - o Location specific findings
 - Frontal = Raccoon eye, Halo sign, Partial/Total Vision/Smell loss, Eye movement defect
 - Sphenoid/Temporal = Battle Sign, Otorrhea, Carotid A. Damage, Hearing loss, Balance loss
 - Occipital = Cervical/Vertebral spine injury, CN Injury
 - o Complications:
 - Meningitis (Low risk but becomes High risk if CSF leak persists after 7 days)
 - Post Traumatic Seizure (High risk w/ depressed skull fracture)
 - Hearing Loss (Conductive or SNHL 50% High risk if Temporal skull fracture)
 - Anosmia (CN I injury)
 - Facial nerve palsy (CN VII)
 - Abducens nerve palsy (CN VI > lateral rectus dysfunction)
 - o Invx: CT Brain
 - o Tx: Analgesia (Acetaminophen)
 - No Prophylactic Abx, Start Abx only if CSF leak persist > 7 days (High risk for meningitis)

PEM R | 8 Y/O, girl kicked by horse & fell headfirst into wooden fence, not wearing helmet, had LoC, now walking, complains of headache & Nausea, 4cm boggy to Rt. Temporal bone, CT (shows Temporal Fr.), Risk of developing = Hearing loss (SNHL)

PEM R | 10 Y/O boy, complaining pain to head & trouble hearing on Rt. Ear, 2 days ago hit curb while riding bicycle, No LoC but dazed for 10 min, vitally stable, swell/abrasion/ecchymosis of Rt. Ear, clear fluid comes from ear canal obscuring tympanic membrane, Dx = Basilar skull fracture (Petrous portion of temporal bone fracture most common)

Promo | All signs of Temporal basal skull Fr. Except = Rhinorrhea (Not Otorrhea nor Battle sign nor Hemotympanum)

Promo | Child w/ trauma to Rt. Side of face & ecchymosis around ear & fluid coming out from ear, Risk for = Meningitis (if hearing loss then it is the answer)

Chapter 4: Trauma

Amal | 10 Y/O, MVA not wearing helmet, brief LOC, now alert and answering appropriately, complaining of nausea and unable to hear from left ear, multiple abrasion, 6cm laceration on his forehead, **blood drainage from left ear**, his mid face stable in palpation, oculomotor function normal. Of the following his clinical presentation most consistent with = Temporal bone fracture (Not Diffuse axonal injury nor Orbital floor fracture nor Subdural hematoma)

Amal | What statement is correct, About pediatric head trauma = Seizures occur 20 minutes after the insult or 10 greater possibilities of internal injury and further seizures (Not Impacts seizures that occur within an insult are usually associated with intracranial parenchymal injury. Nor Sutures provide probability to the pediatric skull, which protects both the skull and the brain parenchyma from injury. Nor Pediatric brain is really myelinated even during period of rapid change & growth of brain)

- AED prophylaxis indication:
 - Late SZ in Trauma = > 20min
 - Highest risk of future SZ
 - Temporal lobe injuries are highest risk for future SZ
 - Schools of starting AED: Wait till 2nd SZ or Start with 1st SZ

Final | Case of Basal skull fracture with headache, about Tx in first 7 days = Acetaminophen PO (Not PO Abx nor IV Ceftra)

Final | Basilar skull fracture, Next = Ceftriaxone IV

- Risk factors
 - IF Depressed skull Fr = Post-Traumatic Seizure
 - IF CSF leak after 7 days = Meningitis risk

Final | Scenario trauma clear fluid from ear = Basilar skull fracture

Final | Child has trauma to his rt side of face with ecchymosis around the ears & fluid coming out from it, pt risk for = Meningitis (if hearing loss then it is the answer)

Final | Ex consistent basal skull Fr = Hemotympanum

Final25 | Pt. came due to ear pain & decreased hearing after falling yesterday while riding a bike & hit his head when he fell, in ER his Ex shows redness (ecchymosis) behind right ear w/ clear discharge but tympanic membrane normal, has = Basal skull fracture (Not Parietal fracture)

Final25 | scenario about basal skull fracture asked about what next = Oral paracetamol (Not Abx for 5 days)

- Growing skull Fr (Leptomeningeal cyst)
 - Post Skull Fr. Complication in under 3 Y/O (< 1 Y/O)
 - Path: Dural or Vascular injury w/ Skull fracture > Enlarging leptomeningeal cyst > Cranio-cerebral erosion enlarging skull defect or Neuro deterioration
 - Tx: NSx (Early Repair of Dura & Fr. Fragments)

PEM R | 10 M/O boy, has scalp swelling developed over 3 days, Hx of 6 weeks ago fell on stairs & diagnosed w/ Rt. Linear parietal skull fracture, pt alert & well, Next = NSx consult for procedural intervention

Facial Bone Fractures

- LeFort Fracture
 - In Short
 - 1 = Superior Maxilla
 - 2 = Pyramid Sinus
 - 3 = Orbital rim (Zygomatic arch)
- LeFort I = Superior Maxilla | Horizontal across Maxilla (Alveolar ridge) separate Pterygoid plate = Floating Palate
- LeFort II = Nose/Sinus | Pyramidal Nasal-Orbital-Ethmoid (Nasofrontal suture) | Open book, ciTBI | Tx: NSx/Ophtha/ENT
- LeFort III = Orbital | Transverse across Orbital (Complete Separation Craniofacial dislocation) = Nasal > Zygotoc arch

Chapter 4: Trauma

PEM R | 10 Y/O, GCS 8 facial trauma after flipping over go-cart & landing on head & face, Nasal swell & Epistaxis w/ Flat nasal dorsum & increased inner canthal distance along nasal bridge, You perform RSI protect airway given patient's facial trauma & GCS, CT Head/Facial bones/C-spine, CXR/Pelvis XR, FAST all negative, Dx/Consult based on Ex = Clinically significant TBI, LeFort Type II Fr. (she will likely need NSx, Optha, ENT)

PEM R | 16 Y/O boy, EMS MVA on Bag mask ventilation, C-collar & backboard, IV access, BP 100/50 HR 140 RR 5 shallow irregular SpO2 100%, GCS 5, blood/clear drain from bilateral nares, upper teeth moves as a unit, emergent intubation needed, appropriate management = AVOID NGT

Promo | Facial Trauma having Erythema & pain over Rt. Cheek & nose CT showing Displaced comminuted Fr. Of Zygomatic & Ethmoidal bone, Next = Urgent ENT Consult (Not Start Abx)

Promo x2 | 10 Y/O MVA, CT head shows Fr. of Maxillary sinus & floor of Nasal bone of Rt. Side, Complete Lt. Side separated Facial skeleton from the rest of Cranium & Fr. Line passing through Nasofrontal Suture/Maxilla-Frontal Suture/Orbital wall/Zygotic arch, Dx = LeFort I on Rt. side w/ LeFort III on Lt. Side (Not LF 1 Lt. & LF 3 Rt. nor LeFort I or LeFort III)

- LF 3 = Nasal > Zygomatic arch (across Orbital) & LF 1 = Maxilla > Nasal floor (across Maxilla)

Amal | 12 Y/O boy thrown from car, obvious mid facial injury, CT showed Basilar skull fracture, fracture of lower third of his maxilla and cricoid palate on the right, complete separation facial bone from cranium on left, according to Le fort classification he = Type 1 right, 3 left

Final25 | Trauma patient with midface injury where central part of face separates from skull base, involving nasal bones, maxilla, orbital rim, and upper jaw freely moved as a unit, having clear nasal discharge, what is fracture type = Lefort 3 (Not Lefort 1 nor Lefort 2 nor Zygomaticomaxillary Complex fracture)

- Orbital floor: Diplopia (especially upward gaze), enophthalmos (**sunken eye**), infraorbital numbness (cheek/nose/upper teeth)
- NOE: Telecanthus (**skunk eyes**), enophthalmos, loss of anterior nasal projection (Straight nose), CSF Rhinorrhea/Epistaxis
- LeFort II: Pyramidal midface Fr., Midface/Nasal bridge mobility, infraorbital numbness (V2), step-off at infraorbital rim

- NOE Fr.

- Nasal-Orbito-Ethmoid Fr. By High-Impact force to Nose transmitted posteriorly to Ethmoid bone
- Sx: Flattened nose w/ lose of Anterior projection on lateral face view, Increased inner canthal distance
- Ax: Telecanthus (due to medial canthal tendon injury > Sunken eye), Nasolacrimal duct disruption > Epiphora
 - Enophthalmos (reduced Intra-orbital volume), CSF Rhinorrhea/Epistaxis
 - Loss of anterior nasal projection (Flat Nasal bridge/Straight nose)

PEM R | 11 Y/O girl hit face by foul ball in basketball 2 days ago which was seen w/ normal facial radiograph, but now has pain/trouble smell, has swell/tenderness on bridge of nose, has nasal turbinates moderate edema but no septal hematoma, has clear fluid drainage from Rt. Naris, next = CT Facial bones

- CSF Rhinorrhea, w/ Naso-ethmoid fracture
- CSF Rhinorrhea can be tested for Glucose or B2 Transferrin (to make sure it is CSF, halo sign is less specific)

Challenger | 7 Y/O fell on face onto edge of concrete steps on Ex has swelling over nasal bridge and Telecanthus, CSF rhinorrhea, epistaxis, concerned that = Naso-orbito-ethmoid fracture (Not Superior orbital Fr. nor Inferior orbital Fr. nor Le-Fort 1)

Challenger | 17 Y/O male in ED hit face with baseball, no LoC, has Enophthalmos on Rt., Contusion over Rt. Cheekbone w/ Malocclusion, visual acuity normal & extraocular movement intact, **Nose is straight** w/ moderate swell to bridge no crepitus or septal hematoma, parent voice concern about extensive radiation, studies should be ordered = CT of the Facial bones (Not CT Orbits nor US Orbits nor XR of nasal bones nor XR of face w/ Water's view)

Promo | Child in playground hit his face w/ a swing, having Sunken eye, Epistaxis, Type of Fr. = NOE (Not Blowout nor LeFort)

Final | Scenario of child was playing in the playground and hit his face with the swing, having sunken eye and epistaxis, what type of fracture he has = Naso Ethmoid Orbital fracture (Not Blow out fracture orbital floor nor medial wall fracture)

Final | Scenario of child was playing in the playground and hit his face with the swing, having sunken eyes, **straight nose** & epistaxis, What to order = CT Facial bone (Not CT orbit nor CT brain)

- If NOE = CT Facial Bone | If Orbital floor fracture = CT Orbit

Chapter 4: Trauma

- Other Facial Fractures

PEM R | 17 Y/O hit in face w/ baseball bat, No LoC, has Enophthalmos on Rt., contusion over Rt. Cheekbone w/ malocclusion, Visual acuity normal, Extraocular muscle intact, but has moderate swell to nasal bridge but no crepitus or septal hematoma, family voice concern about excessive radiation, Study to do = CT Facial bone

- Zygomaticomaxillary Complex (ZMC) Fracture
- Enophthalmos & Malocclusion = Depressed fracture
- CT orbit may miss associated injuries, Do CT Facial

- Orbital Floor Fracture (Blowout Fracture)

- Path: Round object Trauma > Pushes globe posterior/inferior > Orbital Floor Fr. w/ intact inferior orbital rim
- Types:
 - Inferior wall (most common) = Inferior Recti M. (Affect Upward gaze) | Infra-Orbital N. (Numbness of Ipsi. Lips/Nose/Lower Lid)
 - Medial wall = Medial Recti M. (Affect Lateral gaze. Diplopia, Enophthalmos)
 - Lateral wall (less common)
- Sx: Sunken eye (Enophthalmos), Proptosis, Orbital dystopia (horizontal asymmetry of eyes), N/V, SC Emphysema, Step-off on rim, Infraorbital N. Affected (Decrease sens. Of Ipsi. Cheek/Upper lip/upper gingiva),
- Invx: CT Orbit, Teardrop sign
- Tx: Optha Consult, Nasal decongestant, Abx, F/U

- Complication: **Trapdoor Fr.** (Inferior Recti Muscle Entrapment, In children)

- Path: Recti Muscle entrapment > Ischemia > Fibrosis (irreversible)
- Sx: Limited upward gaze, Diplopia
- Tx: Urgent operative repair (within 24-48hr)

- Complication: **Retrobulbar Hematoma**

- Path: space-occupying blood collecting within orbit > Displacement/pressure on structures
- Sx: Decrease Vision (due to compression on Optic N.)
- Complication: Ocular compartment syndrome (clinical diagnosis)
- Tx: Emergent Lateral Canthotomy within 2hr (Cantholysis, don't delay management for imaging)
 - Indications: IOP > 40 mmHg, Decrease Visual acuity, Proptosis
 - 2ndry indications: Afferent pupillary defect, Cherry red macula, Ophthalmoplegia, Eye pain
 - Contraindications: Globe rupture
 - Indicator of decompression: IOP & Sx improvement, Release of Retrobulbar blood

- Complication: **Orbital Compartment Syndrome**

- Tx: Emergent Optha Consult
 - Elevate head 30 degrees, prevent sudden increase of IOP (coughing, vomiting, straining)
 - Analgesia, correction of any suspected coagulopathy (like hemophilia)
 - BP management (HTN worsen hemorrhage)

PEM R | 11 Y/O hit in face by baseball practice, No LoC, Rt. Facial swell/ecchymosis/tenderness along inferior orbital rim, pupil round/equal/reactive, clear anterior chamber/sclera, Vision 20/20 but difficult upward gaze, CT (Orbital floor teardrop fracture = blowout) definitive = Urgent operative repair

- Blowout fracture > Inferior orbital rim swell > Entrapment of inferior orbital muscle
- Retrobulbar hematoma Sx: Decrease visual acuity (due to entrapped optic nerve)

PEM R | 18 Y/O struck on Lt eye by elbow, now pain/double vision when gazes upward, has diffuse Lt Periorbital tenderness & swell, when asked to look up her Lt eye remain still, CT (Blowout fracture), Ax Sx = Hyposthesia of Lt cheek

- Orbital floor fracture > entrapment of orbital floor N. > Hyposthesia of Lt cheek & Limited upward gaze

PEM R | 12 Y/O Rt. Eye pain after hit by baseball, having pain & Diplopia w/ pain on palpation to orbital rim w/ decreased sensation over Rt. Cheek & limited upward gaze, No bleed in anterior chamber & pupil reactive, Next = Orbital CT

Chapter 4: Trauma

PEM R | Adolescent struck to Rt. Orbit no LoC, Pain to injured eye w/ unilateral vision loss & Ocular pressure IOP 49, intact globe, Next = Lateral Canthotomy & Cantholysis

Amal | 12 Y/O, was involved in a fight, bunched fence in the face, LOC briefly, presented with right periorbital ecchymosis, diplopia with upward gaze, ipsilateral infraorbital hypoesthesia most likely Dx = Right orbital floor fracture

Final | Case of eye trauma, floor orbit enophthalmos what is the next step = Release entrapment muscle

Final | 6 Y/O w/ eye Trauma, She has limited upward movement of her left eye, Picture What is the association = Left inferior rectus entrapment (Not Right orbital floor fx nor Left superior rectus muscle entrapment)

Final | Eye injury Sx of Orbital floor fracture, what will happen = Trapped inferior rectus

- Afferent Pupillary Defect (Marcus gunn pupil)

- Path: Unilateral or asymmetric afferent optic neuropathy
- Cause: Trauma, Tumor (Glioma in NF1), Genetic, demyelinating disease, Inflammation (Papillitis)
- Sx: Unequal perception of light between the two eyes
- Invx: Swinging flashlight test or Ishihara chart color vision test
- Tx: Referral to Optha (Don't use any medication on eye in ED)

Promo | 13 Y/O assaulted w/ unknown objects/kicks in Head/Face/Torso by 3, confused but able to cooperate questioning, ABC unremarkable, bruise Rt. Side of chest/Abrasion of Lt. hip, moving all limbs no deformities or swell, except bleeding from mouth & tender Lt. infraorbital area w/ Lt. lower eyelid swollen, Lt. pupil sluggish reaction to light w/ blurring of vision but able to count fingers no Proptosis & extra-ocular movements normal, You order Emergent CT Brain/Orbit, Next step = Test color vision w/ Ishihara chart (Not Perform Fluorescein staining nor Measure IOP nor Dilate eye Ex nor SCA screening test)

Amal | Patient with sustained afferent pupillary defect after blunt trauma to the orbit, suggests which of the following = Traumatic optic neuropathy (Not Blowout fracture or Rupture of cornea or iris or Lens dislocation)

- Traumatic Afferent N. = Optic nerve (2nd CN)
- Traumatic Efferent N. = Oculomotor (3rd CN)

- Simple Nasal bone fracture

- Ax: Epistaxis, Septal hematoma, Basilar skull fracture, Airway compromise
- Diagnose: Clinically, Imaging rarely needed, reserved for complex/midface fractures
- Tx: Manage Epistaxis
 - OPD ENT in 3 Days = For Reduction if Deviated (Ideally within 7 days)
 - Emergent ENT = IF Septal hematoma, CSF rhinorrhea, Airway compromise
 - Nasal Deviation = ENT F/U within 3 days (Ideally within 7 days)
 - Nasal Septal Hematoma = I&D
 - Nasal Compound fracture = Abx

PEM R | 10 Y/O struck on face w/ soccer ball, Epistaxis initially, now slow bleeding, No LoC, No tenderness to palpation of orbital wall/sinus, No septal hematoma, (image of deviated nose) Tx = Discharge w/ ENT OPD

PEM R | 8 Y/O girl, tripped and fell over stairs & struck nose, comes w/ moderate tenderness & swell of nasal bridge, no flattening but questionable mild deviation, has dry blood but otherwise unremarkable, breathing well, based on Ex Tx = D/C w/ ENT F/U

Amal | 9 Y/O punched through the face by his classmate brought to you by the teacher to the ED on exam significant nasal swelling, lateral deviation, palpable step, off which of the following should you do = Sent home with close follow up (Not Attempt to manual reduction once nor Immediate surgical consultation nor Obtain nasal pharyngeal radiology)

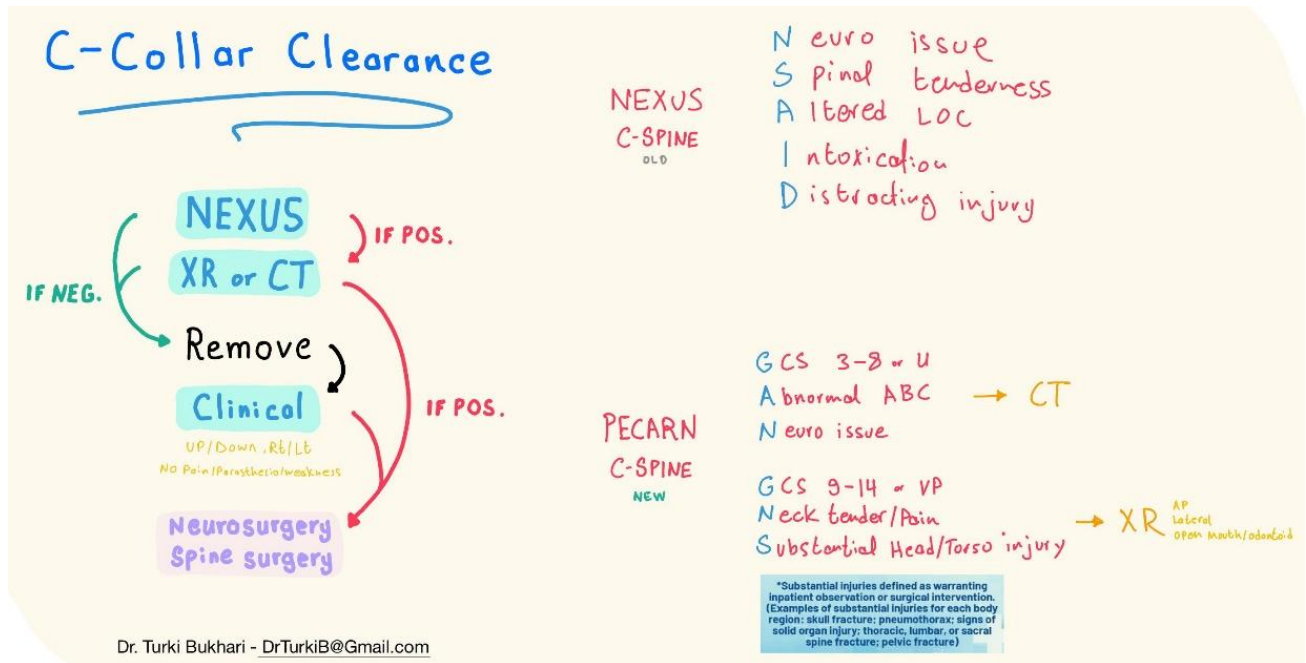
- ENT will not do surgery to remodel unless after 3-4 Months for the edema to go away

Chapter 4: Trauma

Neck & Spine Trauma

Neck Trauma

C-Collar



- C-Collar Clearance

- No C-Collar Clearance if patient Low GCS or Sedated
- NEXUS (NSAID)
 - Neuro deficit, Spinal tenderness, Altered LOC, Intoxication, Distracting injury
 - Approach:
 - POS. = CT or XR (Lateral/AP/Open-Mouth)
 - NEG. = Remove C-Collar > Do Clinical Ex
 - NEG. = Pass
 - POS. = NSx or Spine Surgery Consult
 - XR Lateral Spine Sens (< 8 Y/O = 73%) (> 8 Y/O = 93%) w/ AP & Odontoid Sens > 95% (Odontoid less Sens in < 8 Y/O)
- PECARN (GAN, GNS)
 - Indication of CT
 - GCS 3-8 or Unresponsive
 - Abnormal ABCDE
 - Neuro issue
 - Indication of XR (AP/Lateral/Open mouth/odontoid)
 - GCS 9-14 or Verbal or Pain
 - Neck Tenderness/Pain
 - Substantial Head/Torso injury

PEM R | 17 Y/O boy restrained front seat passenger in MVA airbag, in C-Collar & Backboard given fentanyl due to Rt. Shoulder pain, no neuro deficit, has mild tenderness/ecchymosis of Rt. Shoulder/Clavicular area, evaluation of potential C-spine injury = 3 view Cervical XR (Lateral, AP, Open-mouth)

Chapter 4: Trauma

PEM R | 14 Y/O diving into shallow pool, felt immediate neck pain, given ibuprofen & rest, No LoC/Numbness/Weakness, Ex tender spinous process of C3-C5, not able to turn neck without pain, Next = Place cervical collar & Spine precaution

- Complains of posterior neck pain & difficulty moving neck, CLEAR after further imaging
- NO NSAIDs, Anti-spasmodic before proper spine immobilization/evaluation > do Cervical Spine XR 3 view

PEM R | 9 Y/O fall 2nd story window, on C-Collar & Backboard, GCS 6 5cm Rt. Parietal scalp hematoma, in regards to cervical spine Tx = CT C-Spine & keep him in rigid padded C-Spine regardless of result (C-Collar removal need patient awake to assess)

Promo | 2 Y/O fell from 2nd floor, on Collar/Board, crying wants mother, Lateral Cervical Spine XR, Next = CT (Not AP & Open Mouth nor Reassess after calm nor remove collar)

Promo | 3 Y/O fell from 2nd story balcony, immobilized by board/collar, No LoC or Vomiting, Crying asking for mother, HR 110 RR 24 BP 95/70 SpO2 99% GCS 15/15 Pupils reactive Lung/Abdomen Normal, Pulses/Perfusion Normal, reports Ankle pain & Rt. Frontal headache, Ex Small Frontal scalp hematoma & diffuse Rt. Ankle/foot tenderness, XR ankle shows Fr., Test to likely reveal Ax injury = XR of Thoraco-Lumbar Spine (For C-Collar Clearance) or FAST or CT Brain or CT Abdomen & Pelvis

Promo | 10 Y/O board/collar after high speed MVA w/ significant passenger space intrusion, was restrained back seat, brief LoC, Ex child is Lucid, GCS 15/15, Painful deformed Ankle, no spine tenderness no focal deficits, XR Lateral Spine (bad image) appropriate next step in Cervical spine Tx = Obtain Cervical XR AP/TransOral to Clear Cervical spine if Normal or Obtain Cervical CT w/o contrast to Clear Cervical spine if Normal (3 XR Images needed to Clear C-Collar)

Promo | Child fell down 3 meters with no Neck pain, Fully awake responding to Q, came w/ C-Collar, Normal Ex GVS 15/15 no midline tenderness & you are planning on removal of C-Collar = Remove C-Collar & D/C (Not XR nor Keep C-Collar & Re-Ex 1hr)

Amal | 11 Y/O boy, injured in football game, unconscious in ED but has normal vitals, among following management steps what is the best initial step = Stabilize C-Spine (Not Mannitol nor Intubate and hyperventilate nor Obtain Head and neck CT)

Amal | 7 Y/O girl, bicycle accident, clinically stable. Hass midline tenderness in cervical area, how many lines used to evaluate adequacy of C-Spine Lateral XR = 4

Final | Post trauma with low GCS CT scan of spine normal = keep pt in cervical collar regardless the result

Final | Scenario of MVA GCS 8, intubated = CT and keep in cervical collar (NEXUS criteria)

Neck Soft Tissue Injury

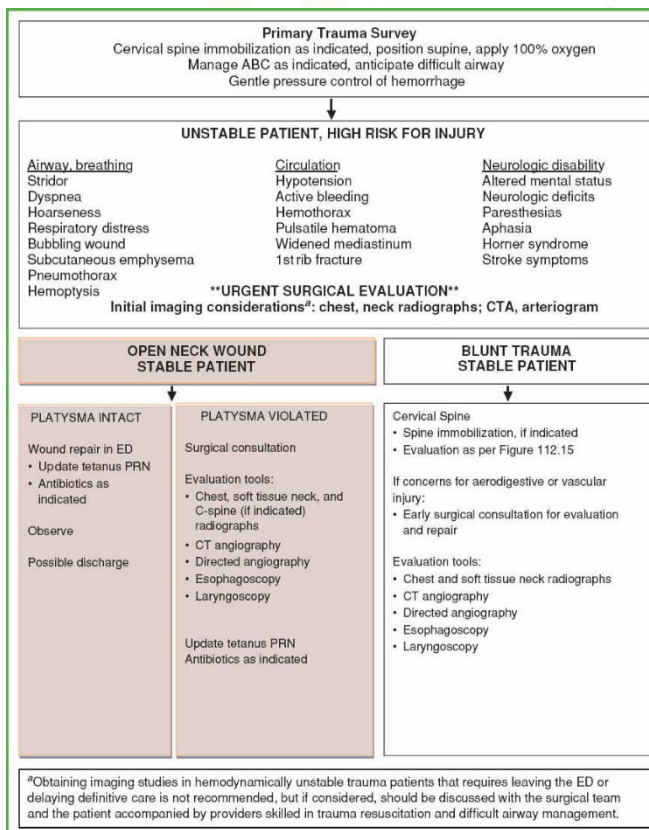


TABLE 112.4

INDICATIONS SUGGESTING SURGICAL EVALUATION IN PATIENTS WITH NECK TRAUMA

Unstable vital signs
Expanding or massive hematoma
Pulsatile or active bleeding
Hemorrhagic shock
Vascular deficits in the upper extremities
Abnormal distal pulses (brachial, superficial temporal, ophthalmologic, fundi)
Hematemesis, hemoptysis, epistaxis
Hemothorax
Progressive respiratory distress
Airway obstruction
Expanding subcutaneous emphysema
Bubbling or sucking wound
Pneumothorax
Progressive neurologic deficits
Hemiparesis
Horner syndrome
Cranial or cervical nerve dysfunction
Diaphragm paralysis
Decreased sensorium
Neurologic deficits in upper extremity
Increasing dysphagia
Odynophagia or dysphonia
Hoarseness
Severe neck pain or tenderness
High-velocity wounds (rifles, explosions)
Multiple low-velocity wounds
Ancillary radiographic studies not available
Experienced observation personnel not available

Chapter 4: Trauma

- Neck Soft Tissue injury
 - Peds neck injuries uncommon (Potentially life threatening due to # of vital structures)
 - Pediatric neck is protected by: Large head, Mandible, Neck muscles, Shoulders, Clavicle
 - Neck Anatomic Zones:
 - Zone I: Thoracic inlet to Cricoid (highest morbidity and mortality)
 - Zone II: Cricoid to Angle of Mandible (best prognosis, most accessible)
 - Zone III: Angle of Mandible to Base of Skull
 - Neck Hard signs:
 - Severe, uncontrolled hemorrhage
 - Refractory shock or hypotension
 - Large, expanding, or pulsatile hematoma
 - Bruit or thrill (new or patient < 40 years old)
 - Unilateral pulse deficit
 - Neurologic deficit consistent with stroke
 - Airway compromise or distress
 - Air bubbling through wound
 - Extensive subcutaneous emphysema
 - Stridor
 - Hoarse voice
 - Neck Soft signs:
 - Minor bleeding
 - Small, nonexpanding hematoma
 - Proximity wound
 - Mild hemoptysis
 - Mild hematemesis
 - Dysphonia
 - Dysphagia
 - Mild subcutaneous emphysema
 - Invx: CTA 100% Sens 93% Spec in detecting Vascular & Aerodigestive Neck injuries
 - Penetrating Neck Trauma Tx:
 - Platysma intact + HD Stable = ED Repair
 - Platysma Violated + HD Stable = Surgical Consult > Invx
 - Platysma Violated + HD Unstable = OR
 - Hard sign + HD Unstable = OR
 - Soft sign + HD Stable = CTA > Surgical Consult
 - AVOID removal of impaled objects

PEM R | 13 Y/O boy anterior neck pain for 2hr after striking anterior of neck on handlebar, difficult breath for 5 min after injury, voice now raspy, Vitally normal, has erythema/mild tenderness on palpation of neck without swell, No mucosal swell, no stridor, Next = Obtain Neck CT

PEM R | 17 Y/O boy, bipolar w/ acute neck pain after injury w/ nail, Neck XR (image of nail from sternal notch till just below mandible), Zone = I & II

PEM R | (for above Q) Team decides to get Lateral XR (Nail is Zone II), Next = CTA Neck & Consult ENT Emergent

PEM R | 15 Y/O Hockey player w/ hoarse voice & anterior neck pain after trauma, felt dizzy but No LoC, has abrasion/bruise in Anterior lower neck in Zone I, Next = AP CXR, CT Spine, Emergent ENT/Trauma Surgery

- Neck Zone I
- Ax injuries = Laryngeal injury, Hemothorax/Pneumothorax
- Invx: CXR (to r/o Hemothorax/Pneumothorax)

PEM R | 5 Y/O girl back seat passenger improper restrain without booster, ecchymosis overlying Lt lateral aspect of neck w/ small palpable hematoma but normal carotid pulse, Next step in evaluation for potential vascular injury of neck = CTA of Neck

Chapter 4: Trauma

PEM R | 11 Y/O sustained neck injury by cutting his neck while holding knife, HR 105 RR 22 BP 110/75 SpO2 98% on RA, has straight 3cm laceration on Anterior-Lateral neck 1cm superior to cricoid, laceration penetrates platysma & blood controlled by pressure, no bruit/thrill/palpable mass, No RD, true = Has Zone 2 injury requires surgical exploration (Not Zone 1 requires XR or His injury requires bronchoscopy in OR or Zone 3 require surgical exploration or Discharge home after laceration repaired)

PEM R | 5 Y/O MVA of back-seat improperly restrained, has ecchymosis on Lt. lateral aspect of neck w/ small palpable hematoma but normal carotid pulse, Next to evaluate potential vascular injury of neck = CTA of Neck

Promo | 11 Y/O sustained neck injury when he inadvertently cut his neck while holding knife, Temp 37 HR 105 RR 22 BP 110/75 SpO2 98%, 3cm laceration Anterior-Lateral neck 1cm superior to Cricoid Cartilage (Zone 2), Penetrates Platysma, Bleeding controlled by pressure, No Bruit/Thrills/Palpable mass on neck, Breath comfortable no RD, statement correct = Zone II Injury that requires Surgical Exploration or Zone I w/ CXR or Zone III w/ Surgical Exploration or D/C if Laceration repaired

Promo | 15 Y/O girl, fell off motorized scooter after hitting a bump on road then fell forward hitting front neck against handle bar, no RD, Tenderness at midline Zone 1 of Neck, No crepitus or Tracheal deviation, No Bruit, No difficult swallowing, mom noticed Hoarse voice, Management = CT Scan of Neck (Not Cervical AP/Lateral XR nor Doppler US of Neck)

Promo | Child involved in MVA, window glass in his neck, unstable, intubated, Next = OR (Not CT)

Promo | 12 Y/O school boy presenting w/ shotgun fragments in face/neck, on Ex conscious, alert, symmetrical smile, but has ptosis/miosis on Lt. side, wound involve mainly neck in Zone II, Next = CT Angiography

Amal | 10 Y/O boy, gunshot wound to neck just below the angle of mandible w/ surrounding hematoma **slowly** expanding, He is uncomfortable but able to talk and answer questions with good voice. HR 136 RR 24 BP 115/90 other exam unremarkable, next step in management = Angiography (Not OR for exploration nor US of Neck nor CT of neck)

- If Fast expanding hematoma = Hard sign
- Expanding hematoma is hard sign, if HD stable imaging study, unstable or fast expanding OR

Final | 11 Y/O neck cut in w/ knife, HR 105 RR 22 BP 110/75 SpO2 98% RA, 3cm anterior lateral & 1cm superior to Cricoid cartilage, penetrating platysma w/ bleeding controlled after applying pressure, no bruit/thrills/palpable mass, No RD, correct management = Zone 2 injury requires surgical exploration

Final | Hard sign of Neck injury = bruit on auscultation

- For patients who have "hard signs" of injury (cardiovascular shock, pulsatile bleeding or expanding hematoma, audible airway compromise, bubbling wound, extensive subcutaneous air, signs of intracerebral ischemia, hemiparesis, hematemesis), surgical evaluation and intervention will likely ensue.)

Final | Child involved in MVA window glass in his neck, unstable intubated what next = OR

Final | Pt w/ penetrating neck, intubation secured, what to do = Surgically remove in OR

Final x2 | Neck w/ Expanding pulsatile hematoma = Surgical exploration

Final | Case of neck trauma with laceration above cricoid cartilage & pulsatile hematoma, next step = Exploratory OR (Not CTA)

Final | Case of neck trauma above cricoid cartilage with pulsatile mass = Surgical exploration

Final25 | Patient with gunshot to the neck at the level above the thyroid cartilage area, with dysphonia and without bruit or hematoma, which zone affected = Zone 2 with affected carotid, larynx or esophagus (Not Zone 3 with affected. Nor Zone 1 with affected subclavian artery. Nor Zone 1 with affected -something not related to zone 1-)

Chapter 4: Trauma

Spine Trauma

Cervical Spine Fractures

- Atlanto-Axial Rotatory Subluxation

- Cause: Trauma or Viral Infection
- Types: AARS (Atlanta-Axial Rotatory Subluxation) C1-C2
- Differentiation:
 - **Rotatory Subluxation:** Chin points Toward SCM Spasm
 - Robin Position: Head tilt to one side w/ Rotation to Opposite side & flexing it
 - **Torticollis:** Chin points Away SCM Spasm
 - DDx: Retropharyngeal abscess, MSK pain
- Invx:
 - < 8 Y/O = CT
 - > 8 Y/O = Odontoid XR (1st, Lateral C1 mass forward + close to midline & opposite lateral mass narrow + away)
- Tx: Mild = Immobilization (Collar) + Ibuprofen
 - Severe = + Long Immobilization or Surgery

PEM R | 4 Y/O Rt. Neck pain & difficulty turning neck, has URTI for past several days, no trauma, on Ex contracted SCM on Rt., holding head in position of comfort pointing to Rt., No Neuro deficit, True = CT imaging if XR negative

PEM R | 7 Y/O Lt. Torticollis & Neck pain after falling outside without LoC or Vomit, acting like himself, given Paracetamol but no improvement, Hx of 2-3 day URTI w/ Fever, Head tilted to one side w/ rotation to opposite side & flexion (Robin position), hard to assess tenderness bcz complains of pain all over, No motor/sensory defect, Next = PO Ibuprofen & Cervical Spine CT

PEM R | 6 Y/O Rt. Side neck pain having mild cold now, otherwise normal, Ex Tilting head toward right side w/ chin pointing toward Rt. Shoulder, XR 3 view cervical spine normal, most appropriate next = Obtain CT of Cervical Spine

Promo | Child w/ Flu Sx & has Torticollis and Ataxia, Next = Brain Imaging (r/o Rotatory Sublux)

- If Torticollis always R/O 3 things retropharyngeal abscess, rotator y subluxation, muscle pain

Final | Girl w/ Neck turned to one side chin pointing toward similar side, XR C1 abnormal orientation over C2 = Rotatory Subluxation

Final | Chin toward same site, effect sleep, XR = Rotatory Subluxation

- Atlanto-Axial Subluxation

- Risk factors w/ Minor Trauma to Neck: Trisomy 21 (60%), Morquio, Ehler Danlos
- Sx: Spinal compression Sx, Agitation, Focal deficit
- Tx: C-Spine immobilization > Imaging > NSx

PEM R | 3 Y/O Trisomy 21 w/ neck pain, tripped & fell yesterday but today holding head midline & cries as she attempts to look down, fussier despite ibuprofen, Dx = Atlanto-axial subluxation

PEM R | 6 Y/O girl Down syndrome in ED agitated, mother report child threw her head back & started crying and wont stand up after, EMS placed Adult C-Collar & Backboard and brought her, now Screaming/uncooperative/kicking, 1st = change collar to appropriate size

Amal | 7 Y/O, Down Syndrome, increasingly having unstable gait and worsening, o/e brisk reflexes, 9 months ago she was seen with slight decreased tone, most likely cause = Subluxation of Atlantoaxial joint (Not Cerebellar medulloblastoma nor Chiari malformation 1 nor ALL with CNS involvement)

Final | Down syndrome jumps on Trampoline few days ago, Dx = Atlantoaxial Subluxation

Final | Down syndrome came w/ Upper limb rigidity, vomiting headache Tx = Cervical subluxation

Chapter 4: Trauma

- Pediatric Pseudosubluxation

- C2 protrusion which is Normal variant in children Young w/ Lateral XR mistaken for Hangman's Fr.
- Swischuk line: C2 to C3, assessing protrusion of C2 < 2 mm (Normal)

PEM R | 6 Y/O high MVA, restrained rear passenger w/ lap & shoulder belt, Now on long spine board & C-collar, alert, moving all limbs, normal sensory, Lateral C-spine XR (shows normal C-Spine) which is most helpful to assessing true pathology in the image shown = Evaluate line of Swischuk

Amal | Pseudosubluxation of cervical spine in pediatrics occurs at what level = 2-3

- Normal Cervical spine

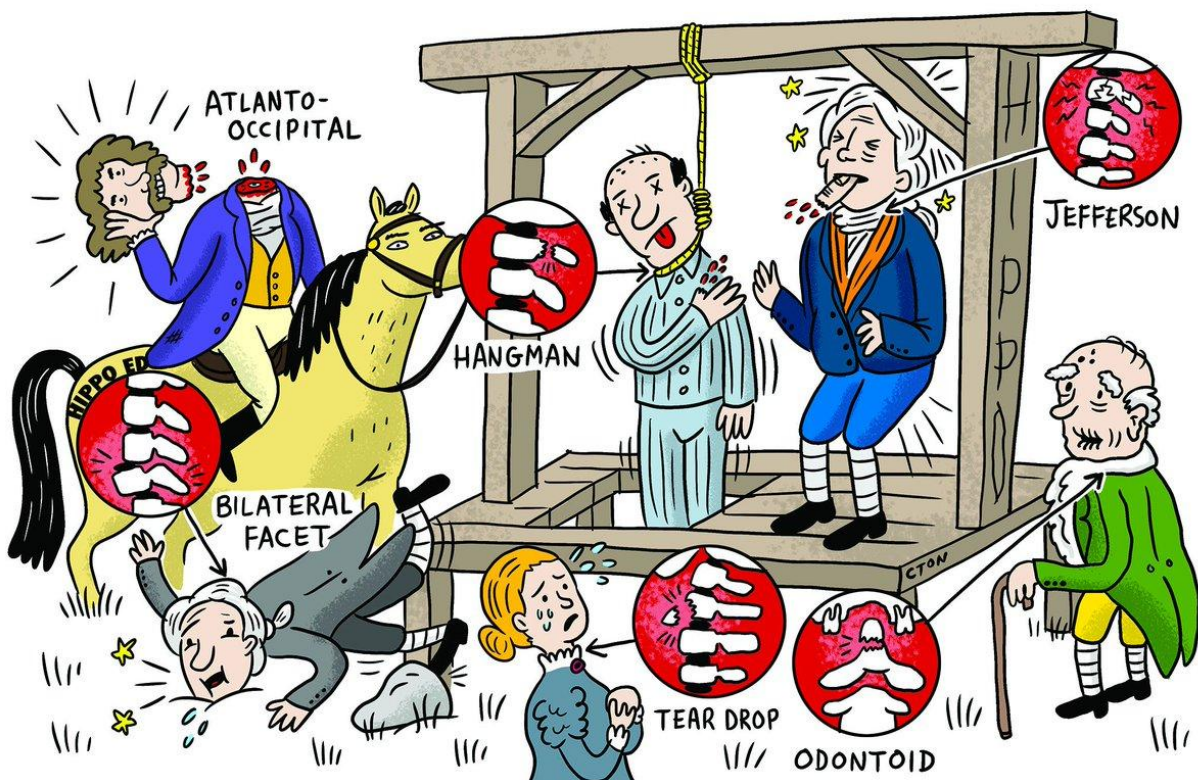
- Radiolucent odontoid synchondrosis: seen in C2 in less than 4 years and 50% in those < 10 Y/O

Amal | Which of the following is normal findings of normal pediatric cervical spine X-ray = Radiolucent odontoid synchondrosis (Not Rounded facet joints or Loss of lordosis or Posterior vertebral wedging or Perivertebral space of width of 21 mm)

- Unstable Spine Fracture = Jefferson Bit Off A Hangman Thumb = Tx: Emergent Spine surgery (to stabilize spine)

- Jefferson
- Bilateral cervical facet dislocation
- Odontoid Fracture (Types 2 & 3)
- Atlanto-occipital dislocation
- Hangman
- Teardrop fracture (Flexion type)

JEFFERSON BIT OFF A HANGMAN'S THUMB



Chapter 4: Trauma

- Cervical Spine Injury

- [C1] Jefferson = Axial Load (Diving) = Unstable
 - Cause: playing football or diving, Hx of Axial loading
 - Path: Burst fracture of C1 (most common cause), Avulsion of transverse ligament
 - Odontoid XR: Space between dense and C1
 - Tx: Collar (Conservative Immobilization) > Surgical
- [C2] Hangman = HyperExtension = Unstable
 - Cause: Neck hanging
 - Lateral XR: C2 displacement on C3
 - Tx: Collar/Halo or Surgical Fixation
- [C2] Odontoid = Ant. HyperFlexion or Pos. HyperExtension = Unstable
 - Odontoid XR:
 - Type 1: Dense tip (upper part)
 - Type 2: Dense base (half)
 - Type 3: Dense away from body
 - Tx: Observation or OP
- [Body] Bilateral facet dislocation = Unstable
 - Lateral XR: All body goes forward
- [Body] Flexion Teardrop = HyperFlexion = Unstable
 - Anterior displacement of a wedge-shaped fragment (teardrop), Ligamentous disruption
 - Caused by Hyperflexion
 - Sx: Quadriplegic, Apneic (C3-C4-C5 keeps the diaphragm alive)
 - Ax: Anterior Cord Syndrome
 - Lateral XR:
 - Anterior wedge fracture
 - Posterior subluxation of affected vertebral body
 - Widening of interspinous distance
 - Tx: Surgical Fixation
- [C6-T1] Clay Shoveler's = HyperFlexion = Stable
 - Cause Abrupt flexion while neck contraction by Direct trauma
 - Path: Lower cervical & upper thoracic
- Wedge fracture = Axial load = Stable

PEM R | 14 Y/O fall ATV collided to a tree, head thrown back on impact & complains of neck pain & unwilling to move neck, likely to have cervical spine injury of = Hangman fracture

PEM R | 13 Y/O w/ neck pain after MVA, restrained passenger, lateral XR (Flexion tear drop), likely mechanism = Flexion teardrop from flexion injury

Final | Fall from the slide on his head what kind of fracture he has = Jefferson fracture

Final | Pool w/ jump came to ED = Collar + Airway

- Axial load = Jefferson

Chapter 4: Trauma

Other Spine Fractures

- Below Cervical Spine Injury
 - o Sx: Paradoxical **Seesaw** movement
 - o Path: Injury Below C5
 - Intact Phrenic nerve (C3-C5) = intact Diaphragm function
 - Affected nerves (Below C5) = Paralyzed Intercostal muscles

Final | Case of chest trauma exam show paradoxical breathing = Diaphragmatic rupture (incomplete A, Not flail chest)

Final25 | Trauma fell from 3 meters hit head came with paradoxical movement of the abdomen protruded "goes out" during inspiration (no other instability mentioned), patient was awake and answering his parents, Dx = Cervical injury (Not Diaphragmatic rupture)

- Paradoxical Abdomen movement (See-Saw) = Cervical spine injury below C5
- Scaphoid Abdomen movement = Diaphragmatic rupture

- CHANCE Fracture
 - o Path: Flexion distraction injury > Unstable horizontal fracture at Thoraco-Lumbar Junction,
 - Involving 3 columns (Anterior, Middle, Posterior), T12-L2 (L1 is most common)
 - o Ax: Seatbelt sign, Intra-Abdomen Injury, Neuro deficit (Weakness/Numbness, Bladder/Bowel Incontinence)
 - o Complication: Conus medularis syndrome (if L1 affected)
 - o Labs: CT Spine
 - o Tx: Without Neuro Deficit = Conservative Immobilization Cast/Thoraco-Lumbo-Sacral Orthosis for 8-12 weeks
 - With Neuro Deficit = Surgical consult

PEM R | 17 Y/O girl in high speed MVA, was drinking w/ friends & driver was intoxicated, restrained w/ lap belt, arriving w/ EMS on collar, backboard, pelvic binder, having slurred words w/ low back/pelvic pain, lap belt abrasion on abdomen, Thoracolumbar image reveal Fr. of T12 spinous process, No Neuro deficits, Tx = Conservative w/ immobilization in a thoracolumbosacral orthosis

Final | Fracture seat belt = CHANCE

Final25 | Lap belt with back tenderness at L3 is it associated with = Chance Fracture (Not Thoracolumbar)

- Wedge (Stable Fr., does not involve the posterior column rarely associated with neurologic injury)

PEM R | 15 Y/O Malle snowboarder in ED w/ low back pain after falling on buttocks from 2m XR Lumbosacral (wedge fracture of vertebra), CT shows no additional abnormal findings, complication expected = No significant complications

- Wedge fracture = No complications
- Burst fracture = LMN Flaccid paralysis
- CHANCE = Conus medularis (if L1)

- SCIWORA (Spinal Cord Injury Without Radiological Abnormality)
 - o Mostly < 8 Y/O, Affecting Cervical Spine more (6-19% of Children Cord injury)
 - o Definition: Clinical Sx of Traumatic Myelopathy w/o Radio/CT feature of Spine Fr./Instability
 - o Path: Pediatric Elastic spine column & ligamentous laxity & underdeveloped processes, allows for spine deforming causing spine cord injury without radio findings of bone fracture
 - o Sx: Transient neuro deficit After injury directly then recovers, might have delayed abnormalities
 - o Invx: MRI (evaluate ligamentous instability & spinal cord)
 - o Tx: NSx or Spine Surgery

Chapter 4: Trauma

PEM R | 7 Y/O, in trauma center for spinal injury after attempted flip on trampoline, landed on head & had immediate neck pain w/ tingling & weakness of bilateral lower extremities, No LoC, CT cervical spine normal, now denies any tingling & has full strength & no focal deficit, Tx = Continue spine immobilization till MRI evaluation of Cervical Spine

Promo | 4 Y/O restrained back seater in small sedan that swerved to avoid another vehicle but struck an oncoming vehicle on freeway, car had moderate passenger compartment intrusion, driver sustained significant injury, boy wasn't moving legs at scene, currently moving all extremities without difficulty, appears terrified & will not calm down to enable reliable Ex, CT Abdomen/Pelvis small amount of free fluid in pelvis region, 3D spine reconstruction on CT does not demonstrate any spinal column injury = MRI of Spine should be ordered or Should give Midaz or Methylpred IV Immediate or Normal CT of spine permit cervical collar removal or If pt. Tolerates PO challenge can be D/C after 2hr observation

Final | 4 Y/O restrained back seat passenger of MVA, at scene can't move, at ED moving all extremities, FAST fluid in pelvic region, CT unremarkable including spine = MRI of spine should be ordered

Spine Syndromes

- Spinal Syndromes

o Ax w/ Neck Injuries:

- Diving = Extension Teardrop (the exit point -tip-, stable) = Central Cord Syndrome
- MVA = Flexion Teardrop (whole v. body, unstable) = Ant. Cord Syndrome > Neurogenic/Spinal Shock
- Seatbelt = CHANCE (Vertebra body compressed) = Anterior cord syndrome
- Stab = Brown squared (brown soccer stab)

o Examination:

Spinal Syndromes	Motor	Pain/Temp	Touch/Proprioception
Anterior Cord	X	X	
Posterior Cord			X
Brown Squared	Ipsilateral	Contralateral	Ipsilateral
Central Cord	X UL More Loss LL Less Loss Sacral Sparing	X	

- Spinal Syndromes (Easy memorization)

- o Brown squared = Ipsi & Contra
- o Central = Up & down
- o Anterior = Bilateral loss, Proprioception Normal
- o Posterior = Motor & Pain/Temp Normal

PEM R | 16 Y/O Neck pain after attempting to tackle & dove headfirst into another player, had brief LoC, now normal, XR (Shows lateral Neck w/ C4 Teardrop Fr.), finding in Ex = Quadriplegia, preserved Touch & Proprioception (Anterior spinal cord injury)

PEM R | 9 Y/O, Girl w/ Neck pain after swimming class during diving hit floor of pool no LoC, but had trouble using arms, EMS boarded/collared her in ED Vitally stable, crying in tears & anxious, Alert not able to move/feel fingers bilaterally, able to wiggle toes bilaterally, decreased sensation all extremities, Spinal cord Syndrome Ax = Central Cord Syndrome

PEM R | 17 Y/O, Boy stabbed in neck during fight, bleeding en route, having Rt. Arm & Leg numbness & Lt Arm & Leg weakness, Dx = Brown-Squared

PEM R | 16 Y/O girl, MVA, on C-Collar/Backboard, having severe neck pain, while face symmetric, has weakness in Rt. Arm & Rt. Leg, normal Lt but only numbness, Dx = Brown squared syndrome

PEM R | 17 Y/O male, severe neck pain after being tackled in football, No LoC, but cervical tenderness, no step off, 3/5 strength in all 4 extremities, No sensation to pain or temp, XR (flexion tear drop of C6), potential complication = Bradycardia

- o Flexion tear drop Ax w/ Anterior cord syndrome Ax w/ Neurogenic Shock

Chapter 4: Trauma

Challenger | 17 Y/O male, severe neck pain after being tackled in a football game. denies LOC. On Ex has marked midline cervical tenderness, but no step-offs are palpable, 3/5 strength in his 4 extremities, no sensation to pain or temperature in his hands and feet. His cervical spine x-ray (shows Flexion tear drop) potential complication of his injury = Bradycardia (Not Hypothermia nor Narrow pulse pressure nor Hypertension nor Cool clammy skin)

- Autonomic dysfunction in Neurogenic/Spinal shock, in which loss of autonomic sympathetic input results in Bradycardia, Hypotension & Warm flushed skin, NOT hypertension or cool clammy skin. Temperature autoregulation is not affected in anterior cord syndrome or spinal shock, so hypothermia is not correct

Promo | Trauma w/ weakness in Lower limb & no sensation, Proprioception intact = Ant. Spinal Cord

Promo | 12 Y/O girl, fell 10 feet into grass, Motor weakness in upper extremities greater than Lower extremities & in forearms more than upper arms, Sensory somewhat variable & appears to involve pain & temp, Spinal cord syndrome = Central Cord

Promo | 16 Y/O Female after MVA, unrestrained in front seat passenger, vehicle was T-boned by a truck & rolled over once, arriving on C-Collar & backboard, awake screaming of neck pain, After ABC you note face symmetric but marked weakness of Rt. Arm & leg, Strength normal but complains numbness Lt. side, Dx = Brown-Sequard Syndrome

Promo | 12 Y/O Fell 15 feet from tree & lands on his head after hitting multiple branches on way down, in ED full spine immobilization, Vitality & GCS Stable, but Paraplegic at L1, Loss of pain & temp Bilateral, Proprioception & vibration preserved, Dx = Anterior Spinal Cord Syndrome

Promo | MVA w/ spinal shock in ex you will find = No Pre-Anal sensation

Promo | Spinal injury Ax w/ = Poikilothermia (Up & Down Temp)

Amal | 12 Y/O boy fell from tree, hit branches from tree, on examination: paraplegic below L1, loss of pain and temperature bilaterally, intact proprioception and vibration. Possible Dx = Anterior Cord

Amal | 12 Y/O girl evaluated due to fall from 10 feet into the grass, has motor weakness in upper limbs more than lower limbs and in forearms more than upper limbs, Sensory loss is variable and involves pain and temperature, most likely spinal cord syndrome = Central Cord Syndrome

Final | 12 Y/O girl fell 10 feet onto grass, she has weakness in upper limbs more than lower, sensory loss variable involves pain & temp sensation, Spinal cord syndrome = Central cord syndrome

Final | 16 Y/O marked weakness of her Rt. Arm & Rt. Leg, complaining of numbness of Lt side, = Brown Sequard Syndrome

Final | Pt had MVA with spinal shock in exam you will find = No preanal sensation (Absent pudendal nerve S2-S4)

Final | Spinal trauma = Hypothermia (I think answer is Bradycardia, as a Spinal shock: bradycardia, hypotension)

- ciTBI = Autonomic dysfunction due to Impending herniation = Bradycardia

- Anterior cord syndrome w/ Flexion teardrop = Autonomic dysfunction due to Neurogenic/Spinal Shock = Bradycardia

Chapter 4: Trauma

Spine Artery Dissection

- Vertebral = Posterior Circulation | Ataxia, Dysarthria, Dizziness (**Vertigo**), Diplopia, ipsi facial palsy, contra hemiparesis
- Carotid = Anterior Circulation | Horner, Transient loss of vision, ipsi neck/facial pain, contra hemiparesis
- Spinal = Sudden back pain, paraparesis/quadriparesis, sensory level, bladder/bowel dysfunction

- Cervical Artery Dissection

- Info: 25% of ischemic stroke in young adults, may mimic intracranial hemorrhage, Concussion
- Ax: Ehlers-Danlos, Marfan, Fibromuscular dysplasia
- Path: Trauma > Vessel wall intimal tear > blood enters vessel wall > Intramural hematoma > vessel narrowing/occlusion > Thrombus formation or Emboli or Cerebral infarction
- Cause: Minor or major trauma (hyperextension, hyperflexion, rotation, trampoline, diving, swimming)
 - Trauma may seem trivial = neurologic symptoms hours to days later
- Types:
 - Vertebral artery injury (Posterior circulation stroke)
 - Sx: Headache (especially occipital) Neck pain, Dysarthria, Hemiparesis
 - Ataxia, Dysarthria, Dizziness (Vertigo), Diplopia, Nausea/vomiting, Seizures
 - Carotid artery injury (Anterior circulation stroke + possible Horner)
 - Sx: Headache (often unilateral, throbbing), Ipsilateral neck pain, Focal neuro deficits
 - Horner syndrome (ptosis, miosis, anhidrosis)
 - Amaurosis Fugax (transient unilateral vision loss)
- Complication: Ischemic Stroke (high risk w/ Carotid or Vertebral artery dissections), Subarachnoid hemorrhage
- Invx: CT Angio Head & Neck (less sensitive, initial), MRI/MRA Head & Neck (Sensitive)
 - Plain CT or XR might be normal
- Tx: Antithrombotic agent + Admission (For monitoring & stroke management)
 - Neurosurgical/endovascular Indication:
 - Large pseudoaneurysm
 - Persistent ischemia
 - Contraindication to anticoagulation
 - Avoid sudden neck movement, sports, or further trauma

PEM R | 7 Y/O brought to ED w/ Altered LoC & Ataxia, had been jumping on trampoline while attempting to flip as his older brother, Temp 37.5 HR 110 RR 24 BP 110/80 GCS 6/4/4, Ataxic gait, placed on C-Collar, on Ex No Cervical tenderness/bruising/swell/deformity of head/back/neck/torso, Cranial N. Normal, UL & LL power/reflex all good, having ataxia and fall to left, disoriented to time & place, Anniston to event, 1st Tx option = CT & CTA of Head/Neck

PEM R | 16 Y/O male w/ Ehlers Danlos syndrome, In ED w/ unilateral throbbing headache & transient loss of vision Ax w/ ipsilateral neck pain & gradual worse since swimming lesson 2 days ago, Now Experiences loss of vision on Lt eye for 10min, on Ex normal cranial N., normal Limb strength/sensation, Brain CT normal, Next step = MRI/MRA of Head & Neck (Not Emergent LP or MRI of brain or begin streptokinase or conventional angiography of head & neck)

Amal | 13 Y/O, 10 hours after minor MVA, after accident only mild neck pain, currently has sudden onset **Vertigo**, nausea, numbness on lower side of body. O/E: right horizontal nystagmus, anhidrosis, ptosis, diplopia, abnormal facial sensation on 1 side. No obvious hematoma or ecchymosis on neck, C-Spine imaging is negative, Injury to what would explain the findings = Vertebral artery dissection (Not Carotid artery or Spinal artery)

Final | MVA case presented with dysarthria, left side facial palsy, eye motor dysfunction hearing, problem ataxia **Vertigo** left sensory level ptosis and right side hemiparesis Dx = Vertebral artery dissection

Chapter 4: Trauma

Aerodigestive Trauma

- Laryngeal injury
 - o Sx: Hoarse voice
 - o Invx: CT Neck

PEM R | 15 Y/O girl, falls off scooter hitting front of neck against handlebar, No RD, has midline tenderness in zone 1 of neck, no crepitus or tracheal deviation, no difficult swell but voice hoarse, Next = CT Neck

Final | 15 Y/O girl riding motorized scooter, hit bump on road fell hitting neck against handle bar, No RD, tenderness on zone 1 of neck w/ Hoarse sound only, management = CT scan of neck

- Laryngeal-Tracheal Injury
 - o Sx: **Crepitus over larynx**, laryngeal/tracheal tenderness, flattened thyroid prominence, Anterior neck deformity, severe RD, Abnormal neck XR, or other evidence suggestive of a laryngotracheal Fr. or disruption
 - o Tx: Airway stabilization by Tracheostomy in OR

PEM R | 12 Y/O blunt neck trauma after hit baseball, voice hoarse, unwilling to speak, spit up blood tinged secretions, having drooling, palpable crepitus over anterior neck RR 22 SpO2 97% on RA, next = Transport patient to OR

- o IF Suspicious Aero-Digestive or Vascular Neck injury = Early Surgical consult

Promo | 12 Y/O blunt neck trauma, voice hoarse unwilling to speak, spitting blood w/ tinged oral secretions, has drool now w/ subcostal retractions, slight swell & palpable crepitus over Anterior neck, RR 22 SpO2 97% on RA, best next = Transport to OR (Not CT of Neck nor Proceed to needle cricothyrotomy)

- Tracheo-Bronchial Injury
 - o Path: Shearing force proximal to Carina > ~2 cm Partial/Total, Horizontal/Vertical
 - o Sx: RD, Hemoptysis, **SC Emphysema (Crepitus on Ex)**, Pneumothorax, **Pneumomediastinum**
 - Persistent air leak post Thoracostomy tube (Pneumothorax not improving w/ chest tube)
 - o Invx:
 - XR findings of SC Emphysema Elevation of Hyoid bone, Pneumothorax w/ dependent lung, Abnormal Endo-Tracheal position, Fr. Of 1st 3 ribs
 - CT (if Stable & no airway compromise)
 - o Tx:
 - HD Stable + No Airway compromise = CT Chest
 - HD Unstable = Emergent Bronchoscopy (due to airway compromise)
 - Secure Airway = ENT for Intubation w/ Flexible Bronchoscope (Visualize location/severity/suction)
 - AVOID ED Thoracostomy (Risky)

PEM R | 16 Y/O w/ severe facial trauma post MVA hitting tree, Chest tube placed for pneumothorax, active hemoptysis, Tachycardia, Normotensive, has no midface instability or nasal drainage, crepitus on palpating of Anterior chest, Noticed air leaking from chest tube, Next = Transport to OR for emergent bronchoscopy

PEM R | 16 Y/O MVA restrained front seater hit telephone pole, chest pain, SOB, coughing blood, HR 100 RR 24 BP 120/80 SpO2 93%, Patent airway, blood in mouth without intra-oral lesions, diminished Rt. Breath sounds w/ crunching sound, seat belt bruise, CXR Rt. Pneumothorax, Chest tube placed w/ Persistent air leak, repeated CXR shows appropriate placement but no change in Pneumothorax size, worsening hemoptysis, securing airway preferred method = ETT w/ Flexible bronchoscope

PEM R | 15 Y/O crushed bicycle from 15 feet ramp wearing helmet & chest protector, has Chest/Back pain, HR 110 RR 35 BP 110/70 SpO2 93% RA GCS 14, taking shallow breath, diffuse tenderness & crepitus on 3rd rib, CXR not available, injury likely to = Bronchial (Not Aortic nor Renal nor Hepatic nor Spinal Cord)

PEM R | 16 Y/O male striking chest, SOB, HR 85 RR 30 BP 120/70 SpO2 94% on RA, Primary survey, clear bilateral air entry intact airway w/ midline trachea, normal heart sound, CXR (pneumomediastinum), Next = Obtain emergent Chest CT

Chapter 4: Trauma

- Esophageal Injury

- Rare, Mortality 5% if diagnosed within 24hr, 70% after and dropping
- Sx: Chest pain, Shoulder pain, Abdomen pain, Tachycardia, Dyspnea
 - Burning retrosternal chest pain
 - Yellow fluid from chest tube
- Ax: Pneumomediastinum, Pneumothorax, Emphysema (Retro-esophageal or SC)
- Complication: Mediastinal Sepsis
- Invx: Chest tube (Yellow fluid) XR (Air in mediastinum) Esophagogram/Esophagoscopy (confirmation)

PEM R | 16 Y/O gunshot to Lt lateral thorax at axilla, has SOB/Chest pain, HR 110 RR 24 BP 130/80 SpO2 94%, diminished breath Lt. w/ crunching sound, CXR Lt. pneumothorax/pneumomediastinum, Chest tube inserted & Yellow fluid beings to drain, explanation = Esophageal injury

PEM R | 14 Y/O male w/ multiple injuries, has burning retrosternal chest & Lt shoulder pain, GCS 15 RR 30 HR 98 BP 130/70 SpO2 94%, has active bleeding 2cm laceration below xiphoid process, bruise on chest/face/knuckles, CXR show Mediastinal air fluid level, Explanation = Esophageal injury

Final | Hx of fall from height on exam neck crepitus what diagnosis = Esophageal rupture (Unsure, if w/ hoarseness maybe Laryngeal injury or if continues chest tube leak then Treacheo-Bronchial injury in answers then it is the answer)

Chapter 4: Trauma

Thoracic Trauma

Pulmonary Trauma

- NEXUS Chest CT Criteria (DR CATI):
 - Distracting injury
 - Rapid deceleration Fall > 6m (20ft), MVA > 64km/h (40mph)
 - Chest pain
 - Altered LoC or Age > 60 Y/O
 - Tenderness of Chest wall
 - Intoxication

PEM R | 16 Y/O walks into ED after MVA as driver, HR 90 RR 18 BP 120/80 SpO2 100%, patent airway, breath sounds equal bilateral, heart sound normal, what warrant diagnostic imaging of chest = Intoxication

- Surgical Thoracotomy Indication:
 - Cardiac Box: Anterior medial to mid-clavicle, Posterior medial to scapular border
 - Chest tube > 25ml/kg (at time of placement) or > 5 ml/kg/hr (continues drain) or (1-2 ml/kg/hr in Fleisher)
 - HD unstable despite transfusion

PEM R | 5 Y/O shot by sibling who found gun at home, difficult to breath, HR 150 RR 36 BP 84/45, SpO2 90%, 20kg, O2 non-rebreather, Airway patent but diminished breath in Lt., cool extremities, penetrating wound Lt side of back medial to scapula, eFAST Lt. Hemothorax, Chest tube 500ml blood drained, 20ml/kg NS & PRBC ordered, Next = Transfer to ×

PEM R | 16 Y/O assaulted/stabbed w/ knife to Medial to Lt nipple, felt chest pain/lightheadedness/SOB, HR 120 RR 20 BP 86/40 SpO2 95% patent airway, bilateral equal air entry, muffled heart sound, palpable pulses, x2 IV lines placed CXR enlarged cardiac silhouette without ax abnormalities, 20ml/kg bolus given and Now HR 100 BP 100/60, eFAST (pericardial effusion), Next = Transfer to operating room

Promo | Trauma Pt. W/ decrease breath in Rt. Side of chest & bruises, inserted Chest tube w/ 400ml coming out & being Hypotensive, Next = PRBC (Not Shift to OR)

Amal | Thoracotomy is indicated in ED for continuing = Bleeding > 2cc/kg/hour

Final | Stab wound tachycardia, hypotension = Give bolus IVF & Exploratory Laparotomy

Final | Thoracotomy indication = Immediate return of 500ml blood (Fleisher = 2 ml/kg/hr blood)

Final | Indication of Thoracotomy = > 2 ml/kg/hr

Final | Stab wound under Scapula = OR (no answers provided but most probable answer bcz its within cardiac box)

Final | Gun shot in anterior mid chest = ? OR

- ED Thoracotomy
 - Indication:
 - Penetrating Thoracic injury + Signs of life + Acute loss of Pulses in ED or prior to Arrival
 - Blunt No Rule!
 - Goals: Pericardial evacuation to relieve tamponade, control of intrathoracic hemorrhage, Cardiac massage, Clamping of Descending aorta (to decrease infra-diaphragmatic blood loss & increase brain/heart perfusion)

PEM R | 4 Y/O Pedestrian MVA thrown several meters, unresponsive EMS arrived w/ no signs of life, CPR initiated, C-Collar, Intubation during transport, IV access failed, in ED no sign of life, NOT indicated = ED Thoracotomy (Not Blood or POCUS or Needle Thoracostomy)

Chapter 4: Trauma

Amal | The best candidate for open thoracotomy in ED = Penetrating thoracic trauma who had vitals then vitals lost during resuscitation (Not Blunt thoracic trauma acutely deteriorates in ED or Blunt thoracic trauma without vitals in ED or Penetrating thoracic trauma without vitals at scene)

- Pulmonary Contusion

- High risk in Peds due to Increased Lung compliance
- Path: Blunt Trauma > Pulmonary contusion > Vascular Leak > Bleed/Interstitial Edema > VQ Mismatch
- Sx: Pain, SOB, Tachypnea, Hypoxia, Potentially decreased lung sounds
 - Many will have extrathoracic injuries
- Complication: Pneumonia, ARDS
- Invx: CXR, CT Chest
 - Delayed findings, usually appear within 6 hours
- Tx: Supportive care (Analgesia, O2, careful IVF -to avoid pulmonary edema-)
- Consider lung positioning to help with oxygenation (particularly patients requiring mechanical ventilation)
 - Good lung should be positioned down (good to ground) to improve V/Q matching and oxygenation
 - Exceptions: bad lung in the dependent position (down), massive hemoptysis (to prevent blood from filling the good lung)

PEM R | 3 Y/O restrained rear seater, MVA w/ airbag, EMS transported, GCS 15 HR 125 RR 35 BP 98/60 SpO2 98%, Primary survey normal, secondary survey normal, CXR normal, 30min later HR 135 RR 40 BP 110/60, SpO2 92% on RA, what likely cause of change in pt status = Pulmonary contusion

PEM R | 10 Y/O high speed MVC was restrained backseat passenger of car struck tree, on C-Collar, difficult breath & anterior chest pain over skin contusion where seatbelt restraint Temp 37.2 HR 110 RR 26 SpO2 94% BP 110/65 chest wall contusion without flail chest CXR unremarkable No Rib/Pulmo contusion/Pneumothorax, Next = Fentanyl

Promo | 2 Y/O Fell from 2nd story window & landed on his back, in ED Alert/Awake, HR 180 BP 98/66 RR 60 SpO2 98%, most likely injury sustained = Pulmonary Contusion (Not Tension Pneumothorax nor Rib Fr. W/ Pneumothorax nor Pulmonary Laceration)

Promo | Most indicative of Intrathoracic injury among scenarios = Femur Fr. & Abnormal Thoracic exam (unsure, Not bruising on chest wall w/ splenic injury & normal BP nor Splenic injury w/ Femur injury)

Amal | Regarding pediatric trauma, which is true = Absence of chest wall injuries doesn't rule out pulmonary injury

- Cervical injury affecting lower Vertebrae
- Majority of spleen and liver injuries require operative management
- Isolated head injury is common cause of hypotension (not common, but can happen in infants)

Final | 2 Y/O falls from 2nd story window lands on his back, in ED alert/awake, Vitals HR 180 RR 60 BP 98/66 SpO2 98%, most likely to injures = Pulmonary contusion

- Traumatic Pneumothorax

- Tx: (Large American > 2cm | British > 3cm)
 - IF < 2-3cm = Admit for serial XR
 - IF > 2-3cm = Chest tube vs Observe (if increasing then Chest tube)
- Indication of Chest tube:
 - Mod-Large
 - Symptomatic
 - Requiring Air travel
 - Requiring intubation
 - After Needle decompression in Tension pneumothorax

PEM R | 14 Y/O falling off bike no LoC on C-collar, has decreased breath sound, tenderness over rt chest, w/ painful swollen left wrist, BP 124/76 good perfusion, CXR (shows pneumothorax 1.8cm), best next = Admit for serial chest radiographs

Chapter 4: Trauma

PEM R | 16 Y/O unrestrained driver into tree, airbag deployed initially had no complains & declined transport, several hours later went to ED w/ worsening chest pain/SOB, HR 110 RR 35 BP 90/60 SpO2 90%, CXR (pneumothorax), Ex = Deviated trachea to Rt. Hyperresonance on percussion, absent breath sound on Lt, normal heart sound

Amal | 8 Y/O child, MVA, unresponsive, CGS 3, obvious trauma to head, chest and lower abdomen. Intubated, SpO2 below 80s, hypertympanic right chest with absent breath sound in the right side, good air entry left side, most likely cause of hypoxia = Pneumothorax (Not Pulmonary contusion nor Right main bronchus intubation nor Low RR)

Final | case of gunshot to the Rt. Chest with decrease sounds in rt. Side and trachea shifted to the left (what I remember there was no shift and going with hemothorax) = Chest tube (if simple pneumothorax -shifting without obstructive shock signs-) or Needle Decompression (if tension)

Final | Case of trauma was cyanotic, RD, blood comes from mouth & nose, decrease air entry in Rt side with femur Fr what next step = Needle decompression (unsure but not Intubation or Chest tube)

Final | 5 Y/O unrestrained back seat MVA, GCS 8 HR 135 RR 40 BP 110/65 SpO2 90% shallow breath, poor respiratory, C-Collar, intubated then HR sudden increases to 150, BP 80/40, RR 25, on Ex Weak dorsalis pedis/femoral pulses, decreased breath sound in Rt. Lung, most next = Perform needle decompression on Rt.

Final | MVA presented to ED hypotensive tachycardiac RR 10 with decrease air entry on left side, Next = Needle decompression

Final | 3 Y/O boy with osteogenesis imperfecta, MVC presented to the ED hypotensive, tachycardiac, RR 8 with decreased air entry over the left side your action = Needle decompression

Final25 | Trauma patient w/ decreased air entry on left side with hypotension & distended neck veins = Tension pneumothorax

- Open Pneumothorax

- Tx: 3 side occlusive dressing
 - Which is Remove once Chest tube inserted

PEM R | 14 Y/O boy penetrating chest wound w/ entry on Lt side w/ air entry w/ each inspiration = Apply occlusive dressing on 3 sides

PEM R | 15 Y/O open pneumothorax = occlusive dressing taped on 3 sides

PEM R | 7 Y/O Girl fell 10 feet tree, branch impaled chest pulled out by father HR 130 BP 110/70 has diminished breath sound on Rt side, air moving in & out of her chest open wound, O2 applied, IV access obtained, 1st step = Apply dressing over wound w/ 3 sided occluded

Final | Trauma scenario w/ chest open wound, Tx = Adhesive tape w/ 3 sides

- Hemothorax

PEM R | 13 Y/O girl, MVA, x2 IV lines inserted w/ 20ml/kg NS, BVM, in ED GCS 3 HR 150 RR 20, BP 50/20 SpO2 85% on 100% FiO2, Doctor intubated pt., Trachea intact in midline, diminished breath on Rt. Sound, heart sound pulses normal, on CXR ETT 1.6cm above carina, complete opacification of Rt. Lung & normal cardiac silhouette, given 10ml/kg pRBC, Next = Thoracostomy

Final25 | EFAST pic showed Hemothorax, Vtally stable, what to do next = CT Chest (Not Insertion of thoracotomy nor Pericardiocentesis nor Needle thoracostomy)

- Patient is stable and further evaluation needed, but Thoracotomy can be considered as the right answer

- Flail Chest

- Path: Ribs Fr. ≥ 2 on same side/segment leading to lose of continuity > Flail Chest
- Tx: Goal stabilize involved Fractured Portion
 - At scene = Place w/ injured side down (improves Tidal volume & ventilation)
 - At hospital
 - If w/ hypoxia = give analgesia
 - If w/ RD = Intubate and provide PPV

Chapter 4: Trauma

PEM R | 5 Y/O girl running across street hit car, transported EMS prepare team for arrival, Traumatic injury most likely be detected during primary survey without further labs = Flail chest

Promo | Major factor of Respiratory Compromise in multiple Rib Fracture Is = Paradoxical chest movements (Not SC emphysema nor Pneumothorax)

Promo | MVA w/ Hypoxia & Flail chest, Next = Analgesia (Not intubation)

- (IF Said Definitive Tx = Intubation & PPV)

Promo | 14 Y/O in ED drove car head into another car, not restrained and ejected, Ex GCS 13, Breathing spontaneous, Portion of Rt. Side of chest seems to move paradoxically moving in w/ inspiration & out w/ expiration, Immediate action = Analgesia & observe (Not Intubate immediately or Insert chest tube or Order CXR)

- ATLS ABCDE Approach as Next appropriate

Final | Child after MVA with hypoxia and flail chest what to do = Analgesia (Not taking good breath due to pain)

Final | which has more impact to pulmonary post trauma = Paradoxical chest movement

- Traumatic Asphyxia (Acute thoracic compressive syndrome)

- Path: Traumatic compression on Thorax while Glottis closed > Increase Thoracic Pressure > Vessel Rupture + High pressured Rt. Atrium Blood pushed to SVC/IVC > Capillaries Rupture Head/Face
- Sx: Conjunctival hemorrhage, Facial edema, Cyanosis above clavicle, Petechiae/Ecchymosis Face/Chest
 - Hypoxemia, RD, Altered LoC
- Complications:
 - Pulmonary Contusion > **Pneumonia** (1st) 20-50%, days post injury or ARDS (Less common)
 - Liver Contusion (2nd)
 - Cerebral Edema (3rd) or Periorbital Edema
- Good Prognosis if survived 1st few hours w/ Low Long term Neuro/Optha sequelae, Otherwise Immediate Death

PEM R | 3 Y/O, Girl Prev. Healthy, in ED after accidentally run over by a motor vehicle of her father was driving slowly in reverse out of their driveway at home, Mother saw rear tire roll over her chest, T 36.5 °C HR 150 RR 50 BP 78/40 SpO2 90%, Ex Persistently crying, Diminished air entry bilaterally, No Murmur, Periorbital edema, Subconjunctival hemorrhages, extensive facial petechiae, CXR Hazy opacities bilaterally, Complication highest risk for developing = Pneumonia

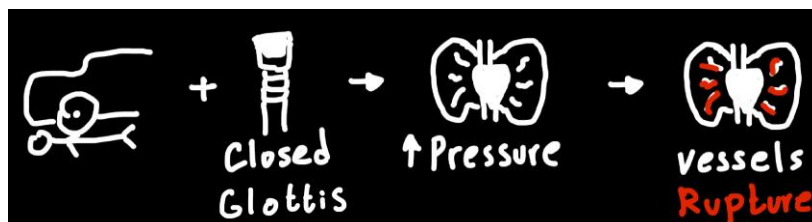
PEM R | 3 Y/O girl TV tube fell on top of chest, GCS 15 anxious w/ Facial petechiae, subconjunctival hemorrhage, bruise on chest, XR/Labs waiting, Ax finding = Periorbital edema

Promo | 15 Y/O, Trauma victim brought to ED after Dirt bike injury, Bike reportedly flipped onto his chest, Ex Conjunctival hemorrhage, Facial edema, Cyanosis, Ecchymosis, Petechial hemorrhage on Upper Chest & Face, Dx = Acute Thoracic Compressive Syndrome

Other | 6 Y/O in ED extracted from under closed garage door 30 min ago by mother by raising the garage door, GCS 13, HR 140 RR 24 BP 110/70, SpO2 98% on 1Lpm NC, Ex Lethargic, Has bloody nose, subconjunctival hemorrhage, face petechiae, has linear contusion/abrasion across midthoracic, lung clear & equal, Abdomen unremarkable, likely to develop as a result of this injury = Cerebral Edema (Not Cardiogenic shock nor Diaphragmatic hernia nor Pulmonary infarction nor Thoracic outlet syndrome)

Amal | 14 Y/O trauma victim, after bike accident, conjunctival hemorrhage, cyanosis, facial edema, petechial rash over upper chest, most likely Dx = Thoracic compression syndrome

Final | 15 Y/O trauma victim, brought to your ED after dirt bike injury, reportedly flipped onto chest, Conjunctival hemorrhage, facial edema, cyanosis, ecchymotic petechial hemorrhage, upper chest & face, Dx = Acute thoracic compressive syndrome



Chapter 4: Trauma

- Rib Fractures

- Ax injuries:
 - 1st rib = Aorta, Trachea
 - Middle rib = Hemothorax/Pneumothorax
 - Lower rib = Liver or Spleen injury

PEM R | 18 Y/O girl, motorcycle accident, complains of lightheadedness, Pain Lt lower rib cage, HR 115 BP 85/60, patent airway, clear breath sound/heart sound, cool extremity, pain w/ palpation to Lt lower rib anterolaterally CXR show 9 & 10 Lt ribs fracture = Splenic laceration

- Diaphragmatic Hernia Trauma

- Rare in children, mostly in Lt side
- Path: Lateral trunk blunt trauma > x3 likely Ruptures Lt. Diaphragmatic hernia (Rt. Protected by liver)
- Ax (75%): Pulmonary contusion, Splenic Laceration
 - Pelvic Fracture (High Association, Toothpaste like)
- Complication: Hernia Strangulation or Necrosis
- Invx: XR: Hemidiaphragm or bowel in lung space
- Tx: NGT/OGT to relieve GI pressure, Intubation
 - Surgical Operation (Always needed)
 - Needle decompression (for either Pneumothorax/Hemothorax/Ruptured DH)
 - Modification by palpating diaphragm & ensuring its intact before insertion (risk of injury to herniated bowel)

PEM R | 5 Y/O MVA, struck Lt thorax against rock, SOB & shoulder pain HR 120 RR 24 BP 90/40 SpO2 96, airway patent but diminished breath sounds Lt., heart/peripheral pulses normal, abrasion lateral thorax, shoulder normal, has Scaphoid Abdomen movement, XR shows Pneumothorax & obscured hemidiaphragm on side of trauma, True = Increases risk of performing Thoracostomy

PEM R | 7 Y/O girl ejected from bed of pick-up truck, High MVA, GCS 5 HR 130 RR 8 BP 88/60, SpO2 90% on RA, x2 large bore IV placed, given NS bolus, RSI done, CXR (Diaphragmatic hernia), Dx = Diaphragmatic Hernia

PEM R | 2 M/O MVA, intubated by EMS GCS 6 HR 180 RR 40 BP 70/40 SpO2 75% on 100% FiO2 EtCO2 35, airway intact midline, breath sound difficult to auscultation but decrease on Lt side, CXR (bowel in Lt side), Next = Transfer OR for surgery

Promo | Significantly Ax w/ Blunt traumatic Diaphragmatic rupture = Pelvic Fracture (Not Shoulder or Femur)

Amal | Most Significantly Ax w/ Blunt traumatic Diaphragmatic rupture = Pelvic Fracture (Not Splenic laceration or Liver or Thoracic inlet)

Amal | 8 Y/O boy presented to ED, moderate RD, Spo2 92% on RA, RR 50, BP 120/75, he has trauma to left lower chest, X-ray (Diaphragmatic hernia) Next step = Insert NGT (Not Intubate and ventilate or Needle decompression or Chest tube in left)

- Diagnosis is Acquired Diaphragmatic hernia VS Ruptured injury (Stomach in chest cavity)

Final | Child involved in MVA with diaphragmatic hernia what to common fracture = Pelvis

Chapter 4: Trauma

Cardiac Trauma

- Cardiac Contusion (Blunt Cardiac injury)

- Right heart commonly injured
- Cause: MVA (most common cause), Deceleration injuries, Falls
- Sx: Chest pain, Dyspnea, Palpitation, Visible evidence of chest trauma, Steer wheel imprint
- Ax Injuries:
 - Structural damage (Vulvar, Coronary, Septal/Free wall rupture)
 - Decrease Myocardial contractility
 - Dysrhythmia (Persistent sinus tachy, ST elevation/depression, BBB)
 - New murmur
 - Signs of HF
- Invx: No gold standard investigation
 - ECG initial then after 4-6hr (Look for BBB, ST Elevation or Depression)
 - Troponin level
 - ECHO (IF Abnormal ECG or New Murmur or HF signs, HD unstable not explained by hemorrhage)

PEM R | 16 Y/O MVA unrestrained collided w/ another car struck chest against steering wheel and complains of chest pain w/ ecchymosis, Chest equal bilateral, heart sound normal, radial pulse strong, HR 94 RR 18 BP 115/80 SpO2 98% on RA, Test indicated to screen for blunt cardiac injury = ECG (Repeat Q4hr)

PEM R | 5 Y/O girl in trauma center accidental shot by sibling, difficult breath HR 150 RR 36 BP 84/45 SpO2 90%, weighs 20kg, given Non rebreather face mask, Airway patent, diminished breath sound on Lt side, cool extremity, gunshot Lt side medial to scapula, Chest tube thoracostomy 500ml of blood evacuated, blood transfusion next step = Transfer to OR (within cardiac box)

PEM R | 14 Y/O girl fell snowboarding, landed prone while attempting new Ariel jump feeling dizzy, weak, light headed, HR 75 RR 18 BP 110/60 SpO2 98% on RA, Clear breath sound, normal heart sound, irregular HR (ECG irregular rhythm), Next = Echo

Final | 7 Y/O unrestrained front seat father drove fast, Hit traffic pole, Having chest pain, upper abdomen pain, Heart murmur, Next = ECG

Final25 | Victim of MVA with chest and abdominal pain, on examination right side abdominal tenderness, muffled heart sound and systolic murmur, stable and negative EFAST next step in ER = ECHO and cardiac enzymes (Not Contrast abdominal and chest CT nor Pericardiocentesis)

- Aortic Trauma (Aortic Dissection)

- Cause: Frontal impact = Airbag (most common) or child without airbag
- Path: Injury at transition point between Arch & Descending at level of Ligamentum Arteriosum
- Sx: Above/Below Diaphragm
- Invx:
 - CXR (Wide mediastinum, Lt. Pleural hematoma, Lt. Hemothorax, Depressed Lt. main bronchus, Deviated Trachea)
 - CT Angio (Gold standard), Echo (initial)
- Tx: Stable = CTA
 - Unstable = OR immediate
 - Aortic Dissection + HTN = Esmolol
(Maintain HR 60, SBP 100-120, Decrease wall tension & shearing force)

PEM R | 15 Y/O fall off 2 story house to lawn, complain of chest pain, back pain, Lt upper extremity pain, inability to move Lower extremity, HR 115 RR 22 BP 120/80 SpO2 96%, on C-Collar, Airway patent, diminished Lt side breath, Heart sounds rapid, deformity of Lt upper & lower extremity CXR (wide mediastinum), Meds 1st to give = Beta Blocker

Chapter 4: Trauma

PEM R | 16 Y/O motorcycle crash, intubated by EMS, GCS 7 HR 120 RR 20 BP 90/50 SpO2 93% on 100% FiO2, Primary survey intact airway & equal bilateral air entry, has bilateral chest crepitus over 1-2 ribs, CXR ETT 1cm above carina, Widened mediastinum, Lt pleural cap, Blurred aortic knob, Multiple lung consolidation, likely = Aortic disruption

PEM R | 16 Y/O restrained driver head on collision at 40mph, air bag deployed and having facial abrasions, having light fragrant as HR 100 RR 22 BP 108/62 SPO2 97%, Primary survey normal, Ex Facial & Chest wall tenderness, CXR (Wide Mediastinum), Next = Obtain Ct Angiogram

- Blunt thoracic trauma > Great vessel injury
- Deceleration injury + CXR Wide mediastinum = Great vessel injury > CTA

Promo | Low mechanism injury w/ widening of Mediastinum on XR = CT Angio (Not Repeat XR nor Artifact)

Amal | 13 Y/O brought to the ED as a motor vehicle accident not restrained driver in a car without air bag Temperature 36 heart rate 128 RR 24, BP 100/60 saturating 96% on the 100 O2, response to verbal stimuli, complains of chest pain and backpain His airway is intact with midline trachea (CXR Wide mediastinum) best = Aortography

Final | Low mechanism injury with widening mediastinum in XR = CT Angio

Final25 | Trauma case w/ scenario and symptoms of aortic dissection mentioned difference in upper extremity pulses CXR (shows widened mediastinum and loss of aortic knob), Dx = Aortic dissection / transection

Turki
Bukhari's
Notes

Chapter 4: Trauma

Abdomen Trauma

General Abdomen Trauma

- E-FAST

PEM R | 12 Y/O girl, Skiing hit a tree, No LoC GCS 15/15 HR 88 BP 115/85 RR 18 SpO2 99% on RA, has chest pain/abdomen pain, bruise on Rt. Lower anterior chest & RUQ tenderness, eFAST done, correct statement = if eFAST shows absence of free fluid this does not exclude possibility of clinically significant Intra-abdomen injury

Final | Pic of US show free fluid between liver and kidney = Morison pouch

Final | FAST US location = Morrison pouch

Final | What does E-FAST Dx = Hemoperitoneum

- Fleisher Abdomen CT Indication (DR APL)

- Distracting injury
- Requiring PRBC or IVF or Anesthesia
- Altered LoC
- Positive Examination or FAST or High Mechanism or Multisystem
- Labs Hgb < 10, Urine RBC > 50, High AST (>200) High ALT (> 125) High Amylase

- PECARN Abdomen CT (If any YES = Go for CT | If All No = Very low risk)

- Evidence of Abdomen wall trauma (seatbelt) or GCS < 14 w/ Blunt Trauma
- Abdomen Tenderness
- Evidence of Thoracic wall trauma or Abdomen pain or Decreased breath sounds or Vomiting

PEM R | 5 Y/O restrained rear seat passenger w/ MVA, no LoC/Vomit, only has Rt. Forearm pain, Vitally stable, forearm swell/tender to palpation, CXR, Pelvis XR, AST/ALT/Amylase/Lipase/HCT all normal, XR Rt. Forearm mildly displaced distal radius & ulna fracture, morphine given for pain control & abdomen re-exam remains non-tender, correct statement = Additional image not required (After analgesia > pain stopped = No distracting injury & patient is not having pain elsewhere = No need for CT)

PEM R | 3 Y/O girl, MVA, brought by EMS Awake/Alert/restrained 5 point harness child seat in back middle seat, parents airlifted from scene and critical, she is consolable on C-Collar and answers when asked, Primary/Secondary survey all normal, Vitally stable, Labs/CXR/Pelvis XR/FAST all normal, Tx = Observe in ED, PO trial if examination remains unchanged (Not Consult NSx for Intracranial hemorrhage nor Consult Surgery for emergent laparoscopy nor Emergent IV contrast CT Abdomen/Pelvis)

- Low risk on PECARN abdomen

PEM R | 12 Y/O Male, Abdomen pain after direct blow to abdomen, no guarding/rebound, Temp 36.5 HR 150 RR 25 BP 110/75 SpO2 99%, After initial stabilization & labs, next = CT Abdomen/Pelvis w/ Contrast

Promo | Abdomen trauma, with Abd. Tenderness, Vitally stable, Next = CT (Not US or Surgery)

Promo | 10 Y/O sustained multiple traumatic injuries in roll over MVC, patient arrived to ED w/ Normal Vital signs, FAST shows Intra-abdominal bleeding, Most appropriate = Abdomen CT w/ IV Contrast (Not Repeat FAST nor Immediate Laparoscopy)

Promo | Pt. Had URTI last week, presented w/ LUQ Abdomen pain post playing football, in shock, diagnostic = Abdomen CT

Amal | 12 Y/O is brought to ED after an accident involving an ATV. The child states that he was driving the ATV by himself on the side of a hill when the ATV tipped over, throwing him to the ground. The ATV rolled over him after he fell. He complains only of abdominal pain. Ex reveals diffused tenderness in the abdomen with rebound tenderness. HR 110 BP 104/70 He has no other apparent injuries. Of the following, most appropriate study to determine extent of his injuries is = Abdominal CT

Amal | 4 Y/O boy, seat restrained in MVA. Which modality is best at detecting and deciding management for this injury (ecchymosis seat belt on pic) = Abdominal CT (Not FAST or XR or DPL)

Final | Case of trauma vitally stable = CT scan

Final | MVA patient, ?? Rollover, came with abdominal pain, tenderness and epigastric bruises, vitally stable, Efast negative Next = CT (Not Repeat Efast or Serial examination and observation)

Chapter 4: Trauma

Final | 10 Y/O multiple trauma injury roll over MVA, patient arrives w/ normal Vitals, FAST shows positive intra abdominal bleed, Tx = Abdomen CT w/ Contrast

Final | 10 Y/O multiple trauma injury roll over MVA, patient arrives w/ normal Vitals, FAST shows positive intra abdominal bleed, Tx = Abdomen CT w/ Contrast

Final | Flank trauma, consider radiological evaluation = Urine RBC 50/mm

Final25 | Patient had direct flank trauma and having RBCs in urine >50 next step = CT with contrast (Not FAST nor Cystourethrogram)

- **Fleisher: Immediate Laparotomy/Laparoscopy Indication (MUUPPE)**
 - o Multi-Trauma w/ Indication of Craniotomy + Positive FAST or Hx or Ex
 - o Unstable + Evidence of Abdomen injury & no other extra abdomen injuries
 - o Unstable + Abdomen distention
 - o Penetrating
 - o Pneumoperitoneum
- **ATLS: Immediate Laparotomy/Laparoscopy Indication**
 - o Hypotensive + Sx of Abdomen Trauma (Positive FAST, Clinical Sx) or No other source of Shock
 - Drop HCT (Supports ongoing bleed)
 - o Hypotensive + Penetration of anterior fascia
 - o Gunshot traversing Peritoneum
 - o **Evisceration** (organs out)
 - o Peritonitis, Free air/Retroperitoneal air/ruptured Hemi-diaphragm
 - o **Bleed from Gastric/Rectum/GU**
 - o Positive CT (GI rupture, Intraperitoneal bladder rupture, Renal injury, Severe Solid organ injury)
 - o Positive DPL (GI contents, bile, vegetable matter, ≥10 mL blood in a hemodynamically unstable patient)

PEM R | 10 Y/O brought by EMS for MVA, has LoC for unknown duration, GCS 13, HR 150 BP 82/60 RR 24 SpO2 94% on RA, looking pale, cool extremities, weak peripheral pulses, Multiple abdomen contusions, tender RUQ, Pelvis stable, placed on NRM 100% w/ 20ml/kg NS bolus, pRBC 10ml/kg, eFAST large amount of free fluid, Next definitive Tx = Immediate laparotomy in OR

PEM R | 10 Y/O girl Multisystem trauma, intubated by EMS, GCS 6 HR 125 RR 20 BP 85/55 SpO2 94%, intact airway, equal air entry, normal heart sound, +1 Radial/Femoral pulse bilateral CXR opacification of Lower Lt lung, 20ml/kg bolus NS & PRBC given, HR 140 RR 20 BP 75/50 SpO2 94% on 100% FiO2, likely explanation = Unrecognized Abdomen hemorrhage

- o Most common cause of blood loss is Abdominal source

Promo x2 | Indication of urgent Laparotomy = Abdomen distention w/ Hypotension

Promo | Indication of Laparotomy in Trauma = Persistence of Hypotension despite resuscitation & no clear cause (Not Pos. fast)

Promo | 9 Y/O Male 6hr after MVA low speed restrained by lap belt in back seat, now has back & diffuse abdomen pain, HR 115 RR 23 BP 82/70 GCS 15, Cooperative but uncomfortable, given x3 NS fluid boluses Vitals/Ex unchanged, Best Next step = Consult Surgery for Surgical exploration (Hypotensive w/ Abdomen pain) (Not Bedside FAST nor 10ml/kg PRBC or CT Abd/Pelvis)

Promo | Fell from tree w/ severe Abdomen pain, GCS 15/15 oriented, given one NS bolus but still Hypotensive, Next (Incomplete Q) = Give another bolus (unsure, not Give PRBC or Call surgery)

- o If Hypovolemic shock > Hemorrhagic shock = Give x1-2 bolus until PRBC available
- o If Stable Abdomen Injury = CT | Unstable Abdomen Injury = OR

Promo | child w/ Trauma Hypotensive, given fluids & x2 Units of PRBC still Hypotensive, Next = Take to OR

Promo | Child playing w/ Bicycle fell on brace, came to ED w/ Low GCS, Abdomen Ecchymosis & Distension, cause of condition = Internal hemorrhage (Hemorrhagic shock) (Not Intra-cranial hemorrhage nor Myocardial contusion)

Promo | Abdomen trauma, CT done normal, after observation patient start to deteriorate w/ increase abdomen pain/distention, Next = Laparotomy

Amal | 10 Y/O girl in ED immediately after being shoot the abdomen. She's alone w/ GCS 15 Vitals T37, HR 120 BP 90/65, Ex normal except for entrance route in LLQ bleeding is controlled, next step in management = Laparotomy in OR (Not CT Abdomen)

- o Patient border line BP which can go Hypotensive so OR

Chapter 4: Trauma

Amal | Which of the following is the most important to make treatment decision in children w/ traumatic abdominal injury = Hemodynamic stability (Not Result of CT or Result of FAST or Tenderness/bruises of abdomen or Severity of the mechanism)

Final | Trauma patient, HR 130 BP 110/80, After bolus 20ml of NS, repeated vitals HR 110 BP 130/80, (Image of XR w/ Air bilaterally under diaphragm) Next = Exploratory laparotomy

Final | 9 Y/O male brought by parent 6hr after Low speed MVA, restrained in lap belt, now w/ back & diffuse abdomen pain, HR 115 RR 23 BP 82/70 GCS 15, uncomfortable, after 3 NS fluid, Ex unchanged, Next step = Consult surgery for surgical exploration

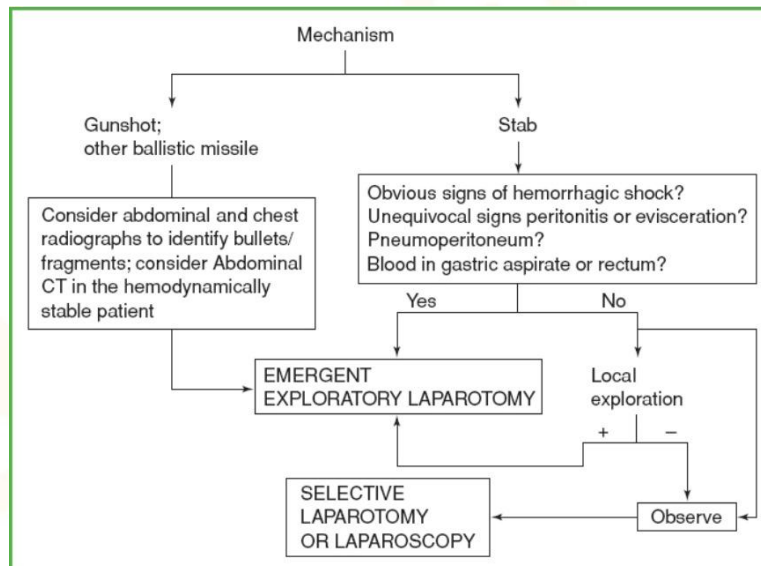
Final | Abdominal trauma, CT scan done was normal, after observation patient start to deteriorate with increase pain and abdominal distension, what to do next = Laparotomy

Final | MVA given fluid and blood still hypotension = Take to OR

Final | Indication for emergency laparotomy = Persistence of Hypotension despite resuscitation & no clear cause (Not Pos. fast)

Final25 | Trauma patient, came with HR 130, BP 110/80, given 20 ml bolus of NS his repeated vital HR 110, BP 130/80, (CXR image shows Pneumoperitoneum) what to do next = OR (Not CT nor PRBC)

Penetrating Abdomen Trauma



- Penetrating Abdomen Trauma

- Sx: Peritoneal penetration/irritation (Abdomen tenderness, Free air in XR)

- Penetrating Abdomen Trauma Approach:

- Stab Posterior + HD Stable = CT Contrast > Observe 24hr
Stab Posterior + HD Unstable = Exploratory Lap.
- Stab Anterior + HD Stable & NO Peritoneal Risk Signs = Local Exploration > Observe or Exploratory Lap.
Stab Anterior + HD Unstable or YES Peritoneal Risk Signs = Exploratory Lap.
 - Peritoneal Risk Signs: Peritonitis Sx, Pneumoperitoneum, Upper/Lower GI Blood
- Gunshot + HD Stable = XR (check bullet) > CT Contrast (check extent) > Serial Ex +/- Exploratory Lap.
Gunshot + HD Unstable = Exploratory Lap.

PEM R | 15 Y/O gunshot, to Anterior RUQ, on Ex only one penetrating wound, diffuse tender but no rebound/guarding, HR 120 RR 23 BP 130/85, XR of Abdomen doesn't reveal bullet, in attempting to map the bullet course which to do next = XR Chest

PEM R | 17 Y/O in ED by EMS after gunshot to abdomen, vitally stable HR 100 and after 1L NS HR 80, w/ single entrance wound in Lt mid abdomen w/ diffuse abdomen tenderness & no exit wound, XR bullet on Rt. Side of abdomen w/ free air present, Next = Emergent Laparotomy in OR

PEM R | 3 Y/O Gunshot wound, has single small entrance wound, awake/crying, HR 110 RR 20 BP 100/55, Soft, nontender abdomen, HCT 35%, surgeon going to start pyloromyotomy for a patient you just admitted, which would best support need to cancel the other case to take this to OR = Rectal bleed (Not Posterior entrance wound nor Her BP nor Her HR nor Her Age)

Chapter 4: Trauma

PEM R | 16 Y/O male, involved in gang fight, stab wound in abdomen, controlled bleed, non-tender, after local exploration surgical resident believes superficial & need observation only, within 1st hour begins to have non-bilious non-bloody vomit, uncomfortable rebound and guarding abdomen w/ midline tenderness/distention, Puncture wound unchanged, HR 120 RR 25 BP 100/70, Next = Emergent re-consult surgery for exploratory laparotomy

Final | Stab wound tachycardia, hypotension = Give bolus IVF & Exploratory Laparotomy

Blunt Abdomen Trauma

- Liver Injury
 - o Sx: Abdomen tenderness, Referred pain to Rt. Shoulder
 - o Invx: High liver enzymes
 - o Tx: (Almost applies to spleen also)
 - HD Stable = Observe (Serial Ex/HCT)
 - HD Unstable = OR

PEM R | 2 Y/O car struck him while backing up knocking him to ground, unknown if tire traveled over him, immediate cry no LoC, agitated, IV obtained, Fentanyl given w/ improved agitation, CT head/cervical spine/chest/abdomen all done, Abdomen Ct (shows Liver injury) AST 1740 ALT 44, HCT 41, Next = Admit to trauma (Admission and no surgery now because HD stable)

PEM R | 6 Y/O Rt. Shoulder pain after struck by family car as it was backing up, GCS 15 HR 150 RR 25 BP 95/50 SpO2 98% on RA, all exam normal except for abdomen diffuse tenderness HCT 35 AST 425 ALT 270, Urinalysis 2 RBC/hpf, CT Abdomen (shows liver lacerations), After 20ml/kg NS, Tx = Admit for serial exams & observations

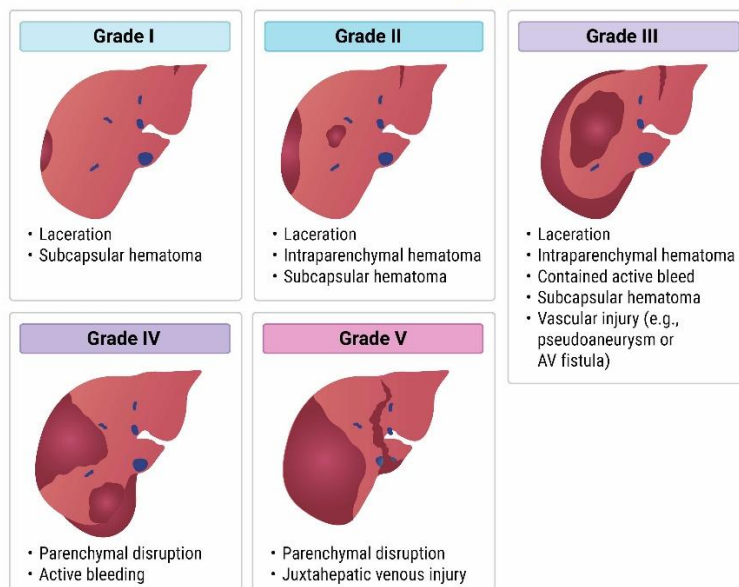
Promo | Most commonly affected organ in Abdomen Penetrating Trauma = Liver (Not Bowel + Colon)

Amal | Which **Penetrating** abdominal organ most common injured in children = Liver (Not Spleen nor Pancreas nor Kidney)

Final | Hepatic injury with pain = ? Class I or Class II

- o Class I: Subcapsular hematoma <10%, laceration of parenchyma <1 cm
- o Class II: hematoma: subcapsular, 10-50% surface area, intraparenchymal <10 cm diameter; laceration: capsular tear 1-3 cm parenchymal depth, <10 cm length

American Association for the Surgery of Trauma Liver Injury Scale



Chapter 4: Trauma

- Spleen Injury

- Most common pediatric Blunt injury
- Sx: Kehr sign (LUQ tender w/ referred pain to Lt. shoulder)
- Tx: Non operative (95% success rate of preserving spleen & immunological function)
- WSES Spleen classification:
 - Non-OP = HD Stable, spleen grade, Free Fluid amount, CT Contrast blush, Pseudoaneurysm
 - OP = HD Unstable, Evisceration, Peritonitis
- Delayed Abdomen organ injury + Unstable HD = Splenic rupture

PEM R | 7 Y/O girl, rear seat unrestrained in MVA, complains of Lt sided abdomen pain & Lt shoulder pain, GCS 15 HR 120 BP 120/60, Abdomen tender in LUQ without guarding/rebound, HCT 38%, AST 75 ALT 150, Urinalysis negative, CT (shows spleen injury) Next = Admit for serial exams & HCT

PEM R | 14 Y/O in ED 8hr after falling 7 feet riding bicycle, wearing helmet, No LoC, Epigastric abdomen pain, HR 85 BP 118/65 RR 20 SpO2 97% RA, LUQ tenderness, no bruise, CT shows (spleen injury), most appropriate = non-operative management

PEM R | 16 Y/O unrestrained MVA, had LoC, now only Lt. shoulder pain, w/ Rt. Facial abrasion, bruise of Rt. Ear & Lt. knee abrasion, Chest/abdomen non-tender & no bruise, pelvis stable, CT/CXR/Pelvis XR/Trauma labs all normal, initial HR 78 BP 114/60 RR 18 GCS 15, 3 hr later while walking to bathroom became pale/diaphoretic/near syncope attack, now HR 98 BP 135/65, Repeat HCT 41 > 31, Likely source = Intra-Abdominal (Spleen most common, Kehr Pos.)

Promo | 8 Y/O Playing soccer then developed Lt. shoulder pain w/ LUQ tenderness, Specific Image to Dx = CT (Not US nor XR)

Promo | Child w/ Abdomen trauma 3 days ago, now has severe pain & hypotension = Spleen rupture (Not Duodenal hematoma)

Promo | Most commonly affected organ in Abdomen Blunt Trauma = Spleen

Amal | Which Blunt abdominal organ most common injured in children = Spleen

Amal | 12 Y/O, sore throat and fever 2 weeks ago, still in his soccer clothes, acute abdominal pain, Tachycardia, Tachypnea and Mild hypotension, c/o intense pain in LUQ, Which of the following is most definitive study for Dx = Abdomen CT (Not US)

- Spleen rupture post Infectious mononucleosis

Final | Patient had URTI last week, presented with LUQ abdominal pain after playing football he is in shock, diagnostic investigation = Abdominal CT

Final | Pedestrian accident with high HR, and Low BP = Splenic rupture (Not Femoral nor Frontal lobe)

Final | Child had abdominal trauma 3 days ago now complain of severe pain with hypotension = Rupture spleen hematoma

Final | case of RTA or handlebar (not sure ?) Came after days with abdominal pain, pale, vitally unstable, low Hb .. they provided ultrasound picture (showed free fluid around spleen), Dx = Splenic hematoma rupture (Not complication of duodenal hematoma nor pancreatic injury)

Final | Trauma to LoC pain, Shoulder pain, Spleen laceration, Dx = CT

Final25 | Blunt abdominal trauma patient, unstable most common organ injury = Spleen (Not Liver nor Pancreas)

Late Presentations of Intra-Abdominal Trauma

Some children with abdominal trauma do not have evidence of intra-abdominal pathology on initial evaluation but may return days or weeks later with abdominal distention and/or pain, persistent emesis, or hematochezia. In particular, three injuries are characterized by late presentations: (i) pancreatic pseudocyst (previously discussed), (ii) duodenal hematoma, and (iii) hematochezia.

Intramural duodenal hematoma is an uncommon injury that results from a direct blow to the epigastrium (blunt force delivered by a small-diameter instrument such as a broom handle or the toe of a boot) or from rapid deceleration (e.g., in the lap belt syndrome) and may cause partial or complete gastric outlet obstruction. Bleeding into the wall of the duodenum causes compression and resultant symptoms of intestinal obstruction, including pain, bilious vomiting, and gastric distention.

Diagnosis is made by ultrasonography, contrast upper gastrointestinal study, or a CT scan revealing the "coiled-spring sign" or a soft tissue mass in the bowel wall. Injury of the pancreas must be suspected when duodenal hematoma is considered. Nonoperative management includes nasogastric decompression and parenteral nutrition for up to 3 weeks.

Rupture of the gallbladder is rare and is almost always associated with severe blunt trauma to the liver. It will almost always be accompanied by severe peritonitis. Likewise, hematochezia is associated with hepatic trauma and is a result of pressure necrosis from an intrahepatic hematoma or direct injury to the biliary

Chapter 4: Trauma

- Abdomen Trauma

- Blunt = Spleen (Most common abdomen organ injury)
- Penetrating = Liver
- Delayed injury + Unstable = Spleen
- Late intra-abdomen = Duodenal hematoma > Pancreatic pseudocyst > Hematobilia > Small bowel
- After 2 weeks = Duodenal hematoma
- Handlebar = Pancreatitis (most common in children Handlebar)
 - Pancreas Pseudocyst (Ax: Handlebar, Epigastric pain, Palpable mass, High Amylase)
- Handlebar + 2wks or Bilious Vomiting = Duodenal hematoma
 - Duodenal Hematoma (Ax: Handlebar/Broom handle/Lap belt, Intestinal obstruction Sx: Bilious vomit)
- Seatbelt = CHANCE + Bowel injury
- Late Lapbelt = Duodenal hematoma
- Waddle = Long bone, Chest/Abdomen, opposite Head injury

- Delayed Abdomen Trauma

- Pancreas Pseudocyst (Ax: Handlebar, Epigastric pain, Palpable mass, High Amylase)
- Duodenal Hematoma (Ax: Handlebar/Broom handle/Lap belt, Intestinal obstruction Sx: Bilious vomit)
- Gallbladder Rupture (Peritonitis/Fever, Rebound/Guarding)
- Hematobilia (Ax w/ Liver injury, Pain RUQ radiating to Rt. Shoulder, Jaundice, Upper GI Bleed)
- Spleen Injury (Kehr Sign Pain LUQ radiating to Lt. Shoulder)

- Pancreas injury

- Tx: NPO, NGT, IV Fluids

PEM R | 5 Y/O abdomen pain, falling while jumping on water trampoline earlier day, hit abdomen on edge of structure, since then pain increasing, and had severe vomit, abdomen soft but tender in Epigastric, Temp 36.8, HR 100 RR 20 BP 100/70, initial labs AST 75 ALT 65 Amylase 500 Lipase 1650, Urinalysis 2 RBC/hpf, Tx = Begin IV fluid, Place NGT

Promo | Child landed on his trunk complains of pain after 4 days, Dx = Pancreatitis (Not Duodenal hematoma)

Promo | 6 Y/O in ED w/ Abdomen pain after handlebar injury yesterday riding his bike, organ injured = Pancreas (Not Duodenal nor liver nor midgut)

Amal | Trauma with handlebar injury, bilious vomiting, abdominal pain whenever he is eating. High pancreatic enzymes, Lipase: 600 Amylase 300, next step = CT and insert NGT

Final | Child was playing landed on his trunk complain of pain after 4 day what is the Dx = Pancreatitis (Not Duodenal hematoma)

- Hollow viscus Injury

- Duodenal hematoma
 - Sx: Bilious vomit, Abdomen pain, Distension
 - Complication: Intestine obstruction

Promo | Which injury most likely to be missed by CT in Pediatrics = Duodenal rupture (Not Splenic rupture nor Liver laceration nor Aortic disruption nor Pancreatic Tear)

Promo | Abdomen trauma, decided to discharge pt., late abdomen organ Sx appear in 2 weeks = Duodenal hematoma (1-2wk) (Not Pancreatic Pseudocyst (6wk) nor bowel perforation or Splenic hematoma)

Promo | 10 Y/O Girl, involved in MVA brought to you w/ RUQ Abdomen pain, GCS 15, Vitally stable, after how long this patient w/ Duodenal Hematoma would appear in ED = 2 wk

Amal | 10 Y/O old boy fell from bike, in ED facial injury & Abd pain, GCS15, fracture central upper incisor with pull fracture, later he came with vomiting, diagnosis duodenal hematoma, when duodenal hematoma usually present = 2 Weeks

- Duodenal hematoma more common than pancreatic cyst (not pancreatitis)

Chapter 4: Trauma

Amal | 11 Y/O, MVA low speed, free of any significant injury and discharged, next day has abdominal pain and vomiting, hemodynamically stable, with significant rebound tenderness. Most likely cause = Small bowel injury (Not Spleen laceration nor Liver contusion)

Amal | Cornerstone of Dx of small bowel injury in trauma in pediatric is = Serial physical Examination (Not Abdominal X-ray of free air nor FAST scan nor Abdominal CT without contrast)

- Corner stone of diagnosing small bowel injury = Serial physical exam
- Gold standard of diagnosing small bowel injury = CT with Contrast

Final | Child fell on toy, in ER after 3 days abdominal pain = Complication of duodenal hematoma (depend on choices provided)

Final | Which injury most likely missed in CT pediatric = Duodenal rupture (retroperitoneal)

Final | Child with Abd Trauma 3 days came with greenish emesis HR 200, Next step = Give IVF bolus

Final | Scenario of Duodenal hematoma Ax w/ = Pancreatic injury

- Handlebar Injury

- Injuries: Pancreas > Duodenal hematoma > hemobiliary > small bowel
- Tx: ATLS approach to Abdomen injury

PEM R | 15 Y/O Hx falling 15hr ago and his bicycle handlebar hit him in abdomen, has poor oral intake w/ x1 vomit, HR 86 BP 120/80, RR 17, Ex 2cm circular contusion of LLQ, labs sent, morphine, eFAST RUQ (fluid in Morison pouch), Next = CT Abdomen

PEM R | 12 Y/O boy, Abdomen pain worsening over 2 days, Hx of riding down hill w/ scooter 1 week ago & fell on handlebar to abdomen, No vomiting, HR 88 BP 119/85, Epigastric tenderness no rebound/guarding/mass/bruising, likely injury = Pancreas

Promo | Bilious vomiting post handlebar injury, Dx = Duodenal hematoma (Not Pancreatic Hematoma nor Gastric Perforation)

Final | Handlebar bicycle trauma post 10 days present by abdominal pain and vomiting = Duodenal hematoma (Depend on choices provided)

- Seatbelt Injury

- Injuries:
 - Abdomen wall bruise and/or Flank ecchymosis (seatbelt/strap pattern)
 - Intra-Abdomen injury (Spleen/Liver, Duodenal perforation, transection of small bowel, pancreatic, bladder)
 - Vascular injury (Mesenteric or Aorta disruption)
 - CHANCE fracture (Most common L1 = Conus medularis)
- 3 points belt injury (high riding shoulder restraint):
 - Carotid injury
 - Shoulder
 - Chest
 - Pelvis
- Sx: Abdomen wall bruise, Lumbar fracture, Intra-Abdomen injury
- Tx: ATLS approach, Intra-Abdomen injury suspected = OR
- If Q about what liability of vascular injury w/ Lap belt it is Aortic injury
- CHANCE fracture look for abdomen injury | Pelvis injury look for diaphragm rupture
- AAP Seat Recommendation (Approximated): 3-6-12
 - < 3 Y/O = Rear facing (use as long as possible till Wt: 40-50lb or 22 kg)
 - < 6 Y/O = Forward facing with harness (many seats support Wt: 65lb or 30 kg)
 - < 12 Y/O = Booster seat (use until adult seatbelt fits properly at 4'9" or 145 cm or 8-12 Y/O)

PEM R | 6 Y/O girl rear passenger w/ head on MVA collision, restrained w/ lap/shoulder belt, No LoC but has severe abdomen pain, HR 85 BP 108 RR 25, x1 bilious vomit, Ex abrasion of Lt side neck, ecchymosis on abdomen at umbilicus, tenderness over

Chapter 4: Trauma

entire upper abdomen, CT shows Large mesenteric hematoma w/ Laceration of duodenum & duodenal hematoma, Next = Immediate OR

PEM R | 9 Y/O male, 6hr after Low MVA, restrained back seat w/ lap belt, now has back pain, HR 115 RR 23 BP 110/70 GCS 15, Cooperative but uncomfortable, Abdomen midline tenderness, No rebound/guarding, (image of bruises abdomen), which fracture types commonly Ax = CHANCE

Final | Trauma patient w/ Lap belt sign = CHANCE Fracture & Bowel Injury

Final | MVA, rear seat passenger with lap belt sign associated injury = Chance fracture

Final | Patient w/ Hx of trauma & "Pic of seat belt signs" and now he is hypotensive, what is the next step = Bolus of NS

- Waddle Triad

1. Long Bone (Femur fracture in child, Tibia/Fibula in Adults)
2. Chest/Abdomen Injury (Spleen if hit on left or Liver if hit on right)
3. Head injury (Contralateral side to all other injuries)

Final | Pedestrian child was hit by MV while he is trying to take his thrown ball, taken to ED, he is in severe pain CGS 14/15.

What is the suspected injury (Waddle triad) = Femur fracture, spleen laceration, head trauma (Not Occipital fracture, humerus fracture, pelvic Fr. Nor Frontal lobe contusion, liver laceration)

Final | Pedestrian child was hit by MV while he is trying to take his thrown ball, taken to ED, he is in severe pain CGS 14/15,

What is the suspected injury = Occipital fracture, humerus fracture, pelvic (unsure but other choices are not right: Frontal lobe contusion, Liver laceration, or C7 Fracture)

Chapter 4: Trauma

GU Trauma

Urinary Tract Trauma

- Kidney Injury

- Abdomen trauma Ax w/ 10-20% GU Trauma 65-90% of them are Renal Injuries
- Invx: Urine dipstick/Urinalysis, CT w/ Contrast & delayed Urographic excretory phase (Gold Standard 98%)
- Complications:
 - Early: Delayed hemorrhage, Urinary extravasation, Abscess, Ureter obstruction (due to clot)
 - Late: AV Malformation, HTN
- Tx: HD Unstable = OR
 - HD Stable
 - Grade 1 Contusion (80%) = Dischargeable
 - Grade 2 < 1 cm Laceration = Admit for observation
 - Grade 3 > 1 cm Laceration = Admit for observation
 - Grade 4 = Admit for Surgical repair
 - Grade 5 = Admit for Surgical repair +/- Nephrectomy
 - Laceration all renal = OR
- Kidney Injury F/U:
 - During admission: Urinalysis until no gross hematuria
 - After discharge: Urinalysis until no more microscopic hematuria
 - BP yearly
- Indication of Kidney CT:
 - Penetrating Abdomen w/ Flank Tenderness or Mico ≥ 5 Hpf
 - Blunt Abdomen +
 - HD unstable
 - or Gross Hematuria
 - or Micro ≥ 50 Hpf
 - or High energy deceleration (6m fall or 64 km/hr)

Management/Diagnostic Testing

Hemodynamically stable patients who present with suggestive clinical findings, gross hematuria, **microscopic hematuria of more than 50 RBCs/hpf**, major associated injuries, or a history of significant deceleration injury should undergo radiographic evaluation. Obtain a contrast-enhanced CT scan with delayed images. Children who remain unstable despite resuscitative measures should undergo a one-shot IVP before emergency laparotomy. **Children with isolated microscopic hematuria of less than 50 RBCs/hpf do not require immediate imaging.** These patients may be discharged and can be evaluated on an outpatient basis with CT, IVP, or ultrasound if hematuria persists. However, in some pediatric trauma centers, management of these patients involves hospitalization for observation, followed by nonemergent radiographic evaluation.

The diagnostic performance of imaging modalities as they relate to the evaluation of renal trauma is reviewed below:

AAST CT Grading + Management		
1	Contusion & Hematuria Hematoma Subcapsular	
2	Hematoma Peri Renal Laceration < 1cm	Admit 24hr Observation
3	Laceration > 1cm	+ IVF, Abx, Serial Ex & CBC
4	Laceration Cortex > Medulla > collecting duct Vascular Injured Main Artery/Vein & Contained Hemorrhage	Serial CBC + Surgical Repair
5	Laceration Complete Shatter Vascular Cut Main Artery/Vein	+/- Nephrectomy

PEM R | 9 Y/O Fell 12 feet from tree landed on back, Lt. flank pain, HR 100 BP 108/82, bruise/tender Lt. flank, Urinalysis 200 RBC/hpf, Tx = CT Abdomen w/ IV Contrast & delayed Urographic phase

PEM R | 13 Y/O boy w/ Rt. Flank injury, after a player hit him, now vitally stable but ecchymosis/tender Rt. Flank w/ frank gross hematuria, CT scan shows 4cm laceration of renal cortex, after intranasal fentanyl no more pain Next = Admit for observation

PEM R | 9 Y/O back pain for being thrown from horse into fence HR 90 RR 20 BP 100/60, UA many RBC/hpf, Hgb 14, otherwise asymptomatic, Next = CT Abdomen/Pelvis w/ IV Contrast

Chapter 4: Trauma

PEM R | 5 Y/O Female, after puncture wound to Lt flank witnessed 1 hr ago by 12 y/o brother as she was playing in garage & fell on screwdriver embedded up to base of handle which then removed by family, vitally stable, Ex small puncture w/ crusted blood on Lt flank, Abdomen soft lax no tenderness, voided once normal color, Next = Obtain triple contrast Abdomen/Pelvis CT

PEM R | 10 Y/O MVA, GCS 15 Alert/Calm, HR 130 BP 110/55, having soft non distended/tender/rebound/guarding abdomen, initial labs HCT 34% ALT 25 AST 35 Amylase 10 Lipase 10, Urinalysis 10-20 WBC/hpf, FAST negative, 1L NS over 30min, within 2hr observation, HR 125 BP 100/55, HCT 33% given 1L bolus, Best justifies Emergent Abdomen/Pelvis CT = Need for repeated bolus

PEM R | 15 Y/O girl fall from horse saddle thrust into her abdomen, complains of diffuse abdomen pain w/ circular erythema & tenderness on LUQ, GCS 15 HR 130 RR 22 BP 130/75 SpO2 97%, CT after stabilization (Bleed over spleen/kidney both shattered), Next = Emergent Surgical consult for Vascular compromise (Grade 5 Renal Shattered/Avulsed Kidney > Surgery)

PEM R | 5 Y/O thrown off ATV, has Lt flank pain, he was stabilized/treated, CT scan (shows kidney contusion), after full recovery, family counseling on long term F/U of = BP yearly

Promo | True about kidney injury = 80% grade 1 (Not Crash is grad IV)

Promo x2 | Pt. W/ Flank trauma when to consider Radio evaluation = Urine RBC 50/mm (Not 20/mm or 40/mm or 5/mm)

Promo | 9 Y/O Girl w/ Abdomen blunt trauma from being kicked by her brother on Rt. Cost o-here if angle, RBC in urine to do CT Abdomen = ≥ 50

Promo | Indication of Renal Radiology evaluation = Gross Hematuria (Not Microscopic Hematuria > 10 RBC/HPF (IF > 50))

Amal | 10 Y/O boy, blunt trauma to right flank. On Ex tenderness to right flank, what is the minimum level of microscopic hematuria to initiate imaging for suspected genitourinary injury = 50 RBC/hpf

Amal | 6 Y/O boy, following of a fall from swing in playground play, pain over left Upper quadrant, Urinalysis showed +3 blood in dipstick, US showed hematoma over left upper pole of kidney, the most appropriate next step = Abdominal CT (Not IV urogram)

Final | Case of trauma CT show kidney injury but vital sign not improved = OR

Final | Trauma case with abdominal pain and dark urine CT showed kidney injury and patient still hypotensive, next step = OR (Not Repeat abdominal CT or IV pyelogram or FAST)

Final | Renal injury = 80% class I

- Ureteral Injury

- Info: < 50% missed in initial evaluation then diagnosed within 24hr due to gradual Sx development
- Types: Partial tear, Complete tear
- Sx: Hematuria (not-reliable, absent in 40%), **Enlarging flank mass w/ Absence of Retroperitoneal bleed**
 - Non-specific, Delayed: Fever/Chills, Ileus, Lethargy, Pyuria, Bacteriuria, Flank pain
- Invx: Urinalysis (Hematuria absent 40% of cases), Trauma Panel
 - Imaging: US, CT Abdomen
- Tx: ATLS Approach
 - Surgical:
 - Partial Tear = Stent
 - Complete Tear:
 - < 10 Days since injury = Surgical Repair
 - > 10 Days since injury = Urinary diversion & delayed definitive repair

Final | 6 Y/O case of RTA with lap belt 5 days ago, he was seen in ED and Abd CT showed multiple lumbar fractures with no retroperitoneal hematoma, discharge on rest and supportive care, presented today with fever and pyuria, **Abdomen US showed flank mass and hematoma** = Ureteral injury (Not Spleen rupture nor Bladder Extravasation nor Shattered kidney)

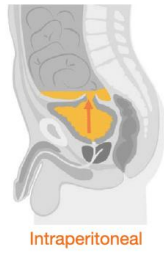
Chapter 4: Trauma

- Bladder Injury

- 80% w/ Pelvic Fracture & High probability w/ each Pubic rami Fr. (10% of Pelvic Fr. has Urinary tract injury)
- Peds Risk Factor: Higher abdominal location, Full bladder, Bladder dome is the Weakest point
- Sx: Abdomen or Suprapubic pain/tenderness, Difficult voiding, Dysuria, Hematuria (reliable, 100% of cases)
- Associations:
 - Combined bladder rupture Ax w/ Gunshot
 - Extraperitoneal bladder rupture Ax w/ Pelvic Fracture (Most common)
 - Intraperitoneal bladder rupture Ax w/ Abdomen blow, (Palpable fluid, Signs of Peritonitis, High Urea)
 - Spontaneous bladder rupture Ax w/ Myelodysplasia undergone Bladder augmentation
- Invx: Urinalysis, U/E
 - Pelvic XR (Ax w/ bladder rupture: Widening of Sacroiliac joint, Symphysis pubis, Sacrum Fr.)
 - Retrograde XR Cystography or CT Cystography (Contraindicated in urethral injury)
- Tx:
 - Intra-peritoneal (Bladder rupture w/ content in peritoneum + dye all over abdomen)
 - Tx: Surgical Repair
 - Extra-peritoneal (Bladder injury + dye around the bladder):
 - Tx: Conservative + Urine Cath/Suprapubic Drain, Surgical (if FB/bony fragment)
- **Suspected Bladder Trauma > Hematuria > Do Retrograde urethrogram > IF normal > Do Retrograde cystogram**

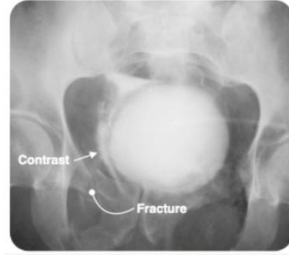
Intraperitoneal rupture

- Trauma to lower abdomen when bladder is distended
- Bladder dome is weakest point, ruptures most commonly
- Contrast seen in **paracolic gutters** and between **loops of bowel**



Extraperitoneal rupture

- Almost always associated with pelvic fractures
- Usually close to **base of bladder anterolaterally**



PEM R | 7 Y/O girl MVA unrestrained rear, No LoC, Tenderness on lower abdomen/pelvis, no bruise, unclear if there is instability, Morphine & 20 ml/kg NS given, Urinalysis contains blood, Pelvis XR shows Lt. inferior pubic ramus Fr., concerned for bladder injury, Test = CT Cystography (Not POC Bladder US nor Abdomen CT non contrast nor Pelvic XR)

PEM R | 14 Y/O MVA, obvious pain Temp 37.3 HR 110 RR 25 BP 125/80 SpO2 99%, having gross hematuria has XR shows multiple pubic rami fractures, w/ CT Abdomen/Pelvis confirms pelvic fracture but otherwise non-diagnostic, Retrograde urethrogram normal, further imaging likely to confirm = Retrograde Cystogram

PEM R | 14 Y/O in ambulance, pedestrian struck, primary survey normal, secondary survey has abdomen/pelvis tenderness without gross instability, blood at penile meatus, CT w/ IV contrast minimal displaced pubic ramus fracture, Next = Obtain retrograde urethrogram

- Abdomen/Pelvis instability > CT Abdomen/Pelvis w/ Contrast > Blood at meatus > Retrograde urethrogram > if normal put catheter > Retrograde Cystogram

PEM R | 15 Y/O unrestrained front passenger in MVA, BP 102/64 HR 110, GCS 15, has contusion & abrasion & tenderness of head & abdomen w/ anterior compression tenderness of pelvis (XR shows pelvis fracture), further imaging includes = Retrograde urethrogram (not US of bladder or MRI abdomen/pelvis or voiding cystourethrogram)

Final | RTA case, CT showing Extra Peritoneal bladder rupture, Tx = Suprapubic drainage

Chapter 4: Trauma

- Urethral Injury

- Types: Blunt & Penetrating (Iatrogenic (difficult urethral cath. > mucosal injury + scarring stricture formation))
- Sx: Hematuria or Blood at the meatus may be seen, decreased stream or inability to void
- Invx: Retrograde urethrography
- Tx: Consult Urologist, Bladder drain by Urology Cath or Suprapubic then Delayed evaluation & Reconstruction

PEM R | 15 Y/O fell striking perineum on crossbar, Blood at meatus w/ perineal hematoma, test = Retrograde urethrogram

PEM R | 8 Y/O boy, inability to void after bicycle accident earlier that day, hit his genitalia on crossbar, now has penile pain & inability to urinate, vitally stable, Image (blood at meatus), Next = Retrograde urethrogram

PEM R | 16 Y/O Female, middle backseat passengers between 2 large persons, driver and front seat passenger were airlifted from scene, she is on backboard/C-Spine, on Ex Suprapubic tenderness, tender pelvis, blood at vagina, HCT 30% AST 55 ALT 75, Urinalysis 50-100 RBC/hpf, After 1L NS, HR 100 RR 25 BP 105/55 SpO2 97%, CT Pelvis (multiple Fr), Next = Retrograde urethrogram

PEM R | 14 Y/O MVA in ED in obvious pain, Temp 37.3 HR 145 RR 30 BP 85/90 SpO2 99%, Lungs clear, +2 central +1 peripheral pulses, has suprapubic fullness, pain w/ pelvis pressure, blood at urethral meatus, given IV 1L, FAST free fluid in Pelvis, Next step in GU injury = Exploratory Laparotomy

Final | Straddle injury unable to void = Retrograde urethrogram

Final | Straddle injury Dx = Retrograde urethrogram

- Indication of Retrograde urethrogram

- High riding prostate
- Blood at urethral meatus/vagina
- Suspected Bladder injury (distended bladder may present w/ urethral disruption & preclude bladder cath until retrograde urethrogram has been performed)

Promo | 12 Y/O Boy MVA, Lower Abd pain, Blood in urine, Digital Rectal Ex high riding prostate, Next = Retrograde urethrogram

Amal | 12 Y/O boy playing on trampoline, fell and came with abdominal pain, on examination high riding prostate, what next step = Retrograde urethrogram (Not Abdominal US nor Abdominal radiograph nor IV Pyelogram)

Genital Trauma

Male GU Trauma

- Emergent urology consults for Straddle injuries:

- Penile injury: at Ventral surface (underside)
- Scrotal injury: Dartos fascia exposed or Depth can't be evaluated
- Testicle rupture: Discontinued Tunica Albuginea (Surgery within 72hr)

- Scrotal Laceration

- Tx: Management depends on Dartos Fascia
 - Dartos Intact = Suture in ED by Urology + Conservative
 - Dartos Violated or Not visualized = OR Urology

PEM R | 12 Y/O fall onto top of fence w/ 3cm laceration to rt. Hemiscrotum without active bleed, has intact dartos fascia, normal testicle lie, slight larger plane Lt w/ tenderness to palpation, US Rt hydrocele no disruption of tunic

PEM R | 16 Y/O male slipped in shower, he broke the shower glass during fall, 3x2 laceration Lt. scrotum, no swell/bleed, Rt. Scrotum, Abdomen normal, testes non-tender, Urinalysis Negative, Next = Explore the wound, repair in ED if dartos is intact

Chapter 4: Trauma

Final | Child broke shower glasses, Laceration on Lt Hemiscrotum, Bleeding controlled w/ pressure Rt. Side normal, Next = Explore & suture can be done in ED if Dartos muscle intact

Final | 16 Y/O male slipped in the shower. He broke the shower glass during his fall. Upon examination, you note a 3 x 2 cm laceration to his left scrotum, There is no swelling, and bleeding is controlled with pressure. His right scrotum and penis are uninjured. Both testes are nontender, and his abdominal exam is normal. A urinalysis shows 0-3 RBC/hpf. What should be done next in the management of this injury = Explore the wound, repair in the ED if the dartos is intact (Not OR or retrograde urethrogram or testicle US w/ doppler)

Final | Slipped in the bathroom with scrotal laceration: = Examine if dartos intact repair in ER

- Scrotal Hematocele

- Scrotal hematocele (within Visceral/Parietal layer of tunica vaginalis)
- Scrotal hematoma (scrotal wall)
- Tx: Conservative
 - OR Indication: Expanding, significant discomfort, compressive of testicle

PEM R | 18 Y/O man fell straddle injury & closed head injury, has 5/10 Lt testicle pain worsen when stand up, urinate without pain/hematuria, vitally stable, awake/alert, having Lt & central scrotum hyperpigmentation, tender to light touch, US complex Lt scrotal fluid collection within scrotal wall inferior to Lt testis, Next step = Discharge w/ supportive care

- Testicle injury

- Testicle fracture
 - US: Preserved Tunica Albuginea, Linear Hypoechoic bands
 - Tx: Conservative
- Testicle rupture
 - US: Discontinuity of Tunica Albuginea, Testicle contour/capsule irregular, Echogenicity affected
 - Tx: Emergent Surgery (72hr window)

PEM R | 15 Y/O male, scrotal injury struck by rapidly moving lacrosse ball in groin, having severe pain/vomit, in ED well appearing, with significant Lt testicle tenderness and US Lt testicle Hypoechoic w/ irregular capsule, Next = OR

PEM R | 15 Y/O boy GU injury while playing soccer kicked in groin, having ecchymosis, tender Lt testicle, US finding that will indicate operative management = Rupture of Tunica Albuginea

PEM R | 16 Y/O boy, kicked in scrotum by horse, having severe scrotal pain, HR 80 BP 130/80 RR 18 SpO2 99% on RA, has swelling/bruising/tenderness on Rt. Side of scrotum, penis intact, no blood at meatus, abdomen soft non tender, pelvic stable, IV morphine, Next = Testicular US

PEM R | 13 Y/O w/ Rt. Scrotal pain after skateboard fell on Rt. Scrotum, Has swell/discoloration, voided without change in color/pain, Abdomen soft/lax, Cremasteric reflex Absent on Rt., Ex (swollen Rt. Scrotum), Surgeon will be in ED in 1hr, while waiting next = Testicular US w/ Doppler

- Testicle insult repair

- Testicular torsion within 6hr
- Testicular rupture within 24-72hr

- Penile Laceration

- Sx: Short period of Dysuria, Hematuria
- Complications: Stricture, Fistula, Incontinence, abscess, erectile dysfunction
- Tx: Anterior (Bulbous) = Observation or Cath. Drain or Suprapubic Drain
 - Posterior (Prostate/Membranous) = Complicated, Realignment, Suprapubic drainage

Chapter 4: Trauma

- Ventral (downside) = Urology

PEM R | 8 Y/O Healthy boy, w/ genital injury climbing chain link fence w/ 2 peers and slipped & sustained straddle injury at top of fence, finding likely warrant urgent surgical evaluation = 1.5 cm laceration to ventral surface of penis

PEM R | 13 Y/O male fell into bicycle crossbar, has penile pain, difficult urination, produces gross bloody urine and now unable to void, have small anterior urethral tear, Next = Consult surgery for Urine Cath placement

- Penile fracture

- Sx: Hx of direct injury, Flaccid, Ecchymosis, eggplant shaped
 - Severe Hematoma/Swelling of shaft, Angulation opposite to injury side
- Tx: OR repair within 36hr

PEM R | 8 Y/O in ED straddle injury on a fence falling forward & landing directly on center of groin, severe pain, on Ex ecchymosis eggplant shaped penis, testis normal, urinalysis normal, Next = Admit for OR next morning

PEM R | 2 Y/O w/ straddle injury, swelling of penile shaft, most consistent to penile fracture = Severe swell of penile shaft

- Zipper

PEM R | 17 Y/O boy foreskin caught in zipper, best approach = cut median bar zipper with wire cutter

PEM R | (follow up of Q above), unable to tolerate any Tx due to significant pain of injury, approach of analgesia = Inject anesthesia at 2 & 10 o'clock at base of penis 3-5 mm deep (always aspirate not to inject into blood vessel)

PEM R | 3 Y/O attempting to dress himself when penis caught by zipper, initial method to release = Cut median bar of zipper fastener w/ wire cutters

PEM R | 6 Y/O uncircumcised male w/ foreskin trapped in zipper Next = Cut median bar w/ wire cutter to release

Amal | 3 Y/O zipper penile trap, next = cut median bar of zipper using wire cutter

- When using electrical Saw cutter needs to apply continuous water on it

Final | Boy with penile zipper injury as shown. Best action = Cut median bar with cutter

Final | Zipper entrapment = local Anesthesia (at 10 o'clock and 2 o'clock)

Female GU Trauma

- Vaginal bleeding

- Penetrating injury
 - Active bleeding from vaginal OS without visible external injury
 - Tx: under Anesthesia examination (by Uro or Ob/Gyn)
- Indication of Female GU Ex under Anesthesia
 - Active bleed from introitus
 - Penetrating injury led to vaginal laceration (Fleisher)
 - Deep Laceration of Lower genital tract
 - Laceration beyond vagina involving Perineum/Urethra/Rectum causing Anatomical disruption
 - Foreign body

PEM R | 2 Y/O climbing in kitchen witness fall on edge of open cabinet penetrating on genitalia, brought by parent, on Ex wound from Labia majora through posterior fourchette to perineum, No Involvement of Urethra/Rectum, Moderate ongoing hemorrhage despite pressure at area, No blood at urethral meatus & able to urinate, AP/Lateral Pelvic XR stable, given IV opioid for pain, Tx = Examination under GA

Chapter 4: Trauma

PEM R | 2 Y/O girl blood in underwear playful & no sign of injury, what sign indicates of urgent urology = Bleeding from vagina without external injury

Promo | 2 Y/O Blood in underwear after daycare, currently active/playful, no sign of injury on Ex, Indication for urgent surgeon evaluation = Bleeding from Vagina without External injury

Final | Girl with straddle injury came with small laceration in labia with minimal blood oozing what is the next step =

Examination under anesthesia (Not Discharge on sitz bath)

- Oozing from introitus = Exam under anesthesia

- Female Straddle injury

- Blunt = Minor Unilateral hematoma, Abrasion, Superficial laceration
- Penetrating = Depend on Mechanism, Consider Abuse
- Tx: Moderate Hematoma = Ice pack & Analgesia
 - Large Hematoma + Can't urinate = Foley's Cath
 - Vulvar Abscess or Vulvar Hematoma Expanding or HD Unstable = Surgery

PEM R | 9 Y/O fell off her older brother bike, struck perineum in bicycle cross bar, pain in perineal area, has vaginal bleed, 2cm hematoma in inferior aspect of Rt. Labia majora, XR Pelvis no fracture, No hematuria, Tx = D/C w/ Ice pack & Analgesia

PEM R | 12 Y/O girl climbing over fence, having 1.5 cm vertical non bleeding laceration on Lt labia majora without hematoma, key component for ED management = Discharging home & recommend Sitz bath

Final | Girl w/ Straddle injury, Ongoing bleeding & vaginal wall laceration, Next = Surgical exploration (if no bleeding Sitz bath)

Final | Straddle injury in girl with small abrasion no bleeding, Hymen intact next = Sitz bath, Vaseline, and discharged

Chapter 4: Trauma

Hip/Pelvis Trauma

- Pelvic Fracture
- Pelvic Binder
 - o Binder or Sheet
 - o Location: Greater Trochanter of Femur !

PEM R | 13 Y/O girl ATV rollover w/ Lower abdomen bruising likely pelvic fracture, stabilize landmark = Greater Trochanter

PEM R | 9 Y/O girl, unrestrained in High MVA, No LoC, Severe pelvic pain, IV placed/fentanyl given, HR 140 BP 88/68, Tender pelvis w/ instability, Non-tender abdomen, given 20ml/kg NS, Pelvis XR (shows fracture), Next = Wrap sheet at level of greater trochanters of femur (Temporary stabilization bcz pt. HD Unstable)

Promo | 4 Y/O involved in RTA hit by truck thrown to other side of street on arrival XR hip, for open book pelvic Fr., false answer is = Less mortality in children (Risk of bleed, Not Need high force to cause injury or need immediate surgery)

Final | Involved in trauma w/ Tender pelvis, Pt. still Hypotensive after boluses what kind of pelvic trauma causes significant hemorrhage = Anterior & Posterior

- o Open book pelvic fracture = Anterior & Posterior

Final | Pelvic Fr. Associated w/ hemorrhagic = Anterior posterior pelvis fracture

- Hip Dislocation
 - o Rare but mostly Posterior dislocation, usually Reduced Spontaneously
 - o Complications: Osseous necrosis (If delayed Reduction > 6 hr)
 - o Invx: XR (enough), CT/MRI (If Evaluating adequacy of reduction if Unstable or Widening of joint space)
 - o Tx: Ortho Consult
 - Closed Reduction under Sedation
 - W/ Hip/Knee Flexed 90 degrees & Pelvis stabilized, Longitudinal traction along axis of femur then femoral head gently manipulated back into Acetabulum
 - During Dislocation Posterior labrum & joint capsule may detach & once reduced may get trapped in joint space (spontaneous or closed reduction)
 - Open Reduction (If closed failed)

Promo | 11 Y/O on bicycle struck by car on Lt. side falling on Rt. Hip, had initial numbness of foot but not anymore, HR 87 RR 18 BP 134/74 weight 40kg, Pelvis stable, Rt. Greater trochanter tender & positioned posterior Lt Hip flexed & held in internal rotation/adduction, can't Active/passive ROM of Rt. Hip/Knee, Intact distal NV, after 4mg IV morphine, XR Rt. Pelvis/Hips/Femur, XR shown (Hip dislocation) Next step = Closed reduction under Sedation or D/C w/ Instructions no bear weight 4 weeks or Open reduction internal fixation or Placement of hip spica cast

- Avulsion fracture of Anterior inferior iliac spine (AIIS)
 - o Sx: Pup in pelvis, Anterior hip pain, hip flexion weakness,
 - o Tx: RICE (Crutches or partial or no weight bearing), No OR

PEM R | 15 Y/O male runner, w/ Rt. Hip pain both at rest & ambulation especially when climbing stairs, No swell/bruise/skin changes, has pain w/ Active flexion of hip, tenderness on palpation of inferior to anterior-superior iliac XR (minor chip fracture on rt. Side of iliac crest), Pathophysiology = Apophyseal weakness relative to tendon

Other | Adolescent was playing football then felt a pop on right, management = Analgesia and non-weight bearing

Final | Adolescent playing football, heard a pop w/ pain on Rt. Pelvic = Analgesia & Non-weight bearing

Final | Avulsion of ischial tuberosity = Pain control + non weight bearing

Final | Avulsion of iliac crest Tx = Non-weight bearing

Chapter 4: Trauma

Orthopedic

Fractures

General

- **Salter-Harris Classification (SALTeR)** = Fracture In Growth plate (Physis)
 - o Type 1 = Straight across (Separating Epiphysis & Metaphysis)
Dx Clinically w/ Point tenderness, may not be seen in XR
 - o Type 2 = Above (Physis to Metaphysis)
 - o Type 3 = Lower (Physis to Epiphysis)
 - o Type 4 = Two or Through (Epiphysis to Physis to Metaphysis)
 - o Type 5 = Rammed together (Epiphysis & Metaphysis Smashing Physis)
- **Ogden = Continuation of Classification**
 - o Type 6 = Peripheral Physis (Peripheral Physis Sheared w/ surrounding structure)
 - o Type 7 = Epiphysis (Epiphysis Pulled off by ligament)

Promo | Fr. Extending to Metaphysis, which Salter = 2

Promo | Fr. Resulting in complete separation of Epiphysis from Metaphysis with a portion of Metaphysis from the Metaphysis is SH = II or IV or III or I (Idiotic Q, they choose II)

Amal | 12 Y/O old boy, MVA, his stuck in dashboard, complaining of left knee pain and swelling, tenderness and effusion, X-ray shown (image of SALTER 2) = Distal Femur Salter Harris type 2

Amal | Salter harris fracture separate entire epiphysis and attach portion of metaphysis of the remaining metaphysis of a long bone is classified = II

Amal | Salter fractures of centers that occurs in the physis (which is the growth plate), Why is this area at risk physis interesting = It lacks mechanical strength (Not rich in bloody supply nor most brittle area nor poor blood supply)

- o Physis is Vulnerable because it lacks mechanical strength (No tendon or muscle that covers it)

- **NV Examination**
 - o OK Sign = Anterior Interosseous of Median
 - o Rock Sign = Median N. = Palmer Index
 - o Thumbs up = Radial = Dorsal Web Space Thumb/Index
 - o Spreading fingers or peace sign = Ulnar = Palmer 5th Finger

PEM R | 7 Y/O girl falls monkey bars & lands on outstretched Lt arm, Location to evaluate sensory function of ulnar nerve = Tip of small finger, palmer aspect

- o Dorsal web = Radius | Index = Median | Little = Ulnar

PEM R | 6 Y/O FOOSH (XR anterior displacement of supracondylar), unable to do OK sign = Anterior interosseous N.

Promo | Pt. W/ Supracondylar Fr., what examines the Ulnar Nerve = Paper between thumb & index & pulling it or Extension of wrist (examines Radius)

Promo | Ulnar N. = Can't take object between thumb & index

Promo | pt. W/ cut wound in his wrist, can't oppose thumb & can't abduct thumb = Interosseous or Median or Radial

Promo | 12 Y/O Girl, Hx falling down on Lt. arm complains of Pain/Swell, on Ex Tender/Swollen Lt. Elbow, XR Posterior elbow dislocation = you find in Exam = Loss of Sensation over Ulnar aspect of 5th finger

Promo | w/ Ulnar N. Injury, you suspect child can't = Abduct fingers or Extend fingers or Extend wrist

Amal | You suspect a patient had injury to his motor ulnar nerve because he is unable to = Abduct finger

Final | With ulnar nerve injury you suspect the child cannot = Abduct the fingers

Chapter 4: Trauma

- Casting
 - o Sugar tong = unstable forearm & wrist
 - o Colles = Volar support of forearm for stable fracture
 - o Gutter = Metacarpal & proximal phalanges
 - o Thumb spica = Scaphoid

PEM R | 4 Y/O w/ fracture and dorsal displacement of radius & ulna, after reduction what to use = Sugar tong splint

Pathological Fractures

- Pediatric bone injuries

Amal | Which is true regarding pediatric bone injuries = Most growth plate injuries heal rapidly (Not Growth plate injuries are uncommon nor Pediatric periosteum is weaker than adult nor Diaphyseal fractures heals better than metaphysical fractures)

- Torus or Buckle Fracture
 - o Tx: Removable functional splint 3-4 weeks

PEM R | 6 Y/O Lt wrist injury, mild swell, Lt distal radius focal tenderness 4cm proximal to wrist, NV intact, XR non-displaced torus fracture of distal radius, care = Removal functional splint

PEM R | 6 Y/O FOOSH (XR Torus), description = Torus Fracture

PEM R | 3 Y/O girl, dresser fell on her Rt. Knee, refuses to ambulate/bear weight Rt. Leg, No NV compromise, XR shows (distal , Dx = Torus fracture of distal tibia distal fibula

PEM R | (for above Q), Next Tx = Place in short leg splint

- o Distal leg fracture = Torus (Buckle fracture) = Short leg cast | Metaphyseal Fr = Consider abuse
- o Most often occurs in the distal radius

PEM R | 9 Y/O falls off hoverboard & catches herself on outstretched hand (XR Distal radius buckle Fr), immobilize = Volar splint

- Bowing fracture
 - o Complication: Fracture when reduction (tell to mother before procedure)
if not treated: deformity & abnormal growth > shortening
 - o Tx: Reduction by Ortho under PSA (might give MSK relaxant) > Cast
 - Technique:
 - Apply prolonged and direct force for several minutes to reverse the bowing
 - Brief force is not helpful, the bone will elastically spring back into its deformed shape
 - Depending on the child's size and direction of deformity, use three-point bending with a thumb, knee, or a firm folded towel as a fulcrum

Amal | 4 Y/O girl arrives to the ED was pain on the right forearm after fall noticed pain on touching the right forearm what is the most appropriate management for this (Pic of bowing fracture of ulna) = Closed Reduction with application cast application and follow up in one to two weeks (Not A cast application for one to two weeks Repeat XR nor Completion of the fracture aiming for anatomical reduction nor reassurance and Repeat the X ray in one to two weeks)

Chapter 4: Trauma

Upper Limb Trauma

Shoulder & Clavicle

URGENT ORTHOPEDIC CONSULTATION
Open clavicle fracture. Any laceration/puncture wound over the clavicle
Tenting of the skin: Can lead to pressure necrosis and an open fracture
Neurovascular compromise
Respiratory or hemodynamic compromise: Associated with posterior displacement
"Floating shoulder": Ipsilateral lateral clavicle fracture and glenoid neck fracture
OUTPATIENT ORTHOPEDIC REFERRAL (MAY REQUIRE SURGERY)
Comminuted clavicle fractures
Displaced fracture: > 1 bone width
Shortening: > 2 cm
Lateral third clavicle fractures: Types 2A, 2B and 5
Medial third fractures: Posterior displacement

- Clavicle Fracture

PEM R | 16 Y/O shoulder pain after falling from bicycle, focal tenderness w/ small break in skin over distal clavicle, NV normal, XR (distal clavicle fracture), Next Tx = Acute operative exploration (Clavicle open fracture)

PEM R | 14 Y/O skiing accident lost control collided w/ tree, HR 95 RR 18 BP 120/80 SpO2 100% on Ex equal breath/heart sound, bilateral radial pulse normal, tender Lt clavicle, XR shows Posteriorly displaced proximal clavicle fracture, Diagnostic Imaging = CT Angiography of chest

PEM R | 10 Y/O girl, injury from trampoline w/ Lt arm focal tenderness, swelling over proximal humerus, XR (shows proximal humerus fracture) likely complication = Axillary nerve injury w/ loss of lateral shoulder sensation (Shoulder Fracture)

Promo | You are in a satellite clinic where a child fell down & complains of pain, XR shows = Angulated/Displaced Transverse Mid-clavicle Fr.

Promo | Action for previous pt = Arm sling & F/U w/ Ortho or Send to ED immediate or Consult Ortho or Reassure & F/U

Promo | Which NOT Ax w/ Shoulder Dislocation = Axillary Artery injury or Axillary N. Injury or Humorous Fr. Or Glenoid Fr.

Amal | 17 Y/O boy falls and felt immediate pain in his shoulder, near your clinic medical history is unremarkable, on examination pain with movement. you gave him analgesia XR (shows at middle clavicle w/ angulated transverse displacement) = Displaced angulated transverse (Medial clavicle Fr is more risky for injuring subclavian artery which will need CTA)

Amal | (For above Q) What is appropriate conservative management step = Arm sling with follow up in 2 w

Amal | Basketball, external rotation and abducted, clear slope and difference on examination to best view to diagnose = Axillary view of shoulder (Not AP clavicle nor AP humerus nor AP left scapula nor Lateral view of humerus)

- Fleisher: Standard views for shoulder dislocation = AP, Axillary (more specific)
- Scapula view is Y view

Final | FOOSH fall down XR AP/Lateral, Normal patient, Had pain w/ supination & pronation, No Swell/Localized tenderness, NV normal, Best next = Analgesia & Re-Examination

- Posterior Clavicle Fracture Internal Thoracic Injury

- Cause: Proximal 1/3 Clavicle Fr. or Sterno-Clavicular joint Dislocation
- Pth: Posteriorly Displaced fragment >
 - Tracheal compression
 - Subclavian/Brachiocephalic vessel laceration
 - Laryngeal N. Injury (Sx: Hoarse voice)
 - Occlusion or Parenchyma injury
- Invx: XR limited can show Fr. Only, CT Angio (to r/o Vascular Injury)
- Tx: Emergent Surgery

PEM R | 14 Y/O in ED skiing when lost control and collided w/ a tree, Temp 37 HR 95 RR 18 BP 120/80 SpO2 100%, equal air entry bilateral, normal heart sound, normal radial pulses, Tenderness in Lt. clavicle, XR shows Proximal Clavicle Posteriorly displaced, Diagnostic = CT Angio of the Chest

Chapter 4: Trauma

- Shoulder Dislocation

- Anterior Shoulder Dislocation (most common)
 - Sx: Squared off appearance of Rt. Shoulder w/ prominence of acromion
 - Complications: Axillary nerve injury, Glenoid fracture, Shoulder instability
 - Ax Nerve: Axillary N. (Sensory assessed over Lateral Deltoid region)
 - XR: Hills-Sachs deformity (Increase Risk of recurrence), Bankart | Y view: anterior humerus
 - Tx: Surgical stabilization (IF Larger defect > Shoulder instability -20% Humeral head-)
- Posterior shoulder dislocation
- XR: Light bulb | Y view: posterior humerus

PEM R | 16 Y/O player having Rt. Shoulder injury w/ deformity, on Ex Rt arm abducted & slightly externally rotated, obvious squared off appearance of Rt. Shoulder w/ prominence of acromion, Hand warm/perfused, Sensory function of Nerve frequently involved in this injury, assessing region = Lateral deltoid

PEM R | 11 Y/O tripped while running hurdle and immediate shoulder pain, has shoulder uneven height, scapula on Rt. Is lower than Lt., NV intact, high student on of shoulder dislocation, XR (noted Hills-Sachs deformity), initial Tx = May require surgery to stabilize shoulder

PEM R | 16 Y/O was playing rugby after tackled from behind, has shoulder/arm pain, w/ abnormal appearance of shoulder contour, limited ROM, intact NV, XR before & after (Anterior dislocation), which correct, has risk of recurrent anterior instability = Visualized Hill-Sachs deformity increased risk

Amal | Which of the following is not complication of shoulder dislocation = Axillary artery (Not Axillary nerve nor Glenoid fracture nor Shoulder instability)

Elbow

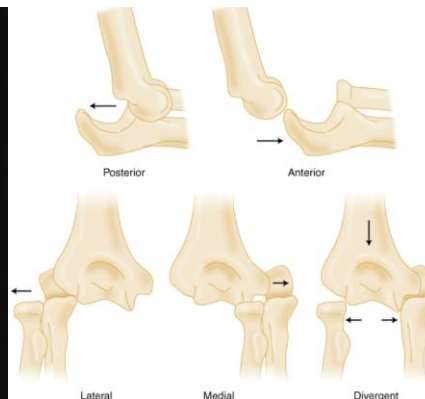
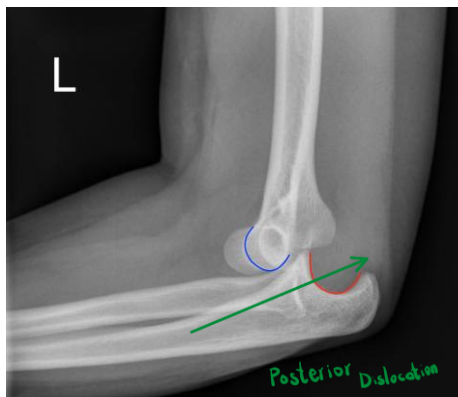
- Elbow Dislocation Nerves affected

- Posterior dislocation = Ulnar nerve injury > Median N. + Brachial Artery
- Anterior dislocation = Median nerve injury + Brachial Artery

PEM R | 16 Y/O girl Elbow injury thrown to mat during judo tournament, landed on outstretched rt arm, has elbow deformity w/ prominence of olecranon posteriorly & medially, No laceration, NV intact, XR has posterior elbow dislocation without fracture, best outcome = Closed reduction successful in Majority of cases (Posterior Elbow dislocation)

Amal | 12 Y/O boy brought to ED after left elbow injury, fell on his arm, immediate pain, placed in sling, moderate swelling of elbow, radiology reveals posterior elbow dislocation, finding most likely to present is loss of = Sensation over 5th finger

Final | 2 W/O boy, w/ his parent with severe respiratory distress, they sign DAMA from private hospital, and he was tachypneic with sat. 88% in 100% FiO₂, with no improvement. You prepare for intubation. After finishing your intubation, you connect him on mechanical ventilation. His father shows you his X-ray that was done there just before he arrived to you = Loss of sensation over ulnar aspect of 5th finger (Not Loss of sensation over thumb & index)



Chapter 4: Trauma

- **Supracondylar Fracture**
 - Transient Neuro dysfunction is common for 2-4 weeks (sometimes > 3 months)
 - **Gartland**
 - 1 = No displacement
 - 2 = Displaced Anterior cortex (Intact Posterior cortex)
 - 2A: NO Rotation
 - 2B: YES Rotation
 - 3 = Displaced Anterior/Posterior cortex
 - 3A: NO Gap
 - 3B: YES Gap (between fractured bone ends)
 - 4 = Complete disruption w/ multi-direction
 - **Supracondylar Fracture Displacement Nerves affected**
 - Posterior-Lateral displacement (Extension) = Anterior Interosseous N. of Median
 - Posterior-Medial displacement (Extension) = Radial
 - Anterior displacement (Flexion) = Ulnar
 - Medial Condyle = Ulnar
 - Lateral Condyle = Radial

PEM R | 5 Y/O fell off sofa landed on Lt Elbow on Ex Swollen tender, (XR shows Supracondylar), Next = Obtain urgent Ortho

PEM R | 12 Y/O elbow pain/deformity after falling from monkey bars, has posterior elbow dislocation, NV intact, after reduction w/ post reduction XR shows fracture fragment of epicondyle in intra-articulated, NV intact, elbow lacks joint instability, Tx = Urgent surgical intervention to remove fragment

- Medial Epicondyle
- Ax: Elbow dislocations in Peds (60%)
- Tx: Controversial except if fragment trapped in joint = Surgical removal

PEM R | 8 Y/O girl, w/ Lateral arm pain after falling from bicycle, swell/tender/mild bruise of lateral elbow, NV intact, ROM good, XR (Lateral Condyle minor fracture), assuming Lateral/oblique views shows nothing more, Next = Full arm splint or cast

PEM R | 9 Y/O gymnast fell on elbow, has focal pain/deformed/swelling elbow, strong radial/ulnar artery pulse & CRT < 2 sec, has decreased sensation on 5th finger w/ strength while attempting to spread fingers, XR (posterior supracondylar fracture), accurate description = Ulnar N. Deficit, Type 2 Supracondylar Fr.

Promo | Picture showing Gartland 3 Supracondylar Fr. W/ Severe pain & crying, Next = IV Analgesia (Not Call Ortho for OR nor Splint & Discharge)

Promo | Anterior & Posterior fat pad at Elbow = Supracondylar Fr.

Promo | XR of Supracondylar Fracture, what is true = Posterior fat pad always pathognomonic

Promo | Pt. W/ posterior fat pad sign in Elbow XR, No tenderness in forearm, Next = Cast (Not Forearm XR)

Promo | Pt. Fell down having swelling on hand (XR shows Supracondylar Fr.), Degree = Stage 3A (Not 3B or 2A or 2B)

Promo | Pt. Fell down w/ swell on hand & sent to XR, degree of Fr. (Fr. Disturbed) = Stage 3A (Not 3B or 2A or 2B)

Promo | Most likely Ax w/ this type of Fr. = Transient Neurological insult suspected (Not Vascular injury)

Promo | 9 Y/O Fell on Rt. Arm FOSH, complains of pain & limited ROM, Ex tenderness & swelling of elbow XR (Anterior/Posterior Fat pad sign), Dx = Supracondylar Fr.

Amal | 8 Y/O, medically free, presented to ED after 1 hour of sustained left elbow after fell from his bike, patient came to ED flexing his arm near to his chest, on local examination: there is swelling, severe limitation of movement, weak grip, XR (Supracondylar Fr) showed which type of injury = 3A

Amal | (for above Q) Regarding the previous patient, which is correct = Transient neurological dysfunction is common

Amal | 5 Y/O boy, complaining of left elbow pain following FOOSH, XR (shows Anterior sail sign & posterior fat pad of Supracondylar Fr). Most likely Dx = Supracondylar fracture

Final | Pt. XR Elbow (posterior fat pad signs) no forearm tenderness what to do = Cast

Chapter 4: Trauma

- Nursemaid elbow

- Subluxation of radial head or Annular ligament displacement (dislocation at radio-humeral joint by pulling arms)
- Sx: Hx pulling up arms, flexed adducted and pronated arm with pain and tenderness
- Invx: No need for imaging
- Tx: Manipulation of forearm to reduce head subluxation (Closed reduction)
 - Hyper-pronation while elbow flexed 90 degrees with marked by subtle palpable pop or click
 - Supination then Elbow flexion past 90 degrees

PEM R | 2 Y/O girl playing & nursemaid elbow = Hyperpronation to Lt arm

PEM R | 2 Y/O girl Lt wrist injury, 1 hr prior to arrival having older brother fight then sudden scream and refusing to move Lt arm, slight flexion & pronation, pain w/ movement of elbow, Next = Gentle traction of arm & Hyperpronation

PEM R | 30 M/O has arm injury 3 hours ago, Hx of dancing holding hands then fell & cried immediately w/ refusal of using rt arm holding arm at his side in pronation, mild swell around wrist but no deformity or skin changes, but no tenderness on clavicle/arm/wrist/hand, next = Attempt hyperpronation maneuver of forearm

Promo | Pt presenting w/ Nursemaid elbow

Promo | Bull out of hand by mother came w/ flexed elbow & pronation, Tx = Reduction of Subluxation of Radial head

Promo | Nursemaid elbow cause = Entrapment of Annular ligament

Promo | Anxious mother brought 2 Y/O Child, he will not move his Rt. Arm & mother tells you that she was walking in local supermarket holding his hand when he stumbled & she attempted to prevent his fall by pulling arm, child crying from pain and holding arm flexed at elbow & close to him, No swell/Tenderness anywhere on arm, Most likely = Subluxation of Radial head

Amal | Father pulled arm of his small girl, Tx = Closed reduction of radial head

Amal | 15 M/O old refusing to use her arm after playing with friends, you suspect radial head subluxation, which statement is true Hyper-pronation of the forearm with elbow extension is used for reduction

Final | Nurse pulled elbow what is the case = Annular ligament interruption

Forearm

- Forearm Fracture

- 20-40% of child fractures
- Types:
 - Shaft = Overlap
 - < 10 Y/O = 1cm
 - > 10 Y/O = None
 - Shaft = Angulation
 - < 10 Y/O = up to 20 degree
 - > 10 Y/O = up to 10 degree
 - Distal = Dorsal Angulation
 - < 10 Y/O = up to 30 degree
 - > 10 Y/O = up to 20 degree
- Tx: Angulation = Reduction | No Angulation = Cast | Open = Surgery

PEM R | 5 Y/O fall from Monkey bars on outstretched hand, has pain on dorsal hand/wrist without numbness/tingling/cool extremities, moves fingers w/ pain in wrists and obvious flexed deformity, XR (shows distal transverse Radius & Ulna fractures w/ 20 degree dorsal angulation, Tx acceptable = Reduce fracture & place in sugar tong splint, F/U w/ Ortho

PEM R | in cruise in Antarctica, 4 Y/O has Lt forearm injury after slippage on ice w/ outstretched Lt arm, no definite of Lt distal forearm, No laceration, well perfused/warm distal limb, XR shows transverse radial fracture w/ 1cm over-riding in bayonet apposition & good alignment, sugar-tong splint placed, currently in sea for 2 more weeks, and ortho only available after cruise completed, outcome = It should heal, without shortening of forearm

- Fracture at diaphysis = will heal without shortening | Fracture at Metaphysis = will heal with shortening ?

Chapter 4: Trauma

- MUGR

- MU = RedUction | PU = Proximal Ulna Fr. + Radial head dislocation | Nerve: Radius
- GR = oR | DR = Distal Radius Fr. + Radio-ulna joint dislocation | Nerve: Ulna
- ORIF Indications: Complete transverse Fr., Oblique Fr., Comminuted Fr.

PEM R | 8 Y/O Rt. Dominant hand fall from scooter landed outstretched w/ immediate pain, no numbness/tingling, swell on elbow & pain w/ movement, given intranasal fentanyl, XR (shows fracture of Ulna), Next = perform reduction under PSA

PEM R | 5 Y/O isolated injury to Lt arm FOOSH, no numbness or paresthesia, XR (Ulnar Fr.), initial Tx = Orthopedic consult for closed reduction & casting

PEM R | 18 Y/O girl w/ Lt arm pain using monkey bars slipped & fell backwards on extended Lt arms, complained of pain immediately, XR (Monteggia), absolute indication for OR = Unable to relocate radial head

- MUGR, Monteggia failure of reduction > OR

PEM R | 17 Y/O male helmeted, after falling from bicycle has swell of elbow/forearm NV intact XR (shows ulnar fracture w/ radial head dislocation), short arm cast & discharged by ortho, complication = Limited forearm supination & pronation

Promo x2 | XR Shows (Fr. of Radius & dislocation of Radio-ulnar joint) = Monteggia

Promo | Monteggia Fr. in = Proximal Ulna (MU-GR)

Amal | Regarding Monteggia fracture = Proximal ulna fracture with radial head dislocation (Not Distal ulna fracture with radial head dislocation nor Proximal radial fracture with ulna dislocation nor Distal Radius fracture with ulna dislocation)

Final | Monteggia w/ = Ulnar shaft fracture with proximal radial head dislocation

Hand

- Hand Trauma

- Scissoring while flexing finger = Cascade sign = Fracture at Phalanx or Metacarpal
- Ortho consult:
 - Malalignment, Functional deficit, Arthritis
- Ortho surgery:
 - Angulation > 30 degree, Rotation deformity > 10 degree, Metacarpal shortening > 5mm

PEM R | 13 Y/O girl basketball practice had hyperextended her Lt 5th finger, no deformity or tendon injury, XR shows Fr of proximal phalanx w/ intra-articular extension into PIP w/ 7 degree volar angulation, Tx = Ulnar gutter splint

- Proximal phalanx Hand Surgery Consult
- Intra-articulated, Unstable, Rotated, Shortened, Comminuted, Angulated > 10

Promo | 15 Y/O Rt. Handed, injured Rt. Fifth finger by ball directly hitting top of outstretched finger then first joint popped & bent backward, Older brother grabbed & pulled & pushed his finger multiple times without success, XR in Urgent care (Avulsion Fr. of Proximal Volar aspect of Fifth Middle phalanx along w/ PIP dislocation) then brother pulled it again w/ success, Ex PIP Pain/Swell/Tenderness volar aspect w/ Numbness/Tingling of distal phalanx, active flexion/extension limited at PIP, another XR in ED post Reduction by brother shows (Avulsion Fr. Rt. Fifth Proximal phalanx volar aspect), Next = Ulnar gutter splint (Not Immediate hand/Ortho Consult nor Open Reduction w/ pinning nor Splint full extension nor Splint full flexion)

- Scaphoid fracture

- Path: Wrist Hyperextension w/ FOOSH
- Scaphoid compression test: Palpating sniffbox, Pushing thumb on longitudinal axis
- Complications: Avascular necrosis (most concerning due to high vascularity, Fr. At proximal site), Non-union
- Labs: XR if negative > CT/MRI
- Tx: Thumb Spica + Ortho, Surgery within 7 days (Risk of Non-union if untreated)

PEM R | 15 Y/O scaphoid fracture on XR splint = Thumb spica splint (Abducted thumb)

Chapter 4: Trauma

PEM R | 18 Y/O girl w/ Lt hand pain after slipping on ice & falling in outstretched hand, moving Thumb or Lateral movement of Respi causes pain, Has pain when pushing on longitudinal axis of thumb (XR Scaphoid Fr), Next = Refer to Ortho surgery urgently

PEM R | 16 Y/O boy, persistent pain on Rt. Wrist after tripping/falling on FOOSH yesterday, Anatomical snuffbox has tenderness w/ mild swell/tenderness along radial aspect (XR Scaphoid Fr), Ex consistent w/ injury = Increased pain w/ axial compression thumb

Amal | What is Correct in immobilization technique for suspected Scaphoid fracture = Thumb spica (No Ulnar gutter nor Volar splint)

Final | Fall out stretching hand with wrist pain x ray normal what to do = Thumb spica

Final | Scaphoid Fr = Thumb spica

- Lunate fracture

Amal | 14 Y/O boy, after fall from second floor window fell on outstretched his hand, presented with wrist pain, XR (Lunate bone) = Lunate Dislocation

- Skier's or Game's Keeper Thumb
 - o Path: Ulnar collateral ligament rupture

PEM R | 16 Y/O pain w/ base of Lt thumb, Hx of Skiing for a week, falling while practice, on Ex moderate swell at base of thumb, limited ROM due to pain & Radial stress on thumb causes pain, on XR (base of thumb unclear Fr), Next = D/C on thumb spica splint w/ Ortho F/U

- Mallet finger Fracture
 - o Path: ball falling on tip of finger > Fracture of dorsal tip of distal finger
 - > Avulsion of Extensor Digitorum > DIP flexion
 - o Tx: Finger Extension Splint for 6-8 weeks
- Jersey finger Fracture
 - o Path: pulling shirt > Volar tip of distal phalanx > Avulsion of Flexor Digitorum profundus > DIP Extension
 - o Tx: Finger Flexion Splint for 6-8 weeks

PEM R | 14 Y/O boy Rt. middle finger injury during basketball, ball came hard on tip of middle finger, holding it in flexion, unable to fully extend joint, XR negative, Tx = Splinting finger in extension

- Little finger

PEM R | 15 Y/O Girl, Rt. Hand pain after punching a person, No laceration/abrasion/erythema/hematoma/effusion, when clenches w/ flexion to 90 degree at MCP and PIP, her 5th digit crosses over 4th digit, (XR shows Boxer fracture ?), true statement = She may require pinning to stabilize fracture

PEM R | (for above Q) best splint = Ulnar gutter

- Seymour fracture
 - o > 5 Y/O common, Hx of door crush
 - o XR: Displaced Juxta-Epiphyseal fracture
 - o Complication: High risk for Infection & Non-union
 - o Ax: Nail laceration
 - o Tx: Remove nail & repair laceration

PEM R | 7 Y/O hand injury while bottling, has distal tip of rt middle finger crushed between two bottling balls, XR has displaced Juxta-Epiphyseal fracture at distal phalanx of middle finger, Tx = Removal of nail & repairing laceration

Chapter 4: Trauma

Lower Limb Trauma

Knee

- Knee Dislocation (Orthopedic Emergency)

- [Fleisher] Complete very uncommon in children
- Path: Hyperextension (Low Velocity -Sports, High Velocity -MVA-) > Distal femoral epiphyseal separation
- Ax: ACL, PCL or MCL, LCL
- Complications: High risk NV Compromise/Compartment syndrome (Higher w/ MVA)
 - Popliteal Artery & Vein
 - Peroneal N. = Motor: Dorsiflex foot + Sensation: Dorsum of Foot (Superior/Lateral aspect)
- Invx: XR Lateral/AP (Ottawa Knee Rule):
 - Patellar tenderness or Fibular Head Tenderness
 - Inability to flex 90 degrees
 - Inability to bear weight immediately & in ED for four steps
- Tx: Emergent Ortho Consult
 - Sedation & Reduction (Axial traction of tibia & Slow flexion of Knee from Extended position)
 - HARD Signs = OR
 - SOFT Signs = CTA
 - NO HARD/SOFT = Check ABI
- Post Reduction Ankle-Brachial Index (Highest Ankle SBP/Highest Brachial SBP = < 0.9)
 - IF > 0.9 = Consult Vascular surgery (+ Observe 24hr Vascular assessment Q2hr)
 - IF < 0.9 = Consider CT Angio (r/o Popliteal artery damage)

PEM R | 16 Y/O Knee injury playing basketball landed on Rt. Leg, immediate pain, Ex Ant. Knee dislocation, After reduction has Mod. joint swelling Ax w/ Instability, Distal pulses palpable, Most common Nerve injury Sx = Sensory loss dorsum of foot

PEM R | 14 Y/O girl Lt knee deformity having laterally displaced patella w/ knee held in mild flexion, technique = Extension of knee w/ pressure directed medially on patella

PEM R | 16 Y/O boy Lt knee injury from snowmobile, jumped at high speed & Lt leg struck ground upon landing & knee forceful hyperextended, Dorsalis pedis/Posterior tibial of pulses palpable, IV pain meds given, XR (image of dislocated knee), Next = Ankle-Brachial index Measurement

Promo | 16 Y/O soccer player 30min after sustaining Lt. knee injury after colliding w/ opposing player Lt. leg, immediate pain & unable to bear weight since, Ex Swelling w/ Ant. Displacement of tibia relative to distal femur, distal pulses present & able to dorsiflex Lt. foot, Analgesia/XR/Closed Reduction done post reduction NV unchanged, Next = Measure Ankle-Brachial Index

- Patella Dislocation

- **Patella dislocation most common Lateral**, Recurrence rate high
- High riding patella (Patella Alta) predispose to frequent patella subluxation & commonest is Lateral Dislocation
- Bipartite patella = normal
- Path: Injury to Medial Patellofemoral ligament & Medial Retinaculum
- Complication: Osteochondral fracture (Fr of intra-articulate portion of femoral condyles or Tibial plateau)
- Invx: XR Not well visualized, Do MRI
- Tx: Extending the knee then pushing patella from lateral to medial

PEM R | 16 Y/O Rt. Knee injury, was doing lateral shuffling drill unable to straighten knee having obvious deformity, denies numbness/tingling of Rt. Foot, after intranasal fentanyl, next = Extend knee while pushing medial on lateral patella

PEM R | 16 Y/O girl knee injury w/ patella displaced then correctly reduced, Xr no Fracture, Next = Knee immobilizer w/ crutches

- Post dislocation reduction needs immobilization

Chapter 4: Trauma

PEM R | 13 Y/O skier w/ knee injury after fall, twisted in her skis & heard pop, visible displaced patella, reduction done & knee immobilization, w/ no fracture on post-recurring, 3 days later complains of persistent pain & limited ROM, missed on initial visit = Osteochondral fracture

Promo x2 | In what direction, does Patella usually dislocate = Lateral or Medial or Inferior or Anterior

Amal | In which direction patella usually dislocated = Lateral

Amal | You are examining teenage girl, soccer player, shooting of knee pain, obvious lateral patella subluxation, most likely predisposing anatomical factor for her injury = High riding patella -Patella Alta- (Not Genuvarus or Bipartite patella or decrease femoral anti version or Obesity)

Final | Patella dislocate = Lateral

- Chondromalacia Patella

- Definition: Softening, fissuring, or erosion of the patellar articular cartilage
Often occurs along the spectrum of patellofemoral pain syndrome (PFPS)
- Risk factors: Early adolescents, especially runners. More common in females due to wider Q-angle
 - Increased Q-angle ($>20^\circ$)
 - Weak vastus medialis (VMO)
 - Shallow trochlear groove
 - Overuse, poor training surfaces, improper footwear
- Cause: Maltracking of the patella over the femoral condyles
- Sx: Anterior knee pain (behind/around the patella)
 - Worse with stairs, squatting, running, or prolonged sitting, Stiffness after rest
 - Tenderness on patellar margins, Pain/crepitus with patellar compression or knee flexion/extension
 - Effusion (rare; if present, think more severe cartilage damage)
- Invx: Primarily clinical, MRI $>80\%$ sensitive if confirmation needed. 📄
- Tx: $>90\%$ improve with conservative therapy
 - Rest, ice, NSAIDs
 - Physical therapy: strengthen quadriceps (especially VMO), hip stabilizers; stretch quads/hamstrings/IT band.
 - Modify training and footwear.
 - Surgery only for refractory cases; outcomes less predictable

Amal | 12 Y/O boy fall down while playing football He complains of **right knee pain**. In retrospect, he has had some complaints of his knee pain for the past two months. The patient denies any hip, ankle or foot pain. When you examine him is the obese lying supine on the stretcher with the hip in flexion abduction externally rotated. Knees, ankles, feet are normal, Dx = Chondromalacia patella (not Slipped capital femoral epiphysis)

Amal | (for above Q) Best management = Relief muscle spasm

Femur

- Femur Fracture

Amal | 11 M/O noticed that not moving Rt. Leg, she mentioned that he fell off bed onto ceramic floor, Ex distal femur swelling, XR findings supporting your Dx = Bucket handle fracture or spiral shaft

Amal | 13 Y/O Left knee pain, slept today, Since then he's been limping, Ex Both knees/thighs are low, w/ slight limitation on internal rotation of his left hip, but no hip pain or tenderness. This is the radiograph (fr of Lt neck of femur), accurate statement to regarding this condition = most common cause of limp in children 4-10 Y/O

Final | Fibular Fr post splint Tx = Splint, crutches & ortho F/U (unsure)

Chapter 4: Trauma

Ankle & Foot

- LisFranc Fracture

- Path: Tarso-Metatarsal joint injury (2nd metatarsal fracture $\geq$ 2mm) Avulsed tendon fracture
- Invx: **Recommended imaging = AP/Lateral/Oblique**
 - Further To fully visualize injury = CT or MRI
- Tx: Ortho Consult

Final | case of metatarsal injury XR AP, lateral done (LisFranc fracture) how to confirm Dx = XR oblique (Not CT or Mortis view)

Final | Case of foot trauma XR Fr in base of 2nd metatarsal (les franc), Done XR AP & lateral, how to confirm = Oblique (Not CT, as CT can be done after full 3 views)

Final | Teenager with trauma to foot (Lis franc) AP LAT X-ray shows fracture, how to confirm = Oblique

- DILEMMA Qs: Decision is split to either CT or Oblique
- As CT can be confirmatory but Fleisher recommended imaging AP/Lateral/Oblique

- Toddler's Fracture

- 9 M/O - 36 M/O
- Types: Distal tibia (95%), Tarsal
- Path: Low energy trauma or twisting
- Sx: Distal tibia tenderness, refuse to bear weight and limping
- Tx: NSAIDs (stable fracture)
 - Short leg cast (below knee backslap for comfort pain management)

PEM R | 20 M/O girl Rt. Leg pain, reporting to have LL pain for 2hr/refusing to walk, given Paracetamol but no improvement, No trauma witnessed, was playing w/ 5 Y/O brother, Afebrile/Well, No swell/Deformity, But tender over Distal Tibia, XR (no fracture apparent), care = Ibuprofen & Reassurance

PEM R | 4 Y/O Lt foot pain for 3 months, complaints of pain after playing/running in park all afternoon, on Ex no deformity but pain w/ lateral palpation of foot, minor fall 5 months, XR (healed fracture ?) = Toddler Fracture of Tarsal bone 5 months ago

Promo | Child XR Ankle not clear, had Tenderness over Tibia, Tx include one of the following = Splint w/ No weight bear or Splint w/ tolerated weight bear or D/C on Pain killers or Refer to Ortho OPD

Promo | 2 Y/O toddler wake up from sleep complains of limping & can't bear weight, mother denies trauma, XR shows (no clear Fr.) one of the following true = Back-slab then F/U w/ Ortho after 1 week or Suspect child abuse or Admit for closed reduction

Promo 2019 Q41 | 18 M/O refusing to walk on Rt. Leg since woke up this morning, mother says always running around house, no fever/trauma, Ex minimal swell in Rt. Leg no point tenderness, Hip/Knee normal, XR (I think Normal), choose trauma statement = Management consist of splint & pain management

Amal | 8 M/O, refusing to walk on Rt leg, no he of fall or fever, minimal swelling without point of tenderness, XR (shows toddler fracture) = Pain management & lower leg splint & ortho F/U

- Toddler fracture below knee backslap for comfort pain management
- Splinting is important & if didn't see any fracture can do XR after 1 week and ortho F/U

Chapter 4: Trauma

- **Triplane Fracture (SALTER 4)**
 - o 12-15 Y/O Path: Salter Harris IV > Fracture at 3 planes: Sagittal, Coronal, Transverse
 - o Complication: Asymmetric closure of distal Tibia growth plate
- **Tillaux Fracture (SALTER 3)**
 - o 12-14 Y/O, Ankle Fr. S-H III of Antero-Lateral Distal Tibial Epiphysis
 - o Tillaux fracture, which is a special type of Salter-Harris III fracture .
 - o Salter-Harris I fractures typically have the best prognosis and are typically treated conservatively with immobilization until the fracture has healed.
 - o Salter-Harris V fractures are associated with the worst prognosis due to the significant damage to the growth plate. Unfortunately, these fractures are often diagnosed after the fact when subsequent radiographs demonstrate a bony bar across the physis or after a leg length discrepancy occurs.
 - o Complication: Asymmetric Physeal closure of distal Tibia growth plate
 - o Invx: Ankle XR (AP, Lateral, Mortise view) or CT
 - o Tx:
 - < 2mm displacement = Close reduction & casting
 - > 2mm displacement = Operation

PEM R | 13 Y/O girl ankle pain/swell, inability to bear weight, injured during gymnastic, Tibia distal XR (triplane fx),

Pathophysiology of this = Asymmetric closure of distal tibial growth plate

PEM R | 10 Y/O boy, twisted ankle while playing tennis, has foot pain & unable to bear weight has swell/tender of dorsum of mid-foot, but no tenderness over 5th metatarsal or either malleolus, XR to do = XR 3-view of Foot

- o Ankle Ottawa rule, malleolus is ok, so no need for Ankle XR
- o Foot Mid foot, unable to bear weight = Navicular bone
- o Ankle pain over malleolus = Malleolar zone = Ankle Ottawa rule

Promo x2 | XR showing ankle trauma = Tillaux Fr

Amal | 14 Y/O boy, sprain his ankle, ankle pain and swelling after twisting, X-ray showed Dx = Tillaux Fracture (SH III)

- o Triplane Fracture (Salter-Harris Type IV)
- o Tillaux Fracture (Salter-Harris Type III)

Final | Triplane Salter Harris Type 4 (Through) Tillaux à Salter Harris Type 3 (lower)

- **Snowboarders Fracture**
 - o Lateral Talar process fracture
 - o Path: Dorsiflexion & Inversion of fixed pronated foot
 - o XR: DIFFICULT to see > CT ankle (Best to confirm)
 - o Complications due to delayed diagnosis

PEM R | 16 Y/O girl Lt ankle injury while snowboarding 2 days earlier, evaluated at urgent care w/ XR negative for fracture but still unable to walk, swell/tender inferior to lateral malleolus, likely injury = Lateral Talar process Fr.

Chapter 4: Trauma

Non-Fracture

Overuse

Overuse related pain in Children/Adolescent

- Sinding-Larsen–Johansson syndrome: **Inferior patella pole** Apophysitis | Anterior knee pain w/ jumping activities
[8-12 Y/O]
- Osgood-Schlatter disease: **Tibial tubercle** Traction apophysitis | Anterior knee pain in active children/adolescents
[10-15 Y/O]
- Patellofemoral stress syndrome: **Patellofemoral joint** | Mechanical stress > Anterior knee pain Adolescent female athletes
[12-18 Y/O]
- Prepatellar bursitis: **Prepatellar bursa** | Overuse from repetitive kneeling > Anterior/superior knee swell/warmth, full ROM
[12-18 Y/O]
- Iliotibial band syndrome: **Lateral femoral epicondyle** | Repetitive friction > Lateral knee pain in Runners/Cyclists
[12-18 Y/O]
- Sever disease: **Calcaneal** apophysitis | Heel pain exacerbated by activity in growing athletes
[8-12 Y/O]
- Iselin disease: **Base of 5th metatarsal** Traction apophysitis | Lateral foot pain in physically active children
[9-14 Y/O]
- Little League Shoulder: Proximal humeral epiphysiolysis SALTER 1 | Lateral shoulder pain & ↓ throwing performance
[11-16 Y/O]
- Little League Elbow: **Medial epicondyle** Apophysitis | Repetitive valgus stress > Medial elbow pain in baseball pitcher
[9-14 Y/O]
- Shin splints: **Anterior Tibial** stress syndrome (Stress Fr.) | pain along Tibia pain Exercise-induced repetitive impact
[10-18 Y/O]
- Stress Fr.: **Tibia/Metatarsals/Lumbar** most common affected | Repetitive microtrauma > Focal bone pain in athletes
[10-18 Y/O]

- Sever Disease (Calcaneal Tuberosity)

- o 8-13 Y/O, Overuse disease Almost like OSD or Plantar fasciitis
- o Path: Tight gastrocnemius soleus muscle complex & limited dorsiflexion of foot > Calcaneal apophysitis
- o Sx: Pain/Tenderness over Achilles insertion, Bilateral, Squeeze test positive
- o Tx Rest, ice, physical, stretching

- Thompson test = Pressure of calf > Absent Planter Flexor = Achilles rupture

- Squeeze test = Pressure of calf > Pain at Achilles site = Sever disease

PEM R | 13 Y/O boy, Lt foot pain 2 wks Lt heel pain, No trauma but competitive high jumper on middle school, on Ex Focal tenderness at insertion of Achilles onto Lt calcaneus, No swell/erythema, Next = Reassurance & referral to physical therapy

PEM R | 10 Y/O male w/ Bilateral heel pain, worsening over last month & more severe after playing soccer, has tenderness bilateral over insertion site of Achilles, Next = D/C w/ Rest, ice, NSAIDs

Chapter 4: Trauma

Final | 10 Y/O male w/ Bilateral heel pain, worsening over last month, more severe after he plays soccer, Ex tenderness bilateral over insertion site of Achilles tendon on calcaneus, Next = Discharge w/ Rest/Ice/NSAIDs

- Osgood–Schlatter Apophysitis (Tibial Tuberosity)

- Common in Active/Athletic Adolescents/Children, Bilateral 25% only
- Path: Overuse causing traction along tibial tuberosity from the extensor mechanism
- Sx: Anterior Knee Pain/Swell worse w/ Activity, Relieved by rest
Tenderness over Tibial tuberosity (Not on joint itself)
- Invx: XR Shows Tibial Tuberosity Fragmentation signs
- Tx: Self limited (fluctuate in severity over a 1–2 year period)
 - Supportive w/ Activity modification (No High impact movement -run/jump-) + Ice & NSAID's
 - Acute pain: Require 1-2 days per week to recover (short term)
 - Periodic (seasonal sports): Require 2-3 months per year post sport to recover (long term)

PEM R | 11 Y/O soccer player w/ 6 weeks pain worsening today, cannot squat due to pain, has tenderness/swelling over proximal tibia, able to fully extend knee (XR shows fragment of tibial tuberosity) best describes mechanism = Traction apophysitis related to quadriceps strain

PEM R | 10 Y/O worse Rt. Knee pain for 6 wks, XR (Osgood), wants to return for play, recommend = return once pain resolved

Promo | Case of Osgood Schlatter disease (Incomplete Q) = Never seen in adult or Usually bilateral or Need cast 6 weeks

Final | 10 Y/O Rt. knee pain worsening for 6 wks, plays as catcher, XR (Osgood) when can return to sport = Once pain resolved

Final | Knee trauma Dx = Osgood Schlatter disease

Final25 | Pt. w/ tenderness over tibial tuberosity after running in game and ask what is the Dx = Osgood (Not Sever disease)

- Prepatellar bursitis

- Path: Overuse injury due to prolonged/repetitive kneeling > Increase synovial production > Swell/irritation/Inflammation cycle
- Sx: Warm superior to knee
- Tx: Rest, ice, NSAIDs

PEM R | 17 Y/O male w/ swell superior & anterior aspect of Rt. Knee, No trauma but playing catcher on baseball, has erythema only, Full ROM, able to bear weight, Next = Discharge home on NSAIDs

- Iliotibial band syndrome

- Athletic 10-15 Y/O
- Path: Lateral femoral epicondyle Repetitive friction
- Sx: Lateral knee pain

PEM R | 14 Y/O girl w/ Rt. Knee pain, 2 months ago started running cross country for 1st time, pain on Lateral knee, having bowing worst during foot strike, No Fever/Trauma/Swell, taking ibuprofen, not much relief, Tenderness over lateral femoral epicondyle, Dx = Iliotibial band syndrome

- Patellofemoral pain syndrome

- Adolescent female athletes
- Path: Patellofemoral joint Mechanical stress (Prolong Stair climbing/Jumping)
- Sx: Anterior knee pain
- Tx: Thigh strengthening exercise

Chapter 4: Trauma

Pedz | 16 Y/O, Chronic knee pain, no injury, pain worse climbing stairs and prolonged sitting periods, abnormal finding in peripatellar tenderness, best action = Thigh strengthening exercise (Patellofemoral pain syndrome)

- Stress Fracture
 - o Risk Factor: BMI < 17.5, Eating disorder, Delayed Menses ≥ 16 Y/O or ≤ 6 in 12 months
 - o Ax: Female Athlete triad = Decrease Energy > Irregular menses > Decrease Bone Density
 - Tx: Restore menses (will restore bone density)
 - o Types: Acute, Chronic
 - o Invx XR Low Sens, if Neg. Do MRI (Standard)
 - o Tx: Ortho consult

- Female Athlete Triad = Low Nutrition, Menstrual dysfunction, Low Bone density

PEM R | 17 Y/O girl complaining of Lt hip pain for 2 weeks, had similar pain on Rt. Hip 7 months ago, she runs total 80 miles per week, she is very thin, having pain w/ internal rotation of hip, Risk of stress fracture if = Has not achieved menarche

PEM R | (for the above Q) XR of hip (XR nothing), recommend = Remain non-weight bearing & obtain MRI

- Osteochondritis dissecans
 - o Path: Overuse > Osteonecrosis of Subchondral bone
 - o XR: Crescentic shaped defect within Subchondral bone
 - o Tx: Restrict activity, Immobilization w/ non-weight bearing

PEM R | 16 Y/O Male Runner, comes w/ worsening Lt knee pain over 6 weeks, pain worse today after finished track, noticed worse pain after running w/ occasional swelling of knee, XR Crescentic shaped defect within Subchondral bone of distal Lt femur, Initial Tx = Restricted activity

Pediatric Hip Disorders

- Limping

PEM R | 18 M/O w/ painful limp immediately after jumping off couch, Afebrile, full ROM of hips/knee/ankle, mild tenderness over tibia, no swell/bruise, refuse to bear weight, XR (Distal tibial oblique Fr.), Tx = Immobilize & recommend Ortho F/U

Challenger | 4 Y/O male complain o Rt. Hip pain for 3 days & limp for 2 days, No Hx of Trauma or Fever, on Ex no focal tenderness of bilateral LL, good passive ROM both hips, but has mild antalgic gait bearing more weight on Lt compared to Rt. Lower extremity, Next = Obtain bilateral hip XR (Not D/C on NSAIDs nor hip joint arthrocentesis nor US of Lt hip nor IV Abx)

Final | 6 Y/O boy Hx limbing no hx of Fever, URTI Examination unremarkable = Bilateral hip XR (Not US or NSAID and discharge)

Final | Child w/ limping = XR Bilateral

Final | 4 Y/O came with limping no fever exam normal good ROM but is Antalgic gait = Bilateral hip XR (Not Hip US or D/C w/ NSAID)

- o if there was history of recent viral illness, Dx. Transient synovitis = NSAIDs

Chapter 4: Trauma

- Perthes = 4-10 Y/O | Boys>Girls | Chronic pain | Limited Internal rotation, Worse w/ Activity | Tx: Immobilization +/- Surgery
 - SCFE = 10-16 Y/O | Obese, Endo | Acute pain | Deformed External rotation (crossed legged) | Tx: OR

- Perthes (Legg Calvé Perthes Disease)

- o 4-10 Y/O (most common cause of limping at this age), Boy Obese
- o Path: Interruption of blood supply > Osteonecrosis (Avascular necrosis) of proximal femoral head (Deformity)
- o Ax: Obesity, SGA, breech delivery, familial, glucocorticoid use, SLE
- o Sx: **Limited Internal rotation**, Worse w/ Activity
 - Unilateral > bilateral, insidious onset, intermittent limp (worse after activity), hip, thigh, or knee pain
- o Invx: XR (initially normal > wide space w/ physeal irregularity misshapen crescent sign), MRI
- o Complication: Subchondral stress fracture
- o Tx: Immobilization w/ Casting & remove any pressure on affected leg by using crutches
 - +/- Surgery (if head of femur fracture)

PEM R | 5 Y/O girl, Lt hip limping for 2 weeks, vague pain for 1 month, No Hx of Fever/URTI, comfortable but ambulates w/ limp, Limited hip abduction & internal rotation, XR (growth arrest of femur head) path = Disruption of vascular supply to Femoral head

PEM R | Discussing possible cause of hip of 18 Y/O, having Lt hip pain & limp 1 month without Trauma/Fever, XR (shows Avascular necrosis), which chronic condition most increased risk of this = Hgb SC

- o Avascular necrosis (Perthes) Risk factor: SCA w/ 21% increased risk and Higher in Hgb SC

PEM R | 12 Y/O, constitutional growth delay, has Rt. Groin pain & weight bearing for 3 months, No Hx of trauma/fevers/chills/systemic Sx, has waddling gait, having hip increasingly stiff, Previously he is able to bear weight & never used crutches, No Numbness/tingling/loss of sensation, limited internal rotation of hip, Next = Discharge home w/ crutches remain non-weight bearing on Rt. Lower extremity, periodic F/U

PEM R | 7 Y/O Male, 2 Months worse Rt. Hip pain, Limping, worse today after involved in field day activity in school, on Ex decreased abduction & internal rotation, No Fever/Trauma, XR (Perthes), known complication = Subchondral stress fracture

Amal | 13 Y/O Left knee pain. He slept and he fell today. Since then he's been limping, so he slipped, and then he started to be limping slightly on Ex, Both knees & thighs are low, but a slight limitation on internal rotation of his left hip, & there is no hip pain or tenderness (XR of wide space & physeal irregular), accurate statement = It is the most common cause of limp in children 4-10 Y/O (Not Commonly seen in obese girls aged 4-10 Y/O or Treated w/ an intra articular steroids & crutches with minimal weight bearing or Usually a result from slipped capital femoral epiphysis trauma or steroid use)

- SCFE (Slipped capital femoral epiphysis)

- o 10-16 Y/O, Obese, Endocrine issue
- o Sx: **Deformed External rotation** (Position as if -crossed legged-, External rotated & displaced anteriorly)
- o Invx: XR (Displaced femoral neck from Acetabular wall, Wide Physeal plate, Irregular Epiphyseal height)
 - Klein line (evaluate degree of displacement of Femoral head epiphysis from Femoral Neck)
- o Complication: Chondrolysis (acute dissolution of articulated cartilage) Osteonecrosis
- o Tx: OR

PEM R | 13 Y/O w/ 2 months intermittent Rt hip pain, XR (SCFE) assess severity by = Evaluate line along superior margin of femoral neck

PEM R | 12 Y/O having Lt knee & Leg pain, 2 months ago had injury to Lt leg, Left LL held in external rotation at hip, having full ROM, next step = Admit for operative pinning

PEM R | 12 Y/O male w/ 2 months progressive Rt. Thigh & knee pain, occasional limping, No Swell/Tenderness of Rt. Leg & knee, Full ROM, but pain w/ internal rotation of Rt. Hip & when passively flexing the right hip, the thigh abducts & externally rotates, Next = XR of hips

Amal | 12 Y/O boy, presented w/ painful limping and groin pain, externally rotated, shorting of the limb, non-toxic appearance, no fever. Dx = SCFE (Not Perthes)

Chapter 4: Trauma

Amal | 12 Y/O complains of pain in his groin, which sometimes goes to the thigh and when the pain is dull, ache intermittent or continuous, exacerbated by physical activity. He walks with his leg externally rotated, and has an intelligent gait Which of the following is the most likely diagnosis of this time = Slipped capital femoral epiphysis

- SCFE = Acute painful | LCP = chronic pain

Final | 12 Y/O complains of pain in his groin, which sometimes goes to the thigh and when the pain is dull, vague intermittent or continuous, exacerbated by physical activity. He walks with his leg externally rotated, and has an gait Which of the following is the most likely diagnosis of this time, A femoral head = slipped capital femoral epiphysis

Final | Obese boy 13 yrs with limbing and knee pain for 1 week, on examination limited hip movement and normal knee Ex, what is the definitive plan of this = Surgery (SCFE because its acute Not NSAID or Crutches)

Final | SCFE obese = Surgery

Final | XR (SCFE) w/ scenario options about the management = Orthopedic consultation and surgical intervention

- DDH

- Sx: Abnormal Gluteal/Thigh/Labial folds, Limb length discrepancy
- Invx: US (diagnostic)

PEM R | 13 M/O female w/ Limp, just started walking independently 1 week ago, on Ex has slight lump but no discomfort has no pain w/ ROM, but limited abduction of Lt hip & slightly asymmetry of her thigh muscles & labial folds, Next = US of hip

Final | 10 M/O during exam pic of DDH what to do = Referred to ortho as out pt

Final | 10 M/O cannot abduct 45 degrees, No Fever, Asymptomatic, Crawl & setting, = OPD referral (not US now or D/C w/ F/U)

Other Ortho

- Spondylolisthesis

PEM R | 15 Y/O ballet dancer w/ worse low back pain for 6 weeks, focal tender lumbar spine, pain w/ ROM & worse w/ extension, XR shows Anterior translation of L5 on S1, Dx = Spondylolisthesis

- Spondylolisthesis = Anterior translation of L5 on S1
- Spondylolysis = Degeneration/Defect of Pars Inter-articularis of Vertebra body due to Trauma/Overuse

- Complex regional pian syndrome

- CRPS1 (Complex regional pain syndrome 1) AKA sympathetic dystrophy

PEM R | 8 Y/O Rt. Foot/Ankle pain w/ burning sensation for 3 weeks, No Trauma/Fever, Trouble walking due to pain, on Ex Rt. Foot/Ankle cool to touch, has exquisitely tender to light palpation over entire Rt foot, Next = Referral to pain specialist

TOXICOLOGY

Toxicity

Toxidromes

Important Keywords

- miOsis = chOlinergic, Oorganophosphate, clOnidine, Opioids, herOin, phenObarbital
- Mydṛiasis = Antichoḷinergics, Sympathoṃimetics
- Sweating = Sympathomimetics, Cholinergic
- Bowel motion Decreased = Anticholinergic, Sedative/Hypnotics
- Bowel motion Increased = Cholinergic, Sympathomimetics
- Hypothermia = Sedative/Hypnotics, Opioids
- Hyperthermia (NASA) = Nicotine, Anticholinergics, Salicylate, Sympathomimetics, Antidepressants, Antipsychotics

- One pill can kill
 - o Oral hypoglycemics
 - o Salicylates
 - o Cyclic antidepressants
 - o Acetylcholinesterase inhibitors
 - o BB, CCB, Clonidine (Alpha 2 Adrenergic Agonist)
 - o Loperamide & Diphenoxylate
 - o Quinine & Quinidine
 - o Camphor
 - o Podophyllin & Colchicine
 - o Buprenorphine

Promo | Small dose overdose can kill except = Iron (Not Clonidine nor Promethazine nor Aspirin)

Amal | Poison deadly in small dose = Diltiazem (Not Iron nor Paracetamol nor Silica gel nor House hold bleach)

- Altered Mental Status Toxins (LETHARGIC)
 - o Lithium, Lead
 - o Ethanol, EG
 - o TCA
 - o Anti-Cholinergic Anti-Depressant, Anti-Psychotic
 - o Risperidone
 - o GHB
 - o Inh, Insulin
 - o Co, Cyanide, Clonidine

Final | Pt went to his grandparent sleepy but arousable what cause this = Intoxication

Chapter 5: Toxicology

- Smell of things
 - Garlic = Organophosphate, Heavy metal (Arsenic, Phosphorus, Thallium), Selenium
 - Rotten Egg = Hydrogen Sulfide
 - Bitter Almond = Cyanide
 - Acetone = Acetone, Isopropyl alcohol, phenol, salicylates
 - Alcohol = Ethanol (alcoholic beverages)
 - Wintergreen = Methylsalicylates (oil of wintergreen)
 - Solvent = Hydrocarbons (Gasoline, Turpentine)
 - No smell = Mercury

TOXIDROMES						
		Sympathomimetic ¹	Anticholinergics ²	Opioids/Opiates	Sedative-Hypnotics	Cholinergics
Examples		Cocaine Amphetamines	Antihistamines Cyclic Antidepressants Antipsychotics	Heroin Morphine	Benzodiazepines Barbiturates Ethanol	Organophosphate Nerve Agents Some mushrooms
Status*		UP (↑)	UP (↑)	Down (↓)	Down (↓)	Down (↓)
Mental Status		Restless Agitated, anxious Paranoia Insomnia, Mania Hallucinations Seizure	Psychosis (Mad as a Hatter) Delirium Coma Seizure Chorea	Sedation Confusion Coma	Sedation Confusion Delirium Ataxia Coma	Confusion Drowsiness Coma Seizure
Pupils		Mydriasis	Mydriasis (Blind as a bat)	Miosis	Mydriasis or Miosis Blurred vision Nystagmus	Miosis
Vital Signs	HR BP RR	Tachycardia Hypertension Tachypnea	Tachycardia Hypertension	Bradycardia Hypotension Bradypnea, Apnea	Bradycardia Hypotension Bradypnea, Apnea	Bradycardia ↑ early → ↓ late Tachypnea
	T	Hyperthermia	Hyperthermia	Hypothermia	Hypothermia	Hypothermia
Physical Exam		Tremor Diaphoresis Warm Skin Hyperactive bowel sounds Hyperreflexia	Dry Skin (Dry as a bone Flushed skin Red as a beet) Urinary retention (Full as a flask) Hypoactive bowel sounds		Hypoactive bowel sounds Hyporeflexia	Salivation Lacrimation Urination Defecation Emesis Bronchorrhea Muscle fasciculation Diaphoresis
Treatment		Benzodiazepine	Benzodiazepine Physostigmine (not for TCA)	Naloxone	Supportive	Atropine Pralidoxime

1. Salicylates, alcohol withdrawal and sedative-hypnotic withdrawal can mimic the sympathomimetic toxidrome
Hyperpyrexia syndromes may mimic the sympathomimetic toxidrome with a addition of muscle rigidity/clonus
2. The anticholinergic toxidrome refers to antimuscarinic agents

TOXIDROMES MADE SIMPLE						
		Sympathomimetic	Anticholinergics	Opioids/Opiates	Sedative-Hypnotics	Cholinergics
UP/DOWN		UP	UP	DOWN	DOWN	DOWN
WET/DRY NORMAL		WET	DRY	NORMAL	NORMAL	WET

*UP/DOWN: Overall increase (UP) or decrease (DOWN) in: Mental status, Vital signs and Pupil size

Chapter 5: Toxicology

Antidotes

- Antidotes

- Anti-Emetic (Phenothiazine) > Extrapyramidal Sx = Anticholinergics (Benzodiazepines, Diphenhydramine)
- Acetaminophen = N-Acetylcysteine
- Anticholinergic = Physostigmine
- Benzodiazepine = Flumazenil
- Bupivacaine (Local anesthetic toxicity) = Intralipid emulsion
- Beta Blockers = High dose Glucagon, High-dose insulin/dextrose, Intralipids
- Calcium Channel Blockers = Calcium, Intralipids
- Carbon monoxide = Oxygen
- Cyanide = Hydroxocobalamin
- Crotalid (pit viper) envenomation = Crotalidae Polyvalent Immune Fab (Antivenom)
- Digoxin = Digoxin-specific Fab fragments
- Ethylene glycol (additional) = Fomepizole, Pyridoxine, Thiamine
- Heparin = Protamine sulfate
- Isoniazid = Pyridoxine
- Iron = Deferoxamine
- Lead = Dimercaprol, Meso-2,3-dimercaptosuccinic acid (DMSA)
- Methemoglobinemia = Methylene blue
- Methanol = Fomepizole, Folate, Leucovorin (enhance formic acid clearance)
- Methotrexate = Leucovorin
- Malignant Hyperthermia = Dantrolene
- Neuroleptic Malignant Syndrome = Dantrolene, Bromocriptine
- Neuroleptic Dystonic Reaction = Diphenhydramine
- Opioids = Naloxone (reverses Resp. depression bcz of competitive inhibition of muopioid receptor)
- Organophosphates = Atropine, Pralidoxime
- Salicylates = Sodium Bicarbonate
- Sulfonylurea hypoglycemia = Dextrose, Octreotide
- Serotonin Syndrome = Active cooling, Cyproheptadine, Benzo (stop shivering)
- Tricyclics Antidepressants = Sodium Bicarbonate, Benzodiazepines (for seizures), Intralipids
- Warfarin = Vitamin K₁, Fresh Frozen Plasma

- Activated Charcoal

- Can be used in 1-2hr post ingestion | Pediatric Dose 1 g/kg
- **Multidose AC Indications (ABCDs):**
 - Antimalaria (Quinine), Aminophylline
 - Barbiturates
 - Carbamazepine
 - Dapsone, Digoxin
 - Salicylate (if sustained release)
- **Not absorbed by AC (PHAILS)**
 - Pesticides, Potassium
 - Hydrocarbons
 - Acids, Alkali, Alcohols
 - Iron
 - Lithium, Lead
 - Solvents

Chapter 5: Toxicology

PEM R | 5 cases coming by EMS, which of the following ingestions highest priority for AC = 10 tablets of verapamil 100 mg (Not 40 tablets of multivitamins with iron. Nor 90 tablets of acetaminophen 500 mg. Nor 60 tablets of extended-release lithium 450 mg. Nor 120 tablets of glyburide 5 mg without emesis)

Amal | Activated charcoal administered in Which of the following = Aspirin (Not Gasoline nor Iron nor Lithium)

- Whole bowel irrigation
 - o PEG Dose 25 ml/kg/hr
 - o Indication: Enteric release of CCB and many others

- Gastric Lavage

Promo | Pt. Ingested unknown amount of meds, mother wants Gastric lavage (Incomplete Q) = Contraindicated in children

- o Usually, Gastric lavage might need intubate before the procedure to prevent aspiration

- Hemodialysis

- o HD Indications (UNSTABLE):
 - Uremia
 - No response to therapy
 - Salicylates
 - Theophylline
 - Alcohols (isopropanol, Methanol)
 - Barbiturates, Boric acid
 - Lithium
 - Ethylene glycol

Chapter 5: Toxicology

Anticholinergic

- Anti-Cholinergic
 - Drugs: Atropine, Antihistamine (Diphenhydramine), OTC Sleep meds, TCA
 - Toxic plants (Moonflower, Mushroom, Jimson weed, deadly nightshade)
 - Sx: "HD FUTAM" (A for Anticholinergic)
 - Hyperthermic Anhidrosis, Dry/Delirium
 - Flush, Urine retention, Tachycardia, Altered LoC/Agitation, Mydriasis (Cycloplegia)
 - + SL = SZ, Long QT/QRS = Diphenhydramine
 - + SLTAH = SZ, Long QT/QRS, Terminal R in aVR, Acidosis, Hypotension = TCA
 - Tx: Supportive, AC,
 - Physostigmine (Relative Contraindication after SZ, Anticholinesterase inhibitor treats Agitation/Delirium)
 - Sodium Bicarbonate (For Wide QRS w/ Diphenhydramine)
 - Benzo (For SZ)

PEM R | 12 Y/O, found after ingesting seeds of (purple like flower = Moonflower) Sx = Anti-Muscarinic Sx

PEM R | 17 Y/O took 150 tablets of Diphenhydramine, coming 45min after progressively somnolent BP 150/90 HR 160 RR 35 SpO2 95 Temp 37.6, GCS 10 ECG QTc 488, Next step = Endotracheal intubation (Not AC -NO AC bcz altered LoC-)

PEM R | 16 Y/O not acting right Temp 38 HR 130 BP 150/90 SpO2 100% on RA, delirious mumbling, dry mucus, no bowel sounds, found at home w/ seeds (Pic Jimson weed) Next Tx = Physostigmine (Tx of Anticholinergic Toxidrome)

Promo | Anticholinergic Toxidrome

Amal | Which of the following helps to differentiate sympathomimetic from anticholinergic Sx = Diaphoresis

Amal | Typical of Anticholinergic toxidrome = Cycloplegia (Not wet skin nor miosis nor diarrhea nor urinary incontinence)

Amal | 12 Y/O girl presented with anticholinergic crisis, used for sedation for her agitation and delirious. What medication should be given = Lorazepam (Not Thorazine nor Etomidate nor Ketamine)

Amal | 5 Y/O, delirious, tachycardia, hypertensive, dilated pupils and hot dry skin, most likely drug ingested = Histop (Not Amphetamine nor Amitriptyline)

Final25 | Asthmatic patient managed by his mother. Presented with tremor, dilated pupils, flushing, hyperthermia and tachycardia probable cause = Antihistamine (Not Theophylline)

Table 1: Comparison of the mechanisms of action of tricyclic antidepressants vs diphenhydramine and corresponding symptoms in overdose

Mechanism of action	Tricyclic antidepressant	Diphenhydramine	Symptoms
Sodium channel blocker	+	+	Wide QRS
Potassium efflux blocker	+	+	Prolonged Qtc
Anticholinergic	+	+	Anticholinergic toxidrome
Antihistamine	+	+	CNS depression, seizures
GABA antagonist	+	-	Seizures
Biogenic amine reuptake inhibitor	+	-	Hypotension
Alpha 1 antagonist	+	-	Hypotension

Chapter 5: Toxicology

- Tricyclic Antidepressant

- Meds: Amitriptyline, Clomipramine, Imipramine, Also AED (like Carbamazepine)
- Sx: HD FUTAM + SLTAH
 - SZ, Long PR/QT/QRS ≥ 100 msec, Terminal R in aVR 40 msec, Acidosis Ph ≤ 7.1 , Hypotension
 - Cardiac: Tachycardia (Early) Bradycardia (Late), Hypotension
 - QRS ≥ 100 predicts SZ ≥ 160 predicts Vtach
 - Terminal R in AvR: Terminal QRS ≥ 40 msec, R ≥ 3 mm
 - CNS: Drowsy, Confused, Delirium, Hallucinations, Lethargy, Seizure, Coma
- Toxic Dose: 10-20mg/kg (Sx within 30min-6hr)
- Tx: AC 1 g/kg within 2hr or Lavage within 1hr ((Both if not risk of aspiration/intubated))
 - Intubation (Protect airway w/ Mild Hyperventilation)
 - QRS ≥ 100 msec = NaHCO₃ (Serum Alkalinization till Ph 7.50-7.55)
 - VTach = Lidocaine bolus 1 mg/kg slow then Infusion 20-50 mcg/kg/min + NaHCO₃
 - Torsades = MgSO₄ 20-50 mg/kg (max 2g) IV over 2min
 - Hypotension = IVF + Nore-Epi or Phenylephrine + NaHCO₃
 - SZ = Benzodiazepine
 - AVOID Physostigmine (Cardiac Toxicity)
 - AVOID Phenytoin or Fosphenytoin (Worsen Na blockade, AVOID in ALL TOX)
 - AVOID Flumazenil (Provoke Seizures)

PEM R | 14 Y/O ingested unknown amount of OTC sleep aid at home, found seizing that resolved, HR 150 RR 30 BP 150/30, SpO₂ 95 on FM, GCS 8, Mydriasis, Dry mucus membrane, ECG shows wide QRS, Next best to give = Sodium Bicarbonate

PEM R & Final | 15 Y/O, found confused/delirium, overachiever in school had failed grade and found at home 6hr later found altered and her brother known to have nocturnal enuresis, Temp 38.7 HR 142 RR 8 BP 125/67 SpO₂ 93%, (ECG R in aVR), next = NaHCO₃ (Not Lidocaine nor Physostigmine nor Procainamide)

PEM R | 13 Y/O girl, seizure after ingestion of mother's antidepressant meds, containing 42 tablets, EMS report pt. Was awake/giddy/laughing, HR 160 RR 16 BP 92/64 SpO₂ 100%, had GTC & given Lorazepam 2mg IV and improved, Now post-ictal HR 140 RR 20 **BP 80/60** Glucose 80 mg/dL, Ph 7.22 CO₂ 44 HCO₃ 14, QRS 180ms QTc 450, Next = Bolus of NaHCO₃ 1 mEq/kg

PEM R | 3 Y/O boy ingested x2 25mg tablets of uncle's Clomipramine, very sleepy but arouses when IV placed, Temp 36.8 HR 120 RR 15 BP 90/70 SpO₂ 99% ECG 1 hr post ingestion (ECG normal), most accurate statement = Evidence of TCA exposure but no cardiotoxicity

PEM R | 16 Y/O female following suicide attempt w/ unknown drug, unresponsive, Myoclonic jerking, Temp 38.1 HR 152 RR 24 BP 90/40, ECG Premature ventricular contractions, short runs of Vtach, next step = Sodium bicarb

- TCA affecting 6 receptors: Anti histamine, cholinergic, GABA, Alpha blocker, Na blocker, Serotonin blocker

Promo x2 | 13 Y/O ADHD & Depression on Meds, came w/ Agitation, Fever, Dry skin & Mucus membrane, dilated Pupils, ECG Wide complex tachycardia, most important Meds = Sodium Bicarbonate

Promo | 22 M/O Toddler girl brought to ED HR 130 RR 30 BP 70/45, Pupils dilated but reacting slowly to light, ECG prolonged QT, Toxicity likely due to = TCA (Not Digitalis -peaked T waver hyperkalemia-)

Promo | R wave in aVR ECG, goes with = TCA Toxicity

Promo | TCA Toxicity brought by parents in 1st hour of Sx, first line = Activated charcoal (Not NaHCO₃ nor Repeat gas)

Promo | Ingested mother medications, having Bradycardia & Fluctuation in ECG, Next = NaHCO₃ (Unsure about Qs)

Amal | 18 M/O infant, was found playing with medications bottle. The top was open, and many pills were on the floor, prescription of tricyclic antidepressant, used for the patient's older brother. On physical exam, the boy appears clumsy, but awake, and flushed. HR 150, RR 28 breath, and has dilated pupils. He's breathing easily, and has strong pulses. important next step in this patient's, Tx = ECG and continuous Cardiac Monitoring (Not Measurement of Serum level of Tricyclic Antidepressant nor Measurement of Serum electrolytes)

Amal | 14 Y/O female, suspected ingestion of 14 tablets of her mother's medications, initial ECG done Most likely ingested medication (R wave) = Tricyclic Antidepressant

Final x2 | Child ingested his mother medication came with I think bradycardia w/ fluctuation in his ECG, what to give (TCA) = NaHCO₃ (TCA initially Tachycardia > Bradycardia > Hypotension)

Chapter 5: Toxicology

Final | TCA with ECG pic show terminal R wave = NaHCO₃

Final x2 | TCA = Sodium bicarbonate

Final | Wide QRS = NaHCO₃

Final | w/ ADHD & Lives w/ father = Overdose

Final | TCA = NaHCO₃

Final | The best indicator of outcome in TCA = ECG

Final25 | 3 Y/O patient found unconscious after 1 hour, patient came by EMS, family assuming he took medication from peruse but no bottle or medication was found on examination, GCS 8/15, mid size pupil, flush skin, absent bowel sounds, shallow breathing, febrile, blood sugar 88 mg/dl, the team assume that he took CNS depressive med then had ECG changes = IV Sodium bicarbonate (Not IV Naloxone assume he took opioids nor IV Flumazenil nor Secure airway and admit to PICU for monitoring)

- Sodium Bicarbonate (NaHCO₃) Preparation

Sodium Bicarbonate Infusion ^{8.4%} تحفیر

D5W + 0.45 NS 3 Ampules of 50 mEq 2 x Maintenance 1 Liter

Rate 2-3 mL/kg/hr or 2 x Maintenance

Add KCL 40 mEq/L ē Salicylate

Keep Serum Ph 7.45 - 7.55

urine Ph 7.50 - 8

Before Starting infusions Make Sure to give Boluses to Reach Alkalosis 1st

Indication of Alkalinization

Bolus 1-2 mEq/kg
until Serum Ph 7.45-7.55

SERUM ē TCA	URINE ē Aspirin
1 Altered Mental Status	1 Tinnitus
2 Hypotension	2 CNS Symptoms
3 QRS > 100 msec	
4 Ventricular arrhythmias	
5 pH < 7.1	

NaHCO₃ effect Blunted IF ↓ K
Normally K exchanged ē H ion
inside cell outside cell

Other Usages: Hyperkalemia ē Acidosis, Methanol/EG Toxicity, Rhabdomyolysis

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Cholinergic

- Cholinergic

- Inhaled/Skin absorbed/Oral ingestion, Petroleum/Garlic odor
- Path: Inhibit cholinesterase enzymes > cholinergic toxicity
- Sx: "DUMBBELS" (L for cholinergic)
 - Defecation, Urination, Miosis, Bronchorrhea/Bronchospasm/Bradycardia, Emesis, Lacrimation, Salivation
 - Nicotinic muscular Sx (Twitching, weakness, Paralysis)
 - CNS: Confusion, Coma, Seizures (maybe delayed 1-3 weeks)
- Invx: Clinical Diagnosis, confirmed by ↓ RBC Cholinesterase activity (usually not performed)
- Tx: Proper protective gear + Decontamination (Expose skin, Throw Cloths, Irrigation/Washing)
 - Atropine (Treat Dry secretions/Bradycardia)
 - Large repeated doses till Secretions/Bronchospasm resolve
 - Atropinization (Atropine causing Dry mouth/Flushing/Dilated pupils), Criteria:
 - Dry oropharyngeal from secretions
 - Dry lungs on auscultation
 - Easier to hook to ventilator (due to dry lungs)
 - Pralidoxime (Treat Acetylcholine receptor bind, Resolves Nicotinic Muscular Sx)
 - Benzothiazines (IF Seizure or CNS Sx)
 - AVOID Succinylcholine

Chapter 5: Toxicology

- Organophosphate = Irreversible bind | Pesticides, Nerve agents, Malathion | Tx Atropine + Pralidoxime
- Carbamates = Reversible bind | Drugs (Mitomycin C, Neostigmine) | Tx Atropine

- Organophosphates

- o Other name of concentrated in chemical warfare: Sarin, VX, tabun, soman
- o Sx (Fleisher):
 - CNS (1st 12hr): Dizziness, Headache, Ataxia, SZ, Coma
 - Nicotinic: Sweating, muscle twitch, tremor, weakness, paralysis
 - Muscarinic (SLUDGE): Salivation, Lacrimation, Urination, Defecation, GI cramp, Emesis
 - Other: Bradycardia, Bronchorrhea, Wheeze, Pulmonary edema

PEM R | RTA with multi victims, all patients having crying/GI upset/wheeze, 1st victim near leaking clear liquid on the floor having bradycardia & seizure What most likely offending agent = VX

Pedz | 2 Y/O, ingested unknown liquid in garage, has multiple vomit and diarrhea, sick looking, Sweating, HR 100 RR 30, on 2 Lpm O2, has a lot of secretions, pupils 2mm mildly reacting, important Tx = Atropine & Pralidoxime

Pedz | 4 M/O, boy, accidentally given Ant-killer in formula, given Salbutamol nebs, in EMS bcz of wheeze, agitated, sleepy, copious drooling, vomited, Temp 37.1 HR 170 RR 28 BP 93/60, Breath sound Rales/rhonchi bilaterally, tachypnea, RD, retraction, loose watery stool in his diaper, Tx = Atropine (IF Also w/ MSK Sx can use Pralidoxime can be started w/ Atropine)

PEM R | 2 Y/O Vomiting Post unknown amount of Malathion (Organophosphate), HR 80 RR 30 BP 96/45 SpO2 90% RA, Temp 37.3, has wheezing, secretions, lethargic, In addition to Atropine Tx = Pralidoxime

PEM R | 16 Y/O unresponsive at home, Temp 35.1 HR 60 RR 6 BP 85/40 SpO2 60% on RA, shallow/slow respiration, Miotic w/ secretions from Oropharynx, Next = Bag valve mask ventilations

PEM R | 13 Y/O girl Vomit/difficult breath/wheeze/sweat, drink unknown liquid in garage, having diaphoresis/soaked cloth w/ strong chemical odor, pinpoint pupil, confused, wheeze bilateral w/ moderate retractions, Decontamination room soapy/water/rinsed/gown, Albuterol/O2, Next = Give Atropine 1 mg IV & Assess response in 2 min

- o Organophosphate (Aging) + Carbamate = DUMBBELLS
 - Atropine = Fixes Bradycardia among other things
 - Pralidoxime = Fixes Nicotinic Sx + Aging (in Organophosphate)
- o Easy memory: Disaster kit meds contain 2PAM which used in Nerve agent warfare as Organophosphate

Promo | Atropinization means = No more secretions (Not No more miosis)

Promo | Smell of Organophosphate toxicity = Garlic (Not Fishy nor Fresh & Daisy nor Mint)

Promo | Child w/ head lice mother try medication & child came w/ organic phosphate poisoning, Next = Atropine

Amal | Clinical endpoint indicating adequate atropinization in organophosphate poisoning = Dry oropharyngeal from secretions

Amal | Characteristic odor of organophosphate is = Garlic

Final | RTA with multi victims, all patients were unresponsive, surrounding by leaking fluid on the floor and vomiting, when assigns the first victims he was bradycardia What is the substance = VX Organophosphate

Final | You are working in local emergency and get several alerts from EMS that multiple victims from multiple car accidents near industrial plant. EMS report accident did not appear to high speed but that all of the victims appear crying having GI upset and significant wheezing 1st victim bradycardia and reported had a seizure there was clear liquid near the 1st victim EMS requesting additional information about appropriate personal protective wondering about detoxification procedure, most likely, offending agent would explain this clinical symptom is = Organophosphorus (Not Hydrogen cyanide nor Hydrogen sulfide)

Final | Organophosphate exposure in farm, Tx = Atropine

Final | Pic of organophosphate bottle with manifestation of respiratory distress and excessive secretions, pupil dilated, tachycardia what antidote = Atropine (Atropine targeting Muscarinic receptors to stop secretions, unsure about dilated pupils)

Final | Organophosphate antidote = Atropine

Final | What mean Atropinization = No more secretion

Final | Child with head lice mother try medication child came with organic phosphate poison what to do = Atropine

Final | Organophosphate toxicity End of atropinization = Dry secretion

Chapter 5: Toxicology

Sympathomimetics

- Sympathomimetic = Mydriasis & Sweaty & **Dry mouth** & High Temp & Normal bowel sounds
- Anticholinergic = Mydriasis & **Dry skin** & High Temp & Absent bowel sounds
- Amphetamines & Cocaine
 - o Sx: Mydriasis, Hyperthermia, HTN, Tachycardia, Diaphoresis (unlike in anticholinergic overdose), Seizures
 - o Tx: IF Agitated = **Benzo**
 - IF HTN = **Benzo (1st)** > Phentolamine (2nd, as a last resort), BB (Never)
 - IF Warm = Passive/Active Cooling (No benefit in Antipyretics) > **Benzo**
 - IF Wide complex dysrhythmia = NaHCO₃

PREP | 17 Y/O Girl, Tachycardic, HTN, Fever, Tachypnea, Diaphoresis, Pupils Dilated = Amphetamine

PEM R | 15 Y/O girl, w/ Altered LoC, Agitation, began in sleepover took a pill online and has Hx of opioid addiction 2 years ago but clean since then, now agitated/speaking coherent words that lacking meaning, Temp 38.1 HR 190 BP 160/110 RR 30, Pupils dilated 8mm reactive, very sweaty, normal bowel sounds, Dx = Sympathomimetic toxidrome & opioid abstinence (withdrawal)

- o Sympathomimetic = Mydriasis & Sweaty & High Temp & Normal bowel sounds
- o Opioid withdrawal = Mydriasis & Sweaty & Normal Temp & Hyper bowel sounds (Vomiting/Diarrhea)

PEM R | 17 Y/O in ED having bizarre behavior w/ agitation/yelling & fresh track marks on arms, HR 106 BP 193/100 RR 22 SpO₂ 98% RA, GCS 13, Sx expected = Dry mouth

PEM R | (For above Q) First line Tx = Diazepam 0.1 mg/kg/dose IV Q4-6hr

- o Fresh track marks = IV drug abuser = Sympathomimetic = Meth (Amphetamine)

Promo | 2 Friends came after a party both Hyperthermic 39 Tachycardic, they admit taking Methamphetamine, Next step = Apply cooling blanket (Not Antipyretic)

Amal | 16 Y/O male, presented to ER by his friends who drop him and run away, unresponsive, confusion. GTC, his vital T 39 HR 160 RR 60 BP 180/110. O₂ 93%. Patient is pale, diaphoretic, pupils 6 mm reactive bilaterally, next step in Tx = Lorazepam

- o For HTN: Benzo (1st choice) then lastly maybe Alpha blocker (Phentolamine)

Final x2 | Cocaine ingestion w/ seizure 5 min, seizure already stopped before arrival to ER, and hypertensive SBP 190 what to give = Benzodiazepine (1st line then Phentolamine 2nd line for the HTN, also not Nicardipine)

Final | Pt. Was camping in desert, she came back home Altered mental status, Hyperactive, Hypertensive, Dry lips, Mucosa, Substance = Amphetamine (causes dry mouth)

Final | Child with ADHD on amphetamine have OPD a week brought by his mother because she was worry that medication will finish after 3 days, pt was setting w/ abnormal movement (fidgeting) = Consult primary team (Not drug lvl nor D/C nor F/U PHC)

Final25 | Patient with hyperthyroidism came agitated, diaphoretic, tachycardic, hypertensive and febrile Temp 38.9, after you gave IV propranolol w/ no response, meds can help in her management = Lorazepam IV (Not Acetaminophen nor Methimazole)

- MDMA
 - o Ecstasy, Molly
 - o Sx: Euphoria, Hyperactivity, Insomnia
 - Bruxism (Jaw clench), Diaphoresis, dehydration, thirst
 - **Hyponatremia** (for excess water intake) > Seizure

PEM R | Teenager male talking to himself, hyperactive, euphoric, jaw clenching, dry lips, diaphoresis, chest/jaw pain after concert = Molly MDMA intoxication

PEM R | 16 Y/O girl, was in party, sudden seizure for 5 min, Temp 37.7 HR 134 RR 24 BP 160/91 SpO₂ 97% on RA, glucose 90 mg/dL, most likely substance = Methamphetamine

Final | Tox w/ Low NA = MDMA

Final | Ingestion w/ seizure and hyponatremia = MDMA (Amphetamine)

Chapter 5: Toxicology

Opioids

- Opioids

- Toxidrome: Miosis, CNS Depression, Resp. Depression, CVS Depression (Bradycardia, Hypotension)
- Tx: Respiratory Support > Naloxone

PEM R | 9 Y/O girl, struck MVA w/ femur fracture, 30kg, given 3mg IV morphine, 5 min later BVM done, still apneic, during assessment found by error she was given 3mg hydromorphone, Best Next = IV Naloxone

PEM R | 16 Y/O found unresponsive Temp 35.1 HR 60 RR 6 BP 85/40 SpO2 60% RA, shallow/slow respiration w/ Miosis & signification oropharynx secretions, Next = BVM Ventilation (Not Intranasal Naloxone nor IV Bolus nor IV Calcium)

Promo | 4 Y/O Unresponsive in kitchen found w/ open bottle of methadone liquid belong to grandparent, Temp 35.8 HR 54 RR 4 gasping, BP 68/40, SpO2 84%, Pupils pinpoint, unresponsive to pain, Most imp = O2 by PPV w/ BVM (Not Naloxone 2mg as soon as IV obtained nor Naloxone 2mg SC)

Promo | Methadone and gasping, next = Ambo bag

Promo | 6 Y/O w/ Hypothermia, Bradycardia, Hypotension, Decrease LoC, likely drug = Opioid (Not Aspirin nor Paracetamol)

Final | Receptor of pain gene = CYP2CD

- Right Answer: OPRM1 gene (mu: opioid receptor)

- Chronic Opioid toxicity

PEM R | 17 Y/O boy, is found unresponsive on a toilet with a needle in his arm, Vitals (pre-EMS): HR 40, RR 8, BP 60/18, SpO2 96%. After EMS medication, he awoke briefly but relapsed into coma within 15 min, In the ED: somnolent but arousable, HR 70, RR 14, BP 80/62, SpO2 95%, (ECG sinus bradycardia) pinpoint pupils, clear lungs, no trauma, normal glucose, Next = Place on Cardiac monitoring for period of observation

- Antidiarrhea

- Anti-Diarrhea = Loperamide = Opioid (Target GI, causes if Toxicity may cross BBB) = Naloxone

Final | Tox Q about antidiarrheal ingestion, what is the antidote = Naloxone

Final | Ingestion of Anti-Diarrhea medication with Decrease LOC & Bradypnea what antidote = Naloxone

Final | Anti diarrhea + low RR = Naloxone

Final | Ingestion of antidiarrheal medication low HR low RR GCS low antidote = Naloxone (Loperamide)

Sedative/Hypnotics

Barbiturates

- Phenobarbital overdose

- Sx: Profound CNS Depression > Rapid resolution

PEM R | 18 Y/O in ED found unresponsive at a party after taking recreational drugs taking unknown amounts, GCS 3, Intubated, wakes up 2 hours after and self-extubates w/ mild residual sedation, likely ingestion = Gamma-Hydroxybutyrate (GHB)

Amal | Known case of seizure disorder on Phenobarbital and Oxcarbazepine, brought by mother due to hypo-activity and somnolence. The medication dose recently increased, O/E he is HR 70, difficult to arouse. Most likely additional PE finding = Hypothermia (Not Dilated pupils nor Hyper-reflexia nor Tremor)

Final | 11 Y/O presented from school with alter mental status, urine toxicology negative, what possible substance you suspect he used = GHB (Gamma hydroxybutyrate = not appearing in urine tox)

Chapter 5: Toxicology

Final | Phenobarbitones facts all true except = Rectal not available

- Side effect: Somnolence, Ataxia Dizziness, Nystagmus, Blurred vision

Final25 | About barbiturate, what statement true = Increase pain sensation (Not can't be given rectally nor Increase cardiac contractility nor Increase respiratory response to hypoxemia)

Cannabis

- Marijuana

Amal | You are rotating in adult ED, brought guy who they're thinking ingested marijuana, What is the correct statement about cannabis = Urine drug screening may be positive after 7 days (Not Metabolized by liver CYP450 & excreted mainly by urine nor Tachycardia & orthostatic hypotension & pinpoint pupils are characteristics nor Cannabinoid has specific & effective antidote)

- Metabolized by hepatic cytochrome p450 & Excreted 60% by Liver, 20% by Kidney

Final | Rotating in Adult ED, a guy who they're thinking ingested marijuana, correct statement about cannabis = Urine drug screening may be positive after 7 days

- Marijuana EVALI (E-Cig or Vaping product use associated lung injury)
 - Dx of exclusion
 - Tx: STOP USE

PEM R | 17 Y/O 3 wk SOB/cough/chills, Dx as pneumonia, had 10 days Amox/Azithro, viral tests & PPD negative, uses marijuana, Temp 37.8 HR 100 BP 128/74 SpO2 89% RA, CXR diffuse bilateral opacities, recommended for improved management = Avoid use of E-Cigarettes & vape

Alcohol Toxicity

- Ethanol = Acetic Acid | Hypoglycemia > SZ > Coma > Death
- Methanol = ≥ 20 | Formic acid | $OG \geq 10 + HA$ Acidosis $\geq 12 + CNS$ Depress + Blindness | Tx: Fomepizole
- EG = ≥ 20 | Oxalic acid | $OG \geq 10 + HA$ Acidosis $\geq 12 + Renal$ Failure + Oxalate Crystals | Tx: Fomepizole
- Isopropanol = Acetone | $OG \geq 10 + NO$ + Ketones + Fruity breath | Tx: Supportive

OG = Osmolar gap | HA Acidosis = High Anion gap Metabolic Acidosis

- Ethanol
 - Products: OTC Mouthwash = Ethanol intoxication
 - Sx: Hypoglycemic > SZ > Death (in children due to their limited hepatic glycogen stores, as compared to adults)
 - Invx: Glucose level, Serum ethanol
 - > 100 = Altered LoC
 - > 300 = Coma
 - > 400 = Resp. Arrest

JTF | 2 Y/O, ingested green mint flavored mouthwash 2hr ago, VS stable, Sleepy, management priority = Glucose check

PEM R | 17 Y/O, student in party where alcohol served but strongly deny taking, may smoke marijuana, also may taken "date rape" drug, Comatose, responds only to pain, Temp 37.3 HR 110 RR 32 SpO2 98%, Blood glucose 80 mg/dL, Lab = Serum Ethanol

Promo | Child ingestion unknown substance looking stable but has Hypoglycemia, Type of ingestion = Ethanol

Promo | 3 Y/O swallowed mouthwash, came w/ lethargy, 1st step = Check glucose (Not Give Fomepizole -No effect-)

Chapter 5: Toxicology

- Toxic Alcohols

- PO intake, rarely by Inhalation or Topical
- Toxic Alcohol: Group of Hydrocarbons containing Hydroxyl group (-OH) = Methanol, Ethylene glycol, Isopropyl
- Products
 - M = Perfumes, Paint, Wiper fluid
 - EG = Adhesive, Ink, Antifreeze fluid, Brake fluid, Hydraulic fluid, De-Icer
 - Iso = Rubbing Alcohol, Solvents
- Tx: Fomepizole 15mg/kg over 30min then 10mg/kg Q12hr then 15mg/kg after 48hr or Ethanol
- Adjuncts
 - Acidosis: NaHCO₃
 - Methanol: Folate, Leucovorin (enhance formic acid clearance)
 - EG: Pyridoxine, Thiamine
- Fomepizole indication:
 - ≥ 20 mg/dL level of EG or Methanol
 - or Metabolic acidosis
 - and/or High Osmolar gap
 - Supportive: Ph < 7.3, HCO₃ < 20, OG > 10, Urine oxalate
- Hemodialysis Indication:
 - Visual impairment
 - Renal Failure
 - Methanol ≥ 50 mg/dL
 - Refractory Metabolic Acidosis
- Severe Isopropyl toxicity
 - Sx: Hypotension, CNS Depression
 - Tx: Hemodialysis

JTF | Suspected methanol intoxication in child drank windshield washer fluid, normal mental status, VS stable w/ mild acidosis on ABG, Pharmacy no longer stock ethanol preparations for toxic alcohol therapy, Alternative = Fomepizole

JTF | 5 Y/O, altered mental status, fruity odor on the breath, which consists w/ isopropanol ingestion = positive serum acetone

PEM R | 15 Y/O in ED Altered and found in garage w/ open containers of automobile products, 1hr ago was normal, Ataxic, Slurred speech, Alcohol level 0 mg/dL, Ph 7.36 PCO₂ 50 HCO₃ 24, Cr 0.9 Urea 18, Na 144 K 4 Cl 110, Glu 109, True = Serial Electrolytes should be measured while under Observation

- Fomepizole indication: EG or Methanol Level ≥ 20 mg/dL or Metabolic acidosis and/or ≥ 10 Osmolar gap
- Suspected: Ph < 7.3, HCO₃ < 20, OG > 10, Urine oxalate

PEM R | 3 Y/O girl, w/ Coma found in garage w/ liquid & vomit in pants, Vitals normal, responding to pain, Glucose 70 Ph 7.31 CO₂ 34 O₂ 94 HCO₃ 16, Anion gap 22, OG 35, Next = Give Loading Fomepizole IV

PEM R | 16 Y/O girl alter mental state, incoherent having Rt. Flank pain, having muscle spasm & twitching on ex, found unresponsive w/ Anti-freeze fluid on side, ECG shows prolong QT, initial gas = Ph 7.14 Na 143 HCO₃ 9 Cl 96

- EG w/ Antifreeze

PEM R | 3 Y/O boy w/ Rapid breath & decreased responsiveness, parent report playing in garage seen very sleepy/ataxic/breath hard, vitally stable, Ph 7.18 CO₂ 24 BE -15.9 Na 135 K 5 Cl 102 HCO₃ 10.4 Urea 20 Cr 0.7 Glucose 122 Serum Osm 315, most likely Dx = EG intoxication

- Calculated osmolarity = $(2 \times [\text{Na}^+]) + [\text{glucose}] + [\text{urea}]$
- Osmolar gap = Osmolality (measured) - Osmolarity (calculated)

PEM R | 16 M/O Altered LoC, seen w/ open bottle of rubbing alcohol, deep sleep, Temp 37 HR 98 RR 20 BP 76/58 SpO₂ 100%, IV line obtained, glucose 84 mg/dL Ph 7.41 CO₂ 38 O₂ 102 HCO₃ 22 Lactate 2, Planning for worst case & severe toxicity, Next step = Contact PICU for possible Veno-Veno Hemofiltration

- Severe Isopropyl toxicity
 - Sx: Hypotension, CNS Depression
 - Tx: Hemodialysis

Chapter 5: Toxicology

Promo x2 | Toxic Alcohol requiring Antidote = Ethylene glycol & Methanol

Promo | Toxic Alcohols Ax w/ Significant Metabolic Acidosis = Ethylene glycol & Methanol

Amal | Which alcohol cause metabolic acidosis = Ethylene glycol & Methanol

Amal | Which alcohol require antidote = Ethylene glycol

Amal | Fomepizole, which of the following is true = Early treatment with it for ethanol poisoning before acidosis may obviate need for dialysis (Not It enhance metabolism of toxic alcohol by alcohol dehydrogenase to less toxic metabolite. Nor Has advantage for being dialyzable. Nor It should be continued until alcohol level be less than 50 mg/dl)

Final | About lethargic and unknown ingestion, Anion gap 2 and osmolar gap is 50, Next = Immediate Fomepizole (Not Immediate ethanol nor Pyridoxine nor Wait 6 hours and repeat lab)

Final | High AG + High Osmolar gap 50 = Fomepizole IV

Final | 2 Y/O w/ Hx drinking mouthwash 2hr ago, strong smell on mouth & clothes, Asymptomatic but sleepy, Awake whenever touching him, Next = Repeat lab after 1hr (Answer: bedside glucose level, Not Give Fomepizole nor ABG to confirm VBG)

Hypoglycemics

- Sulfonylurea

- Meds (Ride & Zide): Glyburide, Glimepiride, Gliclazide, Glipizide
- Path: stimulates insulin secretion, **May cause hypoglycemia 24 hours after ingestion**
- Risk of toxicity: Kidney insufficiency, Multiple co-ingestions of meds
- Sx: Mental status changes, Palpitations, Diaphoresis
- Tx: IV Dextrose (For Hypoglycemia), Octreotide (1st line), Diazoxide (2nd line)

PEM R | 2 Y/O girl found w/ grandmother purse which has medications for DM, child had SZ, Glucose 40 mg/dL, VS stable, given Bolus glucose and became 100 mg/dL, 2 hours later became sleepy & glucose again down 45 mg/dL, Antidote for the suspected ingestion = Octreotide (for Sulfonylurea, not Glucagon for BB)

PEM R | 4 Y/O boy 25 kg, brought after a SZ, initially found w/ open bottle of anti-diabetic Glipizide, glucose at scene 0 mg/dL, given D50, comatose/unresponsive to pain w/ HR 140 RR 30 BP 80/50 SpO2 99%, finger stick glucose 11 mg/dL, IV dextrose bolus, Tx = Octreotide 25 mcg SC

Promo | Child took Gliclazide (Oral Hypoglycemic) tablet 1.5 hrs ago, blood sugar normal, Next = Admission & Serial Glucose

Final | Hypoglycemia sulfonylurea ingestion = Octreotide (First line Dextrose 10% , if refractory hypoglycemia give octreotide)

- Metformin

- Path: Impairment of oxidative phosphorylation, leading to lactic acidosis
- Sx: GI symptoms, lactic acidosis, respiratory distress, euglycemia, or mild hypoglycemia
- Toxic dose: > 50-70 mg/kg or any dose in presence of renal dysfunction
- Tx: Supportive care with fluids and bicarbonate
 - Hemodialysis for severe cases
 - ICU admission for moderate to severe toxicity

Chapter 5: Toxicology

Cardiac Meds

Anti-HTN

- CCB & BB Toxicity Tx:

- GI Decontamination = [AC within 1st hr then +/- WBI]
- Hypoglycemia (for BB) = [Dextrose bolus then w/ IVF Maintenance]
- CVS = [IV Bolus then Atropine then Glucagon (if BB) then/or Ca (if CCB or BB) then High dose Insulin/Glucose]
 - Bradycardia (Goal Normal HR or ≥ 60 bpm)
 - IV Bolus 20 ml/kg (NS or RL)
 - Atropine 0.02 mg/kg (Max 0.5 mg) Q5min (Total per day 1 mg)
 - Cardiac pacing (Internal/External, beneficial in torades or sotalol toxicity)
 - Hypotension (Goal Normal BP or ≥ 90 mmHg)
 - **Glucagon** (for BB, 1st line of Brady/Hypotension, Side effect: Vomiting)
Myocardial Adenylate Cyclase activation bypassing B-receptor $>\uparrow$ cAMP independently
 - Bolus 50-150 mcg/kg (repeat if no response in 15 min)
 - Infusion 20-70 mcg/kg/hr (if beneficial effect seen w/ bolus, titrated according to HD response)
 - Calcium (for CCB/BB, improves cardiac contractility & Hypotension, Monitor Ca)
 - Ca Chloride (10% 1g/10ml) 20 mg/kg or 0.2 ml/kg (Max 1g or 10ml)
Preferred in Resus -rapid dissociation- w/ Central line -Extravasating if given by peripheral line-
 - Ca Gluconate (10% 1g/10ml) 60 mg/kg or 0.6 ml/kg (Max 3g or 30ml)
 - High-dose Insulin/Glucose
 - Insulin Bolus 1 u/kg followed by infusion 0.5-1 u/kg/hr
 - Dextrose 10% 0.5 g/kg/hr
 - Wide QRS ≥ 120 ms (Goal ≤ 120 ms)
 - HCO₃ 8.4% (for severe acidosis/Wide QRS 2ndry to sodium channel blockade by specific BB)
 - Bolus 2-3 mEq/kg over 1-2min (repeat or use infusion till QRS ≤ 120 ms)
 - Decreased SVR = Vasopressors as Milrinone 0.3 mcg/kg/min (read more in clonidine treatment)
 - Other therapies (Goal improve mentation): Lipid Emulsion, Pacemaker, Aortic ballon pump, ECMO
- [Fleisher] Bradycardia/Hypotension improve w/ Atropine, Fluid boluses, Nore-epi, but many can be resistant
 - Glucagon used in BB Toxicity (Increases cAMP > Improves HR/BP)
 - 50-150 mcg/kg boluses followed by infusion 2-5 mg/hr
 - Calcium Infusion in CCB/BB Toxicity (but monitor Ionized Ca)
 - Ca Chloride = 0.2 ml/kg | Ca Gluconate = 0.6 ml/kg

TABLE 142.6 Sequential Treatment Recommendations for Poisoning from Beta-Blockers and Calcium Channel Blockers

Phase of Treatment	Beta-Blockers	Calcium Channel Blockers
Phase 1 (initial resuscitation; primarily bolus dose therapies)	Activated charcoal as indicated Isotonic fluid bolus 20–40 mL/kg Atropine Calcium Glucagon	Activated charcoal as indicated Isotonic fluid bolus 20–40 mL/kg Atropine Calcium
Phase 2 (stabilization; place central & arterial lines, consider cardiac output & SVR monitoring)	Place central & arterial lines HDI infusion Norepinephrine Vasopressin 3rd agent based on type of shock Pacemaker for bradycardia	Place central & arterial lines HDI infusion Norepinephrine Vasopressin 3rd agent based on type of shock Pacemaker for bradycardia
Phase 3 (salvage therapies)	IFE ECMO Other mechanical devices if ECMO not available	IFE Methylene blue ECMO Other mechanical devices if ECMO not available

HDI, High-dose insulin; IFE, intravenous fat emulsion; SVR, systemic vascular resistance; ECMO, extracorporeal membrane oxygenation.

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- CCB: Candy = Hyperglycemia = Verapamil

PEM R | 18 M/O girl may have ingested extended-release Verapamil 90min ago, father is confident pill count correct & no pill missing, Normal vitals & normal Ex but sleeping deeply, parents saying would never sleep at this time, Next step = Admit for Cardio-Respiratory monitoring

PEM R | 17 Y/O overdosed on Father's BP meds, found unresponsive Temp 36.5 HR 40 BP 70/50, SpO2 100% on Non-rebreather, Weak pulse, Glucose 300 mg/dL, ECG Sinus Brady, Medication he ingested = Verapamil (CCB)

Final | Ingestion of amlodipine tab vital is bradycardia and hypotension what is next step = NS bolus

Final | Verapamil (Cause Bradycardia) = Admit for cardiac monitor

- BB: Brady/Low BP/Hypoglycemia = Tx: IVF > Atropine > Glucagon > Insulin/glucose > Intralipid

PEM R | 2 Y/O took grandmother Med: extended-release metoprolol, sleepy, Temp 37 HR 52 RR 16 BP 50/38 SpO2 100%, glucose 88 mg/dL, given x2 boluses & atropine 0.01 mg/kg, no improvement of HR/BP, Next = Glucagon IV

PEM R | 14 M/O comes w/ grandfather after finding him w/ aspirin, propranolol, furosemide, ranitidine, sleepy, HR 62 RR 18 BP 66/38 Temp 37.2 SpO2 98%, blood glucose 76 mg/dL, given 20ml/kg NS, next = IV Glucagon

Promo | Child took father meds HTN & DM meds, now Low HR, Low BP, Sugar normal, Pupils normal, Next = Give Glucagon

Promo | Metoprolol, Give = Glucagon

Amal | 4 Y/O old girl on propranolol, Family were at party last night and she slept later than usual, mother noticed she is less active, had 1 time vomiting, vitally stable, diaphoretic, somnolence. Diagnostic test to reveal cause = blood glucose

Amal | 18 M/O has been brought to the ED for an ingestion. He and his mother are in town visiting their grandmother. The mother tells you that she found him playing with an open bottle of her mom's medication. On physical exam, he's sleepy but arousal, pale, mildly diaphoretic, afebrile. His RR is 20 breaths per minute, HR 60, BP 65/40. His lungs are clear, there's no murmur, and his pulses are weak. Of the following, the most likely cause of this patient's presentation is ingestion of = Beta Blocker (Not Captopril nor Hydralazine nor pseudo acidity)

- o All others cause Tachycardia, only BB causes Bradycardia

Final | Child ingestion of BB medication was bradycardia and persistent hypotension sugar normal next step = Glucagon IV

Final | Beta blocker antidote = Glucagon

Final | BB toxicity Tx = Glucagon

Final25 | Q45: Suicidal Ingestion of father cardiac medication, now hypoglycemic, bradycardic and hypotensive, management = Glucagon (Not Insulin + glucose nor Sodium bicarbonate nor 10% ca)

- Clonidine

- o Path: Stimulates Alpha2-adrenergic-receptors in CNS > Inhibit catecholamine release in periphery > ↓ HR/Contractility/SVR | Opioid agonist at u-receptors (used in opioid withdrawal)
- o Sx: Triad: Bradycardia, Sedation, Miosis (mimic opiate toxicity, mnemonic: B CRAMTH)
 - Bradycardia, CNS Depression, Resp. Depression, Apnea, Miosis
 - Transient Hypertension (Early) > Hypotension, Hypothermia
- o Tx: GI Decontamination (AC within 1st hr then +/- WBI)
 - Naloxone (Reverse opioid signs of clonidine)
 - IV fluid > Atropine > Pacing (If had Bradycardia)
 - Milrinone (If Hypotensive, avoid Norepi)

Promo | One of the following causes Miosis = Clonidine (Not Atropine nor Amphetamine nor TCA)

Amal | 4 Y/O took his father's antihypertensive medications 4 hr ago, He's fully awake, Pupils 1-2 millimeter & skin is normal, Temp 36.9 RR 26 BP 122/64 HR 168, What is the agent = Clonidine

- o Miosis, Tachycardic, paradoxical Hypertension

Final | Child ingestion of antihypertensive medication with pupil size 1-2mm what to do = Naloxone

Chapter 5: Toxicology

Final | Pt. Was with his father who is in antihypertensive medication presented with bradycardia and hypotension and miosis (scenario about clonidine ingestion) = Naloxone

Final | Tox Anti-HTN, GCS 8, Miotic pupils = Naloxone (clonidine)

Final | Drugs causing Miosis = Clonidine (also opioids)

Final | 3 Y/O ingested his father UNKNOWN anti-hypertensive medication, O/E HR 150 bpm, BP 120/79, pupil 1-2 mm. The most likely drug ingested is = Clonidine (Clonidine initial hypertension then hypotension)

Anti-Arrhythmic

- **Digoxin (Cardio-active steroids): Triad: Hypotension/Hyperkalemia>Hypokalemia/Bradycardia**
 - Cause: Meds: Digoxin (used for Afib, Congestive HF), Digitoxin (longer Half-Life)
Plant: Digitalis sp. (Foxglove), Nerium sp. (Oleander), Conavallaria sp. (lily of the valley), Red squill, Bufo toad
Digoxin-like immunoreactive substances: (May elevate digoxin level)
 - Risk factors: Neonate, 3rd-Trimester pregnant women, Subarachnoid hemorrhage, Renal/Liver dysfunction
 - Sx: Sudden Onset, May have a delay of several hours before Sx appear
 - Digoxin Toxicity: Bradycardia, Hyperkalemia, Headache, N/V, Blurry Yellow vision
 - GI: Nausea, vomiting, anorexia, vague abdominal pain.
 - Cardiac: Bradydysrhythmias, AV block (due to increased vagal tone).
 - Neurologic: Weakness, confusion.
 - Visual: Xanthopsia (yellow-green halos) or nonspecific color vision changes.
 - Hyperkalemia: (Hyperkalemia > Dysrhythmia > Hypotension)
 - Key marker of severity (due to Na^+/K^+ ATPase inhibition).
 - Poor correlation with early serum digoxin levels (first 6 hours may be falsely elevated).
 - ECG:
 - Acute: PVC (most common), Bradycardia, SVT, AV Block, Slow Afib
Bidirectional Vtach (classic Rare, pathognomic)
 - Chronic: VT/Vfib, SVT, Salvador dali mustache
(The scooping/downsloping of the ST segment commonly referred to as the "dig effect" or "Salvador Dali" sign is observed in cases of chronic digoxin use and is not a marker of acute toxicity)
 - Invx: ECG, Cardiac monitor
 - U/E Hyperkalemia (Best indicator of End-organ toxicity & prognostic factor in Acute ingestion | useless in chronic)
 - Digoxin level (Useful if obtained within 1st 6hrs | Useless in chronic)
 - Tx: AC, Digoxin FAB
 - Atropine or Cardiac pacing (if Bradycardia)
 - AVOID Ca Chloride (Controversial contraindication)
 - Digoxin FAB indications (also high predictors of mortality):
 - Progressive Sx of intoxication
 - Life-threatening Arrhythmias (Bradycardia, VT/VF/slow A.fib)
 - Hyperkalemia ≥ 5.5 or Late Hypokalemia
 - Ingestion Adult $\geq 10\text{mg}$ or Peds 4mg ($> 0.1 \text{ mg/kg}$ in children)
 - Renal failure with elevated digoxin levels
 - Plant Ingestion + Hyperkalemia

PEM R | 2 Y/O ate flowers from grandmother's garden (foxglove plant purple like?) HR 45 RR 18 BP 80/30, K 2.8, Fab Tx appropriate = Digoxin Antibody fragments

Promo | Known CHD, grandmother taking care of him and gave him his meds 4hr after he started to vomit & became fussy, lethargic, ECG showing (Peaked T wave), meds given = Digoxin (Not Albuterol nor Calcium nor Sodium Chloride)

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Promo | Child ingested Digoxin, Spironolactone, Metformin, came w/ severe Bradycardia, give = Atropine (Not Ca Chloride)

Amal | After acute Digoxin toxicity. What is good predictor of mortality in digoxin acute toxicity = Serum potassium more than 5.5 mmol without treatment (Not Development of PVC nor Development of Bi VT)

Final | Pt. Found w/ open bottle of Digoxin, ingested 5 tabs estimated total dose 2mg, Vomited once, Lab K 5.3 ECG normal, Next = Repeat ECG & Lab after (Not Digoxin specific FAB)

Final | Digoxin ingestion K 5.6 = Start antidote (Digifab)

Final | Child ingested Digoxin, Spironolactone, metformin came w/ severe bradycardia what to give = Atropine (Not Ca Chloride)

Final | Digoxin Toxicity, Tx = Digifab

Final25 | Patient ingested father post cardiac surgery medications, digoxin tablet about 2 mg, patient vomited once and now asymptomatic his labs result shows K 5.6 = Digoxin immune fab (Digifab) (Not Discharge nor Repeat potassium level after 1)

Salicylate, Acetaminophen, Ibuprofen

- Salicylate

- Sx: Acute: Nausea, Vomit, Diaphoresis, **Tinnitus**
Moderate: Tachypnea, Tachycardia
Severe: Fever, Seizure, Coma
 - [Early] Respiratory Alkalosis w/ Hyperventilation
Tachypnea, Pulmonary edema + CNS Up: Agitation/Delirium
 - [Late] Metabolic Acidosis w/ Fluid
Nausea and Vomit + CNS Down: SZ/Lethargy
 - GI Irritation (N/V, High ALT/AST, Abnormal coagulation), AKI
 - Hypovolemia/Hypokalemia, Hyperglycemia > Hypoglycemia, Hypothermia/Hyperthermia
 - Pylorospasm/Pulmo Edema/Parotonia/PLT Dysfunction
- Toxic Dose:
 - > 150mg/kg = Mild toxic
 - > 300mg/kg = Severe Toxic
 - > 500mg/kg = Fatal
- Toxic Levels: Salicylate in serum (closely monitored every 2 hours initially till it's going down)
 - > 30-50mg/dL = Potentially toxic (Follow Pt.)
 - > 50-100mg/dL = typically symptomatic
 - > 100mg/dL = serious toxic
- Tx: Give Activated Charcoal (IF 1hr Post ingestion)
 - Supportive care, hydration and monitor Blood gas, Electrolytes, Coagulation and Salicylate lvls
 - NaHCO₃ for Urine Alkalinization (traps salicylate in Blood and Renal (Away from brain)
 - Endoscopic removal of bezoar (formed by salicylate), Ferric chloride turns urine PURPLE/BROWN if w/ salicylate

- Salicylate toxicity Intubation

- Safest Intubation settings: TV 10-12 mL/kg & High rate 25 bpm
- Intubating a Salicylate toxicity patient can lead to rapid deterioration & immediate death
- AVOID intubation Acidotic patient: Salicylate, DKA, Asthma

PEM R | 2 Y/O vomiting/ill appearing, w/ Household products, Temp 38.1 HR 150 RR 40 BP 90/50 diaphoretic, tired, Kussmaul breathing, Intermittent vomit, Ph 7.45 CO₂ 20 HCO₃ 12, likely ingested = Oil of wintergreen

PEM R | 16 Y/O long distance runner been rubbing topical cream leg 3-4 times daily to relief pain from aches, on package written contains Oil of wintergreen, having N/V, dizziness, **tinnitus**, Temp 40.8 HR 110 RR 48 BP 80/65 SpO₂ 99%, Comatose & critically ill, Ph 7.18 CO₂ 20 HCO₃ 14, Serum level of drug in question 70 mg/dL (10-20 mg/dL), Bolus NS/NaHCO₃/Active cooling/BiPAP/ETT w/ Mechanical ventilation are all treatment options, what intervention is Absolutely contraindication = Post intubation setting Tidal volume 8 mL/kg rate 16 bpm (Not Sodium bicarbonate 2mEq/kg over 10 minutes. Nor Bolus of 1L of NS

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and then 1.5 times maintenance IV fluid. Nor Active cooling with ice packs to the axilla & groin. Nor BiPAP with a pressure of 25cmH₂O/10cm H₂O)

Promo | Salicylate ingestion unknown amount, how to order for Alkalization = D5% 100ml NaHCO₃ + 40 K

Promo | **Last finding** seen in blood gas in Salicylates Toxicity = Metabolic Acidosis (Not Metabolic Alkalosis)

Promo | one of following meds causes Hyperthermia = Salicylate (Not Opioid)

Promo | Worried grandmother bringing 2 Y/O grandchild to ED immediately open child taking 81mg chewable Aspirin used by grandfather for CAD prophylaxis, unsure how many tablets in bottle prior to ingestion originally 30, 3 now remaining, Child vomited once & fussy, Ex 12kg child tachypneic/tachycardic, Ph 7.45 CO₂ 25 HCO₃ 18, level pending, Next = AC

Amal | Toxicity of which drug leads to hyperthermia = Salicylate (Not Barbiturate nor Ethanol nor Opioids)

Amal | 2 Y/O brought immediately in ED after being found by grandmother with open bottle Chewable Aspirin of grandfather unsure of number of tablets but original number was 30 pills of 81mg now 3 remaining, Tachypnea/Tachycardia/Lethargic, Ph 7.45 CO₂ 25 HCO₃ 18 12kg = Activated charcoal (Not NaHCO₃ IV nor Observe clinically in ED nor Remeasure Salicylate level at 6hr)

Amal | 2 Y/O boy, 6hr post ingestion of unknown medication, acute lethargy, diaphoretic, normal neuro exam, T 38.3 HR120 RR 45 BP 110/70. Only K =3.1, given AC, Most likely ingested medication = Aspirin (Not Dextromethorphan nor Indomethacin nor Tricyclic antidepressant)

Amal | 3 Y/O, found with open bottle of aspirin, she has irregular respiration RR12 HR50, minimally responsive, Blood gas: Ph 7.21 Pco₂ 50 Bicarb 9, Tox recommended starting sodium bicarbonate continues infusion, your next immediate step =

Intubation with ETT 4.5 (Not NaHCO₃ 1 mEq/kg IV nor NaHCO₃ infusion nor Epinephrine 0.01 mg/kg IV)

- Patient is Unstable with RF Type 2 (Acidotic w/ PCO₂ 50, RR 12 HR 50), & Low GCS = Use ABCDE
- IF stable then Give NaHCO₃ bolus until urine Ph 7.50-8 then infusion

Amal | Best mechanism for elimination of toxic level of salicylate = Renal excretion in alkaline urine w/ UO of 2.5mL/kg/hr

Amal | Which of the following is true about Salicylate = Urinary secretion is increased with alkalization (Not Entry to CNS is increased with Alkalosis nor amount of unionized form increases with nor ionized form readily crosses the biological barriers)

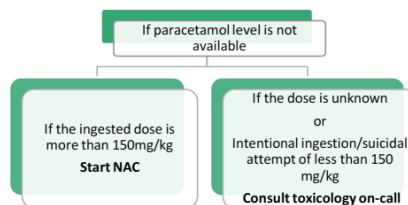
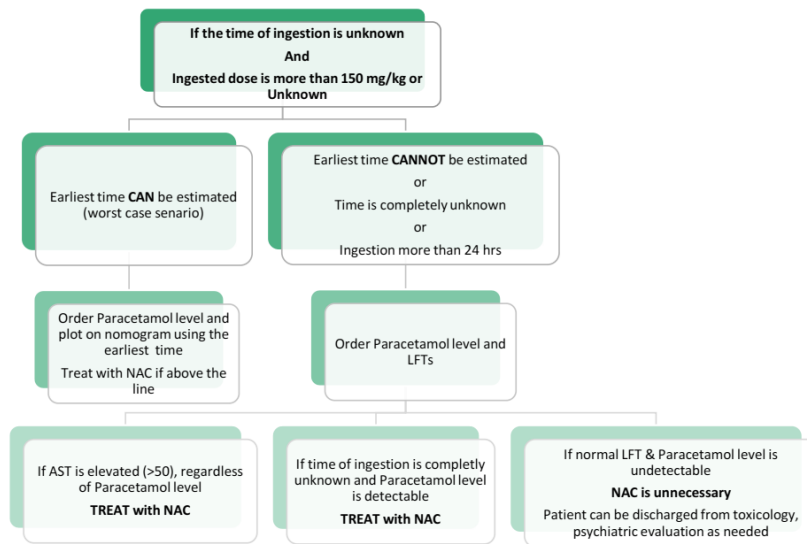
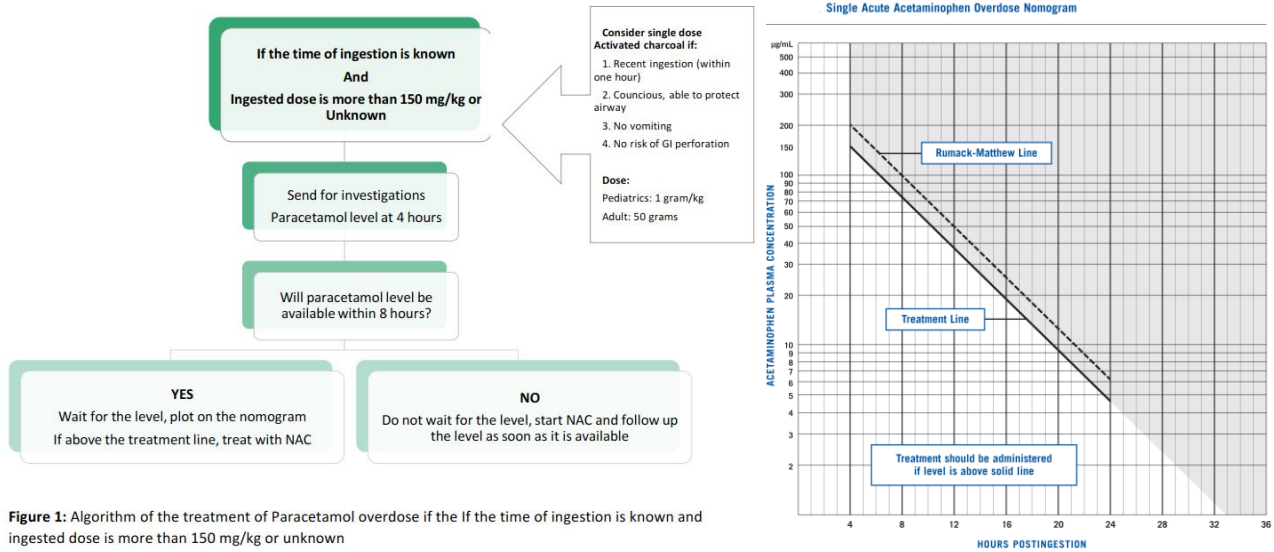
- Salicylate increases CNS Entry in Acidosis

Final | Aspirin toxicity treatment = D5 water 150 ml Sodium bicarbonate running one and a half maintenance + Kcl 40 mEq

- Acetaminophen (Paracetamol)

- Mortality rare if treated within 8-10hr from ingestion, Acetaminophen Metabolizes in by Glutathione Liver
- Stages: [00 - 24 Hr] 1: Asymptomatic or Nausea/Vomiting
 - [24 - 72 Hr] 2: Abdomen Pain + High Transaminases (ALT/AST) + High Coagulation (PT, INR)
 - [72 - 96 Hr] 3: Fulminant Hepatic Failure w/ Coagulopathy + Multi-Organ Failure
 - [04 - 14 D] 4: Recovery or Death
- Toxic Dose:
 - > 150mg/kg = Minimal Toxic = Threshold to start NAC (in ≤ 12 Y/O)
 - > 200mg/kg = Mild Toxic = Hepatotoxicity risk
 - > 400mg/kg = Serious Toxic
- Toxic Level: Depends on Rumack-Matthew (4hr ≥ 150 mcg/ml, 6hr ≥ 100 mcg/ml, 8hr ≥ 75 mcg/ml, 12hr ≥ 40)
- Tx: Give Activated Charcoal (IF 1hr Post ingestion)
 - Check Acetaminophen Level ≥ 4hr Post Ingestion
 - Check Liver Function (AST/ALT, Coagulation) and Renal Function
- Indications of N-Acetylcysteine (NAC)
 - IF Acetaminophen level Toxic by Rumack Matthew Chart
 - IF Abnormal Liver Function (High AST > 50)
 - IF Post 8hr of Ingestion w/ Hx of ≥ 150-200mg/kg/dose
 - IF Extended release
- Liver Transplant (IF Liver Failure)
- Prognosis: NAC Doesn't directly lower level so Follow AST/ALT, Coagulopathy
Major cause of Morbidity/Mortality is Hepatic

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PEM R | 15 Y/O took 10g acetaminophen and arrived after 4hr, his 6hr APAP is 150 mcg/ml, Next = NAC

PEM R | 7 Y/O girl Trisomy 21, found w/ 5 empty bottles that was just bought, Acetaminophen infant drops & syrup, ibuprofen, Hx of same thing happened a month ago, possible ingested 300 mg/kg, 4hr post ingestion Aceta level 120 mcg/mL, (Rumack Mathew shows not in toxic level) Next = Child protective services

PEM R | 16 Y/O, brought by paramedic after she confessed to mother she took entire bottle of over the counter meds, taking 2 handful of meds about 8hr prior CTU presentation, pain/vomit, Temp 37.5 HR 120 RR 20 BP 130/80 SpO2 98% on RA, labs high transaminases, predictive of severity of hepatic dmg = Plasma drug level

- Predictive of severity of prehepatic dmg means what can show toxic ingestion = plasma drug level
- The assessment of hepatic damage by = Transaminases

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Promo | 5 Y/O ingested toxic dose of Paracetamol 2hr back, when to send level = after 2hr (4hr from ingestion)

Promo | Child given 325mg paracetamol Q4hr for 13 kg child, ALT 900 AST 490, Acetaminophen lvl normal, Next = NAC

- Chronic toxicity with rising liver enzymes

Promo | Paracetamol toxic level = > 200mg/kg

Promo | Ingested Acetaminophen last night and had vomiting, Mother brought him today = Start NAC or Wait for level

- Presentation > 8-24hr after ingestion = Start NAC initially & stop once level available or low on Nomogram

Promo | 9 Y/O in ED 3hr after ingestion of unknown amount of Paracetamol, High Liver enzymes, vomiting which stopped in ED, Paracetamol level pending, Next = Start N-Acetylcysteine (indication = High liver)

Amal | 12 Y/O, girl having N/V for 3 hours, she ingested a mouthful acetaminophen, in ED acetaminophen level is pending, and transaminase is elevated. What is the next step = NAC (Not Ondansetron & wait for level nor Multiple AC nor Bolus IVF)

- Most sensitive predictive value of hepatic injury is plasma drug level

Amal | 14 Y/O girl, took entire bottle of pain killer 12hr ago, now diffused Abdomen pain, paracetamol lvl sent, Next = NAC (Not Repeat level 4 hours after arrival to ED nor Start Nahco3 for urine alkalization nor wait for acetaminophen level)

Amal | 14 Y/O, girl in ED by ambulance after her mother found a suicide note on her bed, girl claims took 20 or 30 ibuprofen tablets 4 hr & nothing else, although she is fearful, Ex is normal, appropriate next step in management = Obtain blood level of acetaminophen (Not Administer serum of Ipecac nor Obtain the blood level of ibuprofen nor perform a gastric lavage)

Amal | 13 Y/O, 8 hours after intentional ingestion of 10-gram paracetamol, vitally stable asymptomatic, normal clinical exam. next step = Bulos of NAC while waiting level (Not Order 8 hours Paracetamol level, when level more than treatment line start NAC. Nor If no co-ingestion no need for NAC. Nor initiate multiple doses of AC)

Amal | Which of the following patients can be assumed to be at high risk for hepatotoxicity following acetaminophen overdose ingestion = Asymptomatic patient for first 24 hours (Not Presents 30 hours after ingestion with normal LFT negligible acetaminophen level nor Ingested 15grams and taken NAC within 8 hours or Healthy patient who ingested 100mg/kg nor Healthy patient serum paracetamol level less than 200 mg or 1300 mmol/L at 4 hours)

- Qs want you to choose the choice with lowest chance to help (too late to save)
- Damage to liver mostly happened after 24hr of ingestion

Final | Case scenario of patient ingested acetaminophen last night had vomiting what to do = Start NAC

- Presentation 8-24 hours following a defined time of ingestion
- NAC is initiated immediately & continued or ceased once level is available & plotted on the nomogram

Final | Rumack Matthew represent = When to Start NAC (Not Estimate severity to liver toxicity nor Paracetamol toxicity)

Final | Acetaminophen (extended release) ingestion was asymptomatic level done in 4 hrs post ingestion was normal below Tx line what to do next = repeat level after 4 hrs

- Normal release = 4hr
- Extended release or Co-ingestion of Anti-Muscarinic Agent (Diphenhydramine) = 1st at 4hr then repeat at 8hr

Final | Paracetamol extended release = Repeat level 4 hr

Final25 | Ingestion of extended release paracetamol came after 4hr asymptomatic normal labs and 4-hr level normal, next step = Repeat after 4hr (Not Discharge and reassure nor NAC nor Activated charcoal)

- Liver Transplant

- King's criteria of liver transplant
 - Ph < 7.3
 - INR > 5 (6.5), PT 100, Cr > 300 (3.3 mg/dL), Encephalopathy 3-4
- Hemodialysis indication
 - Severe metabolic acidosis: Unresponsive to medical treatment.
 - Severe hepatotoxicity with multi-organ failure
 - Extremely high serum acetaminophen levels (>900 mcg/mL) or very high levels of NAPQI.
 - Renal failure: If significant impairment of renal function, especially if NAC cannot be administered

Final | Indication of liver transplant in acetaminophen toxicity, I think q about indication of liver toxicity in paracetamol, the question was about the most suggestive of liver injury = High INR, PT (Not paracetamol level > 200 nor Bilirubin nor Albumin)

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- Ibuprofen
 - Sx: Nausea, Vomit, Epigastric Pain,
 - HA Metabolic Acidosis, Renal Failure
 - Ataxia, Seizure, Coma
 - Toxic Doses:
 - $> 300\text{mg/kg}$ = Minimal Toxic
 - $\geq 400\text{mg/kg}$ = Serious Toxic
 - Tx: Activated Charcoal, Supportive

Promo | Took many tablets of Ibuprofen 1hr ago, Father wants gastric lavage, to tell father = Not recommended in Children or AC is superior in Pediatric case

Amal | 2 Y/O girl While being cared by babysitter, ingested multiple ibuprofen tabs, Pt in ED after mother knew about the Incident, most likely toxicity to be developed = Nausea and vomiting (Not Acute renal failure nor ARDS nor Coma nor Jaundice)

Turki
Bukhari's
Notes

Chapter 5: Toxicology

Minerals

- Iron Poisoning

- Stages:
 - [30min-6Hr] 1: GI stage (Nausea, Vomiting, Diarrhea, Abdomen Pain)
 - [06 - 12 Hr] 2: Relative Asymptomatic (danger phase)
 - [12 - 24 Hr] 3: Shock (Hypovolemic, Severe Metabolic acidosis (Lactic acidosis) GI Hemorrhage, Hepatic/Renal failure, Coma)
 - [24 - 48 Hr] 4: Fulminant Hepatic failure
 - [02 - 06 Wk] 5: GI/Pyloric stage (Stricture, pt unable to feed)
- Iron content % = FSG Fumarate (30%) < Sulfate (20%) < Gluconate (10%)
 -  Calculation: ((Tablet x Concentration) x %) / weight = ? mg/kg
- Toxic Dose: 10-20 mg/kg Toxic Level: > 400 mcg/dL
 - < 20mg/kg = Mild (Asymptomatic) < 350 mcg/dL = Mild
 - > 20mg/kg = Moderate > 350 mcg/dL = Moderate
 - > 60mg/kg = Severe > 500 mcg/dL = Severe (Acidosis/Shock)
 - > 150mg/kg = Lethal > 1000 mcg/dL = Lethal (Death)
- Invx: XR Pill fragments (Radio-opacities)
- Tx Supportive hydration
 - Check Iron level every 4-6 hours in significant ingestion
 - DON'T USE Gastric lavage, Ipecac, AC, oral bicarbonate, Mg hydroxide or oral Deferoxamine
- Whole bowel irrigation (WBI) early and aggressively
 - Duration: 4-6 hours or until rectal effluent is clear
 - Indications:
 - Radiopaque iron positive
 - Anion gap Acidosis
 - Ingestion > 40 mg/kg
 - Symptomatic patient
 - Contraindications: Peritonitis or perforation
- Deferoxamine
 - IV Deferoxamine 15mg/kg/hr Continues Infusion (in severe cases 30mg/kg/hr, Max 100mg/kg/day)
 - Indication Deferoxamine
 - Metabolic acidosis
 - Repetitive vomiting
 - Lethargy or toxic appearance
 - Hypotension or shock
 - Serum iron concentration > 500 mcg/ml
 - Large number of pills on XRAY (Consider WBI then Deferoxamine)
 - Deferoxamine Side effect: Red colored (Vin-rose) urine, Hypotension if infused too rapidly, Yersinia infection
 - Deferoxamine when to stop: if No more red color urine or Serum level back to normal

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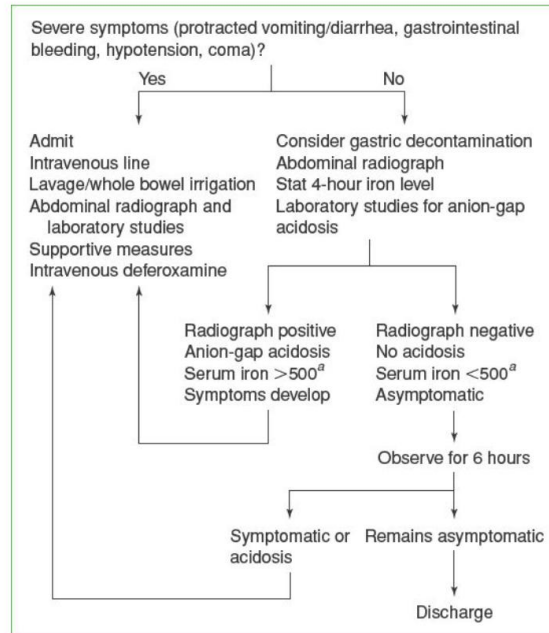


FIGURE 102.4 The initial approach to the patient ingesting a possibly toxic dose of iron. ^a Iron levels expressed in mcg/dL.

PEM R | 4 Y/O Ingested 5mg/kg and 6hr after iron level 100mcg/dL, clinical course = Unlikely to develop iron toxicity

PEM R | 2 Y/O child, vomiting for 1 hr, was playing w/ older sibling who fed her tablets from blister packs 90min ago (image of Ferrous Fumarate 200mg), deeply somnolent responding to pain, HR 160 RR 28 BP 50/38 SpO2 99%, Abdomen XR 60 radio-dense tablets in stomach, given 40 mL/kg NS, now HR 150 BP 60/42, Next = IV Bolus 20 mL/kg

Promo | 5 Y/O, took toxic dose of Iron, having **Abd. Pain initially which resolved**, mother came after hours & was asymptomatic which stage of iron poisoning he is in = 2

Promo | Iron Syrup unknown amount, iron level 400, XR negative, Pt. Asymptomatic, Next = Repeat level Q4hr (unsure, Not WBI nor Discharge nor AC)

Promo | Ingestion iron, x1 vomiting, Vital/Labs normal, Iron high, Next = Observe 6hr (Not Deferoxamine nor Admit nor D/C)

Promo | Iron Toxicity w/ Symptoms & shock, immediate next step = IV Fluid Bolus

Promo | Child ingested Multivitamins w/ Iron, vomited after ingestion, lvl 350 mg/dL, Next = Observe (Not Deferoxamine)

Promo | Most Important indicator of Iron toxicity severity = Lactic Acidosis (Hypoperfusion)

Promo | Child came to ED w/ accidental ingestion of Ferrous Sulfate 20 tab after 90 min with picture of shock, received x2 bolus NS & still hypotensive, XR showed large amount of pills, Next step = Bolus NS (Similar to PEM R Qs) (Not Deferoxamine nor WBI)

Amal | Which of true regarding iron toxicity = patient with major toxicity develop Lactic acidosis

Amal | 2 Y/O, 6 hours after iron ingestion, abdominal pain and diarrhea, what is true = If developed signs of shock chelating therapy should be started immediately

Final | Child ingested multivitamin with iron, he had vomiting after ingestion, level 350 mg/dl what to do = Observe (Not Discharge nor Give deferoxamine)

Final | Adequate decontamination for symptomatic iron toxicity = whole bowel irrigation (unsure)

Final | Iron toxicity (if Hypotensive) = 20 ml NS

Final | Ingestion 10 tabs of 325 mg from ferrous sulphate and vomiting once now asymptomatic, wt 15 Kg, x ray normal, no metabolic acidosis what to do = WBI (Not Discharge nor Gastric lavage nor Deferoxamine)

- o Right answer: Observation for 6 hours with level at 4 hours if asymptomatic D/C

Final | Iron Tox Sulfate 10kg, 325mg iron = D/C (same as above, previous Final Qs they choose Discharge)

Final25 | 15kg child, Ingested 10 tablets of 325mg ferrous sulphate 2 hours ago, he vomited once and now asymptomatic, VBG done and no metabolic acidosis, next = Whole bowel irrigation (Not Gastric lavage nor Deferoxamine nor Discharge home)

Chapter 5: Toxicology

- Lead Toxicity

- Found in Old paint/Houses
- Sx: Impair Neuro-Cognitive development
 - Delay Puberty, Reduce growth
 - Decreased Renal Function (Interstitial nephritis)
 - Anemia
 - Teeth Blue-Line & Burton line
- Invx: Microcytic Anemia
 - High Lead > 5 mcg/dL (Diagnostic)
 - PBS Basophilic Stippling (in Lead poisoning and B Thalassemia minor)
 - BMA Ringed Sideroblasts (In Lead poisoning and Sideroblastic Anemia)
 - X-Ray long bones Radiopaque (Level > 45 MCT/dL)
- Tx: Removal of source, depend on level:
 - < 45 mcg/dL = NO Chelation, Monitor and Get toxicologist help
 - 45-69 mcg/dL = PO succimer (DMSA)
 - > 70 mcg/dL or Encephalopathy = IV succimer (DMSA)
 - Visible material on XR = WBI
 - HD will not remove lead
 - Succimer Side effect: high transaminitis

PEM R | 3 Y/O Hx of Pica, had Blood lead lvl 50 mcg/dL, Asymptomatic reaching milestones, correct statement about treatment = Oral chelation should be initiated which may lead to Liver Transaminitis

Final | Lead poison x Ray abdomen fb = WBI (Not Surgical removal)

Caustics

- Caustics

- Types:
 - ACidic = Coagulative necrosis
 - ALkalotic = Liquefactive necrosis & Corrosive damage
 - Bowl Oven cleaner = Strong alkaline = Sodium hydroxide = Liquefaction necrosis
- Sx: chest pain, dysphagia, drooling
- Tx: PAT + ABCDE
 - Protect Airway (Intubate/Surgical Airway IF Stridor/Hoarseness/Aphonia/Can't Tolerate secretions)
 - Identify GI Perforation (IF Sx of Esophageal or Gastric Perforation)
 - Esophageal Sx of Perforation/Injury: Vomiting, Drooling, Stridor
 - Identify who needs Endoscopy
 - Cardiac Monitor, IV Access, NPO, Bolus
 - Analgesia, PPI (IF N/V, AOVID Vomiting)
 - Abx (IF Perforation suspected or confirmed)
 - XR (Helps R/O Aspiration or Perforation)
 - AVOID neutralizing agent (cause exothermic reaction > dmg)
 - Disposition & Consultation
 - PGS (IF Perforation)
 - Pulmo (IF Pneumomediastinum, Plural effusion, Aspiration)
 - Optha (IF Involving Eye Eye Ph (N 7-7.3))
 - Endoscopy (Within 12-24hr)
 - Call Toxicology center

Chapter 5: Toxicology

PEM R | 2 Y/O on kitchen floor w/ bowl oven cleaner, now refused to open mouth, cries, Next = Make pt. NPO

PEM R | 17 Y/O dysphagia/drooling, abdomen pain after suicide attempt 2hr ago ingesting gulps of drain cleaner, vitally stable, Best Next = Make patient NPO & Start IV fluids

PEM R | 4 Y/O found drinking unknown cleaning solution stored in soda bottle, now grilling, no erythema/lesion in mouth, vitally stable, Next = Start IVF & Admit for Endoscopy

PEM R | 3 Y/O boy agitation/drooling, was playing pool, mouth on plastic bottle next to pool pump, No Hx of choke or fell in pool, now screaming/crying/drooling Temp 37 HR 115 RR 24 BP 94/55 SpO2 100%, Mucous membrane moist, no mouth lesions, Rest Ex normal, Tx = Consult GI for Esophagoscopy

PEM R | 15 Y/O girl ingested liquid drain cleaner 30min ago, has difficult swallowing her saliva, No lips/oropharynx lesions, breath sounds clear bilateral, Tx = Perform Esophagoscopy

PEM R | 12 M/O w/ Bottle of drain clog buster, in ED Temp 36.4 HR 150 RR 30 SpO2 95 RA, Non-bilious Non-bloody vomit, drooling, but No RD, clear lungs & clear oropharynx w/o angioedema or mucosal findings, Next = GI for Dx Endoscopy

PEM R | 16 Y/O ingested oven cleaner, but you suspect it was intent of self-harm, Vomit bright red blood, Severe mouth/Throat pain/Moderate **stridor**, Temp 37 HR 92 RR 24 BP 90/66 SpO2 99%, breathing slightly labored, Oropharynx (image of throat hyperemic mild), Next = Administer Dexamethasone & Secure Airway

- Caustic ingestion, Dexamethasone (decrease Inflammation/Minimize airway swell, recent meta-analysis decrease stricture formation)

Promo | 4 Y/O swallowed corrosive w/ picture showing burn over cheek & lips, having drooling & **stridor** Next = Intubate (Not Urgent Endoscopy nor Observe & do CXR)

Amal | 2 Y/O boy, presented to ER with grunting, gagging, coughing, drooling, after was found him in garage around a lot of bottles at home, On examination: normal pupils, HR 160, RR 24, BP 100/60, O2 100% Patient awake, crying, clear lungs, with **whitish color** of the tongue and soft palate, shortly after examination he started vomiting. What did the patient take = Drain cleaner (Alkaline burn, whitish color tongue) (Not Organophosphate nor Antifreeze nor Glyphosate weed kill)

Amal | 2 Y/O boy witnessed by mother drinking unknown substance from soda can beside pool house. you suspect it to contain acid pool cleaner, On examination lips, oropharynx are clear, appropriate management = Emergent Esophagoscopy (Not Upper GI study nor Parental Reassurance & Discharge nor NGT with lavage)

Amal | Pathological process that occurs to tissue from acidic exposure = Coagulative necrosis

Final | Pt found playing w/ drainage liquid 1 hr ago, now having significant drooling but vitally stable, Next = Refer for Endoscopy

Final | 1 Y/O drink caustic + Drooling = GI endoscopy

Final | Strong acid cause = Coagulative necrosis

Final | Pool corrosive = Call for esophagoscope

Final25 | Strong industrial Alkaline "sodium hydroxide" ingestion with respiratory distress, drooling and stridor, SPO2 96% = Urgent ENT and anesthesia consultation to establish airway (Not RSI intubation in ER nor NGT nor G Consult for endoscope)

- Hydrogen Sulfide

- Sx: Rotten egg, kerato-conjunctivitis, confused, coughing, Turns silver to black

Promo | 8 Y/O girl was playing beside **factory**, started to have eye irritation, Sore throat, cough, nausea, SOB, Her nickel earring destroyed, Ex smell like rotten egg, likely expose to = Hydrogen Sulfide

Amal | 8 Y/O girl was playing near **factory**, she developed rotten egg smell, conjunctivitis, upper airway irritation and confusion, her silver earrings turned black. What likely she been exposed to = Hydrogen Sulfide

Chapter 5: Toxicology

- **Hydrofluoric Acid > Hypocalcemia > QT Prolongation**
 - o Weak acid, Has Fluoride
 - o Product: Wheel/Rust Removal
 - o Ingestion exposure
 - Sx: Fluoride > Chelate w/ Calcium > Hypocalcemia > Prolonged QTc > Sudden Cardiac Arrest
 - Hypocalcemia, Hypomagnesemia, Hyperkalemia
 - Tx: IV Calcium gluconate
 - o Skin exposure
 - Path: Fluoride penetrates skin > Irritation/Red/Pain out of proportion/Edema
 - Tx: Calcium gluconate
 - Apply local gel Q30min till painless then Q4hr
 - or Soak in
 - or Arterial line w/ dilute Ca Chloride

PEM R | 17 Y/O male severe pain to fingertips 10/10, several hours was cleaning vintage scooter removing rust from scooter & cleaned carburetor, No Trauma, vitally stable, (Pic of fingertip blue discolor), Next = Soak Ca Chloride until pain improves

PEM R | 2 Y/O accidental ingestion of unknown amount of Rust removal (contains Hydrofluoric acid), HR 120 RR 22 BP 87/40 SpO 99% RA Temp 36.5, well without focal findings, most concerning for significant ingestion & Severe toxicity = Prolong QTc

PEM R | 15 Y/O cleaning wheels in auto shop, reporting severe pain to palms & fingers, Tx = Topical Ca Gluconate

PEM R | 12 Y/O cleaning wheel cleaner having pain of fingers = Ca gluconate topical gel

PEM R | 15 Y/O in ED after work cleaning wheels in auto-shop, reporting severe palm/fingers pain, Ex diffuse erythema on volar aspect of palm/fingers/fingertips, Brisk CRT, no full ROM of Interphalangeal joints due to pain, Tx to relieve pain & prevent complications = Calcium Gluconate Gel

- Hypo ca = QTc Prolongation
- HyPeR Ca = PR Prolongation

Final | Child ingestion of hydrofluoric acid what should be treated = Hypomagnesemia & Hypocalcemia

Final | Hydrofluoric acid = Hypomagnesemia (Plus Hypocalcemia)

- **Laundry detergent ingestion**
 - o Caustic burn
 - o CNS depression or coma
 - o Tx: NPO

PEM R | 2 Y/O ingested laundry detergent pack, 45min later vomited twice refusing to open mouth, no visible oral lesions but mild pharyngeal erythema, next step = Admit w/ NPO

- **Harmless Caustics**

Amal | Most compatible substance ingested for discharge that doesn't need further evaluation or workup or admission = Liquid chlorine bleach (Clorox ingestion, Not Lye nor Paint thinner -Hydrocarbon- nor Liquid potassium hydroxide drain cleaner)

- o Clorox might develop pneumonitis within 24hr if it was known or unknown aspirated and had no Sx

Final | Mother was cleaning her wound with potassium peroxide, when her son tries to drink it & he spelled on his clothes and lips. Mother want gastric lavage, pt asymptomatic what = Discharge and reassurance

- o Solutions less than 5% concentration w/ small amount asymptomatic patient is safe to discharge.

Final25 | Ingestion of Clorox with choking and coughing vomiting once initially, now asymptomatic but has mild oral erythema next step = Discharge (Not Schedule Urgent endoscopy nor Oral challenge and chest xray at 6 hr)

Chapter 5: Toxicology

Hydrocarbons

- Hydrocarbhone

- Triggers: Highly toxic CHAMP (Camphor, Halogenated, Aromatic, Metal -Arsenic + Mercury-, Pesticide) Tea Tree oil (Hydrocarbhone, Can cause CNS Toxicity)
- Sx: Cough, chock, gag, wheeze, RD, mild CNS depress, fever, ↑ WBC
- Complication: Aspiration pneumonitis within 6-8hr of ingestion (Most common, High risk Gasoline)
 - Sudden Death (Inhaled Halogenated Hydrocarbons > Vigorous activity > Lethal arrhythmia (catecholamine release by exercise) > Sudden Death Postulated to sensitization of myocardium to volatile hydrocarbons)
- Invx: CXR, manifest in 2-8hr typically, but Any CXR infiltrate in 24hr it's aspiration pneumonitis
- Tx: Proper protective gear + Decontamination
 - Asymptomatic = Observe 6-8hr then Do CXR, Discharge if Good O2, Normal CXR
 - Symptomatic or CXR findings = Supportive care O2 & B-Agonists
 - CPAP or ECMO (In severe cases can have ARDS)
 - AVOID Ipecac, AC, Steroids, Prophylactic Abx, Epinephrine, induce vomit, Gastric lavage

PEM R | 14 Y/O swallow gasoline while siphoning it 90 min, he confirms having cough lasted several minutes then Epigastric, chest pain, appears well, no RD, Temp 36.8 HR 70 RR 16 BP 90/74 SpO2 100%, Tx = Observe for 6hr & if CXR normal, D/C

Promo | Child ingested ? Hydrocarbon material, came immediately, Vtally/Clinically stable, Action = Observe 6hr (Not D/C w/ Instructions nor Repeat XR every 2hr nor Admission)

Promo | Correct about Hydrocarbon ingestion = More toxic w/ Lower viscosity Hydrocarbon (Not Epi indicated for bronchospasm Tx nor Ingestion of sun Allen more toxic than benzene nor Abx indicated in all lung infiltration)

Amal | Correct about Hydrocarbon ingestion = Hydrocarbon with low viscosity likely to cause Aspiration (Not Inhaled Epinephrine Is treatment for bronchospasm nor Systemic toxicity with oil compare to benzene nor Antibiotics is recommended to all hydrocarbon CXR infiltration)

Amal | 18 M/O, playing in garage, 20 minutes earlier found him vomiting and gagging brought to ED within 30 minutes, HR 130, BP 90/50, Spo2 93%, RR 50, coughing, next step before XR = O2 (Not Charcoal nor Intubation nor Ventolin nor Racemic Epinephrine Nebs)

Amal | 18 M/O Boy, ingested lemon scented furniture polish, vomited once, no other symptoms, upon examination you smell the scent polish on his breath and clothes, next step = Observe for 6 hours for signs of respiratory distress (Not Administration of activated charcoal 1g/kg. Nor Consultation for urgent endoscopy. Nor Serial CXR within eight hours)

- Hydrocarbons ingestion
 - GI Sx = Endoscopy
 - Respiratory Sx (usually appear after 8hr of ingestion) = CXR
 - Ingestion = ECG (to r/o dysrhythmia)

- Chemical Pneumonitis

- Inhalation of Toxic/Irritating substance
- Sx: Present as Aspiration pneumonia
 - Sudden onset RD, Fever, Diffuse crackles/wheeze
- CXR diffuse opacity, sometimes ARDS like
- Tx: Supportive, Abx (ONLY if persistent/progressive lung impairment)

PEM R | 18 M/O girl, found w/ open bottle of tea tree oil, Temp 37 RR 30 HR 120 BP 100/50 SpO2 99% on RA, Normal neuro, clear lung, intermittent mild cough, Next = Observe for 6hr for progression of Sx

- Hydrocarbon = Tea tree oil
- Complication: Aspiration pneumonitis

Chapter 5: Toxicology

Other | 3 Y/O admitted 4 days ago Aspiration pneumonia secondary to Kerosine Ingestion, now off O2, but has decrease air entry on rt. Side pt. Still febrile no change in fever pattern and team initially didn't start abx, but worried about persistence fever, most next = No indication to start Abx (chemical pneumonitis)

- Hydrochloric acid (Chlorine gas) inhalation
 - o Cause: Chlorine gas from pool tablets of Ca Hypochlorite or Trichloro-s-Triazinetrione
 - o Path: Chlorine Inhalation + Lung H2O = Hydrochloric acid (HCL) > Lung Damage
 - o Tx: NaHCO3 Nebs 1ml of 8.4% in 3ml sterile water
(If given NaHCO3 reacts w/ Hydrochloric acid (HCL) = NaCl + H2O + CO2 > Improves)

PEM R | 11 Y/O boy opened canister of chlorine tablets near pool, After inhaling it fumes, immediate dyspnea, brought w/ RD/Tachypnea/Dry/Chest pain, RD Tx = Sodium Bicarb Nebs

- Sudden Sniffing Death Syndrome
 - o Cause: Butane/Propane (Lighter fluid, Fuel canisters), Toluene (Glue, Spray paint), Benzene (Gasoline)
 - o Path: Inhaled chemicals > Sensitize Myocardium to Catecholamines > Arrhythmia (Vfib) > Sudden Death

Final25 | Ingestion of Benzene came with respiratory distress then suddenly collapsed, what is the cause of cardiac arrest = Cardiac arrhythmia (Not Pneumonitis)

Chapter 5: Toxicology

CO, Cyanide, Methemoglobinemia

VBG	SpO ₂	PaO ₂	Ph	HCO ₃	Lactate	Other
CO	Normal-High	Normal	Normal	Normal	Normal	COHb ≥5-15%
Cyanide	Normal	Normal	Low	Low	>10	
Methemoglobinemia	Low	Normal	Low	Low	High	MethHb ≥3%
Cyanotic CHD	Low	Low				

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- CO Poisoning

- Sx: Flu-like symptoms without fever
 - (Cherry red skin), Singed nasal hair
 - Headache, malaise, nausea
- Invx: COHb poisoning by CO-Oximetry (Diagnostic), PaO₂ and Pulse Oximetry can be normal
 - CO-Oximetry:
 - >15-20% they have symptoms (<1 for most Ppl, 5% urban dwellers, 10% smoker)
 - 20-40% = Sever headache, Dizzy, Visual change, Syncope, Vomit and Ataxia
 - >50% = Coma, Seizures, Myocardial injury and Death
 - High CK (rhabdomyolysis)
- CO Half Life: **Hyperbaric = 30min | Non-rebreather = 90min | RA = 270min (4.5 hours)**
- Tx: HIGH-FLOW OXYGEN with non-rebreather mask
 - Antidote to CO is Non-rebreather O₂ = Reduce CO half-life to 1 hr + 100% O₂ to be delivered
 - Correct any metabolic acidosis and underlying anemia
 - Pt. with altered mental or neuro Sx or CVS dysfunction needs Admission
- Hyperbaric Criteria
 - COHgb ≥ 25%
 - Pregnant COHgb > 15%
 - Syncope or LoC
 - Ph < 7.1
 - Exposure ≥ 24hr
 - Cardiac involvement: Ischemic ECG changes, chest pain, or arrhythmias
 - Persistent neurologic deficits (SZ, Confusion, Cognitive deficits, Focal neurologic signs)
- COHb %: **Non-Smoker < 5% | Smoker 5-10%**
 - 5% = Fine motor & misjudgment
 - < 20% = Mild
 - 20-40% = Moderate
 - 40-60% = CVS Collapse & Neuro Sx
 - > 60% = Coma, SZ, Death

PEM R | 6 Y/O girl brought to ED in October w/ Headache/Nausea, Hx recently turned furnace, No other family member w/ similar Sx, No fever, in ED started to feel better, next in Tx = 100% V₁₀₀ Via BVM

PEM R | 15 Y/O apartment fire, multiple ppl involved w/ inhalation injuries, Ex chest pain/headache/dizziness/nausea but no Face/Nares/Oropharynx burn, HR 90 RR 12 SpO₂ 97% RA, Next = Place on Non-rebreather mask + check CO level

PEM R | 3 Y/O girl, during travel mother car has top cover which she put the child in and put her sleeping bag and slept during overnight drive, now difficult to arouse & when awoke vomited once, HR 140 SpO₂ 100% on RA, Diagnostic = CO-oximetry

PEM R | 6 Y/O girl Rescued from house fire, was in room w/ toys/sofa, No LoC No Carbonaceous at nose/mouth, CO 24%, Ph 7.15 Lactate 2.8, which Management appropriate = O₂ by non-rebreather

Chapter 5: Toxicology

PEM R | 2 Y/O & 3 Y/O siblings, in ED after being on houseboat found unconscious in closed cabin that contained lighted Barbecue grill, Temp 37 HR 130 RR 29 BP 84/67 SpO2 100% for both, Glucose 74 mg/dL, pupil 4mm reactive, brief awake to verbal & painful stimuli, immediate step = Give 100% O2 Non rebreather mask

Promo | True about CO level = > 20% Symptomatic (Not Clinical manifestation not correlate with level)

Amal | Choose true regarding CO poisoning = Carboxyhemoglobin in scene correlates best with clinical presentation (Not Co level 10 to 20 usually found in daily smokers. Nor Cherry red skin is sensitive finding or Nausea, vomiting and diarrhea are common early symptoms and confusing with GE)

Amal | The pulse oximeter reading in a weak patient with carbon monoxide poisoning generally is = Normal (Not Correlates with the carboxyhemoglobin level. Nor decreased nor useful to determine need for hyperbaric therapy)

Amal | 4 Y/O, headache and lethargy, mother reports also similar Sx following long car drive, On examination drowsy but awake child, mild tachycardia, moist mucus membrane, no focality, best initial Tx = O2 100%

- Cyanide Poisoning

- Consider cyanide co-poisoning in House fire if not improving w/ CO Tx (paint before contained cyanide)
- Sx: Neurotoxic (Seizures), HD Instability (Hypotension, Cardiac Arrest)
- Invx: HA gap Metabolic Acidosis + Lactate >10
- Tx: Hospital: Hydroxocobalamin (Vit. B12) 70mg/kg IV or IM push (1-2 doses, max 5000mg/dose)
 - Cyanide Lily kit = Amyl nitrite, Sodium Nitrite, Sodium thiosulfate

PEM R | 5 Y/O from house fire unknown time, Temp 37.8 HR 150 BP 90/50 RR 40 SpO2 100% on PPV, significant skin burns, distal pulse +1, GCS 7, Lactate 10 mmol/L, suddenly having SZ w/ BP dropped to 70/40, in addition to supportive care, what med to give = Hydroxocobalamin

PEM R | 4 Y/O brought by EMS for house fire unconscious in room, w/ surrounded by burning plastic toys, No obvious carbonaceous material around nose/mouth, No dermal burns, HR 75 RR 30 Ph 7.1 Lactate 4.5, Tx = Hydroxocobalamin (Not Deferoxamine nor NAC nor NaHCO3)

PEM R | 9 M/O boy in ED recovered from closed space fire, other 3 ppl also recovered 25 Y/O woman & 5 Y/O boy who is in cardiac arrest, This baby given Crushed amyl-nitrite poppers for cyanide toxicity, awake/mild RD, HR 180 RR 80 BP 94/70 SpO2 91% on RA, VBG Ph 7.18 CO2 24 O2 140 Lactate 12 BE - 22, CO 15% Meth 12% on CO, next step = Hydroxocobalamin 70 mg/kg (Not Methylene blue)

- Cyanide Lily kit = Amyl nitrite, Sodium Nitrite, Sodium thiosulfate
- This patient has CO/Cyanide (Lactate > 10) from house fire & Methemoglobinemia (Meth 12%) toxicity from Amyl Nitrite
- Most concerning from these is Cyanide toxicity w/ High Lactate > 10 (Block O2 utilization by cell)
- Path: Methemoglobin (Fe3) actually reduces cyanide toxicity by binding Cyanide to it, and giving Methylene blue before Hydroxocobalamin will worsen Cyanide toxicity even more

Promo | Cyanide antidote = Hydroxocobalamin (Vit B12)

Promo | Mechanism for Cyanide toxicity = Inhibition of Cytochrome Oxidase

Amal | Primary mechanism of Cyanide toxicity = Cytochrome oxidase Blockade (Not Iron and hemoglobin binding nor GABA block or Formation of methemoglobin)

Amal | 12 Y/O female, was trapped in burning room, brought with SOB, Black charcoal in her nose and mouth, fully alert, vitally stable, no stridor, no skin manifestation, no airway burns, what is true regarding this presentation = Lactate more than 10 concern for cyanide toxicity (Not Thermal injury affects lower airway more than upper -upper more than lower-. Nor Needs prophylactic intubation)

Amal | Antidote of cyanide = Hydroxocobalamin

Final | Pt was in home fire with decrease LOC and severe acidosis = Cyanide kit

Final | Burn Cyanide poisoning = Hydroxocobalamin

Final | Cyanide antidote = Hydroxocobalamin

Final | Cyanide = Hydroxocobalamin

Final25 | Child extracted from house fire with smoke, arrived in ER initially drowsy then started to develop generalized tonic clonic seizure next step = Hydroxocobalamin (Not Hyperbaric oxygen nor Definitive airway nor Benzodiazepine)

Chapter 5: Toxicology

- Methemoglobinemia

- Acquired or Congenital
- Causes:
 - Nitrate high foods/meds
 - Nitric oxide in PICU/NICU
 - Dapsone w/ G6PD
 - Lidocaine/Benzocaine/Prilocaine w/ Local Anesthetics $\geq 15\%$ dose (Risk factor is young age)
 - Infantile Methemoglobinemia (Especially w/ Gastroenteritis, Due to inactive NADH in < 4 M/O)
- Tx: Methylene blue 0.3-0.5 mg/kg/dose
 - Ascorbic acid 5-8 mg/kg/day (in G6PD)
 - Exchange transfusion (if Failed MB, G6PD)

PEM R | 8 Y/O ALL on maintenance Chemo, coming w/ Cyanosis, No fever/cough/chest pain/headache, was started on **Dapsone** 4 days ago as prophylaxis for sulfa allergy, has SpO₂ 88% on RA, after placing him on 10 Lpm Mask, next step = Give Methylene blue (Methemoglobinemia due to Dapsone)

PEM R | 7 Y/O ALL on chemotherapy low grade fever & cough for 1 day, Admitted w/ pneumonia/hypoxemia 3 months ago, home meds Prednisone/**Dapsone**/Ondan, has Latex/Sulfa allergy, Temp 37.8 HR 118 RR 30 BP 98/56 SpO₂ 86% on RA, w/ 100% O₂ raises to 88%, pt Alert but no RD/Cyanosis/Stridor, CXR normal, Ph 7.43 pCO₂ 27 pO₂ 230 HCO₃ 19 Meth 20% HCT 28.4%, Next = IV methylene blue

PEM R | 3 M/O known to have port wine stain, coming grey/dusky after taking home meds, Temp 37.1 HR 140 RR 40 BP 90/40 SpO₂ 88% on 2 NC, Dyspneic/Mild RD but Alert, lung clear, no murmur, normal perfusion, took acetaminophen & **topical analgesia** from Derma, Choice of Tx = Methylene Blue (Not Hydroxocobalamin nor Naloxone nor Physostigmine)

PEM R | 3 W/O, EMLA used, complication = Methemoglobinemia

PEM R | 2 M/O girl w/ cyanosis, loose/non bloody stool 15 times per day for 3 days, PO good/normal wet diaper, bottle fed using boil well water, SpO₂ 80% despite 100% on Non-rebreather, Temp 37.6 HR 120 RR 84 BP 80/58 SpO₂ 76-78% on all limbs, normal grasp/suckle/moro reflex/open anterior fontanelle, good air entry, S1+S2, no organomegaly, CRT 1 sec, skin temp normal, has central/peripheral cyanosis = Prepare to give Methylene blue

- Infantile Methemoglobinemia induced by Gastroenteritis

Promo | Adolescent w/ bluish skin, SpO₂ 86%, meds to give = Methyl blue (Incomplete Q)

Promo | 14 Y/O girl, Altered/Agitated SpO₂ 85% on non-rebreather mask, bluish lips, was w/ friends who were using 'Poppers', Next = Methylene Blue

Amal | 14 Y/O girl, altered and agitated, SPO₂ 85% on non-rebreather mask, bluish lips, she was with friends who were using 'Poppers', next step = Methylene Blue

- Poppers = Alkyl Nitrates > Methemoglobinemia (Bluish discoloration of the skin & mucous membranes)

Amal | 7 W/O, vomiting and diarrhea since 2 days, sleepier and not feeding as usual, normal perinatal course, rectal T 37.3 SpO₂ 90% looks cyanotic, not improving with oxygen, RR 60. Pulses strong, no murmur, CXR normal, Capillary refill 3-4 seconds in LL. Most likely cause of cyanosis = Gastroenteritis

Final | Scenario about patient received **benzocaine** and developed MetHb & level is 25% First to do = Stop offending agent (Not Hyperbaric oxygen)

Final | Methemoglobinemia = Stop the Agent

Final | 14 Y/O girl presented with SpO₂ 86% cyanotic and no respiratory distress = Methylene blue

Chapter 5: Toxicology

Toxicology Syndromes

Hyperthermia Syndromes

- SS = SSRI | Sudden | Fever/Tachy + Clonus + Hypertonia + Delirium/Confusion = Stop Trigger, Cyproheptadine, Benzo
- MH = Anesthetic | Sudden | Fever + Muscle Rigidity + Acidosis = Stop Trigger, Dantrolene
- NMS = Antipsychotic | 2-3d | Fever + Lead Pipe Rigidity > Rhabdo. + Altered LoC = Stop Trigger, Dantrolene, Bromocriptine

- Malignant Hyperthermia (MH) - within minutes

- o AD inheritance, AKA Central core disease, rare, life-threatening complication of Anesthesia
- o Ax w/ Myopathic disorders
- o Path: Trigger > Muscle contraction > Energy failure > increase metabolism
- o Triggers: Inhaled anesthetics (Halothane, isoflurane, and desflurane) + Neuromuscular blocker (Sux)
- o Sx: Sudden Fever during procedure, Muscle Rigidity, Respiratory/Metabolic Acidosis
- o Tx: 1st Stop Triggering Agent (Anesthetic) + HyperOxygenation (To remove ruminant of inhalation anesthesia)
 - 2nd Dantrolene (MSK relaxant)
 - 3rd Cooling measures

PREP | 6 Y/O, Girl taken surgery of Chiari I malformation, FHx of Coronary artery + Aunt died during routine surgery (unexpected) + Now given Midaz/Propofol/Succinylcholine + Cefazolin (Proph. Abx) + Dexa (decrease swell) > Now Febrile, Ph 7.1 CO₂ 80, HCO₃ 12 but Lactate 1.1 = Deteriorated by Succinylcholine

Promo | Q about Malignant hyperthermia = Dantrolene is Tx of both Neuroleptic malignant syndrome & non-neuroleptic malignant syndrome (Not Neuroleptic malignant hyperthermia is genetic disease)

Amal | Choose true statement concerning hyperpyrexia = Both neuroleptic malignant syndrome and malignant hyperthermia are successfully treated with dantrolene (Not Neuroleptic malignant syndrome is genetically inherited disorders)

- o Hyperpyrexia is Fever or Hyperthermia

Other | 4 Y/O, boy given general anesthesia w/ halothane for a tonsillectomy and adenoidectomy, shortly after initiating the procedure, he develops tachycardia, a temperature of 103°F (39.4°C), and muscle rigidity, Initial management w/ hemodynamic support started, MOST appropriate definitive treatment includes D/C of anesthetic & Tx w/ = Dantrolene

Final | Pt after Tonsillectomy Given med by anesthesia then developed fever and rigidity = Dantrolene

Final | Case post tonsillectomy with inhaled sedation, suddenly developed high temperature, rigidity (picture of malignant hyperthermia) next = Dantrolene

- o Anesthesia, Agitated took meds > Muscle rigidity (malignant hyperthermia) = Dantrolene

Final | Anesthesia used halothane, caused Fever & rigidity, Tx = Dantrolene

Final | Hyperthermia w/ Multiple laparotomies, Intubated, Temp 40, Received fluid, what to do for cooling = Evaporation (not Ice IV fluid nor Peritoneal NS lavage nor Gastric water lavage)

Chapter 5: Toxicology

- **Neuroleptic Malignant Syndrome (NMS)** - within days
 - o Rare life-threatening Emergent
 - o Path: Trigger > Dopamine blockade
 - o Triggers: Antiemetic: Metoclopramide Domperidone
 - Dopamine agonist: Levodopa, Carbidopa
 - Typical Antipsychotics: Haloperidol, fluphenazine, and chlorpromazine
 - Atypical Antipsychotics: Risperidone, clozapine, olanzapine, quetiapine, aripiprazole
 - o Sx: Tetrad: Mental state change, **Lead pipe rigidity**, Hyperthermia, Autonomic instability (tachycardia, labile BP)
 - o Criteria: Hx of Neuroleptic Med + Severe Muscle Rigidity + High Temp + 2 Minor Sx:
 - Diaphoresis, Dysphagia, Tremor, Incontinence, Altered LoC, Mutism
 - Tachycardia, High BP
 - Leukocytosis, High CPK
 - o Complications: Rhabdomyolysis
 - o Invx: High CK (supports muscle breakdown and guides IV hydration to prevent renal failure)
 - o Tx: STOP offending drug, Supportive care: IV fluids, cooling measures
 - Lorazepam (for agitation)
 - Dantrolene (for hyperthermia & rigidity)
 - Bromocriptine
 - AVOID haloperidol or other dopamine antagonists
 - Psychiatry consult for future antipsychotic planning (not emergent)

PEM R | 17 Y/O Schizophrenic coming w/ Agitation, found confused/agitated by police, chart shows started **Olanzapine** 3 weeks ago, immediately after placing him in safety room, Temp 38.5 HR 115 BP 130/80 RR 28 SpO2 99% on RA, diffuse profound rigidity, Next = Lorazepam for agitation, bloodwork

PEM R | 13 Y/O boy, confused/agitated in his room (psychosis), on Haloperidol & quetiapine, now confused, skin dry, Temp 40.5 HR 150 BP 102/56 RR 33 SpO2 97% on RA, glucose 87, skin hot/dry, muscle rigid, likely = Neuroleptic malignant syndrome

PEM R | 10 Y/O Bipolar was on lithium for 1 year, relocated and new PCP started Olanzapine, now having motor rigidity, new urinary incontinence, Diaphoretic, Agitated, Temp 38 HR 110 RR 20 BP 135/85, WBC 15 CPK 45000, Mild high transaminases, normal electrolytes & UA, urine drug/lithium/brain CT/CSF all normal, C/S pending, Next = IV Dantrolene & IV fluid & PICU

Other | 12 Y/O, boy, in ED, Fever, Muscle rigidity, diaphoresis, altered mental status, progressively worsened over past 2-3 days, Hx of bipolar disorder on fluoxetine for last 2 months, **Began risperidone approximately 6 days ago**, Ex dry mucous membranes, confused, Severe muscle rigidity, Diaphoretic, Feels hot to touch, Neuromuscular examination does not reveal clonus or Babinski sign; deep tendon reflexes are decreased, HR 150 BP 120/75 RR 30 Temp 40°C SpO2 98%, pH 7.25 PCO2 32 PaO2 85 base deficit 6, HCO3 10 WBC 21 CK 7,500, Dx = Neuroleptic malignant syndrome

Final | Patient with depression on lithium, recently **olanzapine** was added to her management, she developed muscle rigidity, tremulous extremities, next step = Lorazepam (unsure)

- **Serotonin Syndrome (SS)** - within hours
 - o Path: Increased serotonergic activity in CNS & Ax w/ certain meds in therapeutic or supra-therapeutic doses
 - o Triggers: many medications, including antidepressants SSRIs, SNRIs, MAOIs | SSRI + MAOIs = Fatal
 - Combining any 2 Serotonergic agents might lead to SS: SSRIs/SNRIs or MAOIs or TCAs or Tramadol or Meperidine or Linezolid or Dextromethorphan
 - o Sx: Hx of SSRIs within 24hr, Triad:
 - Mental Change (Delirium, Agitation, Confusion)
 - Autonomic (Tachycardia, Hyperthermia, Diaphoresis, Flush skin)
 - Neuro MSK (Tremor, **Clonus**, Hyperreflexia, **bilateral Babinski sign**, and muscle rigidity -in severe-)
 - o Tx: Hyperthermia, Check rectal/core Temp
 - Active cooling, Cyproheptadine
 - Benzo (stop shivering)

Chapter 5: Toxicology

HUNTER SEROTONIN TOXICITY CRITERIA*		TABLE 178-10	Severity Pattern of Serotonin Syndrome
At least one of the following in the presence of a serotonergic agent		Category	Clinical Features
1	Spontaneous Clonus	Mild	Mild agitation, mild fever (<40°C), tremor, myoclonus, hyperreflexia, diaphoresis, mydriasis, elevated blood pressure and heart rate
2	Inducible Clonus AND [Agitation OR Diaphoresis]		
3	Ocular Clonus AND [Agitation OR Diaphoresis]	Moderate	Marked agitation, hyperthermia (>40°C), myoclonus, hyperreflexia, ocular clonus, increased bowel sounds
4	Tremor AND Hyperreflexia		
5	Hypertonic AND [Temperature > 38 C OR Inducible Clonus]	Severe	Hyperthermia (>41.1°C), delirium, marked muscle rigidity, marked swings in blood pressure and heart rate

*Dunkley EJ et al., Quarterly Med J 2003 (PubMed ID: 12925718)

PEM R | 17 Y/O boy playing beer pong & took "legal high" drug named Red fury similar to Molly MDMA, Now babbling words, not following command, Temp 38.1 HR 180 RR 18 BP 172/98 SpO2 97%, soaked in sweat, having increase muscle tone of upper & lower limbs, w/ episode forceful shivering 2-3min, pupils 8mm reactive, w/ wandering eye movement & nystagmus, Jaw clenched & unable to open mouth, highest priority in Tx = Obtain/Continue monitor core temp

PEM R | 13 Y/O recently discharged from psych, Agitated/Flushed skin/Rigidity/Tremor, has dilated pupil & ankle clonus, +3 anterior tibial deep tendon reflex, combination drug Tx = Lorazepam & Cyproheptadine

PEM R | 16 Y/O in resus room w/ new bizarre behavior, Hx of Migraine & depression using Fluoxetine, past 3 days using OTC meds for fever/congestion/diarrhea, on arrival Warm/Flush/Mucus dry/Lethargic/visible hypertonia, Temp 39.2 HR 120 BP 140/80 SpO2 98% on RA, what Neuromuscular abnormality expected = Ocular clonus

PEM R | (for above Q) aside from stopping offending agent, 1st step = Begin passive cooling, IV hydration & start Benzo

Amal | 13 Y/O girl brought to ED by her roommate, reports patient was not acting right, Hx of depression on fluoxetine (Prozac), was well & without complaints until a few hours prior to arrival when she took some SSC, vitals showed Temp 38.5 RR 24 BP 140/85 SpO2 99% room air, Ex confused but oriented, w/ lower extremity hypertonicity & clonus, most appropriate treatment = Cyproheptadine (Not Acetaminophen nor Dextrose water nor Haloperidol)

Final | 13 Y/O, Girl, in ED found not acting right, Hx of depression, prescribed fluoxetine (Prozac) friends report was well till took SSC, Temp 38.5 BP 140/85 SpO2 99% RA, Ex confusion & lower extremity hypertonicity w/ clonus, Tx = Cyproheptadine

- SSC = Cough syrup = Dextromethorphan = Serotonergic
- Prozac = Fluoxetine = SSRI = Serotonergic

Other Syndromes

- Oculogyric Crisis (Dystonia or Extrapyrimaldal)

- Drugs causes:
 - Anti-Psychotic = Haloperidol, Chlorpromazine, olanzapine, (Low risk = Risperidone, Planzapine)
 - Anti-Emetic = Metoclopramide, Promethazine, Domperidone, Cetirizine
 - Anti-Depressants = Tricyclic, SSRI, lithium
 - Anti-Parkinson = Levodopa
 - Others: Nifedipine (CCB)
- Sx: Tongue fasciculation, Dystonia, Akathisia (restless), Parkinsonism (Tremor, Mask face), Tardive Dyskinesia
- Tx: MoA: Anticholinergic antagonism of Muscarinic receptor in basal ganglia
 - > restore dopamine-ACh balance > relive dystonic spasms
 - 1st line = Diphenhydramine 1 mg/kg (max 50mg) (Antihistamine w/ potent anticholinergic effect)
 - 2nd line = Benztropine IV 0.02 mg/kg (max 1mg)
 - Status dystonia (Refractory) = Baclofen

PEM R | 16 Y/O girl w/ generalized headache & photophobia/phonophobia lasted 6hrs, known Migraine on Rizatriptan & Metoclopramide, Now Torticollis/grimacing, HR 100 RR 22 BP 130/80 SpO2 100% on RA, best meds = Diphenhydramine

PEM R | 14 Y/O, ADHD, vomiting/diarrhea, father gave OTC, now child has neck pain, head tilt, abnormal eye deviation, Initial = Diphenhydramine

Chapter 5: Toxicology

Challenger | 16 Y/O Abdomen pain, vomiting, given medication, then having abnormal movement of head and neck, vitally stable, having grimacing of face and muscle tightness, most likely received = Promethazine

Other | 18 Y/O, Woman, 2 Days Severe headache, nausea vomiting, Hx of migraines, as do her mother and aunt, in ED IVF and prochlorperazine was provided to control her Sx, Shortly after nurse calls you to inform that the patient is having a reaction to the medication, Found crying due to pain in her neck & jaw w/ trouble enunciation, Ex head turned to the right w/ sustained contraction of the right SCM, Rest of the Examination is unremarkable, Tx = Diphenhydramine

Amal | 5 Y/O boy with gastroenteritis given antiemetic medication, presented to ED with fascial Grimace, head turn to Rt. side and stiff, he is drooling, but no fever, treatment of choice is = Diphenhydramine

Final | 5 Y/O AGE given antiemetic, in ED Fascial Grimace/head turn to Rt./Stiff/Drooling, NO Fever, Tx = Diphenhydramine

Final25 | Patient was seen in other hospital received meds for vomiting and agitation came with difficulty walking and rigidity of extremities and neck Vital signs tachycardia, hypertensive and afebrile next step = IV Diphenhydramine (Not IM midazolam nor IN lorazepam nor Rectal Diazepam)

Meds Side Effects

- Stimulant induced tic

PEM R | 8 Y/O, evaluating SZ, having eye rolling & grimacing, Mother gave him Adderall (mixed amphetamine salts) to focus on homework, he also takes Venlafaxine for social anxiety, having clears throat frequently, complains of Sorethroat & crusted nasal discharge, normal neuro, cause = Stimulant effect

- Baclofen

- o Muscle relaxant used for spasticity in CP
- o Side effects: Areflexia, Somnolence, Hypotonia, Resp. depression, Temp instability, Refractory dystonia

PEM R | 6 Y/O girl CP on baclofen pump placed 2 years ago, Sx concerns for Baclofen toxicity = Areflexia & somnolence

- GABA Withdrawal

- o Baclofen & Phenobarb are GABA slouched
- o Pt. Having withdrawal symptoms
- o Tx: For Withdrawal Give drug that missed Baclofen & Phenobarb

PEM R | 3 Y/O, 20kg boy, continues seizures, on thecal baclofen pump stopped working 3 nights ago, having intermittent vomit, & not tolerating his regular AED Phenobarbital, Now having GTC for 30min, given x2 Lorazepam w/ no change, Glucose 120 mg/dL, HR 116 BP/RR unobtainable, SpO2 94% on RA, Next line = Phenobarbital 5mg/kg IV over 15min

Challenger | 3 Y/O 20kg CP, SZ on Phenobarb not able to be taken PO due to intermittent vomiting due to Baclofen pump stopped 3 nights ago, having GTC seizure continues since 30min, EMS given Lorazepam 0.1mg/kg no change, glucose is 120 mg/dL HR 116 BP & RR unobtainable, SpO2 94% on RA, Lora given twice in ED over 15min w/ no change, Next line = Phenobarbital 5 mg/kg IV over 15min

- o Status epilepticus due to Discontinuation of Phenobarbital due to failed Baclofen pump
- o Both GABA agonists, so Discontinuation of both may lead to withdrawal symptoms

Chapter 5: Toxicology

- Tacrolimus Toxicity 3H (Headache, HTN, Hand Tremor)

- Ax w/ Azithromycin use (both substrates of P-glycoprotein & CYP3A4 > increasing Tacrolimus levels)
- Sx: Headache, Hand Tremor, HTN
- Labs: Tacrolimus level (12-24hr)

PEM R | 14 Y/O girl, Liver transplanted, in ED w/ Headache/Hand tremor for 2 days, not had this before, taking meds as directed, just finished 5 days of Azithro for strep pharyngitis, appear well, but constant fine tremor of hand that is not distractible, no thyromegaly, no jaundice, what lab to do to diagnose = Tacrolimus level

- INH (Isoniazid)

- TB Abx, Toxicity > Pyridoxine Impairment > Seizure
- Path: INH binds to Pyridoxine & stops its conversion to Pyridoxal phosphate (Vit B6) > Stop Glutamate Decarboxylase from converting Glutamate to GABA ! > Reduced Inhibition of Neuronal Activity > Seizure
- Sx: Triad: **Seizure** (refractory to Benzo), **Metabolic acidosis** (Lactic acidosis), Coma
 - Metabolic acidosis, **Hypoglycemia** (in children), High Liver enzymes
 - N/V, Abdomen pain, Rhabdomyolysis, Resp. Depression
- Invx: HA Metabolic Acidosis, High Lactate, High LFT, High INH levels, Hypoglycemia
- Tx: Pyridoxine (Vit B6) 1 g of 1mg of INH or 5 g Q15min PRN

PEM R | 4 Y/O Boy, Status epilepticus, ingested grandmother meds, in ED given 5mg rectal diazepam, still seizing w/ HR 140 SpO2 100% on non-rebreather, glucose of 50 mg/dL which given D10 for, then IV Lorazepam then IV Phenobarb 20mg/kg but still having seizure, Vitals of Temp 38.1 HR 130 BP 120/78 SpO2 100% Glucose 105 mg/dL, Ph 7.18 CO2 56 HCO3 12, electrolyte normal, best choice of meds = Pyridoxine 5 g IV

Promo | Pt. W/ Intractable Seizure not stopped after Benzo & Phenytoin, having Lactic acidosis, Toxin most likely responsible is = INH (Needs Pyridoxine) (Not Iron nor Salicylates nor NSAID)

Promo x2 | Pt. W/ Continues seizure, not improving on Benzo & Phenytoin, Patient in coma & having Increased Lactic acidosis, Toxin likely responsible for Sx = Isoniazid

Amal | Patient presented with rapid progressive coma, seizure which is resistant to AED, with lactic acidosis, VBG showed metabolic acidosis, what is the most likely toxin = Isoniazid

Final | Patient with intractable seizure not stopped after benzodiazepine & Phenytoin, Pt. have lactic acidosis. The toxin which is most likely responsible for this is = INH

- ACE Inhibitors

Final | Scenario of patient ingested antihypertensive medication and developing angioedema (on the lips) pt was vitally and clinically stable with normal BP and HR, which side effect antihypertensive drugs can cause **angioedema** = Angiotensin-converting enzyme (ACE) inhibitors (Not BB nor CCB nor Statins)

- Silica gel (bags)

- Sx: Diarrhea
- Tx: Hydration (if needed ORS)

Promo | 3 Y/O ingested shoes silica (small bags), came to ED, Action = Observe at home for dehydration (Not Observe ED 4-6hr or AC or Gastric lavage)

Amal | 2 Y/O 30min after Silica gel granules ingestion = Home observation for GIT upset (Not AC or Whole bowel irrigation or Gastric lavage or ED observation for 4-6hours)

Chapter 5: Toxicology

- Rat poison

- Pediatric concentrations of rodenticide usually low
- Coagulopathy happens in 2-3 days, need PCP follow up
- Path: Inhibit Vit. K cycle (similar to Warfarin) > Rodent = Coagulopathy | > Humans Large amount = Coagulopathy/Bleed
- Types (Most non-industrial strength rodenticides): Brodifacoum, Super warfarin
- Sx: Bleeding (IF Severe = Coagulopathy within 2-3 days)
- Tx: Mild = Discharge w/ F/U PT/APTT levels in 2 days
 - Sev = Vit. K (for coagulopathy)

PEM R | 15 M/O in ED accidental ingestion of D-con rat anticoagulant rodenticide, 30min prior to ED unknown amount, Asymptomatic, Next = Discharge w/ PCP F/U

Final | Asymptotic Rat ingestion = Discharge home (Not Observe and repeat coagulation 4 hrs (like the naphthalene)

- Mushroom

- Death Cap (Amanita phalloides Mushroom)
 - Sx: 6-24hr = GI (Dysentery)
 - 24-36hr = False recovery (High AST/ALT)
 - 48-96hr = Multisystem failure (irreversible Liver, Kidney)
 - Tx: Supportive, IVF
 - Delayed liver toxicity: Amatoxin, Multiple AC, NAC
- Gyromitrin (Mushroom)
 - Sx: Seizure (due to INH deficiency), GI Sx Hepatotoxicity
 - Methemoglobinemia
 - Tx: Pyridoxine, Methylene blue

Final | Mushroom Tox organ = Liver (Not heart nor brain)

- Dumbcane plant (Mother-in-Law tongue)

- Path: Ca oxalate crystals > Idiopathic angioedema
- Sx: if ate it = Mucosal pain/Swell
- Tx: Milk, Water

PEM R | 2 Y/O ate houseplant (dumbcane plant) Sx to present w/ = Mucosal pain & swell

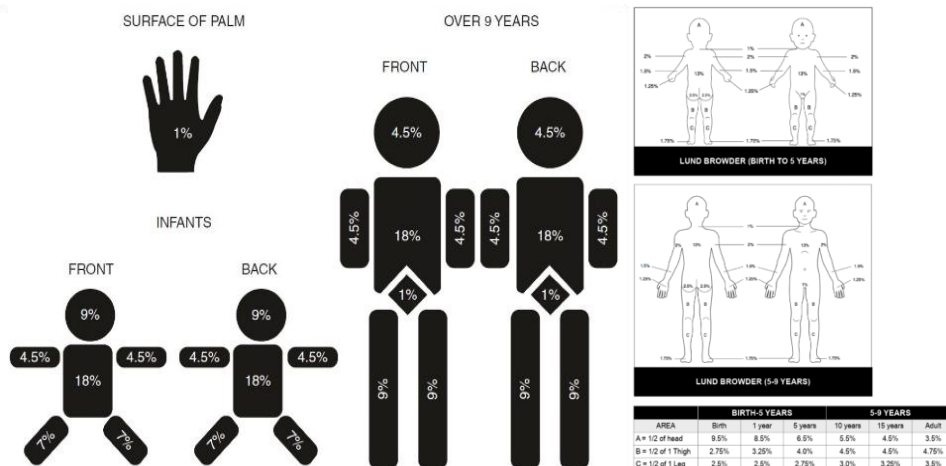
ENVIRONMENTAL

Fire

Burn

- Burn Injury
 - 18% of burns are due to abuse
 - Burn depth classification (Red Dry -Pain- > Pink Moist -Pain- > Red/White Moist -Pain- > Black -Painless- > MSK)
 - Superficial (1st degree prev.)
 - [Area] Limited to Epidermis
 - [Sx] Red, blanches with pressure, Dry, Minor swell, **Pain**
 - [Resolves] 5-7 days
 - Partial-Thickness (2nd degree prev.)
 - Superficial
 - [Area] Papillary Dermis
 - [Sx] Pink, Blister, Moist, **Pain**
 - [Resolves] 7-21 Days (2-3 weeks) **Heals Without scarring**
 - Deep
 - [Area] Reticular Dermis
 - [Sx] Red/White, Poor Blanching/CRT, Blister, Moist, **Pain**
 - [Resolves] 3-9 weeks often **Heals with scarring**
 - Full-Thickness (3rd degree prev.)
 - [Area] Entire Epidermis + Dermis (You see Subcutaneous Fat)
 - [Sx] Blackish/Charred or White/Pale, Waxy/Leathery, Dry, **Painless**
 - [Tx] Skin grafting unless small +/- Escharotomy

IF Full circumferential full-thickness > Strangling Eschar > Distal ischemia
Heals with Hypertrophy scarring
 - 4th degree
 - [Area] Skin + Subcutaneous tissue +/- Underlying (Fascia, Muscle, Bone)
 - [Sx] All of the above
 - [Tx] Skin/Muscle/Bone grafting + Surgical
 - TBSA%: Including only Partial Thickness and Higher for BSA
 - Rule of 9 not accurate in < 14 Y/O, use Lund & Browder chart or estimating by child's hand/fingers (BSA ~1%)



Chapter 6: Environmental

- Burn Management

o Minor Tx:

- Superficial Partial-Thickness > No need for therapy, Only Analgesia
- Small Partial-Thickness:
 - Blister < 2cm or Thick-Skinned area -Palm/Soles- > Leave it unless Ruptured then Debride it
 - Change dressing to clean Then BID (As some Biological/Synthetic burn dressings if left longer)
 - Antibiotic Ointment (Silver Sulfadiazine or Bacitracin or Fucidin) [For healing]
 - Analgesia [For Pain]
 - Consider Tetanus vaccine
 - Re-evaluate every 2-3 days [For Assess for infection, Poor healing, Progression]

o Major Burn Tx:

- Stabilization
 - ABCs, Remove clothing, Wash off chemicals, covering burn area with clean dry sheet
 - Cold + Wet compress [For Small burns], No Cold+Wet Compress [For Large burns] > Leads to Hypothermia
 - Intubation early [if Inhalation injury] (Singed facial hairdo, Carbonaceous sputum, Stridor)
- Analgesia [To control pain as not to enter severe pain > Neurogenic shock > bradycardia + etc.]
- IV Fluids, Consider Parkland formula for Burns > 15% of BSA
 - Ringer lactate [For High volume resuscitation]
 - Maintenance D5% + Ringer's lactate [For Pt < 20 Kg to prevent Hypoglycemia]
 - Monitor Blood Sugar and Electrolytes
- Escharotomy (IF Full-thickness Circumferential burn)
- I/O chart and Urine Output [For Fluid adjustment]
 - Put Foleys Cath in Genitalia Burn!
 - Use Foleys cath. For better calculation (Better in significant burns)
 - U/O Maintain 1m/kg/hr in children, 30-50ml/hr in Adult/Adolescent

PEM R | 4 Y/O spilled hot instant cup noodle onto Arms/Thighs, Pink/Moist skin w/ blister on Bilateral Forearm & Lt. Thigh, after treating wounds, expected heal time = 7-21 days

PEM R | 3 Y/O spilled noodles causing blister over 1/4 of length of anterolateral surface after removal of non-viable skin, moist pink, dermal surface remains w/ zone surrounding erythema, intact skin, heal likely = Minimal or no scarring

- o (Red Dry -Pain- > Pink Moist -Pain- > Red/White Moist -Pain- > Black -Painless- > MSK)
- o Superficial (Red Dry -Pain-) = No Scarring, 5-7 days
- o Partial thickness superficial (Pink Moist -Pain-) = No Scarring, 7-21 days
- o Partial thickness deep (Red/White Moist -Pain-) = Scarring, 3-9 weeks
- o Full thickness (Black -Painless-) = Hypertrophy Scarring

Promo | 4 Y/O Scald burn Abdomen/Groin/Legs after pulling soup onto lap, Alert/Crying HR 175 BP 109/75 Erythema w/ multiple intact ruptured blisters over lower abdomen/inner thighs/perineum/penis, estimated 7% TBSA, after analgesia, Next priority = Place Foley Cath. to gravity drainage (Not Cover burns w/ Silver sulfadiazine nor debride blisters nor IV Cefazolin)

Promo x2 | 3 Y/O in ED Spilled hot water from roof on lower abdomen & thighs, Ex 7% partial thickness in Lower Abdomen, Rt. Thigh, Scrotum & Penis, Next = Insert Foley's Cath (Not Report Social worker nor Transfer to Burn center nor Dressing & D/C)

Promo | Burn Thickness w/ Blister, Redness, Erythema in hand w/ pain, Degree = 2nd Degree Partial thickness

Amal | The best guide of adequate fluid resuscitation response in burn patient = Adequate urine output (Not Reversal of acidosis or Normalization of HR nor Normal Blood pressure)

Amal | 3 Y/O boy, pulled hot boiling water on himself, vitally stable, 7% BSA partial thickness burn over lower abdominal with groin, penis and testicles. What is your next step = Ask nurse to put foleys catheter (Not child protection nor Call nearest burn center for transfer)

- o Always start w/ Foleys then transfer (as edema will not make it easy later)

Final | 3 Y/O Burn including lower abdomen, Rt. Thigh/Scrotum/Penis, Next = Insert foleys cath

Final | Burn in thigh with erythema and pink skin what will u say to the parents regarding the scar = Minimal or no scar

Chapter 6: Environmental

- Burn Fluid Calculations

- IVF to give over 24hr divided 1st Half in 8hr & 2nd Half in 16hr
- All Boluses should be counted when calculating fluid volumes
- Formulas:
 - Parkland = $4 \times \text{TBSA}\% \times \text{Kg}$
 - Modified parkland or ATLS = $3 \times \text{TBSA}\% \times \text{Kg}$
 - Adult ATLS = $2 \times \text{TBSA}$
- Flame Injury
 - Adult $> 14 \text{ Y/O}$ = ATLS Adult Burn Fluid ($(2 \text{ LR} \times \text{TBSA}\% \times \text{Kg}) / 2$)
 - Child $< 14 \text{ Y/O}$ = Modified Parkland ($(3 \text{ LR} \times \text{TBSA}\% \times \text{Kg}) / 2$)
 - Age $\leq 5 \text{ Y/O}$ or $< 30 \text{ Kg}$ = Give Parkland or Modified + D5% running as Maintenance rate
- Electrical Injury
 - All ages = Parkland (Given 1st half in 8hr & 2nd half in 16hr) until urine clears

PEM R | 3 Y/O, 15kg, TBSA 40%, adding to maintenance IVF w/ Dextrose, initial fluid resus = RL 113ml/hr 8hr, 56ml/hr 16hr

PEM R | 3 Y/O 16kg having 25% TBSA, given bolus 400ml NS then after 4hr from initial injury, using traditional parkland formula = RL 100ml/hr for 4hr, then 50 ml/hr for 16hr

Promo | 18 M/O extracted from house fire w/ deep partial burn over entire abdomen & chest, Bilateral anterior leg, Rt. Entire arm, given bolus NS, Total fluid to be given over 24hr if his weight 10kg = 2200 ml (Not 1600 ml nor 2600 ml)

Promo x3 | Rate of IV fluid to give for 20kg patient w/ 50% Burn, immediately after burn = 320 ml/hr (Not 560 nor 175 nor 275)

- $< 30 \text{ kg}$ to give in 1st 8hr = 310ml/hr (Includes Burn Fluids + D5% Maintenance) then 2nd 16hr = 185ml/hr

Amal | A child presented with burn BSA 15%, which formula you will follow to calculate appropriate fluid = $4 \text{ ml} \times \text{wt (kg)} \times \text{BSA}\%$

Amal | 5 Y/O old girl, brought after fire at home 50%partial and full thickness. Weight 20 kg. Using Parkland formula, which of the following is suitable IVF rate = 320

- 5 Y/O or less calculate the Maintenance with it
- Preparation of fluids for this
 - D5 is on 1 line & RL or NS for Parkland is on another line
 - You can use D5 + NS if you use RL w/ Parkland
 - And D5 alone if you use NS w/ Parkland

Final | rate of fluid for 20kg, 50% burn, presenting immediately after burn = 320 ml/hr

Final | 11 M/O Burn 40% BSA, Weight 10kg, Total fluid in 1st 24hr = 1600

Final | Burn 2nd degree 20% & 1st degree 10% wt. of pt. 30, what fluid in first 8hr = 1200

Final | burn 3 years old calculate the IVF in 1st 8hr in 24hr = 2600

Final | 16 kg burn received a bolus of 400 ml calculate the fluids = Ringer lactate 100ml/hr (Remove boluses from 1st 8hr)

Final | What is the rate of fluid that you should give for 20kg patient with 50% burn, presented immediately after the burn =

A- 320 ml/hr (if $\leq 5 \text{ Y/O}$ add maintenance rate w/ D5%)

B- 275ml/hr (if $> 5 \text{ Y/O}$ this is the answer as calculated rate in 1st 8hr 250 ml/hr)

Final | Scenario BSA 30%, IVF 8hr = Calculate deficit + maintain in 8hr

Final25 | 10 Y/O Boy, 30 kg, has 20% second degree burn & 10% erythema only, asks about fluid rate over first 8 hr excluding maintenance = 1200ml (Not 900ml nor 1800ml nor 2400ml)

Fluid Resuscitation. An initial bolus of 20 mL/kg of normal saline or Ringer lactate solution is recommended while assessment of the extent of the burns takes place. Fluid volume from all initial boluses including prehospital care should be counted when calculating fluid volumes during the first 24 hours of treatment. A urinary catheter should be placed early in the management because there may be several hours of monitoring during transport or in the ED during which urine production can provide clinicians with information about fluid status.

TABLE 104.2

FLUID RESUSCITATION FORMULAS

Parkland: 4 mL/kg/% of BSA second- and third-degree burns, half in the first 8 hrs following injury, half in the next 16 hrs. Add maintenance with 5% dextrose containing fluid in children $< 5 \text{ yrs old}$

Galveston Shriners: 5,000 mL/m² /% of BSA second- and third-degree burns, half in the first 8 hrs, half in the next 16 hrs. Add 2,000 mL/m² /day maintenance with 5% dextrose containing fluid

Chapter 6: Environmental

- Burn wound issues
 - o Infection
 - Grey/Green discharge + YES Surrounding Erythema = Infection
 - Grey/Green discharge + NO Surrounding Erythema = Silver Sulfadiazine False-Positive
 - o Specific wound
 - Partial thickness: Tx = Silver Sulfadiazine, Transfer = Dry Cover
 - Full thickness: Tx = Skin graft, Circumferential = Escharotomy
 - o Escharotomy Indication: Circumferential burn w/ No Pulse or w/ compartment syndrome
 - Who does it: Plastic and if no one there then PEM using Cryo

PEM R | 9 Y/O 4 days after partial thickness forearm burn, on daily wash & silver sulfadiazine application, mother came for grey-greenish material drain from wound, has no fever & no surrounding erythema, best choice = Reassure & continue care

- o Silver Sulfadiazine: False positive Infection presentation w/ Grey-green material
- o Burn Infection: Erythema, Foul smell, Fever, Systemic Sx

PEM R | 10 Y/O w/ Campfire burns, partial thickness w/ intact blister circumferential hands/forearms, for transfer to burn center, best initial Tx after analgesia prior to transfer = Cover wounds w/ dry sheet

PEM R | 4 Y/O scalding burn (image of scald burn in trunk w/ dead skin), best course of initial Tx to minimize pain, risk of infection & optimal healing = Moderate sedation & debridement

PEM R | 6 Y/O girl burn from iron took 15-20sec before mother removed it, has well circumscribed burn white/shiny non painful to touch covering 8% TBSA, care plan = Cover w/ sterile sheet & transfer to burn center

PEM R | 7 Y/O girl spilled hot beverage on lap, vitally stable, anterior thigh erythema, posterior thigh/buttocks/perineum has intact flaccid blisters, local cooling & morphine decrease pain from 10/10 to 2/10, Next = Arrange Tx at regional burn center

PEM R | 3 Y/O has erythema/blisters covering both feet w/ sharp demarcation at ankle = Apply antibacterial ointment cover w/ non-adherent gauze under roller gauze & contact child protection

PEM R | 16 Y/O male ignited several dry Christmas trees in campground fire having extensive burns of both arms/face, has circumferential involvement of forearm with whitened & insensate skin, CRT 6 sec, Next = Immediate escharotomy

Promo | 16 Y/O male ignited bone fire & sustained extensive burns both arms/face w/ circumferential forearms whitened & insensate skin (can't feel), CRT 6 sec, Next = Immediate Escharotomy (Not Splint & Elevate nor Rapid NS nor Fasciotomy)

Amal | Leading cause of mortality and morbidity in burn = Infection (Not Renal failure nor RF nor SIRS nor Cardiac impairment)

Final | scenario about chemical burn to the hand and no pulse in posterior tibial artery, Next = Escharotomy (Not Surgery nor Call vascular surgery)

- Accidental burn

Amal | Which of following etiology is most common cause of accidental burns = Spills and splashes from hot liquid (Not Contact with electrical outlet nor House-fire nor Chemical injury)

- Chemical Burn
 - o Sodium Hydroxide (Alkali) = Irrigate w/ Normal saline, Brushing of powder

Final | Scenario about chemical burns (sodium hydroxide) to hand how to irrigate = Normal saline, brush, mineral oil (Not Immersion in cold water normal saline and VIT C or immersion in polyethylene glycol)

- Friction Burn

PEM R | 10 Y/O girl, lost control of bicycle slid face first down on adjacent embankment, has abrasion to Rt. Upper lip/cheek/forehead, wound surface ground-in dirt, tissue pink w/ no tissue lost, Tx = Remove ground-in dirt, apply antibacterial ointment instruct to clean 2-3 times daily, reapply ointment

Chapter 6: Environmental

- Mafenide Side effects
 - o Burn + Mafenide = Acidosis
 - o G6PD + Mafenide = Hemolysis

PEM R | 4 Y/O has scald injury of Face/Ear/Neck/Torso, planned for debridement, adverse effect of Mafenide = Acidosis

Circulation Management and Fluid Resuscitation

Burn injuries result in significant fluids losses and shifts due to loss of the epidermal barrier and an increase in capillary permeability, respectively. Leakage of plasma proteins into the interstitial space during the early phases of a burn increases its oncotic pressure, further contributing to fluid shifts and tissue edema. As a result, a major focus of burn care is fluid resuscitation to restore tissue perfusion and prevent hypovolemic shock. Intravenous fluid resuscitation through large bore intravenous cannulas should be instituted for most burns greater than 20% TBSA in adults, and greater than 10% in children.²⁷ Avoid IV placement through burned tissue if at all possible. A number of formulas have been proposed for estimating the fluid requirements of burn patients (Table 54.3). The Parkland formula is the most common

"I have a patient who has 10% TBSA superficial burns, 7% TBSA partial-thickness burns, and 4% TBSA full-thickness burns, totaling 21% TBSA burned. I called the burn center to transfer the patient, and I calculated the fluids for resuscitation. They accepted the transfer, but told me to recalculate the TBSA affected."

Superficial burns are not included in calculation of the percentage of TBSA affected by burns; only partial-thickness and full-thickness burns are included. This estimate should be calculated as accurately as possible, as it will determine fluid volume for resuscitation and will help determine a patient's appropriate disposition for definitive care.

Fluid Resuscitation

For ACS-classified minor burns or burns < 20% TBSA, oral rehydration is usually sufficient for management. For burns > 20% TBSA, IV fluid resuscitation is indicated.²⁰ The relationship between burn area involvement and the volume of resuscitation fluids required was established in the 1940s, and formulas for fluid estimates were created.⁴⁸ Common methods for estimating fluid requirements in pediatric burn patients include the Galveston, Parkland, and Cincinnati formulas. (See Table 5, page 14.) These 3 formulas have the same distribution of timing: the first half of calculated fluids are given over the first 8 hours, and the second half are given over the remaining 16 hours. Timing should begin from the time of injury rather than the time of arrival. For children aged < 5 years, maintenance fluids are added to each of the formulas. The goal should be to avoid both hypovolemia and fluid overload. As with other trauma patients, pediatric burn patients who are hypotensive and in shock should be given initial fluid boluses of up to 60 mL/kg of crystalloid (in 20-mL/kg aliquots), with consideration of transfusion of blood products and administration of vasopressive medications as clinically indicated.⁴⁹

Disposition (Transfer Criteria). Guidelines for admission must be individualized when treating children with burns. Hospitals, physicians, and parents have varying capabilities for managing pediatric patients with burns. If a physician suspects that the burns cannot be adequately cared for in the home, admission to the hospital is warranted.

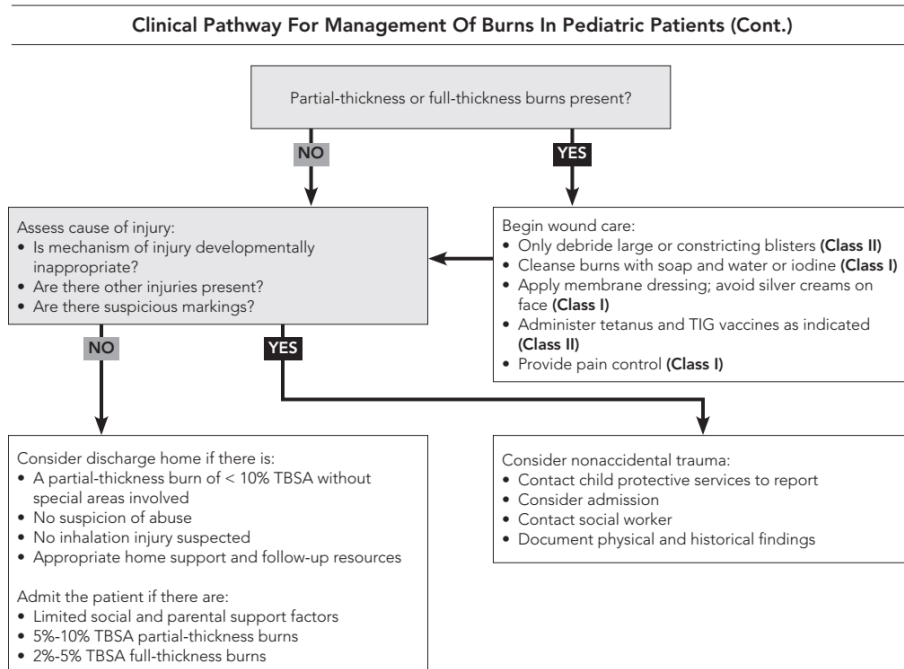
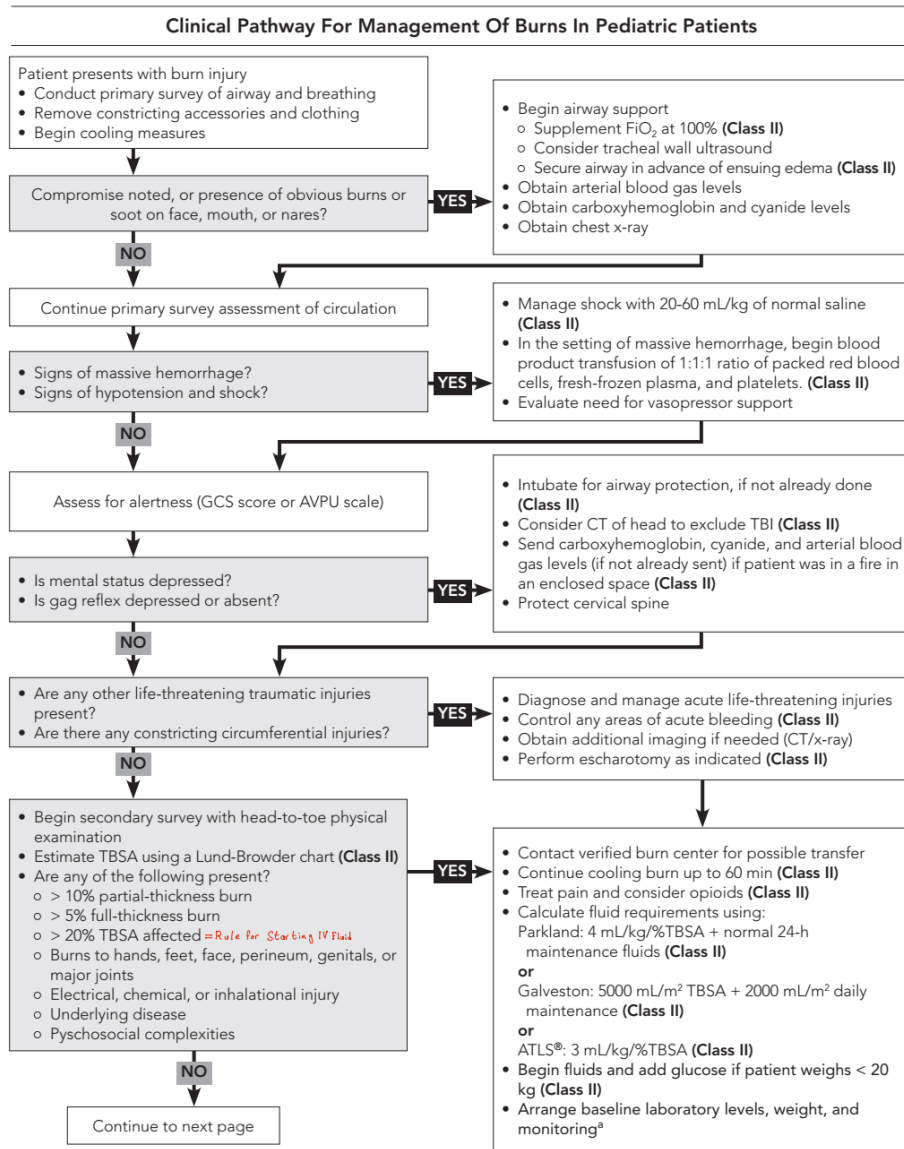
Children with burns <5% TBSA can be considered for outpatient management with close follow-up. Admission criteria include 5% to 10% TBSA burn, 2% to 5% TBSA full-thickness burn, high-voltage injury, concern for inhalational injury, circumferential burn, significant associated trauma, or medical comorbidity (such as diabetes or sickle cell disease). Burns in certain locations are at higher risk for disability or poor cosmetic outcome and should be considered for treatment in the hospital. These include more than 1% of BSA burns of the face, perineum, hands, and feet; or burns overlying joints. Children with any of the following should be considered for transfer to a burn center: >10% TBSA burn, >5% TBSA full-thickness burn, high-voltage burn, chemical burn, known inhalational injury, burn to face, hands, feet, perineum, joints, significant comorbidities that could affect burn treatment, or when social or emotional factors related to the burn injuries will influence rehabilitation.

Triage level	Characteristics
Resuscitation room	Inhalational injury, altered mental status/LOC, chest pain, arrhythmias, associated major trauma
1—Critical	Facial burns with singed nasal hairs, hoarse breath sounds, oropharyngeal edema, dysphagia Burns >25% TBSA Electrical burns with history of either altered mental status or seizure
2—Acute	Any full-thickness burn Partial thickness >15% TBSA Burns to face, genitalia Caustic chemicals to eyes Circumferential burns Significant burns of hands, feet Any burn with significant pain Caustic skin burns Electrical burns with any of the following: Loss of consciousness Thrown from source or frozen to source Entrance and exit wounds Concern for abuse
3—Urgent	Partial thickness >5% TBSA Infected burn Burns requiring debridement
4—Urgent	<5% partial-thickness burn
5—Nonurgent	Burn redress Superficial burn

Table 9. Indications for Transfer to a Burn Center¹¹⁰

- Partial-thickness burns > 10% TBSA in children aged < 10 years or > 20% TBSA in any age
- Full-thickness burns > 5% TBSA
- Burns to high-risk areas, such as the face, hands, feet, genitals, perineum, or major joints
- Electrical burns, including lightning strike
- Chemical burns
- Inhalation injury
- Pre-existing conditions known to impair healing and increase risk of mortality
- Burns in combination with traumatic injury (eg, fracture, traumatic brain injury) whereby the burn is the leading risk for patient mortality
- Children requiring support in social, emotional, or rehabilitative care
- Burns in a setting (personnel, equipment, or unit) unequipped to care for critically ill children

Chapter 6: Environmental



Abbreviations: TBSA, total body surface area; TIG, tetanus immune globulin.

Chapter 6: Environmental

House Fire

- House Fire
 - o Invx to order
 - SpO2 %, CO oximetry, ECG, Reflo, CBC, U/E, CK, Troponin
 - ABG (+ Check Lactate) = Respiratory Acidosis + High Lactic Acid + Low PO2 + High CO +/- Methemoglobinemia, Blood CO level
 - o Complications Approach:
 - Airway Edema (Edema of Burned Airway will worsen within 24-48hr)
 - Use Small ETT diameter anticipating narrow airway
 - Use Cuffed ETT preferred accommodating changing edema over recovery course
 - Don't allow RT to cut tube to make it long (due to swelling that will happen to face)
 - Inhalation Injury
 - Indication of Early Intubation early with Inhalation injury
 - o Face/Neck/Upper Chest Burn
 - o Singed facial hair (nasal, eyebrows)
 - o Carbonaceous sputum
 - o Stridor/Hoarseness
 - Hypovolemia, Airway edema if burn in face/neck
 - CO poisoning (from smoke)
 - Cyanide poisoning (from furniture/paint)
 - o Other approach
 - ABCs, Remove clothing, Wash off chemicals, covering burn area with clean dry sheet
 - Cold + Wet compress [For Small burns], No Cold+Wet Compress [For Large burns] > Leads to Hypothermia
 - Analgesia [To control pain as not to enter severe pain > Neurogenic shock > bradycardia + etc.]
 - IV Fluids, Consider Parkland formula for Burns > 15% of BSA
 - Ringer lactate [For High volume resuscitation]
 - Maintenance D5% + Ringer's lactate [For Pt < 20 Kg to prevent Hypoglycemia]
 - Monitor Blood Sugar and Electrolytes
 - I/O chart and Urine Output [For Fluid adjustment]
 - Use Foleys cath. For better calculation (Better in significant burns)
 - U/O Maintain 1m/kg/hr in children, 30-50ml/hr in Adult/Adolescent

PEM R | 11 Y/O girl, brought 20min after house fire, conscious/breathing spontaneous, set on Non-rebreather FM, HR 110 RR 30 BP 100/65 SpO2 94%, has bilateral soot in nares, surrounding mouth/tongue, mild diminished sounds, expiratory wheeze, tightness, Ph 7.30 PCO2 52 PO2 56 HCO3 30, Next step = ETT

PEM R | 3 Y/O, extracted from house-fire unconscious but breathing, has soot in around mouth, swollen tongue, faint bilateral wheeze, which additional info helpful need to intubate = None, pt should be intubated based on presentation

PEM R | 4 Y/O girl w/ facial burns, superficial/deep partial thickness on rt. Cheek/Malar region/Ala nasae, eyebrows eyelash bangs singed, initial evaluation having agitation & stridor, Next = Sux & Intubation

- o Inhalation injury: No Sux w/ Hyperkalemia
- o Hyperkalemia Risk > 5 days of: Burn > 10% + Crush + Denervation | Indefinite w/: NM disease (ALS, MS, DMD)

Promo | Burn w/ Airway affected = Prepare for intubation

Amal | You are resuscitating house fire victim, she has singed nasal hair and eyebrows, now she is awake but in discomfort. You arrange transfer to burn center which is 40 min away, she has hoarseness, carboxyhemoglobin level is 15, what should be done = Intubate before transport (Not Administer 100% O2 in the way nor Alert transfer crew about possibility of difficult airway nor Sedate and evaluate vocal cords)

Final | Pt found in fire during his sleep, airway patent but decrease air entry and wheezy chest, the highest valuable test = ABG

Chapter 6: Environmental

Hyperthermia

- Heat Cramp = Temp N, Mental N, BP N, Mild Dehydration, Sweat | Muscle cramping | Tx: PO Salt, IVF > D/C
- Heat Exhaustion = Temp < 39, CNS Confused, BP Orthostatic, Sweat | Fatigue/N/V/Headache/Vertigo | Tx: Rest/Cool > **
- Heat Stroke = Temp > 41, CNS Affected, BP Hypo, Non-Sweat | Exhaustion + End-Organ DMG* | Tx: Rapid cool > ICU

* Heat Exhaustion Sx + CNS Dysfunction Sx = Heat Stroke

** VS normal + No Lab abnormal = D/C

VS abnormal or Lab abnormal = Admit

- Hyperthermia

- Definition: Core Temp ≥ 38.5
 - Fever = Hypothalamic set point increased by cytokines in response to infection
 - Hyperthermia = Hypothalamic set point unable to dissipate heat effectively bc of External exposure/Internal production
- Ped risk factors
 - Great BSA to Mass
 - Less sweat production
 - Higher heat production
 - Low CO in relation to Metabolic rate

- Heat Stroke Path:

- CNS Dysfunction by Decrease Cerebral flow
- End-organ DMG by Mitochondrial Dysfunction direct/indirect by Splanchnic vasoconstriction (GI Blood)
- indirect: vasoconstriction > Gut permeability > Endotoxin leak > Cytokines production > Inflammation > Dysfu.

- Heat Stroke Tx:

- Monitoring (Rectal/Esophageal for core temp, HR, BP, U/O, Neuro/Mental state)
- Rapid cooling (Rectal temp Goal 39 or less within 30min)
 - Removal Environment/Clothes
 - Non-invasive = Ice pack Axilla/Groin/Neck, Cool blanket, Evaporation (wet sheet, spray water w/ fan)
 - Invasive = Cool IVF, Ice water immersion, Peritoneal/Thoracic Lavage, Ice water rectal lavage, ECMO
- Rapid Cooling indications:
 - Core Temp ≥ 40 + Altered LoC
 - Hyperthermia + HD Unstable
 - Suspected Malignant Hyperthermia or Neuroleptic Malignant syndrome
- Circulation: IVF & Vasopressors (Dobutamine, avoid alpha agonists & anticholinergic agents)
- Diuresis: Lasix 1mg/kg and/or Mannitol 0.25-1g/kg (Rhabdomyolysis prevention, Maintain U/O ≥ 1 ml/kg/hr)
- Shivering/SZ: Benzo (shivering will increase heat production > decrease effectiveness of cooling methods)
- Dantrolene (ONLY if Malignant Hyperthermia or Neuroleptic Malignant syndrome)
- AVOID Antipyretics (NO Effect)

PEM R | 1 Y/O girl left accidentally in her car seat for 2hr, during hot weather 41 degree, EMS arrived core temp 43.5 somnolent & unresponsive Active cooling on route w/ cool IVF & ice packs axilla/groin, in ED Temp 41 HR 180 RR 35 SpO2 100% RA, NOW Shivering, appropriate med to give now = Lorazepam IV (Benzo = stop shivering > Decrease heat production)

PEM R | 7 Y/O GDD, having Temp 42 w/ active cooling having 40.5, now severe shivering, Tx = Midazolam

PEM R | 22 M/O unresponsive after left unattended in locked car, Temp 41, Next = Cooling w/ Ice packs on trunk & extremities

Promo | 16 Y/O football player practicing w/ his teammates in full pads & uniform mid-day sun for 2hr, suddenly collapsed, Confused lethargic, RR 32 HR 120 Temp 41, Note skin dry and hot, Accurate statement about condition = End organ Damage due to endotoxin & cytokine release is common (Not evaporative cooling using fan & fine water spray is preferred over ice. Nor Oral rehydration is preferred over IV. Nor Cooling process should be gradual)

Chapter 6: Environmental

Amal | 13 Y/O boy playing soccer in summer for 2 hours suddenly collapsed, In ED confused and lethargy, RR35 HR:130 T:41.1C skin hot and dry, the most accountable for this condition = End-organ damage due to endotoxin cytokine (Not Evaporating cooling by fan and water better than ice or Dehydration is the sole of damage or cooling proses should go slowly)

- Heat Exhaust = Dry, Hot, Temp < 40
 - Tx: Evaporating (fan & spray)
- Heat Stroke = CNS affected, Temp > 40
 - Tx: Rapid cooling

Final x2 | 3 Y/O Child on travel by car arrived hypotension lethargic & grandmother has same Sx, Temp 39.5 what is the Dx = Heat Exhaustion (Not Heat Cramp nor Viral GE)

Final | Hyperthermia = Iced water gastric lavage

- Passive Treatment 1st line
- Heat stroke 1st line
 - Adult/Peds = Water evaporates
 - Athlete = Water immersion & Ice (AVOID in Infants -not recommended-)

Turki
Bukhari's
Notes

Chapter 6: Environmental

Water

Drowning

- Drowning

- Info: 2nd cause of death in pediatrics after MVA, Peaks < 5 Y/O, also males 15-25 Y/O
 - Submersion deaths in adolescents often linked to abuse
 - Neurological status during presentation predictive of outcome
 - IF coming awake/responsive > generally will do well
 - IF no spontaneous movements for 24hr > likely to die or Severe CNS Injury
- Definition:
 - Near-drowning/Rescue: Surviving at least 24hr Process of drowning interrupted
 - Drowning: Dies within 24hr Death from Respiratory Impairment when Submerged or Immersed
 - Submerged: Airway below liquid surface
 - Immersed: Water splash on face
- Path: Water in mouth/nose > Conscious breath holding (~60 sec)
 - > Inspiratory drives becoming hard to resist > Water aspirated OR Laryngospasm occurs (Preventing aspiration)
 - > Cerebral hypoxia terminates Laryngospasm > Hypoxia, Acidosis > Bradycardia, Pulseless Electrical Activity
 - > Asystole > Hypoxic Ischemic Neurologic Injury
- Complications If Rescued: ARDS or Acute Lung Injury (ALI) (Results from water washing out surfactant)
 - CNS Injury (Most frequent cause of death), Persistent Neurological deficit (In many survivors)
- Tx: Fresh-water and Salt-water drowning managed same way
 - At Scene (Important steps that can help):
 - Ventilation
 - Chest compressions if pulseless
 - Protect spine (If Diving injury or abuse)
 - At Hospital:
 - ABCs, Ventilator support (if RD), NGT (To avoid aspiration as vomiting is expected)
 - Warming (Check Hypothermia management)
 - If Cold water > Warm patient (Removal of cloths, warm packs or blankets)
 - if Severe Cold > Warmed IVF, Body cavity lavage
 - If Freezing > Resuscitative efforts till core Temp 32-35 (Not dead until warm dead)
 - CXR [If stable], Reflo, U/E, VBG (All to look for Acidosis metabolic/respiratory)
 - Asymptomatic observe for 6-8 hours, if CXR normal > Discharge
 - All Symptomatic (even if mild) > Admission
- Risk Factors of Poor outcomes
 - < 5 GCS
 - ≥ 5 min Submersion
 - < 7.1 Ph (Mainly Lactic acidosis due to Hypoxia)
 - ≥ 10 min to BLS
 - ≥ 25 min of Resus
 - Persistent Apnea or Cardiopulmonary Resus

Poor Prognostic Indicators

- Submersion > 5 minutes
- No resuscitation for > 10 minutes
- Fixed and dilated pupils
- GCS < 5 (comatose)
- pH < 7.1

Good Prognostic Indicators

- Age < 14
- CPR in the field
- CPR < 25 min
- Detectable pulse on arrival EMS
- T Core < 35°C (mixed results; some studies support this, some show no effect)

< 3 < 5 > 5 min < 7.1 10 min 25 min
Age GCS Submersion Ph to BLS of Resus

Persistent in ED Apnea

< 2 90% } chance of Recovery
> 3 5%

Risk Factors
of Poor Outcomes

Chapter 6: Environmental

PEM R | 10 M/O girl, Left unattended in bathtub for few min, found face down in water + not breathing, EMS intubated & brought to ED, Acid/Base abnormality commonly seen = Metabolic Acidosis

PEM R | 5 Y/O boy initially swimming in shallow end but then submersion in deep end, father gave him rescue breath and started spontaneous breath, SpO2 91% on RA, has minimal rhonchi, no RD, ABG PaO2 60, Next step = Give IVF Half Maintenance

- Drowning w/ Pulmonary edema
 - Aspiration of water > Surfactant washout > Capillary leak > Pulmonary edema > High metabolic rate
 - Tx: IVF half Maintenance

PEM R | 18 M/O boy, immersion in local swimming pool, boy wearing vest/arm flotation band, he tipped his head for 90 sec then pulled from pool within seconds, Spontaneous breath, regained consciousness, in ED Vitally stable, GCS 15/15, good bilateral air entry, normal neuro exam, labs normal, 4hr after observation, disposition appropriate = Discharge home now w/ drowning education (Drowning if Asymptomatic = observe for 6-8hr then IF CXR normal = D/C)

Promo x2 | Best swimming pool prevention = Fence Auto-Lock door all over (Not Observe pt. During swimming don't allow to do alone nor teach toddler how to swim)

- Pool Safety

Promo | Which of the following intervention improve outcome in drowning = Early bystander CPR

Amal | Which of the following intervention improve outcome in drowning = Early bystander CPR

Amal | Mother had her child drowning for 3 min, EMS arrived and pulse was detected. Which of the following most predictive good prognostic factor in drowning = Palpable pulses when EMS arrived (not Estimated submersion time less than 3min)

Amal | old boy pulled from bottom of the neighbor's swimming pool when he was submerged for an unknown period, although initially pulseless & in respiratory arrest, CPR is done, HR 110 RR 4 per minute BP 100/65, GCS score was one for the eye, one for verbal because he's intubated and two for the motor, pupils fixed dilated, True = 20% of the near drowning patients with the GCS of 3/15 Upon arrival to the ED will fully recover (Not Aspirated motor interferes with successful ventilation because of mechanical obstruction. Nor Application of Helmick maneuver that will help in evacuating the lungs of the excess fluids. No Injuries of the cervical spine are quite uncommon in such scenarios of near drowning)

Amal | 12 Y/O URTI, planning to go for boat trip for days, what advice you will give that will decrease mortality related to boat trips = Having life jacket on all the time (Not Taking swimming lessons nor Install CO2 detector in the boat)

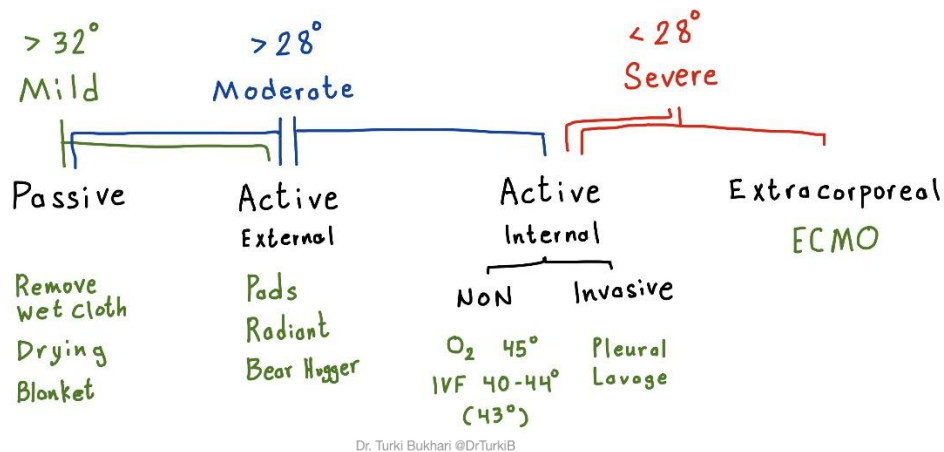
- Life jacket because they will get tired

Final | Drowning scenario = Keep more observe in ER (6-8 hr)

Final | Drowning patient CPR > 25min, Temp 36, Next = Declare death

Chapter 6: Environmental

Hypothermia



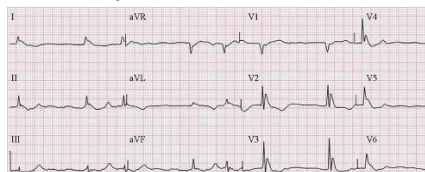
Dr. Turki Bukhari @DrTurkiB

- **Warming strategies**
 - 32-35°C Mild Shiver/Pale/Clumsy/Slurred | Passive > Active External
 - 28-32°C Moderate Confusion/Loss of compensation | Active External + Passive > Active Internal ± ECMO
 - < 28°C Severe Flush/Rigidity/Edema/Stupor | Active Internal > ECMO
 - < 28°C Severe + Perfusion Affected | ECMO or Max Active Internal
 - < 25°C Profound
- **Warming degrees**
 - O₂ = 45
 - IVF = 43
- **Hypothermia Afterdrop phenomenon**
 - Avoiding Afterdrop by Starting rewarming from Trunk & Head
 - Fleisher: External rewarming techniques limited to head & trunk may minimize vasodilation and afterdrop
- **ECG changes related Hypothermia**
 - 32-35 °C = Sinus tachycardia
 - 28-35 °C = Bradycardia and atrial/ventricular dysrhythmias
 - < 28 °C = Ventricular dysrhythmias
 - < 20 °C = Asystole
- **Hypothermia Resus:**
 - Continue Resus till core Temp 32-35 C or till ROSC, Except if life-threatening injury

< 30°C	30-35°C	> 35°C
x3 Shocks deliveries then stop (Adjusted PALS -PEM Practice-)	x2 Duration between Epi doses (Adjusted PALS -Double time-)	x1 Duration between Epi doses (Normal PALS -No time change-)

PEM R | 2 Y/O girl slips into beneath covered pool during winter, missing for 20min then EMS found her unresponsive immediately intubated & removed her wet clothing, covered w/ warm blankets, in ED HR 30 Rectal Temp 27.5, Important Next = Core body rewarming w/ warmed IVF & ECMO

- Pt. Has Metabolic failure + RD + Bradycardia = Rewarm till 32-35 for Cardiac pacing & CPR to be Effective



PEM R | 13 Y/O, during winter season, homeless, Temp 29.2 HR 46 RR 46 BP 79/46, SpO₂ 86% RA, O₂ given, IV access established, ECG (above) = Warmed IVF (Not Amiodarone nor Epinephrine nor Transcutaneous pacing)

Chapter 6: Environmental

PEM R | 3 Y/O being lost 12hr from family while camping, EMS transported via helicopter child confused Temp 29.2 HR 55 RR 44 BP 78/45, SpO2 88% RA, IV access established, ECG (shows Osborn waves) = Warmed IVF

PEM R | 4 Y/O boy fell in ice-covered pool, took over 1 hour to retrieve him, intubated & brought to you, in ED asystole, Rectal temp 20, Next = Begin aggressive rewarming

PEM R | 18 Y/O college freshman found unresponsive outside house w/ -13 degree outside, known to have seizure disorder found w/ biting marks & bowel incontinence EMS suspected cause is seizure, No Asystole w/ core temp 27, after 30 min CPR & external warming, options in order = ECMO > Pulmonary lavage > Gastric lavage > Bladder lavage

Promo | Child came to you, after CPR for 40 min with Temp 29, Next = Continue CPR till 32 (32-35 degree)

Promo x3 | 4 Y/O found in swimming pole, Asystole body temp 30, as part of resus, begin core rewarming w/ IVF, max degree of warm IVF is = 43

Other | 4 Y/O MVA, Unrestrained rear seat, found lying across console minimally responsive but conscious w/ Multiple contusions on chest/abdomen w/ Lt. thigh deformity, prolonged extrication, persistent tachycardia, hypotension, lethargy during transport given x2 IV lines & 40 ml/kg NS, in ED Temp 34 HR 170 RR 24 BP 68/50 SpO2 96% on Non-rebreather, you started uncross-matched blood rapid infusion, Best Tx for Body temp = Active warming to above 35°C

- Major multisystem trauma w/ hemorrhagic shock
- Hypothermia < 35°C in Hemorrhagic Shock w/ Trauma > Affect Cardiac function, clotting, acid-base
- Tx: Active Rewarming till 35°C.
 - Passive & Active External warming = Reduce further heat loss
 - Active Internal warming = Add Heat to body's core

Amal | 10 Y/O girl fell on cool pool pulled after an hour in ED she is cool unresponsive T:34 HR:65 with perfused rhythm RR 16 what is the best way modality = Passive external warming

Amal | Core rewarming in <32 C, heat the IV solution = 43

- Fleisher: dialysis with dialysate warmed to 43°C (109.4°F)

Amal | Child w/ hypothermia w/ Temp 33, rewarming method = External rewarming of head and neck (Not Core rewarming by peritoneal lavage nor ECMO)

Amal | 8 M/O old the baby is found by the police in a dumpster, on Ex poor tone, there are no signs of trauma Temp 30 HR 60 RR 10 You managed to intubate and secure IV line, Which of the following methods is the best way to rewarm This baby = The warm humidified oxygen heated IV fluids (for moderate) (Not Cardio pulmonary bypass or by ECMO * -usually less than 28C severe hypothermia-. Nor Forced air warming device, bear huger -passive for mild-. Nor Warm blankets heat packs heat lamps - passive for mild-)

Final | Temp 35 shivering w/ wet cloths = remove wet cloths

Final | 4 Y/O swimming pole brought to ED, Asystole Temp 30, as part of Resus & rewarming fluid, what max degree = 43

Final | Child came to you after CPR for 40 min with temp 29C what to do = Resume till temp 32

Final | Pt with hypothermia what is the correct statement = VT with temperature less than 22

Final | Hypothermic patient and you want to give warm IV fluid what the degree = 43

Chapter 6: Environmental

Frostbite

- Frostnip
 - Tx: Supportive, full recovery
- Frostbite
 - Superficial: 1st = No blister, Pale/Anesthesia/Edema | 2nd = Blister
 - Deep: 3rd | 4th
 - Tx: Analgesia, Tetanus prophylaxis, Abx Prophylaxis (only if infection, covering strep/staph/pseudomonas)
 - Rewarming Approach (Fleisher): Goal: minimize dermal ischemia + promote timely healing
 - Phase 1 – Prethaw (prehospital):
 - Remove from cold environment
 - Remove wet clothing
 - Apply soft padding; avoid rubbing the tissue
 - Phase 2 – Rewarming (15–30 min):
 - Immerse in 40-42°C water (or Lukewarm water 36-40)
 - Expect significant pain → give IV analgesia
 - Stop when Thawing (15-30min, Red/purple color + tissue soft to touch)
 - Phase 3 – Postthaw:
 - Wound care + loose sterile dressings
 - Separate digits with cotton; splint extremities
 - Arrange wound care specialist follow-up

PEM R | 6 Y/O hand pain, experiencing snow for 1st time, using very thin gloves & became very wet, on Ex Swollen/Erythema/Digit very cold, Fingertip in danger of necrosis & amputation = Loss of sensation in their fingertip

PEM R | 15 Y/O pain in feet while cross country skiing for over 10 miles, having multiple toes erythema & intact blisters, technique = Warm water immersion

Amal | The best way to rewarm frozen extremity = Immerse directly in warm water around 40-44 oC

Final | Frostbite with pallor, warm water immersion done at home and presented w/ pale tips & erythema & blisters, next step in Tx = Warm Luke water (Not Heat pads nor Apply Flamazine)

Final25 | Frostbite w/ blister on scene, removal of cloths done by EMS en route, what to do = Delay warming till arrival to hospital (Unsure if not: Warm in 40-45C for 15-30 min nor Apply warm packs)

Final25 | Frostbite after rewarming for 1hr was hemorrhagic blister and black fingers next step = Give tetanus and dressing (Unsure if not: Surgical Specialist referral for debridement and possible amputation surgical referral. Nor Do debridement and Rewarming for another hour. Nor Discharge home after dressing)

Chapter 6: Environmental

Electricity**Electrical injury****- Electrical Injury**

- AC = Amskah (أمسكه) Tetany + Explosive exit wound | Low Voltage = Home Electricity | ECG: Vfib
- DC = Defah (دفعه) Throws | High Voltage = Lightning/Defib | ECG: Asystole (if Low Voltage DC = Vfib)
 - High-Voltage more Dangerous than Low-Voltage, causes "Locking-on" Ax w/ Deep tissue injury
- Invx: CK, U/E, Urine Myoglobin
 - ECG if High Voltage or Transthoracic electrical exposure or Chest pain post electrical injury
- Lightning strike Tx: Observe for 18-24hr

PEM R | 17 Y/O accidental high voltage electrical shock at work trimming trees around power lines, had brief LoC, didn't fall, initial evaluation should include = ECG

PEM R | 17 Y/O girl in struck by lightning while surfing, amnesic to event, regained consciousness shortly after and no cough/choke/RD indicating aspiration, photo of surfboard shows burned area where rear foot was standing, CBC/CK/Electrolytes/ECG/Trop taken 2hr & 4hr after incident are normal, Now at 6hr what recommendation plan of discharge = Discharge at 18-24hr if asymptomatic & labs are normal

PEM R | 10 Y/O sitting under tree when storm started & lightning hit him, had LoC but back to baseline now, entrance wound on Lt. side of occiput, exist in Rt. Lower leg w/ 1st degree burn on chest/abdomen, Diagnostic tests immediately warranted = ECG

PEM R | 18 M/O boy after electrical injury at home, sticking metal knitting needle in electrical socket & immediately withdraw hand & dropped object, spark heard, Temp 36.8 HR 116 RR 22 SpO2 99%, Neuro Ex normal, Next = D/C now w/ no further invx

Promo | High voltage electrical injury = Skin injury doesn't Reflect extent of injury

Promo | Which tissue has highest resistance to passage of electricity = Bone (Not Muscle nor Dry skin nor Nerve)

Promo | Most severe mechanism of Lighting = Direct strike (Not side flash nor ground spread nor contact current)

Amal | Which of the following types of lightning strikes is the most serious for lightning injuries = Direct

Amal | Which of the following statements regarding electrical injuries true =

A. AC is the one responsible to produce explosive exit wounds

B. Dysrhythmias produced by direct current is usually Asystole

(Not For the same voltage, DC produces a worse effect than the AC nor Lightning behaves physiologically like alternating current -Lightning is Direct Current-)

- Answer: A & B (but in exam choose A)
- DC = fatal Asystole ? not usual | AC = Vfib, Explosive exit wound

Amal | Lightning is = Neither DC or AC but unidirectional current pulse (Not DC or AC)

Amal | Which statement concerning the physiology of electrical injuries is true = Tetany occur when muscle fibers are stimulated at 40-110 Cycle/second (Not DC exposure to same voltage more dangerous 3 times than AC or The higher the resistance of tissue to the flow to currents the less likely of transmitted the electrical injury to thermal energy or Tissue resistance remains constant throughout the length of exposure)

- Household AC in most countries runs at 50–60 Hz, right inside the tetany-inducing range (40–110 Hz)
- At this frequency, continuous muscle contraction occurs > patient cannot let go of the electrical source > prolongs exposure and increases injury severity
- This is why AC is more dangerous than DC for the same voltage in terms of inducing sustained contact

Final | An infant has an electrical cord injury in his lips at home (Low voltage electrical injury) what will you expect to see in the ECG = Vfib (Always Vfib if Low Voltage)

Final | Severe mechanisms of lighting = Direct Strike (Not Ground spread or Side flash or Contact current)

Chapter 6: Environmental

- Oral Commissure electrical injury

- Electrical cord chewing > after eschar sloughing (5-10 up to 21 days)) > Oral commissure (labial artery) bleed
- Tx: Direct compression
 - Surgery consult (if still bleeding)

PEM R | 2 Y/O chewing on electrical cord now red/edematous skin at oral com issuer otherwise normal, monitor at home = Bleeding might occur in next 7-14 days (Labial Artery hemorrhage)

PEM R | 22 M/O in ED 6hr after chewing on extension cord & parent hearted popping, Ex Rt. Mouth corner gray eschar, complication of this injury = Labial artery hemorrhage

PEM R | 14 M/O, w/ EMS excessive facial bleed from mouth, No trauma but Hx of 5 days ago in Ed w/ chewing on lamp cord, No has bleed on Rt. Oral commissure, vitally stable, you apply pressure, Next = Urgent

PEM R | 2 Y/O burn at corner of mouth after chewing electrical cord, advise parent most likely short term complication = Hemorrhage

Amal | 3 Y/O bit into electrical cord, electrical cord injury, crying with blister at lip, most serious frequent complication you should be concerned about = Bleeding (Not Delayed oral swelling nor Fracture of Mandible nor Cardiac Arrhythmia)

- Bleeding from labial artery, usually at risk up to 14 days
- if bleeding occurs put pressure at the angle of the mouth by pinching w/ index & thumb (1 in & 1 out)
- Commonest arrhythmias with electrical injuries is Vfib and it will be early complication not late

Final | Labial electrical injury = Bleeding

FACTORS DETERMINING THE EXTENT OF ELECTRICAL INJURY

Resistance	Injury extent inversely related to resistance High resistance tissue heats up, develop coagulation necrosis High resistance (bone, fat, dry skin) greater thermal injury Low resistance: Wet skin, thick skin on palms, soles, nerves, blood vessels
Current Type	Alternating Current (AC): Bidirectional Current (more serious injuries) Sources: Electrical transformers, household/office equipment, electrical cords Tetanic contractions: Multiple contraction leading to increased contact time Clinical: Ventricular fibrillation, Rhabdomyolysis → Renal Failure Direct Current (DC): Unidirectional Current Sources: Defibrillation, pacing, railroad tracks, electrical transformers lightning Single large contraction that can throw patient from the source Clinical: Asystole, deep tissue burns
Frequency	Low voltage (< 1000 Volts) versus High Voltage (> 1000 Volts) Low voltage follows the path of least resistance High voltage follows a direct path High voltage injury can cause muscle contraction enough to throw the victim. Decreases time of contact but increases the risk of blunt trauma
Contact Duration	Longer contact will lead to more severe symptoms. However even a very brief contact with a high voltage source can lead to significant injury
Pathway	Entry and exits wounds do not correlate with extent of internal injury Hand to hand flow: Mortality from spinal cord transection C4-C6 Hand to foot flow: Mortality from cardiac arrhythmia

ELECTRICAL INJURY COMPARISON

	LOW VOLTAGE	HIGH VOLTAGE	VERY HIGH VOLTAGE (LIGHTNING)
Duration	Long	Brief	Instantaneous
Cardiac	Ventricular Fibrillation	Ventricular Fibrillation	Asystole
Burns	Superficial	Deep Common	Rare, Superficial "Flashover"
Rhabdomyolysis	Common	Very Common	Common
Blunt trauma	Rare, Fall	Fall (Tetany)	Blast Injury
Mortality	Low	Moderate	High

TABLE 90.8**LIGHTNING VERSUS HIGH-VOLTAGE ELECTRICAL INJURY**

Factor	Lightning	High voltage
Duration	Brief	Prolonged
Energy level	100,000,000 V 200,000 A	Much lower
Type of current	Direct	Usually alternating
Shock wave	Present	Absent
Cardiac arrhythmia	Asystole	Ventricular fibrillation
Burns	Superficial, minor	Deep, frequently obscured
Renal failures	Rare	Common secondary to myoglobinuria
Fasciotomy and amputation	Rare	Common, early, extensive

Chapter 6: Environmental

Barotrauma

- **HAI (High-Altitude illness)**
 - DDx: HAI, HAPE, HACE, AMS
≥ 2000m + Unacclimated person
 - Risk: Infant, SCA, Asthma, genetic, prev. Hx of HAI
 - Sx: AMS: Dizzy, Headache, Fatigue, Vomit
 - HACE: AMS Progress over 3 days > Altered LoC, CT/MRI Cerebral edema
 - HAPE: Non-productive cough > pink/frothy w/ XR patchy alveolar infiltrates
 - Tx: O₂, Immediate descent
 - Dexamethasone (first-line for HACE or Mod-Sev AMS)
 - Acetazolamide (to prevent AMS/HACE/HAPE)
 - Nifedipine (to prevent HAPE in high-risk individuals)
 - Prognosis: w/ Tx Most will recover without sequelae
- **AMS (Acute Mountain Sickness)**
 - Sx: CNS Sx
 - Tx: Next step = Analgesia/Anti-emetic (not preferred morphine)
 - Prophylaxis = Acetazolamide
 - Best Tx = Descent
- **HACE (Cerebral edema)**
 - Sx: cerebral ataxia, Decreased LoC in 0-3 days)
 - Tx: Next step = Hyperbaric O₂/Meds
 - Prophylaxis = Acetazolamide
 - Best Tx = Descent, Dexta (if Cerebral edema)
- **HAPE (Pulmonary edema)**
 - Sx: Cough, XR Patchy alveolar
 - Tx: Next step = O₂/Nifedipine
 - Prophylaxis = Nifedipine, Acetazolamide
 - Hyperbaric (IF > 3000 meters)
 - Immediate descent (IF > 4000 meters)

PEM R | 18 Y/O girl in US climbing Mt. Kilimanjaro at 2400m has dizziness/headache, told to rest after waking up from sleepless night insist to continue but became disoriented & hard time walking, Best Tx = Immediate descent (+ O₂)

PEM R | 17 Y/O camp at elevation 2900 meter, child having occasional blood tinged sputum, cough, has NO Mental state change, but has Headache/Lightheadedness, HR 90 RR 28 BP 110/60, lung clear, medical team camped w/ them asking what to do next = Rest, breath O₂ via Facemask, Reassess in 2hr (HAPE)

- **Dysbarism (Decompression Sickness)**
 - Info: Injuries related to SCUBA, Diving causing injuries
 - Path: Boyle's law: Small space w/ High gas volume = High pressure | Big space w/ Low gas volume = Low pressure
 - Types: Barotrauma, Decompression sickness, Other (Nitrogen Necrosis, Immersion pulmonary edema)
 - Invx: HIGH: Hgb/Albumin (Endothelial leak), CPK (w/ AGE or MSK damage), Inflammatory markers (Meningitis)
 - LOW: ALT/AST/LDH (w/ severe AGE), Troponin (Gas embolism or myocardial infarction)
 - Imaging: Chest CT, Head CT, Brain/Spine MRI, ECG (ST up/low w/ AGE, Arrhythmia)
 - Tx: Prehospital Tx: O₂, Horizontal position, Warming without hyperthermia, Oral/IV fluids, Rapid transfer

PEM R | 16 Y/O after open water scuba dive, during dive Panicked and ascended immediately from 30meter, Now 10/10 Knee pain/Elbow pain/Frontal Headache, also 5/10 chest pain w/ difficult breath that then relieved, Non-rebreather mask, Temp 37.2

Chapter 6: Environmental

HR 84 RR 14 BP 86/70 SpO2 99% on O2, Bedside US shows Pneumocephalus, after analgesia, broad spectrum Abx, Next step = Hyperbaric O2 therapy

PREP EM | 16 Y/O Asthmatic went scuba diving on Vacation then same day on flight back he developed Chest pain, Cough, SOB, NO Fever, has RD, decrease breath sound on Lt. side but no wheeze, T 37 HR 115 RR 24 O2 97%, Explanation = Pneumothorax

- Ascend = Ear/Sinus Barotrauma (Barotitis)
- Descend = Pneumocephalus, Inner/External Ear
- Decompression sickness
 - o Type 1 (Extravascular): Skin, MSK, LN (cutis Marmorata)
 - o Type 2 (Intravascular): CNS, Inner ear, Lungs

- Middle ear (Barotitis)

PEM R | 16 Y/O Acute hearing loss tinnitus & vertigo after scuba diving, No head trauma, Alert/Awake, small perforation of Rt. tympanic membrane w/ small amount of blood in ear canal, Fluid in Lt tympanic membrane, Pupil reactive, has nystagmus, Tx = Start systemic Abx

Amal | The most common medical complaint of scuba divers = Middle ear squeeze (Not The bends -Decompression sickness-)

Final | Sopite syndrome = Motion sickness

- Sinus Barotrauma
 - o Maxilla most common affected
 - o Sx: Headache/Epistaxis, Sinus rupture,
 - o Complication: Pneumocephalus (Sinus rupture, Admission + IV Abx to prevent meningitis)
 - o Tx: O2, no need for drainage
 - Abx (If purulent discharge)

PEM R | 15 Y/O Headache responding to ibuprofen, headache location Frontal severe Ax w/ Nausea/Vomiting/Vertigo, normal neuro exam, Pt given migraine cocktail of ketorolac & 1 L NS, Diphenhydramine, Prochlorperazine, you overhear saying to brother about scuba diving yesterday, no improvement w/ your management & unable to tolerate PO, Next = Obtain CT Sinus/Brain study

PEM R | 15 Y/O boy, scuba diving trip and next day flying home, comes 1 day after flight w/ severe Lt ear pain & purulent nasal drainage, (image: bulging tympanic membrane), Tx = Pain control, D/C & Augmentin

- Pneumoparotid (Traumatic Stensen duct insufflation)
 - o Path: Increased oral pressure > retrograde air entry into salivary ducts > gland distension
 - o Risk factors: Balloon blowing, wind instruments, glass blowing, coughing, Valsalva
 - o Sx: Unilateral facial swelling post prolonged forceful blowing, crepitus
 - o Invx: CT or US (may show air in parotid gland)
 - o Tx: Reassurance (Self-limited), Analgesia (for pain), Avoid precipitating activities

Final25 | Patient previously healthy with unilateral facial swelling after blowing balloons for 24 hr vigorously most likely Dx = Traumatic Stensen duct insufflation (Not Viral nor Mumps nor Tumor)

Chapter 6: Environmental

Bites & Stings

On Land

Mammalian

- Bites

o Bite Organisms:

- Human + Bite (MCP) = Eikenella Corrodens > Augmentin
- Dogs (15%) Cat (50%) + Bite/Scratch = Pasteurella Multocida > Augmentin or Clinda + Bactrim
- Cat Scratch + Large LN or HSM = Bartonella Henselae > Azithromycin

o Tx: Local Wound care (Suturing) > Treat established infections > Prophylaxis (Abx, Tetanus/Rabies) > Reporting

	Examples	Suture	Antibiotics
Low Risk Mammals	Dogs, wolves, coyotes	Suture all wounds Except Hand & Feet	Not indicated Except if high Risk of Infection
High Risk Mammals	Humans, cats, monkeys, horses, camels, pigs	No Suturing Except Face	Indicated for all wounds that breach the Epidermis

- o Low Risk Mammals = Don't Suture: Hand/Fat | Suture: All | Abx for High Risk of Infection
- o High Risk Mammals = Don't Suture: All | Suture: Face | Abx All through Dermis
- o High Risk of Infection:
 - Bites Hand/Feet
 - Wounds Joints/Tendons/Ligaments/Fractures
 - Crush (requiring extensive debridement)
 - Puncture
 - > 6-12hr Closed Primarily
 - Immunodeficient
- o Abx Choice:
 - Human bites = Augmentin
 - All Animal bites = Augmentin
 - All Animal bites Allergic = Bactrim + Clindamycin
 - Camel = Ciprofloxacin
 - Rabbit = Ciprofloxacin (Bacteria: Francisella Tularensis)
 - Rodent = Nothing
 - Rat Fever = Penicillin
 - Cat scratch = Nothing
 - Cat Scratch disease = Azithromycin for 5 days or leave them for 14 days
- o Tetanus, Rabies

- Human Bite

PEM R | 17 Y/O male juvenile detention w/ swell/pain & Maximal tenderness over 5th MCP, having fever for 2 days and Temp 39.3 HR 132 RR 20 BP 85/42, having overlying erythema/swell on dorsal surface XR (unclear boxer fracture) likely organism in C/S = Eikenella corrodens

PEM R | 13 Y/O immunized, has Rt. Hand pain after striking another student in mouth w/ his fist, Has swell/bruise, 1cm laceration of 3-4 MCP joints, non-displaced metacarpal neck Fr on XR, irrigation/immobilization done, Tx = Augmentin 3-5 Days

Promo | Human bite, Appropriate Abx = Augmentin

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Promo | 11 Y/O involved in fight 5 days ago, multiple face/upper extremity lacerations, now Hx of swell/pain Rt. Hand, Ex tender/swell/redd w/ small laceration over Rt. 4th Metacarpal area, Organism = Eikenella Corrodens

Other | 16 Y/O, Puncture wound over fourth metacarpophalangeal joint of Rt. Hand after fist fight 1 hr earlier, Tx = Amoxicillin/clavulanic acid is effective for suspected Eikenella Corrodens contamination (Human Bite)

Amal | 6 Y/O came to ER with history of human bite 24 hours ago, what's the best Tx = Oral Augmentin for 7 days (Not Reassure, with follow up within 2-3 days nor Take swab from the wound and send for culture nor Oral cefalexin 7 days)

- Human bite Organism Eikenella corrodens and Staphylococcus, Streptococcus, and Corynebacterium species

- Animal Bite

PREP | 16 Y/O, came to ED w/ Swollen painful Lt ear 12hr after bitten during fight by classmate, Temp 38.4 Erythema + Puncture mark on Lt. Ear pinna w/ tenderness, Best Abx = Augmentin

PREP | 7 Y/O, Bitten by stray dog yesterday then washed hand w/ soap, Now Red/Swollen/Painful ROM, No Fever, dog captured and normal acting, child fully immunized and has penicillin allergy, Best therapy = Clinda + Bactrim

PREP | 10 Y/O, stung by flying insect 36hr ago, shortly after had local itching/red raised bump at site of sting, Diphenhydramine Q6-8hr w/ cold packs, but swell continued to increased, no rash/difficult to breath/dizziness/fever, Ex red/raised/warm/mild tender 12cm area in Rt. Lower leg, Most appropriate Tx = Continue PO Diphenhydramine + Application of cold packs NOT Prescribe Clindamycin for developing Cellulitis

- Most likely still a reaction till 48hr then might be cellulitis
- For insect bite Tx = Diphenhydramine for itching, Ice packs, Topical Steroids

PEM R | 3 Y/O unvaccinated, bitten by bat, Tx = RIG, TIG, Rabies vaccine & Tetanus vaccine

PEM R | Toddler playing w/ family cat pulling nail, having 2 puncture lesions & abrasions, incident hours ago, No Tenderness/Full ROM, Abx = Augmentin

PEM R | 2 Y/O bitten by cat both vaccinated, child allergic to Amox, after irrigation, what Abx for 3-5 days = Bactrim + Clinda

- Mammalian bites Abx = Augmentin if allergic Bactrim (Pasteurella M.) + Clinda (Anaerobic cover)

PEM R | 15 M/O bitten on face by uncle docile pit bull as it wanted to take a sandwich, girl immunized, dog unknown, has 5cm jagged laceration along cheek, covered by gauze not washed, Tx = Prescribing prophylactic Abx for 5 days

PEM R | 11 Y/O unimmunized, raccoon bite him w/ 2cm jagged laceration, family concerned of infection & now is amenable to immunization, Tx = Tetanus IG, Tetanus Vaccine, Rabies IG, Rabies Vaccine

Promo | 4 Y/O Hand Erythema, Induration, tense, pain after bitten by cat, has Amoxicillin allergy Most important Abx to include is = Clindamycin (Not Bactrim nor Cefazolin) (Answer should be Bactrim & Clindamycin)

Promo | 3 Y/O Bitten on Rt. Hand by family's pet cat, redness/swelling/tenderness of dorsal Rt. Hand, has allergy to penicillin, Abx to give = Trimethoprim-Sulfamethoxazole & Clindamycin (Not Azithromycin nor Augmentin nor Cephalexin nor Ciprofloxacin)

Promo | 3 Y/O boy complain of swollen finger, he was playing w/ family cat yesterday, within 24hr mother noticed swelling/redness of finger, Temp 38.3, Local Ex shows (?), after good cleaning of wound, action = PO Augmentin for 5-7 days

Amal | Patient complaining of hand pain and ascending redness 12 hours after her cat bit her Most likely causative organism is = Pusturella multicauda

- Organism Time of Presentation post Cat Bite
 - < 2 days post bite = Pasturella multicauda (aggressive/fast)
 - > 2-3 days post bite = Usual organisms

Amal | 3 Y/O boy was playing with his indoor cat presented to ED with the finding showing in the picture, irrigation done in ED, what is the plan = Discharge home with oral Augmentin (Not rabies post exposure prophylaxis nor IV Abs & Admission)

- Indoor cat = Assume Vaccinated, only needs Abx prophylaxis

Final | Cat bite with allergy to penicillin alternative = Clindamycin (Best answer Clinda + Bactrim)

Chapter 6: Environmental

- Wound management

Promo | Primary suture closure indicated for = Dog bite in face (Not Deep sole foot laceration nor Human bite at hand)

Amal | Primary closure = Facial clean deep wound (Not Cat wound nor Puncture wound nor infected wound)

Amal | Out of animal bites which you might approximate wound = Dog bites (Not Human nor Cats)

TABLE 52.2 Risk Factors for Bite Wound Infections			TABLE 52.1 Recommendations for Bite Wound Closure and Prophylactic Antibiotics		
Factor	High Risk	Low Risk	Species	Suturing	Prophylactic Antibiotics
Species	Cat (domestic and wild) Human Monkey Pig Camel Bear	Dog (excluding hands and feet) Rodent	Dogs, coyotes, wolves	The majority except hands and feet	Hand and foot wounds High-risk wounds ^a
Location of wound	Hand (especially clenched-fist injuries [CFIs]) Foot	Face Scalp	Cat	Face only	All wounds extending through the epidermis
Wound type	Puncture Crush injury or damage to deep structures Presence of devitalized tissue Delayed presentation (more than 6 hours) Closed primarily	Laceration Superficial	Human	Face only (up to 24 h after the bite)	All wounds extending through the epidermis
Patient characteristics	Age over 50 Diabetes Renal failure Liver disease Alcoholism Immune disorder Malnutrition Use of corticosteroids or other immunosuppressive medications Peripheral vascular disease Chronic edema of the bitten area		Monkey	Face only (up to 24 h after the bite)	All wounds extending through the epidermis
			Rodent	All (but rarely needed)	No
			Ferret, pig, horse, camel, bear, big cats	Face only	All wounds extending through the epidermis

WOUNDS AT HIGH RISK OF INFECTION

Bites to the hand, wrist, feet (increased risk of involvement of underlying structures)

Wounds involving fractures, joints, tendons, or ligaments,

Crush injuries requiring extensive debridement

Puncture wounds

Cat bites

Old wounds (> 12 hours)

Wounds in patients with impaired host defenses (steroids, diabetes, HIV).

TABLE 133-1 High-Risk Bites Requiring Prophylactic Antibiotics

Type	Location	Underlying Risk Factors
• All cat bites	• Hands, wrist	• Asplenia
• Human bites through the dermis	• Below the knee	• Diabetes
• Deep dog puncture wounds	• Tendon	• Age <2 years
• Crush injuries	• Bone	• Other immunocompromised conditions
• Extensive wounds with devitalized tissue	• Over a joint	
• Delay in presentation >12 hours		

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- Cat Scratch Disease

- Organism: Bartonella Henselae
- Sx: Fever, Enlarged LN (3-6 weeks) | Systematic: Hepatosplenomegaly, Retinitis
- Labs: U/S Hypo-Echoic Lesions in Spleen & Liver
- Complications: Parinaud's oculoglandular syndrome:
 - Ipsilateral conjunctivitis w/ overflow tears + ipsilateral Cervical LN
- Tx: Uncomplicated resolves 2-4 Months or Azithromycin 5-7 Days 10mg/kg (Help reduce LN faster)

Pedz | 5 Y/O LN on Rt. Axilla for 3 days, has scratches on child arm, adopted new kitten = Bartonella henselae

PEM R | 15 Y/O male Hx of Fever 3 days, scratched by kitten 2 weeks prior onset of fever, 4 days ago had pustule at site which drained, appears tired/non toxic/mild redness w/ resolving non tender eschar on Lt cheek near eye site where pustule drained, has single large cervical LN on Lt neck, complication = Parinaud's Oculoglandular syndrome

Amal | 6 Y/O immigrant from Afghanistan, complains of severe sore throat, foul breath, neck swollen, hoarseness of the voice, fever, anterior cervical adenopathy w/ adherent pharyngeal grey membrane WBC 12,000 w/ left shift, CXR cardiomegaly, prev. Healthy accurate statement = Domestic pets as cats may act as a reservoir for human infection

- Tularemia (Qs: Hunting & Handled rabbits) 🐰

- Organism Francisella Tularensis (Gram Negative Small Pleomorphic Bacilli)
- Host: Many animals like rabbits (found in Arkansas, Missouri, Oklahoma)
- Transmission: Ticks + Blood sucking flies or By Inhalation
- Sx: Fever (Sudden onset), Chills, Myalgia, Arthralgia, Ulcero-Glandular
- Invx: Dx clinical, Serology test (confirmatory)
- Tx: Gentamicin or Ciprofloxacin for 10 days
 - Alternative is Doxycycline (can have relapse so give Tetracycline for 14 days)

PEM R | 18 Y/O 1 Day HX of Fever/Chills/Headache, 4 days ago have been rabbit hunting and saw 2cm ulceration on Rt. Upper forearm w/ erythema, & multiple tender axillary LN, after Serology test, what PO Abx to give = Ciprofloxacin

- Rodent bite infection 🐭

- Organism: Streptobacillus Moniliformis (in US) or Spirillum minus (in Asia)
- Sx: Fever/Chills/Headache/Malaise, Maculopapular rash 2-4 days after Fever
- Complication: Septic Polyarthrits
- Tx: Penicillin or Tetracycline
- Rodent bites (Fleisher)
 - Complication: Ratbite fever (Fever, Headache, Maculopapular/Petechial rash)
 - Tx: No need for rabies/tetanus/update & Abx
 - Ratbite fever = Penicillin IV

PEM R | 16 Y/O fever/rash/joint pain, no travel or camping but work in lab w/ small rodent, having now Temp 38.9 Maculopapular rash on Arms/Legs, Red/Swell Knee bilateral, Abx = Penicillin

Final x2 | Mice bite = Clean Augmentin (unsure i think clean bite but not Clean-rabis-cefazolin or Clean Augmentin)

Final25 | Bite by rodent mice with erythema and leg swelling and multiple abrasions they were camping in desert, Tx = Wound cleaning, dressing and oral Augmentin (Not Wound clean, dressing and discharge nor Anti rabies and iv abx)

- Leptospirosis

PEM R | 16 Y/O in dairy farm over summer, 11 days ago Fever/Conjunctivitis/Myalgia/Vomit, PCP diagnosed w/ Viral illness and supportive care, Sx lasted 6 days before complete resolve, 3 days after having Headache/neck stiff worsened past 2 days, No has yellow skin/eyes, lethargic & ill appearing, Tx = No Abx indicated

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Snakes

Venomous Snakes in Saudi Arabia

Description	Toxicity	English Name	Arabic Name
Head as tail, Ready to attack	Atractaspididae = Cardiotoxic	Atractaspis engaddensis	الأسود الخبيث
Typical Cobra, circles himself	Elapidae = Neurotoxic	Walterinnesia aegyptia	الصل الأسود أو كوبرا الصحراء
Cobra Head shape	Elapidae = Neurotoxic	Arabian cobra (Naja arabica)	الكوبرا العربية
Rattling tail	Crotalidae = Hematotoxic	Rattlesnake	المجلجلة أو الجرس
Crawls sideways	Crotalidae = Hematotoxic	Cerastes gasperettii	أم جنيب
Puffs air	Crotalidae = Hematotoxic	Bitis arietans	النفاثة أو النافخة

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- Snake bite

- Crotalidae: Cotton mouth, Copper, Vipers, Rattle (Triangle head, Elliptical pupil)
 - 98% Envenomation
 - Sx: **Coagulopathy** (Low PLT Rhabdomyolysis), Severe Local tissue necrosis, Metallic taste, Hypotension
 - Tx: Anti-venom if Envenomation effects
- Elapidae = Cobra, Black mamba, Sea snakes, Coral (Red on Yellow, Kills a Fellow, Red on Black venom Lack)
 - Sx: **Neurotoxic** progress to Paralysis, Lack fang marks
 - Tx: Anti-venom if Neuro Sx
- Dry bites = No venom release = no Sx or Sequelae

- Snakes Management approach:

- Crotalid snake + Sx (Severe Local/Systemic Metallic taste, Hematopoietic) = Supportive +/- CroFAB Antivenin
- Crotalid snake + No Sx = Dry bite = Observe 8hr
- Crotalid snake + Minor Sx = Observe 12-24hr
- Elapidae snake + Sx (Neuro) = Supportive +/- Micrurus Fulvius Antivenin
- Elapidae snake + No or Minor Sx = 24hr Observe = Wait for Neuro Sx

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PEM R | 10 Y/O boy on a hike bitten by rattlesnake on leg, EMS on command, giving advice on how to care, their estimated time 30min = Immobilize leg & keep it dependent

- Immobilizing leg = Prevent Venom spread by lymphatic drainage

PEM R | 7 Y/O bit by (rattle snake) has mild pain on Rt. Foot, vitally stable, no swell no edema, Next = Observe in ED

- Crotalid dry bite, Tx Observe for 8hr

PEM R | 3 Y/O girl on hike bitten by snake (Rattlesnake = Abu Jaras), having bite marks & local swelling on hand Vitally stable, complains of something yucky in the mouth, likely manifestation = Oozing & Bleeding from wounds

PEM R | 12 Y/O Boy transferred after Copperhead snake bit his lower extremity, presuming normal vital signs CBC/PT/APTT on ex (PIC OF wound with 2 puncture wound, Next step = Observe 12hr post-bite & D/C if no changes

- Crotalid dry bite, Tx Observe for 8hr

PEM R | 15 Y/O camping, 2hr closest city, bitten by snake & within minutes of injury having 2 puncture wound & swell/erythema, best 1st step = Transfer to closest hospital

PEM R | 10 Y/O Male, bite by snake in woods (image of snake red touches yellow), came vitally stable & asymptomatic, local mild pain, Next = Admit for observation

- Red touch Yellow = Kills a fellow
- Red touch black = Venom lack

PEM R | 15 Y/O bitten by snake (image of red touches yellow snake), 15 min after arrived in ED having no Sx, which more severe Sx to monitor = Altered mental status & Cranial Nerve palsy

PEM R | 7 Y/O Hx of ADHD bitten by snake, snake has concentric rings w/ red/black/yellow/black repeating pattern, minimal erythema on bite site, otherwise asymptomatic, 4hr elapsed since bite, Next = Discharge home

Promo | Pic of Snake, pt. Will have = Neurologic Manifestations

Promo | Pic of Snake, what will happen (Cobra like?) = Acute bilateral ptosis and ophthalmoplegia

Amal | Most likely will happen after snake bite of this kind (Cobra pic) = Acute bilateral ptosis and ophthalmoplegia

- Riyadh has commonly Crotalid = Hematopoietic

Amal | 3 Y/O child bitten by snake, it was killed and brought, it was identified to be venomous, no local pain or systemic symptoms, has fang marks, you are expected to do which of the following = Observe 24 hours then discharge if no symptoms (Not Observe 4-6 hours then discharge if no symptoms. Nor Give tetanus vaccine. Nor Give anti-venom)

Amal | Most clinical feature of Cobra snake (Naja Haje) = Neuromuscular paralysis (Not Coagulopathy nor Renal failure)

Final | ADHD child came w/ snake (Non-venomous description) = Discharge (unsure I think answer is observation)

Final | Snake bite causing neurotoxicity and Q about what is the type = Coral Snake

Final | Snake with oval head, round pupil 2 tail (non-venomous description) with minimal skin reaction only, the bite was 4 hours ago what is next = Observe 24hr (Not Observe 12hr or Discharge)

- Fleisher: If Coral snake Observe 24hr | If Crotalidae + No Sx = Observe 12-24hr

Final | Patient present after a bite of snake below, you suspect this patient will have (Pic of Cobra) = Neurologic manifestations

- Crotalide = Bleeding with coagulation disturbance
- Elpidea = Neurologic manifestations

Final | Snake tail + Head no = Cardiotoxic (Black snake)

Final | Black snake pic can't recognize the face from the tail what will cause as toxic = Cardio toxic (Atractaspis engaddensis)

Chapter 6: Environmental

- Antivenom
 - o 5 vials over 1hr, Follow improvement 1 hour after given
 - Progressive = 2nd dose can be given after 1hr from 1st dose
 - Non-Progressive = Give 2 vials x3 doses Q6hr
 - o If had Anaphylaxis = Treat as anaphylaxis
 - o If Known allergic + Dilute the antivenom + Epinephrine
 - o Use Standard dose always (No change in dose as you are treating venom & not the patient size)
- Indications of Anti-Venom:
 - o CNS Manifestations
 - o Hematology Manifestations (Coagulopathy, DIC)
 - o CVS Manifestations (Arrhythmia -Sometimes bcz of Hyperkalemia-, Arrest)
 - o Lung (Pulmonary Edema), Renal (Hyperkalemia, AKI)
 - o Vital signs disturbance
 - o Bite on Face or Hand (Compartment 5Ps: Pain, Pallor, Paralysis, Paresthesia, Pulseless)
 - o Sudden or Progressive swelling

PEM R | 11 Y/O weighing 33kg, bit by rattlesnake having oozing from wound/progressive pain & swelling, WBC 19 HGB 11 PLT 95 PT 18 PTT 45, when considering use of medication, which should be followed = Recheck labs 1 hour after administration

Final | Snake bite, severe lower leg pain, and swelling to thigh = Antivenom (Not fasciotomy)

- o Antivenom (1st) > Fasciotomy

Final | Snake bite, swelling increasing in severity given Antivenom then 1 hr later having increased swelling size, Tx = Antivenom

- o 2nd dose can be given after 1hr from 1st dose

Final25 | Snake bite, high INR " labs shows abnormal coagulation profile" with swelling limp, Next = 4-6 vials antivenom , and monitor, repeat if lab abnormal (Not 3 vial antivenom and observe coagulation. nor Observations. nor Antivenom and may repeated after 6 hours if not improve)

SUMMARY: CLINICAL DIFFERENTIATION: SNAKE, SPIDER, SCORPION

	INTENSE LOCAL REACTION	NEUROLOGIC SYMPTOMS	CHOLINERGIC SYMPTOMS	OTHER
Spider	Brown Recluse	Black Widow	Black Widow	Black Widow Severe abdominal pain (cramping)
Snake	Crotalid	Elapidae		Crotalids with hematotoxicity
Scorpion		Bark Scorpion	Bark Scorpion	Roving eyes Site of bite pain Paresthesias

Chapter 6: Environmental

Insects

Spiders

Black Widow vs Brown Recluse Spider			Management. A child who has severe pain and muscle rigidity after a spider bite should be considered a Latrodectus bite victim. A clinical grading scale has been developed by Clark (Table 90.20). Local treatment of the site of the bite with the use of a tourniquet or with incision and suction of the venom has not proven beneficial. Treatment with Latrodectus antivenin (Lyovac, Merck, Sharp & Dohme) should be
	Black widow	Brown recluse	
Identifying feature	Yellow or red hourglass on belly	Brown fiddle on cephalothorax	
Venom	Neurotoxin	Cytotoxin	instituted as soon as a bite is confirmed in children who weigh less than 40 kg; the usual dose is 2.5 mL (one vial). Antivenin should be administered by following the package insert and after skin testing to determine the risk of hypersensitivity to horse serum. For children who weigh more than 40 kg, it is not as urgent to institute antivenin treatment, but indications for its use include patients who are younger than 16 years, who have respiratory difficulty, or who have significant hypertension. Antivenin is usually effective within 30 minutes and may be repeated once within 2 hours if symptoms return. Serum sickness is a possible side effect. Because the dosage is low, however, serum sickness is uncommon, with a rate lower than reported for other types of antivenin. A black widow spider bite in pregnancy is an indication for antivenin due to the risk of venom-induced abortion, although the antivenin is a category C drug. Other supportive measures include prolonged warm baths and intravenous injection of 10% calcium gluconate as needed for muscle pain. If there is extreme restlessness, barbiturates or benzodiazepines may be used, but with caution as the venom is a neurotoxin and can cause respiratory paralysis. Muscle relaxants such as diazepam have also been advocated, but they are variably effective and the effects are short lived. Analgesia may be achieved with opiates.
Clinical effects	Severe muscle cramping and CNS excitation	Local tissue destruction	
Treatment	Mainly supportive (opioids and benzodiazepines)	Mainly supportive (local wound care)	
Antivenom	Yes, but reserved for severe symptoms	No	

- Black Widow (Latrodectus) = **Neurotoxic/Cholinergic Toxidrome + Abdomen Pain**
 - o Sudden Onset Hours
 - o Sx: Site bite pain then Abdomen/back (bite is circular w. Central pallor)
 - Latrodectus face (Swelling of face)
 - HTN, Tachycardia, Diaphoresis
 - o Tx: Benzo (Sedative) & Opioid (Pain control), Antivenom
 - o Black Widow Anti-venom indication:
 - HD Unstable
 - Swelling beyond joint
 - Coagulopathy
 - o Fleisher Black Widow Anti-venom indications:
 - < 16 years
 - Respiratory difficulty
 - Significant hypertension
 - o Antivenom side effect: Serum sickness

PEM R | 5 Y/O normal prior to going to sleep when suddenly left upper extremity pain progressed to abdomen, No fever, Temp 37.8 HR 140 RR 20 BP 150/90 SpO2 99%, Diaphoretic, writhing around, severe abdomen/back pain, has face swelling/edema, but NO extremity edema, no wheeze or rash, Next Tx = Administer Benzo & Opioid

- o Sx: Severe sudden muscle cramp > Abdomen pain, Hypertension, Diaphoresis, Face edema

PEM R | 5 Y/O given antivenin 3 days ago after being bitten by black widow, now coming back w/ rash & Arthralgia, Potential complication of course = Serum Sickness from Antivenin (whole horse IgG Antivenin, SS within 5-7 days)

PEM R | 10 Y/O boy, playing in garage when felt pain in arm (pic of black widow), within an hour, red erythema ring appears site of pain, 1st line Tx for this envenomation Sx = Benzo + Pain control

Other | 14 Y/O w/ Muscle cramps & headache after black widow spider bite, vitally stable, Tx indicated = Benzo + Supportive care (Not Black widow Antivenom nor Abx)

- Brown Recluse (Loxosceles)
 - o Onset Days, Cytotoxic, Rare Systemic
 - o Sx: Cutaneous Sx | Systemic (Rare): Flu-like, Hemolysis, DIC
 - o Tx: Supportive

PEM R | 8 Y/O boy, hide & seek in dark closet, felt pinch on leg, later at night had blister w/ redness & swelling appeared, over few days blister progressed to hemorrhagic vesicle, central necrosis & ulceration developed, Next = Observe w/ Plastic F/U

PEM R | 12 M/O in ED w/ Flu-like Sx w/ Fever/Chills/N/V/Weakness, Labs demonstrate Acute Hemolysis, DIC & Rhabdomyolysis, which envenomation led to these = Brown Recluse

Other | 11 Y/O in ED w/ lesion on her arm thinks she was bitten by "something" 5 days ago, feverish & has dark brown urine for 24hr, Temp 38 HR 100 RR 20 BP 116/70, diffuse erythematous rash & skin peeling (image of wound), correct statement = Supportive care including hydration & transfusion if required, remains the standard of care (Not administer dapsone nor Administer steroid nor Early excision of lesion nor dark brown urine due to exclusive intravascular process)

Chapter 6: Environmental

Final | Patient bitten 5 days ago by Latrodectus, Now Fever/Red urine for 1 days, Skin redness/peeling, Tx = IV Abx (Not Antivenom nor IV dapsone nor Steroids)

- Similar to Q above, the spider was Brown recluse (Loxosceles) mostly mistaking the name in this Q

Scorpion

- Scorpion

- Sx: Roving/Rotatory eye movement, Dilated pupils/Nystagmus, Tongue Fasciculation
 - Restless, Arms/Legs jerking multiple directs
- Complication: Pulmonary Edema, Bradycardia
- Tx 1 & 2 = Supportive/Analgesia/Anxiolytic
 - Grade I = Local pain/Paresthesia
 - Grade II = Local/Remote pain/Paresthesia
- Tx 3 & 4 = Admit, Anti-venom, Supportive/Analgesia/Anxiolytic
 - Grade III = Local/Remote pain + CN Sx or MSK Dysfunction
 - Grade IV = Local/Remote pain + CN Sx or MSK Dysfunction + Airway Involvement
- Roving eye movement is important in Q about scorpion

PEM R | 8 Y/O overnight camping in Arizona, has Rt. Foot pain having eyes roving, likely source = Centruroides scorpion sting

PEM R | 2 Y/O girl, Arizona ED w/ Abnormal behavior, was playing outside & began having upper limb pain & restlessness, having abnormal eye movement, abnormal muscle Fasciculations, increased oral secretion, abnormal eye movement, most likely = Bark scorpion (Centuroides sp.)

PEM R | 10 Y/O girl in Arizona, felt sharp pain in arm, Temp 38.3 HR 132 RR 22 BP 126/82, restless, arms/legs jerking multiple directs, Dilated pupils, Nystagmus, Rotatory eye movement, Mouth full copious secretions, culprit = Scorpion

PEM R | 5 Y/O stung by bark scorpion, coming w/ immediate pain in hand, now Altered LoC, Drooling, Roving eyes, Tongue fasciculation, Flailing extremities, best next = Give Midazolam (Not Early intubation nor Transfer to a hyperbaric oxygen center nor calcium gluconate IV nor Initiation of cardiac pacing)

Promo x2 | 7 Y/O Hx Erythematous Painful/Tender Swell after scorpion bite, agitated, diaphoretic, HR 140 BP 125/80 RR 30, True statement (pic) = IV Antivenom should be given for this pt. (Not Hypoglycemia/Hypokalemia is frequent finding nor morphine)

Amal | Choose the correct statement about spider and scorpion stings = Absence of local reaction signs at sting site is not uncommon in case of fatal scorpion stings (Not Although local symptoms more common, brown recluse bite can cause systemic manifestations including seizures and myocarditis. Nor If severe bite by brown recluse is suspected Antivenom should be given with 50% of the dose infiltrate in the local bite site. Nor IV magnesium chloride provides relieve of pain caused by black widow spider bite)

- Black widow: Cholinergic toxidrome, abdominal pain
- Brown recluse: wound local damage, rare systemic (DIC)

Amal | 2 Y/O sting by yellow scorpion he is apprehensive HR:150 RR:40 BP:120/80 Which of the following true statement = Polyvalent antivenom is indicated (Not Morphine to control the pain nor hypoglycemic & hypokalemia)

- Scorpion bite = Hypertensive + Apprehensive (CNS) = Anti-Venom
- AVOID Morphine in scorpion bites = causes histamine release > Enhancing effect of toxin release
- Use of Fentanyl is preferred narcotics or Lidocaine local w/ ICE

Final | 7 Y/O, erythematous painful swelling tender, after having scorpion bite, Agitated/diaphoretic, HR 140 BP 125/80 RR 30, the local site is erythematous, swollen & tender, true statement = IV antivenom should be given for this pt. (Not This scorpion is called Androctonus crassicauda nor Hypoglycemia & Hypokalemia is frequent findings nor IV morphine should be used)

- Scorpion bite + CNS or Hypertension or Tachycardia = unstable = Antivenom

Chapter 6: Environmental

Other insects

- Eye Insect bite

Promo | Insect bite over eyelid, complicated w/ Cellulitis, most common organism = Staph. Aureus

Amal | 6 Y/O boy with erythema, edema and pain in area around his eye Insect bite few days ago, vision and EOM intact, Most likely organism = Staphylococcus Aureus (Not E.Coli nor Bactroids nor Staphylococcus Epidermis -Normal flora unless neonate or immunocompromised-)

- Hymenoptera sting:

- Type: Bee, Hornet, Yellow Jacket, Wasp, Ant
- Tx: Local Sx = Cold compress | Bee stinger = remove fast using card
- Grade 1: Rash/urticaria, malaise = Antihistamine
- Grade 2: Angioedema + ≥ 2 (chest tight, N/V, dizzy) = IM Epi + Antihistamine + Steroid > Admit for obs 24hr
- Grade 3: Dyspnea/wheeze/stridor + ≥ 2 (dysphagia, hoarseness, weakness, confusion, doom) = same as Grade 2
- Grade 4: Shock/hypotension = Airway + Fluids + IM+IV Epi + IV Steroid > ICU

PEM R | 5 Y/O boy living in Texas was at picnic and had swarm of bees having multiple stings, Vitally stable, alert, awake, lungs clear to auscultation, having localized erythema/swell/tender to palpation, African bees (Apis negligees), likely to cause Sx compared to Hymenoptera species = Hemolysis, Rhabdomyolysis, Renal failure

- African bee more severe

PEM R | 14 Y/O girl having skin flushing/abdomen cramp/diarrhea/pruritus, having flushed face, Lungs clear, itching, Next step = PO Antihistamine

- Caterpillar & Tarantula

- Path: hair > irritation & Dermatitis
- Tx: Supportive

PEM R | 6 Y/O plays w/ caterpillar, developed Sx parent identified Metalopyge/puss caterpillar, Sx = Localized dermatitis & pain (Puss Caterpillar have hairs irritating > localized swell & pain)

PEM R | bitten by per tarantula expected clinical course = Mild local skin reaction

PEM R | 14 Y/O fully immunized, in urgent care w/ hand pain pit by pet Tarantula, having severe erythema & itching 4cm, after irrigating wound copiously, best Tx = Hydroxyzine 25 mg PO TID as needed (Antihistamine)

- Fire ant bites

- Sx: Pustules (Fire ant venom, appear within 24hr and persists for 1 week)
 - Large local reaction (Severe edema, increase in severity 24-48hr, 10cm or more for 5 days)
- Tx: Local skin care only

PEM R | 14 Y/O Male itching/irritation of hand for 1 day after bitten by ants, occurred while camping, initial pain then subsided, when awoke (having rash/bite marks all over), most appropriate = Local skin care only

Amal | 9 Y/O female, brought to the ED by her father, claimed to be bitten by fire ant, in distress, hyperventilate, urticaria, no air entry bilaterally no wheezing, next step = IM Epinephrine and prepare for intubation if not improved

Chapter 6: Environmental

- Mosquito/Ant bite

- Sx: Redness, Firm, Warm, No Tenderness (Cellulitis) No Fluctuance (Abscess)
- Tx: PO Antihistamine, Topical Steroid

PEM R | 3 Y/O girl, 1 day of swell/red arm & face, Hx of mosquito bite, having pruritus & worsening of arm/facial swell, w/ Redness/Warm/Firm but NO Tenderness/Fluctuance = Discharge w/ PO Antihistamine & Topical Steroid

PEM R | 4 Y/O boy w/ ear swelling developed after playing outside, Smiling Vitally stable, has Multiple mosquito bites yesterday, accurate description = Type 1 & Type 4 Hypersensitivity

Other

- Lizard

- Venomous = Supportive
- Strong bites = possible fracture = XR

PEM R | 3 Y/O boy brought animal that bit him & could not pry loose, EMS pour saline into animal nose/mouth then animal released bite, Child Temp 37.2 HR 100 RR 16 BP 82/68 SpO2 99%, not ill or distress, having wounds of hand that was bitten, Tx = Do XR of bite

Chapter 6: Environmental

In Water

- Ciguatera = CNS = Cold\Hot
 - o Fish: Grouper (Hamour), Snapper, Amberjack, Parrot fish, Barracuda
 - o Path: Large fish eats Small fish that ate coral reef (w/ toxins)
 - o Sx: GI: N/V, Abdomen pain
 - CNS: Cold/Hot Reversal, Loose teeth sensation, Ataxia
 - CVS: Bradycardia, Hypotension, Pulmonary edema
 - o Tx: Supportive, Mannitol (For CNS), Atropine (For Brady)

PEM R | 15 Y/O was fishing w/ grandfather in deep sea, at grouper fish, after 45min having N/V, feeling cold when things are hot, to give = Mannitol

PEM R | 18 Y/O "complains feels like my teeth falling out", earlier ate snapper from seafood restaurant, having N/V, Diarrhea, Weakness, Dizziness, Etiology = Illness is often due to eating larger fish high in food chain

PEM R | 12 Y/O ate fish 6hr ago, now system vomit/diarrhea/abdomen pain, pain in teeth & numbness/tingling of extremities, increasing pain w/ cold water, Tx Orion for preventing progression = IV Mannitol

- Scombroid
 - o Fish: Tuna, Mahi Mahi, Sardine
 - o Sx: Allergic reaction
 - o Tx: IVF, Antihistamine, No rule for Steroids

PEM R | 10 Y/O girl, having headache, N/V, Diarrhea, Urticaria, after eating seafood 1hr ago, likely = Tuna

PEM R | 8 Y/O girl ate Mahi Mahi for dinner, having facial flush & break out w/ hives N/V, she report having Mahi Mahi numerous times before but not any similar reaction, Tx = IV Diphenhydramine

- Jellyfish Stings and Marine Envenomation
 - o Nematocysts
 - Capsules with a coiled and usually barbed or poisonous thread that rapidly everts upon proper stimulation, Produced by Box jellyfish (*Chironex fleckeri*), Portuguese Man o' War (*Physalia physalis*), fire corals, sea anemones,
 - o Sx: Local pain (Most common), Respiratory paralysis
 - Cardiac toxicity > Cardiac arrest (Most fatal)
 - o Tx: Basic life support
 - Remove tentacle
 - Acetic acid immersion for Australian or Indo-Pacific species
(not recommended for Portuguese man o' war stings) or hot water immersion for Hawaiian species
 - Can rinse sting with seawater (do not use fresh water)
 - Box jellyfish sting: antivenin available in some locations

PEM R | 17 Y/O boy, swimming in ocean felt sudden sting across leg, has Rt. Lower leg has ladder type pattern lesion, immediate Tx by EMS = Rinse w/ sea water or normal saline

Final | Child was sting by box jellyfish while swimming in halfmoon beach, he have erythema and tenderness at the site of the sting, vitally stable. What could be a life-threatening condition because of this = Cardiac arrest/toxicity (Not Anaphylaxis nor Respiratory paralysis nor Coagulopathy)

Chapter 6: Environmental

- Portuguese Man-O-War

PEM R | 3 Y/O girl in remote ED being treated after marine envenomation, stung Portuguese Man-O-War and despite immersion in hot water, continued to have severe pain & decrease level of alertness, Tx to prevent sequelae of severe envenomation = IVF bolus followed by 1.5x Maintenance fluid

- Tetrodotoxin

- Fish: Puffer fish & Blue ringed octopus
- Sx: Small doses: Oral Tingling/Numbness/Paresthesia
 - Large doses: Paralysis
- Tx: Observe till muscular Sx resolves

PEM R | 18 Y/O at Fugu at sushi restaurant, having tingling mouth overall weakness, decrease patellar reflex & ptosis, animal toxin similar to fugu = Blue-ringed octopus

PEM R | Teenager prepared sushi from exotic fish (puffer fish), after eating it w/ its liver had perioral numbness, weakness, respiratory distress, which indicated for his weakness = Close monitoring until all muscular Sx resolve

- Conotoxin

- Fish: Cone snail
- Path: Inhibit acetylcholine Nicotinic receptors & Na channels
- Sx: Paralysis

PEM R | 15 Y/O girl swimming in ocean & stuck her hand into rock underwater and had painful sting, has erythema/swell/tender, HR 150, Normal BP, which envenomation should hot water NOT used = Cone Snail

- Use hot water: Lionfish, Stonefish, Stingray

- Coral

- Tx: Wound cleaning, Tetanus & Abx Prophylaxis, Imaging to check for FB, Surgical evaluation

PEM R | 6 Y/O stepped on coral, has multiple superficial lacerations & abrasions, step in management should not be performed = IV calcium (only for specific venomous cardiotoxic marine envenomation)

- Stingray

- Stingray might have sting as FB retained and might lead to infection

PEM R | 16 Y/O girl, tropical vacation, came w/ painful swollen foot after stepping on (image of stingray), vitally normal, has Erythema/swelling/warm of planter surface of Lt foot preventing her from weight bearing, Best course of action = Radiographic imaging & possible surgical evaluation

PEM R | 16 Y/O girl in local beach, sustained leg injury by stingray, immediate ankle pain, Next = Immerse ankle in heated water 45 C

- Lion Fish

PEM R | 12 Y/O girl cleaning fish tank, had sting from fish (image of lion fish), given Acetaminophen no improvement of severe pain, Rt. Hand erythema/extreme pain, 1st step = Hot water immersion & analgesia

PEM R | 10 Y/O boy Rt. 5th digit severe pain after being pricked w/ one of the fish spines (lion fish), pain 10/10, Tx = Soak finger in water heated 45C

Chapter 6: Environmental

- Sea urchin
 - o Invx: XR to check if embedded stinger
 - o Tx: Local cleaning, removal of sting > Immerse hot water

PEM R | 16 Y/O male having foot pain after stepping on (image of urchin), severe pain at time of injury but after 2hr now 3/10, clinical findings of erythema/swell around multiple puncture marks without foreign body visualized, most useful = XR of foot

PEM R | 8 Y/O stepped on sea urchin having difficult bearing foot w/ urchin spine on sole, erythema/swell, spine removed, wound care, tetanus toxoid, Abx given, further = No additional treatment

- Other Marine Questions

PEM R | 16 Y/O pain in shoulder after scraping against underwater coral/rocks, few days ago was having stinging/pain, 2cm long & 1.5cm deep laceration w/ wheal around, after copious irrigation & removing any FB, recommended management for laceration, prior to discharge home = Leave wound open & give Tetracycline

- o Marine exposure + Deep cut = Leave Open + Abx
 - < 8 Y/O Cephalexin or Bactrim
 - > 8 Y/O Doxy or Tetracycline

PEM R | 14 Y/O female walking in shallow part of ocean stepped on something and felt sharp pain in lower leg 10/10, has jagged laceration in calf & visible barbed stringer within wound, Most important Management = Heat water 45

- o Important management is inactivating venom by heat water then remove barb

PEM R | 14 Y/O girl cleaning aquarium & pricked her index finger w/ fish spines & screaming extreme pain, Tx = Hot water immersion

Chapter 6: Environmental

Warfare

Organ damage

- Radiation
 - o Radiation levels
 - Rad ≥ 100 = Hematopoietic Syndrome (Progression: Drop lymphocytes > Neutrophils > PLT > RBC)
 - Rad 300-2000 = Cutaneous Syndrome (300 = hair loss, ≥ 2000 = skin necrosis)
 - Rad 600-3000 = GI Syndrome
 - Rad ≥ 1000 = Neurovascular Syndrome
 - o Sx: N/V, Lethargy within min, Coma, Death within 24-48hr
 - o Acute radiation syndrome = Vomit/Diarrhea, Headache, Rash, Hema Sx also Low Lymphocytes
 - Lymphocyte level drop progression & follow up
 - Severe = 100-1000
 - Lethal = < 100
 - o Most Sensitive organ = Hematopoietic (Bone marrow)
 - o Most Resistant organ = CNS

PEM R | 10 Y/O transported from contact exposure while playing around commercial truck transporting radioactive material, HazMat team report radiation level of site around 800 rad, Syndrome to develop first = Hematopoietic (≥ 100 rad exposure = Hematopoietic syndrome = drop WBC)

PEM R | 5 Y/O Japanese girl exposed to nuclear power plant, 2 days as, Asymptomatic, vitally stable, WBC 8.2 Hgb 14, Lymphocytes 700, Next step = Admit & repeat CBC every 12-24hr

Promo x3 | Nuclear radiation most resistant tissue = CNS (Not GIT nor Bone -Most resistant to electricity- nor Cardiac)

Amal | Which of the following body organ system most **resistant** to ionized radiation exposure = CNS

Final | Nuclear radiation most **resistant** tissue = CNS

Final | Which of the organ more **sensitive** to radiation = Hematopoietic (Not Bone nor CNS)

Final25 | 12 Y/O, exposed to nuclear radiation Gy4 present Febrile, Pale with leukopenia WBC 1800, what to do next step = Abx (Not reassure with Hematology F/U nor Steroid nor Potassium iodide)

- Electrical
 - o Most Sensitive organ = CNS
 - o Most Resistant organ = Bone

Final | Electricity **resistant** = Bone

- Blast
 - o Sensitive body part = Ear > Eye

Promo | 7 Y/O girl brought after explosion near her home, which of following will be affected more by Blast wave = Ear

Amal | The most body part that most **sensitive** of blast wave = Ear (Not Eye nor Liver nor Lung)

Chapter 6: Environmental

Warfare Agents

- Specific Pediatric difference in Warfare

Promo | Why Environmental injury affect child more than adult = Thin skin (Not Low minute ventilation nor Small surface area)

Amal | Children are more vulnerable to weapons of mass destructions than adult due to = Thinner and under keratinized skin (Not Less RR and minute volume nor Smaller surface area -bigger body surface area compared to size-. Nor Large body fluid reserve -Small body fluid reserve-)

- o Child > Female > Male

Final | Children are more vulnerable to weapons of mass destructions than adult due to = Thinner & under keratinized skin (Not less RR and minute volume nor smaller surface area nor Large body fluid reserve)

- Phosgene = takes time then gives Sx Ocular/Nasal > Pulmonary edema
- VX/Sarin = High dose of Organophosphate
- Phosgene
 - o Colorless gas with cut grass, used in chemical warfare
 - o Sx: Ocular & nasal irritation, Bronchospasm, Pulmonary edema

Promo | School poison = Phosgene (COCl₂ colorless gas causes lung injury used as chemical weapon)

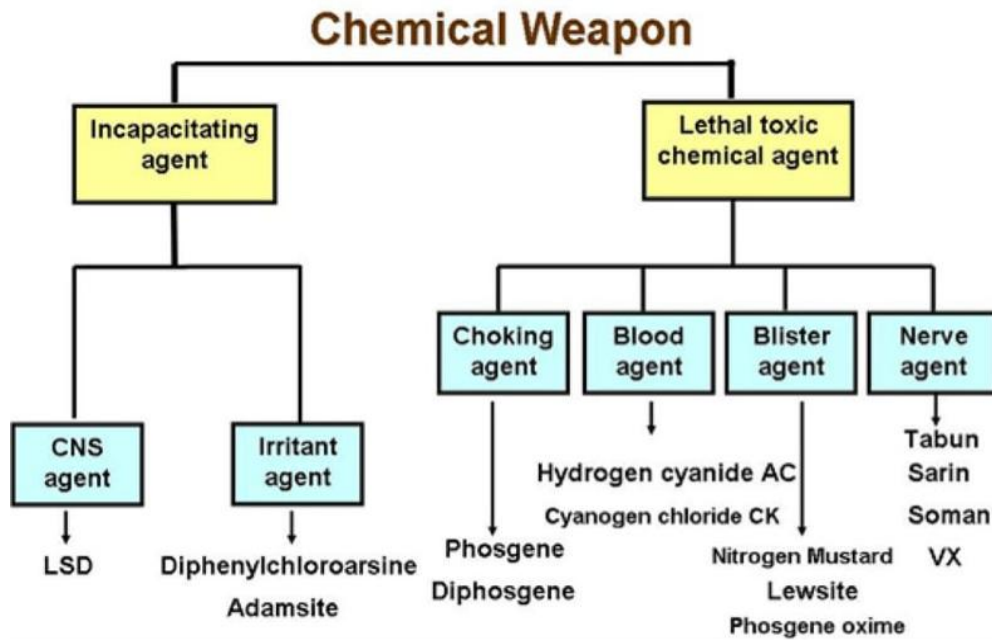
Amal | Terrorists released chemical in school, Students are now complaining of ocular and nasal irritation, followed by trouble breathing with chest tightness, CXR shows pulmonary edema. No other physical examination or abnormalities are noted. What is the most likely chemical used in this = Phosgene

Final | School poison = Phosgene (COCl₂ colorless gas causes lung injury used before as chemical weapon)

Final | Case about toxic inhalation: (Sx of ocular & nasal irritation, cough, chest tightness, pulmonary edema) = Phosgene

- Anthrax
 - o Inhalational Anthrax
 - Caused by Bacillus anthracis spore inhalation; NOT transmitted person-to-person.
 - o Sx: Abrupt fever, Chest pain, RD, Mediastinitis

Amal | 20 children, fever, cough, poor perfusion, chest tightness, headache, all patients attended a circus, most likely cause = Bacillus anthrax (Not Influenza nor Sarin nor Cyanide)



- **Nerve Agents**
 - Examples: Sarin (GB), VX, Tabun (GA), Soman (GD)
 - Mechanism: Inhibit acetylcholinesterase > continuous nerve stimulation
 - Sx: SLUDGE (salivation, lacrimation, urination, defecation, GI upset, emesis), seizures, respiratory failure
- **Blister Agents**
 - Examples: Mustard gas, Lewisite
 - Mechanism: Chemical burns on skin, eyes, respiratory tract
 - Sx: Redness, blistering, eye irritation, respiratory distress, pulmonary edema
- **Blood Agents**
 - Examples: Hydrogen cyanide, Cyanogen chloride
 - Mechanism: Inhibit cellular respiration by blocking cytochrome oxidase
 - Sx: Dizziness, confusion, seizures, cardiac arrest
- **Pulmonary Agents**
 - Examples: Chlorine gas, Phosgene
 - Mechanism: Damage respiratory mucosa > fluid accumulation in lungs (pulmonary edema)
 - Sx: Coughing, chest tightness, difficulty breathing, delayed respiratory distress
- **Incapacitating Agents**
 - Examples: Tear gas, pepper spray
 - Mechanism: Irritate mucous membranes and skin
 - Sx: Eye/respiratory irritation, skin burning
- **Industrial Chemicals**
 - Examples: Ammonia, methyl isocyanate, chlorine
 - Mechanism: Effects vary (choking, systemic toxicity) depending on chemical
 - Sx: Respiratory distress or systemic toxicity depending on exposure

TABLE 132.3A**CLINICAL FEATURES OF BIOLOGIC AGENTS OF TERRORISM**

Syndrome	Clinical presentation	Incubation period	Precautions and transmission	Diagnosis
Acute respiratory distress with fever	<i>Inhalational anthrax</i> —abrupt onset of fever, chest pain, respiratory distress; mediastinitis; progression to shock and death within 24–36 hrs	1–5 days (may be wks)	Person to person transmission: None Standard precautions	Chest x-ray: widened mediastinum, hemorrhagic pleural effusion Isolation of <i>Bacillus anthracis</i> from affected tissue (usually blood, nasal secretions, or pleural fluid)
	<i>Pneumonic plague</i> —apparent severe community-acquired pneumonia; hemoptysis, cyanosis, gastrointestinal symptoms, septic shock	2–3 days	Person to person transmission: YES Droplet precautions	Gram-negative bacilli/coccobacilli in sputum, blood, or lymph node; safety-pin appearance with Wright or Giemsa stain. Confirmation with isolation of <i>Yersinia pestis</i> from blood or sputum
	<i>Ricin (aerosolized)</i> —acute onset of fever, chest pain, and cough, progressing to respiratory distress and hypoxemia; not improved with antibiotics; death in 36–72 hrs	Symptomatic within hours	Person to person transmission: None Standard precautions	Isolation of toxin from respiratory secretions or serum
	<i>Tularemia (pneumonic)</i> —abrupt onset fever, fulminant pneumonia	2–10 days	Person to person transmission: None Standard precautions	Chest x-ray: infiltrate, hilar adenopathy, effusion Small, faintly staining, slow-growing, gram-negative coccobacillus in sputum or blood
Acute rash with fever	<i>Cutaneous anthrax</i> —papule progressing to vesicle, to ulcer, then to depressed black eschar, with marked edema. May not be associated with fever	1–10 days	Person to person transmission: YES Contact precautions	Isolation of <i>B. anthracis</i> from affected tissue
	<i>Plague (bubonic)</i> —tender, enlarged, fluctuant lymph node in the distribution of the infected flea bite; fever and malaise; progresses to DIC, sepsis	4–7 days	Person to person transmission: None Standard precautions	Confirmation with isolation of <i>Y. pestis</i> from blood or bubo aspirate
	<i>Smallpox</i> —macules and papular evolve to pustules and scabs; fever; headache; delirium; rash is synchronous and is more prominent on the extremities	7–17 days	Person to person transmission: YES Airborne precautions	Clinical diagnosis with laboratory confirmation
	<i>Viral hemorrhagic fever (e.g., Ebola)</i> —fever with mucous membrane bleeding, petechiae, thrombocytopenia, hypotension	7–42 days (virus specific)	Person to person transmission: YES Airborne precautions	Clinical diagnosis with laboratory confirmation
Neurologic syndromes	<i>Botulism</i> —acute bilateral descending flaccid paralysis beginning with cranial nerve palsies	1–3 days	Person to person transmission: None Standard precautions	Clinical diagnosis with confirmation after toxin isolation

TABLE 132.4

PRIMARY THREAT CHEMICAL AGENTS OF TERRORISM

Agent	Toxicity	Clinical findings	Onset	Decontamination ^a	Management
Nerve agents: tabun, sarin, soman, VX	Acetylcholinesterase inhibition: muscarinic and nicotinic effects in CNS, muscle (skeletal, smooth, and cardiac), and exocrine glands	Vapor (local effects): miosis, rhinorrhea, wheezing Liquid (local effects): localized twitching and diaphoresis; systemic effects Systemic effects: generalized twitching (with eventual paralysis), bronchospasm, increased secretions, seizures, coma, apnea	Seconds: vapor Minutes–hours: liquid	Vapor: fresh air, remove clothes, wash hair Liquid: remove clothes, spot decontamination with RSDL, copious washing of skin, hair with soap and water, ocular irrigation; <i>decontaminate as soon as possible!</i>	ABCs Optimal therapy for individual, critical patients in hospital includes parenteral atropine, pralidoxime, and benzodiazepine (treatment of mass casualties in the ED or the prehospital setting may be better effected by the use of autoinjectors of these agents, Table 132.5) Atropine: 0.05 mg/kg IV ^b , IM ^c (min 0.1 mg, max 5 mg), repeat q2–5 min prn for marked secretions, bronchospasm Pralidoxime: 25 mg/kg IV, IM ^d (max 1 g IV, 2 g IM), may repeat within 30–60 min prn, then again q1h for one or two doses prn for persistent weakness, high atropine requirement Diazepam: 0.3 mg/kg (max 10 mg) IV; Lorazepam: 0.1 mg/kg IV, IM (max 4 mg); <i>or</i> Midazolam: 0.2 mg/kg (max 10 mg) IM prn seizures, or severe exposure Symptomatic care
Vesicants: mustard	Alkylation and inflammation	Skin: erythema, vesicles Eye: inflammation Respiratory tract: epithelial denudation with partial or total airway obstruction Systemic: bone marrow suppression	Hours	Skin: RSDL; adsorption, then flushing (decon within 2 min if possible) Eyes: water (major impact only if prompt)	Consider BAL 3 mg/kg IM q4–6h for systemic effects of Lewisite in severe cases
Lewisite	Arsenic toxicity, including increased vascular permeability	Eye: inflammation Respiratory tract: inflammation, ARDS with hypotension ("Lewisite shock")	Immediate pain and irritation	As for mustard	
Pulmonary agents: Chlorine	Liberation of HCl; alkylation	Eyes, nose, throat irritation (especially chlorine)	Minutes: eyes, nose, throat irritation, bronchospasm	Fresh air and water to skin	Symptomatic care, bronchodilators Pulmonary toilet, bronchoscopy for necrotic debris in large airways
Phosgene	Alkylation (primary effect), liberation of HCl (at higher doses)	Respiratory: bronchospasm, pulmonary edema (especially phosgene)	Hours: pulmonary edema		Mandatory rest, PPV (CPAP or PEEP), oxygen, fluid management in ICU setting
Cyanide	Inhibition of cytochrome oxidase with histotoxic anoxia, ↓ avO ₂ diff, hyperlactatemia	Hyperpnea, collapse, seizures, muscle rigidity, apnea, coma	Seconds	Fresh air Skin: soap and water	ABCs, 100% oxygen Na bicarbonate prn metabolic acidosis Choose antidote: Estimated Hgb (g/dL) • Amyl nitrite 1 ampule at nose (or in ambug) 30 sec out of each min • Na nitrite (3%): Dose (mL/kg) 0.27 10 0.33 12 (est. for average child) 0.39 14 (max 10 mL) • Na thiosulfate (25%): 1.65 mL/kg (max 50 mL) • Hydroxocobalamin 70 mg/kg (adult dose 5 g) IV • May repeat 35–70 mg/kg (2.5–5 g adults) prn severe toxicity Topical ophthalmics, symptomatic care
Riot-control agents: CS CN (Mace) Capsaicin (pepper spray)	Nonspecific irritation (most agents); stimulation of release of substance P (pepper spray)	Eye: tearing, pain, blepharospasm, nose and throat irritation, ARDS (high doses)	Seconds	Fresh air, eye lavage	

Chapter 6: Environmental

Decontamination

- Decontamination

PEM R | Dirty bomb detonated in school your staff in PPE, after ambulatory patient was swabbed nasally for radioactivity, next = Remove all clothing & place in bags

PEM R | you are medical director of children camp w/ now several campers w/ rhinorrhea/vomiting/urinary & fecal in continence, you call 911, best next = Begin decontamination of affected campers

PEM R | After dirty bomb containing radioactive cesium detonated, 8 children suspected exposed, after decontamination, important initial = Stabilizing serious injuries

Promo | 5% Hydrochloride solution, is the most common solution used for decontamination for Chemical warfare, what is the appropriate preparation = Diluting 9 parts water to 1 part bleach (9:1)

Amal | Best universal liquid decontamination for chemical warfare is 0.5% Hypochlorite solution, how to prepare it = Diluting household bleach to 9:1 (Not Diluting household bleach to 5:5 nor Diluting 5% hydrochloric acid 9:1 nor Diluting 5%hydrochloric acid 5:5)

- Universal Decontaminating agent = 0.5% Hypochlorite (Diluted household bleach) = 9L water : 1L Hypochlorite
 - can use soap and water
- Diluted household Bleach = Clorox (Alkaline) | DON'T USE ACID

Amal | Universal decontamination agent for hazard solution is = Water

Final | Decontamination of organophosphate = 90% by Cloth removal

Final | Case about organophosphate asking about decontamination = 90% of decontamination achieved by removing clothes (Not Intubate critically ill patient before decontamination nor eye decontamination before the skin)

Final | Bomb = Decontamination by removing all clothes & wash by water and soap

Final | Child saying there is radiation material in his leg what to do = Irrigation With water and soap (Decontamination)

Final | Radioactive bomb, best way to decontaminate = Decontaminate w/ water and soap (Not Stabilize serious injury)

- Approach of Unstable Chemical agents or Radioactive exposure
 - 1st Staff PPE
 - 2nd Decontaminate (Removing cloths & wash w/ soap & water)
 - 3rd Stabilize serious injury
- IF Cardiac Arrest You will start CPR with full PPE for all team members, yet, simultaneously, decontamination will be on going as much as possible without interrupting the code dynamics

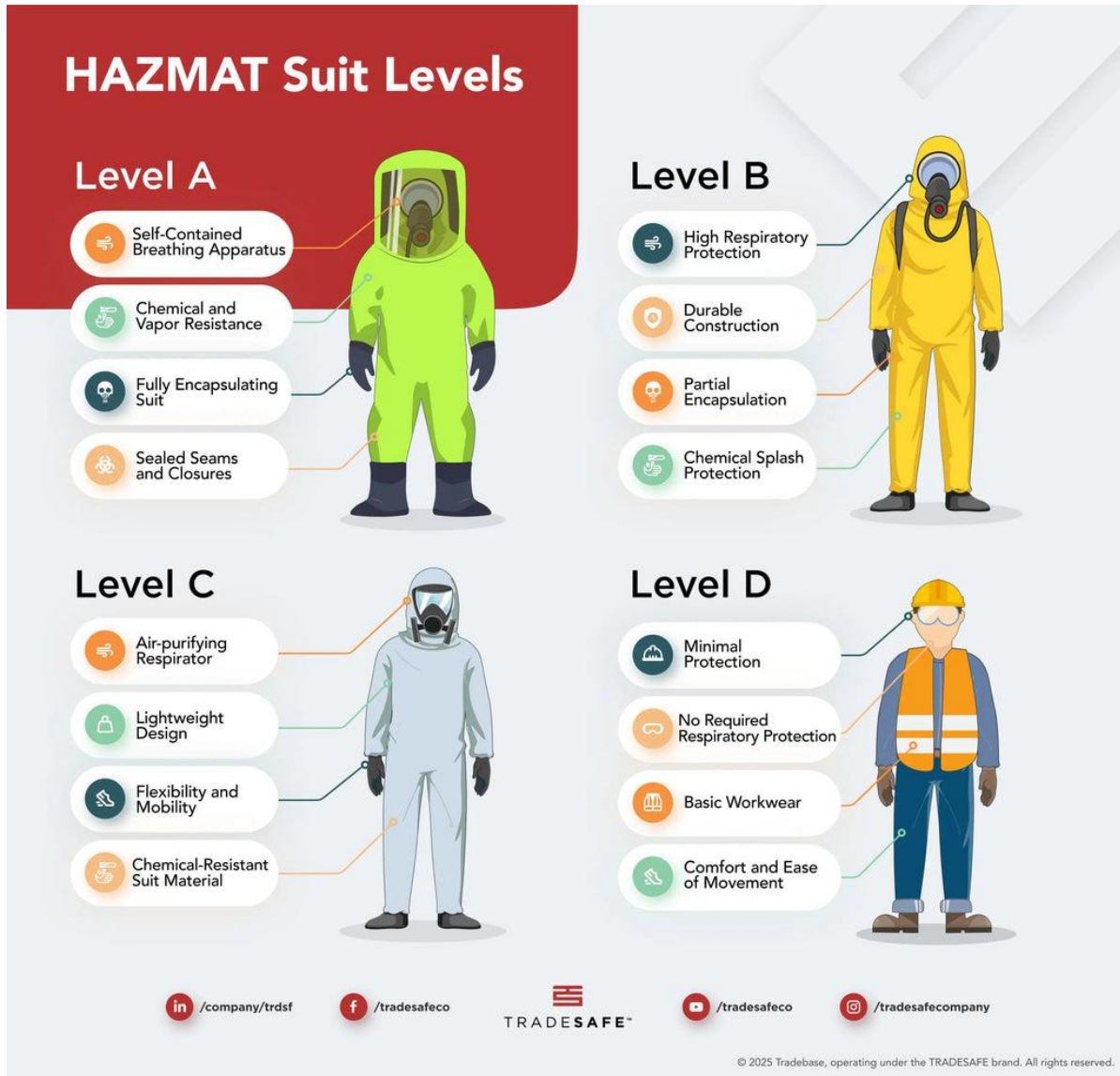
Final25 | patient exposed to nuclear radiation presents without visible wounds but has a whitish substance on the skin. His clothes have been removed, The team in rush as they expect lots of cases coming soon to ED, Available water soap and household bleach, What is the next best step for decontamination = Wash with warm saline and gentle soap; use diluted bleach if contamination persists (Not Wash with water only; avoid soap and bleach to reduce absorption. Nor Use diluted bleach 1:10. Nor Apply undiluted bleach)

Chapter 6: Environmental

- PPE

- Level A = **Self-contained** breathing, Chemical/Vapor resistance, Fully encapsulated = Terror: Nuclear, Anthrax
- Level B = **Supplied air respirator**, Chemical resistance, Partial encapsulation = Chemicals, Inhalation hazard
- Level C = **Air-purifying respirator**, Chemical resistance = Pandemic, Biological agents
- Level D = **No respiratory protection** = Normal clothes, No hazard

Amal | which of the following is the correct match of the level of PPE personal protective equipment in case of decontamination = level c chemical resistance class suit with powered air purifying respirator (Not Level A normal regular work clothes, gowns, gloves, eye and face field sat the level. Nor Level B fully encapsulated suit with self-containing breathing apparatus. Nor Level D encapsulated soup with self-containing breathing apparatus outside)



OTHERS

Psychology

Behavior disorders

- Tourette or Tic

Amal | 20 Y/O boy having twitching movement for the past three months. He has had right sided blinking occurring several times per minute. activity worse when he's in a stressful situation, well appearing, except for intermittent blinking on right arm & able to suppress the activity with a carrot. rest of exam is normal. Plan = No further testing needed (Not ASO nor EEG nor CT)

- Breath Holding Spell

- o Types: Cyanotic (most common):
 - Triggered by frustration or anger
 - Vigorous cry followed by breath-holding and then cyanosis
 - LOC is < 1 minute and children quickly regain normal consciousness
- Pallid:
 - Triggered by fright, pain, or fall with head injury
 - Child gasps, becomes pale, and then loses consciousness
 - LOC < 1 minute and children quickly regain normal consciousness
- Mixed: Has features of both cyanotic and pallid breath-holding
- o Ax: IDA
- o Tx: behavioral measures, iron supplementation

PEM R | 16 M/O infant w/ ongoing SZ like activity, mom reports will pass out & lose consciousness after tantrum lasting for 1 min then immediate return to normal, likely to present in this pt. = Iron deficiency anemia

Amal | 16 M/O boy exclusive breast feeding, fell on floor in toy shop then cried became limp and had bluish discoloration of lips then stiff for around 1 minute then back to baseline, what test will be most helpful in determining the contributor factor for his condition = CBC (Not CT brain nor EEG nor ECG)

Amal | 18 M/O brought to the ED for evaluation after a brief episode of tonic clonic extremity movements immediately after spankings in the grocery store. The child reported the screams became limb pain, sent to the ground and then exhibit unusual movements. The episode lasted for one minute and occurred about 30 minutes ago, the toddler now is interactive, appears healthy has normal vital signs, Dx = breath holding spell

- Separation anxiety

Promo | Separation anxiety most common finding = abdominal pain and vomiting

Amal | You are discussing with your resident about separation anxiety in details. Most common finding in this disorder = Abdominal pain and vomiting (Not More in girl than boys nor Run away from school -Truancy- nor Poor achievement at school)

Final25 | A child with autism not acting well, not slept for 2-3 days and was in his father care as mother recently give birth what could be the cause = Separation anxiety (Not Drug overdose nor Psychosis nor Depression)

- Development

Promo x2 | 2 M/O infant mother brought baby saying he fell off bed after rolling, which age rolling starts = 4 M/O

Chapter 7: Others

Amal | At what age does the child roll from side to side = 4 M/O

- Nightmare & Night Terror
 - o Nightmare = in Deep sleep (Non REM) + Remembers
 - o Night terror = just slept (REM) + Doesn't Remember
 - o Tx: Reassurance, routine sleep, avoid stressors

PEM R | 6 Y/O having abnormal nighttime behavior soon after falling asleep, sitting up making noises, Hx of head trauma, next step = Reassure parent

Amal | 5 Y/O boy awakes 15 minutes after he has fallen asleep. He screamed as if in pain. He was extremely anxious sweating hyperventilating, He was not normally interacting with his mother. The episode lasted for five minutes, after which he was brought to the ED. he is now sleeping and your physical exam, this is known as = Pavor Nocturnus -night terror- (Not Narcolepsy Sleeping at any time- nor Somnambulism -Sleep walking- nor Sleep apnea)

- Cataplexy = Loss of tone + NO Catatonia (Not awake) + w/ Narcolepsy
- Catalepsy = Rigid tone + Catatonia (Awake) + w/ Schizophrenia

PEM R | 17 Y/O transported by EMS after seen "found down" Girl makes no eye contact, lies motionless & mute entire time, parent say she Hx of Schizophrenia & 1-2 month Hx of increasing paranoia & withdrawal, they suspect she has not been on her meds, what behavioral syndrome = Catalepsy

Final x2 | Schizophrenia + quiet, not talking, Dx = Catalepsy

- Echopraxia = repetition movement
- Echolalia = repetition of words

PEM R | 14 Y/O Known psych issue, and now off meds, now refusing to get out of bed, motionless, mute till you Ex him and he mimic your movement, you want to describe this to the psych oncall = Echopraxia

Psychiatric disorders

- Schizophrenia

Final | Pt had fly of ideas & delusions that his neighbor will kill him, Dx = Schizophrenia

Final | Flight of ideas & Delusion = Schizophrenia

Final | Guy with thinking neighbor wants to kill him jump from topic to topic = Schizophrenia

- Bipolar

Final x2 | Pt came by force with her mother due to decrease sleep, she is hyperactive and saying she is totally fine and want to go home, Dx = Bipolar (Not Psychosis nor Conduct nor Depression)

Final25 | Child with bizarre behaviour last week; flight of ideas, aggressive behaviour, sleeping for 2-3 hours per day, first time to have these symptoms but used to have depression, Dx = Acute manic episode (Not Schizophrenia nor Anxiety nor ADHD)

- Anxiety

Final | Teenager anxiety case = ?

Chapter 7: Others

- Panic Attack

- Path: Hyperventilation > Hypocapnia > Respiratory Alkalosis
- Tx: Re-breathe into bag or use Non-rebreather without connecting it to keep CO₂

PEM R | 13 Y/O had argument w/ father, today having ringing in his ears, saying im really afraid im going to die, Temp 37.9 HR 96 RR 64 BP 109/69, confused/diaphoretic, Ex normal, Next = Obtain blood gas

- Use Blood gas as quick way to differentiate Aspirin toxicity from Anxiety Hyperventilation

Promo x2 | Pt. Known to have VSD, saw horror movie then had chest pain, he is Tachycardic/Tachypnic, Expected Blood gas = Respiratory Alkalosis (Panic Attack > Hyperventilation)

Amal | 12 Y/O intermittently the complaints of dizziness and numbness in hands bilaterally. On and off for the last four months. She's well but while she's waiting in the ED she started to complain of shortness of breath and began hyperventilating = Re-breathing into a bag (Not oxygen by laundry grid nor Lorazepam 0.05 milligram nor Propranolol 10 or 20 milligrams)

Amal | According to Blood gas: Ph 7.64 Pco₂ 18 Po₂ 94 HCO₃ 26 BE 1 What appropriate action you will take = Ask patient to Rebreathe in a paper bag

Final | Unconscious panic patient = Ambubag

Final25 | Q27: Girl with hyperventilation syndrome, looks well normal exam, but tachypneic and in distress next = Breathe in paper bag (Not O₂ nor Diazepam)

- Depression

PEM R | Important Dx of Major depressive episode = Loss of interest or pleasure

- Suicide

- Child/Adolescent Suicide attempt characteristics (Fleisher):
 - Positive family hx
 - Low self-esteem, Hopelessness
 - Active desire to die
 - Depression
 - Anger/Desire for revenge

PEM R | 11 Y/O sitting in bridge w/ a gun plans to kill's himself, has Hx of x2 previous admission for attempt suicide, greatest risk factor = Prior suicide attempt

Promo | Risk of successful suicidal attempt = Drug abuse (Not stressful life nor girl gender nor marriage)

Amal | which of the following factors is a risk factor of successful suicidal attempt = Substance abuse (Not Stressful life nor Being married nor Female gender)

- Substance, Prior attempt, underlying psych issue
- Female attempt but does not do it
- Male attempt and does it

Amal | 13 Y/O, slashed her wrist with razor following argument with her father, presented before with similar behavior, single most important question = Do you want to kill or hurt yourself or any other person? (Not do you use drugs or is your father physically abusing you)

- This question directly addresses the most critical concern: the risk of further self-harm or suicide, which requires immediate assessment and intervention

Final | Adolescent her father was in southern area most important Q to be assessed in depressed patient = Suicidal ideation (Not Start anti-depressant medication)

Final | Case with suicide attempt 3rd time, for future attempt risk is = Prior attempts

Final | 14 Y/O Suicidal attempt, increase risk factor = Previous attempt (Not broken family nor age)

- Always previous attempt or drug abuse

Final | Risk factors for suicidal attempt = previous suicidal attempt

Chapter 7: Others

Final25 | A girl living in other city for financial issue and has no friends, spending a lot of time reading how to hurt herself and suicide, what is most likely risk factor for her = Romanticizing Suicidal and social isolation (Not Financial stress nor Conditional stress and no boyfriend nor Stress of grades)

- Factitious disorder imposed on self (Munchausen syndrome)
 - o individual imitates Sx of illness in order to elicit Attention
Deceptive behavior in absence of clear external rewards
 - o Munchausen mothers
 - Will have Good medical background
 - Never admit it she is doing wrong
 - Will always show Most wonderful personality, Very dedicated, and will not show clear psychosis
 - o Tx: Refer to Psychiatry
 - Early identification to reduce morbidity and mortality
 - Address underlying emotional needs or comorbid psychiatric disorders

PEM R | 4 Y/O Anaphylaxis by Hx, Mother given Auto injector but says child didn't eat any of the known allergen, requesting antihistamine & steroid burst, medical records show 8 visits in last 3 weeks for anaphylaxis, Next = Notify region child abuse team for concern of medical child abuse

PEM R | 8 Y/O brought by mother, w/ 1 year Hx of Abdomen pain & vomit, all normal without improvement with meds, having lost weight & pale/weak, Dx = Perpetrator is usually the mother

Amal | Mother of a 2 Y/O boy presents to the ED with a complaint. My son wants to stop vomiting. On exam, a child looks happy and will have normal vital signs and physical exam. The mother insists that the child is very ill and needs to be hospitalized again. You asked for an old record and you find five prior admissions with a similar complaint, but no organic diagnosis has been ever uncovered. In addition, no one other than the mother has ever seen the child What's your expectation about mother = To have a background in medical in health care or medical field Munchausen by proxy mimic illness

Final | mother of a 2 Y/O boy presents to the ED with a complaint. My son wants to stop vomiting. On exam, a child looks happy and will have a normal vital signs and physical exam. The mother insists that the child is very ill and needs to be hospitalized again. You asked for an old records and you find five prior admissions with a similar complaint, but no organic diagnosis has been ever uncovered. In addition no one other than the mother has ever seen the child What's your expectation about the mother = to have a background in medical in health care or medical field it's Munchausen by proxy mimic illness

Final | 9 Y/O girl presented with her mother complaining that her child can't move her right foot, mother talking about her last fire in her house and her divorce, exam normal next = Detail in social hx (not neurology)

- Somatization
 - o Somatization: ≥ 6 months Multiple physical Sx
 - o Conversion disorder: Sensory & motor affect, Mimic neuro

Final | 15 Y/O with family Hx of depression, no signs or thought suggest depression but had somatization Next = Reassure discharge to be seen by PCP her (Not Admission nor Explain when she has to see doctor)

Final | Depressed girl in ED = Somatization

Chapter 7: Others

Eating disorders

- Anorexia Nervosa

- Sx: Amenorrhea
- Invx: Low K, Mg, Na, Ca, T3/T4
 - High HCO₃, LFT
- Complication: Superior mesenteric artery syndrome (losing fat > narrowing of angle between SMA & aorta > compressing duodenum > small bowel obstruction)
- Admission Criteria:
 - Ideal body weight < 75%
 - Severe Bradycardia (< 50bpm, < 45 at night)
 - Hypotension < 85/50
 - ECG abnormal (Prolong QTc, electrolytes -Low phosphate, Mg, K)
 - Dehydration w/ sequelae (SZ, Syncope, Pancreatitis)

PEM R | 16 Y/O girl, no menstrual cycle for 6 months had menarche at 14 Y/O but was irregular, not sexually active, no change in exercise, no Chest pain/SOB/Abdomen pain, Temp 37 HR 44 BP 88/65 RR 18 SpO₂ 100%, BHCG negative, test relevant = Mg Po₄ K levels

PEM R | 16 Y/O female, weakness/palpitation/dizziness w/ eating disorder & admitting taking laxatives regularly, likely finding = ECG w/ u waves

PEM R | 13 Y/O girl competitive swimmer, picky eater, now having indication for medical admission = Anorexia nervosa

Promo | 13 Y/O Girl, Hx of intentional weight loss (case of anorexia Nervosa), Expected finding = Prolong QT

Amal | 13 Y/O girl w/ Hx of loss of 9kg over 3 months w/ dietary restrictions, has no purgin behavior, no menses for 3 months, HR 165 Wt 42 kg, medical complication = Prolong QT

Final | Anorexia nervosa what is concerning = Prolonged QT

Final | 16 Y/O girl, has irregular menstruation, last one 6 months back, Low BMI, Bradycardic, Hypotensive, which of the following labs abnormalities are most commonly seen = Potassium, phosphate, calcium (Not TSH and free T₄)

Final | Case of diet restriction BMI 15 (anorexia nervosa) = Prolonged QTc

Final | (for above Q), order = Request electrolyte (Low K/Po₄/Mg)

Final | Anorexia nervosa = U wave

Final | Teenager low weight = Qt changes

Final | Eating disorder cardiac = Qt prolonged

Final25 | Q26: Girl with anorexia nervosa came with fatigue and weakness using laxative regularly what to find in labs = U wave (Not Peaked T wave nor Metabolic Acidosis)

- Bulimia Nervosa

- Recurrent episodes of binge eating followed by inappropriate compensatory behavior via self-induced vomiting, laxatives, excessive exercise, caloric restriction (occurring at least once per week for 3 months)
- Sense of lack of control during eating episodes
- Sx: Self-evaluation is usually influenced by body shape or weight
 - Body weight usually within or above healthy range
 - Dental erosions, parotid gland swelling, callused knuckles
- Tx: cognitive behavioral therapy, fluoxetine or other SSRIs, or combined CBT/pharmacotherapy

PEM R | 15 Y/O girl, self-inducing vomit, at night raid refrigerator, has good appetite & frequent snacks between meals, 1.57 meters, 54.4 kg, on Ex petechiae to posterior pharynx, what additional findings = Decrease potassium level

Chapter 7: Others

Final | Girl with vomiting (bulimia nervosa) and picture of teeth from inside with dental caries, what you will find more = Knuckles calluses

Final | 14 Y/O Girl. Came w/ vomiting after eating. She has a good appetite & awake at night to eat snacks. She has callus over knuckles of hand. Her labs expected to show = QT & T wave changes (Not Serum amylase is low nor LH releasing hormone is low)

- Male runner syndrome

PEM R | 17 Y/O lost 15kg of weight, 4 month period of intense training for marathon, missing meals/family activity, no bingeing or burging behavior, 1.88 m, 60 kg, BMI 16.9, Temp 35.9 HR 42 RR 18 BP 93/64 = Sudden death

Agitation

- Agitated Family

PEM R | 16 Y/O obese w/ multiple tattoos, threatening your staff, security assisting, asking to provide assistance, you initially = Stand least 1-2 arm length away

PEM R | 7 M/O father angry & threatening & went to his car saying ill be back, best step = call hospital security

PEM R | (for above Q) came back w/ gun & shouting where is my kid, Next best = Quietly barricade room & hide

- o Run > Hide > Fight

Promo | Agitated patient in triage shouting, to do = Safe distance (Not haloperidol or Strap him)

Amal | Agitated patient in ED, verbally threatening triage nurse and you, next thing to do = Stand 1-2 meters away from him (Not Place him in 4 points restrain nor Obtain detailed history of the event nor Hold his dominant hand)

Final | Scenario relative of patient bad words = Leave the room immediately (Not call law enforcement nor call social worker nor put in safe room alone and leave)

Final | Agitation patient in triage shouting, nurse are secretary are around = Safe distant (Not Haloperidol)

- Agitated Child

- o Tx: Assign team, huddle, PAT > Primary + Secondary
 - 1st De-escalate Verbally
 - 2nd Pharma
 - Autism = PO Clonidine/Risperidone | AVOID IM or Benzo
 - Psych = Use his meds | IF anxiety/trauma = Benzo | AVOID Keta or Benzo
 - Delirium Toxin/Glucose/Electrolyte = Treat cause, PO Clonidine/Risperidone, IV Haloperidol
 - Pain = Analgesia, PO Ibut/Aceta, IV Keta
 - Withdrawal = Benzo
 - Opioid = Methadone
 - Unknown Moderate = Benzo or Diphen
 - Unknown Severe = Halo +/- Benzo
 - ALWAYS monitor Side effects: Dystonic Sx
 - 3rd Physical restraint
- o Typical Qs management:
 - Haloperidol IM = if No IV available or Psych Hx/Psych FMx
 - Benzo IV = if IV line available or Non Psych or Tox

PEM R | 14 Y/O girl increasing Aggressive & violent behavior with Hx threatening to kill herself, all after separation of father & mother, now child agitated, she is pacing at room & slowly escalating her tone & body language, next = Attempt verbal

- o Verbal de-escalation | Chemical = Benzo or Haloperidol | Physical = 4 points using 5 ppl

Chapter 7: Others

PEM R | 12 Y/O Autistic in ED 4th time in 2 wks due to irritability & aggressive behavior, 1st time was concerned about pain or infection, labs/abdomen XR/abdomen US normal, CT brain normal, having episodes of crying/yelling/hitting himself several times per day, but follow commands by mother, Non-violent No bruises, cooperative, Next = Consult Neuro/Psych for meds

PEM R | 16 Y/O girl 66kg, agitated/inappropriate behavior & x2 other classmates similar behavior, has HR 160 RR 20 BP 130/90 SpO2 99% on RA, EMS inserted IV line, Pupils 8mm, dry lips girls breath, warm skin, tremor, nonsensical speech, hallucination, Best med for chemical restraint = Lorazepam 2mg IV initially & titrate PRN

PEM R | 15 Y/O girl, injured multiple staff workers, known for hostility, severely agitated, verbal de-escalation failed, not known to use illicit drugs, Next = IM Sedative

PEM R | 10 Y/O boy, on Methylphenidate & fluoxetine but no Hx of psychosis, best choice to reduce agitation = Midazolam

Promo | 10 Y/O present to ED after assaulting his mother, he is taking concerta & sertraline (Zoloft), he is agitated & looks threatening to ED staff, in effort to reduce agitation, meds to give = Haloperidol (Not Lorazepam)

Amal | 13 Y/O brought to ED after assaulting teacher, he is agitated, threatening all ED staff. what meds to use = Haloperidol (Not Lorazepam nor Alprazolam nor Aripiprazole)

- Agitation, rigidity & aggressiveness with no IV access line, Haloperidol IM is the best choice fast and rapid, less side effects. First line with Psychiatric patients
- Psychotic = Haloperidol
- Non-Psychotic =
 - Line = Midazolam IV
 - No Line = Haloperidol IM

Amal | 10 Y/O boy assault his mother and attending police officer, he is taking concerta, certraline, antipsychotic, in ED he is Agitated threatening ED staff, which medication should be administered = Haloperidol (Not Lorazepam nor Lithium)

- IM faster than IV or IN
- Haloperidol can be the best rather than Midaz

Final x2 | Agitated patient yelling mother what is the next step = Encourage conversation and inform her frustration understood (Not Put patient in quiet room until she calm down)

Final | Scenario Agitation = Haloperidol (if psychotic)

Final | Healthy patient w/ agitation & FM Hx of psychosis what to give = Haloperidol (Not Alprazolam -Benzo but for Anxiety-)

- FM Hx of psychosis will make Pt. have 85% tendency for psychosis

Final | Child with agitation has strong family hx of psychosis = Haloperidol

Final | 13 Y/O Boy, K/C of ADHD on Concerta (& another psychotic medication), Came agitated, the best drug to control agitation is = Haloperidol

Final25 | Patient Severely Agitated teen, failed verbal de-escalation and isolation next = Haloperidol IM (Not Parenteral Antipsychotic and Benzodiazepine together nor Parenteral Lorazepam nor Physical restraint)

- Restraint

PEM R | 9 Y/O severe agitation placed on 4 point restraints & transported ED, federal regulation require physical restraint to remove = Pt. No longer poses an imminent threat to self or others & no longer disruptive to therapeutic setting

Promo | When considering restrain during procedure in ED, which statement correct = Could lead to mistrust & future medical procedure fears (Not Human restraints are usually more effective than physical in older children nor Physical restrains standard methods of pharma sedation is not indicated nor Airway compromise is a common complication)

Chapter 7: Others

Abuse

Physical Abuse

- Child Abuse

- Types: Neglect, Physical, Sexual, Psychological, Medical
- **TEN4Faces-P** (Trunk, Ears, Neck, <4 Y/O, Frenulum, Auricles, Cheek, Eyes, Sclera, Patterned)
- Hx Red flags:
 - Inconsistent with the injury, lacking detail, changing Hx
 - Inconsistent with developmental stage of child
 - Bucket-handle fracture
 - Posterior rib fractures
 - Fractures of different ages
 - Cutaneous: Bruises, Bites, Burns
 - Nonaccidental traumatic brain injury (formerly shaken baby syndrome)
 - Retinal hemorrhages, Subdural hematoma
 - Sexual abuse: Genital trauma
- Approach to Abuse/Non-Accidental Trauma:
 - Report to child protection, social worker, trauma surgery
 - **CT Head** (CT is choice for abusive head trauma):
 - CT Head = < 6 M/O (Regardless of Injury)
 - CT Head = 6-12 M/O + Head Injury
 - **Skeletal survey** in all < 2 Y/O

PEM R | 4 M/O w/ complete laceration of anterior upper frenulum, mother says he sucks very hard on pacifier = Skeletal survey, brain CT, report to CPS

PEM R | 2 Y/O Abdomen pain/Bilious vomit for 2 days, absent bowel sounds, Abdomen CT (hematoma of bowel), mechanism = Kick or punch to abdomen

Promo | 5 M/O fussiness for few days, mother noticed sudden multiple episodes of Cyanosis lasting for 1min, last one was frightening so came to ED, Ex bruise seen over arm, mom told maybe brother bite him, Next step = CT brain (Not Arm XR)

Amal | In taking history in child abuse, what is true = Parents are more likely to abuse one child over other children (Not Fathers are more likely to abuse more than mothers)

- Mothers are more likely to abuse more than father
- Premature are more likely to abuse than mature

- Shaken baby Syndrome (Abusive head trauma)

- Retinal Hemorrhage (Seen also in non-shaken Newborns at birth which resolves 2-6 weeks)
- Subdural Hemorrhage (Acceleration/Deceleration (Shaken Baby) > Sheering of bridging vessels)

PEM R | 3 M/O apneic episode, lethargy facial bruise, parent deny trauma, what common trigger of head trauma = crying infant

PEM R | 3 M/O, Image (retinal hemorrhage), lesion explained by = Abuse head trauma

PEM R | 9 M/O fall 2 feet hitting front side of head on wood floor, No LoC, Vitally stable, has bruise of Rt. Outer ear, collection of blood in lower half of anterior chamber of Rt. Eye, bruise to Rt. Upper arm & Lt thigh, Neuro normal, Next = Obtain CT Brain

- Non-accidental trauma

Amal | 3 M/O baby presented with fussiness and decrease attentiveness, in the triage has seizure, on examination had bulged anterior fontanel, CT brain showed acute and chronic subdural hematoma, next to be done to support your Dx = Retinal exam (Not Ceberography nor LP)

Amal | 3 M/O fussiness & decrease attentiveness, in triage has SZ, bulged Anterior fontanelle, CT brain showed acute & chronic subdural hematoma, Next to support your Dx = Retina Examination (Not LP nor Cerography)

Chapter 7: Others

- Skull fractures that need NSx:

- Complicated Basilar
- Open skull
- Fr. w/ Intracranial injury
- Not heal due to Dural injury (Diastatic -across suture lines- $\geq 3\text{mm}$, Burst, Depressed $\geq 1\text{cm}$)

PEM R | 5 W/O w/ intermittent twitch of Rt. Arm for 48hr, father states might started after rolled onto her arm, No palpable deformity, hematoma, fontanelle full, pupils reactive, CBC/CRP/PCT/INR/PTT normal, CT brain (shows Subdural hematoma), suggestive Dx = Subdural hematoma due to non-accidental injury

PEM R | 3 M/O girl mother concern head swell, mother says pt. learned to roll over and hit head against side of crib two days ago, Fussy/Alert, 2cm Lt parietal scalp hematoma, CT (bilateral skull fracture), Next = Lab & Further XR workup indicated

PEM R | 7 M/O girl, brought with aunt having swelling over scalp today, had bumped her head while crawling, fussy but consolable w/ Normal Vitals, Abdomen/Cardiac/Lung exam are normal, but has scattered bruises over legs with various stages on CT brain has 5cm boggy mass on Lt occipital-parietal scalp (image with scalp fracture & sub-galeal), Next = Re-examine child & obtain skeletal survey

PEM R | 3 M/O swollen tender right femur, XR shows mid shaft spiral fracture = Leg deliberately twisted

Final | 11 M/O & fall down & Q about what is injury going with non-accidental = Skull fracture across suture line (Not Linear temporal skull fracture nor Radius fracture nor Frontal hematoma)

Final25 | 4 M/O came to ER after fall down from crib, XR shows transverse Fr. of humerus, when you review the child file you find out that he came before w/ same mechanism & had occipital Fr., Next = Admission for protection observation (Not OPD with General Pediatric nor Discharge home nor Refer to Endocrinology for osteogenesis imperfecta test and follow up)

- CP Abuse

PEM R | 4 Y/O having developmental delay non-verbal, playful/active, brought by stepmother having injury of upper central incisors and saying he headbanging and injured himself, assessment raise concern of abuse = Mechanism of injury

Final | CP pt roll over presented with vomiting, CT Abdomen show duodenal hematoma Hgb 8, vitally stable next = Call child protective (not OR nor give blood nor Call surgery)

- If the question also was Epidural hematoma the right answer is Call child protective

- Ear Abuse

PEM R | 5 Y/O girl, noticed bruises when picked up for weekend from her mother, has left external ear bruise = Bruising to ear

PEM R | 20 M/O girl, Multiple vomiting, not keeping any liquids down, not had wet diaper in 18hr, Temp 37.2 HR 150 BP 80/60, Pale, abdomen distended/tender, bruises on pinnae bilateral, No Hx of recent trauma, NS bolus given, Tx = Abdomen CT

Amal | Which of the following findings most likely indicating inflicted trauma = Hematoma of Pinna (Not Bruises on chin nor Forehead ecchymosis nor Recurrent Nursemaid elbow)

Final | 4 Y/O w/ crying from ear pain for one week, exam showed ear canal ecchymosis, no bulging or fluid in tympanic membrane, what to do in ER = Report to child protective (Not Ear abx drop nor Referral ENT)

- Ecchymosis means repeated purposeful injury especially if tympanic is clear = Child Abuse

Final | 2 Y/O child presented to ER w/ excessive crying and ear pain since 1 week, Ex left ear canal ecchymosis, Tympanic membrane intact no bulging, afebrile Your next step in Tx = Contact child protective services (Not Local ear drop nor ER ENT referral)

- Cord Abuse

Promo | 4 Y/O When is brought to the ED by his mother because of acute skin rash (pic of cord marking on skin), You suspect that these injuries are inflicted Which of the following instrument is the probable cause = Cord

Chapter 7: Others

Amal | 4 Y/O When is brought to the ED by his mother because of acute skin You suspect that these injuries are inflicted, Which of the following instrument is the probable cause (pic of cord marks on body) = Cord (Not Belt nor Hand nor Rope)

- Fracture Abuse

- Bucket handle (Avulsed metaphyseal fracture) = 1st NON-ACCIDENTAL
 - XR shows very small Fracture on Long bone non-walking/not fitting mechanism
- Spiral shaft fracture = 2nd in Non-Accidental for Non-walkers
- Comminuted = not fitting mechanism
- Long bone fracture = Femur (30% infants, <5% toddlers), Humerus (Suspect abuse <18 M/O + No Trauma)
- Posterior rib fracture
- Multiple rib fracture
- Fractures at different healing stages

PEM R | 4 M/O grandmother cares for him while parent at work, having fever for 2 days, cough for 5 days, Rhinorrhea for 6 days Temp 37 HR 120 RR 35 BP 75/60 SpO2 96% RA, No RD, CXR (Multiple rib fracture), Next = Skeletal survey

PEM R | 2 Y/O in ED refuse of walk, unwitnessed fall, XR (spiral fractures of Humerus & Tibia), prompting evaluation of abuse = Multiple injured limbs

PEM R | 6 M/O 34 weeker, 1 week in NICU, irritable/vomit/cough for 1 day, XR (shows multiple rib fracture), Next = Skeletal survey & report to CPS

PEM R | 5 Y/O injury to right forearm, but Hx of beaten by mother, what to do = XR of Rt forearm (not both nor Skeletal survey)

PEM R | 5 M/O w/ XR (showing chip fracture as bucket handle fracture), what common caused = Traction force

PEM R | 11 M/O male w/ decreased use Lt arm for 24hr No trauma Hx and mother says he is cruising & falling frequently, has tenderness without swelling or skin changes over shoulder, XR shows small metaphyseal fracture of proximal humerus, w/ respect to likely diagnosis, additional Hx or findings highest positive predictive value = Healing rib fracture on CXR

Promo x3 | Most specific for child abuse = Posterior rib fracture

Promo | Child abuse which one = 3 Month w/ Bronchiolitis had Rib Fr. (Not 2 Y/O w/ Torus Fr. nor 3 Y/O w/ Tibia Fr.)

Amal | 11 M/O noticed that not moving Rt. leg, she mentioned that he felt off bed onto ceramic floor, on examination there is distal femur swelling, what X-ray finding support your diagnosis = Bucket handle fracture

Amal | Which fracture is most suspicious for non-accidental injury = Femoral fracture 11 months old girl fell from mother hands (Not Linear skull fracture in 4 months rolled off bed nor Spiral tibial fracture of 2 years old or Femoral fracture 11 months old girl fell from mother hands nor Salter Harris type 2 ankle 2 years old fell in daycare nor Buckle fracture of distal radius in 3 years old boy pushed by brother)

- Some say: A child NEVER falls from mother hands! (if happened = suspect Abuse)

Final | 3 M/O baby came with bronchiolitis, excessive crying examination unremarkable they brought CXR with posterior rib fracture what is the next step = Call child protective service

Final | 3 M/O baby came with bronchiolitis, excessive crying examination unremarkable they brought CXR with posterior rib fracture what is the next step = CT head as child abuse

Final | Child abuse scenario = CT Brain (<2 Y/O = CT brain and skeletal survey | >2 Y/O = selective imaging)

Final | indication of child abuse = Healed Fracture

Final | Abuse = Posterior Rib Fracture

- Burn Abuse

- Non-Accidental Burns (Abuse) burns are symmetrical in presentations, like:
 - Patterned (From curling irons and clothing irons)
 - Circular (Cigarette burns -1 cm in diameter-)
 - "Stocking/Glove" distribution (Immersion in hot liquid results in Sharp lines of well demarcation)
 - Also in areas usually protected from burns (Buttocks or between thighs)
 - Full thickness Burn
- Accidental burns
 - More likely to be located on the areas of the body that are exposed such (chest & upper abdomen)

Chapter 7: Others

- Accidental burns tend to be irregular, following a spill or splash pattern, instead of having more symmetrical presentations such as are typically found in child abuse

PEM R | 2 Y/O burn in buttocks/groin, next step = Skeletal survey

PEM R | 2 Y/O girl, splash burn in leg & feet, bilateral partial thickness burns circumferential on feet w/ sharp demarcating rings around ankle, partial thickness on buttocks, Analgesia/Sedation/Debridement/Topical Abx & Dressing done, Next = Consult social worker & child protective services

PEM R | 4 Y/O (image scalding of lower limbs and buttock) = forcibly lowered into tub w/ scalding hot water

PEM R | 15 M/O spilled coffee and having neck/chest burn, mother brought him, after full head-toe exam, Next = Surgical/burn team consult

Amal | Which of following etiology is most common cause of **accidental** burns = Spills and splashes from hot liquid (Not Contact with electrical outlet nor House-fire nor Chemical injury)

- Neglect Abuse

- AAP medical neglect definition: Failure to heed obvious signs of serious illness or failure to follow physician instructions once medical advice sought

PEM R | 15 M/O concern of medical neglect, parent refused all vaccinations, referral for Allergist & epi pen given for suspected egg but parent says they won't give her eggs, Weight dropped from 75th to 25th centile, concern of medical neglect = Refusal of weight check

PEM R | 6 Y/O brought by child protective services for exam, he is dirty, poor dentition, very thin, head lice, consistent of abuse = Neglect

PEM R | 8 Y/O father brought child for cast mistakenly removed, and he came to ED rather than Ortho clinic, father visibly intoxicated, child asks for sandwiches, Next = Report child protective services

Amal | 14 M/O old infant, diarrhea, area of **Alopecia in occiput**, prominent ribs, loose skin, muscle tone increased, weight 5 kg, best course of action = Admission, Skeletal survey and social services and evaluation (Not Urgent OPD referral to endocrinologist nor Elimination diet for food allergy nor Stool culture test for fecal ova and parasite nor Evaluation by neurologist for muscular dystrophy)

- Occipital Alopecia = Very high risk of neglect, represent not being carried for at all

- Reporting

PEM R | 6 Y/O went to closet showed brother 5 Y/O a secret where he dropped pants and started thrusting, he denies prior similar experiences, next = report for child protective services

- Sexual activity/behavior is abnormal if < pubertal age

PEM R | 6 Y/O bruising to leg when picking up from school, Next = Photograph bruising

- Accidental injury & Reassurance of family & maybe Photograph to add to medical record

PEM R | 6 M/O comes w/ mother that was assaulted, baby well before & after her assault, vitally stable, Next = reassurance

PEM R | 3 Y/O Asthma attack, SpO2 86%, poor air movement, you are giving management, mother says will take child abruptly & refuses to stay, next = Ask police to take protective custody of child

Promo | In which case no need for reporting to legal authority = Drug abuse (Self harm) (Not Sexual abuse)

Amal | which of the following is **not** mandatory for reporting = Substance abuse (Not Child abuse nor Sexual Abuse nor Spousal abuse)

Chapter 7: Others

Sexual Abuse

- Sexual Assault

PEM R | 6 Y/O says cousin touched her inappropriately w/ fingers in privates 1 week ago, most likely findings = Normal external examination (Sexual abuse victims 95% have normal genital exam)

PEM R | 7 Y/O girl, unwitnessed fall on her bicycle and says I hit my coochie, what raises concern of non-accidental = Involvement of vaginal introitus

Promo | Child abuse case, True statement = Facial & MSK injuries are common (Not 1st responsibility of physician is to report to legal authorities nor Normal Exam usually r/o abuse nor F/U not needed)

Amal | True about sexual assault = Facial and extremity injuries are common (Kids are always Fighter) (Not The physician first responsibility is to report to legal system -First responsibility is your patient safety-. Nor Lacks of genital injury makes involuntary penetration unlikely. Nor Every female victim should be offered pregnancy prophylaxis -Post pubertal within 72hr-)

Final | Teen girl pregnant her family are religious how will you approach = Admit under child protection

- STI Organisms Indicating Sexual abuse

- Trichomonas Vaginalis (Highly specific for Sexual abuse)
- Neisseria Gonorrhea (Diagnostic)
- Chlamydia Trachomatis (Diagnostic)
- Syphilis (Diagnostic)
- HIV (Diagnostic)
- Condylomata acuminata -cauliflower- (suspicious)
- Genital herpes (suspicious)
- Bacterial vaginosis (inconclusive)

PEM R | What is true = Neisseria gonorrhoeae & Chlamydia trachomatis are diagnostic of sexual abuse

Promo | Girl w/ Vaginal discharge saying someone touched her private parts, organism = N. Gonorrhea (Not Herpes nor Staph)

Promo | 10 Y/O Girl, brought by mother concerning of Chronic Sexual abuse of her step father, strongly suggest it = Wet mount Pos. For Trichomonas Vaginalis (Not Wet mount Pos. For Gardnerella Vaginalis nor ≥ 2 Anal warts)

Amal | 8 Y/O girl with chronic sexual abuse by stepfather you referred patient to appropriate specialty what is the most specific diagnostic findings = Wet-mount positive for T-Vaginalis (Not ≥ 2 perianal wounds nor Wet-mount positive for Gardnerella Vaginalis)

Final | Girl with vaginal discharge saying some one touch her private area the organism = N. Gonorrhea

Final | Most likely for sexual transmission = Chlamydia trachomatis

Final | Diagnostic of sexual abuse = Chlamydia trachomatis (Not Herpes simplex nor Bacterial vaginosis)

Final | 4 years old Cauliflower mass in labia minora what to do next in ER = Child protection team (Not Discharge w/ reassurance nor Start Abx)

Final | 4 Y/O Girl w/ Genital wart "HPV" in labia minora (described as cauliflower rash) next = Contact child protection

Final | 4 Y/O with cauliflower + minor labial swelling = Caution of wart, child protection

- Genital Examination

PEM R | 5 Y/O male brought rectal pain/bleed after male baby sitter at afternoon, Ex if present consistent of definitive anal penetration w/ penis = Laceration of anal mucosa

Chapter 7: Others

- Hymen Examination

- Active bleeding = Interfere Always + OB/Gyn Referral for possible Examination under Sedation
- Inactive bleed & want hymen examination = Refer to Forensics

PEM R | 4 Y/O girl father says vaginal injury while getting out of bath tub, somewhat anxious appearing & will not answer questions regarding injury, having 1cm laceration of posterior hymen, bruising visualized, next step = child protection team

- Hymen tears & Posterior (or at 6 o'clock) fourchette of vagina = Concern of sexual abuse

PEM R | 6 Y/O girl, saying father roommate kissed my cookie, 1st step = Take Hx from the mother apart from child

PEM R | (for above Q) Perform limited forensic examination w/ portion of evidence collection kit

- Follow hospital protocol

Amal Suspected child abuse in 3 weeks old baby girl, which of the following would be normal physical finding in hymen of small girls = An annular shape redundant hymen (Not Nearly annular shape hymen with scalloped edges or A nearly annular shape hymen with notches at 3 and 6 o'clock -Could be pathological variant-. Nor A crescent shape Hymen with thin smooth edges - seen at pubertal age)

- Annular redundant hymen = Normal Pre-Pubertal
- Crescent shaped w/ smooth edges = Pubertal
- Notch at 3 & 9 = Abnormal

- Lichen Sclerosis

- Autoimmune disease, Highly mistaken for sexual abuse
- Sx: Tender, itchy, Very thin skin, pink/white patches, bleed, hemorrhagic blisters
- Tx: Clobetasol cream (Steroid cream)

PEM R | Mother brought daughter w/ genital looking abnormal, on Ex (hyperpigmentation as figure of 8) = lichen sclerosis

Challenger | 7 Y/O girl brought by mother w/ chief complaint itching in her vaginal area for 3 months, today noted bleeding on underwear, denies odor or discharge & does not disclose any concerns for abuse, on Ex (pic of white/pink area around vagina), Tx = Application of clobetasol cream (Not Bubble bath nor estrogen cream nor metronidazole PO nor nystatin cream)

Amal | 10 Y/O girl brought to the ED for evaluation of painful genital rash, mother has also noted spots of blood and have underpants. The following is her findings on local exam. This is whitish pale pink area around her urethra and around her genital exam (image of white/pink patch in genitalia) = Lichen Sclerosis

Final | 10 Y/O girl brought to the ED for evaluation of a pruritic and painful genital rash mother has also noted spots of blood and have underpants. The following is her findings on local exam. This is whitish pale pink area around her urethra and around her genital exam = Lichen sclerosis

Chapter 7: Others

Admin

Admin

Department

- Quality

Promo | As ED Director you have different types of power, but best power to influence changes, increase loyalty & improve performance is = Power to reward (Not Power of reference or Power of Authority or Power to Punish)

Promo | Regarding patients who leave without being seen (LWBS), true = Consider at risk to hospital

Amal | In ED, Patients who leave without being seen are = Consider Risk to hospital (Not Less likely to return nor Most probably not that sick nor Going to seek help somewhere else)

Amal | Delayed time in seeing patient in ED can = Affect quality of care for patient (Not Used for allowing less sick patient to leave. Nor Be fixed to all patients by improving ED staff. Nor Be fixed by being quick and less investigations for patients)

Amal | Common source of complain in ED = Long time

Amal | Practice guidelines attempt to achieve = Standardize practice (Not Increase testing to avoid malpractice suit nor Underutilization of resources nor Over utilization of resources)

Amal | Giving medical advice by phone = Not safe unless life-threatening (Not Reduce number of patient coming to ED nor Safe for anyone who calls & wants advise nor Safe for any safe if given by registered)

Amal | The total quality management is treated as = Consistent

Amal | Quality = Consistent

Amal | In the new paradigm, managers view errors as which of the following = Opportunity (for improvement) (Not Substitute nor Threat nor End)

Amal | For a hospital to maximize the value of its ED. They must realize that ED is = The window from which community sees and judges the hospital

Amal | Which of the following best defines clinical indicator = Measure of clinical management and outcome care (Clinical Management and outcome indicator) (Not Reference tool that helps guide clinical practice -Policy & guideline-. Nor use of best practice in a field to act as a marker and goal for improvement -KPI-)

Final | Emergency director, different types of power, best to increase loyalty & improve performance = Power to reward

- Number of Physicians

- If hospital census 50000, answer = 14 physicians
- If hospital census 100000, answer = 28 physicians

○ Calculation:

-  Visit per year / (Active working weeks) x (Pt per hour per doctor) x (hr per week per doctor)
- Example if 50,000:
 $2.5 \text{ (pt per hour)} \times 30 \text{ (working hr per week per doctor)} = 75 \text{ (patient per hour per doctor)}$
 $52 \text{ week per year} - 5 \text{ vacation} = 47 \text{ (active working weeks)}$
 $47 \times 75 = 3525$
 $50000 / 3525 = 14.18$

Promo x2 | 100,000 visits/year, 5 week vacation, 2.5 patient/hr/physician, 30hr/wk/physician, How many physician you need in ED = 28 Physicians (Not 24 nor 18 nor 32)

- $2.5 \times 30 = 75$ | $52 \text{ wks/year} - 5 \text{ wk vacation} = 47 \text{ wk}$ | $75 \times 47 = 3,525$ | $50,000/3525 = 14 \text{ physician}$

Promo | 50,000 visits/year, 5 week vacation, 2.5 patient/hr/physician, 30hr/wk/physician, how many you need in ED = 14

Amal | Center census 50000 thousand patient, A physician is seeing 2.5 pt per hour, working 30 hours per week, working 47 weeks per year. How many physicians this institution need = 14 Physician

Chapter 7: Others

- ED Space

Promo | What space of entire ER for 10000 visit per year = 50 m²/1000 yard

Final | What the space of the entire ER for 10000 visit per year = 50 M²/1000 yard

- Peripheral ED

Final x2 | 6 Y/O boy post-RTA, in peripheral ER, Asymptomatic & normal, Physical Ex except Temperature 34.5, he refused to talk or answer, Next step = Transfer to trauma center (Not Abdomen CT or Brain CT or CBC and electrolyte)

Triage

- CTAS Levels (Triage Levels, Colors, Times)

- Level 1 = Blue = Nurse Immediate | Physician immediate
- Level 2 = Red = Nurse Immediate | Physician 15 min
- Level 3 = Yellow = Nurse 30min | Physician 30 min
- Level 4 = Green = Nurse 60min | Physician 60min
- Level 5 = White = Nurse 120min | Physician 120min

Promo | Color level V Triage = White (Not Red nor Purple)

Promo | Wait time for Level 4 = 1hr

Promo | Triage depend on = severity (Not urgency)

Promo | 3 Y/O Hx of Runny nose, No Fever, Vomiting, Diarrhea, Temp 37.7 HR 110 RR 25 BP 96/65, According to Canadian Triage, this patient category is = V (Not I nor II nor IV)

Amal | 3 Y/O has runny nose for 1 day, no fever, cough, or diarrhea, T:37.1 RR: 23 HR:110 BP:93/65 sat:100% RA CTAS = CTAS 5

Amal | CTAS 2 should be seen by physician = 15 min

Final x2 | What the time for level 4 to wait = 1hr

Final x2 | Color of level V triage = White

Final | Child triage HR 140/min RR 40 = Primary

Final | Triage depend on = Severity (Not urgency)

Final25 | Case of trauma with audible stridor, drooling, unable to talk, SPO2 92% with visible retractions = Level 1 (Not 2 nor 3)

- ED Overcrowding

Promo | When analyzing ED crowding, which measures are not input measures = Time until physician first sees the patient (Not Ability of Ambulances to offload nor time until triage nor Pt. Who leave without being seen or treated)

Promo | Emergency throughput (output) is most affected by = Waiting times for admitted patients (Not Lab turnaround times nor Radiology turnaround times nor Internal departmental operations)

Amal | The point of entry to ED is triage because = Over triage affect sources utilization and quality of care for patients

Amal | An example of Quality assurance/performance improvement is = Assessing throughput

Amal | ED throughput is most affected by = Waiting time for admitted patients

- Boarded patients for admission should wait up to 120 minutes
- Input affected by = Internal department operations, Radiology turnaround time, Lab turnaround time

Amal | The ED is overcrowded, condition is worsening, disruptive behavior is increasing among some clinicians, which of the following should be done to control this behavior = Combined disciplinary process and organizational changes that help clinicians gain scales to deal with changing climate

Final | When analyzing in ED which what is not input = Time until physician first see the patient

- Crowding, Input, Throughput, Output

Chapter 7: Others

- Other

Amal | Which diagnosis is least likely to result in malpractice lawsuit in pediatric ED = Acute SZ (Not Meningitis nor Appendicitis nor Medication error nor Sepsis)

- In these type of Qs always look for something that is Subjective/Objective and known diagnosis & treatment

Final | Most common Lowest malpractice suit in ED = Acute Seizure (Not Appendicitis, Meningitis, Sepsis)

Final | Best = Patient identification

Practice

- Conflict

Promo | Your fellow approaches after he had conflict w/ Cardiologist Oncall, to get successful resolution of this conflict, you have to = Focus on the interest, not on the position (Not Support your fellow completely nor Issue complaint against oncall nor Insist on cardiologist to apologize to your fellow)

Promo | When there is interdepartmental conflict, most important to = Listen to other side or interview all participants (Not Access the hospital policy/procedure manual nor Perform literature review to identify EBP)

Promo | You are head of ED, when you come to know that a physician from your department has a conflict with other one from other department last night, Next step = To hear from other department or To hear from all participant in conflict

Promo | You are ED Consultant in shift at night when a dentist resident refused to evaluate 9 Y/O boy fell on his face resulted on laceration & alveolar ridge fracture, Action = The consultant should come to ED to evaluate the patient

Amal | you as a director of have been notified about the conflict that happened last night between your department and another department in the hospital? you're evaluating this, What's the first thing you should do = Listen to the other departments story point of view (Not Access to the hospital policy and procedure Site -I should know-. Nor Interview all participants involved in that conflict (I can't interview anyone other than my department. Nor literature review to know the evidence-based practice (if it was raised & look for standard practice)

Amal | 11 Y/O boy fall on examination he is stable, has fracture central upper incisor and bulb exposed, and mandible condyle fractured, you disagreed with the resident plan = Call dental consultant on call and ask to take care (Not You explain to the parent that the resident plan in not correct and ask for another doctor. Nor Follow up the advice of the resident. Nor Manage by ED consultant and discharge with dental follow up)

Amal | disagreed w/ dental resident plan, Next = Call Dental Consultant Oncall & ask to take care

Final | You are the head of ED, one of the hospital departments came to you and tell you over the night there was a conflict between your department and their department what is your first action = Call the other department and head for meeting

- check their point of view

Final | Your fellow approaches after conflict w/ Cardio oncall to get successful resolution of conflict = you have to focus on interest not on position

Final | When there is interdepartmental conflict, important to = Listen to other side

- Debrief

Promo | 2 girls brought by EMS from fire, attempt of resuscitations failed and both died, your team is sad but you have overcrowded patients, Best action = Do debriefing for your team before seeing other patients

Chapter 7: Others

- Documentation

Amal | Regarding ED doctor - patient relationship involved in malpractice suit, what is correct = It can be hard to deny charges that inappropriate care was provided when medical records has no or little information's

Amal | Choose correct statement about minimizing risk in ED = Discussing findings, treatment and expected outcomes with family is expected to be documented in ED notes (Not Acknowledge information from registration nurses note since there reliability is covered by the hospital not you. Nor It is acceptable for triage nurse to tell those in waiting area about delay time and advice to go to PCP. Nor Writing a complete admission order for ICU admissions)

- Best consultant note:
 - Seen
 - Examined
 - Discussed with family
 - Disposition

- Evidence Source

Amal | Best source of evidence about use of certain medication = PubMed

- Sleep

- Anchoring sleep with nights & use naps
- Clockwise shift rotation

Amal | In regards to fatigue and shift work, what is following statement is correct = Circadian dyssynchronicity largely happens in missing sleep during anchor period midway when core temperature and arouse level at its lowest

Amal | Which of the following is helpful strategy to cope with the shift to shift work in ED, Which of the following is helpful strategy to cope with shift work in at = Anchor sleep and use naps (Not Counter clockwise shift rotation nor Dimming of the lights after raising nor longer stretches of night shifts (many days with)

Family

- Consent

PEM R | 15 Y/O stepfather raping her, want to be examined & tested for pregnancy, with respect to consent for treatment & Ex, true = Pt must give consent (most US states if > 13 Y/O can consent)

PEM R | 7 Y/O girl wheezing tried albuterol without improvement, paramedic arrives, parent not answering cell phone, which prehospital treatment & transport = Paramedic team can initiate both emergent treatment & transport without parent consent

- Life or Limb threatening can do treatment & transport without consent

Promo | 4 wk w/ High Fever, want to do Full sepsis workup but father refused, Next = Admission start Abx but inform father he need to consider it again & inform admission team about plan (Not Admit don't do LP nor start Abx nor Call child protection)

Amal | Which of following statements regarding consent and confidentiality is correct = Under some circumstance's children are able to consent for their own (Not Grandparents can consent just as parents. Nor Court order is required to treat a child if a parent or a guardian is not available. Nor Parent or guardian is needed for emergency condition)

- Emancipated minor: the age of majority, marries, leaves school or home, enlists in the military, is convicted of a crime as an adult, or cohabitates without parental consent
- Examples: Father/mother, Solider, own income or living alone

Final | Child for ICU in another hospital another town mother refuse = Father consent and transfer

Final | 4 weeks came with high grade fever, you want to do full septic but father refused what to do = Admission start antibiotic but inform the father he needs to consider it again and inform admission team about the plan

Final | Appendectomy dad is traveling consent = Inform child sign by mother

Chapter 7: Others

- Upset family due to Delay
 - o Very concise meeting with team members

Amal | You are called to see a parents of an 18 M/O child with CHD in CHF unsatisfied of provided treatment and the father want to transfer their child to another hospital, what should be done accordingly = A team meeting with the family should promptly confide (Not Assure the family that the child has appropriate cared for nor Its more helpful as defensive attitude)

- Attending procedure

Amal | 1 week old with history of fever, planned for LP, regarding presence of the family during procedure = Most parents prefer to present during procedure

- o Allow them to attend without interfering & let them sit
- o If they are hesitant, allow the 1 who accepted

- Medical Error
 - o Commonest error in ED = Diagnostic error
 - o Commonest error All over = Medication error

Amal | In regards to patient safety, which of the following is true = Medications errors are most common identified safety issues

Amal | The commonest source error in Emergency department is = Diagnostic error (Not Medication orders nor Misplaced samples nor Tools malfunction)

Promo | Medical intern told you they forgot to take important sample which was salicylate level & they already sent all samples to laboratory, patient now doesn't have line, what to do = Tell family what happened, apologize & inform them about importance of salicylate sample to be collected immediately

Amal | 13 Y/O is evaluated for septic arthritis, given by mistake 2 grams in 2 divided doses (1 grams each) of acetaminophen 30 minutes apart, best course of action = Inform patient about mistake and reassure him

- Informing parents of death

Promo | You received a child unresponsive for unknown period, started resuscitating w/ team for 30min no response, after 30min you decided to terminate efforts of resus, inform parents = In quiet private place w/ social worker

Promo | Patient died best way to inform parents = Provide physical comfort (Not Avoid saying patient name nor Tell them passed away (not died) nor Low dose of Benzo is appropriate)

Amal | Which of the following is true about talking to parents after death of their child = Physical comfort is appropriate

Amal | Delivering bad news in best way of child death to his parents = Physical comfort (Not The deceased child should be referred by name nor Provide benzodiazepine to parents nor Preferred to use term passed away rather than dead)

Chapter 7: Others

EMS

EMS Practice

- EMS Definition
 - o Regionalization = Directing patient to specialized centers

PEM R | True in medical legal issues in EMS & Transport = Prehospital care providers are not covered under Good Samaritan law while on duty

Promo | Network of services coordinated to provide aid & medical assistance from primary response to definitive care involving personal trained in the rescue/stabilization/transportation/advanced traumatic/medical emergencies, Definition of = EMS

Amal | The system which provide for arrangement personal facility and equipment, for effective and coordinating delivery in geographical area is = Emergency medical service

Final | 8 Y/O ejected from car w/ severe multi-system trauma, hypotensive (BP 60), tachycardic (HR 165), unresponsive EMS Stabilized, then bypassed nearby general ED hospital (5 min) and went to pediatric trauma center (35 min), name of this = Regionalization of care

Final25 | Unrestrained passenger is ejected in a high-speed MVC. He has multi-system trauma, is hypotensive (BP 60 by palpation), tachycardic (HR 165), moaning but not following commands. EMS places a cervical collar, starts fluids, and bypasses a general ED 5 minutes away to transport to a pediatric trauma center 35 minutes away. This transport decision is an example of = Regionalization of care (Not Crisis resource management nor Disaster triage protocol nor Offline medical direction)

- EMS Scope of Practice
 - o EMR = 40hr = BLS/AED, Control hemorrhage, Manual Spine immobilization
 - o EMT = 110hr = Triage, IM Epi if part of Home meds Control hemorrhage (Tourniquet), C-Collar
 - o Advanced EMT = 200hr = LMA, ECG, IV/IM meds
 - o Paramedic = 1000hr = ETT/Circ, Defib/Pacing, Pneumothorax, Extended Meds

PEM R | EMT for MVA 12 Y/O w/ RD & Decrease breath sounds on Rt., your medical control = Tell EMT that paramedic on route, Needle decompression not within scope of practice

PEM R | EMT w/ Anaphylaxis, recommend = Give epinephrine bcz it is in his scope of practice

PEM R | 9 Y/O Asthma exacerbation, receiving salbutamol, on 2 Lpm NC w/ SpO2 90% = Advance EMT

PEM R | 8 Y/O boy eats cake, immediate anaphylaxis, EMS given Epi & Salbutamol, can't do IV access, level = EMT

PEM R | Advance EMT & Paramedic responds for 18 M/O w/ RD w/ decreased breath sound at Lt base w/ crackles then suddenly SpO2 86%, HR 182 BP 70/40 RR 12 Delayed CRT, agonal breathing, which Advance EMT can perform = Obtain peripheral IV access

Promo | Difference between basic EMS & Paramedic EMS = Manual defibrillator (Not Simple Ventilation nor C-Collar nor CPR)

Amal | Basic paramedic contacting you after evaluating 6 M/O girl with mottled skin with heart rate of 285, what you will advise them = Ice on the face (Not Get access of line nor Synchronized cardioversion 0.5 J/Kg nor Defibrillator)

- o Because the provider is Basic paramedic so he can apply Ice

Amal | Difference between Basic EMS and Advanced EMS (paramedic) = Manual defib (Not Assessed ventilation nor Cardiac compression nor C-spine immobilization)

Final | Difference between Basic EMS & Paramedics = Manual defib

Final | EMT-basic = Splinting

Chapter 7: Others

- EMS Pediatric

PEM R | NPRP & EMSC, ensuring high quality of ED care for children, what standard minimum equipment = Length based PEM, measuring tape or Peds drug reference based on length & age

Amal | Red Crescent is consulting you regarding pediatric transport equipment, which of the following statements regarding pediatric transport equipment is true = Adult paddles can be used if no pediatric paddles are available (Not Ambulance should have neonatal and adult self-filling resus bags or Ambulance should have Laryngoscope straight size 2 and above or Ambulance should have ETT size 4 cuffed and above)

Amal | Which of the following is true about prehospital providers care to children is correct = Require frequent refreshment about pediatrics life support knowledge and skills (Not They're comfortable managing critical ill children nor Frequently assess ventilation for children nor They infrequently 1-5 % transport critically ill or injured children)

- EMS Protocol

PEM R | 10 Y/O unrestrained MVA, extracted, having face/chest/thigh deformity, HR 150 RR 32 BP 82/46, parent doesn't want paramedic & will take patient to Peds ED, you advise = Provide emergent Tx & transportation per protocol

PEM R | 2 Y/O w/ Femur Fr. You order Paramedic to do IV access/C-Collar/Backboard and Transport, father doesn't want & appear intoxicated = Have paramedics treat & transfer to ED protocol

Promo | EMS contacting you about 12 M/O Unresponsive/Bradycardic/Poor Resp. Effort, caregiver reports DNR order during recent hospitalization but no paper documentation on hand, asking you regarding resuscitative efforts, estimated time of transport is 20min, advice to give = Proceed w/ Tx according to established Pediatric Treatment protocols (Not Provide BVM & CPR but no meds or Provide Supplemental O2 but No BVM/CPR or Provide no Tx in route in accordance to prev. DNR)

- During transport EMS should follow their policies

Amal | 12 M/O old unresponsive with bradycardia poor respiratory effort DNR no documented paper EMS call you in route will take 15 min to arrive to your ED and asking you what to do Your answer = Follow your transferee pediatric protocol & policies

- During transport EMS should Follow their policies
- All National or local or private has certain guidelines or protocols
- Physician for medical advice ONLY

Amal | 13 Y/O female, terminal case of AML, severe SOB and chest pain, DNR. Best Tx = O2 & Analgesia (Not Observe in ED without management or Send home without management or O2 and intubation)

- DNR patient support very well
 - IVF, O2 (not PPV), Stop SZ (until midaz infusion, call neuro, intubate then until SZ stops)
- In DNR if had Any effect or Side effect of my management = Treat them fully
 - Document & reason of why done & why reversed
- DNR if used Opioid then started to have apnea, I have to manage even if intubation
- Opioid be cautious when giving

Final | EMS contacted you regarding 12 M/O who is unresponsive, bradycardic and has poor respiratory effort. The patient's caregiver reports that the patient had a "DNR order" during recent hospitalization, but there is no paper documentation on hand. They are asking you regarding resuscitative effort. The estimated transport time is 20min. your advice to them should be = Proceed with treatment according to their established pediatric treatment protocols

- EMS Guidance

- Direct (online) = Real time supervision (phone/radio/offsite/onsite)
- Indirect (offline) = Protocol based

PEM R | 12 Y/O girl, MVA extracting from scene IV inserted & Fenta/Fluids given, ECG taken sinus tachy, EMS asks for ketamine, your role = Direct medical control when giving ketamine

PEM R | 6 Y/O MVA thrown 5 feet, No LoC but rt. Femur Fracture, during splinting & while trying to get IV, child is hysterical & anxious, paramedic asks you = Give IM Morphine

Chapter 7: Others

PEM R | 2 D/O FT, transporting for fatigue/poor suck, ambulance ground 25min away from hospital and passing other community hospital, now child has Adrenal crisis w K 8.9, nurse tells you doesn't have IV hydrocortisone next = Give IV Ca Gluconate

PEM R | 4 Y/O, head trauma, placed on rigid C-Collar w/ adult long backboard, what modification to do to immobilize child head on backboard = position one-inch padding under child torso (Sniffing position)

PEM R | 10 M/O child w/ bilateral anterior thigh burn 10% 2nd degree, recommend paramedic = Apply dry blanket
 ○ If cloth attached to skin = don't remove & cut around

PEM R | 14 Y/O medical complex Hx on Tracheostomy/GT, paramedic transferring this child w/ Temp 38.1, RR 38, paramedic asks what to do = Suction tracheostomy & transfer to children hospital

PEM R | 3 Y/O seizing for 35min, you ask for weight to give IV lorazepam, best way to do this by telling paramedic = use length based resus tape

PEM R | 3 Y/O Anaphylaxis w/ SpO2 88% on RA, grandmother insist to call parents to inform them of situation and to get their consent, you tell paramedic = initiate treatment & transfer pt to hospital

PEM R | Paramedic went home and saw child rigor mortis, next = Call coroner

PEM R | 10 Y/O femur fracture +2 distal pulse & intact sensation, EMT calls as child uncooperative, best response = Recommend EMT call regional paramedic for pharma intervention

PEM R | 5 w/o crying for 12hr, mother calls & EMS sees child not moving Lt thigh and swollen, mother now refusing transport, paramedic recommendation = call law enforcement

PEM R | EMS called infant leg burn, EMT finds small infant w/ multiple bruise in different stages of heal, true in medical legal issue = EMT mandated report for suspected child abuse

Amal | 2 Y/O girl, choked in small rubber ball, EMS found her pulse less and not breathing, she should be transferred to which hospital Hospital A: Has ED and small in-patient Ward 2 min away Hospital B: Has ED and large in-patient Ward and ICU and 6 min away = Transfer to Hospital A

Amal | Which of the following disease is most common in all age group to be taken care of by EMS = Respiratory Distress (Not Toxin ingestion nor Seizure nor Submersion)

Final | Found by classmate unconscious in toilets, she just moved to new school 3 weeks ago w/ no friends, 1st priority should be addressed by EMS = Ensure patient airway & supportive care

Final | Child in daycare being assessed by EMS due to Multiple events of staring in space followed by confusion, Parents not answering, EMS crew asking for guidance = Transport to ED while attempting to reach out to parents (Not IM Midaz)

EMS Transport

- Air Travel Preparations

- During Ascent, External pressure on trapped gas decreases, allowing its volume to expand (Boyle's Law). This expansion increases the risk of rupturing the confined space in which the gas is trapped in (Risk of: Barotrauma, Air in ETT cuff rupture)
 - Boyle's Law: At a constant temperature, the pressure of a gas is inversely proportional to its volume
- Preparations
 - Any tube w/ air = Change to Saline
 - Pneumothorax = Insert Chest tube
 - Fixed wing + Head trauma = Pt. Head toward front of plane

PEM R | 13 Y/O w/ head trauma transporting w/ aircraft fixed, before dispatching which to address = Pt. Positioning in cabin

PEM R | 15 Y/O w/ pneumothorax for helicopter transport to level 1 trauma center, must be done prior = insert chest tube

PEM R | 8 Y/O MVA, intubated, parent consent transport via helicopter to nearest pediatric trauma 100 miles, prior to transport = Fill ETT cuff w/ Saline

PEM R | 4 Y/O girl, multiple MVA, transferring physician report normal vitals, 10% pneumothorax on Rt. Side, 5mm frontal Subdural hematoma w/ no midline shift, air transport team arrives via fixed wing transport, Vital signs GCS 14 HR 120 RR 20 BP

Chapter 7: Others

100/60 SpO2 97% on FiO2 100%, x2 large IV placed, instructions to air transport team should include completion of which procedure before departure = Thoracostomy tube placement

Promo | Which of the following is complication of Air-Transport = Air embolism

Promo | O2 pressure on Airplane = 100 (Not 90 nor 70)

- 100-125 mmHg, usual pressure inside plane = Atmosphere pressure in 5-8 thousand feet height

Final | What the oxygen pressure in the airplane = 100 (unsure not 90 or 70)

- In Airplane at 6,000-8,000 feet, the total barometric pressure ~ 560-590 mmHg (down from 760 mmHg at sea level), and the partial pressure of oxygen (PaO2) drops from ~159 mmHg (sea level) to roughly **110-120 mmHg** in cabin

Final | Transfer in fixed wing intubated = Deflate tube and water (Not Elective chest tube)

Final | Pt. Was intubated will transferred by Fixed wing = Deflate cuff tube & add water in it

Final | fixed wing ETT before go = deflate + put saline (cuz it doesn't rupture during flight)

Final | Child with MVA simple pneumothorax for fix-wing transport = Put Chest tube

Final | Which of the flowing is of complication of air transport = Air embolism

- Transport Choice & Time

- Ground = | Available, Divert, Low cost, ICU, | Slow, Traffic/Weather delay
- Helicopter = <150 mile | Fast, reach inaccessible | No depressure cabin, Need landing, High cost
- Fixed Wing = >150 mile | Fast, depressure cabin | Need runway + ambulance, High cost

PEM R | 5 Y/O boy fall from tree near hospital stabilized & want to transport 20 miles away pediatric trauma center = ALS ground transport

PEM R | 25miles away from Peds hospital, having 12 Y/O displaced Lt closed supracondylar Fr, given morphine & immobilized, for transfer to Peds ortho, best mode transport = Ground ambulance following all traffic laws

- Stable = Ground ambulance following all traffic laws
- Unstable = Ground ambulance Light & Sirens

PEM R | 16 Y/O scuba diving 2 days ago, having now Joint pain & lethargy, on 100% O2 15 Lpm, continues to have worsening mental state,, tertiary ED is 140 miles away, best mode = Fixed wing aircraft

- Diving injury w/ Decompressions sickness type 2 = Needs Fixed wing w/ depressure cabin & Hyperbaric

PEM R | 12 Y/O, CT head shows minimal depressed Lt parietal skull Fr w/ underlying 4mm epidural hematoma, cerebral edema, no midline shift, NSx 250 miles away, fixed wing faster mode, ETT cuff inflated by saline, 2 large IV cannula, what to do before = position patient head toward front plane (Fixed wing)

PEM R | 12 Y/O MVA w/ GCS 7, using helicopter to transfer pt, has c-collar x2 IV lines, ETT, next = Replacing air ETT cuff w/ water

PEM R | Neonate w/ cyanosis & RF intubated w/ HFOV, SpO2 75 FiO2 100%, CXR (Pneumomediastinum)= Arrange helicopter w/ low altitude along the coast

- Angel wing sign = Pneumomediastinum = usually only needs analgesia

PEM R | when considering interfaculty transport if sole basis of decision of transfer is the EMTALA violation = Expense of ambulance transport

PEM R | Transferring pt. For 150 miles away by helicopter, you have sinusitis w/ mild facial pressure, to do = Arrange for another transport physician to go on transport

Promo | Time for Helicopter to fly = 2hr (2.5-5hr)

Promo | Helicopter Transfer policy = If Extraction time > 20min (Not During bad weather indicated)

Amal | Indication for helicopter transfer = EMS report an in-trapped trauma patient with extraction time more than 20minutes (Not Stable patient who has high insurance coverage. Nor Referring facility wants to send the patient as soon as possible. Nor Weather conditions are poor for ground transfer and will cause delay (what's too bad in ground it is bad for air)

Final | What is time for helicopter to fly = 2 hr

Final | Helicopter transportation of patient which scenario = Prolonged extraction from scene > 20min

Chapter 7: Others

Disaster

- Jumpstart Triage

- Black (Dead) = Not moving > Adjust Airway > Check Breath > Check Pulse > Give 5 Breaths
 - Breathing: Positioning > Pulse > 5 Breaths = No Improve
 - Pulse: No
- Red (Immediate) = Not walking > Check Breath > Check RR > Check Pulse > Check AVPU
 - Breathing: Positioning > Pulse > 5 Breaths = Improves
 - RR: <15 or >45
 - Pulse: Yes
 - Mental: PU
- Yellow (Delayed) = Not walking > Check Breath > Check RR > Check Pulse > Check AVPU
 - RR: 15-45
 - Pulse: Yes
 - Mental: AVPU
- Green (Minor) = Walking wounded

PEM R | 8 Y/O walking crying using Jumpstart = Minor & ask him to wait

PEM R | Severe EF5 tornado w/ nearby elementary school collapse, overwhelming number of children, 6 Y/O emerges from debris, cries, stand up walks, using pediatric jumpstart triage = Minor & direct to her secondary triage

PEM R | 4 Y/O victim mother brings him from beneath large beam, he was GCS 15 then becomes agitated & complains of difficult breathing & gagging, mother say he has nut allergy & want you to give auto injector as appears anaphylaxis to her, Best = Open airway & give rescue breaths

- SALT = Mass casualty (universal for all ages)
- Jumpstart = Any Peds disaster (< 8 Y/O or < 30 Kg)
- Reverse triage = Lightning Disaster (looks dead = safe 1st)

PEM R | Jumpstart, child lying on back unresponsive, given 5 rescue breaths and still not breathing but continues to have pulse, what category = Expectant Black

PEM R | which to jumpstart yellow = Crying toddler holding onto adult w/ Periorbital & postauricular bruising pushing you away

PEM R | large influx of number of Peds +50 victims, what you will treat first = 8 Y/O boy has abdominal bruise w/ abdomen pain RR 46 Radial pulse +2 bilateral w/ awake but moaning in severe pain

PEM R | 5 patients in ED which prioritize = Tom bruising over abdomen w/ pain, RR 30, awake/alert

Challenger | EMS at scene of multi-car involving school bus, multiple pediatric victims, limited resource at scene, patient should receive urgent care = 7 Y/O w/ SOB & Rt sided rib pain HR140 RR 40 (Not 6 Y/O who is apneic HR 30 with weak pulses & remain apneic after 5 rescue breaths. Nor 8 Y/O head injury who is appropriately responsive to verbal stimuli HR 120 RR25. Nor 5 Y/O w/ obvious femur fracture HR 120 RR 30. Nor 7 Y/O ambulatory child bleeding from large scalp laceration)

Promo | You are a member of EMS team arriving at a Mass causality children incident & your team is running out of resources, first to triage = 10 Y/O HR 30 Apneic after you adjust airway still apneic (Not 12 Y/O unconscious but responds to pain nor 8 Y/O w/ Femur Fr. & Stable Vitals)

Amal | EMS relatively limited resources at the scene. Which of the following patient should receive the most urgent care = 8 Y/O who's apneic with weak pulses and remains apneic after adjusting airway (5 breaths in jump start not given)

Final | You are assessing multi injured children by MVA, first child obvious forearm injury HR120 RR30, second child 4 years old with right chest pain and respiratory distress HR140 RR40, third child apneic HR30 after giving 5 rescue breath, fourth child head injury responding to you. Which child will need urgent assessment and management = Second Child (Not Third)

- Similar to MD Challenger Q!
- Dr. Amal: Good resource or In hospital = use regular Triage
 - No resource = use Disaster triage

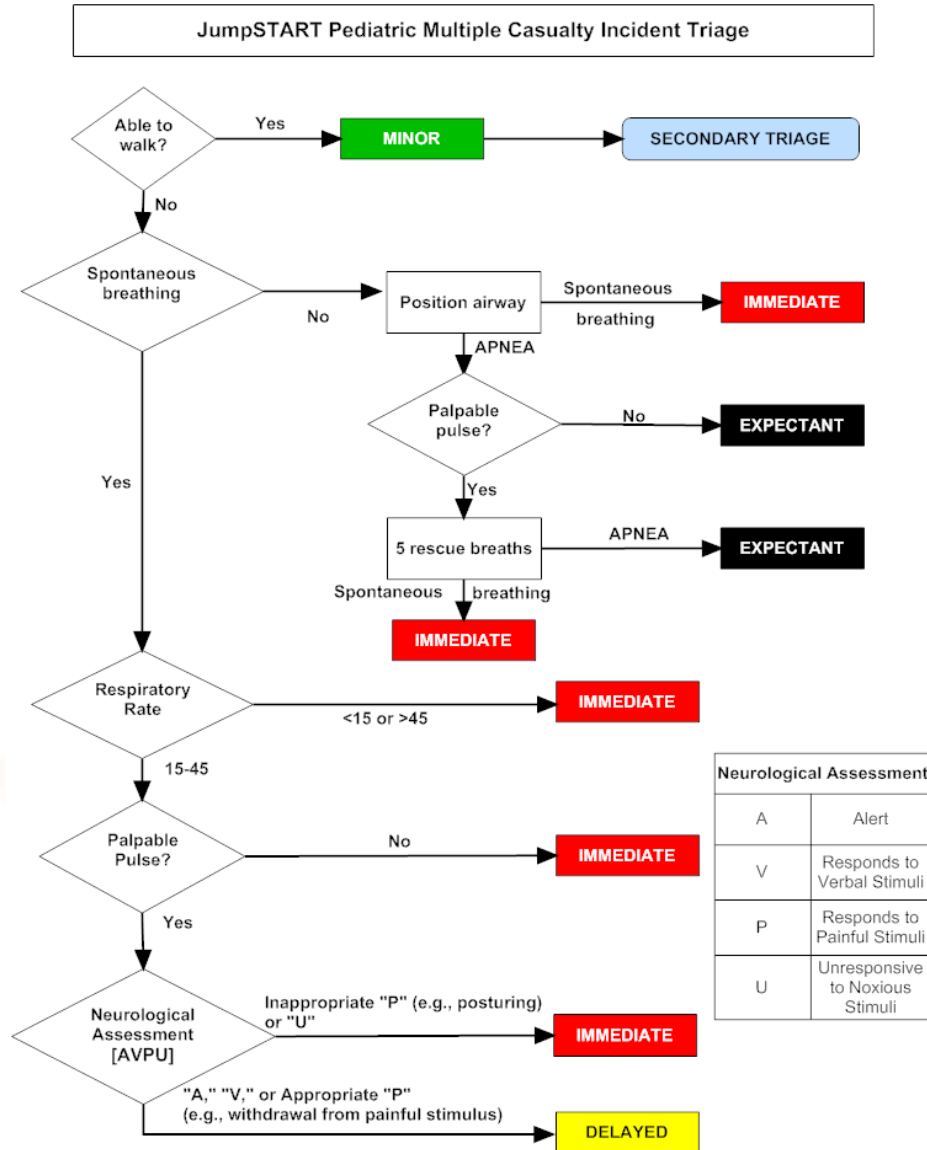
Final | Triage child = Green (walking wounded)

Final | Trauma case w/ Multiple cases for trauma triage which case will be immediate care = ? Triage assessment 2nd child

Chapter 7: Others

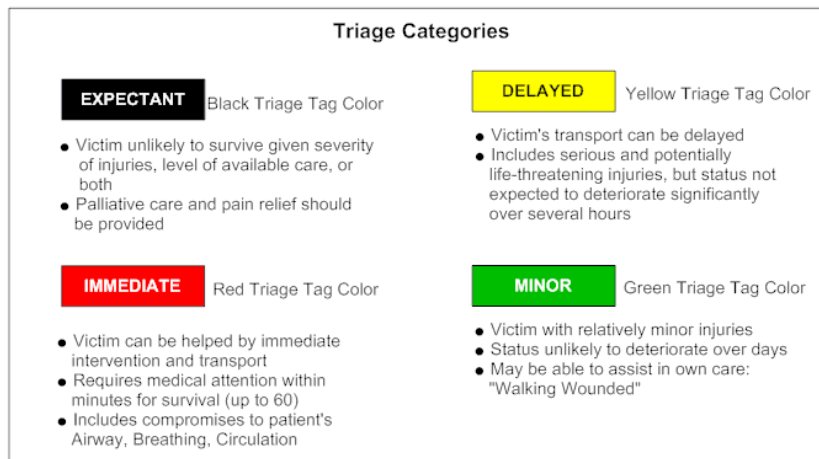
Final | EMS triage of mother and baby and all stable = Second triage the child

Final | You are a member of EMS team arriving a mass causality children incident & your team is running out of resources. The first to triage is = Xy.o. HR 30 bpm, apneic. After you adjust airway remained apneic (Must give 5 rescue breath first before declare him) (Not Xy.o. unconscious but respond to painful stimuli)



Use JumpSTART if the Patient appears to be a child.

Use an adult system, such as START, if the patient appears to be a young adult.



Chapter 7: Others

- Disaster Approach

PEM R | MVA & family involved, as you approach minivan you see fluid leaking from vehicle w/ power line down, 1st priority = Scene assessment

PEM R | during gas line explosion, you hear multiple cries for help, but notice unstable rubble falling w/ rotten egg smell & loose electrical wire, 1st priority = Assess safety of scene

Promo | In Disaster code, what is best = ER Doctor in ER (Not ER doctor in scene or CPR in ED)

Amal | The most single important medical activity at disaster site is = Triage

Amal | Goal of disaster triage = Priority to most salvageable with most urgent conditions

- Normal triage = any critically ill
- Disaster triage = most salvageable

Final | Scenario of terrorist in school triage aim to = Salvageable care

Final | Car accident w/ multi victims & some leaking of petrol/benzene, what immediate respond by EMS = Assess scene first

Final | In disaster code what is the best = ER doctor in ER (Not ER doctor in the scene nor CPR in the ED)

- Best answer ensures safety of the scene, then ER doctor in ER

Outbreak

- Ebola

PEM R | 16 Y/O, child recently returned international air worker, having fever body aches, diarrhea, vomiting, Hypotensive, what PPE = powered air purifying respirator & coveralls

Amal | In regards to Ebola virus outbreak, what is true = Virus is transmitted to people from wild animals then transmitted from human to human (Not The average fatality rate is 7%, used to be higher as 90% in previous outbreaks or Community engagement is not considered a key to successful controlling outbreak or Early supportive care is needed but will not improve survival)

- Coronavirus

Amal | What true regard Middle East Respiratory outbreak = Coronavirus can cause disease ranging from a common cold to a severe acute respiratory syndrome (Not WHO recommends the application of travel or trade restrictions and interest screening guidelines to MERS cough. Nor No vaccine or specific treatment is currently available. However, there are two vaccines undergoing tests trials. Nor The consumption of raw or undercooked animal products including milk and meat carries no risk of infection)

- Study the trendy disease, might bring questions regarding it

Chapter 7: Others

Ethics, Research

Ethics

Promo | Child w/ signs of Abuse, mother confessed that father hitting him, you planned to report it, this action is = beneficence

Promo | Mother brought son 2 M/O looking well, Mother refused LP but then agree, what do you consider her action =

Autonomy (Not Maleficence nor Justice)

Final | Fellow, Paternalism conflict = Autonomy

Final | Doctor devotion and sincere is what profession = Doctor (Not To college nor To community)

Final | ALL for BMA asking what is wrong = encourage family to explain to child

Final | 14 Y/O newly Dx ALL, parent didn't tell him & he is asking why BMA = tell pt bcz its his right to know (Unsure, but Not consult psych & keep family outside & follow SPIKES protocol)

Final | Ethics = Moral principles

Amal | Which of the following is an ethical justification to start and continue CPR = Well known reversible and treatable illness (Not Expired DNR order nor Non survivable trauma nor Persistent poor quality of life)

Amal | If you perform a procedure on someone without the consent, it's considered = Battery (No jail time -تعدي-) (Not Assault (Jail time -اعتداء-))

Chapter 7: Others

Research

Promo | Why take consent in a RCT (Incomplete Q/A)

Promo | New Abx released, If next year the authors want to write article about it, they will face = Publication bias (Not Selection bias nor interviewer bias)

Promo | Risk of reduction calculation in Group1 treated w/ Ondansetron 14 out of 100 developed vomiting & Group 2 treated w/ Placebo 35 out 100 developed vomiting, Risk reduction is = 0.5 or 0.4 or 0.28 (calculating RR)

Promo | Comparing Asthmatic children who receive systemic steroid + Beclomethasone vs Systemic Steroid + Placebo, Return in 1st group 25/100 & 50/94 in 2nd group, relative reduction is = 50% or 25% or 12.5% or 100%

Promo | The factor that affect one group of the study & at the same time affect the control group is = Independent factor

Promo | 200 women doing exercise & 300 women with no exercise, afterword years 20 women from exercise group developed Osteoporosis vs 30 from other group, design of this study = Cohort or Cross-Section or Case Control

Promo | one is true = Predictive value of negative test is the probability that and individual testing negative is truly non-affected

Promo x2 | Which of the following give precision of the test = CI (SD) or NNT or Relative Risk

Promo | It has been reported in 2006 that the rate of head injuries in 5-7 Y/O boys was 5.6 per 10000, Rate called = Prevalence

Promo | Study Conducted comparing outcome between presence of physician & nurses in triage & presence of nurses only in triage, study detected significant differences but in reality there is no difference, type of error = Type I error

Amal | Percentage of cases among those screened positive on screening test that have the disease is = PPV (Not Sensitivity nor Specificity nor NPV)

- Definition of PPV

Amal | in 2006 rate of head injury in 5-7 years old was 5.6/10000, what is this ratio called = Prevalence

- Incidence = New cases rate at no specific time
- Prevalence = Existing cases rate at certain time

Amal | Prevalence = Cross sectional

Amal | A new type of antibiotic getting the press attention. A selected Journal informed authors that it will give priority for articles focusing on new antibiotic, journal at risk of = Publication bias

Final | best for data distribution = Standard Deviation

Final | Categorical variable more then one type of test = Chi square

- Continues = P value
- Categorical = Chi square

Final | Disease incidence in a country in 400/100000 and all the world 150/100000 we call it = Endemic (Not Pandemic or epidemic or hyper endemic)

Final | 100,000 visit/year, 5 week vacation, 2.5 pt/hr/physician, 30 hr/wk/physician, How many physician you need in ED = 28 physicians

Final | Statistics a variable that when it change it will change the other variables what do you call it = Independent

Final | Study effect of soda on obesity, type of study = Cohort

Final25 | you do a study to see the relation of smoking and lung cancer and you fine 1000 people who smoked have lung cancer and ask about Risk ratio of 17 meaning = Smokers are 17 time risk to have lung cancer compared to non smokers (Not 17 more cases in smoking group than non smoking nor 17% higher chance to get cancer nor 17 folds higher)

و صلى الله و بارك على حبيبنا محمد

(وَأَخِرُ دَعْوَاهُمْ أَنِ الْحَمْدُ لِلَّهِ رَبِّ الْعَالَمِينَ)

رقم الإيداع: ٢٥٠٩/١٤٤٨

ردمك: ٨-٦٧٦٢-٠٦-٦٠٣-٩٧٨