Pedpourri – Pediatric Disorders I&II

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 HAT at the Back of the Room!!!!
Can You Hear me now???
FIRST...
SOMETIMES YOU HAVE TO THINK ABOUT THINGS!
NOW FASTEN YOUR SEATBELT
- Review Pediatric by Systems
- Recommended Reading
  - Fleischer and Ludwig 6th Edition
  - ACOEP.org
  - AAP.org
Challenges Facing Today’s ED

- Total outpt. visits steadily ↑ over last 25 years\(^1\)
- 2007 AHA Survey of Hospital Leaders found reported ambulance diversion due to\(^1\):
  - Lack of staffed critical care/general beds
  - ED overcrowding
  - Staff shortages

- Most children are cared for in general EDs
  - Only 7% of US hospitals have a separate peds ED\(^2\)
  - EMSC current Peds Preparedness Survey
    - [www.pedsready.org](http://www.pedsready.org)


Airway and shock mgt paramount
Head injury: ↑ morbidity & mortality
Forces over small area → multi-system injury
Kids die from hypoxia and resp arrest
Psych sequelae
Often 3 patients in the room not 1
Ped Cardiopulmonary Arrests

This is Why we do what we DO!
A1. PEDIATRIC RESUSCITATION

Check for response

No movement or response:
Send someone to call EMS
Position patient face up on a flat, hard surface

Lone rescuer:
Complete 2 minutes of CPR, then call EMS

Open Airway

Lay rescuer: head tilt, chin lift, for both injured and uninjured.
Healthcare provider: head tilt-chin lift for uninjured;
jaw thrust for suspected cervical spine injury

Check for Breathing

Lay rescuer
Not breathing or only gasping

Healthcare provider

Check pulse (optional): DEFINITIVE pulse felt within 10 seconds?

Yes
Rescue breaths:
Give 1 breath every 3 seconds
Recheck pulse every 2 minutes

No
Start cycles of 30 compressions and 2 breaths *
Push hard and fast (100/min) and release completely
Minimise interruptions in compressions

* Following intubation:
Provide 100 – 120 compressions per minute with 8-10 ventilations per minute

If not already done, call EMS
Continue CPR until help comes or victim starts to move
PALS Major Changes 2010

- Emphasis on “compressions first
  - Vast majority of cardiac arrests in kids are respiratory
  - Only 5-15% of pediatric cardiac arrests are attributable to V-fib.

- Rate: Minimum of 100 events/minute

- Minimal interruptions with cycles of two minutes

- One rescuer (30:2); Two rescuer (15:2)

- Neonatal resuscitation maintains the standard “ABC” approach with a 3:1 (compression to breath) ratio.

Circulation 2010: vol 122
Respiratory failure #1 cause of arrest

No surgical airway <10yr---Needle Crich

ET tube size-uncuffed: 4+ (age/4)

Cuff tubes for ALL (except Neonate)! (age/4) + 3

LMA as rescue-weight based sizing
Anatomical Airway Issues in Kids

- big tongue, floppy soft tissue → obstruction
- Anterior & Superior larynx
  - short trachea
  - narrowest at subglottis (cricoid)
  - nose breathers < 6 mos
  - big occiput
  - Big/floppy epiglottis → straight blade
No strong evidence to support prevention of aspiration with cricoid pressure.

No strong evidence to prove that it is harmful, however there are some bad case reports:
- Decrease effectiveness of BVM
- Impedes use of LMA/ILMA
- Can fracture cartilage
- Laterally displaces the esophagus as opposed to completely occluding it.

Cricoid Pressure-Conclusion
Epinephrine into the muscle allows for
  ◦ more rapid absorption
  ◦ leads to higher blood levels than if injected into overlying fat

Ultrasound: skin surface to muscle depth

Measured weight, height, waist circumference, & BMI

Injecting Epinephrine into the Lower Rather Than Upper Thigh May Be More Effective in Overweight Children. Arkwright, MD, PhD, FAAAAI, et al.
At ¼ down the thigh
- 82% of the obese children skin/muscle depth greater than needle length.
- True for 25% of the non-obese children

¾ down the thigh
- Skin/muscle depth surpassed the length of the autoinjector

TAKE HOME: If overweight, consider lower thigh vs. calf
- IO indicated in any age group at any time during resuscitation
  - No age maximum
- Crystalloid: 20 ml/kg (newborns 10 ml/kg)
- If still shock after 40-60 ml/kg, consider
  - Blood if trauma
  - Pressors if sepsis
Intraosseous line use, complications, and outcomes among a population-based cohort of children presenting to California hospitals. 

Hansen M, Meckler G, Spiro D, Newgard C.

Abstract

450 California hospitals and EDs - 2005 - 2007

All children aged 0 to 18 years with ED or inpatient visits

RESULTS:

291 IO lines placed in 90 hospitals (239 in the ED and 52 inpatient).

6,660,564 pediatric ED visits and 2,276,231 pediatric admissions,

incidence of IO line placement of 0.04 per 1000 ED visits and 0.02 per 1000 admissions.

Mortality 37% among patients with IO

The most common diagnoses included cardiac arrest (34%), trauma (19%), and respiratory failure (6%). No complications were identified.
Shock Assessment
- Earliest sign is tachycardia
- Hypotension is late sign

Compensated shock
- Tachycardia, poor skin signs may be only early signs
  - Decreased mentation, UOP, narrowed pulse pressure

Decompensated shock
- Hypotension below minimal SBP
  - Minimal SBP = 70 + (age in years x 2)
Drugs/Shock

- **Epinephrine**
  - 0.01 mg/kg (0.1 ml/kg of 1:10,000 solution) IVP
  - ETT dose 0.1 mg/kg (0.1 ml/kg 1:1,000 solution)
  - High-dose IV Epi no longer used

- **Atropine**
  - 0.02 mg/kg IV/IO (minimum dose 0.1 mg)
  - Only PALS indication is symptomatic bradycardia
    - Epinephrine still first line
  - Not used for neonatal resuscitation
Electricity

- Cardioversion
  - 0.5-1 J/kg first dose
  - 2 J/kg subsequent doses

- Defibrillation
  - 2 J/kg first dose
  - 4 J/kg subsequent doses
Neonatal Resuscitation

- Heart rate most important factor
  - If >100/min, okay
  - If <100, give PPV
  - If <60 despite stimulation, PPV, and O2, start CPR and give epinephrine

- Atropine not used for neonatal resuscitation

- Umbilical vein can be used for fluids and medications
Anatomy and Physiology

- Cardiovascular
- Respiratory
- Neurologic
- Musculoskeletal
- Gastrointestinal
- Renal
- Thermoregulation
- Metabolism
- Glucose requirements
Growth and Development

- **Neonates:**
  - Higher surface area to mass ratio = heat loss intolerance

- **Airway:**
  - Large occiput
  - Floppy glottis

- **Breathing:**
  - Obligate nose breathers
  - Diaphragm dependent

- **Circulation:**
  - CO = HR x SV — Hypotension is LATE!
• High Emotions
• Many questions w/few answers
• Importance of communication
• Family Centered care
  • Spend the time and LISTEN to them
  • Try not to point out mistakes
  • Remember to EDUCATE as well
  • Personalize any issue if possible
  • Contact PMD when possible
- Priorities are similar to adult
- Greater emphasis on airway, breathing

**Patient Assessment**

- **1° Respiratory**: 10%
- **Shock**: 10%
- **1° Cardiac**: 80%
Patient Assessment

- Limit to essentials
- Look before you touch
- Rapport
  - Get down to their level: Mentally and Physically
  - Smile
  - Play
  - Distraction
  - Parents
    - Painful/anxiety provoking exam last
    - Give parameters for child to deal with
    - Don’t give options they don’t have...
Pediatric Assessment Triangle: First Impression

- Appearance - mental status, body position, tone
- Breathing - visible movement, effort
- Circulation - color
Initial Assessment

- Identify / correct life threats
- If not correctable,
  - Support oxygenation, ventilation, perfusion
  - Transport
General Assessment Concepts

- Children **not** little adults
- Do **not** forget parents
- Do **not** forget to talk to child
- Avoid separating children, parents unless parent out of control

- THE ENEMY OF GOOD IS BETTER!!!!!!!
General Assessment Concepts

- Children understand more than they express
- Watch non-verbal messages
- Get down on child’s level
- Develop, maintain eye contact
- Tell child your name
- Show respect
- Be honest
General Assessment Concepts

- Kids do **NOT** like:
  - Noise
  - Cold places
  - Strange equipment

- Or Spiders
Vital Signs

- Essential elements
  - Proper equipment
  - Knowledge of norms

<table>
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Weight

- Why is weight a pedi vital sign?
- \((\text{Age [yrs]} + 4) \times 2\)

- All pharmacologic interventions & Treatments are WEIGHT based
Heart Rate

- Apical auscultation
- Peripheral palpation
- Tachycardia may result from:
  - Fear
  - Pain
  - Fever
  - OR???????
Heart Rate

- Tachycardia + Quiet, non-febrile patient = Decrease in cardiac output
  - Heart rate rises long before BP falls!

- Bradycardia + Sick child = Premorbid state
  - Child < 60
  - Infant <60
Blood Pressure

Children >1 year old
  ◦ Systolic BP = (Age x 2) + 80

  • Minimums: (Age x 2) + 70 (this is the lowest 5\textsuperscript{th} percentile)

  • Max: (Age x 2) + 90 (this is the 95\textsuperscript{th} percentile)
Blood Pressure

- **Hypotension = Late sign of shock**
- Evaluate perfusion using:
  - Level of consciousness
  - Pulse rate
  - Skin color, temperature
  - Capillary refill
Hypotension: LATE sign: kids compensate well

- $\geq 25\%$ loss of blood volume

Scalp laceration can cause shock in infants and younger children
Respirations

- Before touching
- For one full minute
  - (yeah right!)
- Approximate upper limit of normal = (40 - Age[yrs])
Respirations

- > 60/min = Danger!!
- Slow = Danger, impending arrest
- Rapid, unlabored
  - Metabolic acidosis
  - Dehydration
  - Shock
Neurologic Emergencies
Headache

- **Vascular**
  - Fever
  - Migraine-increasing incidence
  - Systemic HTN
  - Hypoxia

- **Muscular**
  - Tension
  - Fatigue

- **Inflammation**
  - Intracranial infection
    - Meningitis
    - Encephalitis
  - Dental infection
  - Sinusitis
  - Otitis media / externae
- Increased Intracranial Pressure
  - Cerebral edema
  - Hydrocephalus
  - Intracranial Hemorrhage
  - Abscess

- Tumor
  - Beware Headache with neck pain!

- Spinal-Headache s/p Spinal tap

- OTHER:
  - Post-traumatic, psychogenic, etc.
- Encephalopathy associated with Aspirin use in kids
- Most (90%) with prodromal illness
  - Varicella was the predominant illness
- Vomiting
- Followed by Altered mental status
- Usually reversible with supportive therapy
- Mitochondrial injury
  - Hepatic dysfunction

Reye Syndrome
Meningitis

- Kernig Sign
- Brudzinski Sign
- Fever
- Nuchal rigidity
- Headache
- Nausea / vomiting
- Photophobia
- Seizures
- Altered Mental Status
  - Irritability / paradoxical consoling / “Lethargic”
- Bulging fontanelle
Meningitis Bacterial—Most common

- **Newborn**
  - Grp B Strep (GBS)
  - Gram Neg bacilli (E.Coli)
  - ??Listeria?? (1-3%)

- **>1 to <3 months**:
  - GBS
  - Gram Neg bacilli (E.Coli)

- **>3mo to <10yr**
  - Strep pneumo (older)
  - N. Meningiditidis (older)
  - Grp B Strep
  - Gram Neg bacilli

- **>10 and <19**
  - N. Meningiditidis
Meningitis Viral

- **Enteroviral** (summer)
  - Poliovirus, Coxsackie, etc
  - Higher Fever (38-40)
  - ?Biphasic
  - Systemic findings
    - Conjunctivitis
    - Pharyngitis

- **Arboviruses**
  - Encephalitides
    - Fever
    - Chills
    - HA’s /N/V
    - No focal Neuro finding

- **Herpes**
  - HSV
    - Fever/AMS/Seizures
    - Bloody tap
Meningitis the Weird

- Fungal
  - Cryptococcus
  - Candida
- Leptospirosis
- Syphilis
- Tuberculosis
- Ehrlichia Canis

- Parasites
  - Trichonosis
  - Toxoplasmosis
  - Cysticercosis
  - Maria

- Mycoplasma
- Rickettsia
Non-Infectious

- Neoplasm
- Hemorrhage
- Hypersensitivity rxn
- Heavy Metal Poisoning
- Collagen Vascular Dz
- Sarcoidosis
- Kawasaki’s
- ABCs
- O2 & assist ventilations as needed
- Check blood glucose
- IV
- Spinal Tap
  - **NOT A LIFE SAVING PROCEDURE!!!!!**
- Steroids before antibiotics???
- Antibiotics (Cephalosporins)
  - Newborn: Amp & Cefotaxime
  - >1month: Ceftriaxone
- Treat increased ICP & Shock as needed
Sequelae of Meningitis

- **Early:**
  - Apnea, Shock, Hypoglycemia, Hyponatremia, Seizure

- **Late:**
  - Hyponatremia, Subdural empyema, Seizures

- Hearing deficits.....what?
- Developmental Delays
Seizures

- Status epilepticus
  - Classic definition is any seizure persisting more than 30 min OR greater than one seizure without return of consciousness
  - Recent recommendation that it be defined as a single seizure lasting longer than 5 minutes or 2 or more seizures without return of normal cognitive function
- Any child seizing on ED arrival should be considered in status
Status Epilepticus: Treatment

- Benzo’s
  - Lorazepam
  - Midazolam
  - Diazepam

- Phenytoin / fosphenytoin

- Phenobarbital
Treatment pearls

- Diazepam considered 2nd line after lorazepam

- Anticonvulsant duration
  - Diazepam <20 min, Lorazepam 4-6 hours

- Phenobarbital levels
  - 1 mg/kg raises level by approximately 1
Febrile Seizure

Simple
- Brief: less than 15 min.
- Occurs only once in a 24-hour period
- Generalized seizure without focal findings
- Age range: 6 months – 6 years

Complex
- The opposite of simple

1/3 will have another febrile seizure later in life.
- Doubles risk of epilepsy of general population
  - 0.5-1% to 1-2%
Simple Febrile Seizure

- Diagnostic Evaluation
  - Glucose level
  - Fever evaluation based on age and PE
    - Risk of serious bacterial infection same as similarly aged febrile patient without a seizure
  - No need for routine electrolytes, calcium, magnesium
  - No need for CT or EEG
- Diarrhea?----Shigella aka Shakella
Simple Febrile Seizure

- Lumbar puncture after 1st seizure?
- AAP suggestions
  - Consider strongly if <18 months with any of following:
    - history of irritability, decreased feeding, or lethargy
    - abnormal appearance or MS after postictal period
    - any physical signs of meningitis
    - any complex features
    - any slow postictal clearing of mentation
    - pretreatment with antibiotics
  - If all are absent, LP can be safely deferred
- AAP recommendations from 2011

Simple Febrile Seizure

- Most are discharged home (if not all)
- Reassurance
- Close follow up with PMD
- Return for repeat seizure
- Antipyretics---
  - Cannot stop a febrile seizure from occurring
  - Support patient during seizure
  - Don’t just do something….stand there!
Hyponatremic Seizures

- Generally seen with sodium < 120 mEq/L
- Treatment: 5 cc/kg of 3% saline over 10 min
  - Should raise sodium by 5 mEq/L
WORK UP

➢ Toxic appearing or Focal Neurologic Deficit?
  ◦ Do everything- CT, Labs, Tap, etc.

➢ Well Appearing?
  ◦ Nothing to do
  ◦ Arrange outpatient follow up

➢ Known Epilepsy?
  ◦ Check medication levels
  ◦ Contact Neurology or PMD to discuss
### Neonatal Seizure

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<tr>
<th>Etiology</th>
<th>Treatment</th>
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<tr>
<td>Hypoxia</td>
<td>A - B - C’s</td>
</tr>
<tr>
<td>Hypoglycemia</td>
<td>Oxygen -?Nasal trumpet</td>
</tr>
<tr>
<td>Hypocalcemia</td>
<td>Benzodiazepine</td>
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<tr>
<td>Opiate withdrawal</td>
<td>Glucose</td>
</tr>
<tr>
<td>Trauma</td>
<td>Phenobarbital</td>
</tr>
<tr>
<td>Infection</td>
<td>B6 10mg/kg IV</td>
</tr>
<tr>
<td>Pyridoxine deficiency</td>
<td>Folinic acid 2.5mg IV</td>
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</table>
True infections are within 1st 6 months of surgery
- Most within 2-4 weeks

Exceptions:
- Pus in peritoneum (i.e. ruptured appy)
- V-Atrial shunts – infection from Bacteremia
- V-Pleural shunts – infections from pneumonic process
Fever
  ◦ Low grade, intermittent, or high temp
Abdominal pain?
Signs of cellulitis over shunt
  ◦ Erythema, calor, dolor
After 6 months—treat child as any other their age
Meningitis outside 6 mo post-op phase is the same as a child without hardware
- Call Neuro-Surgery ASAP
- Tapping the shunt?
  - Preferably done by the Neuro-Surgeon
  - CT prior to ensure no mass effect
- Antibiotics
- Admit
Shunt Failure

- Signs of ICP
  - Vomiting
  - Headache / alteration of mental status
  - LISTEN TO THE PARENTS!!!!
  - Cushing’s reflex (↑Bp, ↓pulse, irregular RR)
    - Elevate head of bed 30 degrees
    - Mannitol vs. Hypertonic saline
    - Shunt tapping in emergency

- CT or Fast MRI
- Shunt series x-rays
Cardiovascular Emergencies
Accounts for 90% of arrhythmias in children
- Infants present before 4 months of age
  - Irritable / fussy
  - Feeding issues
- Rate 220-320 bpm
- Males 3:2

Dysrhythmias- SVT
- Idiopathic 50%
- Causes (24%)
  - Fever
  - Infection
  - Drug exposure
- Congenital Heart Disease 23%
- Wolf Parkinson White 22%
Vagal maneuvers
- Dive reflex (newborn)
- Rectal Stimulation (newborn)
- Knee to chest
- Blowing in a tube

Adenosine if stable

Synchronized cardioversion if unstable
- Epinephrine

- Atropine only if there is a cholinergic cause for the bradycardia
Neonatal Circulation

Figure 2.209. Diagram of normal fetal circulation. For discussion, see text.
Congenital Heart Disease

- Occurs in 6-13/1000 live births
- **Blue baby**: right to left shunting: ToF, TGA, TAPVR, single ventricle, pulmonary atresia, Tricuspid Atresia, Truncus arteriosus
- **Mottled or gray baby**: systemic outflow tract obstruction: Coarctation, aortic stenosis
- **Pink baby**: CHF with left to right shunting: VSD, PDA, endocardial cushion defect

- Most common Ductal dependent lesions to missed by the nursery: TGA, HLHS, Coarct of Aorta
Congenital Heart Disease

- Causes of cyanotic heart disease – the Terrible “T”s!
  - Tetralogy of Fallot (6-10%)
  - Transposition of the great arteries (3-5%)
  - Tricuspid atresia (1-2%)
  - Truncus arteriosus (1-2%)
  - Total anomalous pulmonary venous return
  - Pulmonary atresia or stenosis (5-7%)
  - Hypoplastic left heart

OR JUST COUNT
CHD – Clinical Presentation

- Difficulty feeding
- Sweating with feeds
- Sudden onset of pallor, lethargy or central cyanosis
- Poor weight gain
- If not detected at birth, will usually present within first few weeks of life
CHD – Signs

- Tachypnea, retractions, grunting, poor perfusion
- Murmur is present in most cyanotic CHD
- Hepatomegaly may be seen
- Weakened/absent femoral pulses – coarctation
  - Check 4 extremity BPs
  - Check pre- and post-ductal sats
- Hyperoxia test
  - 100% for 10 minutes
    - ABG PaO2 <150 mmHg or O2 sats < 75% suggest cyanotic CHD
CHD – Treatment

- ABC’s! No PEEP as this decreases PBF
- First two weeks of life:
  - **Start PGE1 infusion**: 0.05mcg/kg/min
    - Life-saving for ductal-dependent lesions: TGA, TOF/PS, coarctation, HLH, interrupted arch
    - SE: apnea, tachycardia, hypotension
  - Administer Lasix 1mg/kg if CHF present, also consider dopamine, morphine, dobutamine
  - Perform septic workup and start antibiotics
  - Admit to PICU/NICU
Endocrine-Metabolic Emergencies
Diabetic Ketoacidosis

- Leading cause of death among children with IDDM
- Initial presentation of 20-40% of IDDM
- Mortality ~2%

- Dehydration and acidosis are immediate concerns
  - Cerebral Edema comes later

- Dehydration → Acidosis → hyperventilation

- Potassium loss due to shifted H+ intracellularly and K+ lost from cells into urine
PATHOPHYSIOLOGY OF DIABETIC KETOACIDOSIS

- Fatty acid oxidation
- Gluconeogenesis
- Glycogenolysis
- Peripheral glucose uptake and metabolism

KETONE BODIES

ACIDOSIS

- Hyperkalemia
- Renal Ca, phos, Mg loss
- Renal K+ loss

HYPERGLYCEMIA

- Osmotic diuresis

DEHYDRATION

- Vomiting
- Increased insensible fluid losses
- Poor tissue perfusion
- Increased lactate
- Renal Na+ loss
- Polyuria, Polydipsia, polyphagia
  - Weight loss despite eating/drinking
- N/V, abdominal pain
- Changes in behavior
- Changes in activity level
Fluid Administration in DKA

- Most DKA patients are ~7% dehydrated.
- Administer 20 mL/kg NS or LR over 30 to 60 min, repeat to reverse shock.
- Other fluid deficits should be replaced gradually.
- If no evidence of hypovolemia, be less aggressive with fluid management.
- Glucose is often lowered significantly with fluid resuscitation.

- Check bedside glucose hourly. Gradual decline by 100 per hour is preferable.

- Add glucose to IV fluid once glucose is < 250-300 mg/dL to avoid hypoglycemia.

- Begin insulin infusion at 0.1 μg/kg/hr.
Due to lipolysis (ketoacids) and dehydration (lactic acidosis)

- Insulin and fluids are sufficient treatment.
- Bicarbonate treatment is not recommended and is associated with cerebral edema.
Electrolyte Imbalance

- Factitious hyponatremia (hyperglycemia effect)
  - $1.6 \times \left[ \frac{(\text{Glucose} - 100)}{100} \right] + (\text{current Na}) = \text{true Na}$

- Potassium level is falsely elevated. Most patients have true potassium depletion.

- Hypophosphatemia

- Once urine output is established, replace K, half as KCl and half as Kphos (total 30-40 mEq/L).
- Assess mental status and neurological exam hourly.
- CT or MRI if cerebral edema is suspected.
- Treat with hyperosmolar agents such as mannitol, but this is controversial.
- Glucocorticoid efficacy is unclear.
- Aggressive hyperventilation is detrimental.

**Cerebral Edema**
Treatment of Hypoglycemia

- Normal BS: >30 mg/dl in newborns, >40 mg/dl in infants and children
- Reasonable to replace if BS <50 and sx
- Replace with 0.25-1 gm/kg of dextrose
  - Using 0.5 gm/kg
    - D10: 5 ml/kg -- infants (newborns 2 ml/kg)
    - D25: 2 ml/kg -- children 2-8 y
    - D50: 1 ml/kg -- >8 y
- D10 in newborns and young infants to avoid vein damage
- D25 in older infants and children
Congenital Adrenal Hyperplasia

- Defects in adrenal biosynthesis of cortisol
  - Elevated ACTH results in increased steroid precursors
    - Hyperplasia of adrenal cortex
    - Female virilization
  - 21-hydroxylase deficiency 95% of CAH cases
    - Majority are salt-losing
    - Simple virilization 1/3
    - Salt wasting 2/3
Congenital Adrenal Hyperplasia

- Clinical presentation – adrenal crisis
  - Males more prone to missed diagnosis
    - Females usually exhibit ambiguous genitalia
  - Vomiting/ dehydration
  - Circulatory collapse within the first 2 weeks of life
    - Unresponsive to IVF
  - ↓Na+, ↑K+, ↓Glu
  - Anion gap metabolic acidosis
  - Seizures due to ↓Na+ or ↓Glu
  - Fever may or may not be present
Congenital Adrenal Hyperplasia

- **Treatment**
  - IVF bolus, then maintenance of D5 0.9%NS at 100-125cc/kg/day, Replace glucose!
  - Hydrocortisone 25mg IV, then 25-50 mg/m²/day (approx 2-3 mg/kg) divided q 6-8 hours
  - Treat hyperkalemia
  - Admit to PICU/NICU
  - Draw extra blood tubes
Rashes
Henoch-Schonlein Purpura

- Systemic vasculitis of small vessels
- Most common acute vasculitis in children
- Major organ systems involved
  - Skin
  - Renal
  - GI
  - Musculoskeletal
- “ARENA”
  - Abdominal pain, Rash, Edema, Nephritis, Arthritis
Dermatologic
- Rash of some form occurs in all
- Presenting symptom in >50%
- Starts in LEs – ankles/feet and buttocks
  - Face, trunk, palms/soles usually spared
- “Palpable purpura”
- Typically no itching
Henoch-Schonlein Purpura

- Diagnostics
  - No pathognomonic tests
  - Hgb, platelets usually nl
  - ESR nl or mild elevation
  - WBC frequently elevated

- ↑BUN/Cr or significant hematuria → glomerulonephritis
HSP – Management

- Admit: severe abdominal pain, severe joint pain, GI bleeding, hypertension, renal disease
- Steroids controversial
  - Some use for GI, joint, or renal involvement
- New trials of IVIG
Skin and Soft Tissue Infections
<table>
<thead>
<tr>
<th></th>
<th>Preseptal</th>
<th>Orbital</th>
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<tbody>
<tr>
<td>Fever</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Lid edema</td>
<td>May be severe</td>
<td>Severe</td>
</tr>
<tr>
<td>Proptosis</td>
<td>None/minimal</td>
<td>Yes</td>
</tr>
<tr>
<td>Chemosis</td>
<td>None/minimal</td>
<td>Yes</td>
</tr>
<tr>
<td>Pain and decreased eye movement</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Elevated WBC</td>
<td>Yes</td>
<td>Yes</td>
</tr>
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</table>
Viral Exanthems
Erythema Infectiosum

- Fifth Disease
- **Parvovirus B19**
- Rash
  - Slapped cheeks
  - Lacy reticular rash trunks/extremities
- Arthralgias/arthritis common
- Complications
  - Aplastic crisis in hemolytic disease (sickle cell)
  - Fetal hydrops in pregnancy
- **Human Herpesvirus 6**
- Children 6 months – 2 years
- Incubation 5-15 days
- Exanthem subitum (“sudden onset”)
- High fevers 3-5 days
  - Febrile seizures, irritability
- **Rash after defervescence**
Varicella

- Macules, papules, vesicles
- Spread over 24 hours
- Trunk, face to extremities
- Often in scalp, mouth
- Highly contagious until crusted
Orthopedic Emergencies
Physeal Injuries

- Up to 1/3 of all peds fractures involve physis
  - Usually upper extremities
- Peak incidence 11-13 years of age
- Described by Salter-Harris Classification System
- Distal radius most common site of injury
  - 30-60%
- Salter Harris Type 2 most common by far
- Ligaments tend to be stronger than physis
  - Physis separation/fracture more common than sprain
Salter-Harris Classification
S-A-L-T-E-R

Same
Above
Lower

Through
Entire Region
Supracondylar Fractures
Slipped Capital Femoral Epiphysis

- Typically obese male 8-15 yrs
- Higher incidence in African-Americans
- Gradual hip/thigh/knee pain
  - Can present acutely following minimal trauma
  - Hip externally rotated
- 10-25% bilateral
- Xrays – wide physis, Klein line
  - Include frog-leg view
- Admit for ORIF
Legg-Calve-Perthes Disease

- Avascular necrosis of femoral head
- No known precipitating event
- Age 5-9 years, boys > girls
  - Younger age presentation than SCFE
- Presentation
  - Limp
  - Referred pain to the knee
  - Hip or thigh pain
SCFE vs. LCP

**SCFE**
- Insidious onset common
  - May have inciting event
- Male > female
- Peak 12-14 years
- Bilateral in up to 25%
- Limp/hip pain

**LCP**
- Insidious onset common
- Male > female
- Peak 5-7 years
- Bilateral in up to 20%
- Limp/hip pain
Osgood-Schlatter Disease

- Usually teenage athletes
- Apophysitis of tibial tuberosity from repeated stress – jumping, running
- Presentation
  - Pain below knee
  - Tenderness/swelling over tibial tubercle
- Can result in microfractures or avulsion fractures
- Conservative management: rest, NSAIDS
Transitient Synovitis

- Peak age 3-6 years
- Decreased ROM
- May have fever
- WBC, ESR, CRP, Lyme (if endemic)
- NSAID’s
Septic Arthritis

- Surgical Emergency
- 3 modes of infection
  - Hematogenous spread into synovium (Most common)
  - Migration of bacteria from wound near by
  - Penetrating injury
    - Can be delayed
- 80-90% in lower extremity
  - Knee and Hip Most common
  - Neonate can have multiple locations
- Pain or Limp
- Decreased ROM
- Fever (High prognostic factor)

**WORK UP**
- CBC/D; ESR; CRP; Lyme (if endemic)
- Ultrasound vs. X-ray for Effusion
- Blood Cx (+) in 40% of cases
- Arthrocentesis by Ortho or Interventional Rads

**Septic Arthritis - Symptoms**
- Bone infection ~ 6 per 1000 admissions in US (2004)
- 75% in lower extremity
- 80-90% single bone involvement
- Staph Aureus #1
- Mostly hematogenously spread

- S. Aureus #1 for ALL ages
- GBS for neonates as #2
- Salmonella in Sickle Cell while S. Aureus is only 25%
- Plain films may show periosteal reaction after 10-14 days
- Ortho consultation
- Analgesics
- Antibiotics
  - Dealer’s choice
- Admit

Osteomyelitis
Apophysitis of Tibial Tubercle

Overuse?
- 11-15 years old
- Males>Females
- Runners / Jumpers

Repetitive Stress onto patellar tendon
- Micro-avulsions of ossification center and cartilage
Children 1-4 years old

- Peak between 2-3 yrs
- As young as 6 months

Females > Males

Recurs 1/3 cases

Classic “pulled” injury in >50% of cases

Annular ligament slides over radial head and is trapped between radius and capitellum
Radial Head Subluxation
A.K.A. NurseMaid’s Elbow

- **Treatment**
  - Hyperpronation
  - Supination and flexion

- Perform reduction then walk away

- OTC Analgesics as needed
Is this Abuse????
Is this Abuse???
Is this Abuse???
Is this Abuse????
Is this Abuse???

Pediatric Disorders, ACOEP

- More likely to occur as magnetic moments on particles increase (due to interparticle magnetic dipole interactions)
- Very large aggregates → precipitation (i.e., gravitational forces significant)
Is this Abuse????
General Principals:

- Suspecting abuse
- Establishing Diagnosis
- Treating injuries
- Addressing safety
- Report to appropriate agency
- Documentation
- Follow up
>3 million reports/year

United States: >3 children die per day from child abuse in the home

- Most of the children who die are younger than six years of age
By age 18, one of every four girls and one of every six boys has been sexually abused.

It is estimated that 100,000-500,000 children are sexually abused each year.

85% of sexual assaults on children are committed by someone the child knows and usually trusts.
- Child Abuse: occurs worldwide with similar incidence and prevalence as U.S in industrialized countries.
- Child abuse is without bounds: class, race, ethnicity, education, economics.
- A report of child abuse is made – on average - every 10 seconds.

Epidemiology cont’d
Types of Child Abuse

- Neglect – 63%
- Physical – 19%
- Sexual – 10%
- Emotional – 8%
The actual incidence of abuse and neglect is estimated to be 3 times greater than the number reported to authorities.

Nine in 10 Americans polled regard child abuse as a serious problem, yet only 1 in 3 reported abuse when confronted with an actual situation.
What to do

- Be open and understanding
- If the child tells you of the sexual abuse immediately after it occurred, DO NOT bathe the child, or wash or change his or her clothes
- Let the child talk as much as he or she wishes
- Understand that the child is probably having mixed feelings
- Believe the child
- Explain what you will do next to help them
Our Role

- History
  - Open ended questions
  - History taken by only one person
  - Interview everyone separately
  - Inquire about all forms of abuse
Our Role

Physical

◦ Observation of interaction with caretaker
◦ General appearance
◦ Nutritional state
◦ Complete examination (perineum)
Abusive Injuries:
- Unexplained or poorly explained injury
- Injuries incompatible with history
- Changing history - Key for Nurse
- Significant delay in seeking care
- Various healing stages of injury
Report the abuse

UNDER State LAW, EVERYONE HAS A LEGAL OBLIGATION TO REPORT SUSPICION OR KNOWLEDGE OF CHLD ABUSE
For each case of child maltreatment reported, two go unrecognized.

Follow the guidelines of:
- Listen, Look, Explain, Evaluate, Record, Report

Follow a multidisciplinary approach:
- Clinicians, social services, law enforcement