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Pediatric Pitfalls

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	<h2 style="text-align: center;">Pediatric Pitfalls</h2> <p>Jed Grant, PA-C Program Director, SJVC PA Program Staff PA, AMCH Emergency Department</p>

	<h2 style="text-align: center;">Objectives</h2>
	<ul style="list-style-type: none"> ■ Recognize subtle presentations of potentially serious pediatric conditions ■ Identify when referral to the emergency department or subspecialty care is appropriate.

	<h2 style="text-align: center;">Not just miniature adults</h2>
	<ul style="list-style-type: none"> ■ Large surface area to weight ratio ■ Significant differences in airway ■ Physical exam differences <ul style="list-style-type: none"> - Traditional auscultation and palpation are less effective - Vital signs may be insensitive <ul style="list-style-type: none"> ■ Skin color, temp, and cap refill better tools - Behavioral cues very important <ul style="list-style-type: none"> ■ Quality of cry, reaction to parent, talking, <u>smiling</u>

	<h2 style="text-align: center;">Who makes you nervous?</h2>
	<ul style="list-style-type: none"> ■ Neonates (28 days or less) <ul style="list-style-type: none"> - Someone is trying to kill me ■ Infants (29-60 days) <ul style="list-style-type: none"> - Like walking through a mine field ■ Toddlers (2-24 months) <ul style="list-style-type: none"> - Dodging grenades ■ Children <ul style="list-style-type: none"> - Generally not drug seeking

	<h2 style="text-align: center;">Neonatal Problems</h2>
	<ul style="list-style-type: none"> ■ Jaundice <ul style="list-style-type: none"> - Multiple causes- based on age at onset - 1st 24 hours more serious, send to ED - 2-3 days old usually physiologic <ul style="list-style-type: none"> ■ If feeding well, not anemic and bilirubin less than 18-20mg/dl ok to go home ■ Any problems, admit and bill lights - After 3rd day of life <ul style="list-style-type: none"> ■ May be more serious ■ Sepsis, hemolytic anemias, hypothyroidism, breastfeeding ■ Work up directed at possible etio

	<h2 style="text-align: center;">Fever</h2>
	<ul style="list-style-type: none"> ■ Most common chief complaint of children presenting to the ED ■ Must differentiate ill from well ■ 100.4 and above ■ Age related risk <ul style="list-style-type: none"> - Age < 2mo (60 days) at risk for serious life threatening infections 

	Neonatal/infant Fever
	<ul style="list-style-type: none"> ■ Under 60 days of age send to ED <ul style="list-style-type: none"> - History <ul style="list-style-type: none"> ■ Length of gestation, type of delivery, abx use in mother or infant and neonatal complications ■ Feeding/BM/Urination - Exam <ul style="list-style-type: none"> ■ VS, General appearance ■ Undress completely ■ Consolability ■ Head to toe 

	Fever in Infants
	<ul style="list-style-type: none"> ■ Serious Bacterial Infection (SBI) risk <ul style="list-style-type: none"> - 0-28 days 3% risk - 28-60 days 6-10% risk ■ Labs to detect occult infection <ul style="list-style-type: none"> - If all normal risk of SBI 0.2% ■ UTI has 30% bacteremia rate and is most common bacterial infection in the infant ■ Consider Herpes Simplex Encephalitis in neonates ■ Treatment for infants (generally): <ul style="list-style-type: none"> - Under 1 mo: Admit, ampicillin or cefotaxime, gentamycin, and acyclovir - 1-2 months: Rocephin 50mg/kg consider admission vs very close out pt f/u 

	Neonatal/infant Problems
	<ul style="list-style-type: none"> ■ Sepsis <ul style="list-style-type: none"> - Meningeal signs absent - May have normal or subnormal temp - UA frequently normal initially <ul style="list-style-type: none"> ■ culture diagnoses many UTI (Cath, NO BAGS) ■ Surgical problems <ul style="list-style-type: none"> - Resp distress, poor feeding, wt loss <ul style="list-style-type: none"> ■ TE fistula, tracheomalacia, necrotizing enterocolitis, gastroschisis, vovulus etc

	Neonatal/infant Problems
	<ul style="list-style-type: none"> - Pyloric stenosis <ul style="list-style-type: none"> ■ 2-6 weeks ■ Projectile vomiting after feeding ■ Wt loss, irritability ■ Epigastric mass "olive" ■ US - Incarcerated hernia and intussusception <ul style="list-style-type: none"> ■ Most common cause of neonatal surgery ■ Most common after 2 month ■ Irritability, crying, abd distention, vomiting

	Neonatal/infant Problems
	<ul style="list-style-type: none"> ■ Feeding problems <ul style="list-style-type: none"> - Intake pattern not fully established until 1 month - Use weight as gauge...gain is good ■ Regurgitation <ul style="list-style-type: none"> - No forceful contraction of abdominal muscles - Small amount - No significance in thriving infant unless resp problems.

	Neonatal/infant Problems
	<ul style="list-style-type: none"> ■ Vomiting <ul style="list-style-type: none"> - At birth- anatomic abnormality - Later- infection - Look for signs of dehydration and candidiasis - Usually require work up and frequently admission

	Neonatal/infant Problems
	<ul style="list-style-type: none"> ■ Apnea <ul style="list-style-type: none"> - Periodic breathing is normal <ul style="list-style-type: none"> ■ 3-20 second pauses are OK if no cyanosis, hypotonia, pallor, or bradycardia - Apnea >20 sec signifies critical illness with or without cyanosis <ul style="list-style-type: none"> ■ Impending respiratory arrest - Apparent Life Threatening Event (ALTE) <ul style="list-style-type: none"> ■ Episode that is frightening to the observer and involves some combination of apnea, change in muscle tone, color change, and choking or gagging

	ALTE	
	<ul style="list-style-type: none"> ■ Usually completely normal exam ■ Usually digestive, neuro, respiratory or cardiovascular in origin, however 50% have unknown cause. No definite relation to SIDS. ■ 8% of ALTE patients will require significant medical intervention during admission despite normal ED work up. ■ BELIEVE THE PARENTS! Get a detailed hx and send to ED if ALTE is suspected. <ul style="list-style-type: none"> - Surroundings and circumstances just before and during event - Position of child, awake or asleep, interventions performed - Central or obstructive apnea? 	

	Neonatal/infant Problems	
	<ul style="list-style-type: none"> ■ Cyanosis <ul style="list-style-type: none"> - Methemoglobinemia or congenital heart disease ■ Rapid but not labored breathing: congenital heart disease ■ Labored breathing: pulmonary disease <ul style="list-style-type: none"> - Retractions, flaring, grunting, tachypnea ■ Irregular or shallow breathing: sepsis, meningitis, cerebral edema, intracranial hemorrhage (shaken baby) ■ In general we admit them all 	

	Fever Age 2-24 months
	<ul style="list-style-type: none"> ■ Exam more reliable ■ Viral illnesses most common causes ■ Meningeal signs unreliable ■ Inappropriate responses to exam indicate toxicity ■ Petechia indicate serious underlying infection <ul style="list-style-type: none"> - most frequently correlated with bacteremia

	Bacteremia/Sepsis	
	<ul style="list-style-type: none"> ■ Vaccines have greatly reduced risk of bacteremia/sepsis ■ Clinically relevant bacteremia is extraordinarily uncommon (<1%) after 60 days of age. <ul style="list-style-type: none"> - Almost all (>90%) clear without treatment ■ The presence of an identifiable viral syndrome such as croup, bronchiolitis, or varicella makes bacteremia even more unlikely in an immunized child ■ Greater elevation in temperature correlates with a higher risk ■ Well appearing children are not septic <ul style="list-style-type: none"> - Smile is a sensitive indicator* 	
	<small>*McCarthy PL, Lembo RM, Fink HD, et al. Observation, history, and physical examination in diagnosis of serious illnesses in febrile children less than or equal to 24 months. J Pediatr. Jan 1987;110(1):26-30.</small>	

	Sepsis	
	<ul style="list-style-type: none"> ■ Clinical diagnosis ■ Deterioration may be rapid ■ Poor feeding, hypotonia, irritability, inconsolability, lack of smile ■ Fever, unless < 2 mo, then may be hypothermic ■ Tachypnea/retractions due to acidosis ■ Cold extremities, delayed refill, resting tachycardia, mottling 	
	<small>Knight C, Glennie L. Early recognition of meningitis and septicaemia. J Fam Health Care. 2010;20(1):6-8.</small>	

	Sepsis
	<ul style="list-style-type: none"> ■ Usually a progression from bacteremia ■ Usually involves encapsulated organisms ■ Risk Factors <ul style="list-style-type: none"> - Impaired splenic function - Congenital metabolic disease - Indwelling foreign body (catheter) - Obstruction of drainage of body cavity

	Sepsis	
	<ul style="list-style-type: none"> ■ May have petechia, purpura with meningococcal disease ■ Differential <ul style="list-style-type: none"> - Toxic ingestion - Cardiac disease (myocarditis) - Trauma (shaken baby) - Metabolic etiologies ■ WBC typically up, may be normal. Low with meningococemia ■ Procalcitonin, lactate, indicators of systemic inflammatory response 	

	Sepsis
	<ul style="list-style-type: none"> ■ Blood C&S controversial in this age group <ul style="list-style-type: none"> - Almost all bacteremic kids resolve without abx <ul style="list-style-type: none"> ■ Rest high risk usually treated anyway - Most positives are contaminant - Reserve for septic appearing children, or those at high risk. - Get it if the pediatrician wants it.

	Fever age 2-24 months
	<ul style="list-style-type: none"> ■ Work up dictated by exam, immunization status, appearance, likely sources of infection ■ Management <ul style="list-style-type: none"> - Septic appearance- send to ED - Ill and fever >103 consider ceftriaxone, close follow up - Well and fever < 103 no abx, close follow up.

	Fever in those >24 mo
	<ul style="list-style-type: none"> ■ Older children <ul style="list-style-type: none"> - Risk of bacteremia even lower, exam is more reliable - Risk of strep pharyngitis higher, esp age 5-10 - Work up dictated by history and exam ■ Antipyretics <ul style="list-style-type: none"> - Reduce fever if symptomatic - Seizure caused by rapid change in temp - APAP 10-15mg/kg - Ibuprofen 10mg/kg

	Persistent Fever	
	<ul style="list-style-type: none"> ■ 3 yo with 5 Days of persistent fever ■ Hands and feet swollen and painful ■ Tongue is irritated and lips dry/cracked ■ Several ant cerv nodes, but one 2 cm ■ Viral looking rash, injected bulbar conjunctiva 	

Kawasaki Disease Criteria	
	<ul style="list-style-type: none"> ■ 5 days of fever and any 4 of the following <ul style="list-style-type: none"> – Changes in the peripheral extremities: Initial reddening or edema of the palms and soles, followed by membranous desquamation of the finger and toe tips or transverse grooves across the fingernails and toenails (Beau lines) – Polymorphous rash (not vesicular): Usually generalized but may be limited to the groin or lower extremities – Oropharyngeal changes: Erythema, fissuring, and crusting of the lips; strawberry tongue; diffuse mucosal injection of the oropharynx – Bilateral, nonexudative, painless bulbar conjunctival injection – Acute nonpurulent cervical lymphadenopathy with lymph node diameter greater than 1.5 cm, usually unilateral

Kawasaki Disease	
	<ul style="list-style-type: none"> ■ Acute febrile vasculitic syndrome ■ Unknown cause <ul style="list-style-type: none"> – Likely viral, with genetic predisposition – More common in SE Asia ■ Surpassed rheumatic fever as leading cause of acquired heart disease in kids ■ 25% of untreated patient develop coronary artery aneurysms (CAA) which can thrombose and cause MI <ul style="list-style-type: none"> – 2% die from this

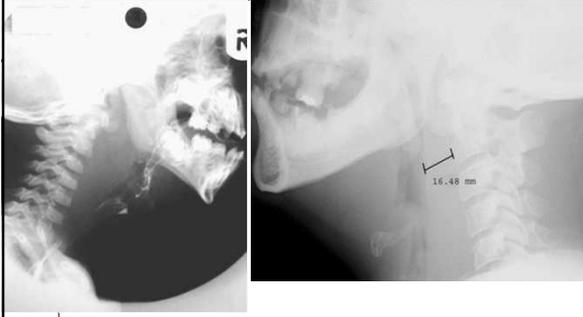
Kawasaki Disease	
	<ul style="list-style-type: none"> ■ Delay in dx results in increased incidence of coronary damage ■ Incomplete KD has less than 4 of the criteria but same risk of CAA <ul style="list-style-type: none"> – ESR, CRP, WBC, and transaminases elevated ■ ASA, IVIG and immune modulating drugs are mainstays of treatment ■ Ideally tx starts within 7-10 days of fever onset ■ Prognosis is good if caught early and treated ■ Late has increased incidence of CAA which can be devastating

Retropharyngeal abscess	
	<ul style="list-style-type: none"> ■ Where is that? <ul style="list-style-type: none"> – Behind OP, but in front of vertebral lig. – Laterally bordered by carotid sheaths ■ More common in kids but can be seen in adults ■ Presentation is variable ■ High mortality from airway compromise and sepsis

Retropharyngeal abscess	
	<ul style="list-style-type: none"> ■ Localized symptoms of dysphagia, voice changes, odynophagia, trismus, and neck/jaw pain. ■ Fever, chills, and loss of appetite common but not universal ■ Stridor, shortness of breath, drooling, cervical lymphadenopathy, and bulging of the pharyngeal wall common.

Retropharyngeal abscess	
	<ul style="list-style-type: none"> ■ Lateral radiographs will manifest with pre-vertebral air/fluid levels or abnormal widening of the pre-vertebral soft tissue ■ normally 5 – 7 mm wide at the level of the second cervical vertebrae

Pre-vertebral soft tissue swelling



Croup



- Generally benign self limited illness age 6m-3yr but can be severe, and is not the only thing that causes stridor
- Barking cough worse at night, occasional gradual onset stridor
- Croup score to determine severity
 - Generally admit if
 - Under 6 mo
 - Poor response to treatment
 - Inadequate oral intake
- Cool mist neb, steroid, consider racemic epi (requires 3-4hrs of observation)
- Differentiate from FB, RPA, bacterial tracheitis, or epiglottitis- all of which present like more toxic severe croup- needs intubation and IV abx
- Stridor at rest is indication of potentially serious illness

Foreign Body Aspiration

- 90% in kids under 4
- Under 6 months usually from sibling feeding patient
- Signs depend on location of FB
 - Wheezing
 - crackles
 - Tachypnea
 - Persistent pneumonia
 - Stridor
 - Cough
 - Apnea



Foreign Body Aspiration

- Can not rule out with a single XR
 - Many FB are radiolucent
 - May see hyperinflation of the obstructed side
- Nasal FB will present as chronic foul smelling nasal discharge
- Laryngoscopy or bronchoscopy under anesthesia for removal.
- Treat residual pneumonia or reactive airways

Meningitis

- Most common in kids under a year old but can occur at any age
- Usually a complication of bacteremia
- May cause permanent neurologic deficits due to:
 - Direct inflammatory effects
 - Brain edema
 - Increased ICP
 - Decreased cerebral blood flow
 - Vascular thrombosis

Meningitis

- Neonates
 - *L. monocytogenes*, *E. coli*, group B strep, herpes
- Children
 - *Strep pneumoniae* and *N. meningitidis*
- Meningococcal disease may have a fulminant course progressing to shock and death in hours

	Meningitis
	<ul style="list-style-type: none"> ■ Presentation is age dependent <ul style="list-style-type: none"> - Neonates non specific: <ul style="list-style-type: none"> ■ Poor feeding, vomiting, fever (+/-), poor responsiveness, paradoxical irritability (doesn't want to be held or rocked) ■ Bulging fontanelle late sign ■ Respiratory distress - Infants and children <ul style="list-style-type: none"> ■ Fever, HA, and vomiting ■ Lethargy and toxic appearance ■ Nuchal rigidity is not reliably apparent until age 3 - Older children like adults <ul style="list-style-type: none"> ■ HA, photophobia, N/V, fever, neck stiffness

	Meningitis
	<ul style="list-style-type: none"> ■ Generalized seizures occur in 25% of patients ■ Differential diagnosis <ul style="list-style-type: none"> - Sepsis - Intracranial mass - Trauma/abuse - Metabolic abnormalities - Cardiac or respiratory failure - Toxic ingestion

	Meningitis
	<ul style="list-style-type: none"> ■ Diagnosis- LP and CSF analysis ■ Treatment <ul style="list-style-type: none"> - Critically ill, same as sepsis - Rapid administration of IV antibiotics <ul style="list-style-type: none"> ■ Do not delay for CT/LP if critically ill ■ Neonates: ampicillin and cefotaxime (Claforan), consider acyclovir ■ Children: Ceftriaxone (Rocephin)

	Vomiting and Diarrhea
	<ul style="list-style-type: none"> ■ Usually self limited but dehydration occurs in 10% and is life threatening in 1% ■ Smaller children are at increased risk of significant dehydration ■ Viral infection is the most common cause <ul style="list-style-type: none"> - Rotavirus is most common, Norwalk, adenovirus follow

	Vomiting and Diarrhea
	<ul style="list-style-type: none"> ■ Bacterial more common in children who attend day care <ul style="list-style-type: none"> - <i>Campylobacter jejuni</i>, <i>Shigella</i> spp., <i>Salmonella</i> spp., <i>C. difficile</i>, <i>E. coli</i>, etc. - <i>Giardia lamblia</i> is common in day care centers and 50% are asymptomatic ■ Dysentery occurs with invasion of the mucosa of terminal ileum and colon.

	Vomiting and Diarrhea
	<ul style="list-style-type: none"> ■ Evaluation of the state of hydration is paramount <ul style="list-style-type: none"> - Physical signs- >2=5%, >3=10% likelihood of dehydration <ul style="list-style-type: none"> ■ General ill appearance ■ Capillary refill longer than 3 sec ■ Dry mucus membranes ■ Abnormal skin turgor ■ Absent tears ■ Weight loss ■ Abnormal respiratory pattern

	Vomiting and Diarrhea
	<ul style="list-style-type: none"> ■ Work up <ul style="list-style-type: none"> – Billious vomiting may indicate obstruction – Moderate (10%) or higher dehydration should consider IV rehydration especially if ongoing loss <ul style="list-style-type: none"> ■ Requires measurement and possible correction of electrolyte abnormality ■ No real benefit to IV vs oral fluid replacement – Finger stick blood sugar <ul style="list-style-type: none"> ■ Frequently hypoglycemic due to depletion of glycogen stores

	Vomiting and Diarrhea
	<ul style="list-style-type: none"> ■ Treatment <ul style="list-style-type: none"> – Oral re-hydration therapy (ORT) with oral electrolyte solution can be used in almost all patients and is under utilized. – Ondansetron 0.15mg/kg/dose can be given followed by PO fluid challenge. – IVF if clinically indicated. 20mg/kg bolus up to two. – Clear liquid diet for 24 hours – No anti-motility agents. No abx until culture is back unless septic appearance, then should consider admission – Admit if can not tolerate po fluids and/or CO2 <18

	Incarcerated hernia
	<ul style="list-style-type: none"> ■ Irritability, poor feeding, vomiting, inguinal or scrotal mass ■ Need to completely undress the patient ■ Incidence of incarcerated hernia is highest in first year of life ■ Attempt manual reduction

	Intestinal Obstruction
	<ul style="list-style-type: none"> ■ Presents with irritability, bilious vomiting, abdominal distention, late loss of bowel sounds ■ May be caused by atresia, stenosis, meconium ileus, malrotation, intussusception, volvulus, incarcerated hernia, imperforate anus, and Hirschsprung disease

	Intussusception
	<ul style="list-style-type: none"> ■ One portion of the gut telescopes into another, usually ileocecal. ■ GI bleeding and edema produce bloody mucoid stools giving the classic "currant jelly stools" with abd pain and vomiting. <ul style="list-style-type: none"> – Less than 1/3 present with all three sx, most have 2. ■ 15-20x increased incidence in siblings ■ 3mo-6yrs with sudden pain followed by pain free intervals and RUQ sausage shaped mass on exam ■ US is imaging of choice ■ Air contrast or barium enema is diagnostic and therapeutic <ul style="list-style-type: none"> – May recur, needs to be admitted

	Appendicitis
	<ul style="list-style-type: none"> ■ Extremely variable presentation, atypical 50% cases <ul style="list-style-type: none"> – Under 12 have dx missed 28-57% of time. ■ 36% perforation rate at diagnosis <ul style="list-style-type: none"> – Perforation common under 1 yr due to late diagnosis ■ Fever, low grade, anorexia, pain more than 1d <ul style="list-style-type: none"> – Jump test, other peritoneal signs ■ Frequent recheck and trending over 24-36 hours to diagnose ■ Negative US means nothing

	<h2>GI Foreign Body</h2>	
	<ul style="list-style-type: none"> ■ Common ■ If caught in the esophagus should be removed by endoscopy ■ If past the pyloric sphincter and not sharp will likely pass <ul style="list-style-type: none"> – Alkaline batteries must be removed ■ NO laxatives 	



	<h2>Sources</h2>
	<ul style="list-style-type: none"> ■ Thilo E, Rosenberg A, Hay W, et al, <i>Current Diagnosis and Treatment Pediatrics</i>, 21st ED, Lange 2012, Ch 2 ■ Stephan W, Carter C, Stone C, et al, <i>Current Diagnosis and Treatment Emergency Medicine</i>, 7th ED, Lange 2011, Ch. 50 ■ Mattu A, et al, <i>Avoiding Common Errors in the Emergency Department</i>, LWW 2010, Section XDX ■ Graneto J, <i>Emergency Management of Pediatric Patients with Fever</i>, Medscape.com, accessed Jul 2014 ■ Burnett L, <i>Sudden Infant Death Syndrome</i>, Medscape.com, accessed Jul 2014 ■ Acevedo J, <i>Pediatric Retropharyngeal Abscess</i>, Medscape.com, accessed Jul 2014 ■ Scheinfeld N, <i>Kawasaki Disease</i>, Medscape.com, accessed Jul 2014 ■ Sarthanam S, <i>Pediatric Sepsis</i>, Medscape.com, accessed Jul 2014 ■ Defendi G, <i>Croup</i>, Medscape.com, accessed Jul 2014 ■ Murray A, <i>Foreign Body of the Airway</i>, Medscape.com, accessed Jul 2014 ■ Muller M, <i>Pediatric Bacterial Meningitis</i>, Medscape.com, accessed Jul 2014 ■ Prescilla R, <i>Pediatric Gastroenteritis</i>, Medscape.com, accessed Jul 2014 ■ Levine A, <i>Pediatric Gastroenteritis</i>, Medscape.com, accessed Aug 2014 ■ Bianco F, <i>Intussusception</i>, Medscape.com, accessed Aug 2014 ■ Minkes R, <i>Pediatric Appendicitis</i>, Medscape.com, accessed Aug 2014 ■ Munter D, <i>Gastrointestinal Foreign Bodies</i>, Medscape.com accessed Aug 2014