### Common Pediatric Emergencies

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#### **Objectives**

- After this lecture, you should be able to:
  - recognize the most common injuries seen in the Pediatric Emergency Department
  - understand diagnostic and management plans for common pediatric illnesses

#### **Pediatric Trauma**

- Injuries are the most common cause of childhood death:
  - 40% of deaths children between ages 1-4
    3 times more common than congenital anomalies
  - 70% of deaths for older children and adolescentsmotor vehicle occupant injuries most common
    - pedestrian injuries (age 5 9)
  - drowning ranks second overall as cause for unintentional deaths
    - peaks in preschool and late teen years

### **Pediatric Trauma**

- homicide is leading cause of injury death for infants less than 1 year of age
  - Shaken Baby Syndrome
  - other forms of child abuse and neglect
  - asphyxiation and choking
- homicide is second most common cause of death in adolescents
  - more than 80% involve use of firearm
- suicide
  - rare before age ten but increasingly common
  - third leading cause of death ages 15-19
  - males more successful than females

### Pediatric Trauma Score

Patient Characteristics	Category Value +2 +1 -1				
Weight (kg)	>20	10 to 20	<10		
Airway	Normal	Maintained	Unmaintained		
Systolic blood pressure (mm Hg)	>90	50 to 90	<50		
Central nervous system	Awake	Obtunded	Coma/decerebrat		
Open wound	None	Minor	Major/penetrating		
Skeletal trauma	None	Closed fractures	Open, multiple fractures		
Add the value for each patient character From Tepas JJ III, Mollitt DL, Talbert JL, njured child. <i>J Pediatr Surg</i> , 1987;22:14	istic. Highest possi Bryant M. The ped -18.	ble total score is +12, and low atric trauma score as a predict	est possible total score is -6 tor of injury severity in the		

### **Pediatric Trauma**

#### Systematic Approach to All Patients:

- follow the A, B, C, D, E's of management
- investigate mechanism of injury to see if injury is compatible with age and developmental status of the child

### **Primary Survey**

- A = Airway / cervical spine control
  - assess airway patency:
    - · Patent / Conscious Maintain position of comfort
    - compromised Position, suction, +/- oral airway
    - Not Maintainable:
      - Oral endotracheal intubation
      - Bag-Valve-Mask ventilation
  - maintain cervical spine in neutral position with manual immobilization

    - head or facial trauma
    - suspicious mechanism of injury

#### **Primary Survey**

#### B = Breathing

#### - assess:

- Work of Breathing rate
- color Mental Status
- Adequate?
  - Administer High Flow Oxygen
- Inadequate?
  - Bag-Valve-Mask ventilation with 100% 02
  - naso/orogastric tube
  - consider Intubation

### **Primary Survey**

#### C = Circulation / Hemorrhage Control

- Assess:
  - Heart rate Pulse quality Color
    - Skin signs
  - Direct pressure to bleeding Mental status
- If signs of shock are present:
  - obtain immediate vascular access (IV / IO)
  - isotonic fluid bolus (20cc/kg NS or LR)
  - baseline labs VBG, Lactate, CBC
  - · cardiac monitor
  - urinary catheter
  - consider blood transfusion

#### **Primary Survey**

- D = Disability (Neurologic Status)
  - Assess
    - Pupillary Function
    - Mental Status AVPU
      - -A = Alert
      - -V = Responsive to Voice
      - -P = Responsive to Pain
      - -U = Unresponsive
    - Modified Glasgow Coma Score

### **Modified Glasgow Coma Scale**

	Child	Infant S	core
Eve	Spontaneous	Spontaneous	4
opening	To verbal stimuli	To verbal stimuli	3
	To pain only	To pain only	2
	No response	No response	1
Verbal	Oriented, appropriate	Coos and babbles	5
response	Confused	Irritable cries	4
	Inappropriate words	Cries to pain	3
	Incomprehensible sounds	Moans to pain	2
	No response	No response	1
Motor	Obeys commands	Moves spontaneously and purposefully	6
response*	Localizes painful stimulus	Withdraws to touch	5
	Withdraws in response to pain	Withdraws in response to pain	4
	Flexion in response to pain	Abnormal flexion posture to pain	3
	Extension in response to pain	Abnormal extension posture to pain	2
	No response	No response	1

#### **Primary Survey**

#### • E = Exposure

- Remove clothing for complete exam
- Prevent heat loss
  - Warm blankets
  - Heat lamps
  - Radiant warmers
  - Warm IV fluid

#### **Head Injury**

- 600,000 visits per year
- 250,000 hospitalizations per year
- 95,000 brain injuries per year
  - 4,000 deaths per year
  - 80% of children dying from trauma have a significant head injury
- Primary Injury:
  - skull fracture, contusion, laceration, neuronal or vascular injury
- Secondary Injury: elevated ICP, cerebral hypoperfusion, hypoxia, seizures, hyperthermia
- Predisposing Risk Factors: head is relatively large, brain is less myelinated, skull thinner

### **Head Injury**

#### Clinical Findings:

- hypotension (infants)
- vomiting
- seizures
- bulging fontanelle
- decreased LOC
- motor deficits
- posturing or paresis
- pupillary changes

### **Head Injury**

- Cushing's Triad sign of increased ICP:
  - Bradycardia
  - hypertension
  - Abnormal Respiratory Pattern
- Treatment of increased ICP:
  - elevate head of bed
  - mild hyperventilation (PCO2 28-35)
  - Mannitol (osmotic agent); lasix
  - hypothermia
  - barbituate coma
  - surgical drainage

### **Head Injury**

- Indications for CT:
  - GCS < 15
  - GCS = 15 with features suggestive of significant brain injury
    - prolonged LOC
    - amnesia
    - persistent vomiting
  - seizures
  - increasing headache
  - · focal neurologic signs
  - skull fracture
  - penetrating injury
  - suspected child abuse

### **Spinal Cord Trauma**

- 1,000 sustain cord injury per year

  - young child: C1 C3 injured
    older children: C5 C7 injured
- SCIWORA
  - spinal Cord Injury Without Radiographic Abnormality
  - x-rays are normal
  - delayed onset of neurologic deficits (30 minutes – 4 days)
  - transient symptoms are common
- Pseudo-Subluxation C2/C3 common
  - 40% of children <7 years old

# **Pseudo-Subluxation C2/C3**



#### Abdominal Trauma

#### Solid organs most commonly injured:

- spleen
  - LUQ contusion, lower rib pain
  - Left shoulder pain (Kehr's sign)
  - LUQ tenderness and guarding
- liver
  - RUQ contusion, pain/guarding
  - elevated LFT's

#### Duodenal injuries:

- high speed or direct blows to upper abdomen
- (bicycle handle bars, lap belt)
- general abdominal tenderness, bilious vomiting 19

#### **Abdominal Trauma**

#### Indications for CT:

- suspected intra-abdominal injury and stable vital signs
- slowly declining hematocrit
- physical exam unreliable due to neurologic injury
- hematuria
- need for aggressive fluid resuscitation without obvious source of hemorrhage



#### **Case Study**

A three week old child presents to ER with acute onset of irritability, bilious vomiting, and abdominal pain. Of the following, the most likely diagnosis is:

- 1. Intussusception
- 2. Incarcerated Inguinal Hernia
- 3. Malrotation with Volvulus
- 4. Pyloric Stenosis
- 5. Acute appendicitis

#### Intussusception

- Segment of bowel telescopes into more distal segment:
  - ileocolic most common
  - ileoilial
  - colocolic rare
- Leading cause of intestinal obstruction in infants:
  - hypertrophied Peyer's patches common lead-point
  - consider polyp, Meckel's diverticulum, tumor in older children
- Typical age range: 3mo 12mo

#### Intussusception



#### Intussusception

- Clinical Presentation:
  - crampy abdominal pain intermixed with periods of lethargy
  - irritability / inconsolable crying
  - anorexia, vomiting
  - may feel sausage-like mass in RUQ
  - currant jelly stools typically late feature
  - sepsis-like presentation

#### Intussusception

#### Management:

- IV hydration, lab-work (CBC, BMP, STBB)
- nasogastric tube
- plain films may reveal distended bowel with air-fluid levels
- air contrast barium enema often provides both diagnosis and reduction
- pediatric surgical consultation prior to ACBE



#### **Incarcerated Inguinal Hernia**

- 60% occur in first year of life
- Occur more often in males
  - usually involves ovary rather than intestine in females
- May lead to strangulation if not reduced within 24 hours
  - progressive edema of bowel wall by venous and lymphatic obstruction
  - occlusion of arterial supply resulting in necrosis of bowel and possibly perforation

### **Incarcerated Inguinal Hernia**

#### Clinical Presentation:

- irritability, crying
- vomiting, abdominal distension
- firm, discrete mass palpated at inguinal ring (may extend into scrotum of boys)
- easily confused with tense hydrocele in boys
  - no mass will be felt in inguinal ring
  - hydroceles typically trans-illuminate



#### **Incarcerated Inguinal Hernia**

#### Attempt manual reduction

- sedate with morphine
- older children placed in Trendelenburg position (let gravity work for you!)
- mild pressure exerted at inguinal ring in Vshape with one hand; other hand squeezes gas or fluid out of incarcerated bowel into the abdominal cavity
- surgical reduction if unsuccessful

#### **Malrotation with Volvulus**

- Malrotation Congenitally abnormal fixation of bowel mesentery
- Volvulus Bowel may twist and obstruct at point of abnormal fixation
  - may occur in utero or in early neonatal life
  - can be silent until childhood
  - complete volvulus for more than 1-2 hrs may lead to complete necrosis of involved segment
  - midgut volvulus may lead to loss of entire small bowel and ascending colon





#### **Malrotation with Volvulus**

#### Clinical Presentation:

- bile stained vomiting
- constant abdominal pain
- blood in stools indicates ischemia and possible necrosis of bowel
- mild abdominal distension with palpable dilated loops of bowel; diffuse tenderness to palpation +/- signs of peritonitis

#### **Malrotation with Volvulus**

#### Diagnosis:

- Flat and upright plain films-
  - loops of bowel overlying liver shadow
  - air-fluid levels
  - scant gas distal to volvulus
  - "Double Bubble" sign on upright films
- Upper GI-
  - study of Choice
  - absence of Ligament of Treitz
  - cecum not fixed; usually in RUQ

### Malrotation – "Double Bubble"



#### **Malrotation with Volvulus**

#### Management:

- Surgical Emergency!
  - Volvulus can necrose bowel in 1 2 hours
- IV hydration and electrolyte replacement
- nasogastric tube
- blood products cross-matched
- triple antibiotic coverage if suspect vascular compromise to bowel:
  - ampicillin, gentamycin and clindamycin

#### **Pyloric Stenosis**

#### Narrowing of pyloric canal as a result of hypertrophy of musculature

- first-born male
- familial (especially if mother had PS as infant)
- Male : Female ratio is 5 : 1
- typical age of onset 2 to 5 weeks

#### **Pyloric Stenosis**

#### Clinical Presentation:

- vomiting after feedsnon-bilious
- infant appears hungry
- vomiting becomes projectile
- associated with jaundice, failure to thrive
- examination of infant on empty stomach
- may palpate firm, fusiform, ballotable mass known as "olive"
- prominent peristaltic waves

#### **Pyloric Stenosis**

#### Diagnosis:

- hypochloremic, hypokalemic metabolic alkalosis
   ultrasound:
  - length of pyloric canal >14mm
  - thickness of circular muscle >3mm
- upper GI:
  - "String Sign" in pyloric channel
- Management:
  - correct electrolyte abnormalities
  - surgical consult for corrective pyloromyotomy

### **Acute Appendicitis**

- Most common condition requiring emergency operation in childhood
  - Most frequently seen in 2nd decade of life
  - Perforation rate highest in infancy
- Classic presentation only occurs 25%:
  - Abdominal pain (periumbilical to RLQ; worse with movement)
  - Vomiting
  - Fever
  - Anorexia

### **Acute Appendicitis**

#### Clinical Signs:

- fever
- RLQ tenderness
- involuntary guarding
- rebound tenderness
- irritability, lethargy (in infants)
- hopping causes increased pain
- psoas, obturator signs occur <30%
- WBC usually 11,000 15,000
- urinalysis: pyuria (30%)

#### **Appendicitis**

#### Diagnosis:

- clinical exam
- plain films
  - calcified fecalith (8-10%)
    indistinct psoas margin with rightward scolisis
- ultrasound
- CT with oral, rectal, IV contrast

#### Differential Diagnosis:

- Gastroenteritis
- Constipation Ileus
- IntussusceptionEctopic pregnancy
- Mesenteric Adenitis
- PID / UTI
- Adenitis I ow
  - Lower Lobe Pneumonia

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**Case Study - Answer** 

A three week old child presents to ER with acute onset of irritability, bilious vomiting, and abdominal pain. Of the following, the most likely diagnosis is:

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Common Pediatric Orthopedic Emergencies

### Salter Harris Classification



### Buckle (Torus) Fracture

- Metaphyseal fracture caused by compressive forces in a longitudinal plane
- Bulge in metaphyseal region where cortex is weakest \_\_\_\_\_\_



### **Greenstick Fracture**

- Most common fracture due to a lateral bending force
- Fracture exists only on one side of cortex



### **Toddler's Fracture**

- Occurs in 1-4 year olds
- Non-displaced spiral fracture of the lower tibia
- Make sure history is consistent with injury



### **Clavicle Fracture**

- Most common pediatric fracture
- Most are greenstick
- Mechanism: fall or blow to shoulder
- Treatment: figure-of-eight or sling

#### **Supracondylar Fracture**

- 3-10 years old; males > females
- Mechanism fall on outstretched hand or flexed elbow
- Complications brachial vessel, radial nerve damage
  - Volkmann's Ischemia (5 P's):
    - pain, paresthesia, pallor, paralysis, pulselessness

#### **Supracondylar Fracture**



# Slipped Capital Femoral Epiphysis

- 12-15 year olds
- Obese (90%)
- Males > Females
- Bilateral 20-30%
- Child presents with limp, localizes pain to hip, groin or knee
  - examine hip in any child with knee pain

# Slipped Capital Femoral Epiphysis



### **Legg-Calves Perthes Disease**



Avascular necrosis of femoral head

**Legg-Calves Perthes Disease** 

- 4-8 years of age
- Males > Females
- 10% bilateral
- Antalgic limp; pain referred to knee, thigh, groin
- Limited abduction and internal rotation

### **Septic Arthritis**

- Infection within a joint space
- Most <5 years of age</p>
- Males > Females
- Mechanism: hematogenous > spread from contiguous site, direct inoculation
- 30% misdiagnosed as trauma
- 90% monoarticular
   Knee > Hip > Ankle > Shoulder > Wrist
- Organisms
  - S. Aureus; Streptococcus; H. influenza; GNR
  - GBS (neonates); N. gonorrhea (sexually active)

### **Septic Arthritis**

#### Presentation:

- limp, pain, erythema, swelling, warmth
- decreased ROM
- fever (absent in neonates, GC)
- elevated WBC, ESR, CRP
- positive blood culture (50%)
  x-rays reveal widened joint space, bone
- destruction (late)
- Synovial Fluid:
  - WBC > 50,000 (>75% PMN's)
  - positive gram stain (75%)
  - positive culture (65%)

### **Toxic Synovitis**

- 18 months 12 years (peak age 2)
- Males > Females
- Pain, limp, afebrile
- Minimal pain with ROM
- WBC, ESR, CRP normal
- Synovial fluid turbid but sterile
- X-rays may reveal joint effusion
- Treatment bed rest, NSAID's



#### **Fever in Infant**

- Based on clinical signs and symptoms, it can be very hard to determine which infants develop neonatal septicemia:
  - temperature instability
    - Rectal Temperature > 100.4 or < 96.8
  - change in feeding habits
  - seizure activity
  - respiratory distress
  - jaundice
  - loose Stools
  - no signs or symptoms

#### **Fever in Infants**

- Infants aged 1-28 days are at higher risk of spontaneous bacterial infection
  - studies have consistently shown that 5-6 percent of infants less than 28 days old with fever >100.4 will have a serious bacterial infection:
    - most have UTI's
    - some have bacteremia, pneumonia, or meningitis
    - most common organisms:
      - –GBS, Listeria, gram negative organisms

#### **Infant with Fever**

- Mandatory Work-up Includes:
  - CBC with manual differential
  - blood culture
  - urinalysis, urine culture
  - lumbar puncture
  - (+/-) CXR
  - $-\,empiric\,antibiotic\,coverage$  / admission
    - Ampicillin and Tobramycin

#### **Infant with Fever**

- RSV and Influenza A/B should be sent during appropriate seasons
  - slightly decreased risk of having spontaneous bacterial infection if positive
  - still complete septic work-up and admit

#### **Infant with Fever**

- Infants older than 28 days and less than 3 months of age with fever:
  - controversial
    - at times decision is made on likelihood of adequate follow-up

### Pediatric Ophthalmologic Emergencies

### **Periorbital Cellulitis**

- Infection is anterior to orbital septum
- <6 years of age (peaks at age 2)</p>
- Unilateral lid swelling, erythema, tenderness, warmth, fever
- Most common organisms:
  - S. pneumoniae; S. aureus; Streptococcus;
     H. influenzae
- Treatment:
   Nafcillin or Ceftriaxone; warm compresses

### **Periorbital Cellulitis**



### **Orbital Cellulitis**

- Infection is posterior to orbital septum
- Usually due to complication of sinusitis (ethmoid)
- Swelling, erythema, tenderness, warmth, proptosis, loss of vision, ophthalmoplegia
- Complications
  - meningitis, sepsis, cavernous sinus thrombosis
- Treatment
  - Nafcillin, Ceftriaxone
  - +/- surgical drainage

#### **Orbital Cellulitis**





### **Corneal Abrasion**

- Usually history of trauma to eye - common in infants with inconsolable crying due to fingernails scratching surface of eye
- Symptoms
  - pain when eye is open
  - tearing
  - blurry vision
- Diagnosis Fluorescein stain with wood's lamp
- Treatment Bacitracin ophthalmic ointment

#### **Corneal Abrasion**





Figure 4.1 Corneal Abrasio

# Figure 4.2 Corneal Abra

### **Pediatric Genitourinary Emergencies**



### **Testicular Torsion**

- Most common cause of acute painful scrotum
- Peak age 14-17 years
- Preceding trauma in 5-6%
- 50% recall similar pain which resolved
- Spermatic cord twists and venous drainage is obstructed
  - testicular engorgement
  - arterial shutdown
  - tissue ischemia and eventual infarction (6 hours)

#### **Testicular Torsion**

#### Clinical Findings:

- sudden onset of unilateral scrotal pain
- followed by swelling, abdominal pain, vomiting
- testis is high riding and transverse in position (Bell-clapper deformity)
- cremasteric reflex is absent
- epididymis is tender
- lifting testis increases pain

### **Testicular Torsion**







### **Testicular Torsion**

#### Diagnosis

- doppler US to look for decreased blood flow
- Management
  - manual detorsion
  - surgical exploration and fixating orchiopexy

### **Torsion of the Appendix**

- Peaks in puberty
- Point tenderness at upper pole of testis or epididymis
- Vomiting
- "Blue Dot" sign
  - blue, pea-sized, tender nodule represents ischemic appendage

### Torsion of Appendix





#### **Upper Airway Disease**

- Stridor:
  - externally audible sound produced by turbulent flow through narrowed airway
  - acute vs. chronic-
    - croup
    - epiglottitis
    - retropharyngeal, peritonsillar abscess
    - bacterial Tracheitis
    - foreign body aspiration
    - subglottic stenosis,
    - tracheo/laryngomalacia • anatomic variants

Remember Pousille's Law?



#### Croup

- Typical age range: 6 36 months
- Males > Females (3:2)
- Fall / Winter predilection
- Common causes:
  - parainfluenza
  - -RSV
  - adeonvirus
  - influenza

#### Croup

- Clinical Presentation:
  - prodrome of URI symptoms, fever
  - development of barking, seal-like cough and stridor
    - subglottic mucosal swelling and secretions lead to narrowed airway
  - symptoms worse at night
  - "Steeple Sign" on plain film of neck



### Croup

#### Management:

- keep child calm (sitting in parent's lap)
- humidified air / saline
- steroids
  - Decadron 0.6 mg/kg IM or PO
- Racemic Epinephrine nebulizer treatment
  - decreases mucosal swelling and secretions
  - must observe at least 4 hours after treatment given

#### **Retropharyngeal Abscess**

- Recent history of pharyngitis, otitis media, or penetrating wound to posterior pharynx
- Cellulitis and suppurative adenitis of lymph nodes in prevertebral fascia
- Plain films reveal soft tissue swelling at level of C3-C4
- CT better delineates extent of infection

## **Retropharyngeal Abscess**



### **Retropharyngeal Abscess**

#### Clinical Presentation:

- fever
- difficulty swallowing, drooling
- sore throat, hoarse voice
- painful, stiff neck

#### Management:

- secure stable airway
- broad spectrum antibiotics (Nafcillin/Clindamycin)
- ENT consult for surgical I&D

### **Epiglottitis**

- Not seen as frequently today
  - Haemophilus influenza type B vaccine
- Other bacterial causes:
  - staphylococcus species
  - streptococcus species
- Diagnosis:
  - "Thumbprint Sign" on lateral plain film of neck



# Epiglottitis – Thumbprint Sign



### **Epiglottitis**



Endoscopic view of almost complete airway obstruction secondary to epiglotitis. Note the sili-like opening of the airway, (Courtesy of Department of Otolaryngology, Childrens Hospital Medical Center, Cincinnati, OH.)

### **Epiglottitis**

- Clinical Presentation:
  - sudden onset high fever
  - moderate to severe respiratory distress
  - stridor
  - drooling
  - toxic appearing child that sits in "tripod" position

### **Epiglottitis**

- Management:
  - keep child as calm as possible
  - EMERGENT surgical consult to establish definitive airway in operating room
  - Broad Spectrum antibiotic coverage
    - Second or third generation cephalosporins

#### **Bacterial Tracheitis**

#### Bacterial complication of a viral URI

- Staphylococcus aureus
- Haemophilus influenza (non-typable)
- streptococcal species
- Pathophysiology:
  - swelling of tracheal mucosa below vocal folds
  - thick purulent secretions may lead to mucous plugging

#### **Bacterial Tracheitis**

#### Presentation similar to croup

- more toxic appearing child
- does not respond to typical croup treatment
- outside the typical age range for croup

#### Plain films of neck:

 edema with an irregular border of the subglottic tracheal mucosa ("subglottic membrane")

### Subglottic Membrane



#### **Bacterial Tracheitis**

- Management:
  - assess and maintain patent airway
  - frequent suctioning if intubated
  - ENT consultation
  - Broad Spectrum antibiotic coverage

#### **Foreign Body Aspiration**

- Recurrent wheezing or stridor that is unresponsive to usual therapy

   afebrile
  - alebhie
  - recurrent pneumonia in same location
- Common items found:
  - coins, small toys
  - nuts or seeds
  - popcorn, small candy
  - beads, buttons, safety pins
  - balloons, latex gloves

### **Foreign Body Aspiration**

#### Diagnosis:

- plain films of the neck
- PA and lateral chest xray
  - radio-opaque FB
  - atelectasis
  - mediastinal deviation
- bilateral decubitus films
- inspiratory and expiratory chest films
  hyper-inflation or air trapping on side of
  - FB

### **Foreign Body Aspiration**





gure 3.12 Findings associated with foreign body

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### Lower Airway Illnesses

#### Intrathoracic Structures

 mainstem bronchi, bronchial tree, bronchioles

#### Clinical Findings:

- wheezing
  - obstruction of intrathoracic airways
  - heard both during expiration and inspiration
- rales
  - air trapping and atelectasis
  - Focal Consolidation
- diminished air movement

#### Asthma

#### Reversible airway obstruction

- bronchospasm of lower airway
- swelling of airways and increased mucous production (inflammation)

### Asthma - Triggers

- Atopic Conditions

   allergic rhinitis, eczema, chronic sinusitis
- Allergen Exposures
  - cigarette smoke
  - pets
  - carpeting, ceiling fans
- Viral Illnesses

#### **Asthma - Presentation**

- Cough
- Wheeze
- Shortness of breath
- Chest tightness / pain
- Vomiting
- Increased work of breathing – retractions, flaring

#### **Asthma - Management**

#### Bronchospasm:

- beta-2 agonists
  - Albuterol vs. Xopenex
  - Terbutaline, epinephrine
- anticholinergics
  - Atrovent
- Inflammation
  - corticosteroids

### **Bronchiolitis**

#### Viral etiology

- RSV, parainfluenza, adenovirus, rhinovirus
- Symptoms:
  - cough
  - tachypnea
  - accessory muscle use
  - high pitched wheezing
  - fine inspiratory crackles and rhonchi
  - copious, thick nasal secretions

#### **Bronchiolitis**

#### Management:

- supportive care
  - nasal saline spray / suctioning
  - adequate PO intake
  - ensure adequate oxygenation
- pharmacologic
  - Albuterol
  - racemic Epinephrine
  - steroids consider if history of atopy exists
- infants <2 months old, history of prematurity</li>
  - risk of developing apnea generally admit and observe

### **Wound Management**

#### **Wound Management**

#### Get a Good History:

- mechanism of injury
- wounding object mass, velocity, etc
- environment in which injury occurred
- time of injury
- general health of patient
- medications
- allergies
- immunization status

#### Wound Management

#### Perform a Good Physical Exam:

- assessment of distal neurovascular function
- assessment of tendon integrity
- palpation of adjacent bony structures
   consider radiographs to look for fractures
  - surgical referral for all open fractures
- explore wound through full ROM and in position of injury
- evaluate for presence of foreign bodies

   consider radiographs to look for foreign bodies
  - remove all reactive foreign bodies
  - (vegetable materials, wood, organic materials, clothing)

### **Wound Management**

#### Local cleansing and irrigation is important in almost all wounds

- remove obvious dirt or foreign materials by irrigation or gentle scrubbing
- use of antiseptic solutions for wound cleansing is controversial
- <u>saline irrigation</u> is standard practice in treating contaminated or dirty wounds
- high pressure irrigation
- 200-300 ml minimum volume
- will cause tissue damage so not needed in clean wounds

### **Wound Management**

#### Hair

- razor removal results in increased rate of wound infections
- use of electric clippers associated with lower rates of infection
- petroleum jelly can keep unruly hairs out of your field
- NEVER shave eyebrows

### Wound Management

#### Debridement

- use to remove heavily contaminated tissue or devitalized tissue
- prevents bacterial growth
- do not create too much tension in your wound by debriding too large an area

### **Prophylactic Antibiotic Use**

#### Indications:

- patient prone to development of infective endocarditis
- immuno-suppressed patients
- soft tissue lacerations occurring in previously lymphedematous tissue
- wounds judged to be contaminated or dirty by the clinician (especially in dependent areas)
- stellate lacerations with adjacent abrasions resulting from high impact

#### **Prophylactic Antibiotic Use**

#### Indications:

- delayed wound closing and repair
  - between 6 to 18 hours after injury, bacteria colony counts reach potentially infective concentrations
  - consider open management and delayed closure
- wounds contaminated by saliva, feces, vaginal fluids
- consider open management and delayed closure
- missile wounds
- certain bite and crush wounds
- foot wounds

### **Antibiotic Use**

#### Broad Spectrum

- effective against Staphylococci, Streptococcus and facultative organisms
- Cephalexin (Kelfex) is inexpensive, well-tolerated, effective choice
- can also use Augmentin, Dicloxacillin
- use of Erthromycin or Biaxin if PCN/Cephalosporin sensitive

### **Animal Bites**

- Dog bites account for about 1% of ED visits:
  - wounds become infected slightly more commonly than wounds in general
  - require meticulous wound preparation
  - loose sutures if needed
  - prophylactic antibiotics indicated for:
    - dog bites to hand
    - bites older than 6 hours
    - bites that inflict puncture wound

#### **Animal Bites**

#### Common Organisms:

- Staphylococcus, Streptococcus
- Bacteroides species
- anaerobic cocci
- Pasteurella multicida
- Best antibiotic choice: Augmentin
- Send wound culture if infected

# Another reason not to have cats!

- Cat bites have higher incidence of wound infections
  - do not close wounds if at all possible
  - meticulous irrigation
  - Pasteurella multocida is implicated in about 50% of cat bites

### **Rabies Prophylaxis**

- Soap and water cleansing decrease transmission of rabies
- Active and Passive Immunoprophylaxis
   Human Rabies Immune Globulin

#### • Dose = 20 IU/kg

- Infiltrate ½ dose around wound and other ½ dose at IM site distant from wound
- Human Diploid Cell Vaccine
  Dose = 1ml IM
  - Give on days 1, 3, 7, 14, and 28
- Contact Animal Control

#### **Rabies Prophylaxis**

#### Table 110.3. Indications for Rabies Prophylaxis

#### 1. Bites of wild carnivores (especially bats, foxes, raccoons,

- Bites of unknown or unavailable dogs and cats in rabies en-
- demic areas 3. Bites of ill-appearing dogs and cats pending testing (may be
- 6) Aniso of an appending outpatient of animals who become ill during a 10-day observation period. Animals who are healthy and can be observed for 10 days do not need to be sacrificed and initial prophylaxis can wait until the animal develops symptoms 4. Individual cases of bites by cattle, rodents, and lagamorphs
- Individual cases of bites by cattle, rodents, and lagamorphs (rabbits and hares, although they almost never transmit rabies)

Immunoprophylaxis is indicated if the animal is acting strangely (very aggressive behavior or nocturnal animals out during daylight hours)

#### **Human Bites**

# Generally associated with higher rates of infection:

- delay in seeking treatment
- high impact mechanism of injury
  - fist fights, sports injuries
  - increased tissue crushing and devitalization

#### Common pathogens:

- Staphylococcus, Streptococcus (includes group A Streptococcus)
- Bacteroides species
- anaerobic cocci
- Eikenella corrodens

### **Tetanus Prophylaxis**

#### All wounds carry risk of tetanus as a potential complication:

- contaminated wounds (soil, feces)
- devitalized tissue
- deep puncture wounds
- Tetanus Immune Globulin
  - dose = 250 IU IM
  - only give in patients who have not received at least three previous doses of tetanus toxoid or whose immunization status is unknown

#### **Tetanus Prophylaxis**

No. Doses of Tetanus Toxoid	Time Since Last Dose	Clean Wound		Tetanus Prone Wound	
		TIG	dT*	TIG	dT*
<3 or unknown	<5 yr	No	Yes	Yes	Yes
	5-10 yr	No	Yes	Yes	Ye
	≥10 yr	No	Yes	Yes	Yes
≥3	<5 yr	No	No	No	No
	5-10 yr	No	No	No	Yes
	≥10 yr	No	Yes	No	Yes

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### Common Pediatric Emergencies: Questions???

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