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 adolescents
  - motor 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

- 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

<table>
<thead>
<tr>
<th>Pediatric Trauma Score</th>
<th>Category Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (kg)</td>
<td>&gt;20</td>
</tr>
<tr>
<td>Airway</td>
<td>Normal</td>
</tr>
<tr>
<td>Systolic blood pressure (mm Hg)</td>
<td>&gt;90</td>
</tr>
<tr>
<td>Central nervous system</td>
<td>Awake</td>
</tr>
<tr>
<td>Open wound</td>
<td>None</td>
</tr>
<tr>
<td>Skeletal trauma</td>
<td>None</td>
</tr>
</tbody>
</table>

Note: The value for each patient characteristic: Highest possible score is 12, and lowest possible total score is 6.

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

B = Breathing
- assess:
  - rate Work of Breathing
  - color Mental Status
  - Adequate?
    - Administer High Flow Oxygen
  - Inadequate?
    - Bag-Valve-Mask ventilation with 100% O2
    - naso/orogastric tube
    - consider Intubation

C = Circulation / Hemorrhage Control
- Assess:
  - Heart rate Pulse quality
  - Color Skin signs
  - Mental status Direct pressure to bleeding
  - 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

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

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

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

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

Pediatric Abdominal Emergencies

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
  - ileoileal
  - 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

- Figure 11B.4: Ileocolic intussusception. A. Beginning of an intussusception in which terminal ileum prolapses through ileocecal valve. B. Ileocolic intussusception continuing through the colon. This can often be palpated as a mass in the right upper quadrant.
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

Hydrocoele
**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 V-shape 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**

**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 feeds
    - non-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
  - Intussusception
  - Ileus
  - Ectopic pregnancy
  - PID / UTI
  - Mesenteric Adenitis
  - Lower Lobe Pneumonia

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
Buckle (Torus) Fracture

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

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

Legg-Calves Perthes Disease
- Avascular necrosis of femoral head
- 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
- 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

### Febrile Infant

### 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)
- Unilateral lid swelling, erythema, tenderness, warmth, fever
- Most common organisms:
  - S. pneumoniae; S. aureus; Streptococcus; H. influenzae
- Treatment:
  - Nafcillin or Ceftriaxone; warm compresses
**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

**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

**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

**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

Pediatric Respiratory Emergencies
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?

<table>
<thead>
<tr>
<th>Normal</th>
<th>Edema 1 mm</th>
<th>Resistance ( R = \frac{1}{\text{radius}^2} )</th>
<th>Cross-sectional area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infant</td>
<td>4 mm</td>
<td>↑10x</td>
<td>↑75%</td>
</tr>
<tr>
<td>Adult</td>
<td>6 mm</td>
<td>↑3x</td>
<td>↓44%</td>
</tr>
</tbody>
</table>

Croup

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

Croup – “Steeple Sign”

- **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

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

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 - normal airway

Epiglottitis – Thumbprint Sign
Epiglottitis

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

**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

Epiglottitis

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
  - 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

**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
    - 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

- 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)

- 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
  - saline irrigation 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

- 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

- 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 (Keflex) 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 multocida*
- **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, skunks, and weasels)
2. Bites of unknown or unavailable dogs and cats in rabies endemic areas
3. Bites of ill-appearing dogs and cats pending testing (may be discontinued if testing negative) or 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 cats, dogs, and other animals (rabbits and hares, although they almost never transmit rabies). Immunoaphylaxis is indicated if the animal is acting strangely (very aggressive behavior) or nocturnal animals are out during day

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

<table>
<thead>
<tr>
<th>No. Doses of Tetanus Toxoid</th>
<th>Time Since Last Dose</th>
<th>Clean Wound</th>
<th>PRoT</th>
<th>Wound</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;3 or unknown</td>
<td>&lt;5 yr</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>≥3</td>
<td>≥10 yr</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>≥5 yr</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>≥10 yr</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>≥3 yr</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

* In children under 7 years of age, DTaP or pediatric DT (if pertussis vaccine is contraindicated) should be given.

Common Pediatric Emergencies: Questions???

Phone: 828-7400
Email: cwoleben@vcu.edu