REVISED: NOV. 3, 2011
NWC EMSS Continuing Education Independent Study Materials
October 2011 – Pediatric Emergencies

Pediatric Assessment

Pediatric patient assessment must be guided by awareness of the patient's developmental stage. Consideration should be given to the following developmental behaviors and corresponding approaches to physical examination.

Normal Development
Birth to one year

By 3-4 months:
- Establishes attachment to parents
- Can be quieted easily (more readily by primary caretaker
- Smiles readily

By 4-6 months:
- Is learning to treat individuals differently
- Laughs out loud and may show displeasure if social contact is broken
- About 6 mos begins to be anxious around strangers

By 8-9 months:
- Protests when primary caregiver leaves
- Shows happy feelings when interacting with people
- Starts to experiment with independence (crawls away from parents, cries, then comes back

One and two year olds
- Exhibits the beginnings of autonomy (showing clothing or food preference
- Explores the environment, using the parent or primary caretaker as a secure attachment
- May use a transitional object - a doll, blanket, or thumb to calm himself or help himself go to sleep
- Learns to soothe self verbally and deal with emotional issues with words
- Demonstrates interest and enjoyment in play
- Demonstrates a wide variety of emotions feelings, and moods, including protest, anger, pleasure, joy, assertiveness, and warmth

Preschool years: Ages 3-5
- Continues to demonstrate curiosity and interest
- Exhibits a vigorous enjoyment of new skills
- Is imitative and imaginative (play may include an imaginary friend)
- May be even more strongly attached to a transitional object
- Begins to be curious about gender differences
- May express anger using words (sometimes includes profanity)
- Continues to show a variety of emotions

Ages 6-11
- Enjoys interaction with peers, make friends easily
- Recognizes the need for rules
- Shows self-esteem an self-confidence
- Feels good about accomplishments
- Has a vivid imagination, and in play often stages dramatic scenes using favorite toys

Ages 12-15
- Enjoys close interaction with peers and develops intimate relationships, especially with friends of the same sex
- Is industrious, demonstrates a sense of mastery and progressively takes responsibility for own work (homework, chores)
- Demonstrates self-confidence and sense of pride
- May occasionally exhibit anger and rebelliousness but is generally enthusiastic, energetic, and cooperative
- Spends leisure time involved in complex games and sports teams with less need for adult supervision (by age 15, play and leisure time are part of the child's identity and may incorporate music, lounging around or experimental risk-taking, such as harmless pranks or daredevil-type sports activity

Ages 16-18
- Is self-confident
- Has a sense of pride, competence
- Enjoys close interaction with peers of both sexes
- Is moving toward independence
- Feels responsible for his own health and behavior
- Participates in activities outside of school
- Is generally energetic, enthusiastic, idealistic
- Is generally cooperative and considerate (although a certain amount of rebelliousness is normal)

Approach to Physical Exam
Infant 6-12 months:
- The baby will reject the attention of strangers. Make first contact with the infant in the mother's lap until the child views you as a safe person.
- Will probably not object to being undressed but will object violently from being removed from their primary caregiver and placed on a table or cart for examination
- Distract infant with verbal stimulation and examine while sitting in mother's lap
- Conduct exam from toe to head

1-3 year olds

The young patient is more vulnerable and more challenging because of their rapid development & their greater dependency.

Biggest fears:

- Unknown
- Possibility of pain or loss
- Separation
- Strangers
- Hostile strange machines & equipment

Basic principles to facilitate examination & treatment of children:

Establish rapport with parent or caretaker & the child.

- Remain calm and confident
- Be direct & honest
- Do not separate the parent or caretaker from the child if it can be avoided

- Make as many assessments as possible without touching the child
- Provide feedback, information, & reassurance.
- Toddlers have little fear of danger. They do not initially realize that they can hurt themselves or be hurt by others. Their limited language ability combined with the presence of threatening strangers can be overwhelming. Although toddlers need to assert themselves and have control, their security is determined by the physical presence of their mother. Separation from the mother causes them undue stress and decreases autonomy.
- Allow the parent to remain with the child under most circumstances. A child too young to understand explanations before hand will also have difficulty understanding why the parent allows them to experience pain from an injection or IV. It is especially confusing if the parent holds the child down while the pain is being applied. They see the parents as the sole source of protection from all bad things. Therefore, it is best if you allow the parents to remain in the background during a painful procedure and give immediate support and love as soon as it is finished.
- Allow a toddler to play with safe equipment used in their care when you are finished (stethoscopes, pen lights, etc.)
- Crying is a universal reaction to stress in this age group. As cognitive skills develop, the child is better able to verbalize their fears and tension and active resistance diminishes. Verbal responses include "No" and "Don't". Non-verbal responses include clinging to the parent, attempts to return to the parent if separated, attempts to escape, turning away, avoiding eye contact, kicking, flailing, and biting.
- Give them a familiar toy or blanket as a transitional object.
- Use their name
- Restrain them as little as possible
- Avoid covering their face
- Describe sensations and talk with them during procedures
- Praise, smile, and have a cheerful attitude

Preschool child: (3-5 years)

- Tend to depart from nl. patterns of behavior to a greater extent than do other children. They are becoming aware of their body & its capacity for pleasure, pain, & power. This age child is best able to cope w/ unfamiliarity as well as stresses due to threatening situations by acting out their thoughts & feelings.
- They need to handle an object before they can understand it. It time permits, allow them to feel a syringe and alcohol wipe, investigate the wonders of your stethoscope and pen light. Explain procedure immediately before performing it to minimize the amount of time they have to fantasize about the procedure. Their major fears are of monsters, aggression, and body mutilations. Their perception of time is the here and now so ask only specific questions. Their verbal responses include protests, screams, or whimpering. They use words or sentences to acknowledge pain, to express anger or fear. They try to postpone treatment in an attempt to escape it altogether, "Wait a minute!"
- Nonverbally, they are preoccupied with their injury or the actions of personnel. They reach for help, support seeking bodily contact, usually with parents. They may frown, kick, scratch, turn away, hold rigidly still, clench teeth, shut their eyes tight or keep them wide open.

Strategies to decrease their stress:

- Provide them with intellectual & motor stimulation
- Allow the child some autonomy. Give them permission to object but be firm about what you are doing. If there is no choice, do not imply that there is by asking their permission to proceed.
- Allow the child a means of coping by crying or holding a favorite toy.
- Don't discuss the child within his or her hearing. Assume they understand what you are saying.
- The sight of their own blood may precipitate utter panic. Cover all sites of bleeding so the young egocentric maintains their bodily integrity. Bandages keep the blood in where it belongs!
- Give small rewards.

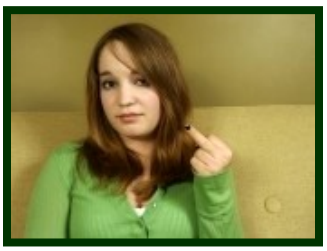
School age child

- A school age child may have the same anxieties as younger children but are able to communicate more effectively. Older children are more likely to ignore pain and hide discomforts. They become much less dependent on their family and more involved with their peers. They develop a sense of industry and interest in learning how things work.
- Their curiosity usually prevails - explain procedures or equipment to them in understandable language. Their fears of the unknown may make them subject

to anxiety, therefore, explain the reasons behind your actions to enhance their ability to cope & cooperate.
- Information tends to be reassuring. Help them verbalize their feelings and fears about the injury or treatment. Encourage questioning, expression of feelings, and active participation in their care.
- Give alternatives. You can yell, but you cannot move.
- A school age child thrives on praise for their actions or behaviors and positive feedback can be an effective tool in gaining cooperation. Give rewards.
- When obtaining a history, use a 50:50 parent-child source.
- The physical exam should be conducted in a sitting or standing rather than supine position if at all possible. These children respond favorably if treated with respect, honesty, and modesty.

Adolescents

This is a period of precarious self-esteem and peer pressure. There is striving for identify and struggling to achieve socially responsible behavior. Adolescents vary as to how modest hey are during an examination and treatment. Factors such as site of injury or etiology of illness, trust in care providers, and sex of the providers may influence the teen's behavior. They manifest their fears either verbally or nonverbally. It is important to be accepting and non-judgmental. Their self-image is based not only on how they perceive their own actions, but also on how others react to their body and behavior. They want attention paid to themselves as well as their injury. They have an exaggerated concern with themselves and will ignore or rebel against anyone they believe is not allowing them to be an individual. They are also in the process of developing their values and standards. They demand honest and accurate information and lose trust in a person who they believe tells them less than the truth. They dislike being "bossed". They need to feel that they have control of the situation and their refusal to cooperate or their angry, rebellious actions often reflect a loss of self-control. Include them in their care. The adolescent has intense body concerns and regards even minor injuries as serious. They worry about their physical growth, height, sexual maturation, and the development of secondary sexual characteristics.



When doing a physical exam, begin at the head. This is the least threatening part of the body psychosexually. Maintain their modesty by sheltering them from any bystanders and covering exposed areas with sheets. In many ways, they must be supported psychologically as a child, but present factual information as if they are an adult.

Communication Guidelines

Children are unpredictable by adult standards. You must know psycho-social growth and developmental stages to communicate with them effectively. See chart.
- Be prepared: Children cry loudly!
- Younger children have limited language skills and a decreased ability to communicate. Look at their faces for clues to their well-being.
- Keep voice at even, quiet tones, don't yell. They tend to respond to our facial expressions and tone of voice more than to what we actually say.
- Use toys or penlight as distracters; make a game of assessment. Use non-medical techniques such as pacifiers, toys, or books to calm children.
- Keep a small child with their caregiver(s) if possible; do assessment on a stable child while being held. Allow parents to remain with the child and offer comfort.
- Only one person should give instructions
- Get down on their eye level if possible. Speak slowly, communicate in words they understand.
- Make as many observations as possible before touching and upsetting the child or inflicting pain.

Psychological vulnerability: Fears
- They are placed in an unfamiliar setting surrounded by strangers, bright lights, scary machines and sounds. They are afraid of separation from their parents, permanent removal from their homes, their parents being angry or the possibility of punishment. Children are used to being scolded or punished for doing dangerous things. Now he knows he's done something "*really bad*", and the fear of imagined punishment blends with the pain of the injuries to create a living nightmare (Hawkins, 2002).

- They are afraid of pain, mutilation or disfigurement & the unknown.
- **Never lie to a child, be honest no matter what - even if it involves pain. Smile at the child and appear calm and in control.**
- Parents, too, may feel anger, guilt, or fear especially if they caused the injury. They may fear that the child will die, be brain damaged or experience permanent disability. They may also be injured, adding to the child's decompensation.
- Provide your name & qualifications
- Acknowledge their fears & concerns
- Remain calm & provide reassurance
- Explain exam & procedures

- If the parent cannot cooperate, assign someone to remove them until they can remain calm.

Pain in children

- Defer the painful part of the exam to last
- Avoid having parents participate in the painful part of any exam or treatment. Ex: Don't have them hold the child down to start an IV.
- Tell them how it will feel, not what will happen. Example: cold, wet, prick like a mosquito, mushy.
- Children do not localize pain well and can only appreciate severe pain in one place at a time.

Initial Assessment

- Purpose: Detect and resuscitate all clinically evident, immediate life threats.
- Observe before touching, especially if conscious
- Preferred position
- Unusual/significant odors
- Movement: spontaneous, purposeful, symmetrical
- Obvious injuries, bleeding, bruising, impaled objects, gross deformities
- **General impression:** While walking up to the child, do a quick look to determine the severity and urgency of the situation using the **pediatric assessment triangle (PAT)**

- The PAT focuses on three independent aspects of the physical assessment that are used to determine the physiologic stability of a child by just looking at them.
- In other words, ***"How sick?"*** *"**How quick**?"*
- **Appearance:** The child's overall appearance reflects the adequacy of oxygenation, ventilation, and perfusion. Appearance is the single most important factor in assessment. There are very few false negatives (very few really sick or injured children have a normal appearance). However, a child can have a chronic illness with visible abnormalities, but not be physiologically sick. **A sick child will look sick**.
- **Alertness, mental status and child's response to environment:** Observe for age-appropriate behavior, level of consciousness; affect, or restlessness. Is the child looking around, making eye contact; distractible, responding with curiosity or fear, playing, or quiet, eyes open but not moving much or uninterested in environment? Do they recognize parents/favorite toy? Are they uncooperative and clinging to parent vs. unconcerned and allowing invasive procedures? Are they irritable and unresponsive to comforting measures yet they stop crying and fall asleep when left alone? Paradoxic irritability is a sign of meningeal irritation.
- Muscle tone: good or limp; sucking on a pacifier or bottle; hands of an infant should be in fists.
- Cry or speech

Work of breathing

- General respiratory rate while child is quiet
- Respiratory effort: Obvious respiratory distress or extreme pain; *retractions, nasal flaring*
- *Abnormal audible breath sounds* – stridor, wheezing, grunting.

A normal appearance with increased work of breathing means **respiratory distress**. An abnormal appearance with increased or decreased work of breathing means **respiratory failure.**

Circulation to skin: Inadequate perfusion of vital organs leads to compensatory vasoconstriction in non-essential areas, especially the skin. Circulation to the skin reflects overall adequacy of perfusion.

- Skin signs: Obvious bleeding
- Skin color: pink, pale, flushed, cyanotic, mottled
- Skin temperature
- Pulse strength
- Capillary refill time (CRT)

Normal appearance + poor circulation to skin means observe carefully. Abnormal appearance + poor circulation to the skin means shock.

Other causes for vasoconstriction (mottling and/or prolonged capillary refill time (CRT): fever, hypothermia, medications, and normal vasomotor lability in infants.

The PAT can also help identify a child with CNS or systemic problems who has normal oxygenation, ventilation & perfusion. **Abnormal appearance + normal WOB and normal circulation to skin may mean brain/CNS dysfunction.**

Pediatric Respiratory Emergencies: Assessment

Respiratory infections are more serious in children than in adults because serious obstruction can occur due to the small size of the eustacian tubes, larynx and bronchi. Children have a poor cough reflex and minimal pulmonary reserves.

History: Localizing site of illness to upper or lower airway may assist field treatment decisions.

- Has the child had a fever? For how long?
- Has the child had an acute episode of coughing or choking suggestive of F/B aspiration?
- Will the child drink? Has he/she been drooling?
- Has the voice changed?
- Has the child had a similar problem in the past?
- Is the child a known asthmatic?
- On what medications? Last dose?

Physical Exam:
Assess for causative factors of distress: Causes of acute deterioration in the infant or child include the **H's and T's**

- **H**ypoxemia
- **H**ypovolemia
- **H**ypothermia
- **H**yperkalemia, hypokalemia
- **H**ypoglycemia and other metabolic disorders

- **T**amponade
- **T**ension pneumothorax
- **T**oxins, poisons or drugs
- **T**hromboembolism

Airway assessment – determine patency
Airway obstruction in children may be acute, insidious, progressive or recurrent. Maintain high index of suspicion.
Possible causes of airway impairment

- Tongue; improper positioning
- *F/B aspiration, secretions, trauma
- Supra or subglottic allergic edema/anaphylactic shock
- Reactive airway disease
- Ingestion of caustic agent
- Unique airway infections: croup, epiglottitis, infectious mononucleosis, peri-tonsilar abscess, retropharyngeal abscess, bacterial tracheitis, diphtheria
- Pneumonia, pneumothorax, Reye's Syndrome, metabolic acidosis
- Congenital disorders
- Most deaths occur when fragments from popped balloons occlude a child's airway or food is aspirated, i.e., hot dogs, peanuts, bread with peanut butter, beans. If a F/B passes the glottis, it can lodge in a lower-airway (suspect in child with recurrent pneumonia always in same place). F/B most commonly land in the R mainstem bronchus; aspiration episodes are rarely witnessed. Ask about choking history or coughing spell that went away. They may present with unilateral "new-onset asthma". Clues: unilateral wheezing, coughing, and decreased or absent breath sounds.

Inspect: Look/listen for signs of airway obstruction
If patient is responsive: are they crying or talking without difficulty?

- YES → assess breathing, quality of voice (hoarse or raspy?)
- NO → feel for air movement
- If unresponsive: look, listen, feel for air movement
- Position
- Face & neck: symmetry, wounds, edema, F/B, oral secretions
- Symmetry of chest expansion & depth
- Listen for audible sounds

S&S of partial airway obstruction

- Stridor
- Choking
- Drooling
- Hoarseness
- Wheezing
- Grunting
- Retractions
- Tachypnea
- Tripod position
- Accessory muscle use: nasal flaring, head bobbing
- Diminished breath sounds
- Tachycardia/bradycardia
- Altered level of consciousness

Breathing/ventilation/oxygenation: Inspection
Ventilatory attempts: Spontaneous? Fast or slow?
Tachypnea may be due to metabolic acidosis secondary to ↓ perfusion with ↑ lactic acid production. Bradypnea may indicate impending respiratory arrest.
Mechanics: Symmetry of chest expansion; retractions, tracheal tugging, accessory muscle use/head bobbing/ expiratory grunting, work of breathing.
Abdominal contour: Distended?
Skin color: Mottling of extremities?
SpO_2: Children should easily maintain SpO_2 well over 96% w/ supplemental O_2 (higher than normal adult values). SpO_2 of ≤ 94 is a clue that pulmonary function is impaired. Use a pediatric sensor.
Breathing/ventilation/oxygenation: Palpation

- Amount of air movement
- Tracheal position in neck
- Chest wall expansion
- Skin temperature/moisture

Breathing/ventilation/oxygenation: Auscultation
Done immediately if patient appears to be in ventilatory distress. Assess if breath sounds are present, diminished, or absent; compare equality; note adventitious sounds.
Signs of inadequate ventilations/gas exchange

- ↑ work of breathing
- Increased use of accessory muscles: **Head bobbing** in infants 6-12 months. Head bobs with each breath to ↑ the effectiveness of the accessory muscles

- Presence of **retractions**
- RR: Increase then decrease
- Depth: decreased
- **Nasal flaring**
- Expiratory grunting
- I/E Ratio: Prolonged expiration
- Frequent coughing
- Mottling/cyanosis of extremities
- Anxiety, irritability,
- AMS; lethargy
- Tachycardia → bradycardia; ↓ BP
- Irregular respiratory pattern
- Breath sounds: wheezes, crackles, stridor or absent
- Central cyanosis: **late** sign of hypoxia

Oxygen/ventilatory therapy:
Children may have subtle initial presentations and rapidly deteriorate. Use a NRM or BVM for those with AMS, those who have S&S of hypoxemia, ↑ or ↓ RR, ↑ work of breathing or retracting or those who appear exhausted.

- **Nasal cannula**: Difficult for child to tolerate
- **NRM 12-15 L**: Need correct size to prevent leaks
- **BVM**: 15 L; Use appropriate size bag and mask; support ventilations at 1 breath every 3 to 5 seconds; volume should just cause the chest to rise. BVMs require a high degree of skill to operate effectively, particularly in the peds patient. Insert an oral or nasal airway and apply Sellick's maneuver to diminish gastric distension.

BVM Sizes

0 - 1 Month	-	Neonatal bag
1 - 8 Years	-	Peds bag
Over 8 Years	-	Adult bag

Circulation:
CO/ECG/fluid status/perfusion: It is critical to rapidly recognize hypovolemia with inadequate perfusion and/or shock. **Hypotension is a late sign of shock in children**. Assess for other signs of perfusion deficit. Often, seemingly subtle clues such as sustained tachycardia, listlessness, or mottled skin signify impending cardiovascular collapse.

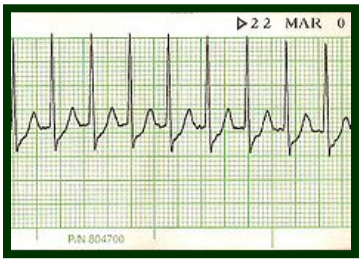
- **Palpate** presence, location**, general rate,** volume/ strength, and regularity **of pulses** in all extremities. Compare to central pulses (brachial, femoral, carotid).
- **Pulse assessment sites**
  - Umbilical cord/brachial artery in newborn
  - Brachial artery in infants, young children
  - Radial/carotid arteries in older children
  - Femoral artery in undressed child of any age
- Interpret the significance of your findings by taking into consideration age-appropriate norms and whether the child is crying, is fearful and in need of family presence, has a fever or is in pain (Hawkins, 2002).
- **Sustained tachycardia**: In the quiet or unconscious, non-febrile child, HR ↑ long before the BP falls, and is an indicator of ↓ CO. Even more alarming is **bradycardia**, which often signals severe hypoxia and extreme distress.
- If no central pulse & unresponsive, or pulse present but < 60 in infant/child w/ poor perfusion: Start CPR.

Skin

- **Color**: Pink, pale, flushed, mottled. Decreased peripheral perfusion triggers ↑ peripheral vasoconstriction resulting in cold, mottled extremities - ***look at the knee caps*****!**
- **Temperature**: Hot, warm, cool, cold
- **Moisture**: Dry, moist, diaphoretic
- Delayed **capillary refill** (normal < 2 sec in ***warm*** ambient environment in child < 6 years)
- **Altered LOC** with agitation, restlessness, confusion, listlessness, or stupor.
- **Decreased muscle tone** = poor central perfusion
- Inspect for uncontrolled **external bleeding**; note type and amount. Suspect **concealed internal bleeding** if shock is apparent without external hemorrhage.
- **Hemorrhage control:** Apply direct pressure to any bleeding wounds; elevate the bleeding areas if possible; avoid tourniquets as they cause distal tissue ischemia and hypoxia. Pay close attention to scalp lacerations as they bleed profusely and can decrease BP and cerebral perfusion.

Cardiac rhythm/ECG monitoring

- Apply ECG monitor (defib/pacing pads) if actual or potential cardiorespiratory compromise. **The most common cause of pediatric cardiac arrest is respiratory compromise/arrest**. Asystole and brady-arrhythmias are responsible for 90% of the rhythms seen in peds arrests. Ventricular dysrhythmias are responsible for the remaining 10%.



- Standard size electrodes may be used in children > 10 kg. Use the largest size that fits the chest wall without touching with 3 cm between them. Prepare peds defib paddles if no pads. If bradycardic and hypoperfused, initiate pacing. Provide receiving hospital with a copy of the ECG.

Recognize children at risk for cardiac arrest

- Respiratory compromise/hypoxia
- Hypotension/shock due to trauma/acute

blood loss/ cardiac tamponade
- Dehydrated
- Sepsis
- Congenital heart disease
- Altered mental status/lethargy

Hydration status:
- Assess ant. fontanel in infants, mucous membranes, skin turgor, presence or absence of tears when crying, urine output.

- Carefully assess signs of fluid imbalances to recognize subtle as well and obvious signs and appropriately intervene before the child is in trouble.

Vascular access:
- IV is indicated if IV drugs or fluid resuscitation is needed.
- Limit time spent establishing peripheral venous access in critically ill or injured patients. Peripheral access may be challenging during emergency – may use IO if unresponsive.
- If hypovolemic, infuse NS 20 mL/kg IV/IO in < 20 min. May repeat x 2 if necessary.

Disability:
- AMS: Assess capillary glucose. If glucose is less than 60 or low give **Dextrose 25%** 2 mL/kg IVP/IO for children and **Dextrose 12.5%** 5 mL/kg IVP/IO for infants. If borderline (60-70), give ½ the above doses. Confirm IV patency before infusing dextrose. If there is no IV/IO give **glucagon** 0.03 mg/kg IM/IN.
- Assess pupils for size, shape, equality, and reactivity to light.
- Assess for movement or posturing

Expose & examine as indicated. **Keep child warm!**

Secondary assessment
Patient history (Acquire during/incorporate into PE). Obtaining patient and event histories may account for 90% of the initial impression. Obtain from the patient, family, significant others, bystanders, medic-alert tags, or personal belongings. Ask verbal child simple questions. Adolescents may need to be interviewed without their caregivers present if accurate information is to be obtained regarding sexual behavior, pregnancy, drug use, alcohol use, or child abuse.
Signs & symptoms as they relate to chief complaint.
- Onset
- Precipitating factors
- Quality
- Recurrence/region
- Severity
- Time/Duration

To accurately assess pain requires careful observation of key behaviors appropriate for their age.
FLACC pain scale for children
- Infant: Intense crying, unable to be consoled, tremors, unable to suck without crying
- 1-2 y/o: Intense reaction to painless procedures, aggression, regression, physical resistance. May shriek NO over and over again.
- 3-5 y/o: Perceive pain as punishment; aggressive with verbal attacks, such as "I hate you!"
- 6–10: Past experience influences reaction to pain, exaggerated by fear of bodily injury and death. This age can localize and describe pain.

Additional pain assessments
- Patient's rate of breathing

- Negative vocalizations
- Facial expressions
- Body language
- Consolability

Note that social/cultural/spiritual influences may affect pain experience.

Treatment of pain
FENTANYL 1.0 mcg/kg. May repeat 0.5 mcg/kg in 5 min (**max 100 mcg)**
IVP/IN/IM/IO. **Additional doses require OLMC**. May repeat 0.5 mcg/kg (max 50 mcg) in 5 min. Additional doses require OLMC order. May repeat 0.5 mcg/kg q 5 min. up to a total of 3 mcg/kg (max 300 mcg).

The safety of FENTANYL in children younger than two years of age has not been established. Call OLMC.
Consider pain management augmentation with distraction techniques and use of nitrous oxide.

Allergies: Medications, foods, environmental
Medications: Prescribed, over-the-counter, compliance with prescribed doses, time/amount of last dose.
Pertinent past medical history
- Pertinent medical or surgical problems
- Co-morbid conditions/preexisting diseases
- Are they being seen by a doctor?

Last oral intake; adolescent females: LMP
Events surrounding current problem: associated factors such as toxic inhalants, drugs, alcohol

Obtain baseline vital signs
Normal, age-appropriate pediatric VS are rarely remembered in an emergency. Use memory joggers like laminated charts or cards.
Pulse rate: Count rate for 30-60 seconds

Pulse Rate Norms for Age		
Age	**Average**	**Range**
Newborn-3 mo	140	85-205
3 mo – 2 yrs	130	100-190
2-10 years	80	60-140
> 10 years	75	60-100

Respiratory rate, pattern, depth: know age-appropriate findings.

Respiratory Rate Norms for Age	
Neonate (0-28 days)	30-60
Infant 1-12 months	24-40
1-10 years	18-30
> 10 years	12-16

Blood pressure: Children compensate well to early volume losses by vasoconstricting so there is a stable BP until sudden decompensation leads to cardiac arrest & irreversible asystole.

Blood Pressures Norms for Age			
Age	**Typical SBP 1-10 yrs 90 = (2x age in yrs)**	**Lower limits SBP 70+(2x age in yrs)**	**Hypo-tensive SBP**
Neonate	90	70	< 60
Infant	90-92	70-72	< 70
1-10 yrs	94-100	74-90	< 70+2xage
> 10 yrs	> 100	90	< 90

Hypotension does not occur until the blood volume is decreased by 25%-30%. **It is an ominous sign!** BP should be taken in each arm at least once. It is **essential to use appropriate size cuff!** Cuff too large (≥ 2/3 upper arm length) = false low reading. Cuff too small (≤ ½ length upper arm) = false high reading. If BP cannot be heard/palpated, attempt the "**Flush method"**:

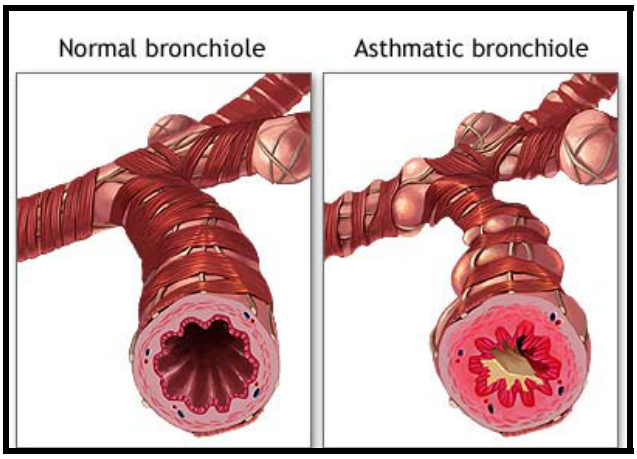
- Elevate extremity to drain blood
- Inflate cuff to above expected SBP
- Lower arm and slowly deflate

Point at which color returns is approximate SBP.

Pediatric Asthma

Of the 6-8 million people who suffer from asthma, an estimated 1.5 million are school aged children. The airway has increased sensitivity and reactivity to external stimuli i.e., URI, aspirin, exercise, odors and smoke, weather changes, cold air, and stress. Usually has a history of asthma or allergies. Manifested by a set of symptoms caused by various processes that result in bronchospasm, edema of the bronchi, and increased mucus production (occurs in that order). Some airways are occluded, others are distended with old, stale air.

Clinical presentation/S&S:
Due to small airway diameters, even incremental edema & bronchoconstriction may cause severe air exchange



problems and distress. The inability of pediatric patients to increase their tidal volumes often results in markedly increased respiratory rates that rapidly dehydrate the airways and accelerates the development of mucous plugs. Common presenting signs/symptoms include prolonged expiration, nasal flaring, use of accessory muscles (↑ work of breathing), retractions, audible wheezing, sub-q emphysema between neck & navel, sudden sharp chest pain (signaling pneumothorax). Hypoxemia and hypercarbia lead to acidosis and bradycardia. **Kids die from acidosis, not hypoxia.** ***Treat aggressively!***

Children may present differently than adults, w/ symptoms known as ***cough variant asthma***. They may not wheeze, but may continuously cough for 20 – 30 minutes after excitement or exercise. They also may abruptly vomit without nausea.

How can you differentiate mild/moderate from severe asthma?

Mild/Moderate VS Severe Asthma		
	Mild/Mod.	**Severe**
Appearance	**Awake; may be anxious**	**Exhausted**
WOB	**Mild/mod. SOB**	**Severe SOB**
SpO2	**> 95%**	**94% or <**
Capnography	**< 55; sharkfin**	**> 55; sharkfin**
Lung Sounds	**Present; may have wheezing**	**Decreased or absent**
Heart Rate	**Expect tachycardia**	**May be bradycardic**

Treatmentof asthma: SOP page 68
IMC special considerations: If wheezing but no history of asthma, consider foreign body aspiration, respiratory infection or a cardiac cause. IV access is typically not needed for pediatric patients in mild distress. Monitor ECG for bradycardia (signals deterioration).

Management of mild to mod. asthma:
Mild to moderate distress w/ wheezing and/or cough variant, SpO_2 > 95%.
- **ALBUTEROL 2.5 mg (**3 mL) via HHN or mask
- Supplement w/O2 6 L/NC if patient is hypoxic and using a HHN.
- **Begin transport as soon as Albuterol is started. Do not wait for a response.**
- Continue/repeat **ALBUTEROL** while enroute to hospital.

Management of severe asthma:
Severe SOB, diminished or absent breath sounds, SpO2 94 or <, hypoxic, exhausted, bradycardic. **TIME SENSITIVE PATIENT!**
- **EPI 1:1,000** 0.01 mg/kg (~~0.1 ml/kg~~ **0.01** mL/kg), max 0.3 mg (0.3 mL) IM
  - Beware of tachycardia from Albuterol
  - Begin transport as soon as Epi given
  - May repeat x 1 in 10 min. if response minimal
- If wheezing present: **Albuterol** 2.5 mg (3ml) via HHN, mask BVM. Continue enroute.
- Severe distress persists: **Magnesium** 25 mg/kg (max 2 Gm) mixed w/ NS to total 10 mL, given over 10-20 min.
- Follow appropriate SOP if HR < 60, pulseless, or apneic.

Epi VS Albuterol?
Practically speaking, why is epi given before albuterol in patients with severe distress?
- The hypoxic patient needs high FiO2. If albuterol is given first, w/ only 1 source of O2, you are unable to give more than 6L until you get to the ambulance or bring another portable tank.
- In the ambulance, can give O2 6 L/neb and 6 L/NC.
- If patient is severely bronchoconstricted, nebulized albuterol may not reach target tissues. Need a parenteral medication.
- The combination of epi and albuterol on a hypoxic heart can be lethal.

How to tell the difference between asthma and an allergic reaction?

Complaint / Exam Finding	Asthma	Allergic Rxn
SOB/wheezes/cough	Yes	Yes
Skin signs	No	Yes
N/V and or diarrhea	No	Yes
Exposure to allergen or trigger	Yes	Yes
Progression to cardiovascular S&S (shock/hypotension)	No	Yes

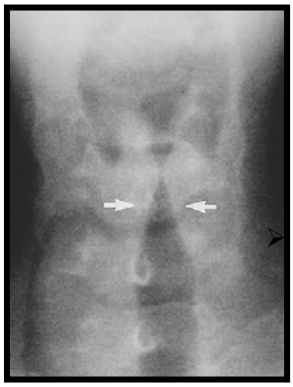
Pediatric Asthma: Report to Hospital: include the following:
- Degree of respiratory distress (WOB
- Vital signs
- Presence and/or degree of retractions
- Adequacy of gas exchange (SpO_2 capnography
- Cyanosis
- Breath sounds
- Hydration status

Croup

Croup is a generic term used to describe a syndrome causing inflammation and edema of the larynx, trachea, and bronchi. It accounts for 90% of upper airway infections in children. While croup is the most common cause of stridor, it is not the most serious. Croup is usually a viral illness, but is occasionally caused by bacteria. It is seen more often in temperate zones in urban areas w/ smog during the winter months & is most common in children aged 6 months to 4 years. Croup is generally preceded by an URI & or slight fever for

several days. It is notorious for getting worse at night and improving during the day.

Croup: Signs and symptoms



Respiratory distress, dyspnea, ↑resp. rate
- Marked stridor and or retractions (may not be noted until the child becomes anxious (exam)
- Hoarseness Barking cough (sounds like a seal bark)
- Mild cyanosis when breathing room air
- Sits up & holds head back to open airway
- Tachycardia
- Possible low grade fever 101-102 max
- Xray findings at hospital: *steeple sign* (narrowed subglottic airway)

Croup: Presentation will be in one of three ways:
- Mild resp. distress amenable to treatment w/ nebulized saline. Discharged w/ symptomatic therapy.
- Moderate to severe resp. distress not amenable to nebulized saline. Admission usually required.
- Severe resp. distress w/ poor air exchange, cyanosis, and possibly altered mental status. May require invasive airway.

Croup: Management
- **Time sensitive patient!**
- IMC: O2 15 L/peds NRM – assess tolerance
- Assess for evidence of reactive airway disease and airway obstruction
- **Avoid agitation**. Allow adult to hold upright in position of comfort until transport. Transport in sitting position if possible.
- Do not attempt NPA/OPA, intubation, glottic visualization or vascular access except in presence of cardioresp. collapse
- Monitor pulse ox if sensor available for child's size
- Monitor ECG for HR changes (esp. bradycardia)
- **If airway/ventilatory distress**: prepare airway & suction equipment

None to Mild cardioresp. compromise: (no cyanosis; mild resp. distress)
- NS 6 mL w/ 6 L O2/NNH by mask or mist
- If wheezing: Albuterol 2.5 mg/NNH mask/mist
- Do not delay transport waiting for a response.
- May repeat x 1 while enroute if distress persists.

Mod. to Severe cardioresp. compromise: (Cyanosis; marked stridor @ rest; resp. distress)
- Epi (1:1000) 3 mL (3mg) w/ 6 L O2/HHN or mist
- Do not delay transport to set up medication

Epiglottitis

Epiglottitis is a true emergency and may be life-threatening. Viral and bacterial causes are known, but it tends to be a bacterial infection caused by the *Haemophilus influenzae* Type B bacteria. Other bacterial causes include pneumococci, strep and staph. Usually seen 2-7 year olds, the incidence is decreasing as most children have been vaccinated against the H-flu bacteria. It is seen more often in winter. The upper airway becomes completely occluded due to edema & impaired mobility of the epiglottis. Onset may be gradual or rapid (progression to severe airway obstruction over just hours). Respiratory arrest occurs very rapidly.

Epiglottitis: Assessment/Clinical Picture
Critical observations include interaction w/ caregivers, verbal ability, movement, and awareness of surroundings. The child *will look sick*. Generally, he or she will be anxious w/ minimal movement, and will be irritable or lethargic. Assess for the **4 D's**:
- **Drooling**: Pain, swelling and inflammation cause secretions to pool in the hypopharynx and supraglottic larynx; swallowing is too painful.
- **Dysphonia** (difficulty speaking): Whispering or muffled voice w/ little air exchange. No hoarseness.
- **Dysphagia** (difficulty swallowing): Has pain on swallowing; verbal child complains of sore throat.
- **Distressed inspiratory efforts:** evidenced by nasal flaring, ashen/gray color, retractions (substernal, intercostal, suprasternal); insp. Stridor or wheezes, not as loud as w/ croup.

The child will be protective of their airway, sitting up w/ neck thrust forward, still, w/ mouth open. The child may sit in a tripod position. Fever will usually exceed 102°. Heart rate and resp. rates will be fast. Xray at the hospital will demonstrate the "thumb sign".

Epiglottitis: History
- Time of onset
- Prior illness (URI)
- Time of most recent oral intake & meds
- Evidence of prior events consistent w/ airway obstruction (differential): choking @ home, playing w/ small objects, eating small food items

Epiglottitis: Management
Cardinal Rule: avoid any stimulation of child until personnel &equipment necessary to protect & stabilize airway are available. Provide clear, calm & concise explanations to parent and child. **DO NOT**:

- Undress the child
- Separate the child from caregiver
- Examine the throat
- Put anything into the child's mouth
- Take an oral temp
- Lay the child flat
- Leave the child unattended at any time

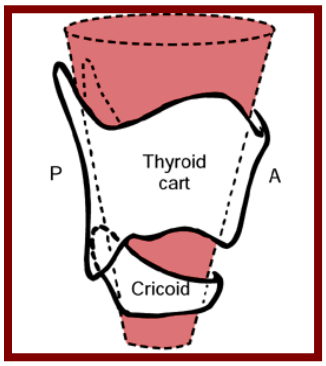
Epiglottitis:Treatment per SOP
Time sensitive patient!
If <u>none to mild</u> cardiorespiratory compromise: (no cyanosis; + effective air exchange)

- Peds IMC only.
- Anticipate rapid deterioration

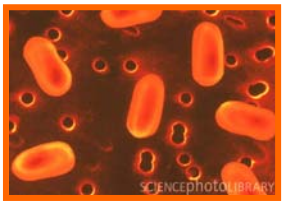
If <u>moderate - severe</u> compromise:
(bradycardia, AMS, marked ventilatory distress, retractions, ineffective air exchange, actual or impending respiratory arrest)

- Epi (1:1000) 3 mL (3 mg) w/ 6L O2/HHN/ aim mist @ face
- **DO NOT DELAY TRANSPORT SETTING UP MEDICATION**
- If continued inadequate ventilation: position in sniffing position, ventilate w/ 15L O2 via peds BVM, using slow compressions of bag
- If unable to ventilate: stop ambulance, provide airway according to Peds Airway Adjuncts SOP.
- Be prepared for airway status to worsen after intubation attempt unsuccessful

Bacterial Tracheitis



Bacterial tracheitis is an acute bacterial infection of the subglottic area of the upper airway. While uncommon, it is actually more prevalent now than acute epiglottitis. Predominant causative bacteria include staph aureus, H. influenza, and diphtheriae. The major site of the process is at the cricoid cartilage level, the narrowest part of the pediatric trachea. Obstruction develops due to edema and sloughing of mucopurulent membranes that develop and adhere to the tracheal lining. The patient struggles w/ copious pus-like airway secretions. Signs & symptoms are commonly worse than croup but less severe than those of epiglottitis. Morbidity and mortality are attributed to potential acute upper airway obstruction and related hypoxic results. This condition can occur in children of all ages, but is most typically reported in kids aged 6 mo.-3 years. The most commonly reported complication is pneumonia.



Bacterial Tracheitis: History
Presentation may be acute or subacute. Classically, the condition presents acutely w/ fever, a toxic appearance, stridor, tachypnea, resp. distress, and elevated WBC on CBC. Cough is frequent, though not painful. Bacterial tracheitis is usually preceded by an URI, which progresses to high fever, cough, inspiratory stridor, and various degrees of resp. distress. Acute decompensation is possible, w/ worsening resp. distress due to obstruction from a purulent membrane that has loosened.
I

Bacterial Tracheitis: Assessment/Presentation
High index of suspicion for this condition should be entertained when children w/ croup-like symptoms do not respond to standard croup therapy. Exam findings may include:

- Insp. stridor, w/ or w/o exp. stridor
- Bark-like/brassy cough hoarseness
- Worsening or abruptly occurring stridor
- Varying degrees of resp. distress
- Sore throat
- Painful swallowing
- No drooling
- No specific position of comfort (able to lie supine)

Bacterial Tracheitis: Management
Prehospital care parallels that for croup and epiglottitis. Of primary importance is maintenance of an adequate airway. As with croup & epiglottitis, care should be taken to avoid agitating the child. If resp. status deteriorates, it is probably attributable to dislodgement of an characteristic, previously adherent membrane. BVM ventilation should be attempted first, and is usually effective. If high pressures are required to ventilate w/ BVM, the child may require intubation w/ an ET tube 0.5 – 1 mm smaller than what would be normally appropriate for age/size. Frequent suctioning may be necessary.

Once hospitalized, these patients are treated w/ antibiotics and are discharged on continued oral antibiotics.

Pediatric Allergic Reactions

A major cause of allergic reaction in children today is food/food additives. Milk, eggs, wheat, and soy (MEWS) as a group are the most common food allergens; however, peanuts and fish are among the most potent. Other common triggers include preservatives (in food and drugs), medications (esp. antibiotics), insect venom (bites & stings), and latex. Sometimes, the inciting cause is unknown. Allergic reaction occurs at differing "levels" of severity, requiring different & specific treatment. The most severe form, anaphylaxis, is an acute, life-threatening condition, involving multiple organ systems (skin, resp., cardiovascular, GI).

Allergic Reaction: Signs and Symptoms
Usually, cutaneous symptoms present first. Often, a history of exposure to a known trigger is given. , Symptoms may develop slowly and insidiously over several hours or may rapidly progress over several minutes. Parenteral agents generally have a faster onset of symptoms than ingested ones.

Levels of Allergic Reaction & Associated Findings	
Level / Severity	**Assessment Findings**
Local	**A&O x 3; hives & edema @ site of exposure, or GI distress if ingested**
Mild	**BP normal**; periph. tingling; warm sensation; fullness in mouth/throat; nasal congestion; periorbital swelling; rash; itching; tearing; sneezing
Moderate	**BP > 70**. Any of above, plus: bronchospasm; **wheezing**; edema of airways or larynx w/ **dyspnea, cough**; soft tissue edema; flushing; N&V; warmth; anxiety.
Severe / Anaphylaxis	**BP < 70**. Any of above, plus: intense bronchospasm; **absent/diminished breath sounds**; laryngeal edema; hoarseness; stridor; severe dyspnea; cyanosis; resp. arrest; dysphagia; intense abdominal cramping; diarrhea; vomiting; **Leads to resp. failure and CV collapse**.

Allergic Reaction: Management
IMC/Special Considerations:
- Aggressive, early airway intervention
- Apply venous constricting band proximal to site if swelling is ↑ rapidly
- Attempt to identify and or removed inciting casue
- Apply cold pack to site unless contraindicated
- Do not start IV or take BP in affected extremity

Local Reaction:
Observe for progression and transport

Mild Systemic Reaction:
- Diphenhydramine 1 mg/kg (max 50 mg) IM or slow IVP over 2-3 min.
- Use ant. mid-thigh for IM injection if < 6 yrs.

Moderate Systemic Reaction
- **Epi** (1:1000) 0.01 mg/kg (mL) **IM** (max 0.3 mg max)
- May repeat Epi x1 in 5-10 min. if symptoms persist
- **DO NOT DELAY TRANSPORT** awaiting response
- Diphenhydramine 1 mg/kg (max 50 mg) slow IV over 2-3 min. If no IV, give IM.
- If wheezing: Albuterol 2.5 mg (3 mL) HHN or mask
- May supplement w/ O2 6 L/NC if hypoxic and using HHN

Severe Systemic Reaction/Anaphylaxis
Quote from Jeffrey F Linzer Sr, MD in his article on Pediatric Anaphylaxis: **"It cannot be stressed enough that the early use of epinephrine is the most important step in managing anaphylaxis."**

IMC special considerations:
- If airway/ventilations severely compromised, treat per Peds Airway Adjuncts SOP
- IV NS fluid challenge 20 mL/kg IV/IO x 3 if indicated
- CPR in indicated

- **Epi** (1:10,000) 0.01 mg/kg (0.1 mL/kg), in maximum 0.1 mg increments q 1 min. up to 1 mg **IVP/IO**
- If no vascular access, Epi 1:1000 0.1 mg/kg IM, up to 1 mg
- **DO NOT DELAY TRANSPORT** waiting for response
- Diphenhydramine 1 mg/kg (max 50 mg) slow IV/IO over 2-3 min. If no IV/IO, give IM.
- If wheezing: Albuterol 2.5 mg (3 mL) HHN. Mask, or BVM
- If SBP remains < 70: Dopamine IVPB 10 mcg/kg/min, up to 20 mcg/kg/min. Titrate to maintain SBP > 70.

Pediatric Seizures

A seizure is a sudden, uncontrolled episode of high voltage electrical discharge of brain cells in the cerebral cortex, w/ accompanying sensory, motor, and or behavioral changes. Causes of seizures in children include genetic and metabolic defects, developmental neuro defects, perinatal injuries, hypoxia, metabolic disorders, brain infections, tumors, toxins, vascular disease, degenerative disease, trauma, infectious diseases, and fever (under age 4).

Types of seizures:
Partial seizures (AKA focal motor seizures), occur as a result of abnormal activity in a specific region of the brain. They may or may not be associated w/ impaired consciousness. **Generalized seizures** (formerly known as grand mal, petit mal) are characterized by bilat. involvement and loss of consciousness.

Generalized seizures: **Tonic-clonic**
Formerly known as grand mal seizures, tonic-clonic seizures, are the most common form of generalized seizure. They are characterized by initial loss of consciousness, tonic-clonic movements affecting the entire body, and usually tongue biting, incontinence, and mental confusion. They are followed by a period of sleepiness w/ minimal responsiveness (postictal state), which may last minutes to a few hours. These seizures may be preceded by ill-defined feelings, but no actual aura.

Other generalized seizures include the following:
Absence seizures: (formerly known as petit mal). There is a brief loss of consciousness 10 sec. or less, during which time child stares vacantly, neither speaking or hearing what is said, then returns to consciousness w/out demonstrating any typical motor symptoms. If motor symptoms occur, they are things such as eye blinking, face twitching, or lip smacking. The patient maintains posture, and the seizure is frequently missed as it is so brief and subtle. There may be over 100 of these seizures a day. Generally do not need to be treated as an emergency. There is no aura. Onset and duration are brief, and they end w/ instantaneous return to clear consciousness.
Atonic seizures: (AKA minor motor seizure). Legs give way and patient drops to the ground. Seizure duration is 10 sec. to 1 minute. The patient recovers normal mental status and physical abilities promptly.

Myoclonic seizures: Sudden brief shock-like contractions involve the entire body or are confined to the face, trunk, or extremities. They may be rapidly repetitive or relatively isolated.
Infantile spasms: This syndrome begins between the ages of 3 mo. and 2 years. The movement lasts for seconds, during which the head, neck and trunk are flexed forward w/ knees drawn up. There may be repeated spasms throughout the day. Many of these patients are mentally retarded, and some known causes include hypoglycemia, PKU, & anoxic brain damage.

Febrile Seizures are single, **generalized tonic clonic** seizures lasting fewer than 20 min., that occur when a child is febrile, in the absence of intracranial infection or other defined cause. Patients w/ hx of nonfebrile seizures, known neuro disease, anticonvulsant use, or hx of (or suspicion of) head trauma are excluded from this diagnosis. These usually occur within the first 24 hours of fever. They are classified as either simple of complex. **Simple** febrile seizures are brief (less than 15 min.), generalized, and occur only once in 24 hrs. Simple is the most prevalent form of febrile seizure. **Complex** febrile seizures are longer in duration (> 15 min.), are focal in nature, and or occur more than once in a 24 hour time period. Fever lowers the seizure threshold. So does a rapidly rising temperature. Most children have a temp of at least 102° at the time of the seizure. Rate of rise may be more important than the absolute temperature. Febrile seizures occur more often in the presence of a viral infection than a bacterial one. They can also be provoked by recent immunizations (within 7-10 days of MMR, w/in 48 hours of DPT), and are most frequently associated with the pertussis vaccine.

Febrile seizures occur in 2-5 % of all children under 5 years of age, and generally occur between the ages of 6 months to 3 years. There is greater incidence of febrile seizures in children whose siblings had febrile seizures. A child who has had one febrile seizure has a 1 in 3 chance of having another if the first occurred before the child was 1 year old.

Partial Seizures: Simple Partial
(formerly known as focal motor/focal sensory). These seizures are generally preceded by an aura, and are usually limited to certain muscle groups on one side of the body. Most last no longer than 30 sec. There is generally no loss of consciousness. Motor movements that may be observed: clonic movements of a limb, sometimes beginning in a confined area and progressing or spreading to other adjacent muscle groups.

Partial Seizures: Complex Partial
(formerly known as psychomotor or temporal lobe) These seizures do not generally occur in children. The patient usually has an aura characterized by a glassy stare, and an altered personality state, confused responses, possibly yelling and no response to simple commands. The patient may report unpleasant odors or ringing sounds.

Generalized Seizures: Assessment
History:

- Hx, frequency, type of seizures
- Prescribed and OTC meds; compliance; time and amount of last dose
- Recent head trauma
- Predisposing illness/disease
- Recent fever, headache, stiff neck
- Hx possible substance ingestion; time

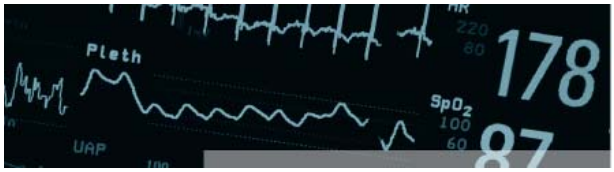
Exam:
- ABC's
- Consider possible etiologies: anoxia/hypoxia, cerebral palsy, metabolic causes, trauma, med noncompliance or w/drawal, infection, intoxication or poisoning, epilepsy
- Seizure description (focus, progression, duratioin, aura, simple/complex, partial/generalized, eye deviation prior to or durin, abnormal behaviors)
- Loss of consciousness & duration
- Incontinence
- Trauma to oral cavity
- Duration and degree of mental status changes in postictal period

Generalized Seizures: Management

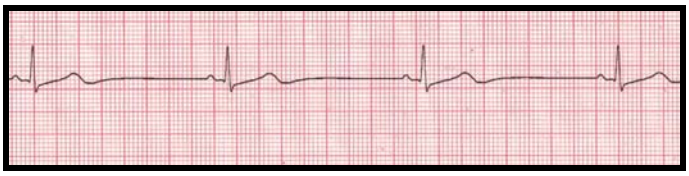
- IMC: clear and protect airway; vomiting precautions
- IMC: protect from injury
- IMC: position on side while postictal unless contraindicated
- IMC: if hx of generalized tonic-clonic seizure, *consider* need for IV
- If gen. tonic-clonic seizure activity present: **Midazolam** 0.1 mg/kg IV/IM/IO (dose for IN: 0.2 mg/kg) max single dose 5 mg. If no IV/IN/IO, may give IM. May repeat to total dose of 10 mg titrated to stop seizure activity. If seizure activity persists, contact OLMC for additional orders.
- Identify and attempt to correct reversible causes.
- If blood glucose < 70: Dextrose or glucagon per peds hypoglycemia SOP.

Febrile Seizures: Assessment
- Focus on relationship of seizure to fever, description of the seizure, info leading to source of the fever
- Family hx of febrile seizures?
- Recent head trauma, drug ingestion, sudden discontinuation of anticonvulsants?
- Current meds, last dose & time
- **Physical exam**:
  - 13-18% of kids w/ **meningitis** present w/ seizures. Be alert for nuchal rigidity, Kernig's sign, Brudzinski's sign, irritability, bulging fontanel (infants), and ↓ sensorium. **Use appropriate PPE** if any suspicion or worrisome findings!
  - Assess hydration status
  - Assess temperature
  - Blood glucose
- **Management**:
  - If dehydrated, may attempt IV x 1. Infuse NS 20mL/kg IVP.
  - Reassure patient & caregivers
  - Passively cool by removing all clothing but diaper/underwear. Cover lightly. DO NOT induce shivering. (Rebound temp may cause repeat seizure)
  - NPO (no OTC fever meds unless OLMC order)
  - Never give aspirin

Pediatric Arrest



Cardiac arrest in children is almost always a complication of resp. failure (not a primary cardiac problem). Bradycardia in children is almost always a sign of profound hypoxemia and is generally the **only** arrhythmia seen prior to asystole. When a hypoxemic insult has progressed to the point of full arrest, the extent of CNS injury may be so great that brain death will ensue, even if the heart itself is restored to a perfusing rhythm. **Early recognition of the need for respiratory support is the key to avoiding cardiac arrest and to a successful resuscitation. Treatment for bradycardia, then, is oxygenation and ventilation.**



Prompt consideration should always be given to potential treatable factors; if found, they should be treated aggressively and immediately. These include:

▪ Hypoxemia (acidosis)	▪ Toxins
▪ Hypovolemia	▪ Tamponade (cardiac)
▪ H+ ion (acidosis)	▪ Thrombosis
▪ Hypothermia	▪ Trauma
▪ Hyper/hypokalemia	▪ Tension pneumo
▪ Hypoglycemia	

All care is organized around 2 minute cycles of CPR. Multiple BLS steps may be done simultaneously if personnel resources allow. CPR should be done in a C-A-B priority, unless a hypoxic cause of arrest is known or suspected. Patients should not be moved while CPR is in progress unless in a dangerous environment or the patient is in need of intervention not immediately available. Attach and use AED or cardiac monitor as soon as it is available. Apply pads while compressions are in progress. Compressions should be provided while defibrillator charges, until immediately prior to shock, and should be resumed immediately after shock.

- Determine unresponsiveness
- Open airway using manual maneuvers, assess for breathing
- Assess pulse. If not definitely felt in < 10 sec. **OR** if HR <60 w/ hypoperfusion, **begin CPR with compressions**
- Provide supplemental O2 w/ ventilations if available
- Apply pads as soon as available – attach ECG monitor
- Check rhythm.
  - If shockable, deliver shock @ 2J/kg; subsequent shocks are 4 J/kg
  - Not shockable/asystole: confirm in 2 leads and resume compressions
  - Not shockable/PEA: resume compressions
- Next rhythm check does not take place until another 2 min. of CPR has been given OR patient wakes or begins to move spontaneously

Pediatric Arrest: Chest compressions in children:
Cardiac output in children is dependent on heart rate. Compressions are done on children who have a HR < 60 w/ hypoperfusion. There are four critical elements of high quality chest compressions:

- Push **HARD**
- Push **FAST**
- **RELEASE** completely
- **MINIMIZE** interruptions

Other elements of chest compressions specific to a child's stage of development are as follows:

Infant:
- Location: lower 1/3 of sternum; hands encircling chest depending on size of infant
- Depth: 1/3 depth of chest
- Rate: at least 100/min.
- Ratio: 30:2 for single rescuer; 15:2 for 2 rescuers
- Ventilations after advanced airway: 1 breath every 6-8 sec unless asthmatic

Child:
- Location: Lower ½ of sternum
- Depth: At least 1/3 A-P depth of chest
- Rate: At least 100/min.
- Ratio: 30:2 for single rescuer; 15:2 for 2 rescuers
- Ventilations after advanced airway: 1 breath every 6-8 sec. unless asthmatic

Pediatric Arrest: Defibrillation:
Use the largest electrodes that will fit on the child's chest w/out touching. Adult size pads can be used for children > 10 kg (usually over 1 year old); smaller children should have infant pads. Ant.-post. placement is acceptable. Initial shock is 2 J/kg; subsequent shocks are 4 J/kg. Use adult energies for children who weigh at least 50 kg.

Pediatric Arrest: Airway Management:
Intubation is NOT a priority in pediatric arrest provided the patient can be safely and effectively ventilated and oxygenated with a BVM. Possible reasons for intubation:
- Actual or potential airway impairment
- Aspiration risk
- Ventilatory failure (apnea; RR < 10 or > 40; shallow labored effort; SpO2 < 92%; increased WOB; fatigue)
- Inability to ventilate/oxygenate adequately after insertion of OP/NP airway and or via BVM

- Need for ↑ insp. or positive end expiratory pressures to maintain gas exchange or sedation to control ventilations

Pediatric Arrest: Vascular Access:

In cardiac arrest, immediate IO access is recommended if no other IV access is already in place (AHA, 2005). No longer are the needles labeled as "peds", "adult" and "bariatric". Reference is made to them by their needle length. (15mm, 25mm and 45mm). This will hopefully avoid prejudging needle sizing by "pink = peds". Pediatric pts come in all different shapes & sizes. Retrospective account notes that about ½ of kids need the pink (15mm) needle & ½ of kids need the blue (25mm) needle. How do you decide? No longer is it taught that if they fit on the Broselow tape that they get the 15 mm needle. Teaching includes palpation over the landmark to assess for tissue depth over the landmark. (Use the example of palpating over the wrist & then palpating over the crook of the elbow to demonstrate tissue depth difference.) In summary most kids will require either the 15 mm or 25 mm needle, however, there are some morbidly obese kids out there that may actually require the 45 mm needle! As always, insertion technique for inserting an IO in children is to not push but let the drill pull itself in, & then stop drilling when a loss of resistance is felt. If you are down to the black line, you should be touching bone. If not, the needle is too short to enter the medullary space. If you need a second needle, the longer one is always able to be used. (Updated Messaging Highlights on the EZ IO, 2011) NWC EMSS recommended IO insertion site for infants is medial tibia, 2 fingers below the patella. The recommended site for children is the medial tibia, 1 finger below the tibial tuberosity.

Peds Arrest: The Importance of Epi

Epinephrine (Adrenalin) is a catecholamine & a sympathetic agonist. It acts on alpha & beta receptors, causing ↑ in:

- heart rate
- force of cardiac contraction
- automaticity
- myocardial electrical activity
- systemic vascular resistance
- BP

Alpha vasoconstrictor activity increases aortic diastolic pressure, which improves myocardial & cerebral blood flow, making CPR more effective.

Stimulation of Beta-1 receptors in the heart produces a positive chronotropic effect on the SA node (makes it fire faster) & a positive inotropic effect on the myocardium, increasing the force of contractions & improving cardiac output.

The effects of Epi are dose & route dependent. When given IV/IO, the dose received by the patient is "high". High dose Epi, since it is delivered directly into the circulation and is rapidly absorbed, provides predominantly alpha and Beta-1 (see above). When delivered IM, Epi is absorbed slowly and the dose received is "low". Low dose Epi provides primarily Beta-2 stimulation of the bronchial smooth muscle, resulting in relaxation of spasming, constricted bronchioles, and relief of congested bronchial tissue edema.

Cardiac arrest necessitates delivery of high dose Epi via the IV/IO route. To maximize delivery, a 20 mL fluid bolus should be given immediately following IV Epi, and the arm (IV) should be elevated for 20 seconds.

Dosing of epinephrine varies according to the effect desired & the reason for which it is given. Dose & route are specified below for the various conditions epi is administered for.

Epinephrine		
Condition	**Dose**	**Route**
Cardiac arrest	Epi 1:10,000 0.01 mg/kg (0.1 mL/kg) up to 1 mg	IV / IO
Allergic Reaction (moderate)	Epi 1:1000 0.01 mg/kg (mL) (max 0.3 mg)	IM
Anaphylaxis (Severe Al. Rxn)	Epi 1:10,000 0.01 mg/kg (0.1 mL/kg) Titrate in max 0.1 mg increments q 1 min. up to 1 mg	IV / IO
Asthma	Epi 1:1000 0.01 mg/kg (mL) (max 0.3 mg)	IM
Severe Croup/Epiglottitis	Epi 1:1000 3 mL (3 mg) w/ 6 L O2	HHN mask or mist

Mild Traumatic Brain Injury

Often referred to as a concussion, a mild traumatic brain injury (MTBI) is defined as a complex pathohysiologic process affecting the brain, induced by traumatic biomechanical forces secondary to direct or indirect forces to the head. (cdc.gov) This blow or jolt to the head results in disruption of brain function, however upon neuroimaging, may find normal structural findings. Appreciation of the fact that these MTBI can result in a mired of cognitive, physical and emotional symptoms even if the pt has not experienced a loss of consciousness (LOC). Unfortunately, there is no way in which to tell how long these symptoms may linger, from days to even months.

Facts regarding MTBI

TBI is a contributing factor to a third (30.5%) of all injury-related deaths in the US.

Approximately 1.6-3.8 million sports & recreational related activities will result in TBIs each year. In every age group, TBI rates are higher for males than for females, with males aged 0-4 years having the highest rates of TBI-related ED visits, hospitalizations & deaths.

Estimated 75-90% of the 1.4 m TBI related deaths, hospitalizations and ED visits that occur each year are classified as concussions or a form of MTBI.

Direct & indirect medical costs from MTBI totaled an estimated $12 billion in the US in 2000 (such as lost productivity).

Those individuals who sustain a concussion are at greater risk from subsequent concussions.

With proper diagnosis & management, most pts. w/ MTBI can fully recover from their injuries.

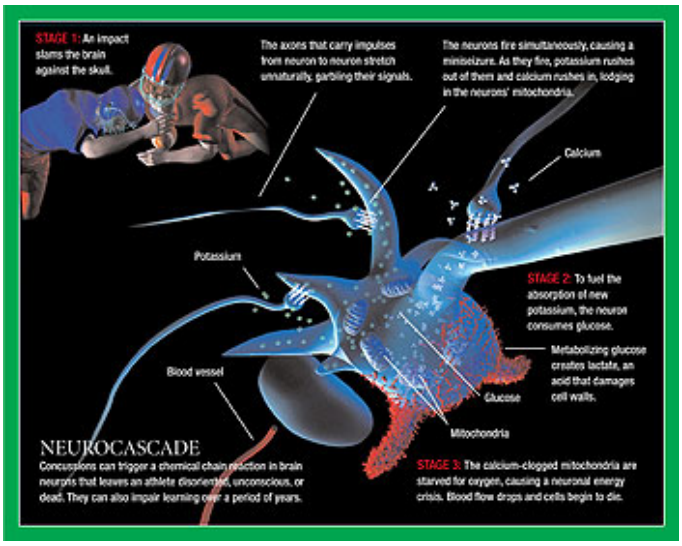
The leading causes of MTBI as seen in the ED are:

- Falls
- MVC
- Unintentionally struck by/against events
- Sports

Groups at highest risk for MTBI

- Infants & children (ages 0-4)
- Children & young adults (age 5-24)
- Older adults (> 75 y.o)

Neuropathophysiology



We are learning more about these types of injuries through clinical research. We know that the disturbance of brain function is primarily a symptom of metabolism rather than structural damage. What is emphasized is the neuronal dysfunction involving a cascade of ionic, metabolic & physiologic events. Therefore we rely more on the clinical presentation including:

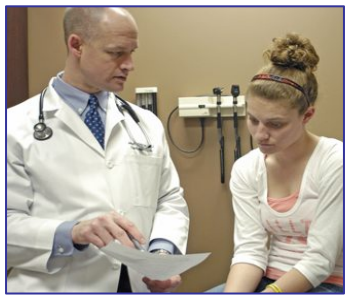
- Memory disturbance
- Processing speed as related to brain function
- Fatigue and dizziness that result from brain stress

in order to determine the underlying neurometabolic cascade.

Symptoms of MTBI usually fall into 1 of 4 categories, physical, cognitive, emotional or sleep and may include:

Physical	Cognitive	Emotional	Sleep
• Headache • Nausea • Vomiting • Balance problems • Dizziness • Visual problems • Fatigue • Sensitivity to light • Sensitivity to noise • Numbness/ Tingling • Dazed or stunned	• Feeling mentally "foggy" • Feeling slowed down • Difficulty concentrating • Difficulty remembering • Forgetful of recent information or conversations • Confused about recent events • Answers questions slowly • Repeats questions	• Irritability • Sadness • More emotional • Nervousness	• Drowsiness • Sleeping less than usual • Sleeping more than usual • Trouble falling asleep

While EMS is not responsible for diagnosing MTBI, it is imperative that EMS transports these pts so they can be evaluated by a licensed medical professional to ensure the proper follow up care is provided. Coaches & training staff have been instructed, in accordance with state law, to take the athlete out of play & the decision to return to practice or play is a medical decision. This change in practice may invoke greater EMS involvement in an athletes care & best practice dictates transport to the emergency department for further evaluation. Clinical management can include initial monitoring of the pt (either in the ED or physician's office), referral to a MTBI specialist if symptoms have not diminished within 3-5 days post injury, diagnostic testing, (including a CT or MRI scan), and if persisting symptoms, more extensive neuropsychological tests.



Treatment & Return to Play

After medical evaluation has taken place & the physician has allowed the athlete to return to play, a modestly progressive return to activity program is established. There is a 5 step gradual program that is used in coordination with the health care team & the athletic training staff. This routine gradually increases over days to months.

1. Initial exercise includes light aerobics, but only to increase hart rate. Basically, a 5-10 minute routine on an exercise bike or walking/jogging. Nothing that includes contact, weight lifting or even hard running.

2. Exercise that will increase not only the heart rate but involve limited head movement. Moderate intensity of weights, jogging, running for short stents, but remains at a non-contact level.
3. Increase activity to include high-intensity biking or weight-lifting or a non-contact sport-specific drill.
4. Re-introduce the athlete into practice sessions; it may include full-contact with others in a controlled practice setting.

5. The athlete may return to full play.

If at any step along the way, the athlete c/o ANY symptoms, as minimal as "fuzzy thinking" or difficulty when concentrating, that activity stops & they then return to the physician for evaluation. Upon clearance from the physician, the athlete may return to step one of the program. (Heads UP: Facts for Physicians & Sports Trainers/Coaches; CDC US Dept of Health & Human Services. www.cdc.gov/injury)

Mental/cognitive status exam:

Upon initial assessment of pts w/ suspected TBI, a prehospital examination will need to be performed. To provide consistency in assessment, describe the pt's response in specific behavioral terms.

Level of consciousness: Sensitive indicator of cerebral perfusion & neuronal function.

General level of consciousness /arousal: Awake or asleep, alert or **lethargic** (drowsy, but answers questions appropriately before closing eyes), or **obtunded** (opens his eyes & looks at you but gives slow, confused responses).

Affect/mood: General appearance /emotional status - Observe facial expressions. Does it change through the interview or remain immobile (labile)?

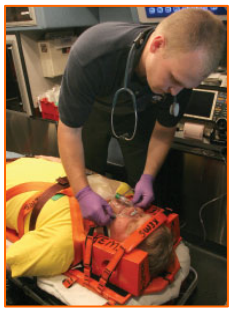
Behavior: (verbal/non-verbal) & posture: Watch the pace, range & character of movements.

Cognition: Difficult to completely measure by EMS or ED.

Thought processes: As detailed in the "On-field Mental Status Evaluation" from CDC, obtaining a baseline assessment of pt cognition is valuable.

Orientation to events: Ask probing questions, such as: "What period/quarter/half of the game were you in?" or "What stadium/field is this?"

Amnesia by asking, "Do you remember what happened in the play prior to the hit?" or '"What was the score before the hit?"



Concentration is assessed by asking the pt to repeat the days of the week/month/year backwards. While in the specific situation such as a sports injury, the athlete may be very upset about being pulled from the game. However, watch for subtle clues, irritability with even simple attempts to express thought regarding prior incident. If any symptoms, such as pain, confusion, blurred vision or ↑ agitation occur, attempt to stop the process & rest. Document findings & relay to ED staff.

Concussion in Sports

This palm card provides information and tools to help medical staff with the on-field recognition and management of concussion.

Concussion Signs and Symptoms[1]

Signs Observed by Medical Staff	Symptoms Reported by Athlete
Appears dazed or stunned	Headache or "pressure" in head
Is confused about assignment	Nausea
Forgets sports plays	Balance problems or dizziness
Is unsure of game, score, opponent	Double or fuzzy vision
Moves clumsily	Sensitivity to light
Answers questions slowly	Sensitivity to noise
Loses consciousness (even briefly)	Feeling sluggish or slowed down
Shows behavior or personality changes	Feeling foggy or groggy
Can't recall events prior to hit or fall (retrograde amnesia)	Does not "feel right"
Can't recall events after hit or fall (anterograde amnesia)	

The palm card is part of the "Heads Up: Brain Injury in Your Practice" tool kit developed by the Centers for Disease Control and Prevention (CDC). For more information, visit: www.cdc.gov/ncipc/tbi.

No Return to Play
Any athlete who exhibits signs and symptoms of concussion should be removed from play and should not participate in games or practices until they have been evaluated and given permission by an appropriate health care provider. Research indicates that high school athletes with less than 15 minutes of on-field symptoms exhibited deficits on formal neuropsychological testing and re-emergence of active symptoms, lasting up to one week post-injury.[2]

Exertion
Symptoms will typically worsen or re-emerge with exertion, indicating incomplete recovery. If the athlete is symptom-free, provoking with exertion is recommended (e.g. 5 push-ups, 5 sit ups, 5 knee bends, 40 yard sprint).

Return to play should occur gradually. Individuals should be monitored by an appropriate health care provider for symptoms and cognitive function carefully during each stage of increased exertion.

Repeated Evaluation
On-field, follow-up evaluation (e.g. every 5 minutes) is important, as signs and symptoms of concussion may evolve over time.

Off-Field Management
The physician should provide information to parents/caregivers regarding the athlete's condition. For example, the athlete:
- Should not operate a motor vehicle or participate in activities such as sports, PE class, riding a bicycle, riding carnival rides, etc.
- May experience cognitive/behavioral difficulties at home, making it necessary to reduce physical and cognitive exertion (e.g., running, lifting weights, intensive studying) until fully recovered.
- Should receive follow-up medical and neuropsychological evaluation, both for managing injury and determining return to sports.

[1]Adapted from: Lovell MR, Collins MW, Iverson GL, Johnston KM, Bradley JP. Grade 1 or "ding" concussions in high school athletes. The American Journal of Sports Medicine 2004;32(1):47-54.
[2]Lovell MR, Collins MW, Bradley J. Return to play following sports-related concussion. Clinics in Sports Medicine 2004;23(3):421-41.

Signs of Deteriorating Neurological Function

An athlete should be taken to the emergency department if any of the following signs and/or symptoms are present:
- Headaches that worsen
- Seizures
- Focal neurologic signs
- Looks very drowsy or can't be awakened
- Repeated vomiting
- Slurred speech
- Can't recognize people or places
- Increasing confusion or irritability
- Weakness or numbness in arms or legs
- Neck pain
- Unusual behavior change
- Significant irritability
- Any loss of consciousness greater than 30 seconds or longer. *(Brief loss of consciousness (under 30 seconds) should be taken seriously and the patient should be carefully monitored.)*

On-Field Mental Status Evaluation

(This mental status assessment is recommended for high school age athletes and older. Any inability of the athlete to respond correctly to the questions below should be considered abnormal.)

Orientation
What period/quarter/half are we in?
What stadium/field is this?
What city is this?
Who is the opposing team?
Who scored last?
What team did we play last?

Anterograde Amnesia
Ask the athlete to repeat the following words: *Girl, Dog, Green*

Retrograde Amnesia
Ask the athlete the following:
Do you remember the hit?
What happened in the play prior to the hit?
What happened in the quarter/period prior to the hit?
What was the score of the game prior to the hit?

Concentration
Ask the athlete to do the following:
Repeat the days of the week backwards (starting with today)
Repeat the months of the year backward (starting with December)
Repeat these numbers backward 63 (36), 419 (914), 6294 (4926)

Word List Memory

ALTE

In accordance w/ the National Institutes of Health, **ALTE** (Apparent Life Threatening Event) is defined as "an episode that is frightening to the observer & is characterized by some combination of apnea (central or occasionally obstructive), color change (usually cyanotic or pallid but occasionally erythematous or plethoric), marked change in muscle tone (usually marked limpness), choking, or gagging."

The term ALTE was coined in the late 1980's to distinguish it more clearly from SIDS as it became evident that no definite link could be established between apnea & SIDS. (NIH Consensus Development Conf on Inf Apnea & Home Monitoring)

Epidemiology

The population that is most affected are infants less than 12 months old, but should be suspected in any child less than 2 years of age who display symptoms. Because of variability in clinical presentations of ALTE, it makes the true frequency in unknown. However, it is estimated that the frequency among healthy term infants widely varies from 0.5-6% of all newborns. (http://emedicine.medscape.com/article/1418765-overview)

Physical Examination

Pre-hospital evaluation will be limited to a primary & secondary physical examination & should focus specifically on any neurologic, respiratory, or cardiac abnormalities. Be sure to include the infant's general tone & appearance. Most pts will appear stable & may have a normal physical exam by the time EMS arrive. ***Caution:*** Despite their appearance, some of these pts WILL be later diagnosed with a condition(s) that may require further medical care.

Treatment

For specific treatment, EMS will refer to individual SOP based on primary complaint. Provide pediatric IMC. ***ASSUME*** history given is accurate & obtain a description of the severity, nature & duration of the event.

Documentation

Description of the event including any intervention given & the infant's response, estimated time of recovery & duration of the event is important to record. Additional questions can include:

Any known chronic illnesses?
Evidence of seizure activity?
Current or recent infections?
History of gastroesophageal reflux?
History or evidence of recent trauma?
Current medication list?
Associated events (eating, crying, etc)?

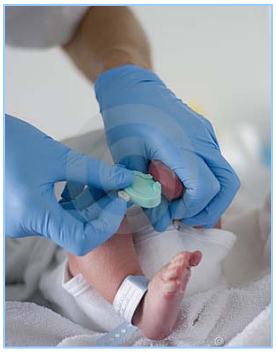
Upon arrival to the ED, the evaluation begins with a thorough history & physical examination. One of the biggest challenges is determining the severity of the event. Very detailed questioning about the event should ensue, ideally from the person who witnessed it. Questions should include the duration of the episode; intervention required for the episode to cease; color changes in the infant (& lighting in the room to clarify the ability to observe the infant's color); respiratory effort; muscle tone; activity of the infant immediately prior to the event; relationship to time of feeding; & the presence of choking, gasping, emesis, rhythmic movements, eye movement, nasal congestion, or fever. It also should be clarified if the infant appeared normal after the event & the length of time for him / her to reach that stage. In addition to the history of the event, the medical history should be evaluated thoroughly, including pregnancy, birth, neonatal period, subsequent medical problems, and a complete review of systems. Details of the family history should be ascertained, w/ particular attn to genetic or neurologic disorders, cardiac disease, infants dying suddenly & unexpectedly, & prior ALTEs in other family members.

www.rain.org/.../**ALTE**/An%20Apparent%20Life-Threatening%20Event%20(**ALTE**.ppt)

Diagnosis

While it is difficult to diagnose ALTE, it will require extensive workup including infection (particularly pertussis, respiratory syncytial virus, sepsis, or meningitis), gastroesophageal

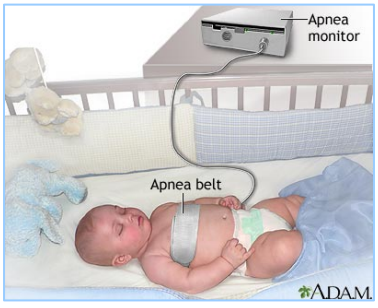
reflux (GER), seizures or other neurologic disorders, airway anomalies, aspiration, asthma, cardiac dysrhythmias such as prolonged QT syndrome, metabolic abnormalities, apnea of infancy, & nonaccidental trauma or Munchausen by proxy. The etiology in as many as 50% of ALTEs remains idiopathic. *In some instances*, the event is the result of benign perfusion changes in the infant that lead to overreaction by the caregiver. Details of the history & physical examination are critical in guiding subsequent evaluation of the events. One of the most important aspects is to determine the true severity of the event & proceed w/ evaluation according to details of the event. A non-focused evaluation ruling out all potential diagnoses is costly & unwarranted.



Most common diagnoses include:
50% Gastrointestinal (GERD, swallowing dysfunction)
30% Neurologic (sz, CNS hemorrhage)
20% Respiratory (upper airway obstruction, infection)
5% Cardiovascular (prolonged QT, arrhythmia)
5% metabolic/endocrine (electrolyte imbalance)
3-5% non-accidental trauma (abuse, shaken baby, Munchausen by proxy)
(pediatrics.uchicago.edu/chiefs/documents/**ALTE**MR-**Danielle**.ppt)

Follow Up Care

Most infants who experience an ALTE should be hospitalized for further evaluation. However, in cases in which the child appears completely normal and the details of the event indicate a benign occurrence, it may be appropriate to follow the infant as an outpatient. If the episode appears to be significant or required vigorous resuscitation or results of the physical examination are abnormal, further evaluation is warranted. These infants should be placed on continuous monitoring, & detailed descriptions of subsequent events should be documented. The initial evaluation may include a blood work to evaluate for evidence of infection or anemia and assessment of serum electrolytes and glucose for metabolic abnormalities. As noted previously, further evaluation is based primarily on details obtained through the history & physical examination that may suggest possible etiologies. Additional studies may include cardiac evaluation, including electrocardiography or echocardiography; neurologic testing, including electroencephalography or cranial computed tomography; & a variety of tests to evaluate for gastro esophageal reflux (GER).



Conclusion

From the Annals of Emergency Medicine, research was conducted in which they studied 804 infants encountered by EMS for the purpose of defining the prevalence & significance of ALTE among infants in the out-of-hospital setting. The research concluded that ALTE in an infant can present without signs of acute illness & is commonly encountered in the EMS setting. It is often associated with significant medical conditions & EMS should be aware of the clinical importance of an ALTE event. Additionally, the stance was that infants meeting criteria of an ALTE event should receive a timely and thorough medical evaluation. (A of EM, June 2004)

At the end of the day, the take home point for both MTBI & ALTE pts is this, to serve them well, healthcare providers must take the witness at their word, believing their story regardless of what the pt may look like upon EMS arrival & transport them for appropriate follow up care. This is the way in which we do the best service for our patients!

References

About Brain Injury. (2009-2011) Retrieved September 2011, from Brain Injury Association of America, www.biausa.org

Aehlert, B. (2010). *Paramedic Practice Today: Above and Beyond.* St. Louis, Missouri: Mosby, Inc.

ALTE: Morning Report. (2005) U of Chicago hospitals Retrieved September, 2011, from http://pediatrics.uchicago.edu/chiefs/documents/ALTEMR-Danielle.ppt

Carolan, Patrick L. MD, Apparent Life-Threatening Events. (2011) Medscape Reference, Drugs, Diseases & Procedures.http://emedicine.medscape.com/ article/1418765-overview

Claudius, Ilene. Keens, Thomas. Do all Infants with Apparent Life-Threatening Events need to be admitted? Am Academy of Pediatrics 2007; 119; 679

Concussion training for coaches (2010) Retrieved August 2011, from U.S. Dept of Health & Human Services, CDC http://www.cdc.gov/concussion/HeadsUp/online_training.html

Heads Up: Facts for Physicians about MTBI. (2010) Retrieved August 2011, from U.S. Dept of Health & Human Services, CDC. http://www.cdc.gov/concussion/ HeadsUp/physicians_tool_kit.html

Mattera, C. (2011). *NWC EMSS paramedic training program: pediatric assessment/peds trauma*. Unpublished manuscript.

Mattera, C. (2011). *NWC EMSS paramedic training program: pediatric growth and development: approach to physical exam*. Unpublished manuscript.

Mattera, C. (2011). *NWC EMSS paramedic training program: pediatric medical emergencies*. Unpublished manuscript.

National Institute of Health. Infantile apnea & home monitoring. Natl Inst Health Consens Dev Conf Consens Statement. Oct 1 1986; 6(6):1-10.

Position Statement on Sports Concussion (2010) Retrieved September 2011, from American Academy of Neurology, www.aan.com/advocacy

Public Act 097-0204 The Protecting our Student Athlete Act http://ilga.gov/legislation/ publicacts/fulltext.asp?Name=097-0204&print=true&write

Rajan, S. et al. (2010, April). BacterialTracheitis. *Medscape*. Retrieved September 2011, from www.eMedicine.medscape.com/article/961647-workup

Semmekrot, B.A. et al. (2010) Surveillance study of apparent life-threatening events in the Netherlands. European J of Pediatrics, 2010 February; 169(2): 229-236.

Stratton, Samuel, MD. Taves, Adrian, RN et al. (2004) Apparent Life Threatening Events in Infants: High Risk in the Out-of-hospital Environment, College of Emergency Physicians, j.annemergmed.2003.10.038

Testing helps change the game on youth concussions, (2011) retrieved from USA Today, http:// www.usatoday.com/sports/2011-05-25-youth-concussions-cover_N.htm

Youth Sports community supports concussion laws (2011) Retrieved September 2011, from http://specialselections.suntimes.com/health/6990934-555