Chapter 34
Pediatric Emergencies

Neonate – Birth to 1 month
Young Infant – 1 to 5 months
Infant – 6-12 months, may have fear of separation, minimize separation, decrease parental anxiety
Toddler – 1-3 years, may fear separation, loss of control, keep it simple, play with equipment, do not ask permission – they will refuse
Preschooler – 3-5 years, fear bodily injury/mutilation, loss of control, the dark, being alone, keep it simple, be honest
School Age - 6-12 years, fear bodily injury/mutilation, loss of control, death, provide choices, explain loger term consequences
Adolescent - 12 to 15 years, fear loss of control, altered body image, peers, allow them to be part of the decision regarding their care, give info sensitively, be honest, teach coping

Anatomical Differences:
Occlusion of the airway is one of the major causes of pediatric death in the prehospital setting

- Airway is smaller and more likely to get obstructed
    - Larger tongue in proportion to the mouth
    - Large, floppy epiglottis
    - Airway is narrowest at the cricoid cartilage
    - Vocal cords are more superior and more anterior than an adult's (around 1st or 2nd vertebra)
- Skeletal structure is smaller
    - Internal organs packed in a smaller space
    - High incidence internal injuries – most often the liver
    - More multisystem injures
    - Bones are softer break less, bend more
- Head is much larger in proportion to an adult
    - Large, heavy head exerts pressure on spine
    - Fontanelles (soft spots) on the tops of infant's heads til 18-24 months
        - Bulge with pressure
        - Depressed with dehydration
- Nervous system more immature
    - Nerves less well insulated
    - Nerves less well-developed
    - Does not know how to move out of the way of an object

Approaching the Pediatric Patient

- Keep control of the scene
- Keep parents informed and calm
- Get the child's age and weight
- What is the level of comprehension?
- Who can offer emotional support
- Who knows the medical history

Family-centered Care: involves the parent/guardian in care of the pediatric patient
Assessment: scene size-up: is the scene safe? In what position was the child found? Do the history and the injuries match?

- Pediatric Assessment Triangle (first 30-60 secounds):
    - Appearance
    - work of breathing
    - circulation
- Initial Triage decision: if immediate treatment is necessary, then rapid
    - LOC - AVPU

    - ABCs 90% of cardiopulmonary problems start as respiratory problems
        - Respiratory distress is hypoxia, where work of breathing is increased
        - Respiratory failure is the inability to maintain adequate O2 in the blood
        - Apnea is the absence of airflow (breathing) for more than 15 seconds
        - Signs and symptoms: nasal flaring, retractions, head bobbing, grunting, stridor, prolonged expiration, slow irregular resps. Dyspnea causes bradycardia
    - Vital signs: respiratory rate and quality, pulse rate and quality, BP (over 3), pupils, skin temp. color and condition
- Broselow Tape: resuscitation tool referencing proper range of vital signs as well as resuscitation equipment
- History: get info from the parent/guardian/caregiver. SAMPLE history
- Detailed physical: Infants and young children go toes to head. Older children head to toes

Managing the ABCs:

- Allow the parent to hold infant and young children
- Unconscious children, towel under shoulders will hold head in a sniffing position. Hyperextension can occlude the airway
- Blocked airway? Never blind sweep the back of the mouth – abdominal thrusts for older children, chest thrusts and back blows for infants
- OPAs: must use the right size – corner of mouth the earlobe, use tongue depressor to hold the tongue up, NPA: proper size, tip of nose to tragus ET tube can double as an NPA
- Suction: no greater than 120 mm Hg, use a flexible tip. Monitor heart rate so they don't vagal out and brady down
- Intubation equipment: ET tube should be the size of the pinkie finger or Age/4 + 4 = mm ET Tube, blade sizes go down to zero
- Bag Valve Mask Ventilation: at least 20 breaths/minute, O2 set at 15 L/min with a 450 mL bag
- Nasal Cannual @ 2-4 L/min O2
- Blow by O2 from a cup and hold the mask close to face

IV Therapy: very important to ill and injured children
Do not try to start a line in the cases of:

- Traumatic injury – transport asap
- Epiglottitis or other severe resp. distress

Intraosseous Infusion: Children 6 and under. Inserting a needle in the long bone of the leg. The tibular plateau

- Severe shock
- Cardiac arrest
- Unconscious
- Can't get an IV anywhere else

Fluid Administration: Isotonic (LR or normal saline) 20 mL/kg in less than 20 minutes
Kid's weight in kg x 20 for example:

20 lbs / 2.2 = 9.09 x 20 = 181.1
30 lbs / 2.2 = 13.6 x 20 = 272
40 lbs / 2.2 = 18.18 x 20 = 363.6
50 lbs / 2.2 = 22.72 x 20 = 454.4
60 lbs / 2.2 = 27.27 x 20 = 545.4
70 lbs / 2.2 = 31.81 x 20 = 636.2
80 lbs / 2.2 = 36.36 x 20 = 272.2

Pediatric Resuscitation: cardiac arrest usually results from respiratory arrest/hypoxemia
Asystole: flatline on the cardiac monitor: To treat asystole:

- CPR
- Ventilate with BVM 15 L/min O2

- Intubate
- IV with LR or normal saline
- Epinephrine

V-Fib: chaotic looking rhythm with varied waveforms, no P waves, QRS complexes or T waves. Rarely occurs in children except congenital heart disease, acidosis, hypothermia, drug toxicity. To treat V-Fib:

- CPR
- Ventilate with BVM 15 L/min O2
- Defibrillate up to three times with 2 joules/kg
- Intubate
- IV with LR or normal saline
- Epinephrine
- Repeat defib at 4 L/kg
- Repeat epinephrine

Pediatric Respiratory Compromise:
Upper Airway Obstruction:

- Foreign body: toddlers/preschoolers most common. Abdominal thrusts for children back blows and chest thrusts for infants
- Tonsillitis
- Croup (laryngotracheobronchitis): children 3 months to 3 years. Viral infection, slow onset, upper resp infection and low fever, Hoarse with stridor (subglottic edema) and a barking cough. O2, transport in position of comfort
- Epiglottitis: inflammation of the epiglottis, most often 3 years to 7 years. Bacterial infection, progresses rapidly and can lead to complete airway obstruction and respiratory arrest. They look very ill, stay very quiet, tripod position, drooling, muffled voice and stridor. They need nebulized epinephrine. Keep them comfortable and calm

Lower Airway Obstruction:

- Asthma: reactive airway disease, any age, response to allergy exercise, infection, family history, drugs reverse bronchospasm. High flow O2, transport
    - Statud asthmaticus: severe, prolonged attack which can't be stopped with traditional bronchodilators
- Bonchiolitis: 6-18 months, any time or year, viral infection, mild fever, cough runny nose which progresses to respiratory distress. No history of asthma, drugs may not be effective
- Pneumonia: infection of the lower airway and lung. Common in infants, toddlers and preschoolers. Bacterial or viral.Fever, rales, rhonchi, pain in chest, grunting respirations

Pediatric Shock: inadequate delivery of O2, and is the body's response to poor perfusion. A child may lose up to 20% blood volume before a change in appearance. Leading cause of shock in kids is gastroenteritis with dehydration.

- Palpate peripheral pulse and listen to apical heart rate for clues on hypovolemia
- Compensated shock: BP normal, compensate longer than adults
- Decompensated shock: hypotensive and shows signs of inadequate perfusion, often irreversible
- Signs of shock:
    - Altered level of responsiveness
    - Hyperventilation leading to respiratory failure
    - Tachycardia
    - Normotension progressing to hypotension
    - Cool, or cold clammy skin
    - Prolongen cap refill
    - Oliguria – lack of urine production
    - Acidosis

Dehydration: threat to infant and child because they are greater proportion of water than adults (they are 65%), decrease in cardiac output>renal failure>shock>death

- Fever
- Viral gastrointestinal disorder
- Nausea, vomiting, diarrhea

Treatment:

- Moderate to extreme: IV of normal saline of LR
- High flow O2

Seizures/Epilepsy: 8% of pediatric transports, many are febrile (fever) seizures. Make note of duration, aura, level of responsiveness, parts of body involved, postictal period, incontinence

- Simple Partial: no loss of consciousness, motor signs or sensory symptoms
- Complex Partial: psychomotor or temporal lobe seizures; purposeless activity
- Absence: formerly called Petit Mal, loss of consciousness, short periods of staring
- Clonic: jerking muscle activity
- Tonic: stiffening of the body
- Tonic-Clonic: formerly called Grand Mal, total loss of consciousness with convulsions
- Myoclonic: Start/stop abruptly, single or multiple myoclonic jerks
- Atonic: drop attack, unexpected lack of muscle tone
- Akinetic: lack of movement
- Unclassified\

Treatment:

- Nasal airway, suction, ventilation is apnea or prolonged hypoventilation
- If due to a fever, reduce fever with moist cloths, tepid water, fanning
- Prolonged seizures, IV Valium or Ativan may be required, rectal diazepam is available for age 2 and older
- Status epilepticus: continuaous seizure of more than 30 min. or a series of seizures with no conscious period in between.

Meningitis: inflammation of the membranes around the brain and spinal cord. Viral or bacterial. Bacterial is much more serious and contagious. Symptoms:

- Fever, dehydration, disorientation
- Bulging fontanelle
- Loss of appetite, poor feeding, vomiting
- Seizures
- Respiratory distress, cyanosis, rash
- Older children: Kernig's sign, headache, nuchal tenderness
- Later symptoms of bacteria in the bloodstream: chills joint pain, sore throat, headache, red spots, exhaustion

Treatment:

- BSI, could be contagious, use a mask
- Maintain the respiratory and circulatory efforts
- Monitor vital signs and cardiac status
- High flow O2
- IV bolus of 20 mL/kg as necessary
- Make comfortable, transport, watch for seizures

Poisoning: extremely high risk because they are so inquisitive. Kids 18 months to 3 years account for 30% of all accidental poisonings. Household products, medications, toxic plants, contaminated foods. School age and adolescents poison themselves with alcohol, organic solvents, and drugs.

Trauma: 20-40% of pediatric deaths due to trauma are preventable. Most common: Falls, then MVA, accidental injury, sports related injury, assaults/abuse.

- Assessment: ABCs

- Treatment: IV saline or LR for hypovolemia
- Head trauma: most common cause of death because their big, heavy heads hit first. Manage airway, O2, intubate as necessary
- Spinal Trauma: more flexible, lack of neck muscle, serious injury can occur without external signs of injury. 60-70% of pediatric neck fractures are at C1 or C2

Child Safety Seats: Cervical spine is still susceptible to maximum flexion. If child's head sticks up over the seat, the head can hyperextend during a rear-end collision. Use the seat for immobilization unless the child is critically injured and will deteriorate. Inspect the seat for damage too. Then pad the body and head to prevent further movement.

C-spine devices for children: make sure it fits. It is much worse to hyperextend the kid's neck to force the collar on than to secure it with towels etc.

Backboards:	Short of long can be used, pad under their torso to bring the spine into alignment. Pad around the sides of the board
KEDs/Vest Devices:	Adult vest is not recommended because in-line spinal position can't be achieved
Helmets:	Removal is recommended to bring the spine in line. Their heads are already so big you have to pad under their shoulders, the helmet just makes it worse.

Chest and Abdominal Trauma: more flexible, fractured ribs are associated with a high mortality rate due to the force required to break the ribs. Flail segments rare. Liver, kidney and spleen are most commonly injured. Treatment: O2, transport definitive care at the hospital.

Hypothermia: CBT below 95 F, 35 C. Children more susceptible due to large body surface area compare to weight. Look for signs and symptoms:

- 95 degrees - Shivering, increased resps, may be alert
- 90 degrees - Muscular ridgity, decreased resp rate, atrial fibrillation, impaired cognition, loss of dexterity
- 86 degrees – Decreased cerebral blood flow, tachycardia, tachypnea, supraventricular dysrhythmia
- 80 degrees – bradycardia, bradypnea, V-fib, decreased O2 uptake, rigid extremities, metabolic rate decreased by 50%
- 77 – hypotension, blood to kidneys reduced 30%
- 68 – unconscious, no reflexes, unresponsive pupils etc.

Treatment: move to warm environment asap, warm blankets, maintain airway, high flow O2, CPR if no pulse, if heart rate, handle gently to prevent V-Fib. Use heat packs, but don't let them directly touch the skin

Drowning: third leading preventable cause of death. 2,000 annually. Focus on ABCs. Do not intubate a child that has been submerged but has a heart rate – stimulating the vagus nerve may cause asystole.

- Water rescue: ditress in water but is alert
- Submersion: water-related distress, transported to ER
- Drowning: considered fatal. Drowning-related death is if they die within 24 hours

SIDS: Sudden Infant Death Syndrome: unexplained after post-mortem exam. Third leading cause of death in children age 1 month to 1 year. 3,400 annually. Peak age 2-4 months. 95% occur by 6 months. More males, during sleep, more in winter esp. January. Native Americans/Blacks, premature, multiples, soft bedding, overheating, young cigarette-smoking moms.

- Try to determine the scene as the baby was found, esp. if they have been removed from the bed
- Continue CPR if the parents started
- Be compassionate, don't give the impression of any wrongdoing
- Stress that SIDS can't be predicted or prevented

Child Abuse/Maltreatment

Child Abuse: any recent act or failure to act that results in imminent risk of serious physical or emotional harm, death, sexual abuse or exploitation by a parent or caretaker. 1 million children annually, over half are under 7, 56% of those are under 4. The most important thing for an EMT to remember is to be nonjudgmental. Document everything. Treat physical injuries as appropriate. Protect the child from further abuse. Reporting is mandatory to hospital/local authorities:

- Physical abuse: Bruises, welts, burns (glove), fractures, dislocations, wounds in various levels of healing, inappropriate reactions, acting out behavior, withdrawal
- Sexual abuse: bruises, bleeding on genitals, torn underwear, pain on urination, STCs
- Emotional abuse: withdrawal, fearfulness, lags in development, sleep disorders
- Neglect: failure to thrive, malnutrition, unclean, poor teeth

Maltreatment: intentional physical abuse or neglect, emotional abuse or neglect and sexual abuse

Neglect: failure of a parent or guardian to provide for the child's basic needs and an adequate level of care

Shaken Baby Syndrome: can cause fatal intracranial trauma without signs of external head injury. Retinal hemorrhage, CNS injury, bleeding, concussion, soft tissue swelling, skull fracture, hypotension

Special Needs: any condition that interferes with usual growth and development: hearing impaired, mental retardation, tracheostomy, gastrostomy, cerebral palsy, spina bifida, etc.

- Cognitive Disabilities: some degree of impaired adaptation in learning, social adjustment or maturation. Actual physical evaluation is all the same, the major difference is the child's level of understanding and ability to communicate
- Physical Disabilities: some limitation of mobility, attend to ABCs and don't let devices get in the way
- Chronic Illnesses: any disease/situation that extends for a prolonged period
- Assistive Technology
    - Tracheostomy: temporary or permanent. Airway trauma or weak respiratory muscles. Watch for mucus plugs
    - Central Venous Access Devices: extended access to a vein. Several types of devices, but they al end at the superior vena cava or the right atrium. Implanted ports are accessed using a Huber needle
    - Vagus nerve stimulator: over 12 yo, stops the progression of seizure activity
    - Apnea Monitors: alarm sounds if a breath is not detected in a certain period of time
    - Gastrostomy Tube or Button: children who can't take food by mouth. The tube may have become dislodged, there may be internal bleeding
- Medications: find out what they are taking and when their last dose was
- Latex Allergies: especially in kids with spina bifida, assemble a latex-free kit
- Family Issues: Stressful for the entire family
- General Considerations: special needs kids are at risk for medical complications or traumatic events. Infections, decreased reflexes, paralysis. Look for Medical Tags, ask for Emergency Information Form (EIF)
- Pain Management: pain in children is often underestimated, includes verbal and nonverbal expressions
- Family Involvement: always keep the parents and caregivers involved
- Transport Guidelines: critically ill or injured kids need a pediatric trauma center