Pediatric Assessment & Emergencies

Pea Ridge Fire Department

EMS refresher

Introduction

- Children differ from adults in their anatomy, physiology, and emotions.
- Your approach to pediatric patients must:
  - Be based on age
  - Accommodate developmental and social issues

Neonate and Infant

- Neonatal period: First month
- Infancy: First 12 months

Table 43-1 Infant Development

	Birth to 2 Months	2 to 6 Months	6 to 12 Months
Physical Development	▪ Controls gaze ▪ Turns head	▪ Can recognize caregivers ▪ Makes eye contact ▪ Uses both hands ▪ Rolls over ▪ Most sleep through the night	▪ Sits without support ▪ Crawls ▪ Puts things in mouth ▪ Teething begins ▪ Eats soft foods
Cognitive Development	▪ Begins crying to communicate needs ▪ Crying peaks at 6 weeks	▪ Increased awareness ▪ Explores own body	▪ Babbles (learns first word by 12 months) ▪ Remembers objects ▪ Curious about what objects do
Emotional Development	▪ Trust develops in parents	▪ Uses expressions of joy, anger, fear, surprise ▪ Seeks attention	▪ Separation anxiety develops ▪ Start of tantrums ▪ Self-determination while eating

Neonate and Infant

- During assessment:
  - Keep child warm.
  - Support a young infant's head and neck.
  - Older infants will be calmest in a parent's arms.
  - If child is quiet, listen to heart and lungs first.

Toddler

- Ages 1 to 2

Table 43-2 Toddler Development

	12 to 18 Months	18 to 24 Months
Physical Development	▪ Crawls ▪ Walks ▪ Front teeth emerge ahead of molars ▪ Undergoes sensory development	▪ Has improved gait and balance ▪ Runs ▪ Climbs ▪ Head grows more slowly than body
Cognitive Development	▪ Imitates others ▪ Makes believe ▪ Understands more than expressed ▪ Knows major body parts ▪ Knows 4 to 6 words	▪ Begins to understand cause and effect ▪ Labels objects ▪ Speech picks up to approximately 100 words by 24 months
Emotional Development	▪ Demonstrates basic reasoning ▪ Understands object permanence ▪ Demonstrates separation anxiety	▪ Demonstrates attachment to certain objects, such as a pacifier, doll, or blanket

Toddler

- Use the Pediatric Assessment Triangle (PAT) to assess the child.
- Strategies for examination:
  - Examine on parent's lap.
  - Get down to the child's level.
  - Have a parent assist when possible.
  - Be flexible.

Preschool-Age Child

- Ages 3 to 5
- Becoming verbal and active
- Respect modesty.
- Let child participate.
- Set limits on behavior if the child acts out.

School-Age Child

- Ages 6 to 12
- Capable of abstract thought, understand cause and effect
- By age 8, anatomy and physiology is similar to adults.
- Explain steps in simple language.

Adolescence

- Ages 13 to 18
- Once secondary sexual characteristics have developed, treat as an adult.
- Address and reassure patient.
- Offer as much control as appropriate.

The Head

- Infants' and young children's heads are large relative to the rest of their bodies.
- During infancy, the anterior and posterior fontanelles are open.

The Neck and Airway

- Short neck, smaller airway
- Epiglottis is long and floppy.
- Keep nares clear with suctioning.
- Avoid hyperextension of neck.
- Keep the airway clear of all secretions.
- Use care when managing the airway.

The Respiratory System

- Smaller tidal volume, double metabolic oxygen demand
- Smaller functional residual capacity
- Faster breathing

Table 43-3 Pediatric Respiratory Rates

Age	Respirations (breaths/min)
Neonate (0 to 1 month)	30 to 60
Infant (1 month to 1 year)	30 to 53
Toddler (1 to 2 years)	22 to 37
Preschooler (3 to 5 years)	20 to 28
School-age child (6 to 12 years)	18 to 25
Adolescent (12 to 15 years)	12 to 20

Data from: American Heart Association (AHA). Vital signs in children. In: AHA. *Pediatric Advanced Life Support*. Dallas, TX: AHA; 2015.

The Respiratory System

- Infants use diaphragm during inspiration.
- Experience muscle fatigue quicker
- Highly susceptible to hypoxia
  - Can cause cardiovascular collapse and arrest

The Cardiovascular System

- Children rely on pulse rate to:
  - Compensate for decreased oxygenation
  - Maintain cardiac output

Table 43-4 Pediatric Pulse Rates

Age	Awake Rate (beats/min)	Asleep Rate (beats/min)
Neonate (0 to 1 month)	100 to 205	90 to 160
Infant (1 month to 1 year)	100 to 180	90 to 160
Toddler (1 to 2 years)	98 to 140	80 to 120
Preschooler (3 to 5 years)	80 to 120	65 to 100
School-age child (6 to 12 years)	75 to 118	58 to 90

Data from: American Heart Association (AHA). Vital signs in children. In: AHA. *Pediatric Advanced Life Support.* Dallas, TX: AHA; 2015.

The Cardiovascular System

- Limited but vigorous cardiac reserves
- Injured children can be in shock and maintain blood pressure for long periods.
- Hypotension is an ominous sign.

The Heart

- ECG: Large right-sided forces are normal in young infants.
- Cardiac output is rate dependent in infants and young children.
- Mediastinum is more mobile.

The Nervous System

- Neural tissue and vasculature are fragile.
- Brain and spinal cord are not as well protected.
- Pediatric brain: Nearly twice the blood flow
  - Makes even minor injuries significant
  - Increases risk of hypoxia

The Spinal Column

- Fulcrum is higher (descends with age).
- Vertebral fractures and spinal cord injuries in young children are uncommon.
- With a significant MOI:
  - Assume cervical spine injury.
  - Transport with spinal immobilization.

The Abdomen and Pelvis

- Organs are susceptible to injury:
  - Proportionally larger solid organs
  - Less subcutaneous fat
  - Less protective abdominal musculature

The Musculoskeletal System

- Adult height requires bone growth.
- Most growth plates will be closed by late adolescence.
- Immobilize all sprains or strains.

The Musculoskeletal System

- Slipped capital femoral epiphysis (SCFE)
  - Occurs in children and adolescents
  - Prominently found in overweight children
  - Symptoms include:
    - Difficulty walking and noticeable limp
    - Inability to bear weight on a limb
    - Painful/limited normal flexion and rotation

The Chest and Lungs

- Chest wall is quite thin.
- Ribs are more pliable.
- Risk of pneumothorax during bag-mask ventilation
  - Signs are often subtle.

The Integumentary System

- Infants and children have:
  - Thinner and more elastic skin
  - Higher body surface area (BSA)–weight ratio
  - Less subcutaneous tissue
- Contribute to:
  - Increased risk of injury and hypothermia
  - Increased severity of burns

Metabolic Differences

- Limited stores of glycogen and glucose
- Hypovolemia and electrolyte derangements are common.
- Keep warm during transport.

Parents of Ill or Injured Children

- Rapport with caregivers is critical.
- Approach in a calm, professional manner.
- Transport with the child.
- Remember that your first priority is the child.

Pediatric Patient Assessment

- Differs from adult assessment
- Adapt your assessment skills.
- Have age-appropriate equipment.
- Review age-appropriate vital signs.

Scene Size-up

- On the way to the scene, prepare for pediatric:
  - Size-up
  - Equipment use
  - Assessment
- Collect information from dispatch.

Scene Size-up

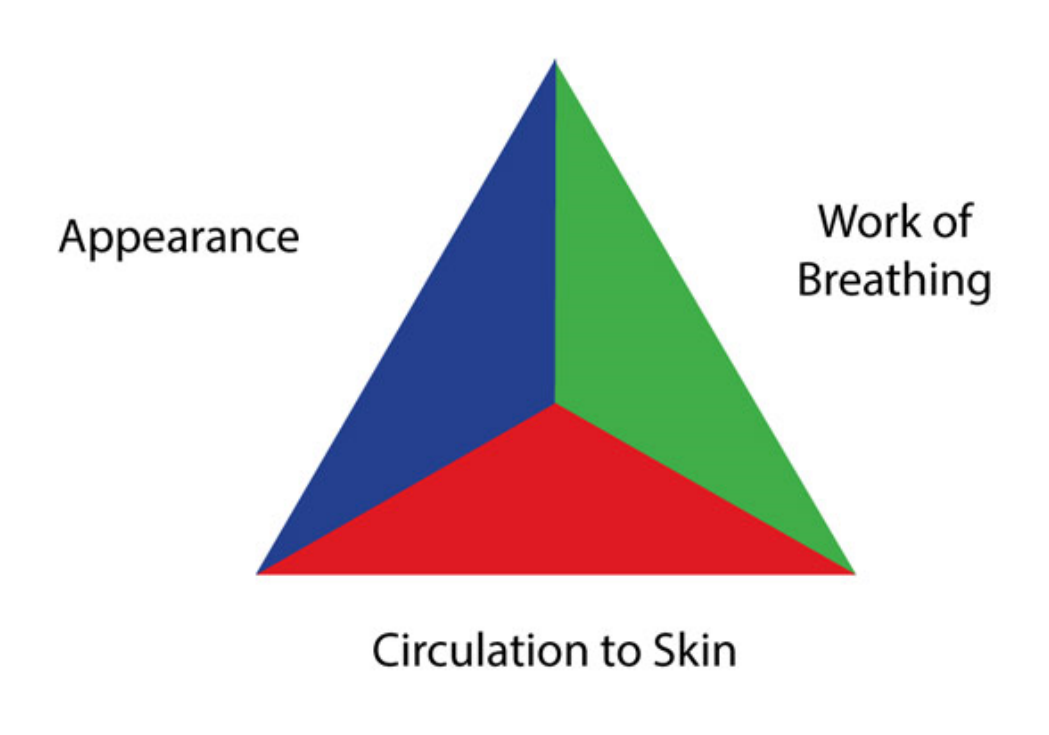
- Take appropriate standard precautions.
- Note child's position.
- Look for clues to MOI or NOI.
- Note pills, medicine bottles, alcohol, drug paraphernalia, or household chemicals.
- Observe the scene or vehicle for clues.

Scene Size-up

- Other important assessments:
  - Cleanliness of home
  - Appearance of other children in family
  - Presence of medical devices
  - Indications of substance abuse

Primary Survey

- Use the PAT to form a general impression.



Primary Survey

- Appearance
  - Often the most important factor in determining the severity of illness, need for treatment, and response to therapy

Table 43-5 Characteristics of Appearance: The TICLS Mnemonic

Characteristic	Features to Look For
Tone	Is the child moving or resisting examination vigorously? Does the child have good muscle tone? Or, is the child limp, listless, or flaccid?
Interactiveness	How alert is the child? How readily does a person, object, or sound distract the child or draw the child's attention? Will the child reach for, grasp, and play with a toy or exam instrument, like a penlight or tongue blade? Or, is the child uninterested in playing or interacting with the caregiver or prehospital professional?
Consolability	Can the child be consoled or comforted by the caregiver or by the prehospital professional? Or, is the child's crying or agitation unrelieved by gentle reassurance?
Look or gaze	Does the child fix his or her gaze on a face, or is there a "nobody home," glassy-eyed stare?
Speech or cry	Is the child's cry strong and spontaneous, or weak, muffled, or hoarse?

Modified from: American Academy of Pediatrics. Pediatric assessment. In: Fuchs S, Klein BL, eds. *Pediatric Education for Prehospital Professionals*. Rev 3rd ed. Burlington, MA: Jones & Bartlett Learning; 2016:6.

Primary Survey

- Appearance (cont'd)
  - A child with a grossly abnormal appearance requires immediate life-support interventions and transport.

Courtesy of Health Resources and Services Administration (HRSA), Maternal and Child Health Bureau (MCHB), Emergency MedicalServices for Children (EMSC) Program.

Primary Survey

- Work of breathing
  - Reflects attempt to compensate for abnormalities in oxygenation, ventilation

Table 43-6 Characteristics of Work of Breathing

Characteristic	Features to Look For
Abnormal airway sounds	Snoring, muffled or hoarse speech, stridor, grunting, or wheezing
Abnormal posturing	Sniffing position, tripod position, refusal to lie down
Retractions	Supraclavicular, intercostal, or substernal retractions of the chest wall; head bobbing in infants
Flaring	Flaring of the nares on inspiration

Primary Survey

Courtesy of Health Resources and Services Administration (HRSA), Maternal and Child Health Bureau (MCHB), Emergency Medical Services for Children (EMSC) Program.

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Primary Survey

- Circulation to skin
  - Determines adequacy of cardiac output and core perfusion.
  - Pallor, mottling, cyanosis

Primary Survey

- Stay or go
  - Use findings from PAT to determine whether the patient requires urgent care.
    - Assess ABCDEs.
    - Treat life threats.
    - Transport.
  - If condition is stable, finish assessment.

Hands-on Primary Survey

- Manage threats to ABCs as you find them.
- Steps are the same as with adults.
- Estimate child's weight.

Hands-on Primary Survey

- Airway
  - Determine whether airway is open and patient has adequate chest rise with breathing.
  - If there is potential obstruction, position airway and suction as necessary.

Hands-on Primary Survey

- Breathing
  - Calculate the respiratory rate.
  - Auscultate breath sounds.
  - Check pulse oximetry.

Hands-on Primary Survey

- Circulation
  - Integrate information from PAT.
  - Listen to the heart or feel pulse for 30 seconds.
    - Double the number to get pulse rate.
  - After checking the pulse rate, do a hands-on evaluation of skin CTC.

Hands-on Primary Survey

- Disability
  - Use the AVPU scale or Pediatric Glasgow Coma Scale to assess level of consciousness.
    - Assess pupillary response.
    - Evaluate motor activity.
  - Combine this information with PAT to determine neurologic status.

Hands-on Primary Survey

Table 43-8 AVPU Scale

Category	Stimulus	Response Type	Reaction
Alert	Normal environment	Appropriate	Normal interactiveness for age
Verbal	Simple command or sound stimulus	Appropriate Inappropriate	Responds to name Nonspecific or confused
Painful	Pain	Appropriate Inappropriate Pathologic	Withdraws from pain Makes sound or moves without purpose or localization of pain Posturing
Unresponsive			No perceptible response to any stimulus

Abbreviation: AVPU, Awake and alert, responsive to Verbal stimuli, responsive to Pain, Unresponsive

Hands-on Primary Survey

Table 43-9 Pediatric Glasgow Coma Scale (GCS)

Activity	Score	Infant	Score	Child
Eye opening	4	Open spontaneously	4	Open spontaneously
	3	Open to speech or sound	3	Open to speech
	2	Open to painful stimuli	2	Open to painful stimuli
	1	No response	1	No response
Verbal	5	Coos, babbles	5	Oriented conversation
	4	Irritable cry	4	Confused conversation
	3	Cries to pain	3	Cries; inappropriate words
	2	Moans to pain	2	Moans; incomprehensible words/sounds
	1	No response	1	No response
Motor	6	Normal spontaneous movement	6	Obeys verbal commands
	5	Localizes pain	5	Localizes pain
	4	Withdraws from pain	4	Withdraws from pain
	3	Abnormal flexion (decorticate)	3	Abnormal flexion (decorticate)
	2	Abnormal extension (decerebrate)	2	Abnormal extension (decerebrate)
	1	No response (flaccid)	1	No response (flaccid)

Modified from: Davis RJ et al. Head and spinal cord injury. In: Rogers MC, ed. *Textbook of Pediatric Intensive Care.* Baltimore, MD: Williams & Wilkins; 1987; James H, Anas N, Perkin RM. *Brain Insults in Infants and Children*. New York, NY: Grune & Stratton; 1985; and Morray JP et al. Coma scale for use in brain-injured children. *Critical Care Medicine*. 1984;12:1018.

Hands-on Primary Survey

- Exposure
  - Perform a rapid exam of the entire body.
  - Avoid heat loss, especially in infants.
  - Cover child as soon as possible.

Transport Decision

- Transport immediately for trauma with:
  - Serious MOI
  - Physiologic abnormality
  - Significant anatomic abnormality
  - Unsafe scene
- Attempt vascular access en route.

History Taking

- Conduct en route if condition is unstable.
- Goals:
  - Elaborate on chief complaint.
  - Obtain history.

Table 43-10 SAMPLE Components for Pediatric History Taking

Component	Features
Signs and symptoms	Onset and nature of symptoms of pain or fever Age-appropriate signs of distress
Allergies	Known medication reactions or other allergies
Medications	Exact names and doses of ongoing drugs (including over-the-counter, prescribed, herbal, and recreational drugs) Timing and amount of last dose Time and dose of analgesics or antipyretics
Past medical history	Previous illnesses or injuries Immunizations History of pregnancy, labor, delivery (infants and toddlers)
Last oral intake	Timing of the child's last food or drink, including bottle or breastfeeding
Events leading to illness or injury	Key events leading to the current incident Fever history

Secondary Assessment

- May include a full-body examination or a focused assessment
  - Head
  - Pupils
  - Nose
  - Ears
  - Mouth
  - Neck
  - Chest
  - Back
  - Abdomen
  - Extremities
  - Capillary refill
  - Level of hydration

Secondary Assessment

- Attempt to take the child's blood pressure on the upper arm or thigh.
  - Minimal systolic blood pressure = 70 + (2 × Age in years)

Table 43-11 Normal Blood Pressure for Age

Age	Systolic Blood Pressure (mm Hg)	Diastolic Blood Pressure (mm Hg)
Neonate (0 to 1 month)	67 to 84	35 to 53
Infant (1 month to 1 year)	72 to 104	37 to 56
Toddler (1 to 2 years)	86 to 106	42 to 63
Preschooler (3 to 5 years)	89 to 112	46 to 72
School-age child (6 to 12 years)	97 to 120	57 to 80
Adolescent (12 to 15 years)	110 to 131	64 to 83

Data from: American Heart Association (AHA). Vital signs in children. In: AHA. *Pediatric Advanced Life Support.* Dallas, TX: AHA; 2015.

Secondary Assessment

- Pediatric pain
  - When assessing pain:
    - Consider developmental age.
    - Discuss child's pain with caregivers.
    - Use pain scales with pictures.

Secondary Assessment

- Pediatric pain (cont'd)
  - Consider pharmacologic methods:
    - Acetaminophen
    - Opiates
    - Benzodiazepines
    - Nitrous oxide
  - Weigh benefits and risks of administration.

Reassessment

- Includes the following:
  - PAT
  - Patient priority
  - Vital signs
  - Assessment of interventions
  - Reassessment of focused exam areas

Respiratory Emergencies

- Frequently encountered
- Respiratory failure and arrest precede majority of cardiopulmonary arrests.
- Early identification and intervention are critical.

Respiratory Arrest, Distress, and Failure

- First determine severity.
  - Distress, failure, or arrest
- Keep anatomic and physiologic respiratory differences in mind.

Respiratory Arrest, Distress, and Failure

- Respiratory distress
  - Increased work of breathing results in adequate gas exchange.
- Respiratory failure
  - Patient can no longer compensate; hypoxia and/or carbon dioxide retention occur.
- Respiratory arrest
  - Patient is not breathing spontaneously.

Respiratory Arrest, Distress, and Failure

- Determining severity of illness will indicate urgency of treatment and transport.
  - Obtain SAMPLE history on scene or during transport.

Table 43-12 Signs of Impending Respiratory Failure

Assess	Sign
Mental status	Agitation, restlessness, confusion, lethargy (VPU components of the AVPU scale)
Skin color	Central cyanosis despite oxygen administration, pallor
Respiratory rate	Tachypnea → bradypnea → apnea
Respiratory effort	Severe retractions and accessory muscle use, nasal flaring, grunting, paradoxical abdominal motion, tripod positioning
Auscultation	Stridor, wheezing, crackles, or diminished air movement
Blood oxygen saturation	Low despite supplemental oxygen administration
Pulse rate	Tachycardia → bradycardia

Abbreviation: AVPU, Awake and alert, responsive to Verbal stimuli, responsive to Pain, Unresponsive

Respiratory Arrest, Distress, and Failure

- Respiratory distress is most common.
  - Requires only supportive care
- With fatigue, distress may progress to failure.
- Reassess frequently.

Respiratory Arrest, Distress, and Failure

- Respiratory emergency treatment
  - Give supplemental oxygen.
  - Perform ECG monitoring.
  - Establish IV access.
  - Manage the airway.
  - Use supraglottic airway devices and intubation only if bag-mask ventilation fails.

Foreign Body Aspiration or Obstruction

- Infants and toddlers have a high risk of foreign body aspiration.
  - Mild obstruction:
    - Awake
    - Stridor
    - Increased work of breathing
    - Good color
  - Severe obstruction
    - Cyanotic
    - Unconscious

Foreign Body Aspiration or Obstruction

- Removing a foreign body in responsive infants
  - Deliver five back slaps and five chest thrusts.

Foreign Body Aspiration or Obstruction

- Removing a foreign body in unresponsive infants
  - If infant loses consciousness, start CPR.
    - Perform 30 chest compressions.
    - Look inside mouth; remove object if seen.
    - Continue compressions and ventilation.
    - Assess for a pulse.

Foreign Body Aspiration or Obstruction

- Removing a foreign body in children
  - Use the Heimlich maneuver.
  - If the child becomes unresponsive:
    - Position supine; perform 30 chest compressions.
    - Look inside mouth; remove object if seen.
    - Proceed with laryngoscopy and removal with Magill forceps.

Anaphylaxis

- Potentially life-threatening allergic reaction
  - Triggered by exposure to an antigen
  - Onset of symptoms occurs immediately.

Anaphylaxis

- Severe anaphylaxis
  - Child may be unresponsive due to respiratory failure and shock.
  - Primary survey may reveal:
    - Hives
    - Swelling of the lips and oral mucosa
    - Stridor and/or wheezing

Anaphylaxis

- Treatment of anaphylaxis should include:
  - Epinephrine
  - Supplemental oxygen
  - Fluid resuscitation
  - Diphenhydramine (Benadryl)
  - Bronchodilators

Croup

- Viral infection of the upper airway
- SAMPLE history usually reveals several days of cold symptoms and low-grade fever followed by:
  - Barky cough
  - Stridor
  - Trouble breathing

Croup

- Initial management:
  - Position of comfort
  - Avoid agitating the child.
  - Administer dexamethasone IV or IM.
  - Nebulized epinephrine
  - Assisted ventilation with bag-mask ventilation may be necessary.

Epiglottitis

- Inflammation of the epiglottis and supraglottic tissues
- Classic presentation:
  - Sick, anxious; sitting in sniffing position
  - Drooling
  - Increased work of breathing
  - Pallor or cyanosis

Epiglottitis

- Symptoms progress rapidly.
- Ask about immunizations, and get the child to an appropriate hospital.
  - Be prepared with a bag-mask device and an ET tube.

Bacterial Tracheitis

- Bacterial infection of subglottic area of the upper airway
- Children typically present with:
  - Cough, stridor, respiratory distress
  - History of preceding viral infection
- Keep patient as calm and comfortable as possible.

Asthma

- Most common chronic childhood illness
- Main components:
  - Bronchospasm
  - Mucus production
  - Airway inflammation

Asthma

- Triggers
  - Upper respiratory infections
  - Allergies
  - Exposure to cold
  - Changes in the weather
  - Secondhand smoke
- Clinical signs
  - Frequent cough
  - Wheezing
  - General signs of respiratory distress

Asthma

- Initial management:
  - Position of comfort
  - Supplemental oxygen
  - Bronchodilators
  - IM dexamethasone
  - Epinephrine for severe respiratory distress

Respiratory Syncytial Virus (RSV) Infection

- Common and contagious virus that causes bronchiolitis and pneumonia in children
- Transmitted via:
  - Direct contact with large droplets
  - Indirect contact with contaminated hands or items

Respiratory Syncytial Virus (RSV) Infection

- Early signs and symptoms include:
  - Sneezing
  - Runny nose
  - Nasal congestion
  - Cough
  - Fever

Respiratory Syncytial Virus (RSV) Infection

- Prevention requires use of personal protective equipment:
  - Gloves
  - Alcohol-based foams and gels
- Post-transport vehicle cleaning
- Postexposure treatment is supportive.

Bronchiolitis

- Inflammation or swelling of small airways in lower respiratory tract due to viral infection
  - Highly contagious
  - Characteristic findings include:
    - Mild to moderate retractions
    - Tachypnea
    - Diffuse wheezing and crackles
    - Mild hypoxia

Bronchiolitis

- Danger of respiratory failure:
  - Sleepy
  - Severe retractions
  - Diminished breath sounds
  - Moderate to severe hypoxia
- Greatest risk for respiratory failure:
  - First months of life
  - Prematurity
  - Lung disease
  - Congenital heart disease
  - Immunodeficiency

Bronchiolitis

- Management is supportive.
  - Position of comfort
  - Supplemental oxygen
  - Suction thick secretions.
- If suctioning and oxygen administration fail, nebulized racemic epinephrine should be given for severe respiratory distress.

Pneumonia

- Disease infecting lower airway and lung
- Signs include:
  - Unusually rapid breathing
  - Grunting or wheezing
  - Hypothermia or fever
- Primary treatment is supportive.

Pertussis

- Also known as whooping cough
- Highly contagious
- Symptoms similar to common cold
- Keep airway patent, and transport to ED.

Cystic Fibrosis (CF)

- Genetic disease that affects respiratory and digestive systems
- Chronic mucus production
  - Tachypnea, chest pain, crackles
- Assess breathing, and administer supplemental oxygen as needed.

Bronchopulmonary Dysplasia

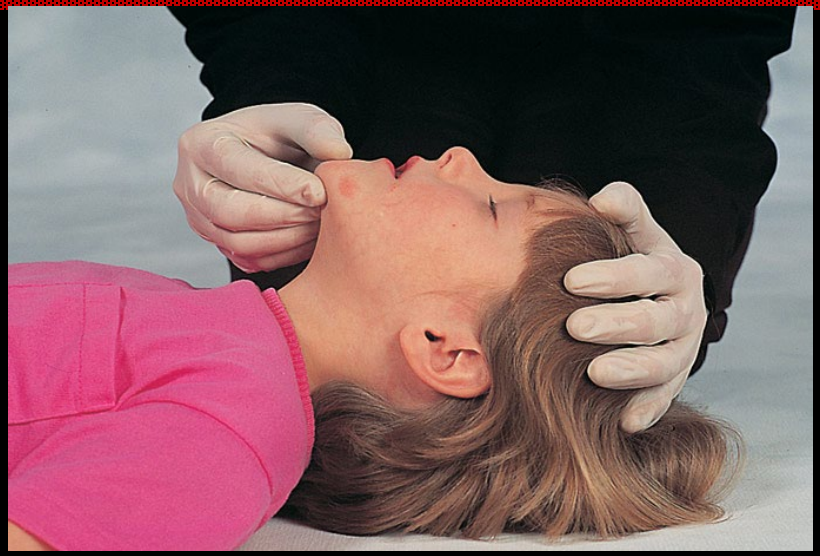
- Spectrum of lung conditions found in full-term and preterm neonates who required:
  - Long periods of high-concentration oxygen
  - Ventilator support
- Many patients will be on home oxygen.

Bronchopulmonary Dysplasia

- Remember the ABCs.
- Consider bag-mask ventilation and positive airway pressure.
- Patients may require intubation.

Airway Management

- Check for obstruction.
- Position airway using head tilt–chin lift or jaw-thrust maneuver.
- Airway adjunct may be helpful.



Oropharyngeal (Oral) Airway

- Keeps the tongue from blocking the airway
  - Makes suctioning easier
  - Use with patients who are unresponsive.
- Avoid injuring the hard palate as you insert.

Nasopharyngeal (Nasal) Airway

- Usually well tolerated
- Used for conscious patients and patients with altered levels of consciousness
- Rarely used for children younger than 1 year

Nasopharyngeal (Nasal) Airway

- Several problems are possible:
  - Diameter that is too small
  - Airway that is too long
  - Inserting the airway in responsive patients
- Do not use with facial trauma or moderate to severe head trauma.

Oxygenation

- All patients with respiratory emergencies should receive supplemental oxygen.
- Common methods for pediatric patients
  - Blow-by technique
  - Nonrebreathing mask

Oxygenation

- Blow-by technique
  - Best used when:
    - Small amount of oxygen is needed.
    - Patient cannot tolerate the mask.

Oxygenation

- Nonrebreathing mask preferred for:
  - Respiratory distress or failure
  - Older children
- Can deliver up to 95% oxygen

Bag-Mask Ventilation

- Use if airway positioning or adjunct does not improve respiratory effort.
- May need to try a variety of mask sizes
- Deliver breaths at a rate of 12 to 20 breaths/min for infants and children.

Bag-Mask Ventilation

- Ensure that equipment is the right size.
- Maintain a good seal with the face.
- Ventilate at the appropriate rate and volume.

Bag-Mask Ventilation

- Errors in technique can result in gastric distention or decreased venous return to the heart (preload).
- Two-person bag-mask ventilation is usually more effective.

Supraglottic Airways

- Devices used to provide:
  - Positive pressure ventilation to apneic patients
  - Maintain a patent airway in unresponsive patients who are breathing but need advanced airway management

Endotracheal Intubation

- Consider only if:
  - Bag-mask technique is not effective.
  - Transport times are long.

Endotracheal Intubation

- Advantages
  - Definitive airway
  - Decreased risk of aspiration
- High complication rate, which includes:
  - Bradycardia
  - Increased ICP
  - Incorrect placement

Endotracheal Intubation

- Indications include:
  - Cardiopulmonary arrest
  - Traumatic brain injury
  - Inability to maintain a patent airway
  - Need for prolonged ventilation
- Remember the differences between the adult and pediatric airways.

Endotracheal Intubation

- Pediatric equipment is mandatory.
  - Laryngoscope blades sizes 0 to 3
  - ET tubes sizes 2.5 to 6.0
- Any size laryngoscope handle can be used.

Endotracheal Intubation

- Appropriately sized blade extends from the patient's mouth to the tragus of the ear.
  - Length-based resuscitation tape measure
  - General guidelines:
    - Premature newborn: Size 0 straight blade
    - Full-term newborn to 1 year: Size 1 straight blade
    - 2 years to adolescent: Size 2 straight blade
    - Adolescent +: Size 3 straight or curved blade

Endotracheal Intubation

- Uncuffed ET tube
  - Use a 3.5-mm tube for infants up to 1 year.
  - Use a 4-mm tube for children between 1 and 2 years.
  - Use formula for children older than 2 years:
    - 4 + (Age in years ÷ 4) = Uncuffed tube size (in mm)

Endotracheal Intubation

- Cuffed ET tube
  - Use a 3-mm tube for infants and a 3.5-mm tube for children between 1 and 2 years.
  - Use formula for children older than 2 years:
    - 3.5 + (Age in years ÷ 4) = Cuffed tube size (in mm)

Endotracheal Intubation

- Appropriate depth for insertion is 2 to 3 cm beyond vocal cords.
  - Record as the mark at the corner of the child's mouth.
- With stylet in place, bend ET tube into a gentle upward curve.

Endotracheal Intubation

- Preoxygenate before intubation.
- Ensure head is in the proper position.
- Insert an airway adjunct if needed.
- Apply a cardiac monitor if one is available.
- Use a pulse oximeter before, during, and after the intubation.

Endotracheal Intubation

- Have suction handy.
- If an intubated child deteriorates, use the DOPE mnemonic to identify the problem.
  - Displacement
  - Obstruction
  - Pneumothorax
  - Equipment failure

Endotracheal Intubation

- Complications:
  - Unrecognized esophageal intubation
  - Induction of emesis, possible aspiration
  - Hypoxia from prolonged intubation attempts
  - Damage to teeth, soft tissues, and intraoral structures

Orogastric and Nasogastric Tube Insertion

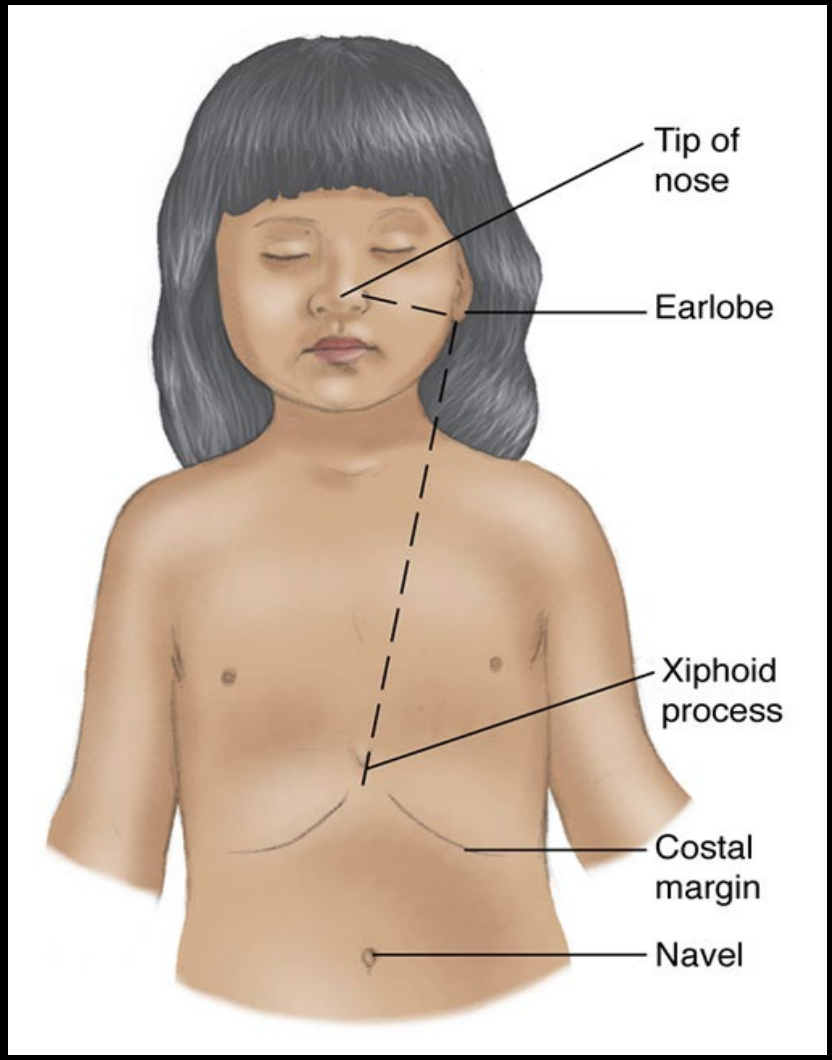
- Invasive gastric decompression
  - Placement of a nasogastric (NG) tube or orogastric (OG) tube to decompress the stomach
  - Removes the contents with suction
  - Makes assisting ventilation easier
  - Contraindicated in unresponsive children

Orogastric and Nasogastric Tube Insertion

- Needed equipment
  - Appropriately sized NG or OG tube
  - 30- to 60-mL syringe with funnel-tipped adapter
  - Mechanical suction
  - Adhesive tape
  - Water-soluble lubricant

Orogastric and Nasogastric Tube Insertion

- Select tube size.
- Measure tube on patient.
- Mark length on the tube with tape.



Orogastric and Nasogastric Tube Insertion

- Place patient in a supine position.
- If patient is unresponsive, perform ET intubation before gastric tube placement.
- In a trauma patient, maintain in-line stabilization of the cervical spine.
- Lubricate the end of the tube.

Orogastric and Nasogastric Tube Insertion

- OG tube insertion
  - Insert tube over tongue.
  - Advance tube into hypopharynx, then rapidly into the stomach.
  - Immediately remove tube with coughing, choking, or change in voice.

Orogastric and Nasogastric Tube Insertion

- NG tube insertion
  - Insert tube gently through the naris.
  - Advance the tube into the stomach.
  - If unsuccessful, use the OG approach.

Orogastric and Nasogastric Tube Insertion

- Assessing tube placement
  - Aspirate stomach contents.
    - If you hear a rush of air over the stomach, the placement is correct.
  - If correct placement cannot be confirmed, remove the tube.

Orogastric and Nasogastric Tube Insertion

- Complications
  - Placement of tube into the trachea, resulting in hypoxia
  - Vomiting, aspiration of stomach contents
  - Airway bleeding or obstruction
  - Passage of tube into the cranium

Cardiopulmonary Arrest

- Most often associated with respiratory failure and shock
- About 25% result from sudden dysrhythmias that require:
  - Delivery of high-quality CPR
  - Recognition of shockable rhythm
  - Prompt defibrillation

Shock

- Inadequate delivery of oxygen and nutrients to tissues to meet metabolic demand
- Three types:
  - Hypovolemic
  - Distributive
  - Cardiogenic

Shock

- Compensated shock
  - Critical abnormalities of perfusion
  - Body is able to maintain adequate perfusion to vital organs.
  - Intervention is needed to prevent child from decompensating.

Shock

- Decompensated shock
  - State of inadequate perfusion
- Child will be profoundly tachycardic and show signs of poor peripheral perfusion.
  - Hypotension is a late and ominous sign.
- Start resuscitation on scene.

Hypovolemic Shock

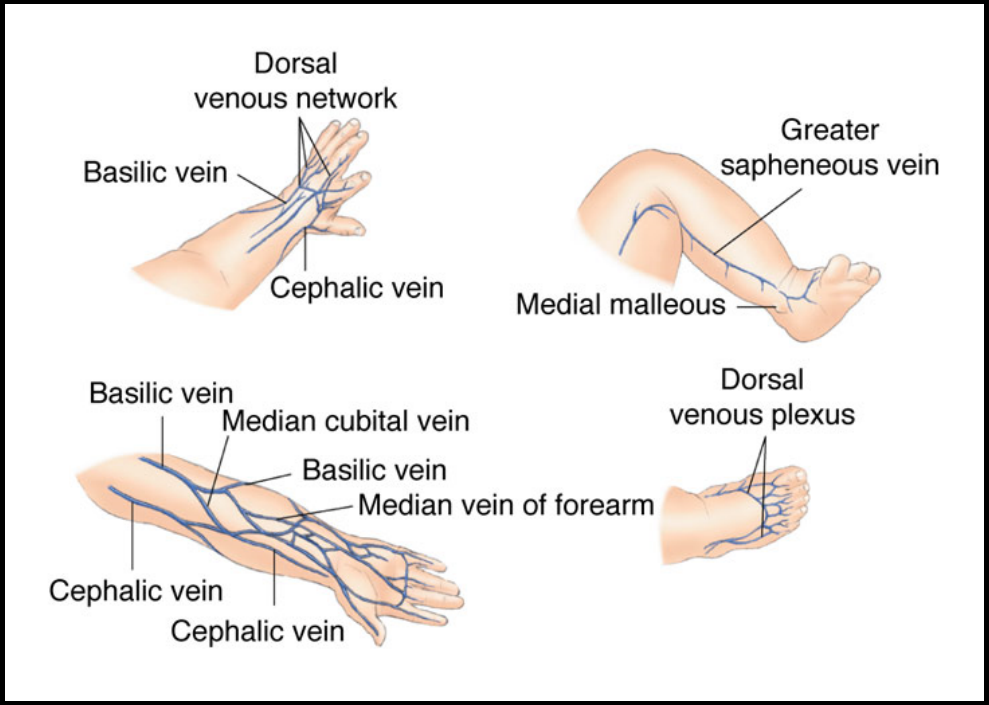
- Most common cause of shock in infants and young children
  - Loss of volume due to illness or trauma
  - Early signs may include:
    - Tachycardia
    - Pale or mottled skin
    - Cool extremities

Hypovolemic Shock

- Management
  - Position of comfort
  - Supplemental oxygen
  - Keep the child warm.
  - Direct pressure to stop external bleeding
  - Volume replacement

Hypovolemic Shock

- With compensated shock, you can attempt IV or intraosseous (IO) access en route.



Hypovolemic Shock

- Establish IV access.
- Begin fluid resuscitation with isotonic fluids only.
- In decompensated shock with hypotension, begin initial fluid resuscitation on scene.
  - Evaluate sites for IV access.
    - If this is unsuccessful, begin IO infusion.

Hypovolemic Shock

- IO needles usually consist of a solid-bore needle inside a sharpened hollow needle.

Courtesy of VidaCare Corporation (www.vidacare.com).

Distributive Shock

- Decreased vascular tone develops.
  - Vasodilation and third spacing of fluids occurs.
  - Caused by sepsis in most pediatric cases
- Treatment is volume resuscitation.
  - With apparent sepsis and persistent hypotension, consider vasopressor support.
  - Treat anaphylactic shock with IM epinephrine.

Cardiogenic Shock

- Result of pump failure
- May be present in children with:
  - Underlying congenital heart disease
  - Myocarditis
  - Cardiomyopathy
  - Rhythm disturbances

Cardiogenic Shock

- Signs and symptoms may include:
  - Listless or lethargic
  - Increased work of breathing
  - Impaired circulation
  - Skin pale, mottled, or cyanotic
  - Enlarged liver
  - Sweating with feeding
  - History of congenital heart disease

Cardiogenic Shock

- Initial management includes:
  - Position of comfort
  - Supplemental oxygen
  - Transport
    - Facility must offer pediatric critical care.
  - Supplemental oxygen

Cardiogenic Shock

- Err on the side of fluid resuscitation unless you are sure of diagnosis.
- The following confirms cardiogenic shock:
  - Increased work of breathing
  - Drop in oxygen saturation
  - Worsening perfusion after a fluid bolus

Cardiovascular Emergencies

- Relatively rare in children
- Often related to respiratory insufficiency, arrest, or infection
- Identify through primary survey.

Dysrhythmias

- Classified based on pulse rate
  - Too slow (bradydysrhythmias)
  - Too fast (tachydysrhythmias)
  - Absent (pulseless)
- Signs and symptoms are often nonspecific.

Bradydysrhythmias

- Often secondary to hypoxia in children
- Initial treatment:
  - Airway management
  - Supplemental oxygen
  - Assisted ventilation as needed.

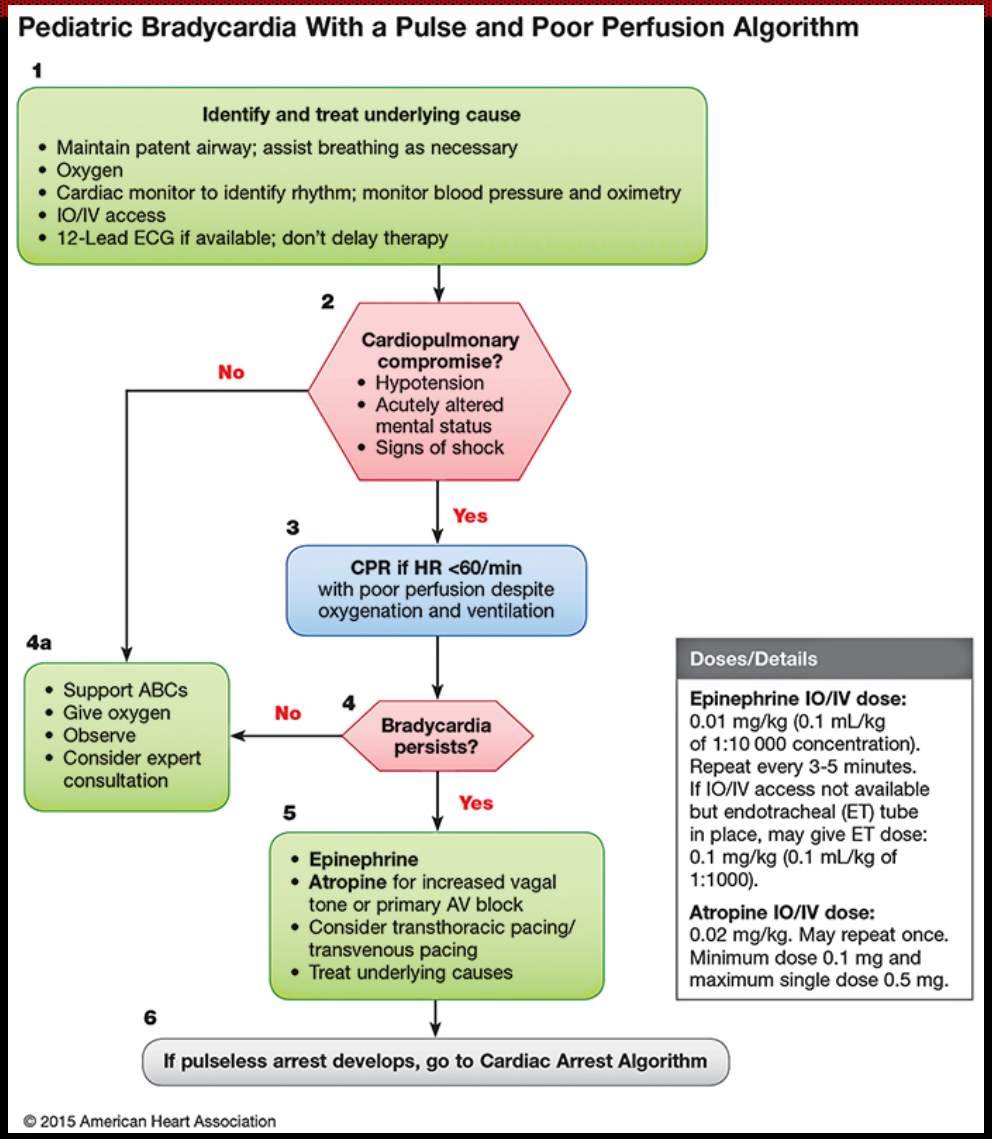
Bradydysrhythmias

- Try to identify and treat the underlying cause of the bradycardia.
- Initiate electronic cardiac monitoring.
  - With a sinus bradycardia, the heart rate is slower than the lower range of normal for the patient's age.
  - Incidental finding in adolescents

Bradydysrhythmias

- Atrioventricular (AV) block
  - First-degree block
    - Asymptomatic, often incidental finding
    - No intervention is needed.
    - Treatment only with signs of cardiovascular compromise
  - Second-degree block
    - Progressive prolongation of the PR interval; drop of the QRS complex
    - May progress to third-degree block

Bradydysrhythmias



Tachydysrhythmias

- Pulse rate is higher than normal for age.
- Subdivided into two types:
  - Narrow complex tachycardia: QRS complex is 0.09 second or less
  - Wide complex tachycardia: QRS complex is greater than 0.09 second

Tachydysrhythmias

- Treatment is directed at underlying cause.
  - Treat with antipyretics if child appears well, has a fever, and monitor shows sinus tachycardia.
  - Use fluid resuscitation for a child with sinus tachycardia and a history of vomiting or diarrhea.

Tachydysrhythmias

- Narrow complex tachycardia
  - SVT: The most frequent tachydysrhythmia requiring treatment
  - Identified by:
    - Narrow QRS complex
    - Absence of P waves
    - Unvarying heart rate of more than 220 beats/min (infant) or more than 180 beats/min (child)

Tachydysrhythmias

- Narrow complex tachycardia (cont'd)
  - Treatment depends on perfusion and stability.
    - If stable, consider vagal maneuvers while obtaining IV access.
    - If poor perfusion, synchronized cardioversion is recommended.

Tachydysrhythmias

- Wide complex tachycardia
  - Wide QRS complex tachycardia and palpable pulse is likely ventricular tachycardia (VT).
  - If stable, consider antidysrhythmic medication.
  - If unstable, use synchronized cardioversion.
  - If pulseless, begin CPR.

Tachydysrhythmias

- Pulseless arrest
  - Provide high-quality CPR.
  - Attach a monitor or defibrillator if indicated.

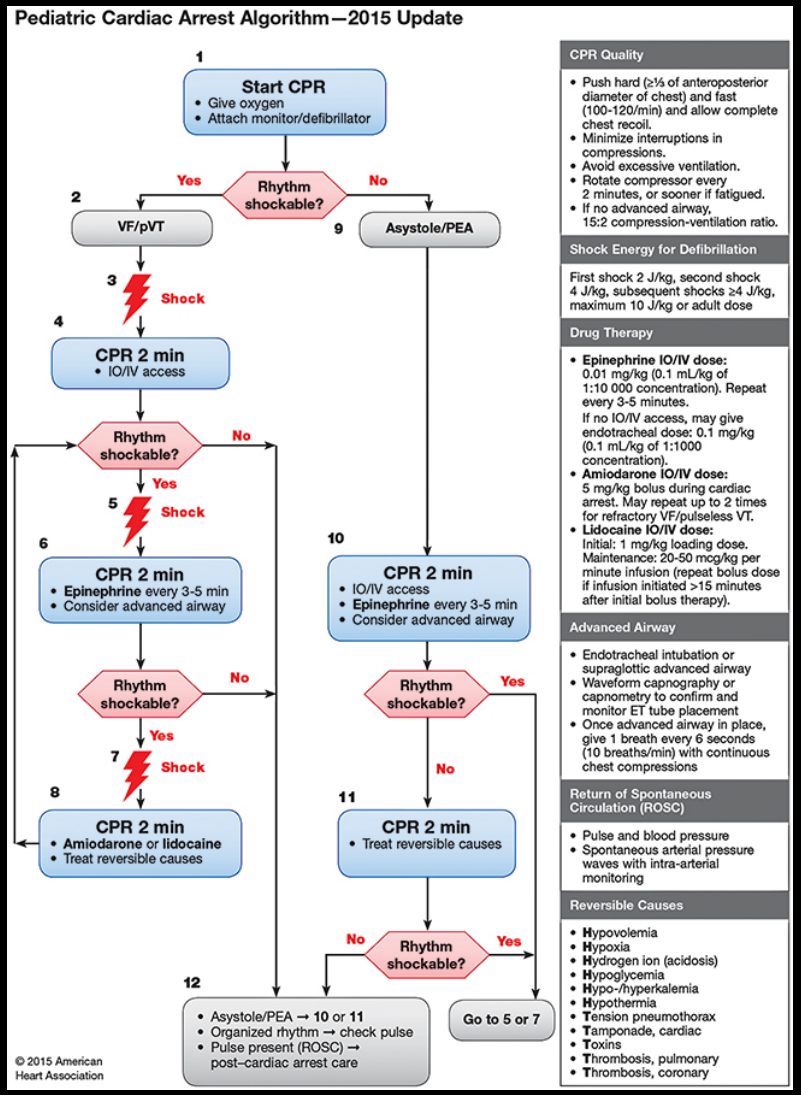
Tachydysrhythmias

- Pulseless arrest (cont'd)
  - Pulseless VT or VF: Defibrillation is indicated.
  - Additional treatment includes:
    - Establishing vascular access
    - Administration of epinephrine
    - Administration of antidysrhythmic

Tachydysrhythmias

- Pulseless arrest (cont'd)
  - Asystole or PEA: Defibrillation is not indicated.
  - Additional treatment includes:
    - Vascular access
    - Administration of epinephrine

Pediatric Cardiac Arrest Algorithm



Heart Failure

- Heart cannot meet metabolic demands at normal physiologic venous pressures.
- Signs and symptoms
  - Infants: Tachypnea, retractions, grunting
  - Children: Profuse sweating, increased work of breathing during feedings
  - Older children: Tachycardia, crackles

Heart Failure

- Treatment may include:
  - Oxygen
  - Diuretics
  - Inotropic medications (may be ordered by medical direction)
  - IV fluids (use judiciously)

Myocarditis

- Inflammation of the heart
  - Results in myocardial dysfunction
  - Can lead to heart failure
- Viral infections are common cause.

Myocarditis

- Transport with cardiac monitors.
- Obtain vascular access but use judiciously.
- Patients will often need inotropic support.
- Apply oxygen during transport.

Cardiomyopathy

- Dilated cardiomyopathy
  - Progressive dilation of the ventricles and poor contraction of myocardial muscle fibers
  - Typically due to viral infection or toxicity
  - Patients can present with fatigue, weakness, and signs of heart failure

Cardiomyopathy

- Hypertrophic cardiomyopathy
  - Heart muscle is unusually thick.
  - Heart has to pump harder to get blood to leave.
  - Patients can present with chest pain, dysrhythmias, dyspnea, syncope, and sudden death.

Cardiomyopathy

- Restrictive cardiomyopathy
  - Ventricle walls are stiff.
  - Ventricle filling is impaired.
  - Signs and symptoms similar to heart failure.

Assessment and Management of Cardiovascular Emergencies

- Begin with PAT, primary survey, and secondary assessment.
  - An abnormal appearance may indicate the need for rapid intervention.
    - Tachypnea is common with a primary cardiac problem.
    - Increased work of breathing and a fast respiratory rate are common with heart failure.

Assessment and Management of Cardiovascular Emergencies

- Determine:
  - Likely underlying cause
  - Patient's priority
  - Need for treatment or transport
- Repeat PAT and ABCs after intervention.

Neurologic Emergencies

- Can be benign or life threatening
- Medical history is important, including:
  - Previous seizures
  - Shunts
  - Cerebral palsy
  - Recent trauma or ingestions

Altered Mental Status

- Conditions that can interfere with mental status include:
  - Metabolic problems
  - Infectious diseases
  - Intracranial structural abnormalities
  - Trauma
  - Hypoxia
  - Poisonings

Altered Mental Status

- Use mnemonic AEIOUTIPS to remember common causes.
- Run through PAT and ABCDEs quickly.
  - Pay attention to disability and dextrose issues.
  - Check glucose.

Altered Mental Status

- Assess and support airway and breathing.
- If hypoglycemic, give glucose.
- If signs or symptoms suggest an opiate toxidrome, consider naloxone.

Altered Mental Status

- Transport all patients expeditiously.
- Assess for increased ICP.
  - Adding lidocaine prior to intubation may blunt the increase in ICP associated with intubation.
  - Signs include Cushing triad.

Seizures

- Result from abnormal electrical discharges in the brain
  - May be predisposed, or result from:
    - Trauma
    - Metabolic disturbances
    - Ingestion
    - Infection

Seizures

- Physical manifestation of a seizure will depend on the area of the brain affected.
- Prognosis is linked to the underlying cause.

Seizures

- Types of seizures
  - Generalized seizures involve the entire brain.
  - Partial seizures involve only part of the brain.
    - Simple partial seizures: No loss of consciousness
    - Complex partial seizures: Loss of consciousness

Seizures

- Febrile seizures
  - Child must:
    - Be age 3 months to 6 years
    - Have a fever
    - Have no identifiable precipitating cause
  - Strongest predictor is a history in a first-degree relative.

Seizures

- Febrile seizures (cont'd)
  - Simple febrile seizures
    - Brief, generalized tonic-clonic seizures occurring without underlying neurologic abnormalities
  - Complex febrile seizures
    - Longer, focal, or occur with baseline developmental or neurologic abnormality

Seizures

- Assessment
  - Give special attention to:
    - Compromised oxygenation and ventilation
    - Signs of ongoing seizure activity
  - Status epilepticus
    - Seizure lasting more than 4 to 5 minutes or consecutive seizures without a return to consciousness between seizures

Seizures

- Assessment (cont'd)
  - As part of history taking, ask about:
    - Prior seizures
    - Anticonvulsant medications
    - Recent illness, injury, or suspected ingestion
    - Duration of seizure activity
    - Character of the seizure

Seizures

- Management
  - Treatment is limited to supportive care if seizure has stopped by your arrival.
  - Provide 100% supplemental oxygen; bag-mask ventilation as indicated for hypoventilation.

Seizures

- Management (cont'd)
  - For ongoing seizure, open airway.
    - Suction for secretions or vomitus.
    - Do not attempt ET intubation.
  - Measure serum glucose; treat hypoglycemia.
  - Consider administering a benzodiazepine.
  - Monitor cardiorespiratory status in any postictal child.
  - Reassess frequently for recurrent activity.

Meningitis

- Inflammation or infection of the meninges
  - Viral meningitis: Rarely life threatening
  - Bacterial meningitis: Life threatening
- Symptoms vary.
  - The younger the child, the more vague.

Meningitis

- May cause sepsis
  - Characterized by a rash
    - Petechial
    - Purpuric

Courtesy of Ronald Dieckmann, MD.

Meningitis

- Infection control is important.
- Signs and symptoms:
  - Fever
  - Altered mental status
  - Bulging fontanelle
  - Photophobia
  - Nuchal rigidity
  - Shock

Meningitis

- Perform a glucose check.
- Provide lifesaving interventions as needed, and transport quickly.
- Patient may need oxygen, airway management, and ventilation support.

Hydrocephalus

- Results from impaired circulation and absorption of CSF
  - Leads to increased ventricles and ICP
- Cerebral shunt often used to decrease ICP
  - Ventriculoperitoneal (VP) shunts
  - Ventriculoatrial (VA) shunts

Hydrocephalus

- Complications of cerebral shunts include infections, blockages, and overdrainage.
- Signs of malfunction include:
  - Vomiting
  - Headache
  - Altered level of consciousness
  - Visual changes

Hydrocephalus

- Manage increased ICP.
- Transport immediately to a facility with pediatric neurosurgical capabilities.

Traumatic Brain Injury (TBI)

- Head trauma is common in childhood.
- Small number of children who appear to be at low risk may have an intracranial injury.
- Evaluate any child with head injury for signs of potential abuse.

Traumatic Brain Injury (TBI)

- Epidural hematoma
  - Hemorrhage into space between the dura and skull
  - Child abuse accounts for significant number of cases in infants and children.
- Subdural hematoma
  - Hemorrhage into space between dura and arachnoid membranes
  - Suspect abuse until proven otherwise.

Traumatic Brain Injury (TBI)

- Management includes stabilization of airway, breathing, and circulation.
- Perform frequent neurologic checks.

Biliary Atresia

- Biliary tract is malformed such that bilirubin cannot be excreted.
  - Leads to liver disease and failure
- Transport children with massive GI bleeds, obtain IV access, and administer fluid boluses.

Viral Gastroenteritis

- Infection caused by:
  - Variety of viruses
  - Ingestion of certain foods or substances
- Nausea, vomiting, or diarrhea is likely.
- If you suspect dehydration, administer an isotonic fluid.

Appendicitis

- Can lead to peritonitis or shock if untreated
- Fever and abdominal pain are common.
- Transport immediately to the ED.

Ingestion of Foreign Bodies

- Foreign body lodged in esophagus causes gagging, vomiting, and difficulty swallowing.
- Difficulty breathing or choking may indicate airway obstruction.
- Keep child calm and comfortable, and transport immediately.

Gastrointestinal Bleeding

- Ingested, upper, and lower bleeding may all present with hematochezia.
  - Blood ingested during birth
  - Maternal bleeding during breastfeeding
  - Ingested blood from epistaxis, after surgery, or after episodes of forceful vomiting
  - Anal fissures from constipation

Intussusception

- Bowel telescopes into itself.
- Presents with:
  - Intermittent severe abdominal pain
  - Lethargy
  - Bloody or currant jelly–like stools
- Surgical emergency; transport immediately.

Meckel Diverticulum

- Congenital malformation of small intestines
- Presents with painless rectal bleeding or hematochezia
- Presents with the “rule of 2s”
- Transport to the ED for further evaluation.

Pyloric Stenosis and Malrotation With Volvulus

- Pyloric stenosis: Pylorus becomes hypertrophied.
  - Presents with projectile vomiting after feedings
  - Surgery is curative.

Pyloric Stenosis and Malrotation With Volvulus

- Malrotation with volvulus: Twisting of bowel around mesenteric attachment to the abdominal wall
  - Presents with bilious emesis, pain, and a distended, rigid abdomen
  - Surgical emergency

Assessment and Management of Gastrointestinal Emergencies

- Consider the following:
  - Age
  - Gender
  - Whether child was born premature
  - Current medication use
  - History of similar complaints

Assessment and Management of Gastrointestinal Emergencies

- Assess and reassess location and severity of abdominal pain.
  - Premature infants and those with symptoms in the first weeks of life require further evaluation.
- Give special consideration to patients with gastrostomy tubes (G-tubes).

Assessment and Management of Gastrointestinal Emergencies

- Replacing G-tube:
  - Lubricate tube end being inserted.
  - Gently press to slide the tube into the stoma.
  - Tape replacement into place.
  - Transport for definitive replacement.

Assessment and Management of Gastrointestinal Emergencies

- To help determine dehydration, ask:
  - How many wet diapers has the child had today?
  - Is your child tolerating liquids?
  - How many times has your child had diarrhea?
  - When he or she cries, are there tears present?
- Give nothing to eat or drink until a thorough assessment can be completed.

Hyperglycemia

- Can result in severe dehydration and diabetic ketoacidosis (DKA) if not promptly treated
- During assessment, you will typically find:
  - Dose of insulin was missed.
  - Greater proportion of food was eaten.
  - Insulin pump malfunctioned.

Hyperglycemia

- During assessment, ask about the following:
  - Insulin administration
  - Functioning of insulin pump
  - Changes in urine output or mental status
  - Patterns on recent glucose checks
  - Presence of urine ketones
  - Any other symptoms

Hyperglycemia

- Provide 100% oxygen or assisted ventilation if needed.
- Monitor vital signs closely.
- Obtain IV access; administer isotonic fluids.

Hyperglycemia

- If patient reports worsening of a headache or mental status deteriorates:
  - Discontinue fluids.
  - Assess and treat for increased ICP.
  - Closely monitor the ECG.

Hypoglycemia

- Abnormally low blood glucose level
  - Infants and children have limited glucose stores.
  - Can lead to irreversible brain damage
  - May occur in patients with diabetes

Hypoglycemia

- Early signs and symptoms include:
  - Hunger, weakness, irritability, agitation
- Later signs include:
  - Cool, pale, clammy skin
  - Tachycardia, tachypnea
  - Abdominal pain, dizziness, confusion
- Severity depends on blood glucose level.

Hypoglycemia

- Management
  - Maintain ABCs and establish vascular access.
  - Give normal saline at keep-open rate.
    - If signs of shock or the child is dehydrated, give a fluid bolus of normal saline at 20 mL/kg.
    - Determine blood glucose level.
    - Repeat glucose reading after 10 to 15 minutes.
    - Reassess frequently until level stabilizes.

Congenital Adrenal Hyperplasia (CAH)

- Autosomal-recessive disorder of an enzyme responsible for the metabolism of cortisol and aldosterone in the adrenal glands
- Often due to 21-hydroxylase deficiency

Congenital Adrenal Hyperplasia (CAH)

- Patients sometimes undergo:
  - Early pubertal development, pubic hair growth
  - Early growth acceleration
  - Development of facial hair
  - Short stature
  - Severe acne
- When child becomes sick, body may not be able to compensate.

Congenital Adrenal Hyperplasia (CAH)

- Infants may have vomiting, poor weight gain, and dehydration.
- If suspected, hydrocortisone and IV boluses of normal saline are needed.
- Stress-dose steroids should be considered.

Panhypopituitarism

- Hypopituitarism
  - Pituitary gland does not produce normal amounts of some or all of its hormones.
- Panhypopituitarism
  - Inadequate production or absence of pituitary hormones

Panhypopituitarism

- When stressed or sick, patients can present with symptoms similar to CAH.
- Patients require:
  - IV fluid boluses with normal saline
  - Glucose replacement
  - Replacement of steroids with IV hydrocortisone

Panhypopituitarism

- Management by a pediatric endocrinologist is important.
- Once hormone therapy is initiated, children can generally live a normal life.

Inborn Errors of Metabolism (IEM)

- Group of congenital conditions that cause either accumulation of toxins or disorders of energy metabolism in the neonate
- Characterized by:
  - Failure to thrive
  - Vague signs such as poor feeding

Inborn Errors of Metabolism (IEM)

- Grouped into two categories:
  - Disorders that result in toxic accumulations
    - Maple syrup urine disease, phenylketonuria
  - Disorders of energy production or use
    - Hereditary fructose intolerance, galactosemia

Inborn Errors of Metabolism (IEM)

- Symptoms can vary and include:
  - Loss of milestones in development
  - Recurring vomiting and diarrhea
  - Skin problems
  - Dental deformities
  - Deafness
  - Blindness

Inborn Errors of Metabolism (IEM)

- Dietary restrictions and replacements can control many of these disorders.
- Boluses of glucose and the use of 10% dextrose (D_{10}) fluids may be necessary.

Hematologic, Oncologic, and Immunologic Emergencies

- Common in pediatrics
- Immunosuppression may be due to:
  - Congenital diseases of the immune system
  - Chronic steroid use
  - Chemotherapy

Hematologic, Oncologic, and Immunologic Emergencies

- May present with severe illness, shock
- Special considerations include:
  - Sepsis
  - Acute chest syndrome with sickle cell crisis
  - Stroke with sickle cell crisis
  - Tumor lysis syndrome
  - Increased overall risk of infection

Hematologic, Oncologic, and Immunologic Emergencies

- Quickly assess for signs of sepsis and decompensation.
- Examination should include:
  - Lung, circulatory, and neurologic examination
  - Evaluation of the extremities for swollen joints

Hematologic, Oncologic, and Immunologic Emergencies

- Because some patients have indwelling catheters, evaluate catheter site for:
  - Erythema
  - Swelling
  - Tenderness
- Can be signs of central line infections

Sickle Cell Disease

- Genetically inherited autosomal-recessive disorder of red blood cells
  - Results in misshapen red blood cells, causing poor oxygen-carrying capability and potential lodging of the cells in blood vessels or spleen
  - Leads to ischemia and painful crises

Sickle Cell Disease

- Infants may present with:
  - Fussiness
  - Irritability
  - Crying
  - Poor feeding
  - Nonspecific findings
- Older children may report:
  - Pain in specific locations, including joints, back, and chest

Sickle Cell Disease

- Opioids manage the pain from vasoocclusive episodes.
  - Medications sometimes inadequate
  - Ask about any medication taken since onset of present pain.

Sickle Cell Disease

- Treatment may include:
  - Oxygen
  - IV fluids
  - Opioids

Bleeding Disorders

- Abnormality in clotting of the blood
- Development of a thrombosis can occur.
- Symptoms depend on the following:
  - Location of clot
  - Size of clot
  - Whether clot becomes dislodged

Bleeding Disorders

- Consider how to best control bleeding.
- Fluid replacement with boluses of isotonic fluids is necessary until patient is at a hospital.
- Bleeding may be
  - Drug induced
  - Inherited
  - Acquired

Thrombocytopenia

- Abnormally low number of platelets
- Causes include:
  - Infections
  - Cancers
  - Rheumatologic diseases
  - Splenic sequestration
  - Inherited conditions
  - Medications and chemotherapy drugs

Thrombocytopenia

- Treatment includes:
  - Treating the underlying cause if present
  - Transfusing platelets if bleeding cannot be controlled
  - Transport for consultation with a hematologist

Hemophilia

- Significant decrease in:
  - One of the clotting factors
  - Proteins in blood that work to help blood to clot
- Child can experience hemorrhage after minor trauma.

Hemophilia

- Not curable, but treated with replacement of the missing factor
- When injuries occur, extra factor is often needed.
- Recognize signs of internal bleeding.

Hemophilia

- Be alert for signs of cerebral bleeding, which may include:
  - Headache
  - Slurred speech
  - Altered mental status
- Be alert for signs of GI bleeding

von Willebrand Disease

- Bleeding disorder in which the patient is missing the von Willebrand factor (a protein essential for platelet adhesion)
  - Prevents blood clotting
- Most people with disease are undiagnosed.

von Willebrand Disease

- Range from mild (nosebleeds) to severe uncontrolled bleeding tendencies
- Treatment
  - Control bleeding.
  - Transport to a hospital with hematology services.

Leukemia/Lymphoma

- Two forms of leukemia are recognized:
  - Acute lymphoblastic leukemia
  - Acute myelogenous leukemia
- Few symptoms displayed at onset.

Leukemia/Lymphoma

- Treatment of leukemia/lymphoma involves:
  - Use of IV chemotherapy
  - Radiation therapy
- These patients may require supportive care and pain management en route to a facility.

Toxicologic Emergencies

- Toxic exposures account for a significant number of pediatric emergencies.
  - Ingestion
  - Inhalation
  - Injection
  - Application

Table 43-21 One Pill Can Kill: Potentially Lethal Toddler Ingestion

Medicine	Lethal Dose
Camphor	One teaspoon of oil
Chloroquine	One 500-mg tablet
Clonidine	One 0.3-mg tablet
Diphenoxylate/atropine	Two 2.5-mg tablets
Glyburide	Two 5-mg tablets
Imipramine	One 150-mg tablet
Lindane	Two teaspoons of 1% lotion
Oil of wintergreen	One teaspoon of oil
Propranolol	One or two 160-mg tablets
Theophylline	One 500-mg tablet
Verapamil	One or two 240-mg tablets

Assessment of Toxicologic Emergencies

- Evaluation follows standard assessment sequence.
- Attend to ABCDEs as indicated.
  - Treat documented hypoglycemia.
- If child is stable, obtain additional history and perform secondary assessment.

Assessment of Toxicologic Emergencies

- Look for toxidromes by assessing:
  - Mental status
  - Pupillary changes
  - Skin CTC
  - GI activity
  - Abnormal odors
- Reassess frequently.

Management of Toxicologic Emergencies

- Begin with supportive care and ABCDEs.
- Other options include:
  - Reduce absorption by decontamination.
  - Enhance elimination.
  - Provide an antidote.

Management of Toxicologic Emergencies

- If you are unsure about an exposure, call the national Poison Center hotline.
  - Available 24 hours a day
  - 1-800-222-1222

Decontamination

- With skin exposure, remove all clothing and wash skin.
- With ocular exposure, wash out the eyes.
- For ingested toxins, options to reduce gastric absorption include:
  - Dilution
  - Gastric lavage
  - Activated charcoal

Decontamination

- For substances that are renally excreted, diuresis may be beneficial.
- Dialysis is required for some overdoses:
  - Salicylates
  - Lithium
  - Methyl alcohol
  - Ethylene glycol
  - Barbiturates

Decontamination

- If inhaled, assess respiratory status.
  - Bronchodilators may be needed for bronchial irritation and bronchospasm.
  - Monitoring of oxygen saturations and intubation may be necessary.

Enhanced Elimination

- Cathartics are sometimes combined with activated charcoal.
  - Work by speeding up elimination
  - Not recommended for young children

Antidotes

- Available for only a few poisons
- Reverse or block effects of ingested toxins
- Dose depends on child's weight

Table 43-23 Common Antidotes

Poison	Antidote
Carbon monoxide	Oxygen
Organophosphate	Atropine/pralidoxime
Tricyclic antidepressants	Bicarbonate
Opiates	Naloxone
Beta-blockers	Glucagon
Calcium-channel blockers	Calcium
Benzodiazepine	Flumazenil
Acetaminophen	*N*-acetylcysteine

Psychiatric and Behavioral Emergencies

- As a paramedic, you will encounter children with behavioral and psychiatric problems.
- Increased calls for behavioral emergencies

Psychiatric and Behavioral Emergencies

- Problems begin as simple complaints not recognized by health care providers.
  - Improperly treated problems persist into adulthood.
  - Children often have coexisting problems along with traditional mental health disorders.

Safety

- Safety is your first priority.
- Approach the child calmly, and explain you are there to help.
- Address patient directly.
- Answer questions honestly.

Safety

- Some children must be mechanically restrained.
  - May be a task for EMS or law enforcement
  - Carefully document the reason.
  - Keep restraints in place until arrival at the ED.

Assessment and Management of Psychiatric and Behavioral Emergencies

- Mental health problems in children are difficult to diagnose.
- Causes are:
  - Organic
  - Genetic
  - Environmental

Assessment and Management of Psychiatric and Behavioral Emergencies

- Abnormal findings are often related to:
  - Adjustment disorders
  - Stress
- Assessment of any child must include suicide risk.

Assessment and Management of Psychiatric and Behavioral Emergencies

- PAT will give you a general impression of mental status and cardiovascular stability.
- Assessment is based on observation and history.
- Treat problems or injuries with standard protocols.

Fever Emergencies

- Fever is a common pediatric complaint.
  - Symptom of infectious or inflammatory process
  - Can have multiple causes
- General impression and primary survey will help determine severity.

Fever Emergencies

- Record temperature.
- Life-threatening signs may include:
  - Respiratory distress
  - Seizures
  - Petechial or purpuric rash
  - Bulging fontanelle in an infant

Fever Emergencies

- History taking and secondary assessment will help determine the underlying cause and severity of illness.
  - Perform on scene if child is stable.
  - Perform en route if seriously ill.

Fever Emergencies

- May require little intervention
  - Support ABCs.
  - Provide temperature control.
  - Transport to an appropriate medical facility.

Child Abuse and Neglect

- Child abuse: Any improper or excessive action that injures or harms a child or infant
  - Physical abuse
  - Sexual abuse
  - Emotional abuse
  - Neglect

Child Abuse and Neglect

- Abandonment
  - Occurs when a parent or guardian leaves a child without regard to the child's health, safety, or welfare
  - Parents have relinquished consent authority; EMS providers should render care without consent.

Risk Factors for Abuse

- Risk factors for abuse
  - Younger children
  - Children who require extra attention
  - Lower socioeconomic status
  - Divorce, financial problems, and illness
  - Drug and alcohol abuse
  - Domestic violence in the home

Suspecting Abuse or Neglect

- If you suspect abuse, trust your instincts.
- Look for “red flags” that could suggest maltreatment.

Table 43-25 CHILD ABUSE Mnemonic for Suspicion of Child Abuse

C	Consistency of the injury with the child’s developmental age
H	History inconsistent with injury
I	Inappropriate parental concerns
L	Lack of supervision
D	Delay in seeking care
A	Affect (of the parent or caregiver and the child in relation to the caregiver)
B	Bruises of varying ages
U	Unusual injury patterns
S	Suspicious circumstances
E	Environmental clues

Assessment and Management of Abuse and Neglect

- Carefully document what you see.
  - Child's environment
  - Condition of home
  - Interactions among caregivers, child, EMS crew
- Prehospital personnel are legally obligated to report suspicion of abuse.

Assessment and Management of Abuse and Neglect

- Involve police early to secure the scene.
- Approach ED staff with concerns.
- Be aware of local regulations.
- Focus on assessment and management.

Assessment and Management of Abuse and Neglect

- Be alert for a history that is inconsistent with the clinical picture.
- Look for bruises.
  - Different stages of healing
  - Concerning locations

Courtesy of Moose Jaw Police Service.

Mimics of Abuse

- Can be difficult to distinguish some normal skin findings from inflicted injuries
- Mongolian spots may be mistaken for bruises.

Mimics of Abuse

- Medical conditions can mimic bruises.
  - Purpura
  - Petechiae
- Exposure to sun can cause reactions with certain medications or fruits.
  - Phytophotodermatitis

Mimics of Abuse

- Certain cultural customs produce skin markings.
  - Coining
  - Cupping

Sudden Infant Death Syndrome (SIDS)

- Sudden unexpected infant death (SUID)
  - Death of an infant younger than 1 year that occurs unexpectedly, the cause of which is not immediately obvious before investigation

Sudden Infant Death Syndrome (SIDS)

- Most SUIDs are one of three types:
  - Sudden infant death syndrome (SIDS)
  - Unknown cause
  - Accidental suffocation and strangulation in bed

Assessment and Management of SIDS

- Be alert to other potential causes of death.
- Decision to start or stop resuscitative efforts can be difficult.
- Thorough scene size-up and history are important.

Brief Resolved Unexplained Event (BRUE)

- Episode during which an infant:
  - Becomes pale or cyanotic;
  - Chokes, gags, or has an apneic spell; or
  - Loses muscle tone
- Causes range from benign to serious diagnoses.

Brief Resolved Unexplained Event (BRUE)

- Provide life support with signs of cardiorespiratory compromise or altered mental status.
- Transport all infants with a history of BRUE.

Pediatric Trauma Emergencies

- Anatomy and physiology make injury patterns and responses different from those seen in adults.
- Developmental stage will affect response.

Pathophysiology of Traumatic Injuries

- Blunt trauma is the MOI in most pediatric injury cases.
  - Less muscle and fat mass leads to less protection against forces transmitted.

Pathophysiology of Traumatic Injuries

- Falls are common.
- Injury will reflect child's anatomy and height of fall.
  - Falls from a standing position usually result in isolated long bone injuries.
  - High-energy falls result in multisystem trauma.
  - Injuries from bicycle handlebars typically produce intraabdominal compression injuries.

Pathophysiology of Traumatic Injuries

- Motor vehicle crashes can result in a variety of injury patterns depending on restraints and position in car.
  - For unrestrained passengers, assume multisystem trauma.
  - Suspect spinal fractures with chest or abdominal bruising in a seat belt pattern.

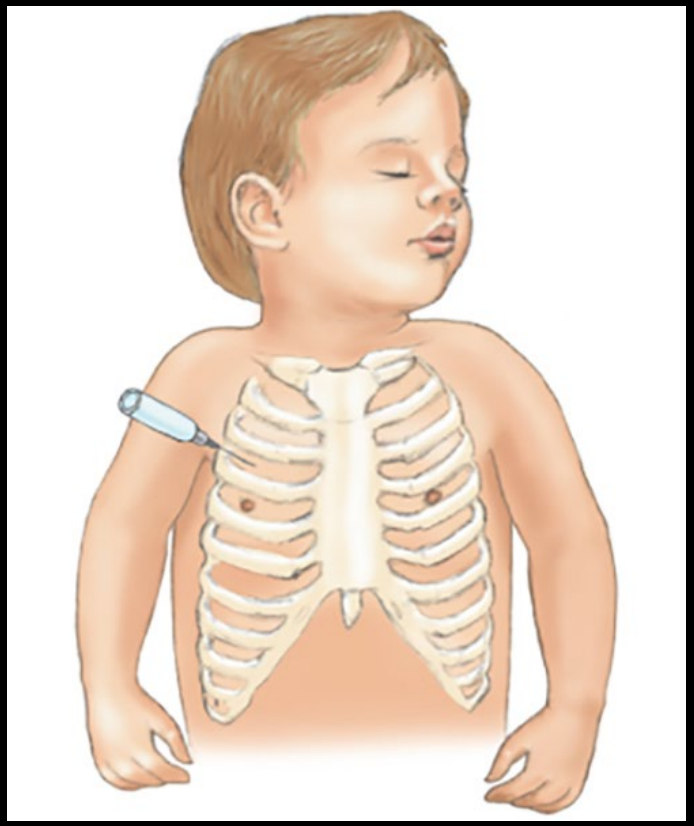
Assessment and Management of Traumatic Injuries

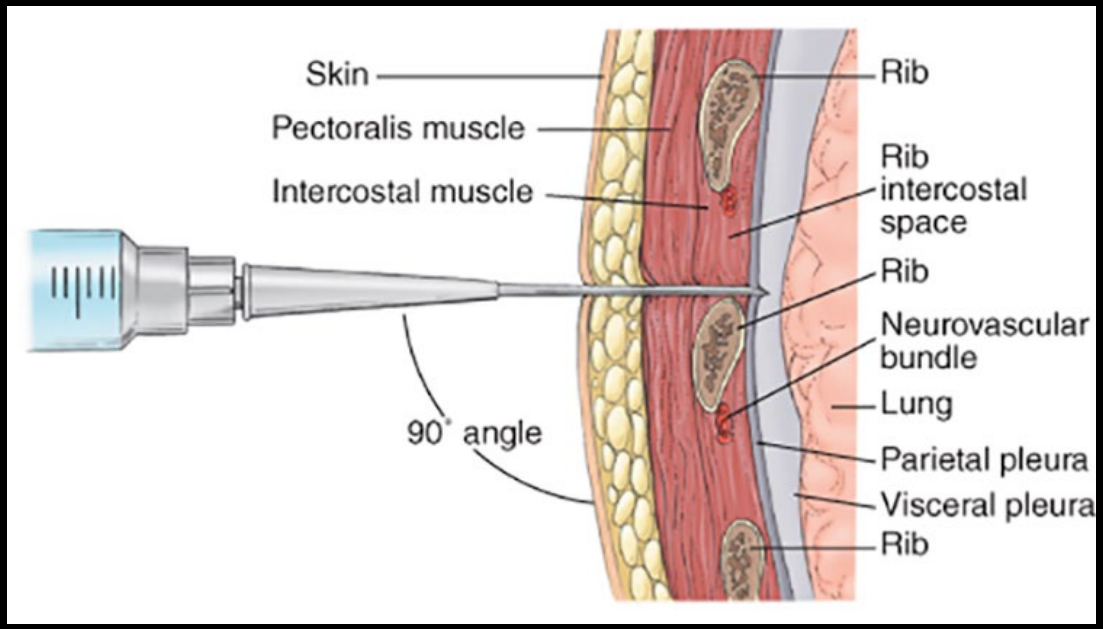
- Begin with a thorough scene size-up.
- Use PAT to form a general impression.
  - If findings are grossly abnormal, move to ABCs.
- Initiate life support interventions.

Assessment and Management of Traumatic Injuries

- Pneumothorax may be present with penetrating trauma of the chest or upper abdomen.
  - Perform needle decompression.
  - Signs and symptoms may include:
    - Tachycardia
    - Jugular vein distention
    - Pulsus paradoxus

Assessment and Management of Traumatic Injuries





Assessment and Management of Traumatic Injuries

- Any trauma patient should be considered at risk for developing shock.
- Once ABCs are stabilized, continue assessment of disability with AVPU.

Assessment and Management of Traumatic Injuries

- Place a cervical collar, and immobilize on a long backboard as indicated.
- Perform rapid exam to identify all injuries.
- Cover the child with blankets.
- Treat any fractures.

Transport Considerations

- Some traumas are load-and-go because of severe injuries and unstable condition.
- For these situations:
  - Perform lifesaving steps on scene or en route.
  - Transfer quickly per local trauma protocols.

Transport Considerations

- All trauma victims with suspected spinal injury require spinal stabilization.
  - Do not place a collar that is too big on a child.

History Taking and Secondary Assessment

- If patient is stable:
  - Obtain additional history.
  - Perform a more thorough physical exam.
    - Look for bruises, abrasions, other subtle signs of injury that may have been missed.

Fluid Management

- Airway management and ventilatory support take priority over circulation management.
  - Tachycardia is usually the first sign of circulatory compromise in a child.
  - Hypotension is a late finding.

Fluid Management

- Establishing vascular access
  - Large-bore IV catheters should be inserted into a large peripheral vein.
  - 20- or 22-gauge needles may be considered “large bore.”
  - Definitive care can only be provided at the ED.
  - To maintain perfusion, administer a bolus of 20 mL/kg of isotonic crystalloid solution.

Pain Management

- Pain is often undertreated in children.
  - Use tools to elicit child's self-report of pain level.
  - Use a calm, reassuring voice, distraction techniques, and medications when appropriate.
  - Children who are in shock and hemodynamically unstable are not good candidates for narcotics or sedatives.

Pathophysiology, Assessment, and Management of Burns

- Assessment and management are similar to that of adults, with a few key differences.
  - Higher skin surface–body mass ratio
  - Worrisome patterns of injury or suspicious circumstances should raise concerns of abuse.

Assessment and Management of Burns

- Scene safety is important.
- Estimate the percentage of BSA burned.
  - Adolescents: Use rule of nines.
  - Younger children: Modify to account for larger head size.
  - Infants: Head and trunk each account for 18% of BSA; arms 9%; legs 13.5% each.

Assessment and Management of Burns

- Burns suggestive of abuse:
  - Mechanism or pattern observed does not match history or child's capabilities.
- Remove burning clothing and support ABCs.
  - Give 100% supplemental oxygen.

Assessment and Management of Burns

- Clean burned areas minimally.
- Avoid lotions or ointments.
- Cover burn and patient as needed.
- Analgesia is a crucial part of management.
- Transport to an appropriate medical facility.

Children with Special Health Care Needs

- Includes children with physical, developmental, and learning disabilities
- Broad range of causes

Tracheostomy Tubes and Artificial Ventilators

- Tracheostomy:
  - Surgical creation of a stoma through which a tracheostomy tube can be placed for long-term ventilatory needs

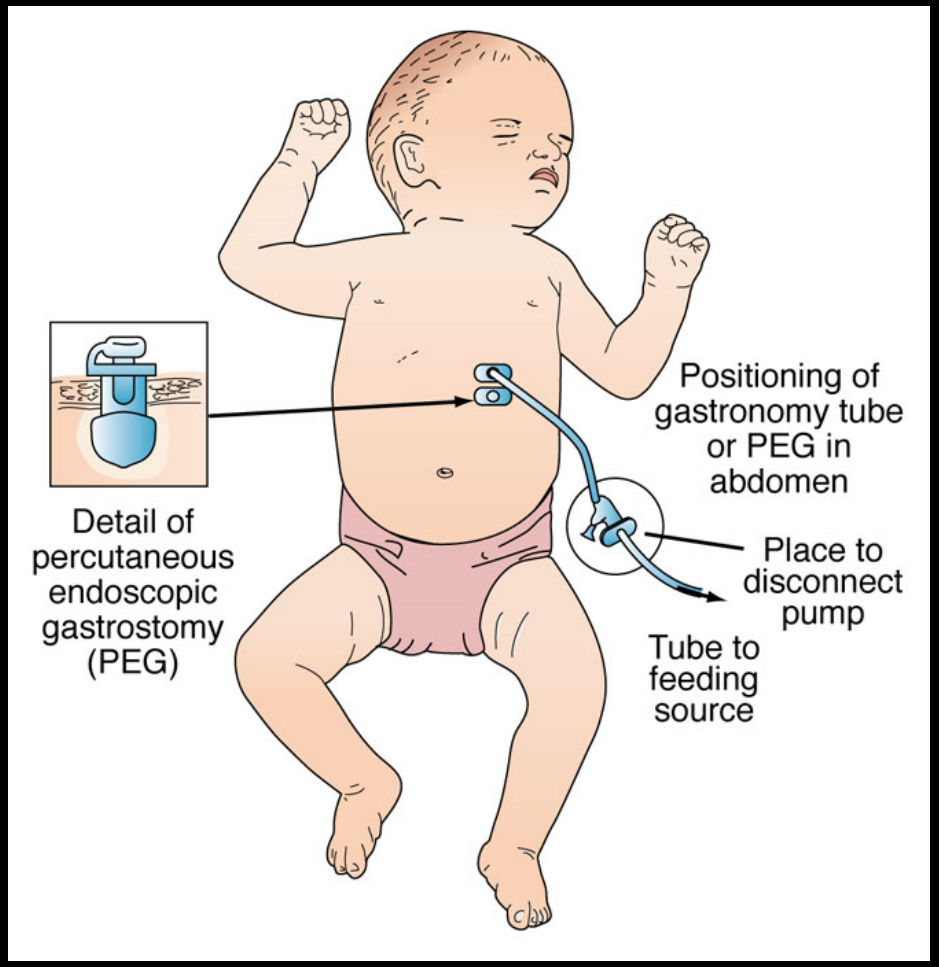
Courtesy of Cindy Bissell.

Tracheostomy Tubes and Artificial Ventilators

- Caregivers are a source of valuable information.
- Child may depend on a home ventilator and supplemental oxygen.
- Most common problem is obstruction of tube with secretions.
- With respiratory distress, assess tube position and suction tube.

Gastrostomy Tubes (G-tubes)

- Surgically placed directly into the stomach
  - Provide nutrition or medications
- Management usually includes supportive care and transport.

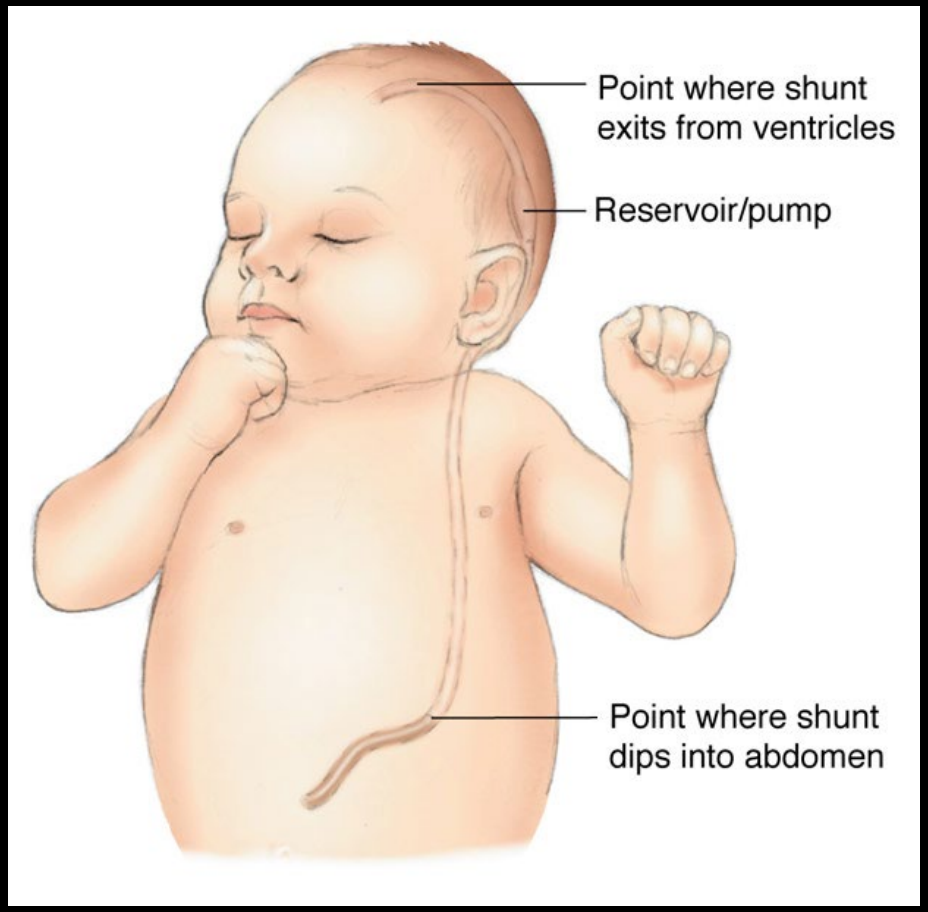


Central Venous Catheters

- May be inserted for long-term IV access for medications or nutrition
- Complications include infections, obstruction, and dislodged or broken catheters.

Ventricular Shunts

- Inserted to drain excessive fluid from the brain
  - Without adequate drainage, CSF fluid accumulates, resulting in hydrocephalus.



Ventricular Shunts

- Shunt obstructions and infections are medical emergencies.
  - Transport for neurosurgical evaluation.
  - Maintain continuous cardiopulmonary monitoring during transport.

Assessment and Management of Children With Special Health Care Needs

- Follow standard assessment sequence.
- Ask questions to establish baseline neurologic function and physiologic status.
- Meet child at his or her developmental level.
- Work with parents to restore child to his or her own physiologic baseline.

Transport of Children With Special Health Care Needs

- Transport to the child's medical home.
  - If this is not possible, take along any medical records and assistive devices.
  - Most important, take the caregiver!

An Ounce of Prevention

- Emergency care for children involves a team approach by health professionals.
- To be an effective child safety advocate, you must be knowledgeable about local and national prevention programs.

Emergency Medical Services for Children

- Federally funded program created to reduce child disability and death
  - Works with local communities and hospitals to improve care in and out of the ED
  - Supports training in pediatric-specific emergency care

Prevention of Injuries

- Most injuries are preventable.
- Tracking injury patterns helps target areas for intervention and prevention.

Prevention of Injuries

Table 43-27 Examples of Common Injuries and Possible Prevention Strategies

Injury	Preventive Measures
Vehicle trauma	Infant and child restraint seats Seat belts and airbags Pedestrian safety programs Motorcycle helmets
Cycling	Bicycle helmets Bicycle paths separate from vehicle traffic
Recreation	Appropriate safety padding and apparel Cyclist, skateboard, skater, ski, and snowboarder safety programs, helmets, and wrist guards Soft, energy-absorbent playground surfaces
Drowning and submersion	Four-sided locked pool enclosures Pool alarms Immediate adult supervision Caregiver CPR training Swimming lessons Pool and beach safety instruction Personal flotation devices
Poisoning and household injuries	Proper storage of chemicals and medications Child safety packaging
Burns	Proper maintenance and monitoring of electrical appliances and cords Fire and smoke detectors Proper placement of cookware on stove top
Other	Discouragement of infant walker use Gated stairways Babysitter first aid training Child care worker first aid training

Abbreviation: CPR, cardiopulmonary resuscitation

Thank You

Please move to the next section