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PEDIATRICS

Advanced Care Paramedicine

Module: 11

Section: 01

Pediatrics

- Pediatric patients are not just small adults…
- Infants and children are anatomically different from adults

Role of the Paramedic

- Pediatric injuries have become major concerns.
- Children are at higher risk of injury than adults.
- Children are more likely to be adversely affected by the injuries they receive.

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General Approach to Pediatric Emergencies

Communication and Psychological Support

- Consider patient’s emotional and psychological development
- Treatment begins with communication and psychological support

- The child's most common reaction to an emergency is fear of:
  - Separation
  - Removal from a family place
  - Being hurt
  - Being mutilated or disfigured
  - The unknown

Responding to Parents or Caregivers

- Most parents or caregivers are overwhelmed by fear
- Expressions
  - Is my child going to die?
  - Did my child suffer brain damage?
  - Is my child going to be all right
  - What are you doing to my child?
  - Will my child be able to walk?

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Allaying Fears

- Tell them your name and qualifications
- Acknowledge their fears and concerns
- Reassure them that their feelings are valid
- Redirect their energies
- Remain calm and appear in control
- Keep them informed

Growth and Development

Newborns

- First hours after birth
- Newborn
  - Baby in first hours of life
- Neonate
  - Birth to one month of age
- Assessed with APGAR scoring system

Neonates

- Birth to one month.
- Tend to lose 10% of birth weight
  - Regain in 10 days.
- Development centers on reflexes.
- Personality begins to form.
- Mother, occasionally father, can comfort child.

Neonates

- Common illnesses
  - Jaundice
  - Vomiting
  - Respiratory distress
- Do not develop fever with minor illness
- Allow patient to remain in caregiver's lap

Infants

- Ages 6 to 12 months.
- May stand or walk without assistance.
- Follow movements.
- Muscle development develops in cephalo-caudal progression.
- Allow patient to remain in caregiver’s lap.

- Infants and young children should be allowed to remain in mothers’ arms

Toddlers

- Ages 1 to 3 years.
- Great strides in motor development.
- May stray from parents more frequently.
- Parents are the only ones who can comfort them.
- Language development begins.
- Approach child slowly.

Toddlers

- Examine from head-to-toe.
- Avoid asking “yes” or “no” questions.
- Allow child to hold a favorite blanket or item.
- Tell child if something will hurt.

Preschoolers

- Ages 3 to 5 years.
- Increase in fine and gross motor skills.
- Children know how to talk.
- Fear mutilation.
- Seek comfort and support from within home.
- Distorted sense of time.

Common Preschooler Illnesses

- Croup
- Asthma
- Poisoning
- Auto accidents
- Burns
- Child abuse
- Ingestion of foreign bodies
- Drowning
- Epiglottitis
- Febrile seizures
- Meningitis

School-Age Children

- Ages 6–12 years.
- Active and carefree age group.
- Growth spurts are common.
- Give this age group responsibility of providing history.
- Respect modesty.

- A small toy may calm a child in the 6–10 year age range

- The approach to the pediatric patient should be gentle and slow

Common Illnesses in School-Age Children

- Drowning
- Auto accidents
- Bicycle accidents
- Falls
- Fractures
- Sports injuries
- Child abuse
- Burns

Adolescents

- Ages 13 to 18.
- Begins with puberty, which is very child-specific; are very “body conscious.”
- May consider themselves “grown up.”
- Desire to be liked and included by peers.
- Are generally good historians.
- Relationships with parents may be strained.

Common Adolescent Illness and Injuries

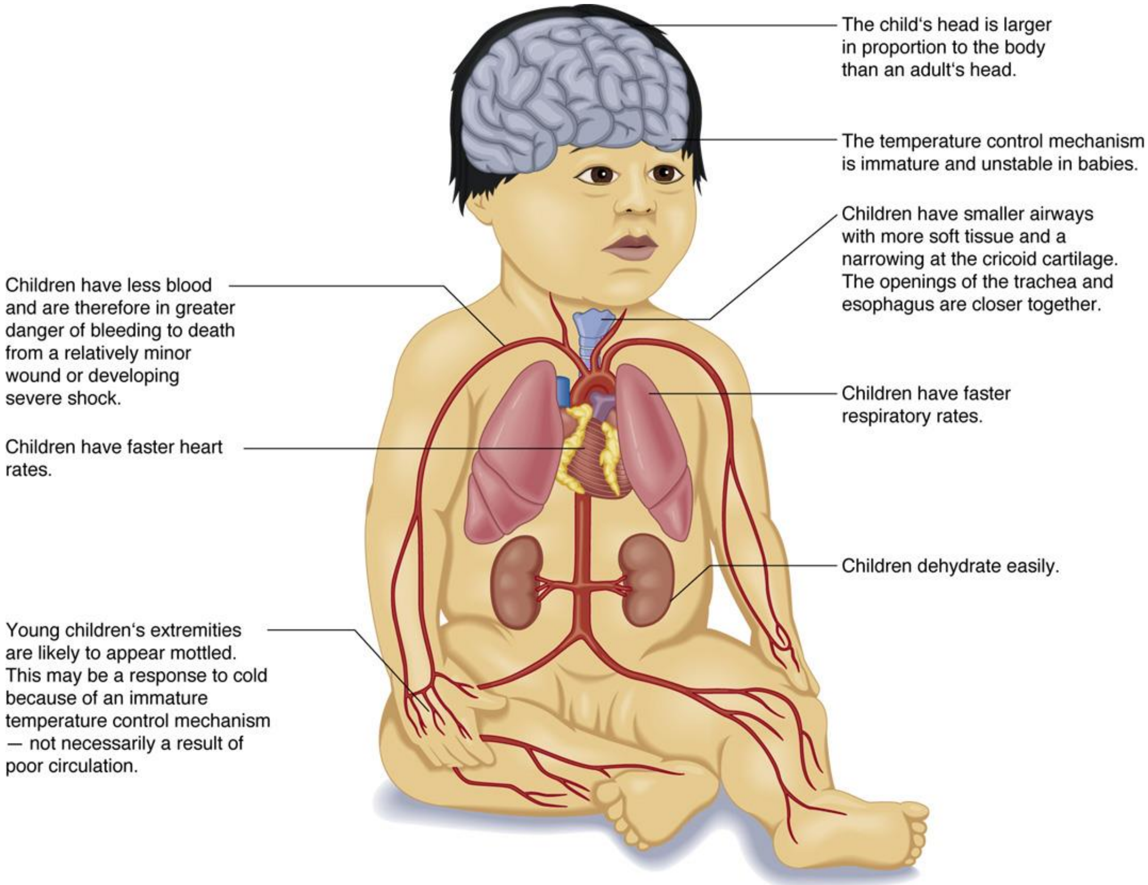
- Mononucleosis
- Asthma
- Auto accidents
- Sports injuries
- Drug and alcohol problems
- Suicidal gestures
- Sexual abuse

Anatomy and Physiology

Table 42-1 Anatomical and Physiological Characteristics of Infants and Children

Differences in Infants and Children as Compared to Adults	Potential Effects That May Impact Assessment and Care
Tongue proportionately larger	More likely to block airway
Smaller airway structures	More easily blocked
Abundant secretions	Can block the airway
Deciduous (baby) teeth	Easily dislodged; can block the airway
Flat nose and face	Difficult to obtain good face mask seal
Head heavier relative to body and less-developed neck structures and muscles	Head may be propelled more forcefully than body producing a higher incidence of head injury in trauma
Fontanelle and open sutures (soft spots) palpable on top of young infant's head	Bulging fontanelle can be a sign of increased intracranial pressure (but may be normal if infant is crying); shrunken fontanelle may indicate dehydration
Thinner, softer brain tissue	Susceptible to serious brain injury
Head larger in proportion to body	Tips forward when supine; possible flexion of neck, which makes neutral alignment of airway difficult
Shorter, narrower, more elastic (flexible) trachea	Can close off trachea with hyperextension of neck
Short neck	Difficult to stabilize or immobilize
Abdominal breathers	Difficult to evaluate breathing
Faster respiratory rate	Muscles easily fatigue, causing respiratory distress
Newborns breathe primarily through the nose (obligate nose breathers)	May not automatically open mouth to breathe if nose is blocked; airway more easily blocked
Larger body surface relative to body mass	Prone to hypothermia
Softer bones	More flexible, less easily fractured; traumatic forces may be transmitted to internal organs, causing injuring without fracturing the ribs; lungs easily damaged with trauma
Spleen and liver more exposed	Organ injury likely with significant force to abdomen

- Anatomical and physiological considerations in the infant and child



Head

- Proportionally larger size
- Larger occipital region
- Fontanelles open in infancy
- Face is smaller in comparison to size of head
- The tongue is larger in relation to the rest of the upper airway

Airway

- Narrower airways at all levels
  - Cricoid ring the narrowest part
  - More easily obstructed
- Tongue takes up more space in mouth
- Obligate nose breathers
  - Nasal secretions can be FBAO
- Jaw is posteriorly smaller in young children
- Larynx is higher and more anterior
- Trachea is softer and more flexible
- Trachea is smaller in both length and diameter
- Omega (Ω) shaped, floppy epiglottis

Airway

- Epiglottis
  - Omega shaped in infants
  - Extends at a 45° angle into airway
    - Epiglottic folds have softer cartilage
- The more pliable lower airways are less able to retain their shape
  - More likely to collapse in the presence of mild-to-moderate pressure changes

Airway

Figure 26: Pediatric Airway
Anatomy of pediatric airway

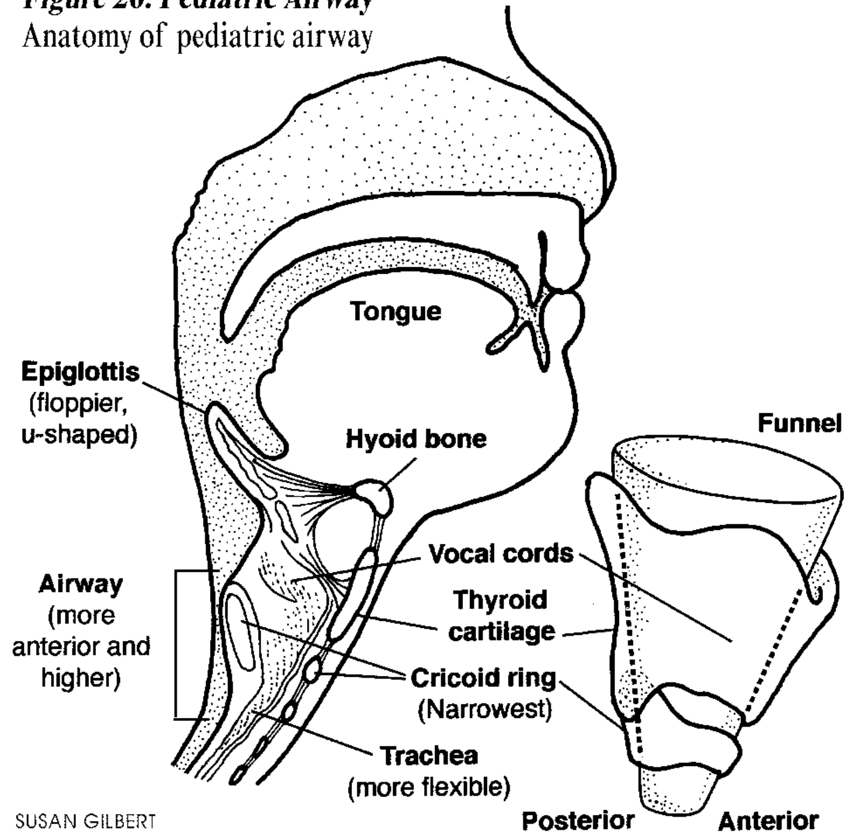
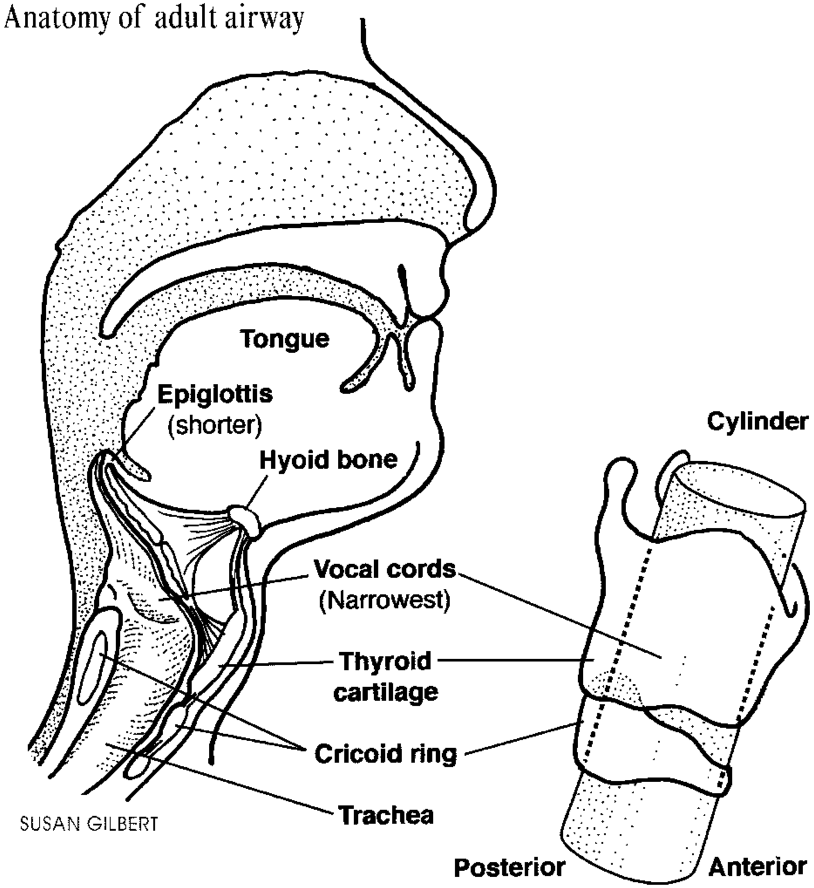


Figure 27: Adult Airway
Anatomy of adult airway



Airway

- Resistance increased due to narrow airway
  - $R \sim \frac{8L}{r^4}$
    - R is resistance, L is length, r is radius
  - Small changes to the radius of the airway (secretions, FBAO, bronchiole constriction) will increase resistance to the 4^{th} power

Air positioning in the infant or child

Chest and Lungs

- Diaphragmatic breathers
- Prone to gastric distension
- Ribs
  - Positioned horizontally
  - More pliable and offer less protection to organs
  - Poorly developed intercostal muscles are less able to assist the diaphragm in the breathing process
- Chest muscles are immature and fatigue easily
- Greater transfer of energy
  - Pulmonary contusions more common
  - Lungs more prone to pneumothorax
  - Mediastinum will shift more easily
- Thin walls more easily transmit sounds

Abdomen

- Internal organs are larger in proportion to their body size
- Packed into a smaller space
- Immature abdominal muscles offer less protection
- Abdominal organs are closer together
- Liver and spleen are proportionally larger and more vascular
  - Often the most common injury with abdominal blunt trauma

Extremities

- Bones are softer and more porous until adolescence
  - have less calcium and minerals than adult bones
  - injury to a child's bone may be a bend instead of an actual break
- Growth plate
  - Area just below the head of the long bone in which growth in bone length occurs.
  - Injuries to growth plate may disrupt bone growth

Skin and Body Surface Area

- Skin is thinner and more elastic
- Thermal exposure results in deeper burn
- Less subcutaneous fat
- Lose fluids and heat more easily
- Larger surface area to body mass ratio

Weight = (age in years X 2) + 8

Approximate average weight

Respiratory System

- Tidal volume is proportionally smaller
- Metabolic oxygen requirements of infants and children are about double
  - Respiratory muscles have significant oxygen and metabolite demands
    - 40% of cardiac output can be accounted for WOB
- Children have proportionally smaller functional residual capacity, and therefore proportionally smaller oxygen reserves
- Dependent on functional diaphragms
  - AMU contribute less to WOB
  - Diaphragmatic fatigue can lead to failure

Cardiovascular System

- Cardiac output is rate dependent in infants and small children
- Vigorous but limited cardiovascular reserve
  - Can ↑ HR an ↑ PVR but not SV
- Bradycardia is a response to hypoxia
- Children can maintain blood pressure longer than adults (healthy vessels)
- Circulating blood volume is proportionally larger than adults
- Absolute blood volume is smaller than adults

Cardiovascular System

- A larger proportional volume of fluid/blood loss is needed to cause shock
- Hypotension
  - Ominous sign of imminent cardiac arrest
- A child may be in shock despite a normal blood pressure.
  - Suspect shock if tachycardia is present.
- Monitor the pediatric patient carefully for the development of hypotension.

Nervous System

- Develops throughout childhood
- Developing neural tissue is more fragile
- Brain and spinal cord are less well protected by skull and spinal column
- Open fontanelles in early months

Metabolic Differences

- Infants and children have a limited store of glycogen and glucose
- Blood glucose can drop very low in response to stressors
- Pediatric patients are prone to hypothermia because of their greater BSA-to-weight ratio
- Significant volume loss can result from vomiting and diarrhea
- Newborns and neonates lack the ability to shiver

Illness and Injury by Age Group

- Some childhood diseases and disabilities are predictable by age group
  - Neonate (first 28 days of life)
  - 1 to 5 month old infant
  - 6 to 12 month old infant
  - 1 to 3 year old child
  - 3 to 5 year old child
  - 6 to 12 year old child
  - 12 to 15 year old adolescent

General Approach to Pediatric Assessment

Basic Considerations

- Many components of the initial patient evaluation can be done by observing the patient
- Use the parent/guardian to assist in making the infant or child more comfortable as appropriate
- Interacting with parents and family
  - Normal responses to acute illness and injury
  - Parent/guardian and child interaction
  - Intervention techniques

Scene Assessment

- Take BSI precautions
- Look for clues to mechanism of injury or nature of illness
  - Observe the scene for hazards or potential hazards
  - Observe the scene for mechanism of injury/illness
    - Ingestion
      - Pills, medicine bottles, household chemicals, etc.
    - Child abuse
      - Injury and history do not coincide, bruises not where they should be for mechanism of injury, etc.
    - Position patient found
- Allow child time to adjust to you before approaching
- Speak softly, simply, at eye level

Initial Assessment

- General impression
  - General impression of environment
  - General impression of parent/guardian and child interaction
  - General impression of the patient/pediatric assessment triangle
    - A structure for assessing the pediatric patient
    - Focuses on the most valuable information for pediatric patients
    - Used to ascertain if any life-threatening condition exists
    - Components

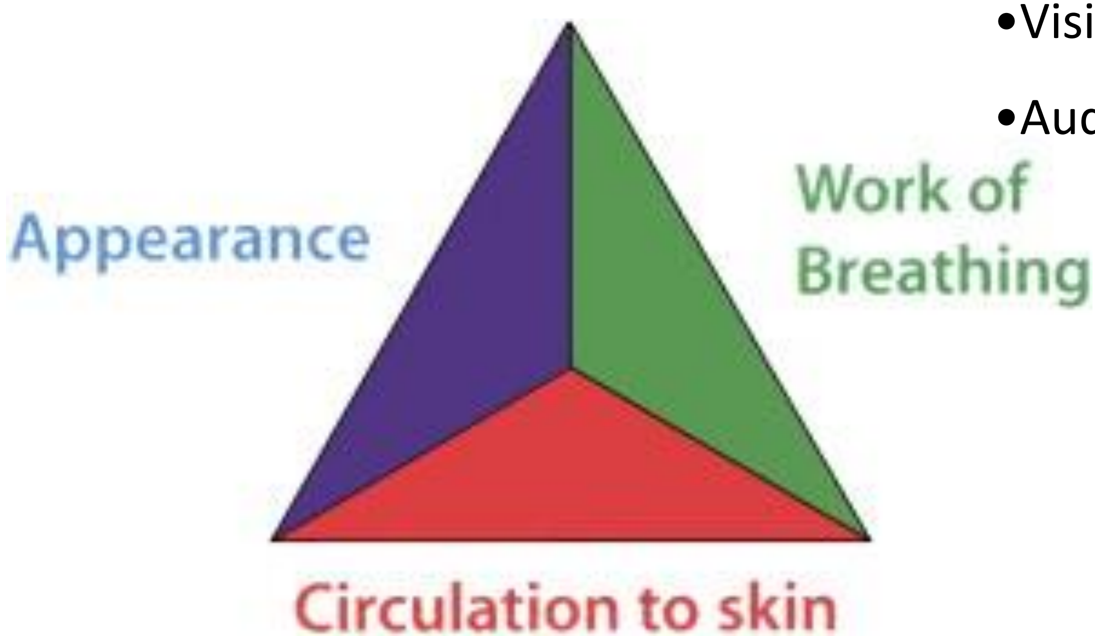
Assessment Triangle

- Appearance
  - Mental status and muscle tone
- Breathing
  - Respiratory rate and effort
- Circulation
  - Skin signs and colour
  - Capillary refill

Pediatric Assessment Triangle

- Mental Status
- Muscle Tone
- Position

- Respiratory Effort
- Respiratory Rate
- Visible Movement
- Audible Sounds



- Skin Signs and color
- Cap refill

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CUPS Approach

Assessment	Critical (Decompensated Shock)	Unstable (Compensated Shock)	Potentially Unstable (Mechanism for Shock)	Stable
Heart Rate	Tachy or brady	Tachy	Normal	Normal
Pulse Strength	Weak central pulse, absent peripheral pulse	Normal central pulse, weak peripheral pulse	Normal	Normal
Cap Refill	> 5 sec	3 – 5 sec	< 2 – 3 sec	< 2 – 3 sec
BP	Hypotensive	Normal	Normal	Normal
Skin	Very pallid, mottled, or cyanotic; cool	Normal, pallid, or mottled; cool	Normal	Normal
Actions	Open airway, suction, give oxygen, assist ventilation as needed, consider ETI; control hemorrhage, keep child warm, begin fluid resuscitation, and transport; initiate pulse oximetry and cardiac monitoring en route	Give oxygen, reassess frequently; control hemorrhage, keep child warm, begin fluid resuscitation; initiate pulse oximetry and cardiac monitoring; prepare for transport	Give oxygen, control hemorrhage, and transport; consider IV access; initiate pulse oximetry and cardiac monitoring; begin focused history and detailed exam during transport	Begin focused history and physical exam on scene; if no mechanism for shock is found, prepare for routine transport

Triage Decisions

- Initial triage decisions
  - Emergent/Urgent –proceed with rapid ABC assessment, treatment, and transport
  - Non urgent –proceed with focused history, detailed physical examination after initial assessment

Vital Functions

- Determine level of consciousness
  - AVPU scale
  - Modified Glasgow Coma Scale
  - Signs of inadequate oxygenation

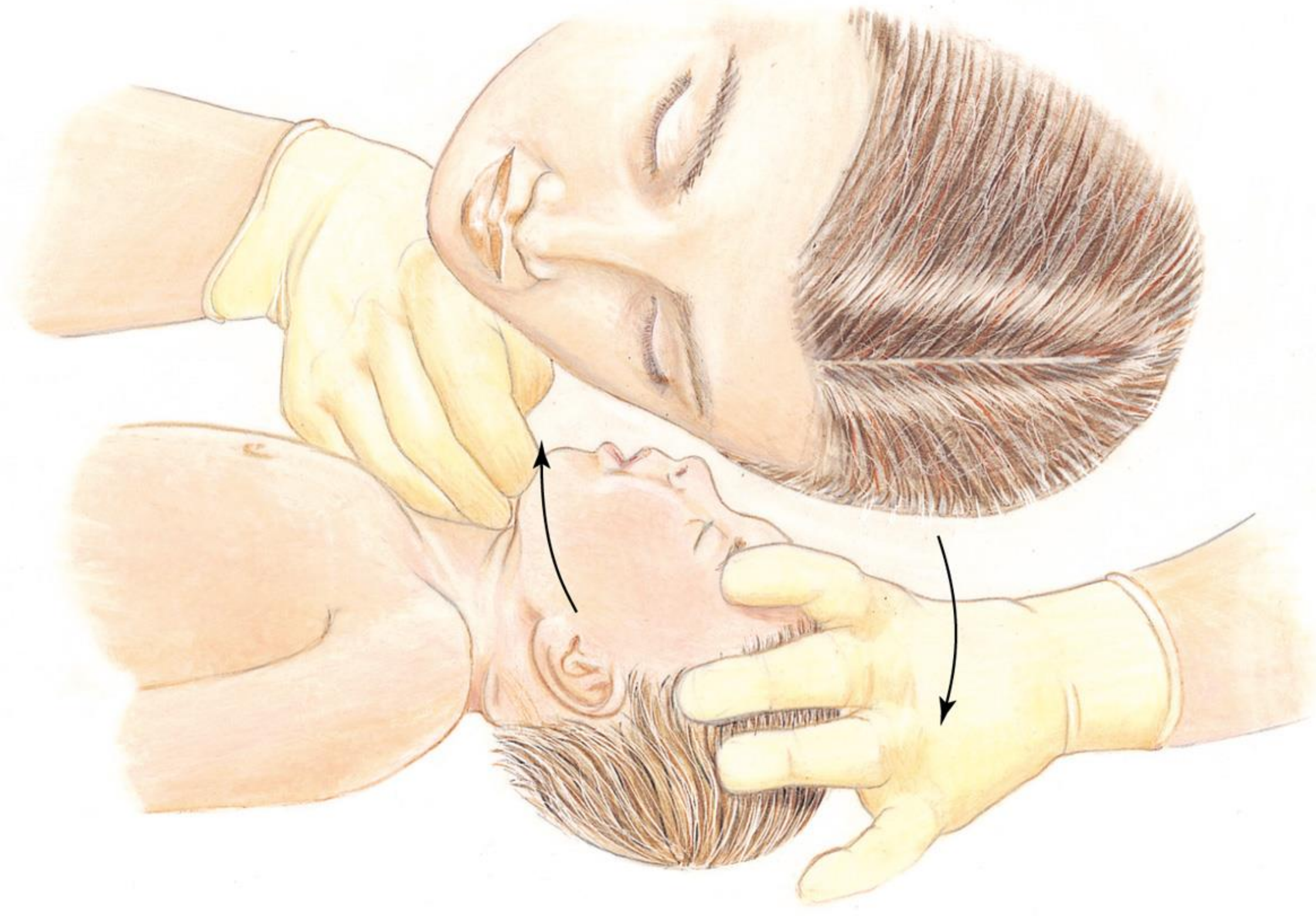
Modified GCS

Children					
Eye Opening		Motor Response		Verbal Response	
4	Spontaneous	6	Obeys commands	5	Oriented
3	To Speech	5	Localizes Pain	4	Confused
2	To Pain	4	Withdraws	3	Inappropriate
1	No Response	3	Flexion	2	Incomprehensible
		2	Extension	1	No Response
		1	No Response		
Infants					
4	Spontaneous	6	Spontaneous movements	5	Coos and Babbles
3	To Speech	5	Localizes Pain	4	Irritable, cries
2	To Pain	4	Withdraws	3	Cries to pain
1	No Response	3	Flexion	2	Moans to pain
		2	Extension	1	No Response
		1	No Response		

Airway

- Airway and respiratory problems are the most common cause of pediatric cardiac arrest
  - Is the airway patent?
  - Is the airway maintainable with positioning or adjuncts?
  - Is the airway not maintainable?

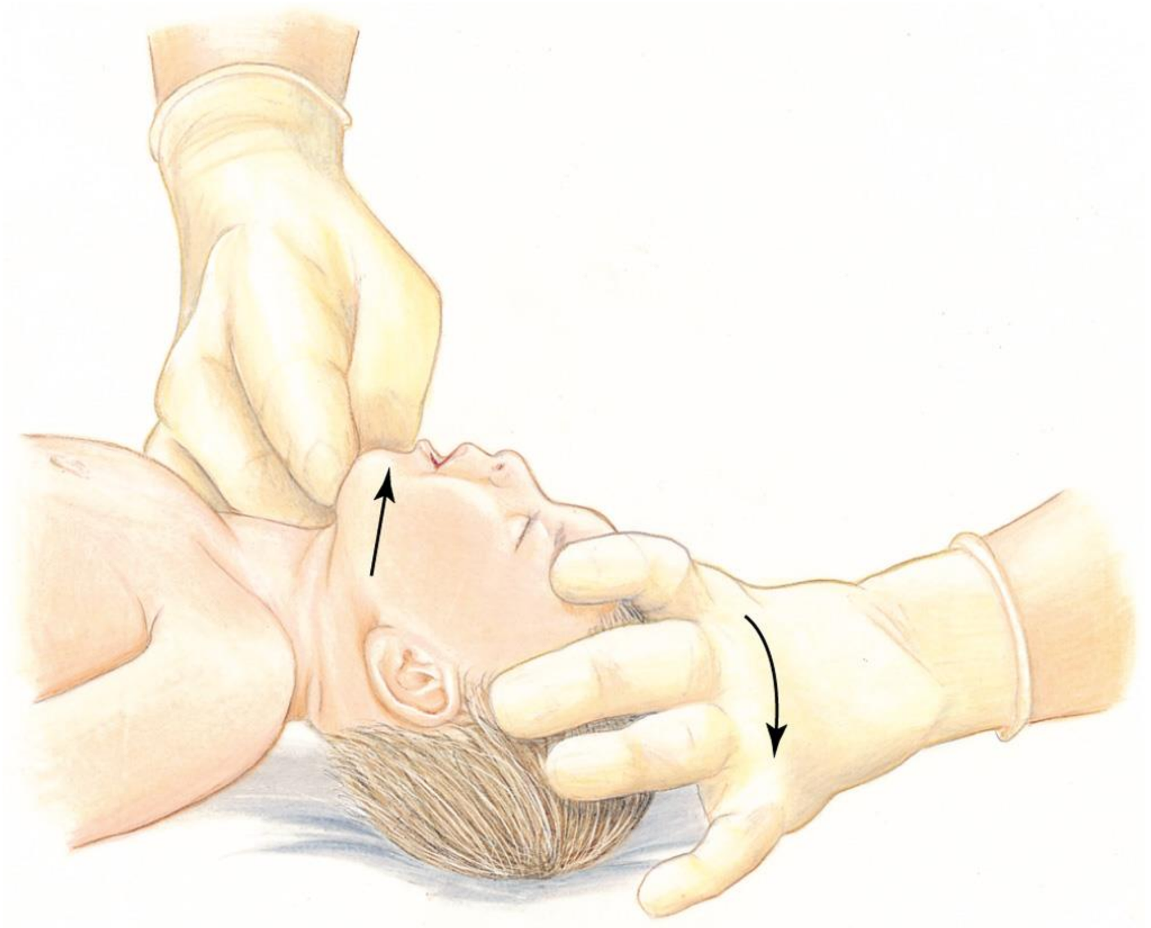
Assessing the airway



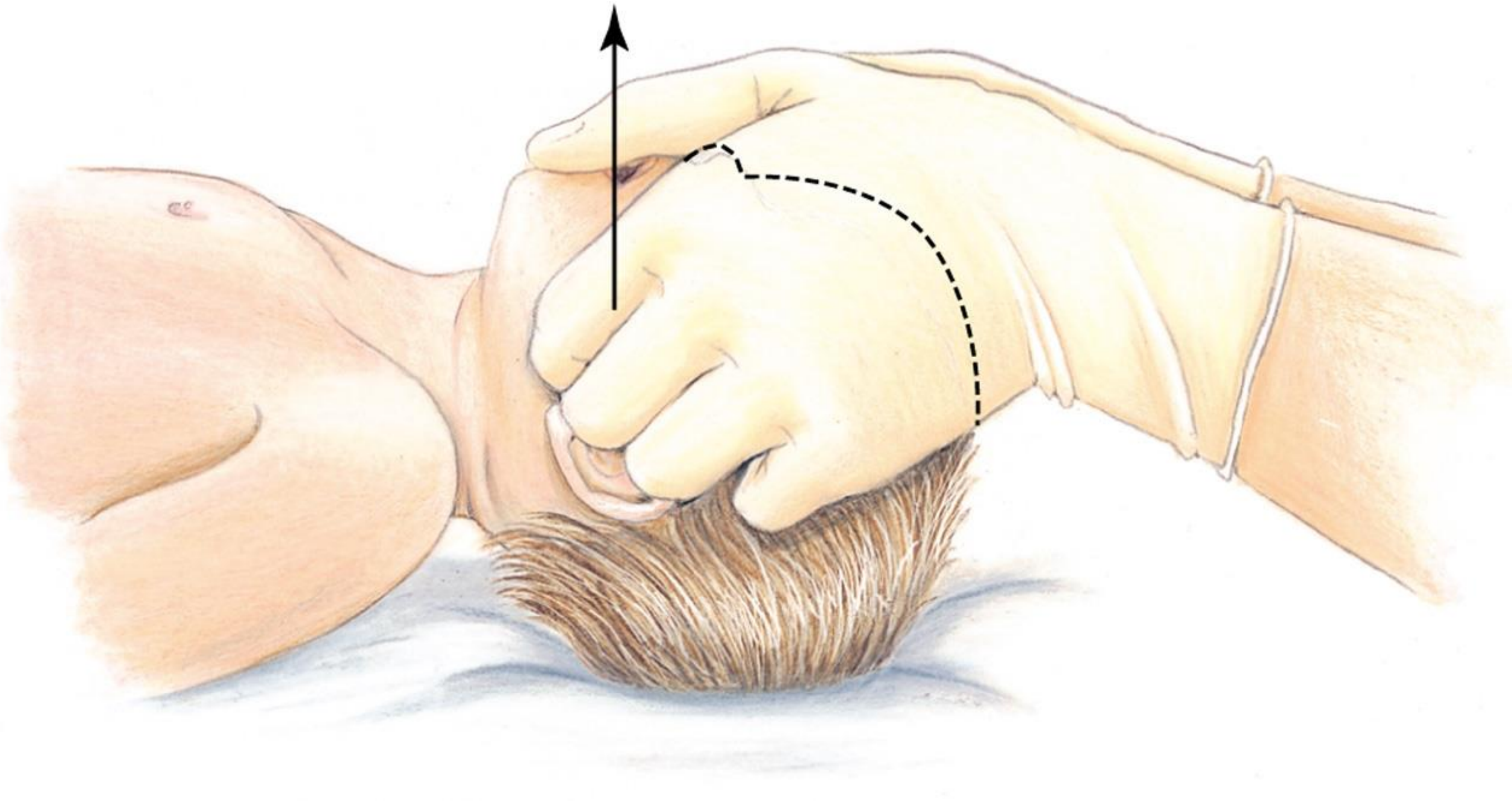
Opening the airway in a child

Never shake an infant or child.

Head-tilt/chin-lift method



Jaw-thrust method



Breathing

- Patients have small chests
  - Keep stethoscope near armpits to reduce transmitted sounds
- Tachypnea
  - First manifestation of respiratory distress
  - Eventually will tire and fail

Signs of respiratory distress

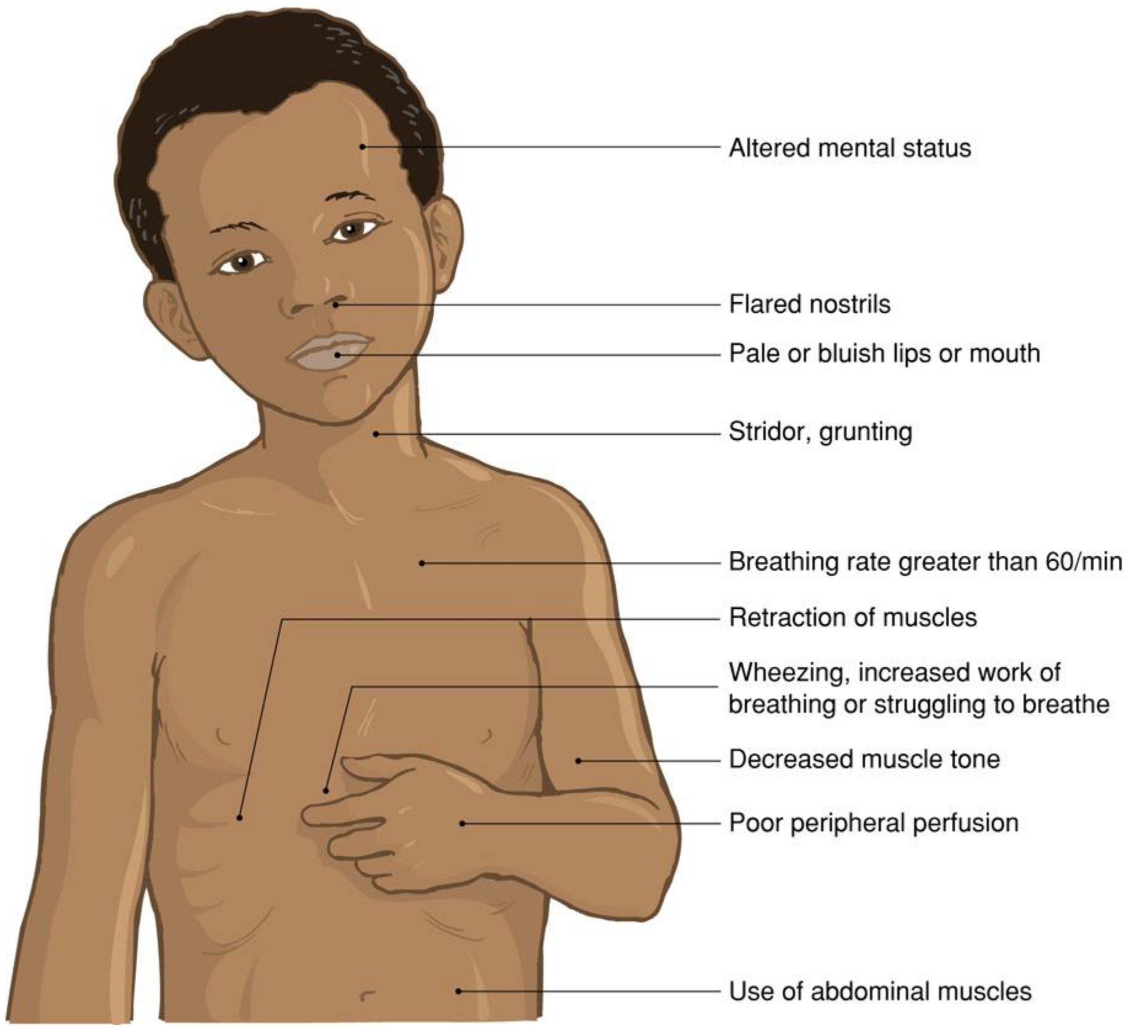


Table 42-3	Signs of Increased Respiratory Effort
Retraction	Visible sinking of the skin and soft tissues of the chest around and below the ribs and above the collarbone
Nasal flaring	Widening of the nostrils; seen primarily on inspiration
Head bobbing	Observed when the head lifts and tilts back as the child inhales and then moves forward as the child exhales
Grunting	Sound heard when an infant attempts to keep the alveoli open by building back pressure during expiration
Wheezing	Passage of air over mucous secretions in bronchi; heard more commonly upon expiration; a low- or high-pitched sound
Gurgling	Coarse, abnormal bubbling sound heard in the airway during inspiration or expiration; may indicate an open chest wound
Stridor	Abnormal, musical, high-pitched sound, more commonly heard on inspiration

Circulation

- Heart rate
  - Tachycardia in response to stress
  - Bradycardia indicates hypoxia
- Central
- Peripheral circulation
  - Loss of central pulses is an ominous sign
- End organ perfusion

Rate = 150 – (5 X age in years)

Estimate only for upper limit of HR

Circulation

- Blood pressure
  - Measuring BP is not necessary in children less than 3 years of age
    - A strong central or peripheral pulse should indicate a good BP
  - Estimates for BP
    - Systolic pressure
      - BP = (2 X age in years) + 90
    - Diastolic pressure
      - 2/3 Systolic

Circulation

- Skin color
  - Cap refill
    - Maybe delayed if skin is cool due to environment
    - Attempt more central location
  - Mottled, pale or cool skin may indicate shock
- Active hemorrhage

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Anticipating Cardiac Arrest

- Respiratory rate greater than 60
- Heart rate >180 or <80 (under 5 years)
- Heart rate >180 or <60 (over 5 years)
- Respiratory distress
- Trauma
- Burns
- Cyanosis
- Altered level of consciousness
- Seizures
- Fever with petechiae

Transitional Phase

- Depends on seriousness of patient's condition
- Intended for the non-acutely ill patient
- Allows patient to become familiar with you and your equipment

Focused History and Physical Exam

Focused History–Approach

- For infant, toddler, and preschool age patient, obtain from parent/guardian
- For school age and adolescent patient, most information may be obtained from the patient
- For older adolescent patient question the patient in private regarding sexual activity, pregnancy, illicit drug and alcohol use

Focused History–Content

- Chief complaint
  - Nature of illness/injury
  - How long has the patient been sick/injured
  - Presence of fever
  - Effects on behavior
  - Bowel/urine habits
  - Vomiting/diarrhea
  - Frequency of urination
- Past medical history
  - Still use SAMPLE
    - Infant or child under the care of a physician
    - Chronic illnesses
    - Medications
    - Allergies

Vital Signs

- Take vitals with patient as close to resting state as possible
- Use appropriate sized BP cuffs
- Feel for peripheral brachial and radial pulses
- Make good estimate of child's weight
- Observe respiratory rate
- Measure temperature early and repeat
- Constantly observe LOC

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Table 42-2	Normal Vital Signs: Infants and Children*	
Normal Pulse Rates (Beats per Minute, at Rest)		
Newborn	100 to 180	
Infant (0–5 Months)	100 to 160	
Infant (6–12 Months)	100 to 160	
Toddler (1–3 Years)	80 to 110	
Preschooler (3–5 Years)	70 to 110	
School Age (6–10 Years)	65 to 110	
Early Adolescence (11–14 Years)	60 to 90	
Normal Respiration Rates (Breaths per Minute, at Rest)		
Newborn	30 to 60	
Infant (0–5 Months)	30 to 60	
Infant (6–12 Months)	30 to 60	
Toddler (1–3 Years)	24 to 40	
Preschooler (3–5 years)	22 to 34	
School Age (6–10 Years)	18 to 30	
Early Adolescence (11–14 Years)	12 to 26	
Normal Blood Pressure Ranges (mmHg, at Rest)		
	Systolic	Diastolic
	Approx. 90 plus 2 × age	Approx. 2/3 systolic
Preschooler (3–5 Years)	average 98 (78 to 116)	average 65
School age (6–10 Years)	average 105 (80 to 122)	average 69
Early Adolescence (11–14 Years)	average 114 (88 to 140)	average 76

*Adolescents ages 15 to 18 approach the vital signs of adults.

Note: A high pulse in an infant or child is not as great a concern as a low pulse. A low pulse may indicate imminent cardiac arrest. Blood pressure is usually not taken in a child under 3 years of age. In cases of blood loss or shock, a child's blood pressure will remain within normal limits until near the end, then fall swiftly.

Detailed Physical Examination

- Should proceed from head-to-toe in older children
- Should proceed from toe-to-head in younger children (less than 2 years of age)
- Depending on the patient's condition, some or all of the following assessments may be appropriate:
  - Pupils
  - Capillary refill
  - Hydration (Skin turgor, fontanels, mucous membranes)
  - Pulse oximetry
  - ECG monitoring

On-Going Assessment

- Appropriate for all patients
- Should be continued throughout the patient care encounter
- Purpose is to monitor the patient for changes in:
  - Respiratory effort
  - Skin color and temperature
  - Mental status
  - Vital signs (including pulse oximetry measurements)
- Measurement tools should be appropriate for size of child

General Management of Pediatric Patients

General Principles in Patient Management

- Principles of management depend on patient's condition and may include:
  - Basic airway management
  - Advanced airway management
  - Vascular access (IV, IO)
  - Fluid resuscitation
  - Pharmacological
  - Nonpharmacological
  - Transport considerations
  - Psychological support/communication strategies

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Table 42-5 Summary of BLS Maneuvers in Infants and Children

Target of Maneuver	Infant (< 1 year)	Child (1 to 8 years)
Airway		
Open airway	Head tilt/chin lift (unless trauma present)	Head tilt/chin lift (unless trauma present)
	Jaw thrust	Jaw Thrust
Clear foreign body obstruction	Back blows/chest thrusts	Heimlich maneuver
Breathing		
Initial	2 breaths at 1 to 1½ seconds/breath	2 breaths at 1 to 1½ seconds/breath
Subsequent	20 breaths/minute	20 breaths/minute
Circulation		
Pulse check	Brachial/femoral	Carotid
Compression area	Lower third of sternum	Lower third of sternum
Compression width	2 or 3 fingers	Heel of 1 hand
Depth	Approximately ½ to 1 inch (Newborn ½ to ¾ inch)	Approximately 1 to 1½ inches
Rate	At least 100/minute (Newborn 120/minute)	100/minute
Compression-ventilation ratio	5:1 (Newborn 3:1)	5:1

Foreign Body Airway Obstruction

- Avoid any manoeuvres that will turn a partial into a complete airway obstruction
- Children
  - Abdominal thrusts if conscious
  - Chest thrusts if unconscious
- Infants
  - Series of 5 back blows and 5 chest thrusts
  - Inspect mouth in between

Advanced Airway

- Removal of Foreign Body with Forceps
- ETI
  - Tube size = (age + 16)/4
  - Depth = 3 X internal diameter
- Needle Cricothroidotomy

Suctioning

- Decrease suction pressure to less than 100 mm/Hg in infants.
- Avoid excessive suctioning time
  - Less than 15 seconds per attempt.
- Avoid stimulation of the vagus nerve.
- Check the pulse frequently.

Table 42-6 Suction Catheter Sizes for Infants and Children

Age	Suction Catheter Size (French)
Up to 1 Year	8
2 to 6 Years	10
7 to 15 Years	12
16 Years	12 to 14

Oxygenation

- Adequate oxygenation is the hallmark of pediatric patient care
- Ranges from blow-by to high concentration mask
- Patient may be reluctant
  - Demonstrate on yourself
  - Enlist parent or caregiver
  - Resort to blow-by

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Table 42-7 Equipment Guidelines According to Age and Weight

Equipment	Premie (1–2.5 kg)	Neonate (2.5–4.0 kg)	6 Months (7.0 kg)	1–2 Years (10–12 kg)	5 Years (16–18 kg)	5–10 Years (24–30 kg)
Airway *Oral*	infant (00)	infant (small) (0)	small (1)	small (2)	medium (3)	medium large (4.5)
Breathing *Self-inflating bag*	infant	infant	child	child	child	child/adult
O_2 ventilation mask	premature	newborn	infant/child	child	child	small adult
Endotracheal tube	2.5–3.0 (uncuffed)	3.0–3.5 (uncuffed)	3.5–4.0 (uncuffed)	4.0–4.5 (uncuffed)	5.0–5.5 (uncuffed)	5.5–6.5 (uncuffed)
Laryngoscope blade	0 (straight)	1 (straight)	1 (straight)	1–2 (straight)	2 (straight or curved)	2–3 (straight or curved)
Suction/stylet (F)	6–8/6	8/6	8–10/6	10/6	14/14	14/14
Circulation *BP cuff*	newborn	newborn	infant	child	child	child/adult
Venous access						
Angiocath	22–24	22–24	22–24	20–22	18–20	16–20
Butterfly needle	25	23–25	23–25	23	20–23	18–21
Intracath	—	—	19	19	16	14
Arm board	6″	6″	6″–8″	8″	8″–15″	15″
Orogastric tube (F)	5	5–8	8	10	10–12	14–18
Chest tube (F)	10–14	12–18	14–20	14–24	20–32	28–38

Ventilation

- Avoid excessive bag pressure and volume
- Obtain chest rise and fall.
- Allow time for exhalation.
- Flow-restricted, oxygen-powered devices are contraindicated.
- Do not use BVMs with pop-off valves.
- Apply cricoid pressure.
- Avoid hyperextension of the neck.

Advanced Airway and Ventilatory Management

Needle Cricothyrotomy

- Needle cricothyrotomy in children is the same as for adult patients.
- The only indication for cricothyrotomy is failure to obtain an airway by any other method.

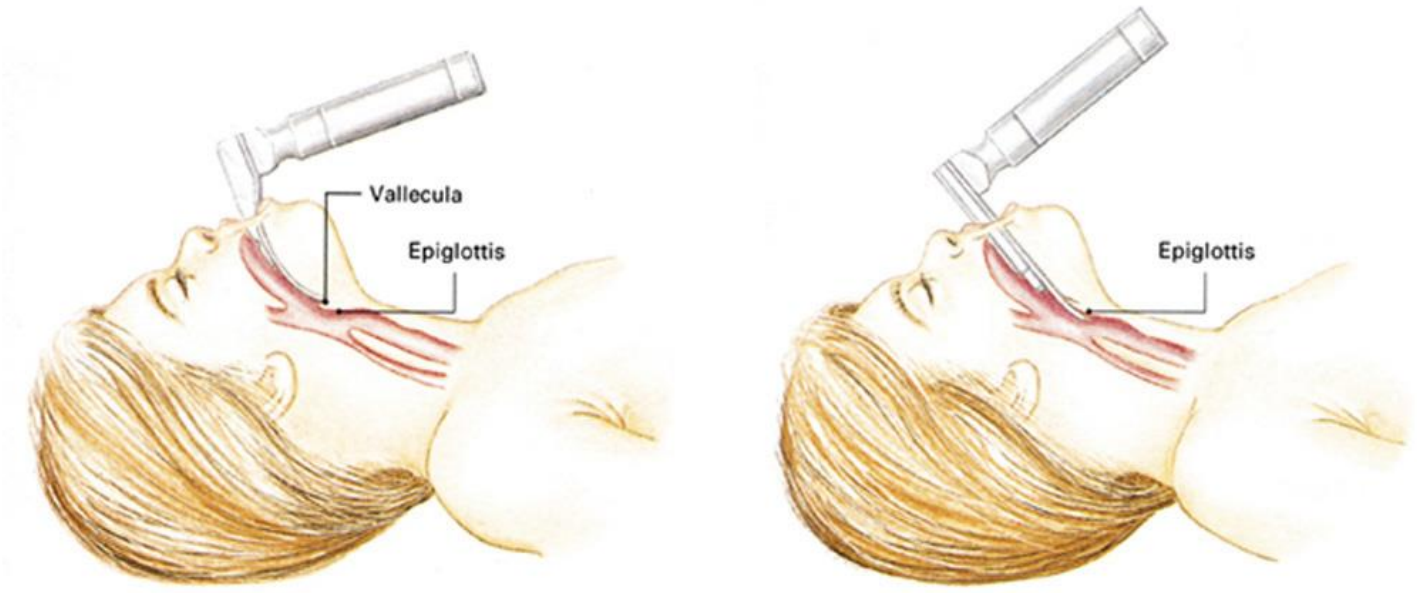
The Pediatric Airway

- A straight blade is preferred for greater displacement of the tongue.
- The pediatric airway narrows at the cricoid cartilage.
- Uncuffed tubes should be used in children under 8 years of age.
- Intubation is likely to cause a vagal response in children.

Indications

- Need for prolonged artificial ventilation
- Inadequate ventilatory support with a BVM
- Cardiac or respiratory arrest
- Control of an airway in a patient without a cough or gag reflex
- Providing a route for drug administration
- Access to the airway for suctioning

- Placement of the laryngoscope to remove a foreign body



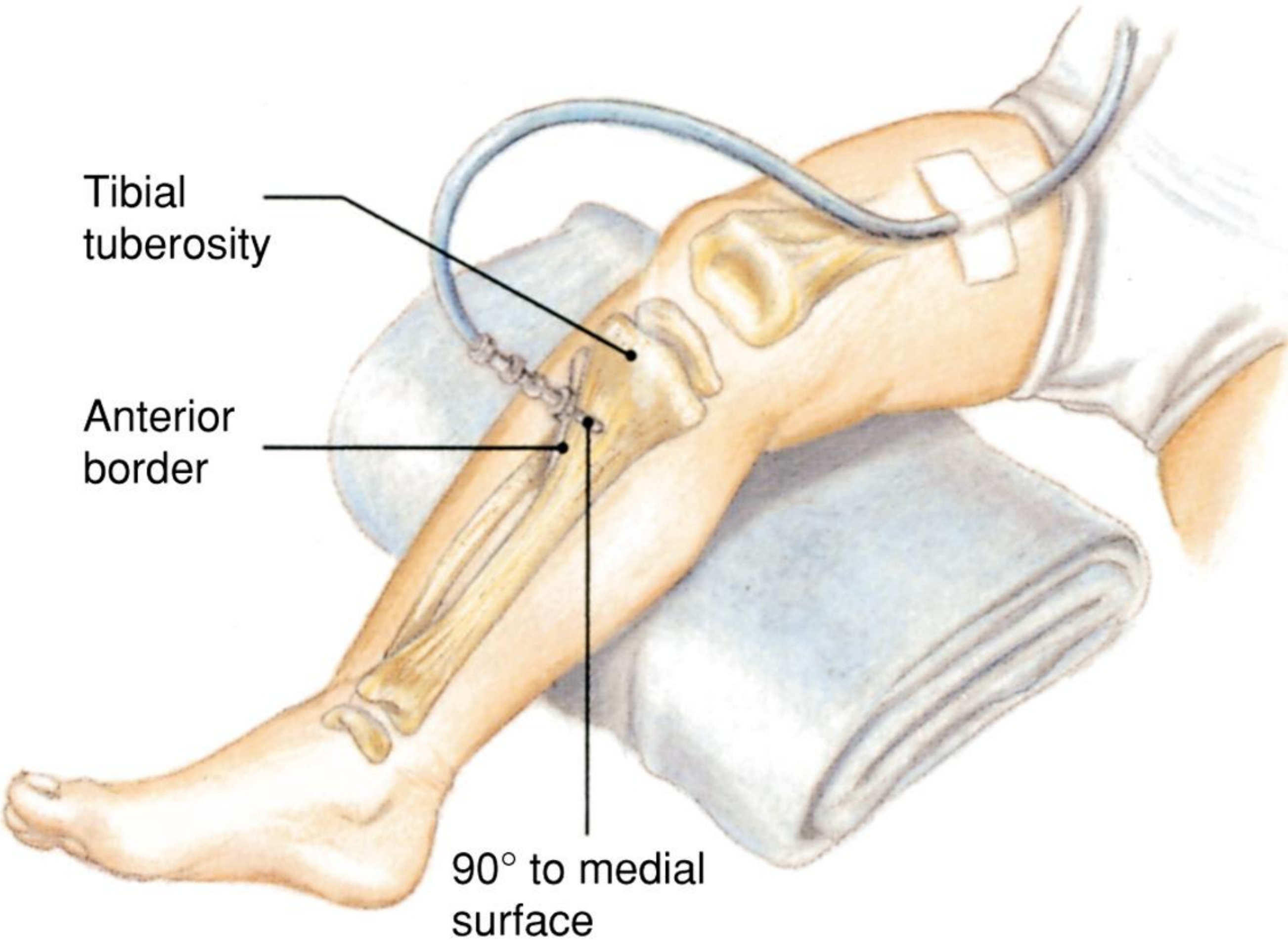
Circulation

- Two problems lead to cardiac arrest in children:
  - Shock
  - Respiratory failure

Vascular Access

- Vascular Access
  - Neck veins
  - Scalp veins
  - Arms
  - Hands
  - Feet
  - Intraosseous infusion

Intraosseous administration



Fluid Therapy

- Accurate dosing of fluids is essential
  - Too much can result in heart failure
  - Too little can be ineffective
- Fluid Resuscitation
  - 20 ml/kg
- Frequent patient assessment
- Minidrip set should be used

Electrical Therapy

- Initial dose is 2 joules per kilogram of body weight.
- If unsuccessful, increase to 4 joules per kilogram.
- If still unsuccessful, focus on correcting hypoxia and acidosis.
- Transport to a pediatric critical care unit, if possible.

Cervical Spine Immobilization

- Spinal injuries are not as common as in adults
- Larger heavier head makes cervical spine vulnerable
- Use appropriate sized immobilization devices
- Minimize emotional stress

Transport Guidelines

- Time of transport
- Specialized facilities
- Specialized personnel
- Never delay transport to perform a procedure that can be done en route

Communicating With Children

- Begin conversations with both the child and parent
- Be aware you are collecting the child's history from a parent's point of view
  - Your interview can put the parent on the defensive
  - Be cautious not to be judgmental if the parents have not provided proper care or safety for the child before your arrival
- Be observant but not confrontational
- Make contact with the child in a gradual approach as you are interviewing the parent

Communicating With Children

- Speak to children at eye level
- Use a quiet, calm voice
- Be aware of your nonverbal communication
- Be knowledgeable of communication with children according to their age group

General Tips

- Allow the parent to hold the child during the examination
- Use a gentle but firm approach
- Be honest
  - including explanations of what is happening and a fair warning about procedures which may hurt
- Ensure consistency of primary care giver if possible
- Respect the child’s dignity regardless of age
- Get down to the child's eye level
- Approach slowly (Give the child time to size you up)

General Tips

- Do not stare at the child (But don't ignore them)
- Use play techniques if possible
- Offer as many choices as possible and opportunities to participate in the care process
- Preserve patient modesty
- Let the patient cry or otherwise express pain or fear
- Show any equipment before using it

General Tips

- Take time to listen and acknowledge responses
- Avoid questions and comments that carry a critical or judgmental tone
- Validate the parents for seeking help

Specific Medical Emergencies

Infection

- Infectious diseases account for the majority of pediatric illnesses
- Relatively immature immune systems
- Take BSI precautions
- Be familiar with common infections
- Differential diagnosis

Respiratory Compromise

- Several conditions manifest chiefly as respiratory distress in children including:
  - Upper and lower foreign body airway obstruction
  - Upper airway disease (croup, bacterial tracheitis, and epiglottitis)
  - Lower airway disease (asthma, bronchiolitis, and pneumonia)
- Most cardiac arrests in children are secondary to respiratory insufficiency thus, respiratory emergencies require rapid assessment and management

Respiratory Emergencies

- Stages of Respiratory Compromise
  - Respiratory distress
  - Respiratory failure
  - Respiratory arrest

Respiratory Distress

- Normal mental status deteriorating to irritability or anxiety.
- Tachypnea
- Retractions
- Nasal flaring (in infants)

Respiratory Distress

- Good muscle tone
- Tachycardia
- Head bobbing
- Grunting
- Cyanosis that improves with supplemental oxygen

Respiratory Failure

- Irritability or anxiety deteriorating to lethargy
- Tachypnea later deteriorating to bradypnea
- Retractions later deteriorating to agonal respirations
- Poor muscle tone
- Central cyanosis

Respiratory Arrest

- Unresponsiveness deteriorating to coma
- Bradypnea deteriorating to apnea
- Absent chest wall motion
- Bradycardia deteriorating to asystole
- Profound cyanosis

Management

- Establish an airway
- Oxygen therapy
- Ventilation with BVM
- Endotracheal intubation
- Consider gastric decompression
- Consider needle decompression

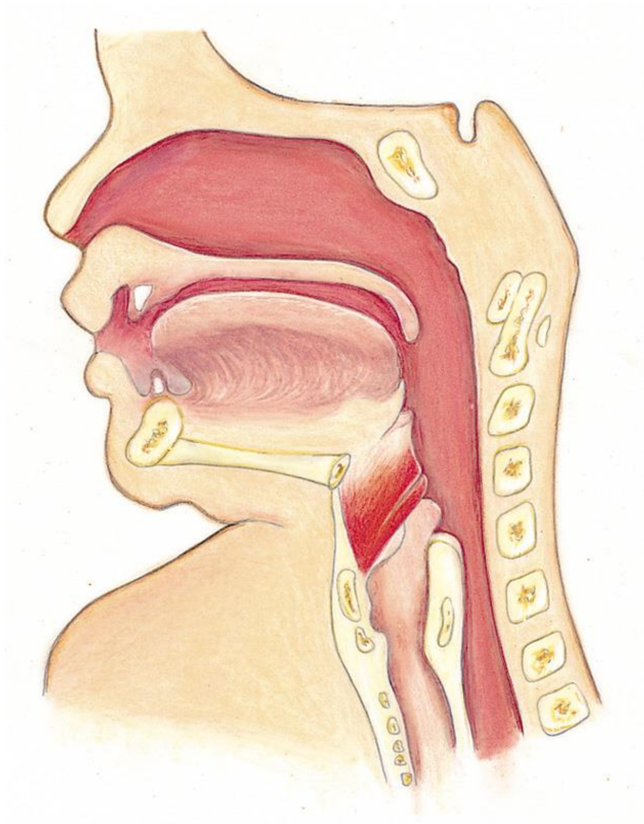
Specific Respiratory Emergencies

- Upper airway distress
  - Croup
  - Epiglottitis
  - Foreign body aspiration
- Lower airway distress
  - Asthma
  - Bronchiolitis
  - Pneumonia
  - Foreign body lower airway obstruction

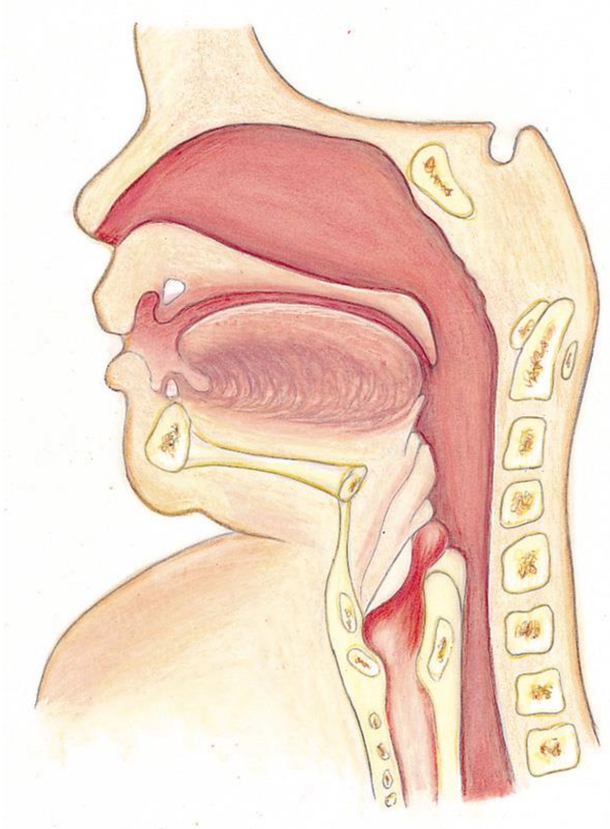
Table 42-11 Symptoms of Croup and Epiglottitis

Croup	Epiglottitis
Slow onset	Rapid onset
Generally wants to sit up	Prefers to sit up
Barking cough	No barking cough
No drooling	Drooling; painful to swallow
Fever approx. 100–101° F	Fever approx. 102–104° F
	Occasional stridor

Croup



Epiglottitis



- Positioning of the child with epiglottitis, often there will be excessive drooling

FIGURE 42-20 The child with epiglottitis should be administered humidified oxygen and transported in a comfortable position.

- The young asthma patient may be using a prescribed inhaler to relieve symptoms

Specific Medical Emergencies

- Shock
- Congenital heart disease
- Cardiomyopathy
- Neurological emergencies
- Dysrhythmias
- Meningitis
- Gastrointestinal emergencies
- Metabolic emergencies

Predisposing Factors for Shock

- Hypothermia
- Dehydration (vomiting, diarrhea)
- Infection
- Trauma
- Blood loss
- Allergic reactions
- Poisoning
- Cardiac events (rare)

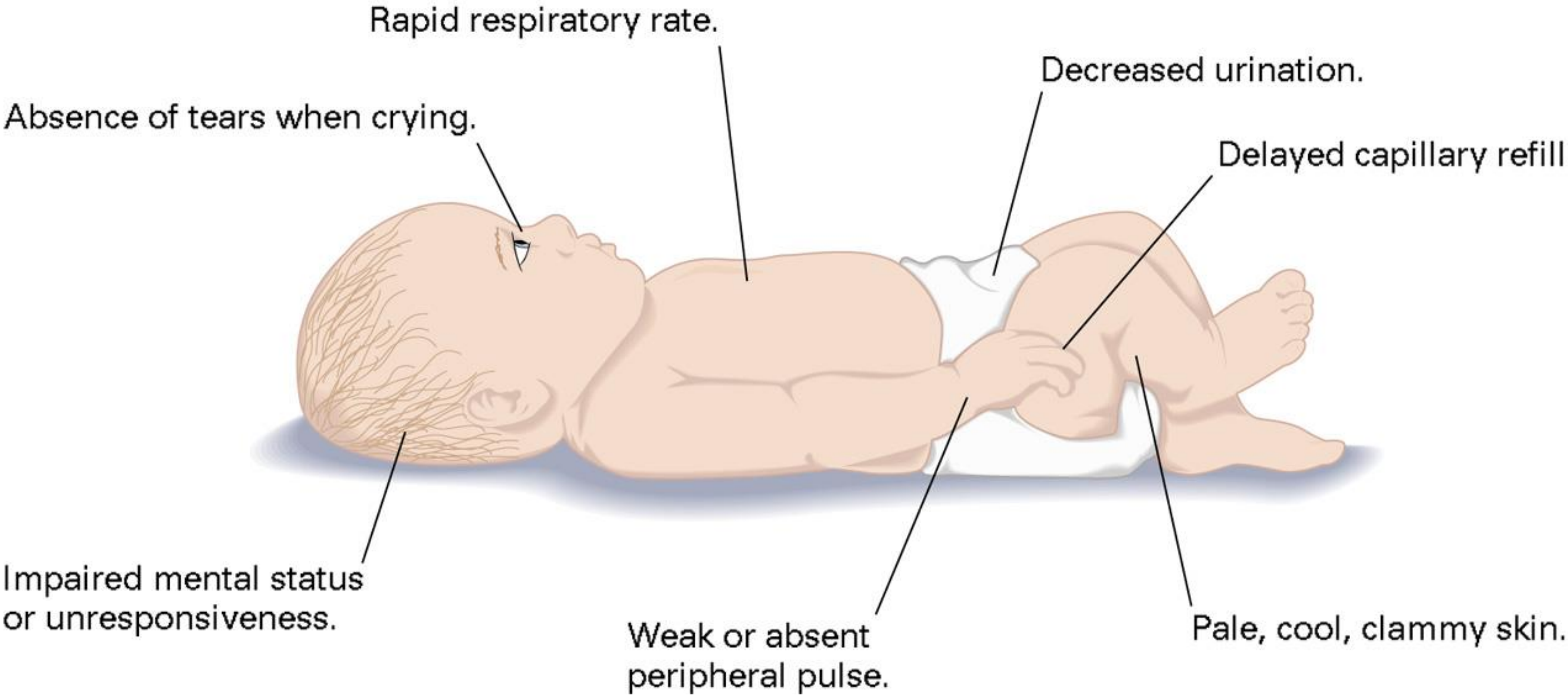
Severity of Shock

- Compensated shock
- Decompensated shock
- Irreversible shock

Categories of Shock

- Cardiogenic shock
- Non-cardiogenic shock
  - Hypovolemic shock
  - Distributive shock
    - Septic shock
    - Anaphylactic shock
    - Neurogenic shock
    - Congenital Heart Disease
    - Cardiomyopathy
    - Dysrhythmia

SIGNS OF SHOCK (HYPOPERFUSION) IN A CHILD



Special Considerations for Pediatric Patients in Shock

- Several special considerations must be taken into account when caring for a child in shock
  – Circulating blood volume
  – Body surface area and hypothermia
  – Cardiac reserve
  – Respiratory fatigue
  – Vital sign assessment

Dehydration

- Profound fluid and electrolyte imbalances can occur in children as a consequence of diarrhea, vomiting, poor fluid intake, fever, or burns
- Compromises cardiac output and systemic perfusion if:
  - Child loses the fluid equivalent of 5% or more total body weight
  - Adolescent loses 5% to 7% of total body weight

Assessment of Degree of Dehydration

Clinical Parameters	Mild	Moderate	Severe
Body Weight Loss Infant Adult	 5% (50 ml/kg) 3% (30 ml/kg)	 10% (100 ml/kg) 6% (60 ml/kg)	 15% (150 ml/kg) 9% (90 ml/kg)
Skin Turgor	Slightly ↑	↑ ↑	↑ ↑ ↑
Fontanels	Possibly Flat or Depressed	Depressed	Significantly Depressed
Mucous Membranes	Dry	Very Dry	Parched
Skin Perfusion	Warm with normal color	Cool (Extremities); Pale	Cold (Extremities)
Heart Rate	Mildly Tachycardic	Moderately Tachycardic	Extremely Tachycardic
Peripheral Pulses	Normal	Diminished	Absent
BP	Normal	Normal	Reduced
LOC	Normal or irritable	Irritable or lethargic	Unresponsive

Severe Dehydration

Hypovolemia

- Hypovolemia results from:
  - Intravascular volume depletion
    - Vomiting
    - Diarrhea
    - Burns
  - Blood loss
    - Trauma
    - Internal bleeding

Neurological Emergencies

- Seizures
  - Status epilepticus
    - Serious medical emergency
    - Prolonged periods of apnea
    - Causes hypoxia to brain cells
  - Febrile seizures
- Meningitis
- Reye's Syndrome
  - Acute, potentially fatal disease, characterized by severe edema of the brain, increased intracranial pressure, hypoglycemia, and fatty infiltration and dysfunction of the liver
  - Almost always associated with a viral infection and use of aspirin and other salicylate containing substances
  - Symptoms include sudden or excessive vomiting, ICP, ALOC and right upper quadrant pain (liver inflammation)

Gastrointestinal Emergencies

- Nausea and Vomiting
- Diarrhea
- Potential for dehydration and electrolyte abnormalities
  - Serious conditions in the pediatric patient

Metabolic Emergencies

- Hypoglycemia
  - Abnormally low concentration of glucose in the blood
  - It is a true medical emergency that must be treated immediately
- Hyperglycemia
  - Abnormally high concentration of glucose in the blood

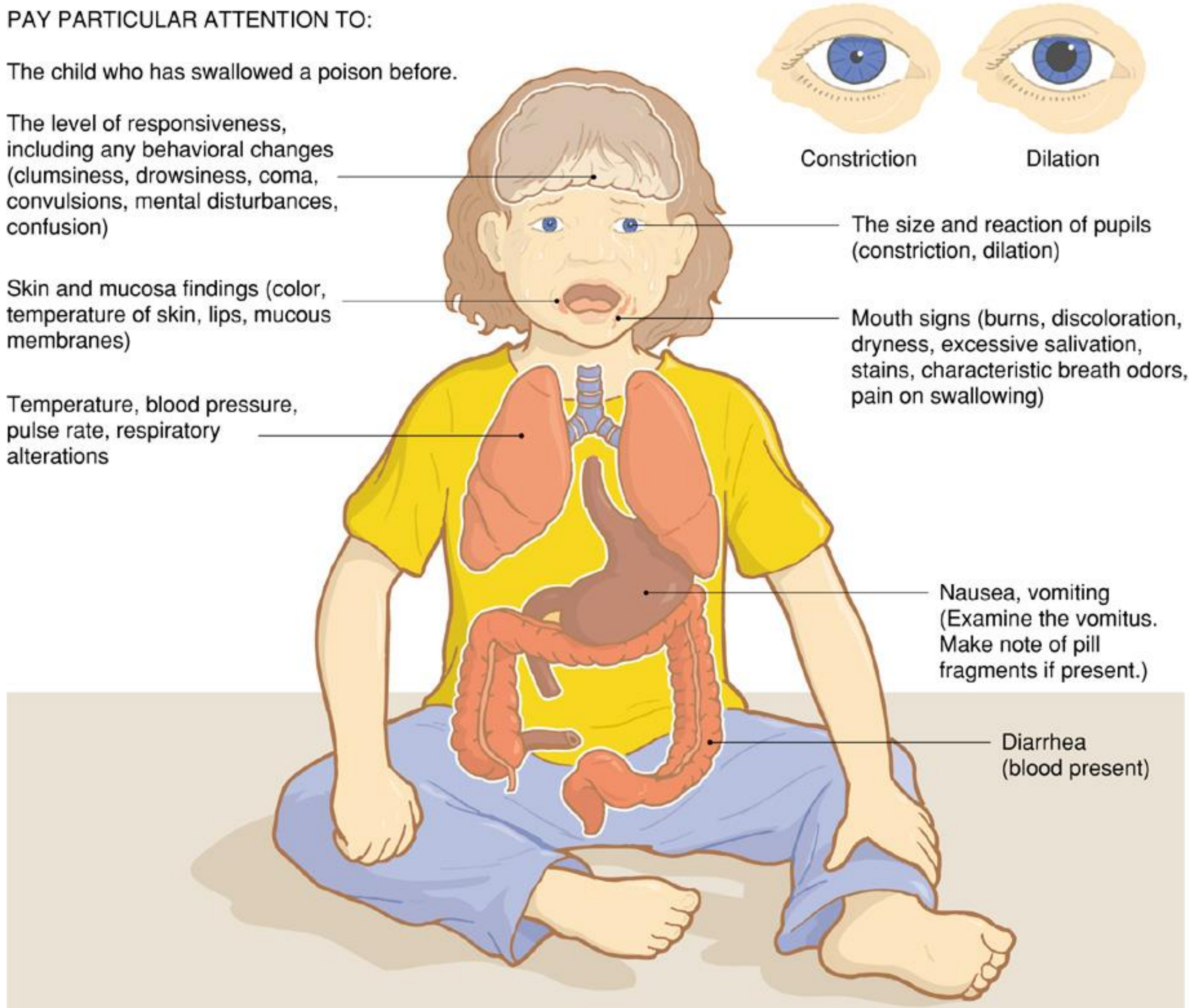
Table 42-13 Signs and Symptoms of Hyperglycemia

Early	Late	Ketoacidosis
Increased thirst	Weakness	Continued decreased level of consciousness progressing to coma
Increased urination	Abdominal pain	Kussmaul respirations (deep and slow)
Weight loss	Generalized aches	Signs of dehydration
	Loss of appetite	
	Nausea	
	Vomiting	
	Signs of dehydration, except increased urinary output	
	Fruity breath odor	
	Tachypnea	
	Hyperventilation	
	Tachycardia	

Poisoning and Toxic Exposure

- Accidental poisoning is a common childhood emergency.
- Leading cause of preventable death in children.

POSSIBLE INDICATORS OF INGESTED POISONING IN CHILDREN



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Trauma Emergencies

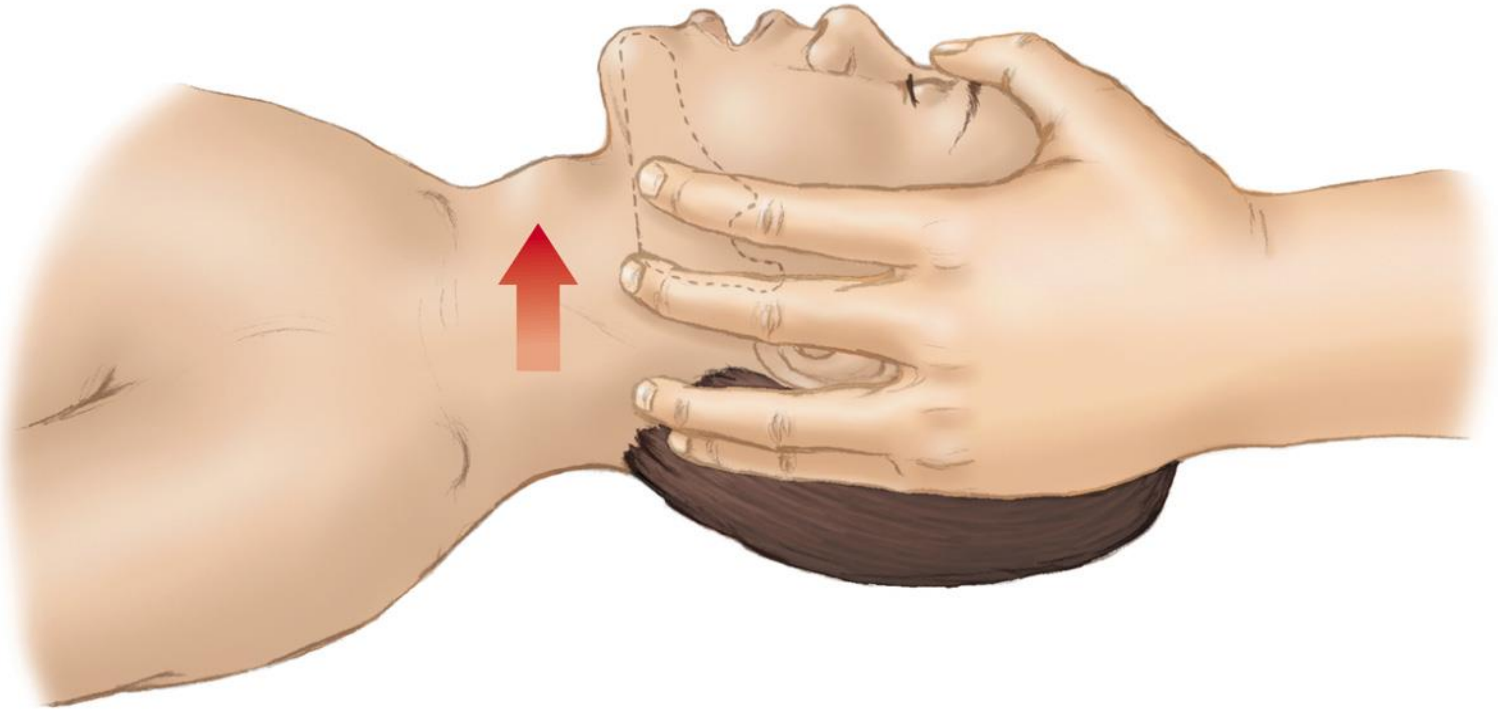
- Falls
- Motor vehicle crashes
- Car vs. pedestrian injuries
- Drowning and near drowning
- Penetrating injuries
- Burns
- Physical abuse

Special Considerations

Special Considerations

- Airway control
- Immobilization
- Fluid management
- Pediatric analgesia and sedation
- Traumatic brain injury

- Use the combination of jaw-thrust/spine-stabilization maneuver to open the airway



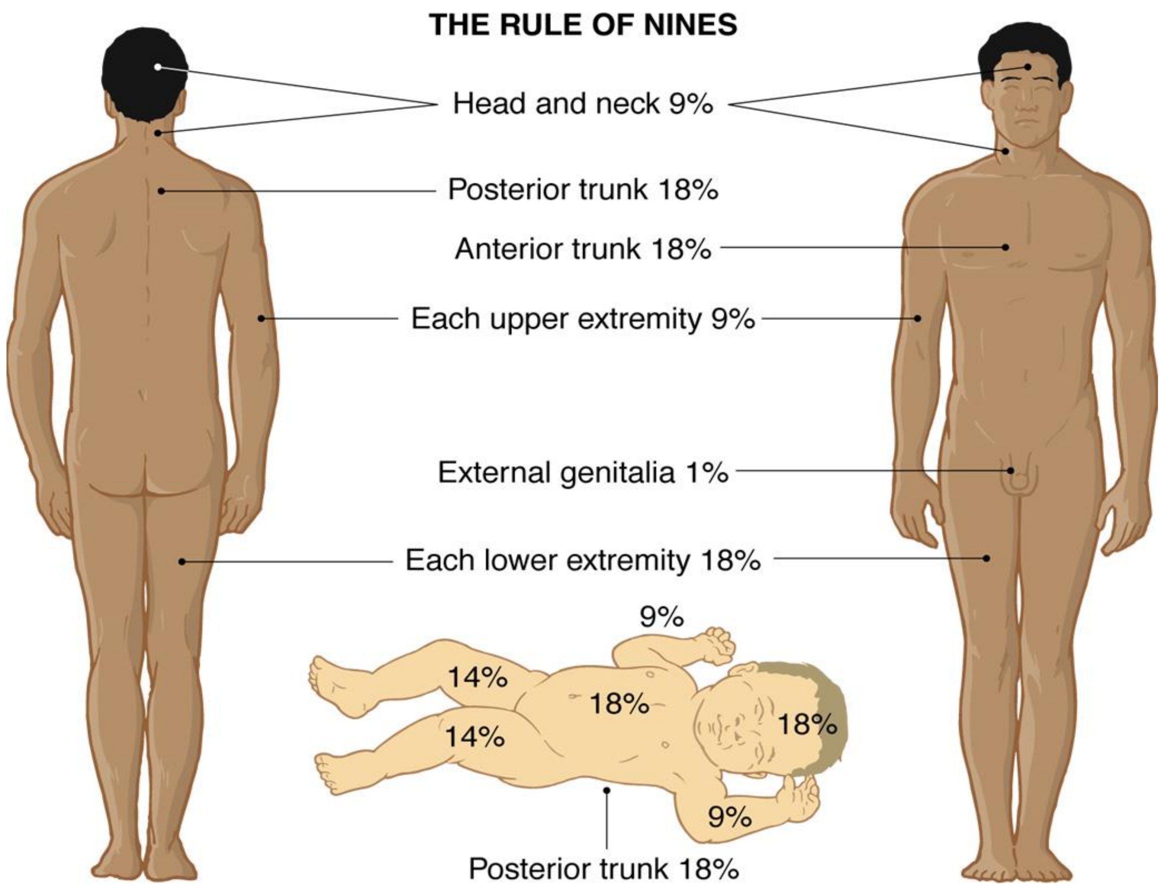
Head, Face, and Neck

- Injuries to the head are the most common cause of death in pediatric trauma victims.
- The most common facial injuries are lacerations secondary to falls.
- Spinal injuries in children are not as common in adults, but the cervical spine is more susceptible to injury.

Chest and Abdomen

- Chest injuries are the second most common cause of pediatric trauma deaths.
- Pulmonary contusions common in blunt trauma to the chest.
- Significant blunt trauma to the abdomen can result in injury to the spleen or liver.
  - Both can cause life-threatening internal hemorrhage.

The rule of nines must be modified for a child



Sudden Infant Death Syndrome (SIDS)

- Sudden death of an infant in the first year of life
  - Illness of unknown etiology
- Active and aggressive care should be continued to the ER
  - Unless obviously dead
- Use the child's name when speaking to the parents