


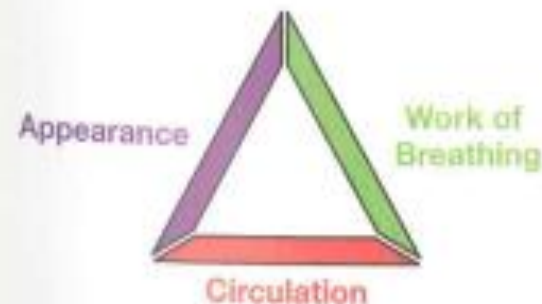
Systematic Approach to the Seriously Ill or Injured Child

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The purpose of this organized approach is to enable quickly recognize sign of respiratory distress, respiratory failure, shock and immediately lifesaving interventions.

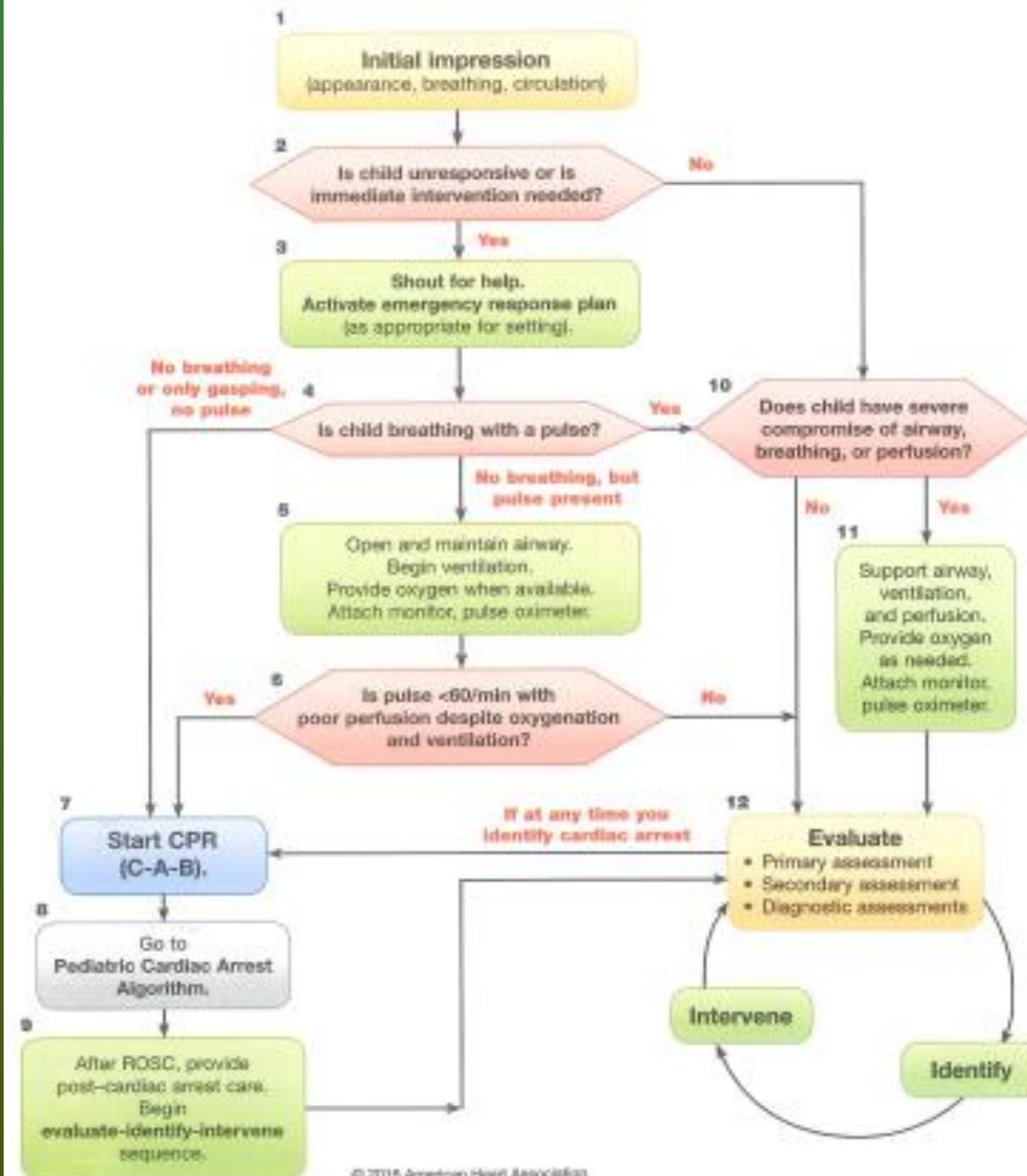


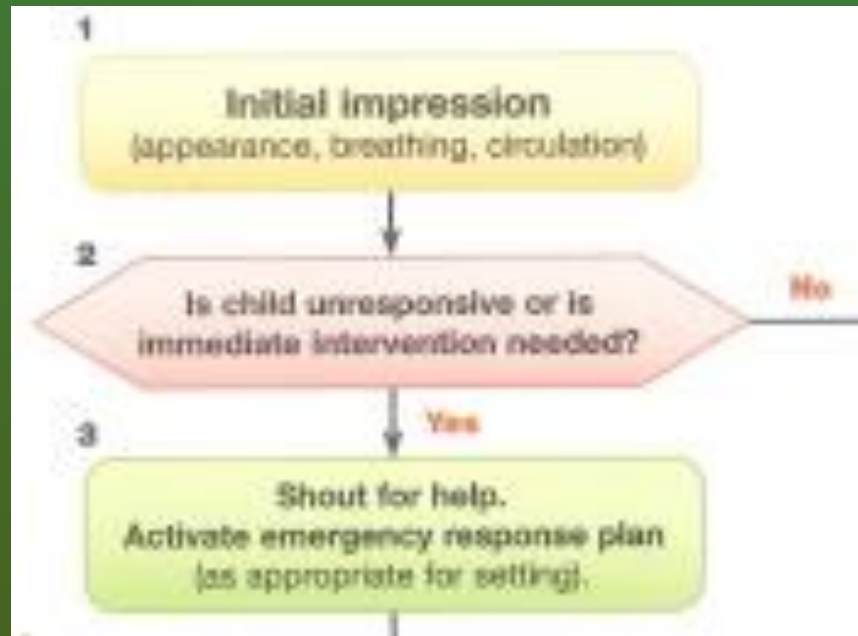
Initial Impression to Identify a Life-Threatening Condition

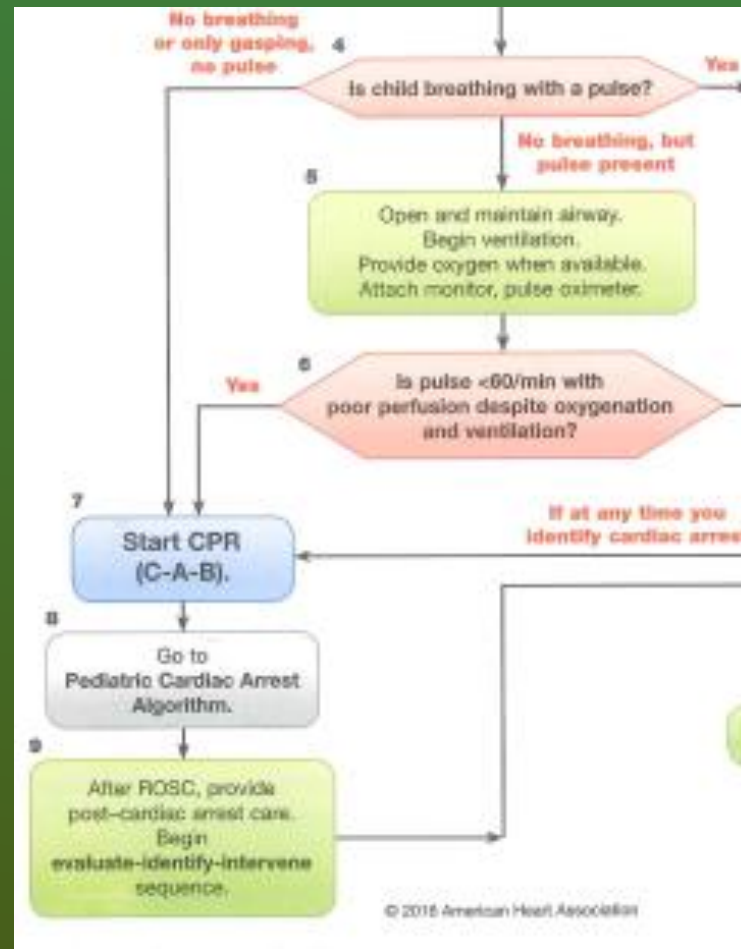


The Systematic Approach Algorithm (Figure 11) outlines the approach to caring for a critically ill or injured child. The initial impression is your first quick “from the doorway” observation of the child’s appearance, breathing, and color. It is accomplished within the *first few seconds* of encountering the child. The Pediatric Assessment Triangle (PAT) is the tool used to make the initial impression. The PAT can be used immediately on entering the scene and helps identify the general type of physiologic problem (ie, respiratory, circulatory, or neurologic) and urgency for treatment and transport.

PALS Systematic Approach Algorithm





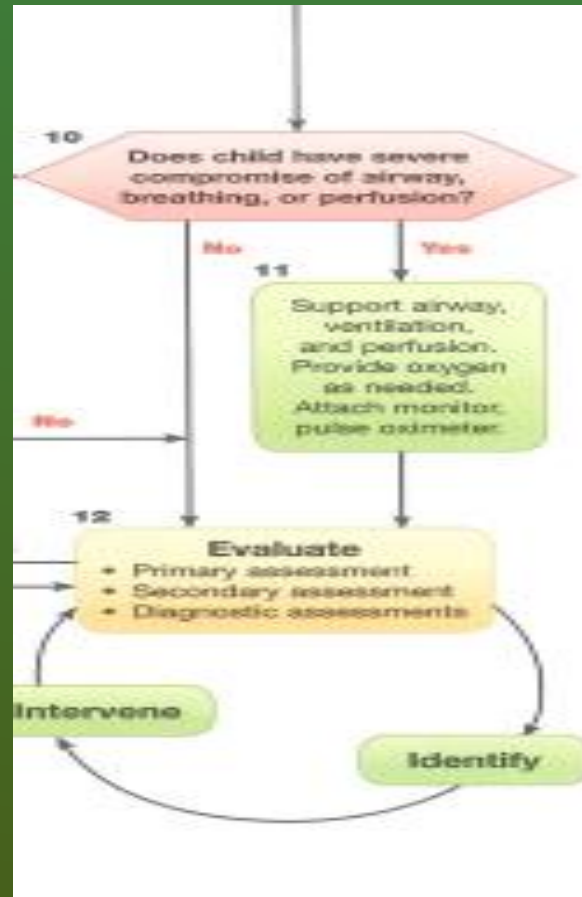


PRIMARY ASSESSMENT:

ABCDE

Pulseoximetry

Vital signs



Secondary assessment:

SAMPLE

Focused PH/E

Focused history

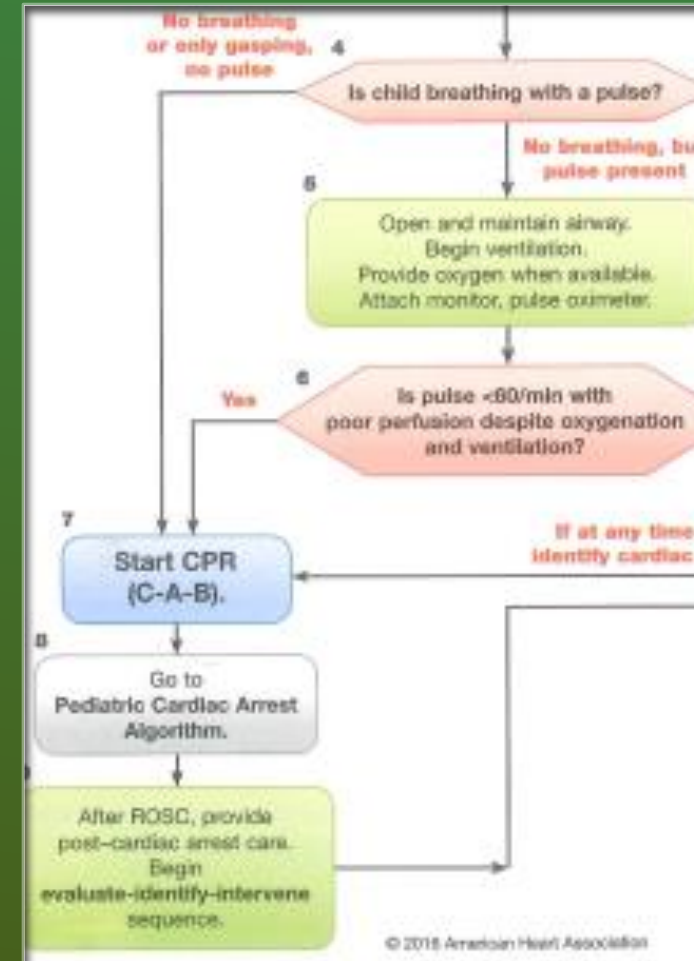
Ongoing reassessment

Identify a Life-Threatening Condition and Act

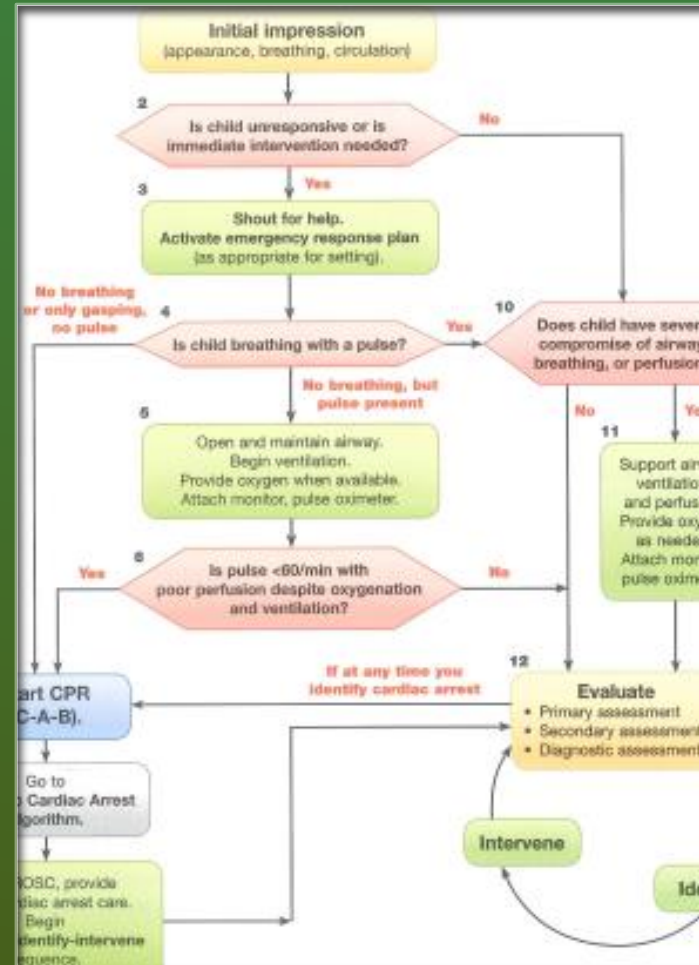
The purpose of the initial impression is to quickly identify a life-threatening condition.

If the child's condition is...	The next action is to...
Life threatening	<ul style="list-style-type: none">• Start life support interventions• Get help
Not life threatening	<ul style="list-style-type: none">• Continue with the Systematic Approach

UNRESPONSIVE+NOT BREATHING
OR ONLY GASPING+NO PULSE



UNRESPONSIVE
+NO BREATHING+PULSE
PRESENT.....>RESCUE BREATHING



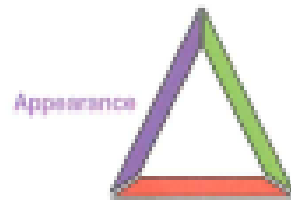
Initial Impression



If you do not immediately detect a life-threatening emergency, you can continue forming your initial impression of the child's condition. As noted above, the PAT is the tool used to form your initial impression.

The PAT uses A-B-C, which stands for appearance, work of breathing, and circulatory status. The PAT begins with evaluation of appearance (A) as an indicator of overall physiologic status, including degree of interactivity, muscle tone, and verbal response or cry. The use of the TICLS (tone, interactiveness, consolability, look/gaze, speech/cry) mnemonic can be used as an adjunct. The second component of the PAT is breathing (B), which determines whether a child has increased work of breathing by assessing the patients' position (ie, tripod or sniffing position), work of breathing (ie, retractions), and adventitious breath sounds (eg, stridor, sonorous respirations). The final component of the PAT evaluates the child's overall circulatory status (C) based on general color (eg, pale, mottled, cyanotic). A child with abnormal PAT findings requires prompt evaluation and management. The findings of the PAT may indicate need for immediate intervention (eg, CPR for a patient who is apneic and pulseless, tourniquet use for exsanguinating hemorrhage of an extremity).

Appearance

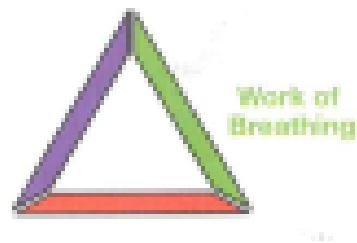


The first part of the PAT is the child's appearance, including level of consciousness and ability to interact. Carefully, but quickly, observe the child's appearance to evaluate the level of consciousness. The level of consciousness may be defined by the child's tone, interactiveness, consolability, look/gaze/stare, and speech/cry. If the child is unresponsive, you should shout for nearby help, assess breathing and pulse, and then activate the rapid response or the emergency response system as appropriate for your clinical setting.

If the child is crying or upset, it can be difficult to know if the child is responding appropriately. Try to keep the child as calm as possible. Let her remain with her parent or caregiver if practical. Use distractions such as toys.

TICLS

Breathing



The next part of the PAT is evaluation of work of breathing (Table 1). During the PAT, you evaluate the child's work of breathing, position, and any audible breath sounds (ie, breath sounds or sounds of breathing that can be heard without a stethoscope). Look for signs of absent or increased respiratory effort. Listen for obvious sounds of abnormal breathing, such as grunting, stridor, or wheezing. Note whether the patient's position suggests respiratory distress, such as the tripod position.

Circulation (Color)

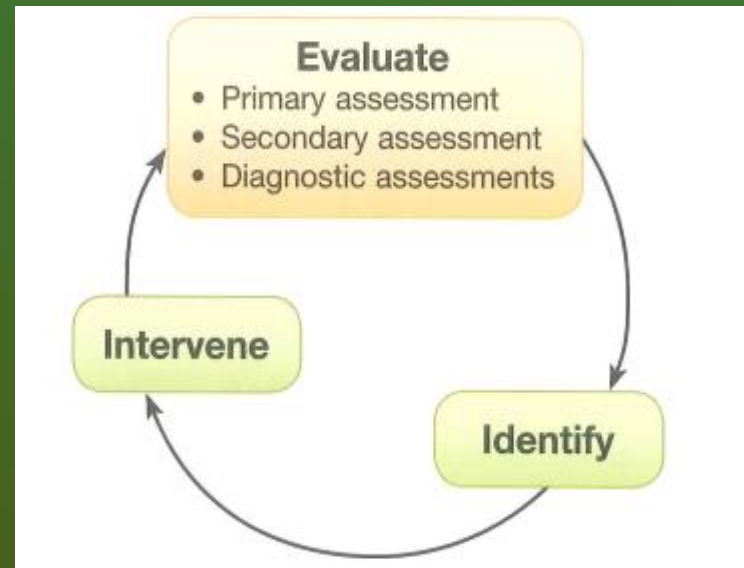


Table 2. Evaluation of Skin and Mucous Membranes

	Normal	Abnormal
Skin color*	Appears normal	<ul style="list-style-type: none">• Pallor• Mottling• Cyanosis
Petechiae or purpura or visible bleeding wounds	Not normal	<ul style="list-style-type: none">• Obvious significant bleeding• Bleeding within the skin (eg, purpura)

Flushing skin.....>fever or distributive shock

Evaluate-Identify-Intervene



Evaluate

Clinical Assessment	Brief Description
Primary assessment	A rapid, hands-on ABCDE approach to evaluate respiratory, cardiac, and neurologic function; this step includes assessment of vital signs and pulse oximetry
Secondary assessment	A focused medical history and a focused physical exam
Diagnostic assessments	Laboratory, radiographic, and other advanced tests that help to identify the child's physiologic condition and diagnosis

Identify

	Type	Severity
Respiratory	<ul style="list-style-type: none">• Upper airway obstruction• Lower airway obstruction• Lung tissue disease• Disordered control of breathing	<ul style="list-style-type: none">• Respiratory distress• Respiratory failure
Circulatory	<ul style="list-style-type: none">• Hypovolemic shock• Distributive shock• Cardiogenic shock• Obstructive shock	<ul style="list-style-type: none">• Compensated shock• Hypotensive shock
Cardiopulmonary Failure		
Cardiac Arrest		

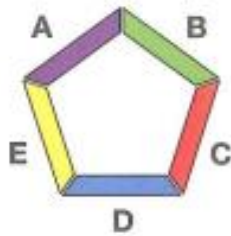
Intervene

- Positioning the child to maintain an open/patent airway
- Activating the emergency response system
- Starting CPR
- Obtaining the code cart and monitor
- Placing the child on a cardiac monitor and pulse oximeter
- Administering O₂
- Supporting ventilation
- Starting medications and fluids (eg, nebulizer treatment, IV/IO fluid bolus)

Continuous Sequence

The sequence of evaluate-identify-intervene continues until the child is stable.

Primary Assessment



The primary assessment (primary survey) uses a hands-on ABCDE approach and includes assessment of the patient's vital signs (including oxygen saturation by pulse oximetry).

- **A**irway
- **B**reathing
- **C**irculation
- **D**isability
- **E**xposure

Airway

Evaluate Airway



When you assess the airway, you determine if it is patent (open). To assess upper airway openness/patency:

- Look for movement of the chest or abdomen
- Listen for air movement and breath sounds
- Feel for movement of air at the nose and mouth

Table 5. Upper Airway Status and Description

Status	Description
Clear	Airway is open and unobstructed for normal breathing.
Maintainable	Airway is obstructed but can be maintained by simple measures (eg, head tilt–chin lift).
Not maintainable	Airway is obstructed and cannot be maintained without advanced interventions (eg, intubation).

The following signs suggest that the upper airway is obstructed:

- Increased inspiratory effort with retractions
- Abnormal inspiratory sounds (snoring or high-pitched stridor)
- Episodes where no airway or breath sounds are present despite respiratory effort (ie, complete upper airway obstruction)

Simple Measures to Maintain the Airway

Simple measures to open and maintain a patent upper airway may include one or more of the following:

Positioning

Allow the child to assume a position of comfort, or position the child to improve airway patency.

For a responsive child:

- Allow the child to assume a position of comfort or
- Elevate the head of the bed

For an unresponsive child:

- Turn the child on her side if you do not suspect cervical injury or
- Use a head tilt–chin lift or jaw thrust (below)

Head tilt–chin lift or jaw thrust

- *If you do not suspect cervical spine injury:* Use the head tilt–chin lift maneuver to open the airway. Avoid overextending the head/neck in infants because this may occlude the airway.
- *If you suspect cervical spine injury (eg, the child has a head or neck injury):* Open the airway by using a jaw thrust without neck extension. If this maneuver does not open the airway, use a head tilt–chin lift or jaw thrust with neck extension because opening the airway is a priority. During CPR, stabilize the head and neck manually rather than with immobilization devices.

Note that the jaw thrust may be used in children without trauma as well.

Suctioning

Suction the nose and oropharynx. Avoid overextending the head/neck in infants because this may occlude the airway.

Relief techniques for foreign-body airway obstruction

If a child is suspected to have aspirated a foreign body, has complete airway obstruction (is unable to make any sound), and is responsive, repeat the following as needed:

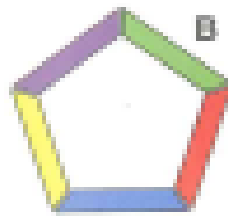
- <1 year of age: give 5 back slaps and 5 chest thrusts
- ≥1 year of age: give abdominal thrusts

If at any time the child becomes unresponsive, activate (if you have a mobile device) or send someone to activate the emergency response system and begin CPR.

Airway adjuncts

Use airway adjuncts (eg, oropharyngeal airway) to keep the tongue from falling back and obstructing the airway.

Breathing



Assessment of breathing includes evaluation of

- Respiratory rate and pattern
- Respiratory effort
- Chest expansion and air movement
- Lung and airway sounds
- O₂ saturation by pulse oximetry

Abnormal Respiratory Rate and Pattern

Abnormal respirations include

- Irregular respiratory pattern
- Fast respiratory rate (tachypnea)
- Slow respiratory rate (bradypnea)
- Apnea

Increased Respiratory Effort

- Nasal flaring
- Retractions
- Head bobbing or seesaw respirations

Other signs of increased respiratory effort are prolonged inspiratory or expiratory times, open-mouth breathing, gasping, and use of accessory muscles. Grunting is a serious sign and may indicate respiratory distress or respiratory failure. (See “Grunting” later in this Part.)

Breathing Difficulty	Location of Retraction
Mild to moderate	Subcostal
	Substernal
	Intercostal
Severe (may include the same retractions as seen with mild to moderate breathing difficulty)	Supraclavicular
	Suprasternal
	Sternal

Inadequate Respiratory Effort

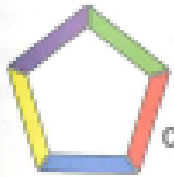
In your evaluation of respiratory effort, look for signs that respiratory effort is inadequate and be prepared to support airway, oxygenation, and ventilation. These include

- Apnea
- Weak cry or cough
- Bradypnea
- Agonal gasps

Signs of probable respiratory failure include

- Very rapid or inadequate respiratory rate; possible apnea
- Significant, inadequate, or absent respiratory effort
- Absent distal air movement
- Extreme tachycardia; bradycardia often indicates life-threatening deterioration
- Low oxygen saturation (hypoxemia) despite high-flow supplementary oxygen
- Decreased level of consciousness
- Cyanosis

Circulation



Circulation is assessed by the evaluation of

- Heart rate and rhythm
- Pulses (both peripheral and central)
- Capillary refill time
- Skin color and temperature
- Blood pressure

Urine output and level of consciousness also reflect adequacy of circulation.

Tachycardia Can Be a Sign of a Serious Condition

A heart rate that is greater than 180/min in an infant or toddler and greater than 160/min in a child older than 2 years of age warrants further assessment and may be a serious condition.

Pulse

Central Pulses	Peripheral Pulses
<ul style="list-style-type: none">• Femoral• Brachial (in infants)• Carotid (in older children)• Axillary	<ul style="list-style-type: none">• Radial• Dorsalis pedis• Posterior tibial

Capillary Refill Time

Common causes of sluggish, delayed, or prolonged capillary refill (a refill time of greater than 2 seconds) are dehydration, shock, and hypothermia. Note that shock can be present despite a normal (or even brisk) capillary refill time. Children with septic shock (see "Part 8: Recognition of Shock") may have warm skin and extremities with very rapid (ie, less than 2 seconds) capillary refill time (often called *flash capillary refill*) despite the presence of shock.

Skin Color and Temperature

Table 9. Skin Findings, Location, and Causes

Skin Color	Location	Causes
Pallor (paleness; lack of normal color)	Skin or mucous membranes	<ul style="list-style-type: none">• Normal skin color• Decreased blood supply to the skin (cold; stress; shock, especially hypovolemic and cardiogenic)• Decreased number of red blood cells (anemia)• Decreased skin pigmentation
Central pallor	Mucous membranes	<ul style="list-style-type: none">• Anemia• Poor perfusion
Mottling (irregular or patchy discoloration)	Skin	<ul style="list-style-type: none">• Normal distribution of skin melanin• Intense vasoconstriction from irregular supply of oxygenated blood to the skin due to hypoxemia, hypovolemia, or shock
Cyanosis (blue discoloration)	Skin or mucous membranes	
Acrocyanosis	Hands and feet and around the mouth (ie, the skin around the lips)	Normal in the newly born

Hypotension

Hypotension is defined by the thresholds of systolic blood pressure shown in Table 11.

Table 11. Definition of Hypotension by Systolic Blood Pressure and Age

Age	Systolic Blood Pressure (mm Hg)
Term neonates (0-28 days)	<60
Infants (1-12 months)	<70
Children 1-10 years	$<70 + (\text{age in years} \times 2)$ (this estimates systolic blood pressure that is less than the fifth blood pressure percentile for age)*
Children >10 years	<90

Assessment of Urine Output

Age	Normal Urine Output
Infants and young children	1.5 to 2 mL/kg per hour
Older children and adolescents	1 mL/kg per hour

Children with shock usually have decreased urine output.

Disability



The disability assessment is a quick evaluation of neurologic function.

and TICLS (muscle tone, interactiveness, consolability, look/gaze/stare, and speech/cry). Signs of inadequate O₂ delivery to the brain correlate with the severity and duration of cerebral hypoxia.

Sudden and severe cerebral hypoxia may cause the following neurologic signs:

- Decreased level of consciousness
- Loss of muscular tone
- Generalized seizures
- Pupil dilation

You may observe other neurologic signs when cerebral hypoxia develops gradually. These signs can be subtle and are best detected if repeated measurements are performed over time:

- Decreased level of consciousness with or without confusion
- Irritability
- Lethargy
- Agitation alternating with lethargy

Standard evaluations include

- AVPU (Alert, Responsive to Voice, Responsive to Pain, Unresponsive) Pediatric Response Scale
- Glasgow Coma Scale (GCS)
- Pupil response to light
- Blood glucose test

AVPU Pediatric Response Scale

A lert	The child is awake, active, and appropriately responsive to caregivers and external stimuli. "Appropriate response" is assessed in terms of the anticipated response based on the child's age and/or developmental level and the setting or situation.
V oice	The child responds only to voice (eg, calling the child's name or speaking loudly).
P ainful	The child responds only to a painful stimulus, such as a sternal rub or pinching the trapezius.
U nresponsive	The child does not respond to any stimulus.

Glasgow Coma Scale Overview

- Mild head injury: GCS score 13 to 15
- Moderate head injury: GCS score 9 to 12
- Severe head injury: GCS score 3 to 8

Table 13. Pediatric Glasgow Coma Scale*





Score	Child	Infant
Eye Opening		
4	Spontaneously	Spontaneously
3	To verbal command	To shout, speech
2	To pain	To pain
1	No response	No response
Best Motor Response		
6	Obeys commands	Spontaneous movements
5	Localizes pain	Withdraws to touch
4	Flexion-appropriate withdraw	Flexion-appropriate withdraw
3	Flexion-abnormal (decorticate rigidity)	Flexion-abnormal (decorticate rigidity)
2	Extension (decerebrate rigidity)	Extension (decerebrate rigidity)
1	No response	No response
Best Verbal Response		
5	Oriented and converses	Smiles, coos, and babbles
4	Disoriented, confused	Cries but is consolable
3	Inappropriate words	Persistent, inappropriate crying and/or screaming
2	Incomprehensible sounds	Moans, grunts to pain
1	No response	No response
Total = 3 to 15		

Table 14. AVPU Scale and Glasgow Coma Scale Equivalents

Response	GCS Score
A lert	15
V erbal	13
P ainful stimulation	8
U nresponsive to noxious stimulation	6

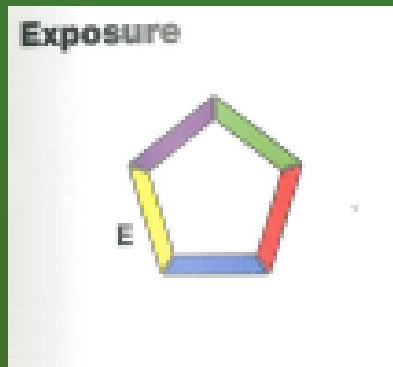
Pupil Response to Light

Table 15. Abnormal Pupil Responses and Possible Causes

Abnormal Pupil Response	Possible Cause
Pinpoint pupils 	<ul style="list-style-type: none">• Narcotic ingestion (eg, opioid)
Dilated pupils 	<ul style="list-style-type: none">• Predominant sympathetic autonomic activity• Sympathomimetic ingestion (eg, cocaine)• Anticholinergic ingestion (eg, local or systemic atropine)• Increased intracranial pressure
Unilaterally dilated pupils 	<ul style="list-style-type: none">• Inadvertent topical absorption of a breathing treatment (eg, ipratropium)• Dilating eye drops
Unilaterally dilated pupils with altered mental status 	<ul style="list-style-type: none">• Ipsilateral (same side) uncal herniation (lateral herniation of the temporal lobe, caused by increased intracranial pressure)

Blood Glucose Test

Hypoglycemia refers to blood glucose less than or equal to 45 mg/dL in the newly born and less than or equal to 60 mg/dL in a child. It may result in brain injury if not recognized and treated.



Trauma

Temperature

Bleeding

Burns

Purpura

Petechiae

Rash

Hives

Secondary Assessment

Secondary assessment consists of a focused history and detailed physical examination with ongoing reassessment of physiologic status and response to treatment. Components of the secondary assessment are

- Focused history
- Focused physical examination
- Ongoing reassessment

SAMPLE

Signs and symptoms	<p>Signs and symptoms at onset of illness, such as:</p> <ul style="list-style-type: none"> • Breathing difficulty (eg, cough, rapid breathing, increased respiratory effort, breathlessness, abnormal breathing pattern, chest pain on deep inhalation) • Wheezing • Tachypnea • Tachycardia • Diaphoresis • Decreased level of consciousness • Agitation, anxiety • Fever • Headache • Decreased oral intake • Diarrhea, vomiting • Abdominal pain • Bleeding • Fatigue • Time course of symptoms
Allergies	<ul style="list-style-type: none"> • Medications, foods, latex, etc • Associated reactions
Medications	<ul style="list-style-type: none"> • Patient medications, including over-the-counter, vitamins, inhalers, and herbal supplements • Last dose and time of recent medications • Medications that can be found in the child's environment
Past medical history	<ul style="list-style-type: none"> • Health history (eg, premature birth, previous illnesses, hospitalizations) • Significant underlying medical problems (eg, asthma, chronic lung disease, congenital heart disease, arrhythmia, congenital airway abnormality, seizures, head injury, brain tumor, diabetes, hydrocephalus, neuromuscular disease) • Past surgeries • Immunization status
Last meal	<ul style="list-style-type: none"> • Time and nature of last intake of liquid or food (including breast or bottle feeding in infants) • Elapsed time between last meal and presentation of current illness can affect treatment and management of the condition (eg, possible anesthesia, possible intubation)
Events	<ul style="list-style-type: none"> • Events leading to current illness or injury (eg, onset sudden or gradual, type of injury) • Hazards at scene • Treatment during interval from onset of disease or injury until evaluation • Estimated time of onset (if out-of-hospital onset)

Focused Physical Examination

Table 16. Some Examples of Areas to Assess During Physical Examination for Certain Illnesses and Injuries

Illness	Areas to Evaluate
Respiratory distress	<ul style="list-style-type: none">• Nose/mouth (signs of obstruction, nasal congestion, stridor, mucosal edema)• Chest/lungs• Heart (tachycardia, gallop, or murmur)• Level of consciousness (somnolence secondary to hypercardia, anxiety secondary to hypoxia)
Suspected heart failure and/or arrhythmias	<ul style="list-style-type: none">• Heart (gallop or murmur)• Lungs (crackles, difficulty breathing, intolerance of supine position)• Abdomen (evidence of hepatomegaly consistent with right heart failure)• Extremities (peripheral edema)
Trauma	<ul style="list-style-type: none">• Abdomen• Back

Ongoing Reassessment

What is the
purpose of
ongoing
reassessment?

Ongoing reassessment of all patients is essential to evaluate the response to treatment and to track the progression of identified physiologic and anatomic problems. This reassessment should be applied in real time as needed based on the child's clinical condition through all phases of assessment. It should not be limited to the last part of the assessment sequence. New problems also may be identified on reassessment. Data from the reassessment will guide ongoing treatment. The elements of ongoing reassessment are

- The PAT
- The ABCDE of the primary assessment with repeat vital signs, including pulse oximetry
- Assessment of abnormal anatomic and physiologic findings
- Review of the effectiveness of treatment interventions, which may then be reviewed by returning to the PAT in a cyclic manner

Diagnostic Assessments

- Arterial blood gas (ABG)
- Venous blood gas (VBG)
- Capillary blood gas
- Hemoglobin concentration
- Central venous O₂ saturation
- Arterial lactate
- Central venous pressure monitoring
- Invasive arterial pressure monitoring
- Chest x-ray
- ECG
- Echocardiogram
- Peak expiratory flow rate (PEFR)



