Life-threatening conditions in childhood

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Life-threatening condition

Seriously ill child with life-threating condition has potential failure of:

- Respiratory system
- Circulatory system
- Neurological system – central or peripheral

The initial visual and auditory observation of the **child's consciousness, breathing and color** is accomplished within seconds of seeing the child.

The clinical assessment - first quick "from the doorway" observation- should take **less than 1 minute!!!**

Causes of life threating condition

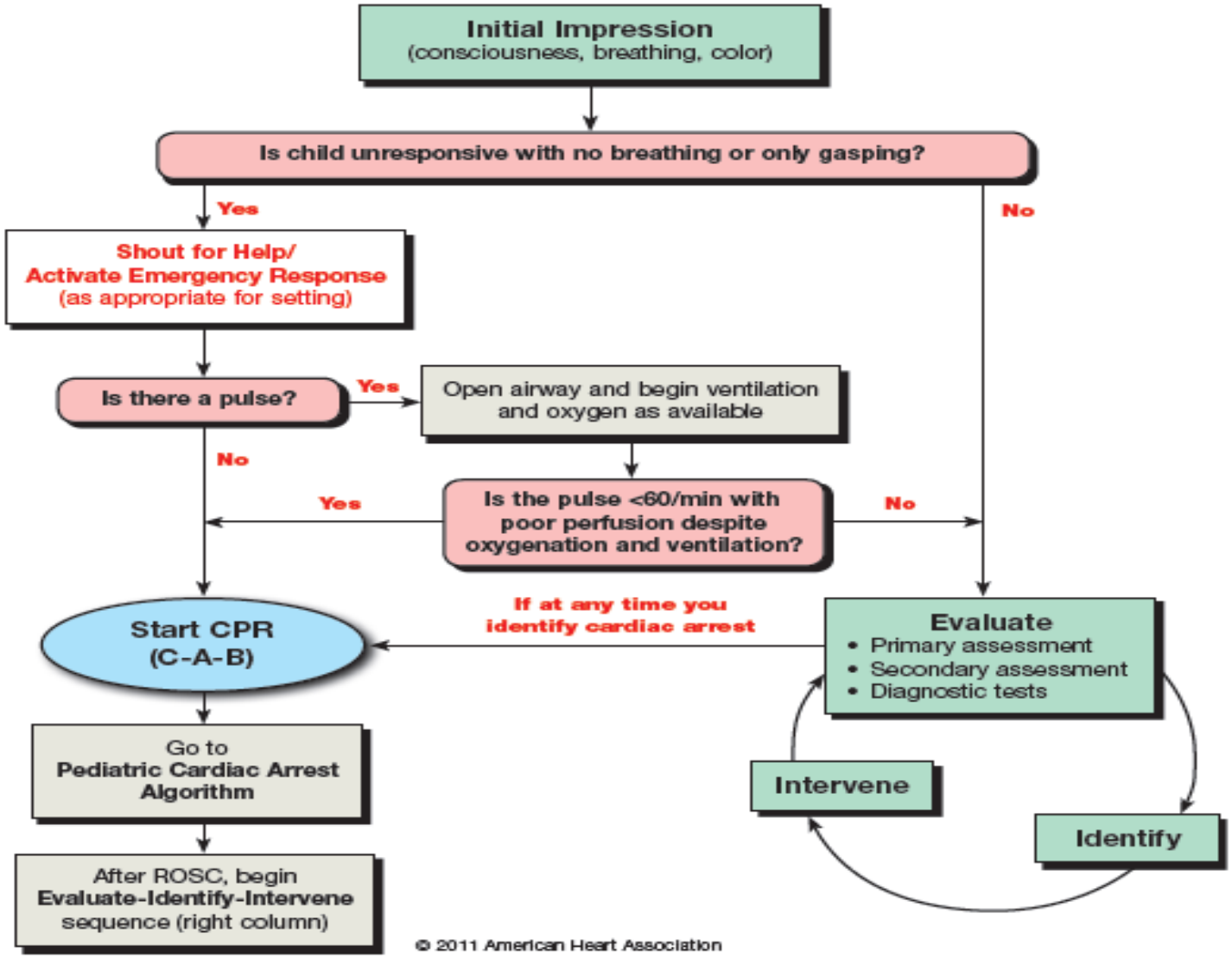
Children	Cause
Infants	Respiratory diseases Infections
1-4 years old	Accidents Drug/ Poision ingestion Oncological diseases Infections (meningitis, encephalitis) Congenital maformation
5-19 years old	Accidents Drug/ Poision ingestion Oncological diseases Infections (meningitis, encephalitis)

Severe ill children - symptoms

- Drowsiness with a complete lack of interest of surrounding
- Excitability and inability to reassure the child
- Weak crying or lack of crying despite painful procedures
- Headache or photophobia
- Malnutrition and lack of appetite
- Persistent vomiting
- Seisures
- Fever or hypothermia
- Dyspnea
- Cyanosis
- Hypotension

Initial impression

Consciousness	• Level of Consciousness (A- alert, V- responds to VOICE, P- Responds to PAIN, U- UNRESPONSIVE)
Breathing	• Increased work of breathing • Absent or decreased respiratory effort • Abnormal sounds heard without auscultation
Color	• Abnormal skin color, eg. cyanosis, pallor, petechiae


Initial Impression
(consciousness, breathing, color)
Is child unresponsive with no breathing or only gasping?
Yes
No
Shout for Help/
Activate Emergency Response
(as appropriate for setting)
Is there a pulse?
Yes
Open airway and begin ventilation and oxygen as available
No
Yes
Is the pulse <60/min with poor perfusion despite oxygenation and ventilation?
No
If at any time you identify cardiac arrest
Start CPR
(C-A-B)
Evaluate
• Primary assessment
• Secondary assessment
• Diagnostic tests
Intervene
Identify
Go to
Pediatric Cardiac Arrest Algorithm
After ROSC, begin
Evaluate-Identify-Intervene
sequence (right column)
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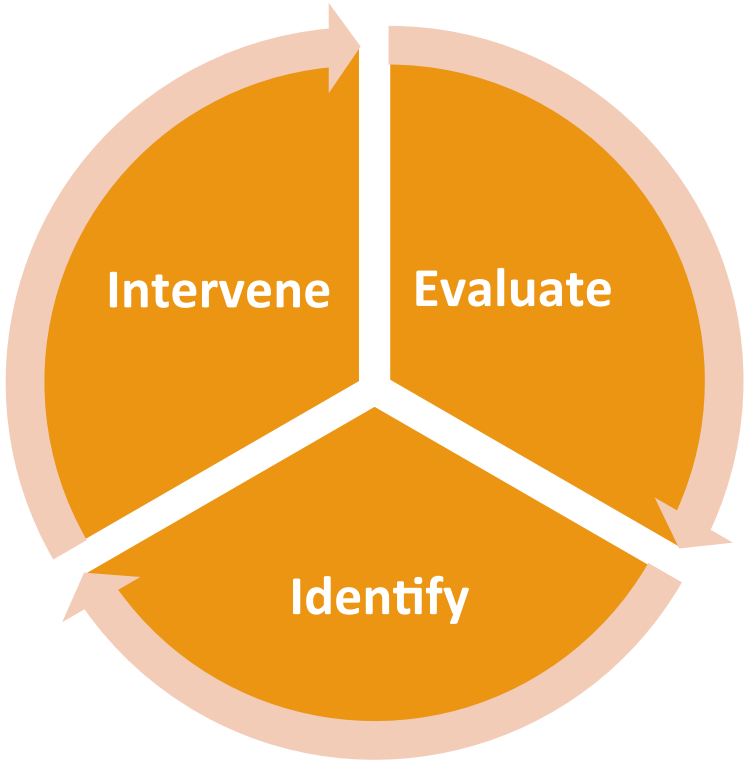
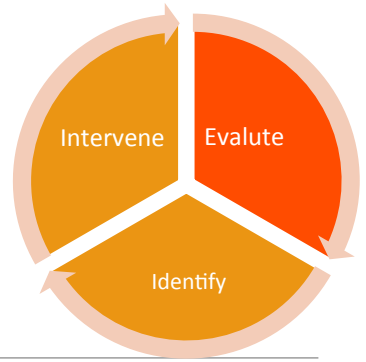
Rapid clinical assessment

1. Use the evaluate - identify - intervene sequence.
2. Always be alert to a life - threatening problem.
3. Identify a life-threatening problem and immediately activate emergency response.



Evaluate



Primary assessment

- ABCDE approach to evaluate respiratory, cardiac and neurologic function
- The assessment of vital signs and pulse oxymetry

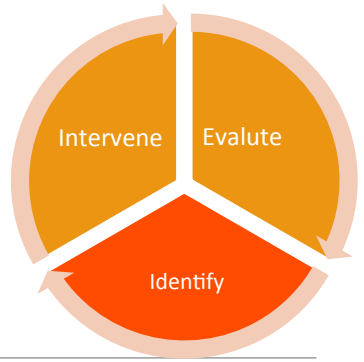
Secondary assessment

- A focused medical history and a physical examination

Diagnostic tests

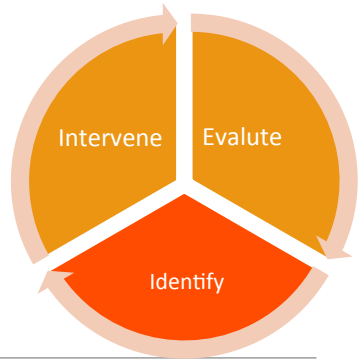
- Laboratory, radiological and other advanced tests that help to identify the child's physiologic condition and diagnosis

Identify



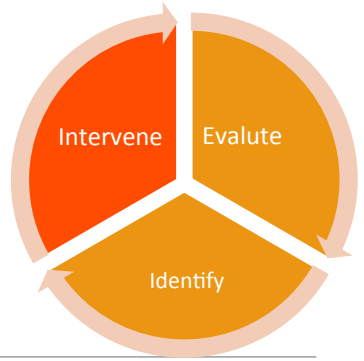
Presentation	Cause	Exemples
Shock	Hypovolaemia	Dehydration- gastroenteritis Diabetic ketoacidosis Blood loss- trauma
	Maldistribution of fluid	Septicaemia, Anaphylaxis
	Cardiogenic	Arrhythmias Heart failure
Respiratory distress	Upper airway obstruction (stridor)	Croup/epiglottis Foreign body Congenital malformation Trauma
	Lower airway disorders	Asthma Bronchiololitis Pneumonia Pneumothorax

Identify



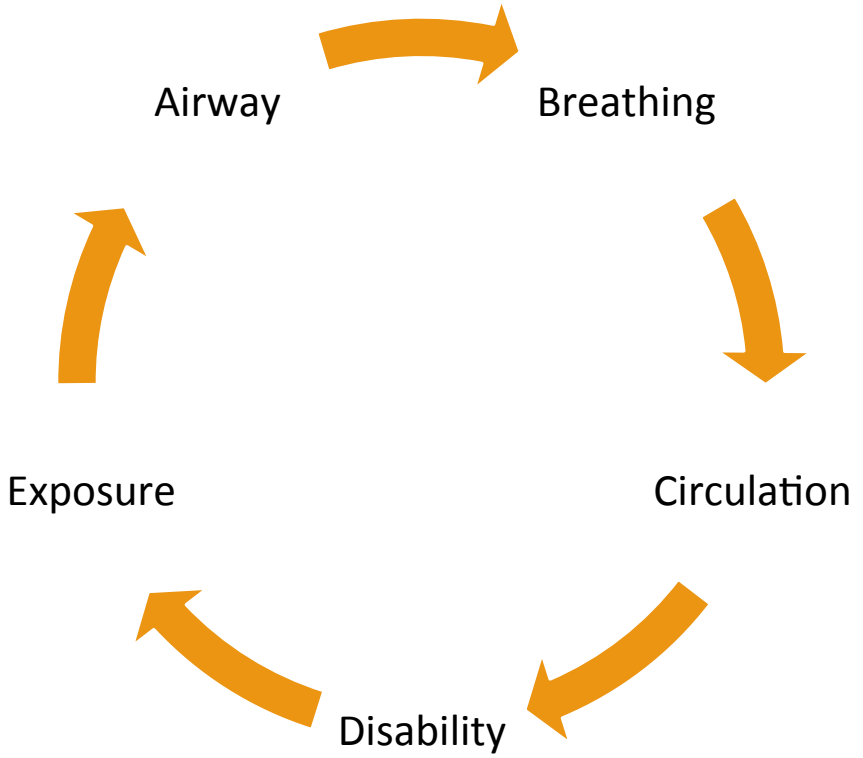
Presentation	Cause	Exemples
The drowsy/ unconscious/seizing child	Postital Status epilepticus	
	Infection	Meningitis, encephalitis
	Metabolic	Diabetic ketoacidosis, hypoglycaemia, electrolyte disturbances (Ca, Mg, Na), inborn error of metabolism
	Head injury	Trauma injury
	Drug/ poison ingestion	
	Intracranial haemorrhage	
Surgical emergencies	Acute abdomen	Appendicitis, Peritonitis
	Intestinal obstruction	Intussusception, malrotation, bowel atresia/ stenosis

Intervene



1. Establish a diagnosis and intervene with appropriate action
2. Positioning the child to maintain a patent airway
3. Activating emergency response
4. Starting CPR
5. Placing the child on a cardiac monitor and pulse oximeter
6. Support ventilation
7. Starting drugs and fluids

Primary assessment - ABCDE



Life Threatening Signs

A- airway	complete or severe airway obstruction
B- breathing	apnea, significant increased work of breathing, bradypnea
C-circulation	absence of palpable pulses, poor perfusion, hypotension, bradycardia
D-disability	unresponsiveness, decreased level of consciousness
E-exposure	significant hypothermia, significant bleeding, petichae or purpura consistent with septic shock

Airway

Assess upper airway patency

1. Look for movement of chest or abdomen
2. Listen for air movement and breath sounds

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

Upper airway obstruction

Signs suggest upper airway obstruction:

1. Increase inspiratory effort with retraction
2. Abnormal inspiratory sounds
3. Episodes where no airway or breath sounds are present despite respiratory effort

Airway

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

Use head tilt-chin lift or jaw thrust to open the airway
(in case of cervical spine injury suspect, open airway by using a jaw thrust without neck extension).

Avoid overextending the head/neck in infants because this may occlude the airway

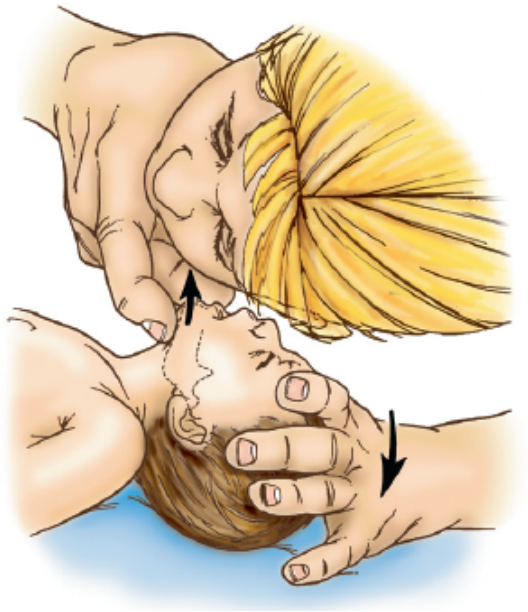
Suction the nose and oropharynx.

Perform foreign- body airway obstruction relief tech if suspect that child has aspirated foreign body

<1 yr old, a combination of 5 back blows and 5 chest thrusts, >1 yr old, providers should give a series of 5 abdominal thrusts (Heimlich maneuver)

Cardiopulmonary resuscitation

Head tilt-chin lift



Jaw thrust

Cardiopulmonary resuscitation

- A: airway
- B: breathing
- C: circulation
- D: drugs

Mouth-to-mouth breathing in an older child

Cardiac massage in an infant

Newborn: 5 initial breaths, then 3:1

Child: 5 initial breaths, then 15:2

Cardiac massage in an older child

Breathing

Assessment of breathing includes:

1. Respiratory rate
2. Respiratory effort
3. Chest expansion and air movement
4. Lungs and airways sound
5. O2 saturation by pulse oxymetry

Respiratory rate

Age	Normal	Tachypnoe
Neonate	30-50	>60
Infants	20-30	>50
Young chidren	20-30	>40
Older children	15-20	>30

Abnormal respiratory rate

Tachypnea :

- First sign of respiratory distress in infants
- Tachypnea without signs of increased respiratory effort.

Bradypnea:

- Possible caused -> respiratory muscle fatigue, central nervous system injury, infection, hypothermia or medication that causes breathing suppression.

Apnea:

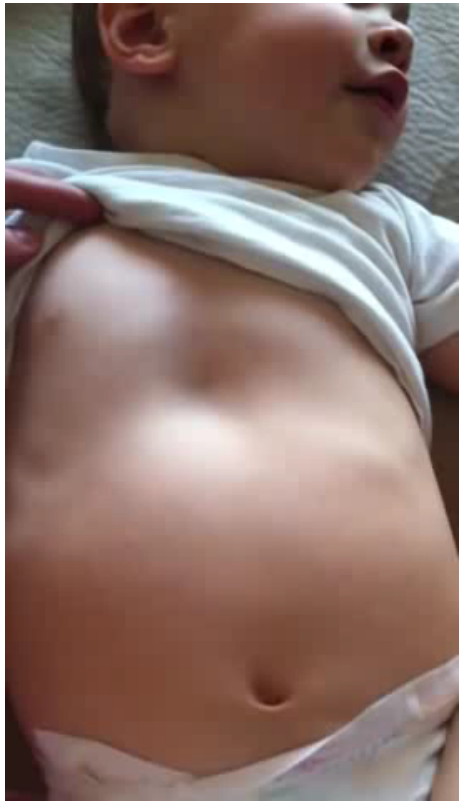
- Cessation of breathing for 20 seconds or cessation for less than 20 sec if accompanied by bradycardia, cynosis or pallor.

Respiratory effort

Signs of increase respiratory effort include:

- Nasal flaring - dilatation of nostrils with each inhalation. Most common in infant and younger children
- Retractions - inward movement of the chest wall or tissues, neck or sternum during inspiration.
- Seesaw respiration- chest retract and abdomen expand during inspiration.

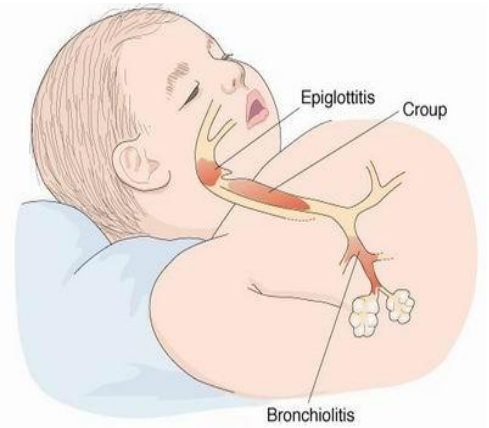
Retractions



Lungs and airway sounds

Stridor:

- Harsh vibrating sound heard during respiration in cases of obstruction of the air passages
- Sign of upper airway obstruction
- Indicate – obstruction is critical and requires immediate intervention.
- Causes: foreign body airway obstruction (FBAO), Croup , laryngomalacia, tumor or cyst, upper airway edema



Stridor

Lungs and airway sounds

Grunting

- Typically a short, low pitched sound heard during expiration
- Misinterpreted as soft cry
- Sign of lung tissue disease resulting from small airway collapse or alvelolar collapse
- Causes: pneumonia, ARDS, Pulmonary contusion

Gurgling:

- Bubbling sound heard during inspiration or expiration
- Results from upper airway obstruction, enlarged airway secretions, vomting or blood.

Grunting

Lungs and airway sounds

Wheezing

- High pitched or low pitched whistling sound heard most often during expiration.
- Indicate lower airway obstruction.
- Causes: Bronchiolitis and Asthma

Crackles/ Rales:

- Sharp creckling inspiratory sounds.
- Dry crackles: atelectasis and interstitial lung disease
- Moist crackles: indicate accumulation of alveolar fluid.

Circulation

Circulation assessed by evaluation of:

- Heart rate and rhythm

Bradycardia: heart rate slower than normal for child's age. Most common cause- hypoxia

Tachycardia: heart rate faster than normal for child's age.

- Pulse
- Capillary refill time
- Skin color and temp
- Blood pressure

Age	Awake rate	Mean
Newborn to 3 months	85-205	140
3 month to 2 yrs	100-190	130
2 yrs to 10 yrs	60-140	80
> 10 yrs	60-100	75

Pulses

Evaluation of pulses is critical to assessment of systemic perfusion in an ill or injured child.

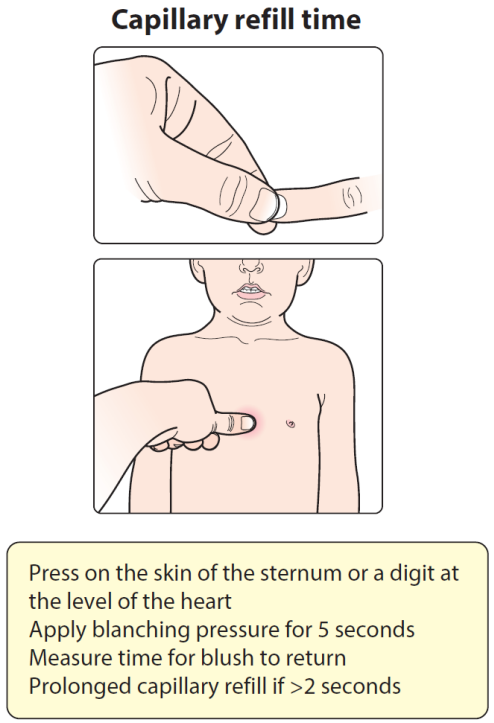
- Central pulses: brachial (in infants), carotid (older children) , femoral, axillary
- Peripheral: radial, dorsalis pedis , post. tibial.

Weak central pulses are worrisome and indicate need for very rapid intervention to prevent cardiac arrest.

Beat to beat fluctuation in pulse volume may occur in children with arrythemias.

Capillary refill time

- Time takes for blood to return to tissue blanched by pressure.
- Increase as skin perfusion decrease.
- Prolonged CFT indicate low cardiac out put.
- Normal CFT <= 2
- To evaluate CFT lift extremity slightly above the level of the heart, press on the skin and rapidly release the pressure.



Capillary refill time

Skin color

Mucous membrane, nail beds, palms and soles should be pink.

When perfusion deteriorates and oxygen delivery to tissue becomes inadequate **the hands and feet** are typically affected first. They may become cool , pale, dusky or mottled.

Pallor:

- Decreased blood supply to the skin (cold, stress, shock)
- Anemia
- Decreased skin pigmentation

Skin color

Mottling:

- Irregular or patchy discoloration of the skin.
- Serious condition such as hypoxemia, hypovolemia or shock, may cause intense vasoconstriction from an irregular supply of oxygenated blood to the skin, leading to mottling.

Cyanosis:

- Peripheral cyanosis: bluish discoloration of hands and feet. Seen in shock, cold exposure, arterial obstruction (e.g. peripheral vascular disease, Raynaud phenomenon)
- Central cyanosis: bluish discoloration of lips and other mucous membranes. Causes: low ambient oxygen tension, congenital heart disease, bronchospasm, pulmonary hypertension

Disability

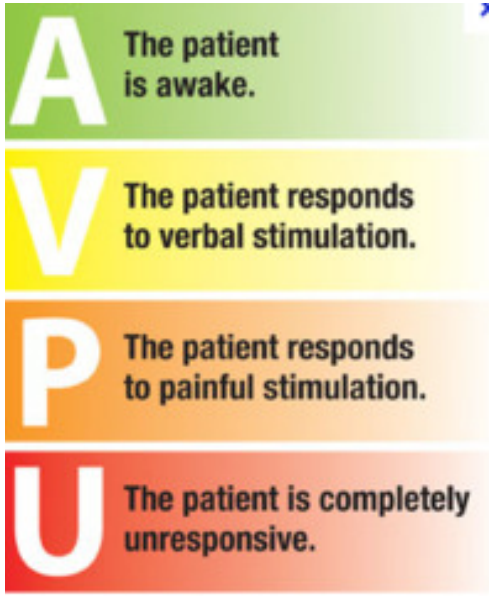
Disability assessment is a quick evaluation of neurologic function.

Clinical signs of brain perfusion are indicators of circulatory function in the ill or injured patient.

Signs include:

- level of consciousness
- muscle tone
- pupil response

Signs of inadequate oxygen delivery to the brain correlate with the severity and duration of cerebral hypoxia.



Disability

Standard evaluations include

- AVPU pediatric response scale
- GCS
- Pupil response to light

A	The child is **awake**, alert, and interactive with parents and care providers
V	The child responds only on the **voice** of care provider or parents call the child's name or speak loudly
P	The child responds only to **painful** stumuli, such as pinching the nail bed of a toe or fingeer
U	The child is **unresponsive** to all stumuli

PEDIATRIC GLASGOW COMA SCALE (PGCS)				
	> 1 Year		**< 1 Year**	**Score**
EYE OPENING	Spontaneously		Spontaneously	4
	To verbal command		To shout	3
	To pain		To pain	2
	No response		No response	1
MOTOR RESPONSE	Obeys		Spontaneous	6
	Localizes pain		Localizes pain	5
	Flexion-withdrawal		Flexion-withdrawal	4
	Flexion-abnormal (decorticate rigidity)		Flexion-abnormal (decorticate rigidity)	3
	Extension (decerebrate rigidity)		Extension (decerebrate rigidity)	2
	No response		No response	1
	> 5 Years	**2-5 Years**	**0-23 months**	
VERBAL RESPONSE	Oriented	Appropriate words/phrases	Smiles/coos appropriately	5
	Disoriented/confused	Inappropriate words	Cries and is consolable	4
	Inappropriate words	Persistent cries and screams	Persistent inappropriate crying and/or screaming	3
	Incomprehensible sounds	Grunts	Grunts, agitated, and restless	2
	No response	No response	No response	1
TOTAL PEDIATRIC GLASGOW COMA SCORE (3-15):				

Pupils response to light

- Indicator of brainstem function
- Pupils fail to constrict in response to direct light → suspect brain stem injury
- Irregularities in pupil size or response to light → ocular trauma or ICP
- Assess size of pupils, equality of pupil size, constriction pupil to light

Exposure

- Undress the seriously ill and injured child is necessary
- Maintain cervical spine precaution when suspected neck or spine injury
- Look for petechiae and purpura → septic shock

Differential diagnosis

- Schoenlein-Henoch disease - a systemic vasculitis and is characterized by deposition of immune complexes containing the antibody IgA
  - Rash- purpura- petechiae (typically on legs and buttocks)
  - Arthralgia
  - Periarticular oedema
  - Abdominal pain
  - Glomerulonephritis

- Scarlet fever- an infectious disease caused by group A Streptococcus bacteria (group A strep
  - Sore throat, strwaberry tongue
  - Fever
  - Red rash

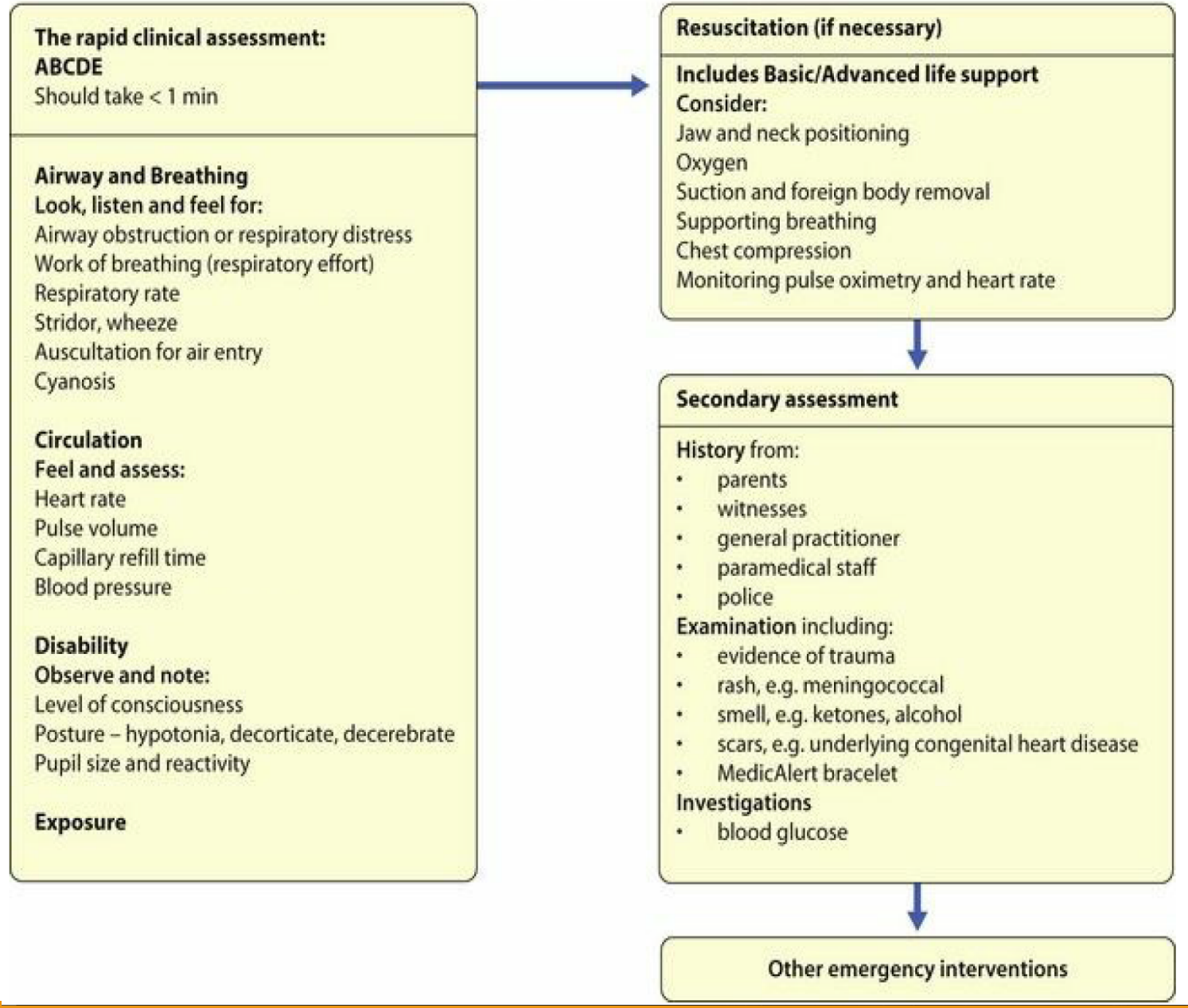
Secondary assessment

Focused history

S	Signs and symptoms: breathing difficulty, decrease level of consciousness, agitation, anxiety, fever, decrease oral intake, diarrhea, vomiting , bleeding, fatigue, time course of symptoms
A	Allergies: medication, foods , latex
M	Medications: name of drug, duration, last dose
P	Past medical history Health history (premature birth), significant underlying medical problem, past surgeries, immunization
L	Last meal- time and nature of last intake of lipid or food
E	Event leading to current illness or injury, treatment during interval from onset of disease or injury until evaluation, estimated time of arrival

Diagnostic test

- Blood tests: Arterial blood gas, Venous blood gas, Hb, Arterial lactate, Glucose
- O2 saturation
- Central venous pressure monitoring
- Invasive arterial pressure monitoring
- Chest X-ray
- ECG
- Echocardiography


The rapid clinical assessment:
ABCDE
Should take < 1 min
Airway and Breathing
Look, listen and feel for:
Airway obstruction or respiratory distress
Work of breathing (respiratory effort)
Respiratory rate
Stridor, wheeze
Auscultation for air entry
Cyanosis
Circulation
Feel and assess:
Heart rate
Pulse volume
Capillary refill time
Blood pressure
Disability
Observe and note:
Level of consciousness
Posture – hypotonia, decorticate, decerebrate
Pupil size and reactivity
Exposure
Resuscitation (if necessary)
Includes Basic/Advanced life support
Consider:
Jaw and neck positioning
Oxygen
Suction and foreign body removal
Supporting breathing
Chest compression
Monitoring pulse oximetry and heart rate
Secondary assessment
History from:
parents
witnesses
general practitioner
paramedical staff
police
Examination including:
evidence of trauma
rash, e.g. meningococcal
smell, e.g. ketones, alcohol
scars, e.g. underlying congenital heart disease
MedicAlert bracelet
Investigations
blood glucose
Other emergency interventions

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