

PALS Study Guide

Study Guide Contents

- PALS Primary Assessment 3
 - Respiratory Problems..... 3
- PALS & Respiratory Distress and Failure 3
 - Management of Pediatric Respiratory Distress and Failure 3
 - General Management Interventions 3
 - Respiratory Case #1: Upper Airway Obstruction 4
 - Respiratory Problem 4
 - Management of Croup..... 4
 - Management of Airway Swelling (Anaphylaxis) 5
 - Management of F.B. Obstruction 5
 - Respiratory Case #2: Lower Airway Obstruction 5
 - Respiratory Problem 5
 - Management of Bronchiolitis 5
 - Management of Asthma 5
 - Respiratory Case #3: Lung Tissue Disease..... 6
 - Respiratory Problem 6
 - Respiratory Case #4: Disordered Control of Breathing..... 6
 - Respiratory Problem 6
- PALS & Shock..... 7
 - Shock Case #1: Hypovolemic Shock 7
 - Signs and Symptoms of Pediatric Hypovolemic Shock 7
 - Treatment 8
 - General management of Pediatric Shock 8
 - Shock Case #2: Distributive Shock 9
 - General Physiology of Distributive Shock 9
 - Treatment of Septic Shock 9
 - Shock Case #3: Cardiogenic Shock 10
 - Shock Case #4: Obstructive Shock 10
 - Tension Pneumothorax..... 10
 - Cardiac Tamponade 10

PALS Study Guide

Pulmonary Embolism 11

Shock Case #5: Compensated Shock..... 11

What You Need To Know 11

PALS & Capillary Refill Time 12

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PALS Primary Assessment

Use the ABC's to complete the pediatric primary assessment in children.

- A. **Airway:** Look for movement of chest or abdomen. Listen for air movement and breath sounds.
- B. **Breathing:** Respiratory rate (RR), effort, lung and airway sounds, and Oxygen (O₂) saturation on oximetry. Consistent RR of less than 10 or more than 60 breaths/min in a child of any age is ABNORMAL and suggests a serious problem. Head bobbing, mostly seen in infants, indicates increased risk for deterioration and is a sign of respiratory failure.
- C. **Circulation:** Heart rate (HR) and rhythm, pulses, capillary refill time, skin color, and blood pressure.

Respiratory Problems

Respiratory Distress – Tachypnea, increased respiratory effort, grunting, stridor, wheezing, seesawing or "abdominal" breathing, and/or head bobbing.

Respiratory Failure – Bradypnea, apnea, falling HR/brady, diminished air. Movement, stupor, coma, poor muscle tone, cyanosis.

PALS & Respiratory Distress and Failure

Management of Pediatric Respiratory Distress and Failure

A large amount of pediatric emergencies are a result of respiratory problems which, if not treated quickly and appropriately, can result in cardiopulmonary arrest.

Early recognition and treatment, thus, is of the utmost importance to improve the outcome of pediatric emergencies.

There are four (4) main respiratory problems that must be addressed for management of pediatric respiratory distress and failure:

1. Upper airway obstruction,
2. Lower airway obstruction,
3. Lung tissue disease, and
4. Disordered control of breathing.

General Management Interventions

There are general management interventions that will apply to all the above listed respiratory problems. This is for stabilizing the condition of the patient while looking for the cause of their respiratory emergency.

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General AIRWAY intervention

1. Maintain an open airway.
2. Clear the airway, if necessary.
3. Consider basic airway adjuncts, such as an oropharyngeal airway (OPA) and nasopharyngeal airway (NPA).

General BREATHING Interventions

1. Monitor the O₂ saturation noninvasive pulse oximetry.
2. Administer O₂ if saturation is <94%.
3. Provide assisted ventilations with bag-valve-mask (BVM).
4. Administer inhaled medications to help improve breathing.
5. Prepare for the possibility of endotracheal intubation.

General CIRCULATION Intervention

1. Important to monitor HR, heart rhythm, and blood pressure.
2. Establish IV or IO access.

Respiratory Case #1: Upper Airway Obstruction

Respiratory Problem

Upper airway obstruction is a common cause of pediatric respiratory distress and failure. The most common causes of upper airway obstruction are infection (croup, epiglottitis, etc.), airway swelling (anaphylaxis), and foreign body airway obstruction.

Major signs that will help to identify upper airway obstruction:

1. Tachypnea, a change in the child's voice or cry, cough that sounds like a bark, inspiratory STRIDOR, poor chest rise, and nasal flaring.
2. Urgent Intervention needed when hypoxia, fatigue, or decreasing conscious state present.
3. Increased effort to breath.

Management of Croup

Mild or moderate croup can be treated with steroids (dexamethasone) or epinephrine nebulizer.

Severe croup can lead to respiratory failure. Increased lethargy or a decreased level of consciousness will often make the barking cough sound weaker, stridor may become less pronounced and retractions weaker, and pallor and cyanosis may be present.

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Management of Airway Swelling (Anaphylaxis)

Administer IM epinephrine. Provide Albuterol for bronchospasm, if needed.

Prepare for possible endotracheal intubation if severe respiratory distress or failure develops.

Management of F.B. Obstruction

If able to cough and make sounds, allow child to clear obstruction themselves.

If conscious with complete obstruction and not able to cough or make noise:

- If <1 year old, give 5 back slaps and follow with 5 chest thrusts;
- If >1 year old, give abdominal thrusts; or
- If child is unresponsive, begin CPR.

Respiratory Case #2: Lower Airway Obstruction

Respiratory Problem

Lower airway obstruction is a common cause of respiratory distress and failure in infants and children.

Two most common types of lower airway obstruction seen in infants and children are asthma and bronchiolitis.

Management should always start with general interventions for management of distress and failure.

Management of Bronchiolitis

- Oral corticosteroids
- Inhaled bronchodilators
- Maintain O₂ saturation >94%

Management of Asthma

- Mild Asthma – Breathless with activity, able to talk, RR slightly elevated, moderate wheezing. Treat with high concentration of O₂, nebulized Albuterol, or corticosteroids
- Moderate Asthma – Breathless when talking, able to talk in phrases, RR elevated, loud wheezing. Treat same as mild asthma.
- Severe Asthma – Breathless when at rest, talk very little, RR significantly elevated. Loud wheezing may diminished along with lung sounds. Treat with epinephrine.
- Impending Failure – Drowsy or confused, speech will be absent, RR inadequate or ceases, wheezes or lung sounds absent, bradycardia late sign of complete failure. Treat with endotracheal intubation!

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Respiratory Case #3: Lung Tissue Disease

Respiratory Problem

Lung tissue disease involves a varied number of disease processes that affect the lowest portion of the lungs where exchange of carbon dioxide and O₂ take place.

Lung tissue disease symptoms progress as a result of impaired gas exchange related to alveolar collapse, fluid infiltration, and/or inflammation.

Signs – crackles, decreased breath sounds, and grunting.

Common disease processes:

1. Infectious pneumonia
2. Chemical pneumonitis
3. Aspiration pneumonia
4. Cardiogenic pulmonary edema
5. Non-cardiogenic pulmonary edema

Respiratory Case #4: Disordered Control of Breathing

Respiratory Problem

There are a number of causes of disordered control of breathing. Some of the most common causes are increased intracranial pressure, CNS depression, and neuromuscular disease.

Common symptoms:

- Irregular RR “funny breathing”
- Shallow breathing
- Central apnea

Common finding that can help identify DCB is that it is likely that the child's lung sounds will be normal since the cause is not associated with any respiratory pathology.

The main intervention is to stop the seizure and then support the airway and ventilation.

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PALS & Shock

Pediatric shock is a condition that occurs when the delivery of O₂ and nutrients to the organs and tissues of the body is compromised.

Metabolic demands of the body are not met.

Types of pediatric shock:

- Hypovolemic
- Distributive
- Cardiogenic
- Obstructive

Shock results from a failure in one of the following components:

1. Sufficient cardiac output – Enough O₂ saturated blood to meet demands of tissue and organs.
2. Adequate hemoglobin – Sufficient O₂ saturated hemoglobin.
3. Proper distribution – Dilated or constricted blood vessels.

Signs and symptoms of shock have to do with the following compensatory changes:

- Tachycardia – Body attempts to maintain cardiac output to increase HR. As HR increases the cardiac filling time shortens. Leads to decrease in cardiac output.
- Vasoconstriction – An attempt to maintain adequate O₂ delivery to vital organs by vasoconstriction, which reduces blood flow to non-vital tissues such as skin, kidneys, and intestines. Compensatory mechanism of vasoconstriction can present as slowed capillary refill, cool, pale and mottled skin and weak peripheral pulses.

Shock Case #1: Hypovolemic Shock

Hypovolemic shock occurs as a result of a reduction in intravascular fluid volume.

The decrease in cardiac output ultimately leads to inadequate delivery of O₂ and nutrients to the tissues and organs (shock).

The loss of intravascular fluid volume, which causes hypovolemic shock, can have a number of causes including dehydration from vomiting & diarrhea, hemorrhage, decreased intake of fluids, pathologic urinary losses and loss of fluids due to burns, peritonitis, and small bowel obstruction.

Hypovolemic shock is the most common form of shock in children. The most common form of hypovolemic shock in children worldwide is dehydration due to diarrhea.

Signs and Symptoms of Pediatric Hypovolemic Shock

The Primary Assessment (ABCDE) of the pediatric Systematic Approach algorithm can be used to identify the symptoms of shock in children.

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- A. **Airway** will be affected
- B. **Breathing** changes might be evident such as non-labored tachypnea
- C. The most notable changes will likely be in **circulation**. These changes include tachycardia, narrowing pulse pressure, possible systolic hypotension, capillary refill time >2 seconds, cool/pale skin, weak to absent peripheral pulses, reduced urine output.
- D. **Disability** or neurological changes include decreased level of consciousness.
- E. **Exposing** the patient – It's better to see cool, pale, and mottled skin.

Treatment

The main treatment is fluid resuscitation using rapid boluses of IV fluids (NS, LR). Normal minimum dosing is at least three boluses of 20mg/kg over 5-10 minutes each bolus.

Indication of improvement would be a decrease in HR, improved urine output, decreased respiratory rate, and improved level of consciousness.

If a result of blood loss shock boluses of IV fluids may not improve condition. In this case PRBCs may be indicated.

Things to Consider During Treatment

Blood pressure may remain normal and a critically ill child may still have signs of shock.

Systolic pressure alone is not a good early indicator of shock because of highly effective compensatory mechanisms.

When hypotension does develop, this is a sign the compensatory mechanisms are no longer effective for maintaining cardiac output. This is an **ominous sign** and can be an indication of impending cardiac arrest.

Common signs and symptoms of deterioration with shock:

- Worsening tachycardia
- Continued narrowing of pulse pressure
- Changes in level of consciousness
- Weakening of central pulses
- Hypotension, which is a late sign

General management of Pediatric Shock

Three (3) general actions that should take place:

1. Improve cardiac output – Rapid intravascular volume expansion with the use of isotonic IV fluids (i.e., fluid resuscitation obtain IV or IO quickly).
2. Improve level of O₂ in blood saturation to 100% of O₂.
3. Decrease body's O₂ demand.

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Shock Case #2: Distributive Shock

Distributive shock occurs as a result of **excessive vasodilation and possibly increased capillary permeability (leaky blood vessels)** which leads to an abnormal distribution of blood volume.

This abnormal distribution of blood leads to inadequate O₂ and nutrient delivery to the tissues and organs.

Distributive shock is similar to hypovolemic shock in that there is **less blood volume in the arterial circulatory system** to ensure adequate cardiac output.

The volume of fluid is still in the body, but it is not in the right place to ensure adequate cardiac output. In contrast, hypovolemic shock the fluid is actually lost from the body.

There are **3 subtypes of distributive shock** and the most common is septic shock. Two less common are neurogenic and anaphylactic shocks.

General Physiology of Distributive Shock

Even though the fluid volume remains in the body, it is in the wrong place!

This results in decreased arterial fluid volume, results in decreased cardiac output

Treatment of Septic Shock

1. Recognize signs of poor perfusion early
 - Decreased mental status
 - Cold extremities
 - Delayed capillary refill
 - Weak pulses
 - Low urine output
 - Hypotension, late in signs
2. Assess ABCs
 - 100% oxygen
 - Early intubation if needed
 - Breathing assistance, ventilator
3. Establish IV or IO
4. Fluid resuscitation
 - Push 20ml/kg over 5-20/min
5. Correct hypoglycemia
6. Infection control by starting antibiotics ASAP

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Shock Case #3: Cardiogenic Shock

Cardiogenic shock occurs when adequate O₂ and nutrient delivery to the organs and tissues of the body is compromised as a direct result of myocardial dysfunction.

In other words, there is **failure of the heart to effectively pump blood**. Common causes of myocardial dysfunction that lead to shock include cardiomyopathy, myocarditis, arrhythmias, congenital heart disease, and post-op period after cardiac surgery.

Can lead to other forms of shock as a result of inadequate O₂ delivery to the myocardium.

The natural compensatory response when cardiogenic shock occurs is tachycardia with increased vasoconstriction.

Unlike other forms of shock where aggressive fluid resuscitation is necessary, with cardiogenic shock it can be counterproductive causing fluid overload and pulmonary edema.

Shock Case #4: Obstructive Shock

Obstructive shock occurs when adequate O₂ and nutrient delivery to the organ and tissues of the body is compromised as a direct result of an obstruction to flow into or out of the heart.

If blood flowing **INTO** the heart is obstructed it causes a decrease in cardiac output because of impaired diastolic filling. If blood flowing **OUT OF** the heart is obstructed it causes a decrease in cardiac output because of excessive afterload.

Common causes are tension pneumothorax, cardiac tamponade, and pulmonary embolism.

Tension Pneumothorax

1. Trauma, asthma, cystic fibrosis, pneumonia, excessive ventilation.
2. Air accumulates in pleural space but cannot escape.
3. Increases pressure and obstructs venous blood return to heart.
 - Tracheal deviation
 - Increased work of breathing, respiratory distress, diminished lung sounds
 - JVD, severe hypertension, tachycardia degrades to bradycardia,
 - Decreased level of consciousness
 - Pale, cool extremities

Treat with needle decompression with chest tube placement.

Cardiac Tamponade

Accumulation of fluid or blood within the pericardial sac.

Primary treatment is pericardiocentesis.

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Pulmonary Embolism

Pulmonary artery or its branches become partially or totally occluded.

Common causes include blood clots, air and fat.

Primary treatment is anticoagulant therapy or fibrinolytic therapy.

Confirm by CT scan, echocardiography, or angiography.

Shock Case #5: Compensated Shock

What You Need To Know

The signs and symptoms of compensated and decompensated shock are different, and if shock is left untreated it can be lethal. For this reason, it is imperative that shock is treated as early as possible to avoid reaching the irreversible phase. Shock can occur in many emergency medical scenarios, including those with massive blood loss (internal or external). It can also occur when there are severe fractures, during a spinal, abdominal or chest injury, when a severe infection or major heart attack occurs, and during anaphylaxis. When shock is suspected or observed, taking frequent vital signs and assessing the mental state of the patient is the best way to monitor the progression of shock.

With compensated shock, the body is experiencing a state of low blood volume but is still able to maintain blood pressure and organ perfusion by increasing the HR and constricting the blood vessels. If responding to an emergency in which shock is suspected, a quick assessment of the patient should be completed to measure the level of consciousness, mental state and vital signs.

Symptoms of compensated shock include:

- Agitation, restlessness and anxiety
- Altered mental status
- Tachycardia or tachypnea
- Change in pallor, cyanosis around the lips, or clammy skin
- Nausea or vomiting
- Thirst
- Weak, thready or absent pulse
- Narrowing pulse pressure
- Shallow, rapid breathing
- Mental status may be normal, in the early stages

For treating compensated shock, the initial step is going to be identifying the cause of shock and treating it. Once that is done, measures to treat shock can be taken. During transport, this is typically applying high-flow O₂ and warming blankets to maintain a temperature in the normal range. Inadequate ventilation can be a major factor in the development and progression of shock. Continue to monitor vital signs and mental state every few minutes and note any changes.

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PALS & Capillary Refill Time

CRT assessment advised as part of primary circulation assessment.

Capillary refill should occur within 2 seconds.

Frequent causes of sluggish, delayed, or prolonged capillary refill include:

- Dehydration
- Shock
- Hypothermia

Shock can be present despite a normal CRT.

Children with emergency signs, CRT greater than 3 seconds, require immediate treatment to avert death.

CRT <3 seconds, check for a pulse.

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