



Chapter 10

Shock

Introduction (1 of 3)

- Shock (hypoperfusion) means a state of collapse and failure of the cardiovascular system.
 - In the early stages, the body attempts to maintain homeostasis.
 - As shock progresses, blood circulation slows and eventually ceases.

Introduction (2 of 3)

- Shock can occur because of medical or traumatic events.
 - Heart attack
 - Severe allergic reaction
 - Automobile crash
 - Gunshot wound

Introduction (3 of 3)

- As an EMT, you cannot go wrong assuming that every patient is in shock or may go into shock.

Pathophysiology (1 of 9)

- Perfusion is the circulation of an adequate amount of blood to meet the cells' current needs.
 - The body is perfused via the circulatory system.
 - Organs, tissues, and cells must have adequate oxygenation or they may die.

Pathophysiology (2 of 9)

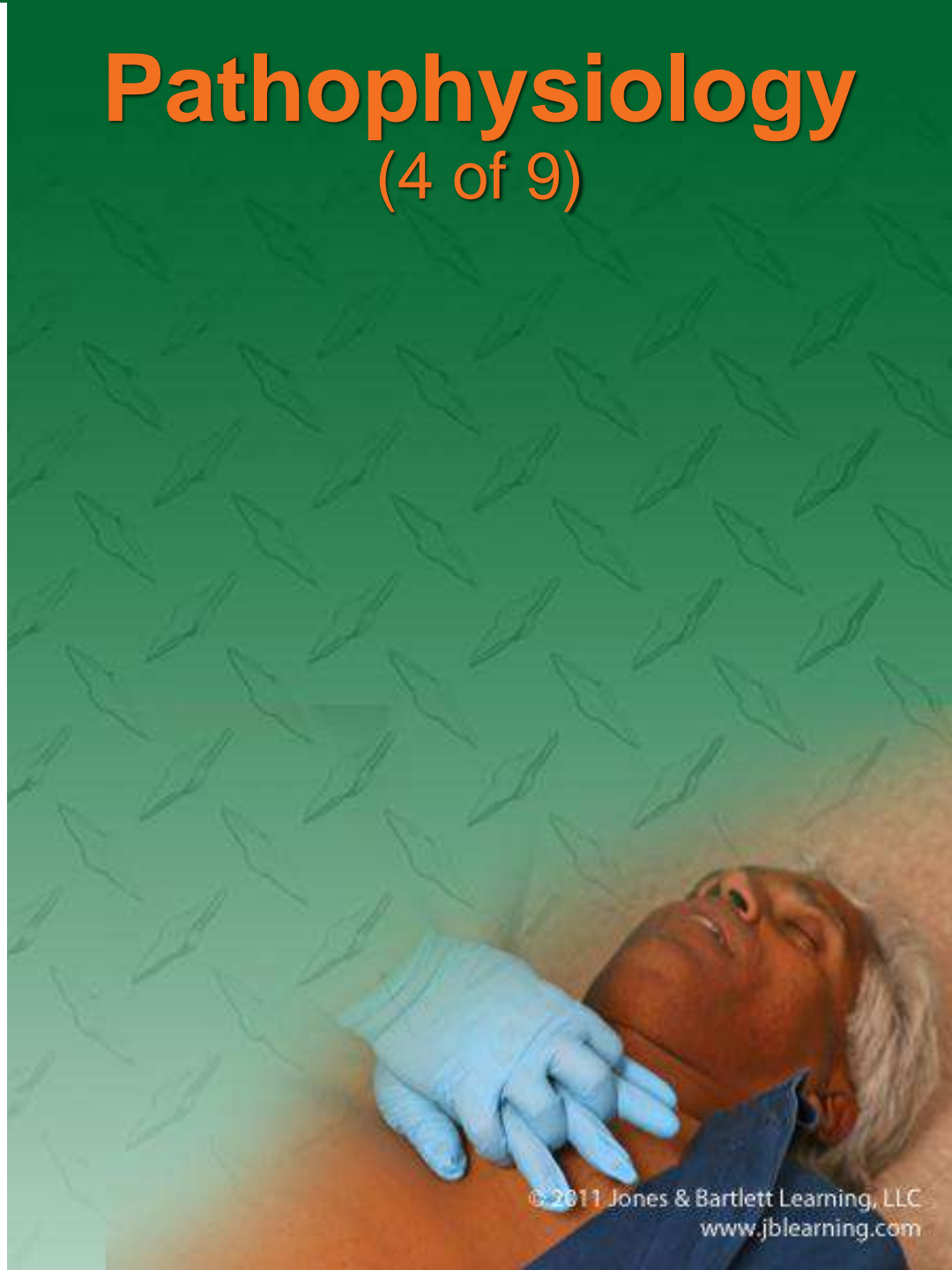
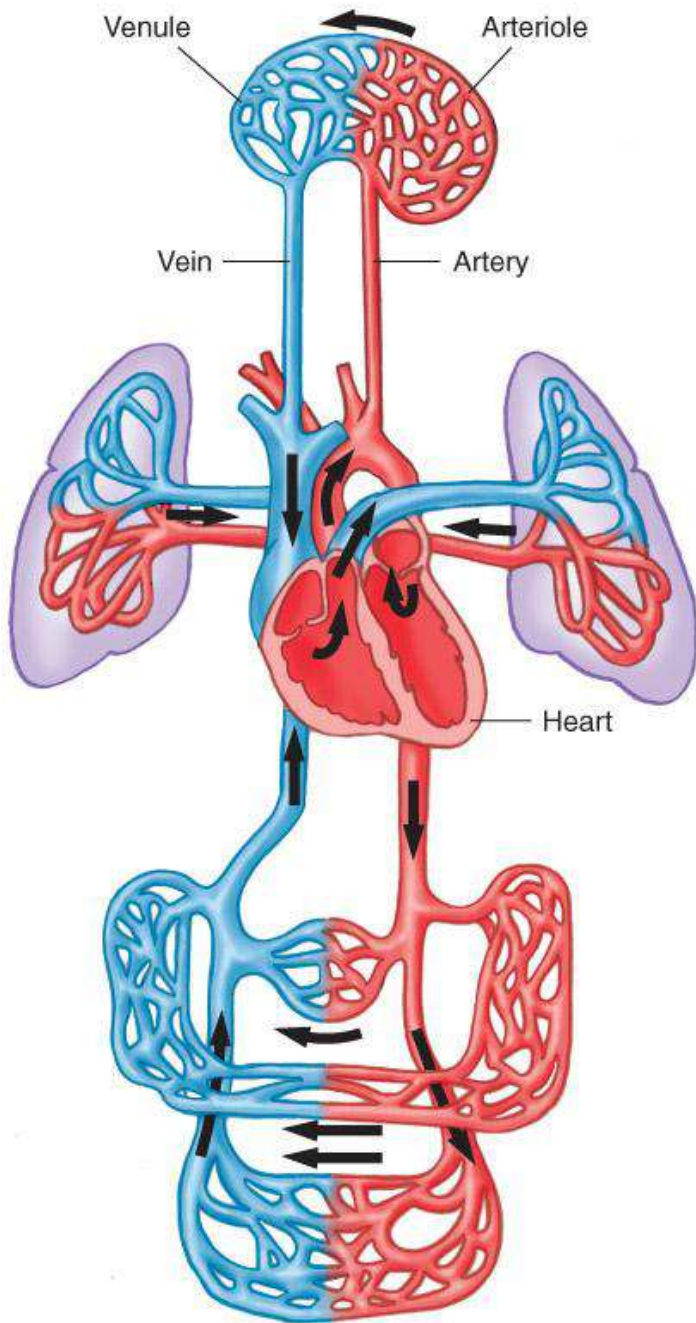
- Shock refers to a state of collapse and failure of the cardiovascular system that leads to inadequate circulation.
 - Shock is an unseen life threat caused by a medical disorder or traumatic injury.
 - If the symptoms of shock are not promptly addressed, the patient will soon die.

Pathophysiology (3 of 9)

- Cardiovascular system has three parts:
 - Pump (heart)
 - Set of pipes (blood vessels and arteries)
 - Contents (the blood)

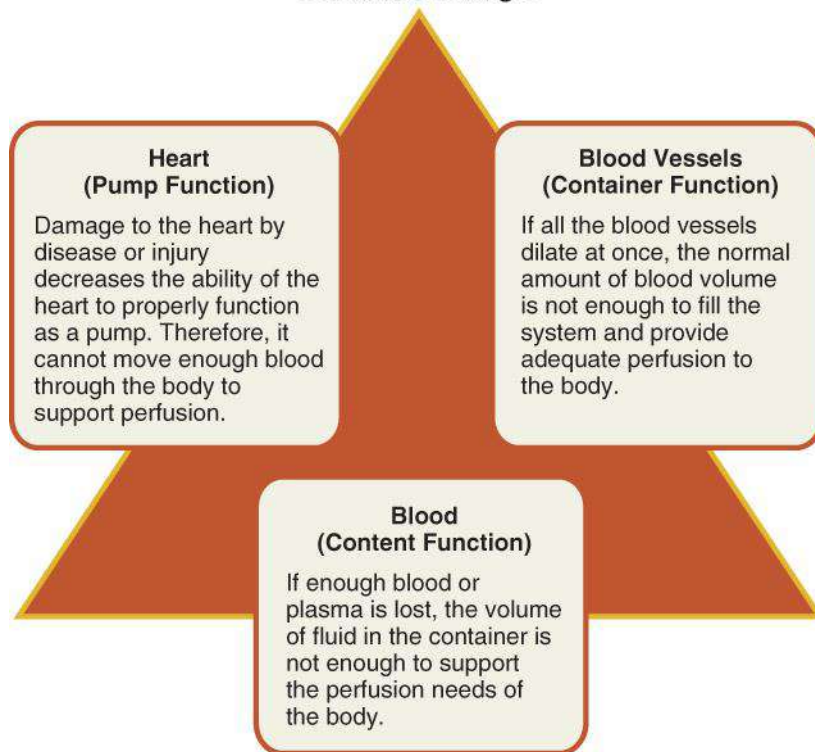
Pathophysiology

(4 of 9)



Pathophysiology (5 of 9)

Perfusion Triangle



- These three parts can be called the “perfusion triangle.”
 - When a patient is in shock, one or more of the three parts is not working properly.

Pathophysiology (6 of 9)

- Blood pressure is the pressure of blood within the vessels at any one time.
 - Systolic: peak arterial pressure
 - Diastolic: pressure in the arteries while the heart rests between heartbeats

Pathophysiology (7 of 9)

- Blood flow through the capillary beds is regulated by the capillary sphincters.
 - Under the control of the autonomic nervous system
 - Sphincters respond to other stimuli:
 - Heat
 - Cold
 - The need for oxygen and waste removal

Pathophysiology (8 of 9)

- Perfusion requires more than just having a working cardiovascular system.
 - Adequate oxygen exchange in the lungs
 - Adequate nutrients in the form of glucose in the blood
 - Adequate waste removal, primarily through the lungs

Pathophysiology (9 of 9)

- Mechanisms are in place to help support the respiratory and cardiovascular systems when the need for perfusion of vital organs is increased.
 - Mechanisms include the autonomic nervous system and hormones.

Causes of Shock (1 of 2)

- Shock can result from bleeding, respiratory failure, acute allergic reactions, and overwhelming infection.
 - Damage occurs because of insufficient perfusion of organs and tissues.



Causes of Shock (2 of 2)



- A Pump failure**
Causes: Heart attack, trauma to heart, obstructive causes



- B Low fluid volume**
Causes: Trauma to vessels or tissues, fluid loss from GI tract (vomiting/diarrhea can also lower the fluid component of blood)



- C Poor vessel function**
Causes: Infection, drug overdose (narcotic), spinal cord injury, anaphylaxis

Table 10-1 Causes of Shock

Pump Failure

- Cardiogenic shock
- Obstructive shock

Poor Vessel Function

- Distributive shock
 - Septic shock
 - Neurogenic shock
 - Anaphylactic shock
 - Psychogenic shock

Low Fluid Volume

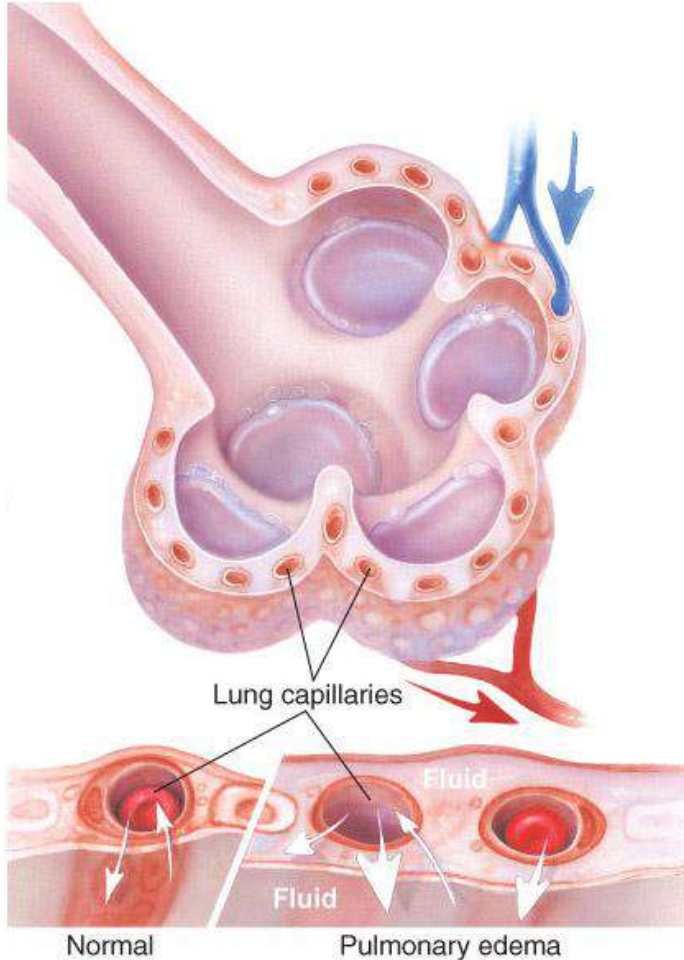
- Hypovolemic shock
 - Hemorrhagic shock
 - Nonhemorrhagic shock

Cardiogenic Shock (1 of 3)

- Caused by inadequate function of the heart
- A major effect is the backup of blood into the lungs.
- Resulting buildup of pulmonary fluid is called pulmonary edema



Cardiogenic Shock (2 of 3)



- Edema is the presence of abnormally large amounts of fluid between cells in body tissues, causing swelling.

Cardiogenic Shock (3 of 3)

- Cardiogenic shock develops when the heart cannot maintain sufficient output to meet the demands of the body.



Obstructive Shock (1 of 3)

- Obstructive shock occurs when conditions that cause mechanical obstruction of the cardiac muscle also affect the pump function
- Common examples include cardiac tamponade and tension pneumothorax.

Obstructive Shock (2 of 3)

- Cardiac tamponade
 - Collection of fluid between the pericardial sac and the myocardium
 - Caused by blunt or penetrating trauma
 - Can progress rapidly
 - Signs and symptoms are referred to as Beck's triad.

Obstructive Shock (3 of 3)

- Tension pneumothorax
 - Caused by damage to lung tissue
 - The air normally held within the lung escapes into the chest cavity.
 - This air applies pressure to the organs, including the heart.



A man in a light blue shirt is looking down at a document or a patient's chart. The background is a purple gradient with a repeating pattern of white, stylized, leaf-like shapes.

Distributive Shock (1 of 11)

- Results from widespread dilation of small arterioles, venules, or both
- The circulating blood volume pools in the expanded vascular beds.
- Tissue perfusion decreases.

Distributive Shock (2 of 11)

- Septic shock
 - Occurs as a result of severe infections in which toxins are generated by bacteria or by infected body tissues
 - Toxins damage vessel walls, causing increased cellular permeability.
 - Vessel walls leak and are unable to contract well.

Distributive Shock (3 of 11)

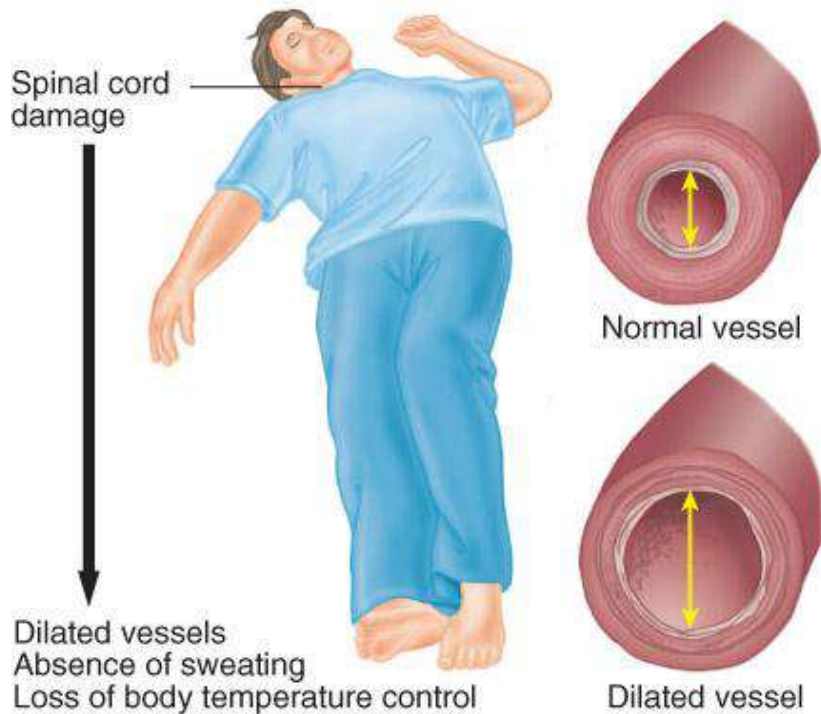
- Septic shock (cont'd)
 - Almost always a complication of a very serious illness, injury, or surgery.

Distributive Shock (4 of 11)

- Neurogenic shock
 - Usually a result of injury to the part of the nervous system that controls the size and muscle tone of the blood vessels
 - Causes include damage to the spinal cord, brain conditions, tumors, pressure on the spinal cord, and spina bifida.

Distributive Shock (5 of 11)

- Neurogenic shock (cont'd)
 - Muscles in the blood vessel walls are cut off from nerve impulses that cause them to contract.



Distributive Shock (6 of 11)

- Anaphylactic shock
 - Occurs when a person reacts violently to a substance to which he or she has been sensitized
 - Sensitization means becoming sensitive to a substance that did not initially cause a reaction.
 - Each subsequent exposure tends to produce a more severe reaction.

Distributive Shock (7 of 11)

- Anaphylactic shock (cont'd)
 - Common causes:
 - Injections (tetanus antitoxin, penicillin)
 - Stings (honeybee, wasp, yellow jacket, hornet)
 - Ingestion (shellfish, fruit, medication)
 - Inhalation (dust, pollen)

Distributive Shock (8 of 11)

- Anaphylactic shock (cont'd)
 - Develops within minutes or even seconds of contact with substance
 - Signs are very distinct.
 - Cyanosis (bluish color of skin) is a late sign.

Distributive Shock (9 of 11)



Table 10-2 Signs of Anaphylactic Shock

Skin

- Flushing, itching, or burning, especially over the face and upper part of the chest
- Urticaria (hives), which may spread over large areas of the body
- Edema, especially of the face, tongue, and lips
- Pallor
- Cyanosis (a bluish cast to the skin resulting from poor oxygenation of circulating blood) about the lips

Circulatory System

- Dilation of peripheral blood vessels
- Increased vessel permeability
- A drop in blood pressure
- A weak, barely palpable pulse
- Dizziness
- Fainting and coma

Respiratory System

- Sneezing or itching in the nasal passages
- Tightness in the chest, with a persistent dry cough
- Wheezing and dyspnea (difficulty breathing)
- Secretions of fluid and mucus into the bronchial passages, alveoli, and lung tissue, causing coughing
- Constriction of the bronchi; difficulty drawing air into the lungs
- Forced expiration, requiring exertion and accompanied by wheezing
- Cessation of breathing

Distributive Shock (10 of 11)

- Psychogenic shock
 - Caused by a sudden reaction of the nervous system
 - Produces temporary vascular dilation
 - Results in fainting (syncope)
 - Serious causes include irregular heartbeat and brain aneurysm.

Distributive Shock (11 of 11)

- Psychogenic shock (cont'd)
 - Non-life-threatening causes include receiving bad news or seeing something unpleasant such as blood.

Hypovolemic Shock (1 of 2)

- Result of an inadequate amount of fluid or volume in the system
- Hemorrhagic causes and nonhemorrhagic causes
- Occurs with severe thermal burns
 - Intravascular plasma is lost.

Hypovolemic Shock (2 of 2)

- Dehydration, the loss of water or fluid from body tissues, can cause or aggravate shock.
 - Fluid loss may be a result of severe vomiting and/or diarrhea.

Respiratory Insufficiency (1 of 2)

- A patient with a severe chest injury may be unable to breathe in an adequate amount of oxygen.
 - An insufficient concentration of oxygen in the blood can produce shock as rapidly as vascular causes.

Respiratory Insufficiency (2 of 2)

- Certain types of poisoning may affect the ability of cells to metabolize or carry oxygen:
 - Carbon monoxide poisoning
 - Cyanide poisoning
- Anemia occurs when there is an abnormally low number of red blood cells.

The Progression of Shock (1 of 5)

- Three stages in the progression of shock:
 - Compensated shock: early stage when the body can still compensate for blood loss
 - Decompensated shock: late stage when blood pressure falls
 - Irreversible shock: terminal stage when transfusion is not enough to save patient

Table 10-3 Progression of Shock

Compensated Shock

- Agitation
- Anxiety
- Restlessness
- Feeling of impending doom
- Altered mental status
- Weak, rapid (thready), or absent pulse
- Clammy (pale, cool, moist) skin
- Pallor, with cyanosis about the lips
- Shallow, rapid breathing
- Air hunger (shortness of breath), especially if there is a chest injury
- Nausea or vomiting
- Capillary refill of longer than 2 seconds in infants and children
- Marked thirst

Decompensated Shock

- Falling blood pressure (systolic blood pressure of 90 mm Hg or lower in an adult)
- Labored or irregular breathing
- Ashen, mottled, or cyanotic skin
- Thready or absent peripheral pulses
- Dull eyes, dilated pupils
- Poor urinary output

The Progression of Shock (2 of 5)

- Signs and symptoms

The Progression of Shock (3 of 5)

- Blood pressure may be the last measureable factor to change in shock.
 - When a drop in blood pressure is evident, shock is well developed.
 - Particularly true in infants and children

The Progression of Shock (4 of 5)

- Use caution when caring for elderly patients.
- Treating a pediatric or geriatric patient in shock is no different than treating other shock patients.
- Expect shock in many emergency medical situations.

The Progression of Shock (5 of 5)

- Also expect shock if a patient has any one of the following conditions:
 - Multiple severe fractures
 - Abdominal or chest injury
 - Spinal injury
 - Severe infection
 - Major heart attack or anaphylaxis

Patient Assessment for Shock

- Patient assessment steps
 - Scene size-up
 - Primary assessment
 - History taking
 - Secondary assessment
 - Reassessment

Scene Size-Up

- Scene size-up
 - Ensure the scene is safe for you, your partner, your patient, and bystanders.
 - Determine the necessary standard precautions and whether you will need additional resources.
 - Observe the scene and patient for clues to determine the MOI/NOI.

Primary Assessment (1 of 3)

- Primary assessment
 - Perform a rapid scan.
 - Treat according to the ABCs.
 - Significant bleeding, internal or external, is an immediate life threat.
 - Provide high-flow oxygen to assist in perfusion of damaged tissues.



Primary Assessment (2 of 3)

- Primary assessment (cont'd)
 - Form a general impression.
 - Assess the airway to ensure it is patent.
 - Assess breathing.
 - An increased respiratory rate is often an early sign of impending shock.
 - Check for a distal pulse.



Primary Assessment (3 of 3)

- Primary assessment (cont'd)
 - A rapid pulse suggests compensated shock.
 - In compensated shock, the skin may be cool, clammy, or ashen.
 - Trauma patients with shock, or a suspicious MOI, generally should go to a trauma center.

History Taking

- History taking
 - Investigate the chief complaint.
 - Obtain a SAMPLE history.

Secondary Assessment

- Secondary assessment
 - Physical examination with a full-body scan
 - Assess the respiratory system, neurologic system, musculoskeletal system, and all anatomic regions.
 - Obtain a complete set of baseline vital signs.
 - Use monitoring devices.

Reassessment

- Reassessment
 - Determine what interventions are needed.
 - Patients who are in decompensated shock will need rapid interventions to restore adequate perfusion.
 - Determine whether your patient is in compensated or decompensated shock.
 - Document these findings.

Emergency Medical Care for Shock

- As soon as you recognize shock, begin treatment.
 - See **Skill Drill 10-1**.
 - Do not give the patient anything by mouth, no matter how urgently you are asked.
 - Accurately record the patient's vital signs approximately every 5 minutes throughout treatment and transport.



Treating Cardiogenic Shock

(1 of 3)

- Patient does not require a transfusion of blood, IV fluids, or elevation of legs.
- Chronic lung disease will aggravate cardiogenic shock.
- Patient is able to breathe better in a sitting or semisitting position.



Treating Cardiogenic Shock

(2 of 3)



- Before administering nitroglycerin, consult with medical control.
- Patients usually have a low blood pressure, weak/irregular pulse, cyanosis, anxiety, and nausea.
- Place the patient in a position that eases breathing as you give high-flow oxygen.

Treating Cardiogenic Shock

(3 of 3)

- Assist ventilations as necessary and have suction nearby in case the patient vomits.
- Provide prompt transport.
- Approach a patient with a suspected heart attack with calm reassurance.



Treating Obstructive Shock

(1 of 2)

- In cardiac tamponade:
 - Increasing cardiac output is the priority.
 - Surgery is the only definitive treatment.
 - Apply high-flow oxygen.
 - The key treatment is rapid transport or ALS management.

Treating Obstructive Shock

(2 of 2)

- In tension pneumothorax:
 - Apply high-flow oxygen to prevent hypoxia.
 - Decompress the injured side of the chest
 - The key treatment is rapid transport or ALS management.

Treating Septic Shock

- Hospital management is required.
- Use standard precautions.
- Transport as promptly as possible.
- Use high-flow oxygen during transport.
- Ventilatory support may be necessary.
- Use blankets to conserve body heat.



Treating Neurogenic Shock

(1 of 2)

- For the spinal cord injury patient, use a combination of all known supportive measures.
- Hospitalization will be required for a long time.
- Keep the patient as warm as possible.

Treating Neurogenic Shock

(2 of 2)

- Emergency treatment:
 - Obtain and maintain a proper airway.
 - Provide spinal immobilization.
 - Assist inadequate breathing.
 - Conserve body heat.
 - Provide the most effective circulation.
 - Transport promptly.

Treating Anaphylactic Shock

- Administer epinephrine.
- Promptly transport the patient.
- Provide supplemental oxygen and ventilatory assistance en route.
- A mild reaction may worsen suddenly.
- Consider requesting ALS backup, if available.

Treating Psychogenic Shock

(1 of 2)

- In uncomplicated fainting, once the patient collapses, circulation to the brain is restored.
- Psychogenic shock can worsen other types of shock.
- If the patient falls, check for injuries.

Treating Psychogenic Shock

(2 of 2)

- If after regaining consciousness, the patient is unable to walk normally, suspect head injury.
 - Transport the patient promptly.
 - Record all initial observations of vital signs and level of consciousness.

Treating Hypovolemic Shock

- Control all obvious external bleeding.
- Splint any bone and joint injuries.
- Secure and maintain an airway, and provide respiratory support.
- Transport as rapidly as possible.

Treating Respiratory Insufficiency

- Secure and maintain the airway.
- Clear the mouth and throat of obstructions.
- If necessary, provide ventilations with a bag-mask device.
- Give supplemental oxygen.
- Transport the patient promptly.

Summary (1 of 5)

- Perfusion requires an intact cardiovascular system and a functioning respiratory system.
- Most types of shock are caused by dysfunction in the heart, blood vessels, or volume of blood.

Summary (2 of 5)

- Shock is the collapse and failure of the cardiovascular system, when blood circulation slows and eventually stops.
- Blood is the vehicle for carrying oxygen and nutrients through the vessels to the capillary beds to tissue cells, where these supplies are exchanged for waste products.

Summary (3 of 5)

- Blood contains red blood cells, white blood cells, platelets, and a liquid called plasma.
- The *systolic* pressure is the peak arterial pressure.
- The *diastolic* pressure is the pressure maintained within the arteries while the heart rests between heartbeats.

Summary (4 of 5)

- The various types of shock are cardiogenic, obstructive, septic, neurogenic, anaphylactic, psychogenic, and hypovolemic.
- If there is any question on your part, treat for shock. It is never wrong to treat for shock.

Summary (5 of 5)

- Remember, by the time a drop in blood pressure is detected, shock is usually in an advanced stage.
- Treating a pediatric or geriatric patient in shock is no different than treating any other shock patient.