

Chapter 13, Shock

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1. Definition and Mechanisms of Shock

- **Shock**, also known as **hypoperfusion**, is defined as inadequate cellular perfusion [4].
- Any compromise in perfusion can lead to cellular injury or death [6].
- In early stages, the body attempts to maintain homeostasis [6].
- The cardiovascular system has three parts: the **pump** (heart), the **container** (blood vessels), and the **contents** (blood) [13].
- These three parts are also called the **perfusion triangle** [16].
- If one or more parts of the perfusion triangle are not working properly, a patient can go into shock [17].
- Poor perfusion impairs the transportation of carbon dioxide out of tissues [11].
 - This results in a dangerous buildup of waste products [11].
 - This buildup can cause cellular damage [12].
- Shock is a state of collapse and failure of the cardiovascular system leading to inadequate circulation [12].
- To protect vital organs, the body redirects blood flow from areas tolerant of low flow, like the skin and intestines, to vital organs like the heart, brain, and lungs [12].
- Early recognition and treatment of shock signs and symptoms can save lives [12].

- Shock is life-threatening and requires immediate recognition and treatment [12].

| Component | Description |
|--------------------|----------------------------------|
| The Pump | The heart [14] |
| The Container | Blood vessels [14] |
| The Contents | The blood [14] |
| Perfusion Triangle | Components |
| ----- | ----- |
| Parts | Heart, blood vessels, blood [16] |

2. Causes and Types of Shock

- There are three basic causes of shock [25].
- These basic causes relate to the perfusion triangle failing [25].
- The three basic causes are **pump failure**, **poor blood vessel function**, and **low fluid volume** [26].
- Different types of shock result from these basic problems [28].
- Types of shock include **cardiogenic** and **obstructive** shock (pump failure) [29].
- obstructive shock is further broken down into tension pneumothorax, cardiac tamponade, and pulmonary emboli [29].
- **distributive shock** is a type of poor vessel function [30].
- Inside of distributive shock are **septic**, **neurogenic**, **anaphylactic**, and **psychogenic shock** [30].
- **hypovolemic shock** is a type of low fluid volume shock [31].
- hypovolemic shock is broken down into **hemorrhagic** and **non-hemorrhagic** [31].

| Basic Cause | Resulting Shock Types |
|----------------------|---|
| Pump Failure | Cardiogenic, Obstructive [29] |
| Poor Vessel Function | Distributive (Septic, Neurogenic, Anaphylactic, Psychogenic) [30] |
| Low Fluid Volume | Hypovolemic (Hemorrhagic, Non-Hemorrhagic) [31] |

3. Detailed Overview of Pump Failure Shock (Cardiogenic and Obstructive)

- **cardiogenic shock** is a pump failure problem [32].
- It is caused by inadequate function of the heart [32].
- A major effect is the backup of blood into pulmonary vessels [32].
- This results in pulmonary edema [32].
- cardiogenic shock is often caused by heart failure or a heart attack [32].
- The heart cannot maintain output to meet the body's demands [33].
- **obstructive shock** is also a pump failure problem [36].
- The heart is unable to work due to a **mechanical obstruction** [36].
- This prevents adequate flow of blood from the heart chambers [38].
- Three types of obstructive shock are **cardiac tamponade, tension pneumothorax, and pulmonary emboli** [38].
- **cardiac tamponade** is a collection of fluid between the pericardial sac and the myocardium [38].
 - This fluid prevents the heart from contracting effectively [39].
 - It can be caused by blunt or penetrating trauma causing hemorrhage around the heart [41].
 - Signs and symptoms are called **beck's triad** [42].
 - beck's triad includes jugular vein distension, muffled heart tones, and narrowing pulse pressures [43].
- **tension pneumothorax** is caused by air damaging lung tissue [46].
 - Air escapes into the chest cavity and the lung collapses [46].

- Untreated, air accumulates and puts pressure on organs including the heart [48].
- This pressure obstructs the heart's ability to beat [49].
- **pulmonary emboli** are blood clots in the pulmonary circulation [51].
 - They block blood flow through the pulmonary vessels [53].
 - A massive pulmonary emboli can prevent blood from being pumped from the right to the left side of the heart [53].
 - This leads to a backup of blood in the right ventricle [53].
 - This can cause catastrophic obstructive shock and complete pump failure [53].

4. Detailed Overview of Poor Vessel Function Shock (Distributive)

- **distributive shock** is caused by **poor vessel function** [55].
- It results from widespread dilation of small arterioles, venules, or both [58].
- Blood pools in the expanded vascular beds [58].
- Tissue perfusion decreases [58].
- There are different types of distributive shock [58].
- These include **septic, neurogenic, anaphylactic, and psychogenic shock** [59].
- **septic shock** occurs from a severe infection, usually bacteria [60].
 - Toxins are generated by bacteria or infected tissues [61].
 - There is widespread vessel dilation and plasma loss through vessel walls [61].
 - Decreased fluid results in shock [61].
- **neurogenic shock** is usually from a spinal cord injury [62].
 - Blood vessel muscles are cut off from nerve impulses [63].
 - Vessels below the injury dilate widely [64].
 - This increases the size and capacity of the vascular system [64].
 - Blood pools, and the body loses the ability to constrict vessels [64].
- **anaphylactic shock** happens when a person reacts violently to a substance [66].
 - This occurs after being sensitized to the substance [68].
 - Sensitization means becoming sensitive to a substance that didn't initially cause a reaction [68].

- Each exposure tends to produce a more severe reaction [69].
- **psychogenic shock** is a sudden reaction of the nervous system [71].
 - It causes temporary, generalized vascular dilation [71].
 - Usually, the patient has a syncopal episode (fainting) [71].
 - Life-threatening causes include irregular heartbeat or brain aneurysm [72].
 - Non-lethal events include bad news, fear, or unpleasant sights like blood [72].

| Type of Distributive Shock | Cause / Characteristics |
|----------------------------|---|
| Septic Shock | Severe infection (bacteria), toxins, widespread dilation [60] |
| Neurogenic Shock | Spinal cord injury, vessel dilation below injury [62] |
| Anaphylactic Shock | Severe allergic reaction after sensitization [66] |
| Psychogenic Shock | Sudden nervous system reaction, temporary dilation, fainting [71] |

5. Detailed Overview of Low Fluid Volume Shock (Hypovolemic)

- **hypovolemic shock** is a **fluid issue** [73].
- It is the result of an inadequate amount of fluid or volume in the circulatory system [73].
- This is a problem with the blood itself [73].
- There are two types: **hemorrhagic** and **non-hemorrhagic** hypovolemic shock [73].
- hypovolemic shock can occur with conditions like thermal burns [74].

6. Stages and Recognition of Shock

- There are different **stages of shock** [74].
- These include **compensated shock**, **decompensated shock**, and **irreversible shock** [74].
- In compensated shock, the body can maintain perfusion [74].

- Once shock has progressed too far, it becomes irreversible [74].
- It is impossible to assess when a patient has reached the irreversible stage [74].
- Recognizing and treating shock **very early** is important [74].
- Treatment is needed well before the patient becomes decompensated [74].
- **Blood pressure** is the last measurable factor to change with shock [75].
- When a drop in blood pressure is evident, shock is well developed [75].
- This is especially true for infants and children [76].
 - Infants and children can maintain blood pressure until they lose more than half their blood volume [76].
 - By the time their blood pressure drops, they are close to death [76].
- Expect shock in many emergency medical situations [77].
- Expect shock if a patient has conditions such as multiple fractures, abdominal or chest injury, spinal injury, severe infection, a heart attack, or anaphylaxis [77].

| Stage of Shock | Characteristics |
|----------------|---|
| Compensated | Body is able to compensate, maintains perfusion [74] |
| Decompensated | Body can no longer compensate effectively [74] |
| Irreversible | Shock has progressed too far, no recovery possible [74] |

7. Assessment and General Emergency Care for Shock

- Begin with **scene size-up** to ensure safety [78].
- Determine the mechanism of injury or nature of illness [78].
- Perform a **primary assessment** [79].
- If shock is suspected, do a **rapid exam** [79].
- Determine the level of consciousness (LOC) [79].
- Identify and treat any life-threatening concerns first [79].
- Determine the priority of patient transport [80].
- Control massive external hemorrhage; this is the first priority [80].

- Use direct pressure first [123].
- If direct pressure fails, use a tourniquet [81].
- Assess and treat ABCs (Airway, Breathing, Circulation) **after** controlling life-threatening bleeding [82].
 - Ensure a patent airway [85].
 - Quickly assess breathing [86].
 - Assess circulatory status for clues of shock [86].
 - Check for distal and central pulses [87].
 - Determine if pulse is fast, slow, weak, strong, or absent [87].
 - A rapid pulse suggests compensated shock [88].
 - Assess skin color, temperature, and condition [90].
 - Check capillary refill [90].
- If the patient has signs of hypoperfusion, treat aggressively [84].
- Provide **high-flow oxygen** [83].
- Initiate rapid transport [84].
- Request advanced life support (ALS) as necessary for aggressive shock management [84].
- Consider spinal immobilization if needed [85].
- Maintain inline stabilization if necessary [100].
- Comfort, calm, and reassure the patient [101].
- Maintain the patient in the supine position [101].
- Do not allow patients to eat or drink [102].
- Prevent body heat loss by using blankets [104].
- Treat additional injuries en route [105].
- Consider rendezvous with ALS or aero medical transport if needed [105].
- Accurately record vital signs every five minutes throughout treatment and transport [106].
- After managing life threats, take a history, including the chief complaint and a SAMPLE history [92].
- Perform secondary assessments, including a physical exam [93].
- Repeat the primary assessment and perform a focused assessment [94].
- Assess the entire body if there is significant illness or injury, a poor general impression, problems in the primary assessment, or an unresponsive medical patient [94].

- Perform assessments quickly but thoroughly [95].
- If a life-threatening problem is found, treat it immediately [96].
- Take vital signs [97].
- Reassess the patient's vital signs, interventions, chief complaint, ABCs, and mental status [97].
- Determine needed interventions based on findings, focusing on supporting the cardiovascular system [98].
- Begin immediate treatment for shock as soon as it is recognized [99].
- Follow local precautions [100].
- Maintain body temperature by placing blankets under and over the patient [104].

8. Specific Emergency Care for Different Types of Shock

- For **cardiogenic shock**:
 - These patients often have chest pain and low blood pressure or a weak, irregular pulse [107].
 - They may show cyanosis, anxiety, and nausea [108].
 - Do not give nitro if they are hypotensive [108].
 - Place them in a position that eases breathing [109].
 - Give high-flow O2 [109].
 - Initiate prompt transport and request ALS [109].
- For **obstructive shock**:
 - For **cardiac tamponade**:
 - Prioritize increasing cardiac output [111].
 - Give high-flow oxygen [111].
 - Surgery is the only definitive treatment [111].
 - For **tension pneumothorax**:
 - Give high-flow O2 via a non-rebreather to prevent hypoxia [111].
 - Chest decompression is required but is an ALS skill [112].
 - Request ALS assistance early but do not delay transport waiting for them [112].
- For **septic shock**:
 - This requires hospital management, including antibiotics [113].

- Use standard precautions [113].
- Transport promptly [113].
- Give high-flow O2 and possibly support ventilations with a BVM [114].
- Preserve body heat [114].
- Notify a specialized sepsis team if available [114].
- Obtain and maintain a proper airway and assist breathing [115].
- Ensure effective circulation [116].
- Transport to a facility capable of managing neurogenic shock [117].
- For **anaphylactic shock**:
 - Administer **Epi** intramuscularly (IM) as the most effective treatment [118].
 - Requires immediate transport [119].
 - Give high-flow O2 and possibly assistance with a BVM [119].
 - Find out the cause of the reaction and how it was received [119].
 - Be aware that a mild reaction can worsen suddenly [119].
 - Due to potential airway compromise, request ALS backup as soon as possible [119].
- For **psychogenic shock**:
 - In uncomplicated fainting, circulation to the brain is restored when the patient becomes supine [120].
 - psychogenic shock can worsen other types of shock [121].
 - If a patient fell from psychogenic shock, check for injuries, especially in older patients [121].
 - If a patient cannot walk after falling, suspect another problem like a head or hip injury [122].
 - Transport promptly; all patients with loss of consciousness need evaluation at the emergency department [122].
- For **hypovolemic shock**:
 - Stop obvious external bleeding first [123].
 - Direct pressure is the best initial method [123].
 - If direct pressure doesn't work, use a tourniquet [123].
 - Handle the patient gently and keep them warm [123].
 - Recognize internal bleeding and provide aggressive general support [123].
 - Secure and maintain an airway and provide respiratory support, including oxygen and ventilations [123].

- Transport rapidly to the emergency department [124].

| Type of Shock | Specific Treatment |
|-------------------|---|
| Cardiogenic | Position for breathing, high-flow O2, prompt transport, ALS rendezvous [109] |
| Cardiac Tamponade | High-flow O2, prompt transport (needs surgery) [111] |
| Tension Pneumo | High-flow O2 via non-rebreather, ALS for chest decompression, prompt transport [111] |
| Septic | Standard precautions, high-flow O2, BVM support, preserve body heat, prompt transport (needs hospital management) [113] |
| Anaphylactic | Administer Epi IM, immediate transport, high-flow O2, BVM support, ALS backup [118] |
| Psychogenic | Check for injuries, prompt transport for all patients with loss of consciousness [121] |
| Hypovolemic | Control external bleeding (direct pressure, tourniquet), secure airway, respiratory support, keep warm, rapid transport [123] |

9. Considerations for Pediatric and Geriatric Patients in Shock

- Treating shock in older patients is no different than treating any other shock patient [125].
- Older patients generally have more serious complications than younger patients [125].
- Many older patients take numerous medications [125].
- These medications can mask or mimic signs of shock [125].
- Blood pressure changes are a late indicator of shock, particularly in infants and children [76].
- Infants and children can maintain their pressure until they lose more than half their blood volume [76].

- By the time pressure drops in infants and children, they are close to death [76].
- Provide inline spinal stabilization if indicated [126].
- If spinal stabilization is not indicated, maintain the patient in a position of comfort [126].
- Control life-threatening hemorrhages immediately with direct pressure [126].
- Suction as necessary [126].
- Provide high-flow oxygen via a non-rebreather mask [126].
- Maintain body temperature [127].
- Provide rapid transport for all patients in shock, including older and younger patients [127].