Lesson Goal

- Describe signs & symptoms of internal bleeding, external bleeding, & shock and care of patients with these conditions

Lesson Objectives

- List components of circulatory system and how they work
- Describe differences in arterial, venous, & capillary bleeding
- Discuss different ways to treat external bleeding
Lesson Objectives

- Discuss importance of wearing protective equipment when caring for bleeding patients
- Establish importance of airway management in trauma patient
- Relate how patient was injured to likelihood of internal bleeding

Lesson Objectives

- List signs of internal bleeding
- List steps of emergency care for patient with internal bleeding
- List signs & symptoms of shock
- State steps of emergency care for patient with shock

Lesson Objectives

- Explain importance of rapid transport of patients with signs of shock
- Demonstrate proper way to control external bleeding using direct pressure
- Demonstrate proper way to control external bleeding using diffuse pressure
Introduction

- Shock occurs when cells are not receiving enough O₂ to produce energy needed for survival
- Know what causes shock, its signs & symptoms, & consequences, and be able to provide appropriate care

Cellular Metabolism

- Every cell requires nutrients, O₂, waste removal
- Normally, metabolism is aerobic
- Perfusion provides cells with nutrients, O₂, waste removal

Cellular Metabolism

- O₂ may be insufficient because of problems with respiratory and/or cardiovascular systems

- Result:
  - Inefficient production of small amounts of energy for limited time
  - Accumulation of acidic waste products
Circulatory System

- 3 fluid compartments
  - Intravascular (circulatory system)
  - Intracellular
  - Interstitial

Circulatory System

- Intravascular space
  - Fluid = blood
    - Transports
  - RBC
    - Hemoglobin carries O₂
  - WBC
    - Fights infection
  - Platelets
    - Aid clotting

Circulatory System
Circulatory System

- **Oxygen-rich blood**
  - Lungs → left side of heart → body (via arterial system)
  - Bright red

- **Deoxygenated blood**
  - Body → right side of heart → lungs (via venous system)
  - Dark red

Circulatory System

- **Arteries**
  - Thick, muscular, elastic
  - Largest—aorta

- **Veins**
  - Low pressure, slow flow

- **Capillaries**
  - One-cell thick
  - Allow exchange of O₂, nutrients, waste products

Circulatory System

- **Closed system**
  - Pump
  - Fluid
  - Vasculature
Circulatory System

- Heart
  - 4 chambers
    - Atria (collection)
    - Ventricles (pump)
  - Valves
    - Pulmonic
    - Tricuspid
    - Mitral
    - Atrial

Intracellular & Interstitial Spaces

- Intracellular
  - Water content of all cells
  - Cells contain water & tiny organs that carry out cellular functions

- Interstitial
  - All fluid neither in circulatory system nor cells

Intracellular & Interstitial Spaces

- Water & some substances move freely among all 3 compartments
- Other substances require carriers, which require energy
- These mechanisms are critical to maintaining balance
- Without energy, shifts in fluids & substances detrimental to body occur
Circulatory Compromise

- Body can compensate to a certain degree for fluid loss

- Mechanisms that can lead to ↓ perfusion:
  - Loss of intravascular volume
  - Failure of heart as pump
  - Inability to maintain pressure in vascular system

Circulatory Compromise

- Anything that opens system will cause:
  - Pressure loss
  - ↓ circulation of oxygenated blood

- Traumatic injury = blood loss

- Hypoxemia = ↓ O₂ content in blood

Volume Loss

- Loss of intravascular volume—hypovolemia

- Causes
  - ↑ Fluid loss
  - ↓ Fluid intake
  - ↓ Blood production
Volume Loss

- ↑ Fluid loss—most common cause of shock
  - Hemorrhage
  - Prolonged vomiting or diarrhea
  - Sweating

- Hemorrhage: obvious or hidden
  - No visible blood loss: suspect bleeding in trauma patient with signs & symptoms of shock

- Same amount of blood loss affects different patients differently
  - Age
  - Pre-existing health
  - Medications

- Other causes
  - Obstetric emergencies
  - GI bleeding
  - Vomiting, diarrhea
  - Fever, hot environment
  - Uncontrolled diabetes
Volume Loss

- Relative volume loss
  - Blood volume is not ↓, but container ↑ in size
    - Spinal trauma
    - Sepsis
    - Anaphylaxis

Volume Loss

- Significant volume loss = ↓ perfusion
  - Regardless of cause

- ↓ Perfusion → hypoxia, anaerobic metabolism, cell death

Compensatory Mechanisms

- Perfusion depends on adequate cardiac output
- Body has compensatory mechanisms to maintain normal functioning
Compensatory Mechanisms

- Cardiac output (CO)
  - Amount of blood pumped by heart in 1 min
  - Heart rate (HR) per minute
- Stroke volume (SV)
  - Amount of blood pumped each contraction
- Normal CO = HR x SV
  - 70 bpm (HR) × 70 mL (SV) = CO (4900 mL)
  - ~5 L/min

Compensatory Mechanisms

\[\downarrow \text{SV} = \uparrow \text{HR}\]

\[\uparrow \text{SV} = \downarrow \text{HR}\]

Compensatory Mechanisms

- Compensated shock
  - Vasoconstriction
  - ↑ HR
  - ↑ respirations
- Uncompensated shock
  - Hypotension
- Rate of fluid loss affects compensatory ability
Pump Failure

- If pump (heart) fails, perfusion stops
- If pump weakens, compensation possible
- If heart cannot meet O₂ demand, patient becomes symptomatic

Pump Failure

- Cardiogenic shock
  - The body cannot compensate for the weakened heart (pump)
  - Causes
    - MI
    - Dysrhythmias

Additional Shock States

- Psychogenic shock
  - Not truly shock
  - Fainting/ vasovagal syncope
  - ↓ BP
  - ↓ HR
  - Emotional upset
  - Cellular metabolism not affected
  - Usually self-correcting
Additional Shock States

- Neurogenic shock
  - Relative hypovolemia
  - Tissue perfusion not affected unless accompanying blood loss

Signs & Symptoms

- Physical exam
  - General appearance
    - Skin pale, cool, moist, cyanotic
  - Respirations
  - ↑ HR, weak pulse
  - ↓ BP
Treatment

- Early recognition & treatment key
  - Prevent death
  - Minimize complications

- Adequate ABCs
- Interventions as indicated
- High-flow O₂
- Supine positioning; Trendelenburg
- Maintain body temperature
- Transport

Controlling Hemorrhage

- Direct pressure
- Tourniquet
- Splinting
- PASG
Skill 25-1: Applying Tourniquet with BP Cuff

1. Apply pressure dressing to wound while elevating extremity
2. Wrap BP cuff above wound; inflate cuff until bleeding controlled without obliterating distal pulse

Skill 25-2: Applying Tourniquet with Triangular Bandage

1. Apply pressure dressing to wound; wrap triangular bandage around extremity above wound
2. Tie single knot in bandage; place stick or tongue blade over knot
3. Tie 2nd knot over stick or tongue blade; turn until bleeding controlled without obliterating distal pulse. Secure blade with tape or remaining length of bandage
Skill 25-2: Applying Tourniquet with Triangular Bandage

Due to the large size of the file for this video clip, this file may be obtained from the Download folder on Evolve under PowerPoint Presentations with Video.

Skill 25-3: PASG Application

1. Obtain authorization from medical direction to use PASG

2. Remove patient’s clothing from waist down. Unfold PASG and place at patient’s feet. Separate Velcro strips to make pants big

Skill 25-3: PASG Application

3. Position 2 EMTs at patient’s feet. Using arm located nearest feet, slide pants up from bottom and grasp patient’s feet with your hand; lift legs and pull garment up onto patient’s legs
Skill 25-3: PASG Application

4. Pull pants up to patient’s diaphragm by lifting up buttocks and pulling pants upward

5. Secure Velcro closures; connect tubing to valves on garment

6. Open valves for inflation; inflate garment per local protocol. Ensure proper inflation by listening for pops in Velcro as bladders reach full inflation

7. Close valves

8. Reassess patient
Skill 25-3: PASG Application

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Consequences of Shock

- Anaerobic metabolism produces acidosis
  - Further cellular impairment, damage, death
  - Organ damage & failure
  - Death

*Early recognition & proper treatment can minimize consequences!*

Summary

- Shock—inadequate cellular perfusion
  - Causes
    - Volume loss
    - Pump failure
    - Vasodilation

- Without oxygen, cells will begin to die

- You can affect patient survival through early recognition and proper treatment of shock