Chapter 13
Trauma Emergencies

Objectives
- List examples of blunt and penetrating trauma
- List three signs associated with a skull fracture
- Describe Cheyne-Stokes respirations
- Describe the Cushing reflex
- Describe decorticate and decerebrate posturing

Objectives
- Describe the mechanism of hypoperfusion
- List four mechanisms of spinal injury
- List three types of devices used to assist with spinal immobilization
- Identify four instances in which rapid extrication techniques may be necessary
- Describe a flail chest
Objectives

- List three signs or symptoms of a pneumothorax
- List two early and two late signs or symptoms of a tension pneumothorax
- State the importance of rapid transport to definitive care
- List four signs or symptoms of abdominal trauma

Objectives

- Describe the position for a pregnant trauma patient that optimizes venous return to the heart
- Describe the care of an amputated body part
- List three types of burns
- Identify one difference between open and closed bone injuries

Objectives

- List three signs or symptoms of a bone or joint injury
- Identify three complications of musculoskeletal trauma
- List three complications of splinting
**Kinematics of Trauma**

- Process of predicting injury patterns that may result from the forces and motions of energy

**Blunt trauma**

- Two forces
  - Change of speed
  - Compression

**Penetrating trauma**—three levels

- Low energy
- Medium energy
- High energy
Kinematics of Trauma

- Penetrating trauma
  - Low energy
    - Low velocity
    - Potential for more injury

- Penetrating trauma
  - Medium energy
    - Handguns
    - Identify type and caliber
    - Tissue damage along track

- Penetrating trauma
  - High energy
    - High velocity
    - ↑ damage
    - Entrance and exit wounds
Assessment/Management
• Scene size-up

• Initial assessment
  • Simultaneous or global
  • Level of responsiveness
    • AVPU

Assessment/Management
• Initial assessment
  • Airway with cervical spine control
    • Immediate in-line stabilization
    • Modified jaw-thrust
    • Snoring or unresponsive
    • Gurgling

Assessment/Management
• Initial assessment
  • Breathing (ventilation)
    • Air exchange
    • Adequacy of chest rise
    • Rate and depth
    • Open pneumothorax
    • Tension pneumothorax
    • Flail chest
Assessment/Management

- Initial assessment
  - Circulation
    - Pulse
    - Location
      - Radial
      - Femoral
      - Carotid
    - Peripheral perfusion
      - Skin color
      - Temperature
      - Moisture

Assessment/Management

- Initial assessment
  - Expose and protect
    - Remove clothes
    - Prevent hypothermia

Assessment/Management

- Initial resuscitation
  - Oxygen therapy
  - Ventilatory support
  - C-spine immobilization
  - Backboard
  - Transport
  - IVs
**Assessment/Management**

- Focused trauma and detailed assessment
  - Mechanism of injury
  - Check for change in patient condition
  - Start at head
  - Baseline vital signs
  - Glasgow Coma Scale

**Head Trauma**

- Leading cause of death
- Scalp injuries
- Face and neck injuries
- Skull injuries
- Brain injuries

**Head Trauma**

- Scalp injuries
  - Closed
  - Open
Head Trauma

- Skull fractures
  - Open
  - Closed
  - Depressed
  - Nondepressed

Suspect if:
- History
- Altered LOC
- Responsiveness
- Pupils
- Obvious injury
- Deformity
- Blood or cerebrospinal fluid
- Raccoon eyes
- Battle's sign

Raccoon eyes
- Late sign
- Basilar skull fracture
Head Trauma

- Battle’s sign
  - Late sign
  - Basilar skull fracture

Brain Injuries

- Types
  - Concussion
  - Contusion
  - Open injuries
  - Hematoma
  - Hemorrhage

Brain Injuries

- Intracranial pressure
  - Deterioration in level of responsiveness
  - Progressive neurological deficits
  - Vomiting
  - Unequal pupils
  - Cheyne-Stokes respirations
  - Cushing reflex
Brain Injuries

- Assessment of brain injury
  - Level of responsiveness most significant sign
    - Sudden loss or decrease requires immediate transport
    - GCS valuable

Brain Injuries

- Paralysis
  - Hemiplegia
    - One side of body
  - Paraplegia
    - Lower extremities
  - Quadriplegia
    - All extremities

Brain Injuries

- Decorticate posturing
  - Upper extremities flexed

- Decerebrate posturing
  - Arms extended and internally rotated
  - Legs extended
  - Feet in forced plantar flexion
Brain Injuries

- Treatment
  - Hypoperfusion
    - Arterial carbon dioxide
    - Ventilate with high-concentration oxygen

Spinal Trauma

- Trauma to:
  - Spinal cord
  - Vertebral column
  - Connective tissue

Spinal Trauma

- Direct trauma
- Indirect trauma
- Contused
- Compressed
Spinal Trauma

- Flexion
  - Spine flexed violently forward
  - V-shaped compression

- Rotation
  - Combination of flexion and rotation

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Spinal Trauma

- Extension
  - Hyperextension
  - Flexion and extension

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Spinal Trauma

- Vertical compression
  - Force directed along axis of spine
**Spinal Trauma**

- **Assessment**
  - Thorough review of mechanism of injury
  - If in doubt, immobilize

- **Complications**
  - Difficulty breathing
  - Respiratory arrest
  - Partial or complete paralysis
  - Spinal shock

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**Spinal Trauma**

- **Emergency care**
  - Initial and ongoing assessments
  - Airway management
    - Jaw-thrust
  - High-concentration O₂
  - IV lines
  - Spinal immobilization
  - Neck immobilization

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**Spinal Trauma—One-Piece Cervical Immobilization Device**
Rapid Extrication

- Only used when patient’s life at risk
- Instances when rapid extrication necessary
  - Fire
  - Water
  - Explosion
  - Structure collapse

Rapid Extrication

- Life-threatening injuries
  - Cardiac or respiratory arrest
  - Airway cannot be maintained in sitting position
  - Uncontrollable bleeding
  - Severe shock
  - Potential for rapid decompensation
Thoracic Trauma

- Flail chest
  - Two or more ribs broken
  - Paradoxical motion

Thoracic Trauma

- Pulmonary contusion
  - Blunt trauma
    - Under flail chest
  - Penetrating trauma

Thoracic Trauma

- Pneumothorax
  - Air present in pleural space
  - Decreased or absent breath sounds
  - Pain
  - Dyspnea
Thoracic Trauma

- Open pneumothorax
  - Air enters during inspiration
  - Air exits during expiration

- Tension pneumothorax
  - Air enters but does not exit
  - Pressure builds
  - Life threatening

  Early signs
  - Decreased or absent breath sounds
  - Dyspnea
  - Tachypnea

  Progressive signs
  - Increasing tachypnea
  - Increasing dyspnea
  - Tympany
  - Tachycardia

  Late signs
  - Tracheal deviation
  - Jugular vein distension
  - Hypotension
  - Tympany
  - Narrowing pulse pressure

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Thoracic Trauma—Needle Decompression

Thoracic Trauma

- Tracheal/bronchial rupture
  - Hemothorax
  - Pneumothorax
  - Subcutaneous emphysema
  - Transport to definitive care

Thoracic Trauma

- Injuries that interfere with circulation
  - Hemothorax
    - Blood within pleural space
  - Hemopneumothorax
    - Air and blood in pleural cavity
  - Myocardial contusion
    - Blunt trauma to the chest
  - Pericardial tamponade
    - Pericardial space filled with blood
  - Aortic rupture
    - Accident involving high energy
Abdominal Trauma

- Signs and symptoms
  - Pain
  - Rigidity
  - Tenderness
  - Distension
  - Bruising
  - Guarding
  - Pelvic instability
  - Evisceration
  - Bleeding

Abdominal Trauma

- Evisceration
  - Organs protrude through wound
  - Do not attempt to replace
  - Cover with wet sterile dressing
  - Transport

Abdominal Trauma

- Abdominal trauma in pregnancy
  - Priority should be given
  - Shock symptoms
  - Transported quickly
  - High-concentration O₂
  - PASG
Abdominal Trauma

- Trauma in pregnancy
  - Backboard tilted to left 10°-15°
    - Takes pressure off vena cava
    - Assists with blood return to heart

Soft-Tissue Trauma

- Closed wounds
  - Contusions and hematomas
    - Blunt trauma
    - Blood vessels torn
    - Apply cold to area
    - Compress area
    - Elevate part
    - Immobilize

- Crush injuries
  - Signs and symptoms
    - Pain
    - Paresis
    - Paresthesia
    - Pallor
    - Pulselessness
  - Treatment
    - Airway management
    - High-concentration O₂
    - Fluid replacement
    - Immobilization
    - Rapid transport
Soft-Tissue Trauma

- Compartment syndrome
  - Surgical emergency
  - Blunt trauma
  - Signs and symptoms
    - Extreme pain
    - Swelling
    - Tenderness
    - Weakness of muscle groups
    - Pain on passive stretching
    - Ischemia

Soft-Tissue Trauma

- Compartment syndrome
  - Treatment
    - Airway management
    - High-concentration O₂
    - Fluid replacement
    - Immobilization
    - Rapid transport

Soft-Tissue Trauma

- Crush syndrome
  - Life threatening
  - Prolonged compression or immobilization
  - Condition is rare
  - Signs and symptoms
    - Appear after patient released
    - Shock
    - Metabolic acidosis
Soft-Tissue Trauma

- Crush syndrome
  - Treatment
    - Airway
    - High-concentration O₂
    - Maintenance of body temperature
    - Rehydration
    - Arterial tourniquet
    - Surgical amputation

Soft-Tissue Trauma

- Open wounds
  - Abrasions
    - Outermost layer of skin rubbed away
    - Signs and symptoms
      - Pain
      - Minimal bleeding
    - Treatment
      - Cleaning surface

Soft-Tissue Trauma

- Open wounds
  - Lacerations
    - Signs and symptoms
      - Pain
      - Bleeding
    - Treatment
      - Control bleeding
      - Treat for shock
**Soft-Tissue Trauma**

- Open wounds
  - Punctures
    - Involve underlying tissues
    - Internal bleeding
    - Signs and symptoms
      - Pain and bleeding
    - Treatment
      - Control bleeding
      - Treat for shock
      - Do not remove impaled objects

- Avulsion
  - Loss of full thickness of skin
  - Signs and symptoms
    - Pain and bleeding
  - Treatment
    - Cleanse area
    - Return skin to normal position
    - Control bleeding
    - Apply bulky dressing

- Amputation
  - Partial or complete loss of a limb
  - Signs and symptoms
    - Pain and bleeding
  - Associated injuries
  - Treatment
    - Control bleeding
    - Save the amputated part
Soft-Tissue Trauma

- Open wounds
  - Amputation
    - Care of amputated part
      - Place part in dry or moist sterile dressing
      - Lactated Ringer’s or normal saline
      - Place in plastic bag
      - Place bag on ice
      - Transport

Burns

- Severity of burns
  - Depth or degree
  - Percentage of body surface affected
  - Locations on the body
  - Preexisting medical conditions
  - Patients <5 or >55 y/o should be evaluated at burn center
Burns

- Rule of nines
  - Minor burns
    - ≤15%
    - No involvement of:
      - Face
      - Hands
      - Feet
      - Perineum
      - Electrical burns
      - Inhalation injuries
      - Preexisting medical problems

- Rule of nines
  - Moderate burns
    - 15%-25%
    - No involvement of:
      - Face
      - Hands
      - Feet
      - Perineum
      - Electrical burns
      - Inhalation injuries
      - Preexisting medical problems

- Rule of nines
  - Major burns
    - >35%
    - Significant involvement of:
      - Face
      - Hands
      - Feet
      - Perineum
      - Electrical burns
      - Inhalation injuries
      - Associated injuries
      - Preexisting medical problems
Musculoskeletal Trauma

- Injury to muscles and bones
- Seldom life threatening

Goals
- Control bleeding
- Prevent further injury
- Minimize permanent damage
- Reduce pain

Musculoskeletal Trauma

Types of bone injuries
- Open injury
  - A break in the continuity of the skin
- Closed injury
  - No break in the continuity of the skin

Musculoskeletal Trauma

Signs and symptoms
- Deformity or abnormal position
- Pain and tenderness
- Grating
- Swelling
- Bruising or discoloration
- Guarding
- Exposed bone ends
- Joint locked into position
Musculoskeletal Trauma

- Complications
  - Damage to muscles, nerves, blood vessels
  - Conversion of closed fracture to open fracture
  - Restriction of blood flow
  - Excessive bleeding
  - Increased pain
  - Paralysis

Musculoskeletal Trauma

- Femur injuries
  - Largest bone in the body
  - Can result in life-threatening bleeding
  - Traction splints available
    - Hare traction splint
    - Sagar traction splint

Musculoskeletal Trauma

- Hare traction splint
  - Manual stabilization
  - Apply manual traction
Musculoskeletal Trauma

- Hare traction splint
  - Slide splint under leg
  - Apply ischial strap

- Attach securing device
- Wind ankle hitch
- Secure support straps
- Release manual traction

Musculoskeletal Trauma—
Immobilizing a Lower Extremity
Musculoskeletal Trauma—Immobilizing an Upper Extremity

Musculoskeletal Trauma—Immobilizing a Shoulder Injury

Summary

Care for trauma patients includes careful airway management with:
- Spinal protection
- Ventilatory support with high-concentration oxygen
- Bleeding control
- Fluid replacement
- Transport
Summary

- Head injuries may be open or closed
- Brain and surrounding structures may be injured
- Assume skull fracture is accompanied by central nervous system damage

Summary

- Signs of skull fracture include:
  - Battle's sign
  - Raccoon eyes
  - Cerebrospinal fluid leak

Summary

- Spinal injuries are trauma to:
  - Spinal cord
  - Vertebral column
  - Surrounding tissues
Summary

- Unstable spinal injuries are high risk for further neurologic damage
- Manage all spinal trauma as unstable injury
- Patients with multisystem trauma require rapid transport to appropriate facility

Summary

- Rapid transport means staying on scene <10 min
- Skilled assessment can identify trauma situations and their proper management

Questions?