Basic Facts of Body Cavity Trauma

- Second most frequent cause of motor-vehicle death
- Injuries can be anticipated by assessing direction of force
- Effects can be predicted by the organ system likely to be injured
- Assessment, recognition of life-threatening conditions, and rapid transportation to a trauma center are the keys to proper care
Anatomy and Physiology

- The thorax--both container and component of the respiratory process and site of major components of the circulatory system
- Thoracic cage
  - Bound and protected by musculoskeletal structures
  - Expansion produces inspiration
  - Relaxation produces exhalation
Anatomy and Physiology

- Mediastinum--central region of the chest that houses several structures vital to body function
  - Heart
    - Pericardium
    - Major vessels
    - Aortic arch
    - Ligamentum arteriosum
Anatomy and Physiology

- Trachea
- Vena cava
- Aorta
- Esophagus
Lungs:

- Fill chest cavity on either side of the mediastinum
- Right lung, three lobes; left lung, two lobes
- Pleura--double layer of tissue
- Parietal and visceral pleura
- Lubricating fluid ensures lungs adhere to chest wall
Alveoli

- Microscopic chambers within lungs
  - Site of oxygen-carbon dioxide exchange
  - 300 million
  - Give lungs spongy compliance, volume, and light weight
Bellows system

- Skeletal muscles change volume of thorax
- Pleura causes chest walls and lungs to move
- Alveoli respond to changes in thoracic volume
- Airway permits air to move in and out of lungs
The abdomen

- Abdominal cavity
  - Diaphragm separates thorax from abdomen
  - Right upper quadrant contains
    - Liver
    - Right kidney
    - Gall bladder
    - Duodenum
    - Part of the pancreas
    - Part of bowels
Left upper quadrant contains
- Stomach, Left kidney, Spleen, Most of the pancreas, Part of bowels
- Left lower quadrant contains
  - Sigmoid colon, Part of bowels

- Right lower quadrant contains
  - Appendix
  - Part of bowels
Alimentary canal

- Continuous tube from esophagus to rectum
- Houses entire digestive system
- Moves food via peristalsis
- Nutrients taken, waste products removed
Accessory organs

- Liver
  - Metabolic regulation, hematological regulation, bile production
- Pancreas
  - Secrete buffers, digestive enzymes, hormones
- Spleen
  - Engulfs pathogens, immune response
- Kidneys
  - Forms and concentrates urine
Peritoneum

- Delicate covering for abdominal organs
- Lubricating fluid
- Mesentery--tissue that provides small bowel with support, circulation, innervation
- Omentum--tissue that insulates anterior abdomen from trauma and temperature extremes
Chest injuries

- Bellows system compromise
  - Pain restricting chest excursion
  - Air entering pleural space
  - Chest wall failing to move in unison
Rib fractures

- Most often caused by blunt trauma, bowing effect with midshaft fracture
- Most often elderly patients
- Ribs 4-9 are most often fractured (thin and poorly protected)
- Can produce respiratory restriction due to pain and splinting
- Can lead to atelectasis, ventilation/perfusion mismatch
- May indicate underlying lung contusion
Flail chest

- History of frontal or lateral impact
- Three or more ribs fractured in 2 or more places, causing floating segment
- Paradoxical movement of flail segment, opposite to rest of chest
Flail chest care

- Stabilize the floating segment
- Provide positive pressure ventilation, if necessary
Pulmonary contusion

- Damage to lung tissue causing bleeding and swelling
- Reduces lung compliance
- Increases respiratory effort
- Interferes with gas exchange
- Increases PaCO2, decreases pH
Closed pneumothorax

- Internal wound allows air to enter the pleural space
- Small tears self-seal, larger ones may progress
- Paper bag syndrome
- Air will accumulate in the apices, check there first for diminished breath sounds
- Trachea may tug toward the affected side
- Ventilation/perfusion mismatch
Open pneumothorax

- Penetrating injury to the chest which does not seal itself
- Sucking chest wound
- Open wound from chest wall to atmosphere
- Air enters and exits the wound, no gas exchange
- Vena cava kinked from swaying of mediastinum
- Preload decreased from kinking of inferior vena cava
Hemothorax

- Blood enters pleural space
- Shock
- Increased dysnea
- Dull to percussion
Thoracic trauma care

- Soft-tissue injury care
- Cover open wounds with occlusive dressing
- Secure on three sides
- Place patient on injured side if spinal cord injury not suspected
- Monitor closely for signs of respiratory distress
Tension pneumothorax

- Caused by opening in chest wall or lung
- One-way opening allows air to enter, but not exit, the pleural space, collapsing affected lung
- Pressure progressively increases, pushing the mediastinum toward the unaffected side
- Infringes on function of unaffected lung
- Severe hypoxia and hypotension probable
- Kinking of vena cava possible, venous return retarded
- Extreme dyspnea, circulatory collapse
- Pleural space may fill with blood (hemothorax)
- Pneumohemothorax common
Tension pneumothorax care

- Emergency needle decompression
  - 12 Gauge angiocath
  - Mid clavicular or mid axillary line
  - Over top of rib
- Monitor for redevelopment of the condition
- Oxygen
Pericardial tamponade

- Blood enters the pericardial space from penetrating or blunt trauma
- Passive filling of the heart is restricted, reducing preload significantly
- Can also be caused by increasing pressure of tension pneumothorax
Pericardial tamponade

- Decreasing pulse pressure
- Shock
- Muffled heart sounds
Pericardial tamponade care

- A dire emergency
- Perform pericardiocentesis, if trained
Traumatic aortic rupture
Traumatic aortic rupture

- Sudden deceleration causes the aortic layers to break apart
- Tears most often occur at the ligamentum arteriosum
- If force is severe, aorta can tear, causing immediate exsanguination
- Very high mortality for any aortic tears or aneurysm
Traumatic aortic aneurysm care

- Rapid and gentle transport
- Treat for shock
- If ruptured, expect rapid exsanguination
Cardiac contusion

- Damage to myocardium causing bleeding and swelling
- Reduces cardiac output
Cardiac contusion care

- Treat as aggressively as an MI patient
- Implement cardiac protocols
- Anticipate arrhythmias or arrest
Injuries to other structures in the mediastinum

- Aortic aneurysm
- Esophageal rupture
- Vena cava lacerations
- Tracheal tear
  - Air enters the neck, mediastinum
  - Can cause mediastinal shifting and tension mediastinum
Diaphragmatic rupture
- Tear in the diaphragm causes abdominal contents to enter the thorax
- Bowel sounds heard in thorax, respiratory distress, hypoxia
Traumatic asphyxia

- Sudden compressional force squeezes the chest (e.g., auto seat and steering wheel)
- Hypoventilation
- Blood backs up into the head and neck
- Jugular veins engorge, capillaries rupture
- Patient presents with cyanotic upper body, bulging eyes, blue tongue
Traumatic asphyxia care

- Expect hypotension as tension is released
- Treat aggressively for shock
- Expect patient to deteriorate to cardiac arrest
- Consider sodium bicarbonate for potential acidosis
Abdominal Injuries
Penetrating trauma

- Injury dependent upon penetrating object and organs involved
- Liver, kidneys, spleen especially susceptible to injury from cavitational wave caused by high-speed projectiles
- Cannot determine depth, pathway, or organs affected from entrance wound alone
Evisceration

- Rupture of abdominal wall that allows abdominal contents to escape
- Can cause three harmful conditions
  - Interference with blood supply to protruding bowel
  - Drying of bowel
  - Infection
Blunt trauma

- Solid organ injury
  - Contusions, lacerations, fractures of solid organs
  - Rapid hemorrhage, exsanguination possible
- Hollow organ injury
  - Rupture of hollow organs with spilling of contents
  - Severe infection (peritonitis) possible
- Other blunt trauma-related injuries
  - Tearing of blood vessels
  - Tearing of liver at ligamentum teres
  - Bladder, colon, or rectum rupture
Genitalia injury

- **Female**
  - Common cause--child molestation/rape
  - May present with severe internal/external bleeding due to tearing from object forced into vagina

- **Male**
  - Injuries more frequent than in females
  - Laceration may cause large blood loss
  - Blunt trauma may cause hematoma
Genitalia injury treatment

- Control bleeding
- Treat shock
- Immobilized impaled objects
Impaled object care

- Immobilize as found
- Cover entry wound with sterile gauze
- Remove object only if it interferes with CPR
Abdominal trauma care

- Transport immediately if internal bleeding is suggested
- Start IV fluids
- Apply PASG and be ready to inflate
- Reevaluate vital signs often
Penetrating abdominal injury care

- Cover open wounds
- Cover eviscerations with wet, occlusive dressings
- Immobilize objects in place
- Examine for exit wounds
- Treat for shock aggressively
Blunt abdominal injury care

- Care is basically supportive
- Place patient in comfortable position
- Transport carefully to trauma center
Assessment

Mechanism of injury
- Analyze the extent of auto damage
- Look for steering wheel deformity
- Check for use of seatbelts/air bags
Primary assessment

- **Airway and breathing**
  - "Look" for signs of chest trauma
    - Inspect the chest wall for asymmetry during ventilation
    - Inspiration should be slightly shorter than expiration
  - "Listen" for abnormal sounds
  - "Feel" for air movement
• Circulation
  - Check for signs of hypovolemia by assessing
    - Heart rate and quality
    - Skin condition
    - Capillary refill time

• Disability
  - Look for altered level of consciousness from hypoxia or circulatory compromise
Expose and examine the Neck for
- Jugular venous distention (tension pneumothorax, pericardial tamponade, traumatic asphyxia, heart failure from myocardial contusion)
- Tracheal displacement (deviated away from injury in tension pneumothorax, tugging toward injury in simple pneumothorax or hemothorax)
● Chest for
  – Subcutaneous emphysema from airway rupture
  – Thoracic cage stability
  – Sucking chest wounds
  – Ecchymosis, soft tissue injuries which indicate underlying tissue damage
  – Auscultation of lung fields for presence, equality, adequacy of ventilations (diminished or absent lung sounds in pneumothorax or hemothorax, pulmonary edema from lung contusion)
Abdomen for

- External signs of injury and exaggerated abdominal wall movement (through inspection and palpation)
- Tenderness, guarding, rigidity, pulsating masses (through palpation)
Evaluate primary assessment

- Identify and treat life threats
- Protect airway and ensure adequate ventilations
- Administer oxygen
- Seal any open wounds
- Limit movement of flail segments
- Treat aggressively for shock
- Assess need for immediate transport
Secondary assessment

- Chest assessment
  - Inspection
    - Observe for symmetry of movement
    - Determine minute volume and adequacy of respiratory effort
    - Use pulse oximetry
    - Assess for signs of respiratory failure
  - Palpation for crepitation, subcutaneous emphysema, deformities
- Auscultation
  - For equality and adequacy of air movement
  - Heart sounds

- Percussion
  - For quality of sound
  - For equality of resonance
Abdominal assessment

- Inspection for external signs of injury
- Palpation for pain, tenderness, guarding, rigidity
- Vital signs
  - Pulse rate, quality
  - Blood pressure
    - Pulse pressure
    - Pulsus paradoxus
  - Respirations
Patient history

- Chief complaint
- Thoracic symptoms (specifically ask about respiratory effort)
- Abdominal symptoms (carefully record location and quality of pain)
Management

- Stabilize the spine
- Secure an open airway
- Provide ventilatory support with supplemental oxygen
- PASG if hypovolemic shock suspected
- Rapid transport if patient is critical
- IV fluid replacement en route
- Reassess and monitor for signs of deterioration
Pain medication

- Nitronox
  - 50/50 mixture of oxygen and nitrous oxide
  - Self-administered by mask
  - Short-acting agent (subsides in 2-5 minutes)
  - May cause side effects (nausea, vomiting)
  - May cause increased ICP
  - Rule out pneumothorax prior to use
Morphine sulfate

- Narcotic analgesic
- May be used to treat pain of isolated rib fracture
- May cause respiratory depression
- Not used in head or abdominal injuries