

**UNIT TERMINAL OBJECTIVE**

4-8 At the completion of this unit, the paramedic student will be able to integrate pathophysiologic principles and the assessment findings to formulate a field impression and implement the treatment plan for the patient with suspected abdominal trauma.

**COGNITIVE OBJECTIVES**

At the completion of this unit, the paramedic student will be able to:

- 4-8.1 Describe the epidemiology, including the morbidity/mortality and prevention strategies for a patient with abdominal trauma. (C-1)
- 4-8.2 Describe the anatomy and physiology of organs and structures related to abdominal injuries. (C-1)
- 4-8.3 Predict abdominal injuries based on blunt and penetrating mechanisms of injury. (C-2)
- 4-8.4 Describe open and closed abdominal injuries. (C-1)
- 4-8.5 Explain the pathophysiology of abdominal injuries. (C-1)
- 4-8.6 Describe the assessment findings associated with abdominal injuries. (C-1)
- 4-8.7 Identify the need for rapid intervention and transport of the patient with abdominal injuries based on assessment findings. (C-1)
- 4-8.8 Describe the management of abdominal injuries. (C-1)
- 4-8.9 Integrate the pathophysiological principles to the assessment of a patient with abdominal injury. (C-3)
- 4-8.10 Differentiate between abdominal injuries based on the assessment and history. (C-3)
- 4-8.11 Formulate a field impression for patients with abdominal trauma based on the assessment findings. (C-3)
- 4-8.12 Develop a patient management plan for patients with abdominal trauma based on the field impression. (C-3)
- 4-8.13 Describe the epidemiology, including the morbidity/ mortality and prevention strategies for solid organ injuries. (C-1)
- 4-8.14 Explain the pathophysiology of solid organ injuries. (C-1)
- 4-8.15 Describe the assessment findings associated with solid organ injuries. (C-1)
- 4-8.16 Describe the treatment plan and management of solid organ injuries. (C-1)
- 4-8.17 Describe the epidemiology, including the morbidity/ mortality and prevention strategies for hollow organ injuries. (C-1)
- 4-8.18 Explain the pathophysiology of hollow organ injuries. (C-1)
- 4-8.19 Describe the assessment findings associated with hollow organ injuries. (C-1)
- 4-8.20 Describe the treatment plan and management of hollow organ injuries. (C-1)
- 4-8.21 Describe the epidemiology, including the morbidity/ mortality and prevention strategies for abdominal vascular injuries. (C-1)
- 4-8.22 Explain the pathophysiology of abdominal vascular injuries. (C-1)
- 4-8.23 Describe the assessment findings associated with abdominal vascular injuries. (C-1)
- 4-8.24 Describe the treatment plan and management of abdominal vascular injuries. (C-1)
- 4-8.25 Describe the epidemiology, including the morbidity/ mortality and prevention strategies for pelvic fractures. (C-1)
- 4-8.26 Explain the pathophysiology of pelvic fractures. (C-1)
- 4-8.27 Describe the assessment findings associated with pelvic fractures. (C-1)
- 4-8.28 Describe the treatment plan and management of pelvic fractures. (C-1)
- 4-8.29 Describe the epidemiology, including the morbidity/ mortality and prevention strategies for other related abdominal injuries. (C-1)
- 4-8.30 Explain the pathophysiology of other related abdominal injuries. (C-1)
- 4-8.31 Describe the assessment findings associated with other related abdominal injuries. (C-1)
- 4-8.32 Describe the treatment plan and management of other related abdominal injuries. (C-1)
- 4-8.33 Apply the epidemiologic principles to develop prevention strategies for abdominal injuries. (C-2)

- 4-8.34 Integrate the pathophysiological principles to the assessment of a patient with abdominal injuries. (C-3)
- 4-8.35 Differentiate between abdominal injuries based on the assessment and history. (C-3)
- 4-8.36 Formulate a field impression based upon the assessment findings for a patient with abdominal injuries. (C-3)
- 4-8.37 Develop a patient management plan for a patient with abdominal injuries, based upon field impression. (C-3)

**AFFECTIVE OBJECTIVES**

At the completion of this unit, the paramedic student will be able to:

- 4-8.38 Advocate the use of a thorough assessment to determine a differential diagnosis and treatment plan for abdominal trauma. (A-3)
- 4-8.39 Advocate the use of a thorough scene survey to determine the forces involved in abdominal trauma. (A-3)
- 4-8.40 Value the implications of failing to properly diagnose abdominal trauma and initiate timely interventions to patients with abdominal trauma. (A-2)

**PSYCHOMOTOR OBJECTIVES**

At the completion of this unit, the paramedic student will be able to:

- 4-8.41 Demonstrate a clinical assessment to determine the proper treatment plan for a patient with suspected abdominal trauma. (P-1)
- 4-8.42 Demonstrate the proper use of PASG in a patient with suspected abdominal trauma. (P-1)
- 4-8.43 Demonstrate the proper use of PASG in a patient with suspected pelvic fracture. (P-1)

## DECLARATIVE

- I. Introduction
  - A. Epidemiology
    - 1. Increased incidence of morbidity and mortality
      - a. Due to delay to surgical intervention
      - b. Death occurs as a result of increased hemorrhage due to delay
        - (1) Solid organ injuries
        - (2) Hollow organ injuries
        - (3) Abdominal vascular injuries
        - (4) Pelvic fractures
    - 2. Prevention strategies
  - B. Anatomy review
    - 1. Boundaries of the abdomen
      - a. Diaphragm
      - b. Anterior abdominal wall
      - c. Pelvic skeletal structures
      - d. Vertebral column
      - e. Muscles of the abdomen and flanks
    - 2. Surface anatomy of the abdomen
      - a. Quadrants
        - (1) Upper
          - (a) Right
          - (b) Left
        - (2) Lower
          - (a) Right
          - (b) Left
      - b. Xiphoid
      - c. Symphysis pubis
      - d. Umbilicus
    - 3. Intraperitoneal structures
      - a. Liver
      - b. Spleen
      - c. Stomach
      - d. Small bowel
      - e. Colon
      - f. Gallbladder
      - g. Female reproductive organs
    - 4. Retroperitoneal structures
      - a. Central structures
        - (1) Duodenum
        - (2) Pancreas
        - (3) Major vascular structures
      - b. Lateral structures
        - (1) Kidneys
        - (2) Ureters
        - (3) Posterior ascending and descending colon
      - c. Pelvic structures

- (1) Rectum
  - (2) Ureters
  - (3) Pelvic vascular plexus
  - (4) Major vascular structures
  - (5) Pelvic skeletal structures
  - (6) Reproductive organs
5. Physiology review
- a. Injury to abdominal structures causes morbidity and mortality primarily as a result of hemorrhage
  - b. Injury may be subtle
  - c. High index of suspicion
  - d. Solid organs
    - (1) Hemorrhage
    - (2) Shock
  - e. Hollow organs
    - (1) Spillage of contents
    - (2) Peritonitis
  - f. Vascular structures
    - (1) Hemorrhage
    - (2) Shock
- C. Mechanism of injury review
- 1. Index of suspicion
  - 2. Blunt mechanisms
    - a. Compression forces
    - b. Shear forces
    - c. Deceleration forces
    - d. Motor vehicle collisions
      - (1) Head-on or frontal impact
        - (a) Down and under path
        - (b) Up and over path
      - (2) Rear impact
      - (3) Lateral or side impact
      - (4) Rotational impact
      - (5) Rollover
      - (6) Restrained (type of restraint) or unrestrained
      - (7) Seat belt injuries
      - (8) Steering wheel injuries
    - e. Motorcycle collisions
    - f. Pedestrian injuries
    - g. Falls
    - h. Assault
    - i. Blast injuries
  - 3. Penetrating mechanisms
    - a. Energy imparted to the body
      - (1) Low velocity
        - (a) Knife
        - (b) Ice pick
      - (2) Medium velocity

- (a) Gunshot wounds
  - (b) Shotgun wounds
  - (3) High velocity
    - (a) High power hunting rifles
    - (b) Military weapons
    - (c) Ballistics
    - (d) Trajectory
    - (e) Distance
- II. General system pathophysiology, assessment, and management
- A. Pathophysiology of abdominal injuries
- 1. Hemorrhage
    - a. No external signs
    - b. Rapid blood loss
    - c. Hypovolemic shock
    - d. Blood is not chemical irritant to peritoneum (therefore, no peritonitis)
  - 2. Spillage of contents
    - a. Enzymes
    - b. Acids
    - c. Bacteria
    - d. Chemical irritation to peritoneum (peritonitis)
    - e. Localized pain sensation via somatic nerve fibers
    - f. Muscular spasm secondary to peritonitis (rigid abdomen)
- B. Assessment
- 1. Focused history and physical examination
    - a. General
      - (1) Head injury and/ or intoxicants (drugs/ ethanol) mask signs and symptoms
      - (2) Hemoperitoneum (solid organ or vascular injuries)
        - (a) Blood not chemical irritant to peritoneum
        - (b) Adult abdomen will accommodate 1.5 liters with no abdominal distention
        - (c) Often present even with normal abdominal exam
        - (d) Unexplained shock
        - (e) Shock out of proportion to known injuries
      - (3) Peritonitis (hollow organ injury)
        - (a) Pain (subjective symptom from patient)
        - (b) Tenderness (objective sign with percussion/ palpation)
        - (c) Guarding/ rigidity
        - (d) Distention (late finding)
      - (4) Abrasions
      - (5) Ecchymosis
      - (6) Visible wounds
      - (7) Mechanism of injury
      - (8) Unexplained shock
    - b. Critical findings
      - (1) Rapid assessment and transport
      - (2) Detailed assessment
      - (3) On-going assessment

- c. Noncritical findings
        - (1) Focused history and physical examination
        - (2) Other interventions and transport considerations
    - 2. Comprehensive assessment
      - a. Vital signs
        - (1) Indications of shock
      - b. Inspection
        - (1) Abrasions
        - (2) Ecchymosis
          - (a) Seat belt sign
        - (3) Distention
        - (4) Obvious external blood loss
        - (5) Wounds
        - (6) Impaled object
        - (7) Evisceration
      - c. Auscultation - not useful out-of-hospital assessment tool
      - d. Percussion (tenderness)
      - e. Palpation
        - (1) Tenderness
        - (2) Guarding/ rigidity
        - (3) Pelvic stability/ tenderness
      - f. Absence of signs and/ or symptoms does not rule-out abdominal injuries
      - g. Not necessary to determine definitively if abdominal injuries are present
      - h. Examine the back
    - 3. Differential diagnosis and continued management
- C. Management/ treatment plan
  - 1. Surgical intervention only effective therapy
  - 2. No definitive therapy possible out-of-hospital
  - 3. Rapid evaluation
  - 4. Initiation of shock resuscitation
  - 5. Rapid packaging and transport to nearest appropriate facility
    - a. Facility must have immediate surgical capability
    - b. Rapid transport
      - (1) Defer if hospital cannot provide immediate surgical intervention
  - 6. Crystalloid fluid replacement
    - a. En route to hospital
  - 7. Airway support
  - 8. Breathing support
  - 9. Circulatory support
    - a. Control obvious hemorrhage
    - b. Tamponade bleeding
    - c. Manage hypotension
      - (1) Fluid resuscitation
  - 10. Patient packaging
  - 11. Transport
    - a. Indications for rapid transport
      - (1) Critical findings
      - (2) Surgical intervention required to control hemorrhage and/ or contamination

- (3) High index of suspicion for abdominal injury
- (4) Unexplained shock
- (5) Physical signs of abdominal injury
- (6) Hemorrhage continues until controlled in the operating room
- (7) Survival determined by length of time from injury to definitive surgical control of hemorrhage
- (8) Any delay in the field negatively impacts this time period
- b. Indications for transport to trauma center
- c. Indications for transport to acute care facility
- d. Indications for no transport required

III. Specific injuries

A. Solid organ injuries

1. Epidemiology

- a. Morbidity/ mortality
  - (1) Secondary to blood loss
  - (2) Result of blunt and penetrating injuries
- b. Prevention strategies
- c. Anatomy and physiology review
- d. Pathophysiology
- e. Assessment
  - (1) Initial assessment
  - (2) Focused history and physical examination
    - (a) Critical findings
      - i) Presence of shock
      - ii) Mechanism of injury
      - iii) Obvious external signs of abdominal trauma
      - iv) Unexplained shock
      - v) Shock out of proportion to known injuries
      - vi) Presence of physical signs of acute abdomen
        - a) Rigidity
        - b) Guarding
        - c) Distention
      - vii) Rapid assessment and transport
      - viii) Detailed assessment
      - ix) On-going assessment
    - (b) Non-critical findings
      - i) Focused history and physical examination
      - ii) Other interventions and transport considerations
      - iii) On-going assessment
  - (3) Comprehensive assessment
    - (a) Vital signs
    - (b) Inspection
    - (c) Percussion
    - (d) Palpation
  - (4) Differential diagnosis and continued management
- f. Management/ treatment plan
  - (1) Airway support

- (2) Breathing support
- (3) Circulatory support
- (4) Patient packaging
- (5) Transport
- (6) Psychological support/ communications strategies
- 2. Liver injuries
  - a. Morbidity and mortality
    - (1) Result of blood loss
  - b. Injuries result of
    - (1) Blunt trauma
    - (2) Penetrating trauma
- 3. Splenic injuries
  - a. Most frequently injured organ
    - (1) Blunt trauma
    - (2) Commonly associated with other intra abdominal injuries
    - (3) May present with left shoulder pain
      - (a) Result of diaphragm irritation
- 4. Kidney injuries
  - a. Often presents with hematuria
  - b. Back pain
- 5. Pancreas
  - a. Most common with penetrating injuries
  - b. May also occur as a result of pancreas being compressed against vertebral column by
    - (1) Steering wheels
    - (2) Handle bars
    - (3) Other structures stronger than the pancreas
  - c. Products of pancreas have an irritation effect on peritoneum
  - d. Auto-digestion of tissue
- 6. Diaphragm
  - a. Injury often insidious
  - b. Herniation of abdominal contents into chest may occur
- B. Hollow organ injuries
  - 1. Epidemiology
    - a. Morbidity/ mortality
      - (1) Secondary to blood loss and content spillage
      - (2) Result of blunt and penetrating injuries
    - b. Prevention strategies
    - c. Anatomy and physiology review
    - d. Pathophysiology
    - e. Assessment
      - (1) Initial assessment
      - (2) Focused history and physical examination
        - (a) Critical findings
          - i) Presence of shock
          - ii) Mechanism of injury
          - iii) Obvious external signs of abdominal trauma
          - iv) Unexplained shock



- v) Shock out of proportion to known injuries
- vi) Presence of physical signs of acute abdomen
  - a) Rigidity
  - b) Guarding
  - c) Distention
- vii) Rapid assessment and transport
- viii) Detailed assessment
- ix) On-going assessment
- (b) Non-critical findings
  - i) Focused history and physical examination
  - ii) Other interventions and transport considerations
  - iii) On-going assessment
- (3) Comprehensive assessment
  - (a) Vital signs
  - (b) Inspection
  - (c) Percussion
  - (d) Palpation
- (4) Differential diagnosis and continued management
- f. Management/ treatment plan
  - (1) Airway support
  - (2) Breathing support
  - (3) Circulatory support
  - (4) Patient packaging
  - (5) Transport
  - (6) Psychological support/ communications strategies
- 2. Small and large intestines
  - a. Most often injured as a result of
    - (1) Penetrating injuries
  - b. Can occur with deceleration injuries
- 3. Stomach
  - a. Most often injured as a result of
    - (1) Blunt trauma
    - (2) Full stomach prior to incident increases risk of injury
- 4. Duodenum
  - a. Most often injured as a result of
    - (1) Blunt trauma
  - b. Recognition often delayed
- 5. Bladder
  - a. Most often injured as a result of
    - (1) Blunt trauma
    - (2) Full bladder prior to incident may increase risk of injury
  - b. Associated with pelvic injury
- C. Abdominal vascular injuries
  - 1. Epidemiology
    - a. Morbidity/ mortality
    - b. Prevention strategies
  - 2. Anatomy and physiology review
  - 3. Pathophysiology

- 4. Assessment
  - a. Initial assessment
  - b. Focused history and physical examination
    - (1) Critical findings
      - (a) Rapid assessment and transport
      - (b) Detailed assessment
      - (c) On-going assessment
    - (2) Non-critical findings
      - (a) Focused history and physical examination
      - (b) Other interventions and transport considerations
      - (c) On-going assessment
  - c. Comprehensive assessment
    - (1) Vital signs
    - (2) Inspection
    - (3) Percussion
    - (4) Palpation
  - d. Differential diagnosis and continued management
- 5. Management/ treatment plan
  - a. Airway support
  - b. Breathing support
  - c. Circulatory support
  - d. Patient packaging
  - e. Transport
  - f. Psychological support/ communications strategies
- D. Pelvic fractures
  - 1. Epidemiology
    - a. Morbidity/ mortality
    - b. Prevention strategies
  - 2. Anatomy and physiology review
  - 3. Pathophysiology
  - 4. Assessment
    - a. Initial assessment
    - b. Focused history and physical examination
      - (1) Critical findings
        - (a) Rapid assessment and transport
        - (b) Detailed assessment
        - (c) On-going assessment
      - (2) Non-critical findings
        - (a) Focused history and physical examination
        - (b) Other interventions and transport considerations
        - (c) On-going assessment
      - (3) Associated injuries
        - (a) Bladder
        - (b) Urethra
    - c. Comprehensive assessment
      - (1) Vital signs
      - (2) Inspection
        - (a) Check perineum for

- i) Ecchymosis
          - ii) Blood
        - (b) Check meatus of penis for blood
      - (3) Palpation
    - d. Differential diagnosis and continued management
  - 5. Management/ treatment plan
    - a. Airway support
    - b. Breathing support
    - c. Circulatory support
      - (1) PASG
    - d. Patient packaging
    - e. Transport
    - f. Psychological support/ communications strategies
- E. Other related abdominal injuries
  - 1. Abdominal wall injuries
    - a. Eviscerations
      - (1) Epidemiology
        - (a) Morbidity/ mortality
        - (b) Prevention strategies
      - (2) Anatomy and physiology review
      - (3) Pathophysiology
      - (4) Assessment
        - (a) Initial assessment
        - (b) Focused history and physical examination
          - i) Critical findings
            - a) Rapid assessment and transport
            - b) Detailed assessment
            - c) On-going assessment
          - ii) Non-critical findings
            - a) Focused history and physical examination
            - b) Other interventions and transport considerations
            - c) On-going assessment
        - (c) Comprehensive assessment
          - i) Vital signs
          - ii) Inspection
          - iii) Percussion
          - iv) Palpation
        - (d) Differential diagnosis and continued management
      - (5) Management/ treatment plan
        - (a) Airway support
        - (b) Breathing support
        - (c) Circulatory support
        - (d) Patient packaging
          - i) Do not replace organs back into abdomen
          - ii) Protect organs from further damage
          - iii) Cover with sterile saline moistened dressing
        - (e) Transport
        - (f) Psychological support/ communications strategies