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)
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
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
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) Military weapons
(c) Ballistics
(d) Trajectory
(e) Distance
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) Defeated 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
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
(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