

MODULE 5
Trauma

Lesson 5-1
Bleeding and Shock

OBJECTIVES

OBJECTIVES LEGEND

C = Cognitive P = Psychomotor A = Affective

1 = Knowledge level

2 = Application level

3 = Problem-solving level

COGNITIVE OBJECTIVES

At the completion of this lesson, the EMT-Basic student will be able to:

- 5-1.1 List the structure and function of the circulatory system.(C-1)
- 5-1.2 Differentiate between arterial, venous and capillary bleeding.(C-3)
- 5-1.3 Describe “severe external blood loss” in terms of volume, signs and symptoms and the body’s natural response.
- 5-1.4 State methods of emergency medical care of external bleeding.(C-1)
- 5-1.5 Establish the relationship between body substance isolation and bleeding.(C-3)
- 5-1.6 Establish the relationship between airway management and the trauma patient.
- 5-1.7 Establish the relationship between mechanism of injury and internal bleeding.
- 5-1.8 Describe causes, injuries and consequences of severe internal bleeding.
- 5-1.9 List the signs of internal bleeding.(C-1)
- 5-1.10 List the steps in the emergency medical care of the patient with signs and symptoms of internal bleeding.(C-1)
- 5-1.11 Define hypoperfusion, its traumatic causes and the body’s response.
- 5-1.12 List signs and symptoms of hypoperfusion. (C-1)
- 5-1.13 State the steps in the emergency medical care of the patient with signs and symptoms of shock.(C-1)

AFFECTIVE OBJECTIVES

At the completion of this lesson, the EMT-Basic student will be able to:

- 5-1.14 Explain the sense of urgency to transport patients that are bleeding and show signs of shock (hypoperfusion).(A-1)

PSYCHOMOTOR OBJECTIVES

At the completion of this lesson, the EMT-Basic student will be able to:

- 5-1.15 Demonstrate direct pressure as a method of emergency medical care of external bleeding.(P-1,2)
- 5-1.16 Demonstrate the use of diffuse pressure as a method of emergency medical care of external bleeding.(P-1,2)
- 5-1.17 Demonstrate the use of pressure points and tourniquets as a method of emergency medical care of external bleeding.(P-1,2)
- 5-1.18 Demonstrate the care of the patient exhibiting signs and symptoms of internal bleeding.(P-1,2)

- 5-1.19 Demonstrate the care of the patient exhibiting signs and symptoms of shock (hypoperfusion).(P-1,2)
- 5-1.20 Demonstrate how to complete a prehospital care report for patient with bleeding and/or shock (hypoperfusion).(P-2)

PREPARATION

Motivation: Trauma is the leading cause of death in the United States for persons between the ages of 1 and 44. Understanding the mechanism of injury and relevant signs and symptoms of bleeding and shock (hypoperfusion) is of paramount importance when dealing with the traumatized patient.

Prerequisites: BLS, Preparatory, Airway and Patient Assessment.

INSTRUCTOR NOTE: Instructors should consider integrating the materials from the various lessons in this module in order to provide a comprehensive understanding of trauma.

MATERIALS

AV Equipment: Utilize various audio-visual materials relating to bleeding and shock (hypoperfusion). The continuous design and development of new audio-visual materials relating to EMS requires careful review to determine which best meet the needs of the program. Materials should be edited to assure meeting the objectives of the curriculum.

EMS Equipment: Sterile dressings, bandages, splints, pneumatic antishock garment, triangular bandage, stick or rod, air splints, gloves, eye protection, blanket.

PERSONNEL

Primary Instructor: One EMT-Basic instructor knowledgeable in bleeding and shock (hypoperfusion).

Assistant Instructor: The instructor-to-student ratio should be 1:6 for psychomotor skill practice. Individuals used as assistant instructors should be knowledgeable in bleeding and shock.

Recommended Minimum Time to Complete: Two hours

PRESENTATION

Declarative (What)

- I. Circulatory (Cardiovascular) System Review
 - A. Anatomy review
 1. Heart
 2. Arteries
 3. Capillaries
 4. Veins
 5. Blood
 - B. Physiology
 1. Perfusion
Definition - circulation of blood through an organ structure.
Perfusion supplies oxygen and other nutrients to the cells of all organ systems and the removal of waste products.
 2. Shock (Hypoperfusion) is the inadequate circulation of oxygenated blood through the tissues of an organ.

- II. External Bleeding
 - A. Body substance isolation must be routinely taken to avoid skin and mucous membrane exposure to body fluids.
 1. Eye protection
 2. Gloves
 3. Gown
 4. Mask
 5. Hand washing following each run.
 - B. Trauma patients may be unable to maintain their own airway. Airway management is essential with every patient. The trauma patient may require cervical spine precautions. Consider:
 1. loss of consciousness
 2. foreign materials
 3. swelling
 4. unstable bone structures
 5. mechanism of injury
 - C. Severity
 1. The sudden loss of one liter (1000cc) of blood in the adult patient, ½ liter (500cc) of blood in the child, and 100 - 200cc of the blood volume in an infant is considered serious. (For example, a one year old only has 800cc of blood, therefore 150cc is a major blood loss).
 2. The severity of blood loss must be based on the patient's signs and symptoms and the general impression of the amount of blood loss. If the patient exhibits signs and symptoms of shock (hypoperfusion), the bleeding is to be considered serious.
 3. The natural response to bleeding is blood vessel constrictions and clotting; however, a serious injury may prevent effective clotting from occurring.

4. Uncontrolled bleeding or significant blood loss leads to shock (hypoperfusion) and possibly death.
- D. Types of bleeding
1. Arterial
 - a. The blood spurts from the wound.
 - b. Bright, red, oxygen rich blood.
 - c. Arterial bleeding is the most difficult to control because of the pressure at which arteries bleed and because arteries are deeper.
 - d. As the patient's blood pressure drops, the amount of spurting may also drop.
 2. Venous
 - a. The blood flows as a steady stream.
 - b. Dark, oxygen poor blood.
 - c. Bleeding from a vein can be profuse; however, in most cases it is easier to control due to the lower venous pressure.
 3. Capillary
 - a. The blood oozes from a capillary and is dark red in color.
 - b. The bleeding often clots spontaneously.
- E. Emergency medical care of external bleeding
1. Body substance isolation
 2. Consider Cervical Spine precautions
Maintain airway/artificial ventilation.
 3. Administer Oxygen
 3. Bleeding control
 - a. Apply a sterile dressing and direct pressure directly on the point of bleeding.
 - b. Elevation of a bleeding extremity should be used secondary to and in conjunction with direct pressure without compromising any other injury.
 - c. Large gaping wounds may require dressing with large sterile dressing and direct pressure.
 - d. If bleeding does not stop, apply additional pressure and dressings.
 - e. Pressure points may be used in upper and lower extremities.
 4. Methods to control external bleeding if direct pressure fails
 - a. Splints
 - (1) Reduction of motion of bone ends will reduce the amount and aggravation of tissue damage and bleeding associated with a fracture.
 - (2) Splinting may allow prompt control of bleeding associated with a fracture.
 - b. Pressure Splints
 - (1) The use of air pressure splints can help control severe bleeding associated with lacerations of soft tissue or when bleeding is associated with fractures.

- c. Tourniquet
 - (1) Use as a last resort to control bleeding of an extremity when all other methods of bleeding control have failed.
 - (2) Application of a tourniquet can cause permanent damage to nerves, muscles and blood vessels resulting in the loss of an extremity.
 - (3) If a tourniquet has been applied:
 - (a) Notify other emergency personnel who may care for the patient that a tourniquet has been applied.
 - (b) Document the use of a tourniquet and the time applied in the prehospital patient report.
 - (4) A continuously inflated blood pressure cuff may be used as a tourniquet.
 - (5) Precautions with the use of a tourniquet:
 - (a) Use a wide bandage and secure tightly.
 - (b) Never use wire, rope, a belt, or any other material that may cut into the skin and underlying tissue.
 - (c) Do not remove or loosen the tourniquet once it is applied unless directed to do so by medical direction.
 - (d) Leave the tourniquet in open view.
 - (e) Do not apply a tourniquet directly over any joint, but as close to the injury as possible.

F. Special areas (bleeding from the nose, ears or mouth)

- 1. Potential causes:
 - a. Injured skull
 - b. Facial trauma
 - c. Digital trauma (nose picking)
 - d. Sinusitis and other upper respiratory tract infections
 - e. Hypertension (high blood pressure)
 - f. Coagulation disorders
- 2. Bleeding from the ears or nose may occur as a result owing to a skull fracture. If the bleeding is the result of trauma, do not attempt to stop the blood flow. Collect the blood with a loose dressing, which may also limit exposure to sources of infection.
- 3. Emergency medical care for epistaxis (nosebleed):
 - a. Place the patient in a sitting position leaning forward without compromising any other injuries.
 - b. Apply direct pressure by pinching the fleshy portion of the nostrils together.
 - c. Keep the patient calm and quiet.

III. Internal Bleeding

A. Severity

1. Internal bleeding can result in severe blood loss with resultant shock (hypoperfusion) and subsequent death.
2. Injured, damaged or diseased internal organs commonly lead to extensive bleeding that is concealed.
3. Painful, swollen, deformed extremities may also lead to serious internal blood loss.
4. Suspicion and severity of internal bleeding should be based on the mechanism of injury and clinical signs and symptoms.

B. Relationship to mechanism of injury

1. Blunt trauma
 - a. Falls
 - b. Motorcycle crashes
 - c. Pedestrian impacts
 - d. Automobile collisions
 - e. Blast injuries
 - f. Look for evidence of contusions, abrasions, deformity, impact marks, and swelling.
2. Penetrating trauma

C. Signs and symptoms of internal bleeding

1. Pain, tenderness, swelling or discoloration of suspected site of injury.
2. Bleeding from the mouth, rectum, or vagina, or other orifice.
3. Vomiting bright red blood or dark coffee ground colored blood. Coughing up blood.
4. Dark, tarry stools or stools with bright red blood
5. Tender, rigid, and/or distended abdomen
6. Signs and symptoms of hypovolemic shock (hypoperfusion)
 - a. Anxiety, restlessness, combativeness or altered mental status.
 - b. Weakness, faintness or dizziness
 - c. Thirst
 - d. Shallow rapid breathing
 - e. Rapid weak pulse
 - f. Pale, cool, clammy skin
 - g. Capillary refill greater than 2 seconds - infant and child patients only
 - h. Dropping blood pressure (late sign)
 - i. Dilated pupils that are sluggish to respond
 - j. Nausea and vomiting

D. Emergency medical care

1. Body substance isolation
2. Maintain airway/artificial ventilation.
3. Administer oxygen if not already done during the initial assessment.
4. If bleeding is suspected in an extremity, control bleeding by direct

- pressure and application of a splint.
- 5. Do not delay transport of a patient with signs and symptoms of shock (hypoperfusion).
- 6. Complete the Prehospital Care Report. Document all pertinent findings of the patient assessment; treatment; and transport decisions.

IV. Shock (hypoperfusion syndrome)

A. Severity

- 1. Shock (hypoperfusion) results from inadequate perfusion of cells with oxygen and nutrients and inadequate removal of metabolic waste products.
- 2. Cell and organ malfunction and death can result from shock (hypoperfusion); therefore, prompt recognition and treatment is vital to patient survival.
- 3. Peripheral perfusion is drastically reduced due to the reduction in circulating blood volume.
- 4. Trauma patients develop shock (hypoperfusion) from the loss of blood from both internal and external sites. This type of shock (hypoperfusion) is referred to as hemorrhagic shock.

B. Types of Shock

- 1. Hypovolemic Shock - A type of shock that is the result of a low blood volume.
 - a. Hemorrhagic Shock - The form of shock that is the result of blood loss either from trauma or a disease process. The natural response to bleeding is blood vessel constriction and clotting. Uncontrolled bleeding or significant bleeding can lead to shock and possibly death. Blood loss may be internal or external.
 - (1) Signs and Symptoms of Hemorrhagic Shock
 - (a) Altered Mental Status
restlessness, anxiety, combativeness, coma
 - (b) Increased respiratory rate
 - (c) Weak, rapid pulse
 - (d) Orthostatic changes
 - (e) Pale conjunctiva
 - (f) Delayed capillary refill
 - (g) Pale, moist, cool skin
 - (h) Nausea, vomiting
 - (i) Thirst
 - (j) Dilated pupils
 - (k) Feeling of impending doom
 - (l) Falling blood pressure (late sign)
 - i) infants and children can maintain their blood pressure until their blood volume is more than half gone, so by the time their blood pressure drops they are

- close to death.
- b. Metabolic Shock - Another form of Hypovolemic shock that is the result of electrolyte or plasma loss and does not involve the loss of whole blood. It can occur due to dehydration or from burns.
 - (1) Signs and symptoms - similar to hemorrhagic but without blood loss. May also include:
 - (a) Furrowed tongue
 - (b) Sunken eyes
 - (c) Poor skin turgor or tenting of the skin
 - (d) Sunken fontanelles in the infant patient
 - (e) Recent episodes of vomiting and diarrhea
 - (f) Presence of burns
 - c. Emergency Medical Care of Hypovolemic Shock
 - (1) Body substance isolation
 - (2) Maintain airway / artificial ventilation (as needed)
 - (3) Administer oxygen (high concentration)
 - (4) Control bleeding
 - (5) Elevate the patient's legs.
 - (6) Apply pneumatic antishock garment
 - (7) Immobilize the spine if trauma is suspected.
 - (8) Maintain body temperature
 - (9) Do not delay transport of a critical patient with signs and symptoms of shock.
 - (10) Complete the Prehospital Care Report. Document all pertinent findings of the patient assessment; treatment; and transport decisions.
2. Cardiogenic Shock- a type of shock that is the result of a massive myocardial infarction. The heart becomes so badly damaged that it is unable to pump effectively. As a result, blood begins to back up in the system.
- a. Signs and symptoms - may include:
 - (1) Chest pain (may or may not be present)
 - (a) pressure, squeezing, etc.
 - (b) may radiate down the arms or into the jaw or neck
 - (2) Epigastric pain
 - (3) Dyspnea
 - (4) Pulmonary Edema
 - (a) pink, frothy sputum
 - (5) Diaphoresis
 - (6) Pallor and cyanosis
 - (7) Cool skin
 - (8) Nausea, vomiting
 - (9) Anxiety
 - (10) Feeling of impending doom
 - (11) Irregular pulse rate / rhythm

- (12) Hypotension
- (13) Cardiac arrest
- b. Emergency Medical Care
 - (1) Circulation - pulse absent
 - (a) >12 years old - CPR with AED
 - (b) <12 years old or < 90 lbs. - CPR
 - (2) Responsive patient
 - (a) Perform initial assessment
 - (b) Perform focused history and physical exam.
 - (c) Place patient in a position of comfort
 - (d) Apply oxygen (high concentration)
 - (e) Monitor vital signs
 - (f) Be prepared for cardiac arrest
 - (g) Do not delay transport
 - (h) Complete the Prehospital Care Report
 - (i) Document all pertinent findings of the patient assessment; treatment; and transport decisions.
- 3. Distributive Shock- A type of shock with several different forms. In Distributive shock, the blood vessels suddenly dilate causing the blood pressure to fall. This can occur for several reasons.
 - a. Anaphylactic Shock - a form of shock caused by a violent systemic reaction to an allergen / toxin. The substance may be ingested, injected, inhaled or absorbed. The patient may know what substance caused the reaction.
 - (1) Signs and symptoms may include:
 - (a) Dizziness / restlessness
 - (b) Swelling of the tongue
 - (c) Swelling of lips
 - (d) Difficulty breathing
 - (e) Stridor
 - (f) Chest pain
 - (g) Hives
 - (h) Itching
 - (i) Weak, rapid pulse
 - (j) Hypotension
 - (k) Pallor and cyanosis
 - (l) Nausea / vomiting
 - (2) Emergency Medical Care
 - (a) Perform initial assessment
 - (b) Perform focused history and physical exam.
 - (c) Place patient in a position of comfort if possible
 - (d) Administer oxygen (if not already done)
 - (e) Assist patient with autoinjector if they have one
 - (f) Monitor vital signs
 - (g) Prepare for respiratory / cardiac arrest

- (h) Do not delay transport
 - (i) Complete the Prehospital Care Report- Document all pertinent findings of the patient assessment; treatment; and transport decisions
- b. Neurogenic (Spinal) Shock - a form of shock that is a result of the severing of the spinal cord. This results in wide spread vasodilation and drop in blood pressure. The compensatory mechanisms are not activated because nerve impulses cannot be conducted through the spinal cord.
 - (1) Signs and symptoms may include:
 - (a) Difficulty breathing
 - (b) Use of accessory muscles
 - (c) Normal to slow heart rate
 - (d) Hypotension
 - (e) Warm, dry and possibly flushed skin below injury site.
 - (f) Loss of motor and sensory function below the injury site.
 - (g) Hypothermia
 - (2) Emergency Medical Care
 - (a) Perform initial assessment
 - (b) Perform focused history and physical exam
 - (c) Administer oxygen (high concentration)
 - (d) Assist ventilations as necessary
 - (e) Immobilize patient on a spine board
 - (f) Elevate the foot of the backboard
 - (g) Maintain body temperature
 - (h) Do not delay transport
- c. Septic Shock-form of distributive shock that is the result of a systemic bacterial infection. This results in wide spread vasodilation and drop in blood pressure. There is also an increase of fluid seeping into the tissues from the capillaries. Urinary tract infection are a common cause.
 - (1) Signs and symptoms may include:
 - (a) Restlessness, confusion
 - (b) Tachycardia
 - (c) Warm, flushed, moist skin
 - (d) High fever
 - (e) Bruising
 - (f) Edema
 - (g) Chills
 - (h) Hypotension
 - (2) Emergency Medical Care
 - (a) Perform initial assessment
 - (b) Perform focused history and physical exam
 - (c) Administer oxygen (high concentration)

- (d) Assist ventilations as necessary.
- C. Emergency medical care
1. Body substance isolation.
 2. Maintain airway/artificial ventilation. Administer oxygen.
 3. Control any external bleeding.
 4. Elevate the lower extremities approximately 8 to 12 inches. If the patient has serious injuries to the pelvis, lower extremities, head, chest, abdomen, neck, or spine, keep the patient supine.
 5. Transport without delay
 6. Prevent loss of body heat.
 7. Splint any suspected bone or joint injuries en route if possible.

SUGGESTED APPLICATION

Procedural (How)

1. Review the methods of controlling external bleeding with emphasis on body substance isolation.
2. Review the methods used to treat internal bleeding.
3. Review the methods used to treat the patient in shock (hypoperfusion).

Contextual (When, Where, Why)

Bleeding and shock (hypoperfusion) are identified during the initial patient assessment after securing the scene and ensuring personal safety. Control of arterial or venous bleeding will be done upon immediate identification, after airway and breathing. Treatment of shock (hypoperfusion) and internal bleeding will be performed immediately following the initial assessment and prior to the transportation of the patient. Bleeding that is uncontrolled or excessive will lead to shock (hypoperfusion). Shock (hypoperfusion) will lead to shock and eventually to cell and organ death.

STUDENT ACTIVITIES

Auditory (Hear)

1. The students should hear simulated situations to identify signs and symptoms of external bleeding, internal bleeding, and shock (hypoperfusion).
2. The students should hear normal systolic and diastolic sounds associated with taking a blood pressure.

Visual (See)

1. The students should see audio-visual aids or materials of the various types of external bleeding and various signs of internal bleeding and shock (hypoperfusion).
2. The student should see audio-visual aids or materials of the proper methods to control bleeding, and treat for internal bleeding and shock (hypoperfusion).
3. The student should see a patient to identify major bleeding and signs of internal bleeding and shock (hypoperfusion).
4. The students should see, in simulated situations, the application of direct pressure, elevation, splints, counter pressure devices, cryotherapy, and tourniquets in the treatment of external bleeding.
5. The students should see, in simulated situations, the treatment of the internal

bleeding and shock (hypoperfusion).

6. The students should see audio-visual aids or materials with known amounts of blood on gauze pads, vaginal pads, clothing, floors, and humans.

Kinesthetic (Do)

1. The students should practice application of direct pressure, elevation, pressure points, pressure bandage, splints, and tourniquets.
2. The students should practice the treatment of internal bleeding and shock (hypoperfusion).
3. The students should practice how to complete a prehospital care report for patients with bleeding and/or shock (hypoperfusion).

INSTRUCTOR ACTIVITIES

Supervise student practice.

Reinforce student progress in cognitive, affective, and psychomotor domains.

Redirect students having difficulty with content (complete remediation forms).

EVALUATION

Written: Develop evaluation instruments, e.g., examinations, verbal reviews, handouts, to determine if the students have met the cognitive and affective objectives of this lesson.

Practical: Evaluate the actions of the EMT-Basic students during role play, practice or other skill stations to determine their compliance with the cognitive and affective objectives and their mastery of the psychomotor objectives of this lesson.

REMEDIATION

Identify students or groups of students who are having difficulty with this subject content. Complete remediation sheet from the instructor's course guide.

SUGGESTED ENRICHMENT

What is unique in the local area concerning this topic? Complete enrichment sheets from the instructor's course guide and attach with lesson plan.

**MODULE 5
Trauma**

**Lesson 5-2
Soft Tissue Injuries**

OBJECTIVES

OBJECTIVES LEGEND

C = Cognitive P = Psychomotor A = Affective

1 = Knowledge level

2 = Application level

3 = Problem-solving level

COGNITIVE OBJECTIVES

At the completion of this lesson, the EMT-Basic student will be able to:

- 5-2.1 State the major functions of the skin.(C-1)
- 5-2.2 List the layers of the skin.(C-1)
- 5-2.3 Establish the relationship between body substance isolation (BSI) and soft tissue injuries.(C-3)
- 5-2.4 List the types of closed soft tissue injuries.(C-1)
- 5-2.5 Describe the emergency medical care of the patient with a closed soft tissue injury.(C-1)
- 5-2.6 State the types of open soft tissue injuries.(C-1)
- 5-2.7 Describe the emergency medical care of the patient with an open soft tissue injury.(C-1)
- 5-2.8 Discuss the emergency medical care considerations for a patient with a penetrating chest injury.(C-1)
- 5-2.9 State the emergency medical care considerations for a patient with an open wound to the abdomen.(C-1)
- 5-2.10 Differentiate the care of an open wound to the chest from an open wound to the abdomen.(C-3)
- 5-2.11 List the classifications of thermal burns.(C-1)
- 5-2.12 Identify factors which define the severity of a burn.
- 5-2.13 Define superficial thermal burn.(C-1)
- 5-2.14 List the characteristics of a superficial thermal burn.(C-1)
- 5-2.15 Define partial thickness thermal burn.(C-1)
- 5-2.16 List the characteristics of a partial thickness thermal burn.(C-1)
- 5-2.17 Define full thickness thermal burn.(C-1)
- 5-2.18 List the characteristics of a full thickness thermal burn.(C-1)
- 5-2.19 Describe the emergency medical care of the patient with a superficial thermal burn.(C-1)
- 5-2.20 Describe the emergency medical care of the patient with a partial thickness thermal burn.(C-1)
- 5-2.21 Describe the emergency medical care of the patient with a full thickness thermal burn.(C-1)
- 5-2.22 Identify factors to be considered when assessing the burned infant or child.
- 5-2.23 Identify precautions the EMT-B must take before treating a patient with chemical or electrical burns.
- 5-2.24 List the functions of dressing and bandaging.(C-1)

- 5-2.25 Describe various types of bandages & dressings.
- 5-2.26 Describe the purpose of a bandage.(C-1)
- 5-2.27 Describe the steps in applying a pressure dressing.(C-1)
- 5-2.28 Establish the relationship between airway management and the patient with chest injury, burns, blunt and penetrating injuries.(C-1)
- 5-2.29 Describe the effects of improperly applied dressings, splints and tourniquets.(C-1)
- 5-2.30 Describe the emergency medical care of a patient with an impaled object.(C-1)
- 5-2.31 Describe the emergency medical care of a patient with an amputation and the severed part.(C-1)
- 5-2.32 Describe the emergency care for a chemical burn.(C-1)
- 5-2.33 Describe the emergency care for an electrical burn.(C-1)

AFFECTIVE OBJECTIVES

No affective objectives identified.

PSYCHOMOTOR OBJECTIVES

At the completion of this lesson, the EMT-Basic student will be able to:

- 5-2.34 Demonstrate the steps in the emergency medical care of closed soft tissue injuries.(P-1,2)
- 5-2.35 Demonstrate the steps in the emergency medical care of open soft tissue injuries.(P-1,2)
- 5-2.36 Demonstrate the steps in the emergency medical care of a patient with an open chest wound.(P-1,2)
- 5-2.37 Demonstrate the steps in the emergency medical care of a patient with open abdominal wounds.(P-1,2)
- 5-2.38 Demonstrate the steps in the emergency medical care of a patient with an impaled object.(P-1,2)
- 5-2.39 Demonstrate the steps in the emergency medical care of a patient with an amputation.(P-1,2)
- 5-2.40 Demonstrate the steps in the emergency medical care of an amputated part.(P-1,2)
- 5-2.41 Demonstrate the steps in the emergency medical care of a patient with superficial burns.(P-1,2)
- 5-2.42 Demonstrate the steps in the emergency medical care of a patient with partial thickness burns.(P-1,2)
- 5-2.43 Demonstrate the steps in the emergency medical care of a patient with full thickness burns.(P-1,2)
- 5-2.44 Demonstrate the steps in the emergency medical care of a patient with a chemical burn.(P-1,2)
- 5-2.45 Demonstrate how to complete a prehospital care report for patients with soft tissue injuries.(P-2)

PREPARATION

Motivation: Soft tissue injuries are common and dramatic, but rarely life threatening. Soft tissue injuries range from abrasions to serious full thickness burns. It is necessary for the EMT-Basic to become familiar with the treatment of soft tissue injuries with emphasis on controlling bleeding, preventing further injury, and reducing contamination.

Prerequisites: BLS, Preparatory, Airway and Patient Assessment.

MATERIALS

AV Equipment: Utilize various audio-visual materials relating to soft tissue injuries. The continuous design and development of new audio-visual materials relating to EMS requires careful review to determine which best meet the needs of the program. Materials should be edited to assure meeting the objectives of the curriculum.

EMS Equipment: Universal dressing, occlusive dressing, 4 x 4 gauze pads, self adherent bandages, roller bandages, triangular bandage, burn sheets, sterile water or saline.

PERSONNEL

Primary Instructor: One EMT-Basic instructor knowledgeable in soft tissue injuries.

Assistant Instructor: The instructor-to-student ratio should be 1:6 for psychomotor skill practice. Individuals used as assistant instructors should be knowledgeable in soft tissue injuries.

Recommended Minimum
Time to Complete: Two hours

PRESENTATION

Declarative (What)

- I. Review the Skin
 - A. Function
 1. Protection of the body. Skin is watertight and not penetrable by bacteria.
 2. Regulation of body temperature. Water evaporates from the skin surface in hot weather and surface blood vessels constrict in cold weather.
 - B. Layers
 1. Epidermis
 - a. Outermost layer consists of dead cells constantly being rubbed off and replaced.
 - b. Deeper part of the epidermis contains cells which some pigment granules.
 2. Dermis - contains many special structures of the skin:
 - a. Sweat glands
 - b. Sebaceous glands
 - c. Hair follicles
 - d. Blood vessels
 - e. Specialized nerve endings.
 3. Subcutaneous Tissue - Beneath the skin is a layer composed largely of fat that serves as a body insulator.
- II. Injuries
 - A. Closed
 1. Types
 - a. Contusion (bruise)
 - (1) Epidermis remains intact
 - (2) Cells are damaged and blood vessels torn in the dermis
 - (3) Swelling and pain are typically present
 - (4) Blood accumulation causes discoloration
 - b. Hematoma
 - (1) Collection of blood beneath the skin
 - (2) Larger amount of tissue damage as compared to contusion
 - (3) Larger vessels are damaged
 - (4) May lose one or more liters of blood
 - c. Crush injuries
 - (1) Crushing force applied to the body
 - (2) Can cause internal organ rupture
 - (3) Internal bleeding may be severe with shock (hypoperfusion)
 2. Emergency medical care
 - a. Relationship to body substance isolation

- (1) Gloves
- (2) Hand washing
- b. Proper airway/artificial ventilation/oxygenation
- c. If shock (hypoperfusion) or internal bleeding is suspected -
Treat for shock (hypoperfusion)
- d. Splint a painful, swollen, deformed extremity.
- e. Transport
- f. Complete the Prehospital Care Report. Document all
pertinent findings of the patient assessment,
treatment and transport decisions.

B. Open

1. Types

- a. Abrasion
 - (1) Outermost layer of skin is damaged by shearing forces.
 - (2) Painful injury, even though superficial.
 - (3) Very little or no oozing of blood.
- b. Laceration
 - (1) Break in skin of varying depth
 - (2) May be linear (regular) or stellate (irregular) and occur in isolation or together with other types of soft tissue injury.
 - (3) Caused by forceful impact with sharp object.
 - (4) Bleeding may be severe.
- c. Avulsion - flaps of skin or tissue are torn loose or pulled completely off.
- d. Penetration / puncture
 - (1) Caused by sharp pointed object
 - (2) May be no external bleeding
 - (3) Internal bleeding may be severe
 - (4) Exit wound may be present
 - (5) Examples:
 - (a) Gun shot wound
 - (b) Stab wound
- e. Amputations
 - (1) Involves the extremities and other body parts
 - (2) Massive bleeding may be present or bleeding may be limited
- f. Crush injuries
 - (1) Damage to soft tissue and internal organs
 - (2) May cause painful, swollen, deformed extremities
 - (3) External bleeding may be minimal or absent
 - (4) Internal bleeding may be severe

2. Emergency medical care

- a. Relationship to body substance isolation
 - (1) Gloves
 - (2) Gown

- (3) Eye protection
- (4) Hand washing
- b. Maintain proper airway/artificial ventilation/oxygenation.
- c. Management of open soft tissue injuries.
 - (1) Expose the wound.
 - (2) Control the bleeding.
 - (3) Prevent further contamination.
 - (4) Apply dry sterile dressing to the wound and bandage securely in place.
 - (5) Keep the patient calm and quiet.
 - (6) Treat for shock (hypoperfusion), if signs and symptoms are present.
- d. Special considerations
 - (1) Chest injuries - occlusive dressing to open wound
 - (a) Administer oxygen if not already done
 - (b) Position of comfort if no spinal injury suspected
 - (2) Abdominal injuries - evisceration (organs protruding through the wound)
 - (a) Do not touch or try to replace the exposed organ.
 - (b) Cover exposed organs and wound with a sterile dressing, moistened with sterile water or saline, and secure in place.
 - (c) Flex the patient's hips and knees, if uninjured.
 - (3) Impaled objects
 - (a) Do not remove the impaled object, unless it is through the cheek, it would interfere with chest compressions, or interferes with transport.
 - (b) Manually secure the object.
 - (c) Expose the wound area.
 - (d) Control bleeding.
 - (e) Utilize a bulky dressing to help stabilize the object.
 - (4) Amputations - concerns for re-attachment
 - (a) Wrap the amputated part in a sterile dressing.
 - (b) Wrap or bag the amputated part in plastic and keep cool.
 - (c) Transport the amputated part with the patient.
 - (d) Do not complete partial amputations.
 - (e) Immobilize to prevent further injury.
 - (5) Large open neck injury
 - (a) May cause air embolism.
 - (b) Cover with an occlusive dressing.
 - (c) Compress carotid artery only if necessary to control bleeding.

C. Burns

1. Classification - according to depth

- a. Superficial - involves only the epidermis
 - (1) Reddened skin
 - (2) Pain at the site
- b. Partial thickness - involves both the epidermis and the dermis, but does not involve underlying tissue.
 - (1) Intense pain
 - (2) White to red skin that is moist and mottled
 - (3) Blisters
- c. Full thickness - burn extends through all the dermal layers and may involve subcutaneous layers, muscle, bone or organs.
 - (1) Skin becomes dry and leathery and may appear white, dark brown or charred
 - (2) Loss of sensation - little or no pain, hard to the touch, pain at periphery of the burned area.

2. Severity

- a. Depth or degree of the burn
 - (1) Superficial
 - (2) Partial thickness
 - (3) Full thickness
- b. Percentage of body area burned - size of the patient's hand is equal to 1%.
 - (1) Rule of nines
 - (a) Adult
 - i) Head and neck - 9%
 - ii) Each upper extremity - 9%
 - iii) Anterior trunk - 18%
 - iv) Posterior trunk - 18%
 - v) Each lower extremity - 18%
 - vi) Genitalia - 1%
 - (b) Infant
 - i) Head and neck - 18%
 - ii) Each upper extremity - 9%
 - iii) Anterior trunk - 18%
 - iv) Posterior trunk - 18%
 - v) Each lower extremity - 14%
 - vi) Genitalia - approximately 1%
- c. Location of the burn
 - (1) Face and upper airway
 - (2) Hands
 - (3) Feet
 - (4) Genitalia
- d. Pre-existing medical conditions
- e. Age of the patient
 - (1) Less than five years of age
 - (2) Greater than fifty-five years of age
- f. Determine severity

- (1) Critical burns
 - (a) Full thickness burns involving the hands, feet, face, or genitalia
 - (b) Burns associated with respiratory injury
 - (c) Full thickness burns covering more than 10% of the body surface
 - (d) Partial thickness burns covering more than 30% of the body surface area
 - (e) Burns complicated by painful, swollen, deformed extremity
 - (f) Moderate burns in young children or elderly patients
 - (g) Burns circumferential to any body part e.g. arm, leg, or chest.
- (2) Moderate burns
 - (a) Full thickness burns of 2 to 10% of the body surface area excluding hands, feet, face, genitalia and upper airway
 - (b) Partial thickness burns of 15 to 30% of the body surface area
 - (c) Superficial burns of greater than 50% body surface area
- (3) Minor burns
 - (a) Full thickness burns of less than 2% of the body surface area
 - (b) Partial thickness burns of less than 15% of the body surface area
3. Emergency medical care for thermal burns
 - a. Stop the burning process, initially with water or saline.
 - b. Remove jewelry and smoldering clothing not adhering to the patient.
 - c. Body substance isolation
 - d. Treat according to NYS Treatment Protocols
 - e. Continually monitor the airway for evidence of closure.
 - f. Prevent further contamination.
 - g. Cover the burned area with a dry sterile dressing.
 - h. Do not use any type of ointment, lotion or antiseptic.
 - i. Do not break blisters.
 - j. Transport.
 - k. Know local protocols for transport to appropriate local facility.
 - l. Complete the Prehospital Care Report Document all pertinent findings of the patient assessment, treatment and transport decisions.
4. Infant and child considerations
 - a. Relative size
 - (1) Greater surface area in relationship to the total body

- size.
- (2) Results in greater fluid and heat loss.
- (3) Any full thickness burn or partial thickness burn greater than 20%, or burn involving the hands, feet, face, airway or genitalia is considered to be a critical burn in a child.
- (4) Any partial thickness burn of 10 to 20% is considered a moderate burn in a child.
- (5) Any partial thickness burn less than 10% is considered a minor burn.
- b. Higher risk for shock (hypoperfusion), airway problem or hypothermia.
- c. Consider possibility of child abuse.
- 5. Chemical burns
 - a. Take the necessary scene safety precautions to protect yourself from exposure to hazardous materials.
 - b. Wear gloves and eye protection.
 - c. Emergency medical care
 - (1) Dry powders should be brushed off prior to flushing.
 - (2) Immediately begin to flush with large amounts of water.
 - (3) Continue flushing the contaminated area when en route to the receiving facility.
 - (4) Do not contaminate uninjured areas when flushing.
- 6. Electrical burns
 - a. Scene safety
 - (1) Do not attempt to remove patient from the electrical source unless trained to do so.
 - (2) If the patient is still in contact with the electrical source or you are unsure, do not touch the patient.
 - b. Emergency medical care
 - (1) Administer oxygen if indicated.
 - (2) Monitor the patient closely for respiratory and cardiac arrest (consider need for AED).
 - (3) Often more severe than external indications.
 - (4) Treat the soft tissue injuries associated with the burn. Look for both an entrance and exit wound.

III. Dressing and Bandaging

A. Function

- 1. Stop bleeding.
- 2. Protect the wound from further damage.
- 3. Prevent further contamination and infection.
- 4. The effects of improperly applied dressing, splint or tourniquet include:
 - a. Infection
 - b. Continued bleeding

- c. Unstable bones
 - d. Pain
 - e. Neurovascular compromise.
 - f. Loss of limb.
 - B. Dressings
 - 1. Universal dressing
 - 2. 4 X 4 inch gauze pads
 - 3. Adhesive-type
 - 4. Occlusive
 - C. Bandages
 - 1. Purpose - holds dressing in place
 - 2. Types
 - a. Self-adherent bandages
 - b. Gauze rolls
 - c. Triangular bandages
 - d. Adhesive tape
 - e. Air splint
 - D. Pressure Dressing
 - 1. Cover wound with bulky sterile dressing.
 - 2. Apply hand pressure over wound until bleeding stops.
 - 3. Apply firm roller bandage.
 - 4. Check for bleeding and circulation.
 - 5. Apply additional dressings and bandages as necessary
 - a. Same general principles
 - b. Bleeding may be more serious in infants and must be controlled.
 - c. Inform all patients as to what you are doing, be reassuring with pediatric patients.
- IV. Airway Management

Patients with a chest injury, burns, blunt and penetrating injuries may be unable to maintain their own airway. Airway management is essential with every patient. Such patients may require cervical spine precaution.

 - A. Loss of consciousness
 - B. Foreign materials
 - C. Swelling
 - D. Unstable facial structures.

SUGGESTED APPLICATION

Procedural (How)

1. Show diagrams of the various layers of the skin.
2. Show diagrams of the various types of soft tissue injuries.
3. Demonstrate the procedure for treating a closed soft tissue injury.

4. Demonstrate the procedure for treating an open soft tissue injury.
5. Demonstrate the necessary body substance isolation that must be taken when dealing with soft tissue injuries.
6. Demonstrate the proper method for applying an occlusive dressing.
7. Demonstrate the proper method for stabilizing an impaled object.
8. Demonstrate the proper method of treating an evisceration.
9. Show a diagram illustrating a superficial, partial thickness, and full thickness burn.
10. Demonstrate the proper treatment for a superficial, partial thickness, and full thickness burn.
11. Show the various types of dressings and bandages.
12. Demonstrate the proper method for applying a universal dressing, 4 X 4 inch dressing, and adhesive type dressing.
13. Demonstrate the proper method for applying bandages: self-adherent, gauze rolls, triangular, adhesive tape, and air splints.
14. Demonstrate the proper method for applying a pressure dressing.

Contextual (When, Where, Why)

Soft tissue injuries, unless life threatening, will be treated after the initial assessment. The EMT-Basic will treat soft tissue injuries prior to the movement of the patient unless the patient condition warrants immediate transport. Major bleeding will be treated prior to the movement of the patient. Failure to treat soft tissue injuries could lead to severe external hemorrhage, further damage to the injury or further contamination.

STUDENT ACTIVITIES

Auditory (Hear)

1. The student should hear simulated situations in which the signs and symptoms of soft tissue injuries and procedures for treating soft tissue injuries are demonstrated.
2. The student should hear the sounds made by open sucking chest wounds.

Visual (See)

1. The student should see diagrams of the various layers of the skin.
2. The student should see diagrams of the various types of soft tissue injuries.
3. The student should see demonstrations for the procedure for treating a closed soft tissue injury.
4. The student should see demonstrations for the procedure for treating an open soft tissue injury.
5. The student should see demonstrations for the necessary body substance isolation that must be taken when dealing with soft tissue injuries.
6. The student should see demonstrations for the proper method for applying an occlusive dressing.
7. The student should see demonstrations for the proper method for stabilizing an impaled object.
8. The student should see demonstrations for the proper method of treating an evisceration.
9. The student should see diagrams illustrating a superficial, partial thickness, and

- full thickness burn.
10. The student should see demonstrations for the proper treatment for a superficial, partial thickness, and full thickness burn.
 11. The student should see the various types of dressing and bandages.
 12. The student should see demonstrations for the proper method for applying a universal dressing, 4 X 4 inch dressing, and adhesive type dressing.
 13. The student should see demonstrations for the proper method for applying bandages: Self-adherent, gauze rolls, triangular, adhesive tape, and air splints.
 14. The student should see demonstrations for the proper method for applying a pressure dressing.

Kinesthetic (Do)

1. The student should practice the steps in the emergency medical care of closed soft tissue injuries.
2. The student should practice the steps in the emergency medical care of open soft tissue injuries.
3. The student should practice the steps in the emergency medical care of a patient with an open chest wound.
4. The student should practice the steps in the emergency medical care of a patient with open abdominal wounds.
5. The student should practice the steps in the emergency medical care of a patient with an impaled object.
6. The student should practice the steps in the emergency medical care of a patient with superficial burns.
7. The student should practice the steps in the emergency medical care of a patient with partial thickness burns.
8. The student should practice the steps in the emergency medical care of a patient with full thickness burns.
9. The student should practice the steps in the emergency medical care of a patient with an amputation.
10. The student should practice the steps in the emergency medical care of the amputated part.
11. The student should practice the steps in the emergency medical care of a patient with a chemical burn.
12. The student should practice the steps in the emergency care of a patient with an electrical burn.
13. The student should practice how to complete a prehospital care report for patients with soft tissue injuries.

INSTRUCTOR ACTIVITIES

Supervise student practice.

Reinforce student progress in cognitive, affective, and psychomotor domains.

Redirect students having difficulty with content (complete remediation forms).

EVALUATION

Written: Develop evaluation instruments, e.g., examinations, verbal reviews, handouts, to determine if the students have met the cognitive and affective objectives of this lesson.

Practical: Evaluate the actions of the EMT-Basic students during role play, practice or other skill stations to determine their compliance with the cognitive and affective objectives and their mastery of the psychomotor objectives of this lesson.

REMEDIATION

Identify students or groups of students who are having difficulty with this subject content. Complete remediation sheet from the instructor's course guide.

SUGGESTED ENRICHMENT

What is unique in the local area concerning this topic? Complete enrichment sheets from the instructor's course guide and attach with lesson plan.

**MODULE 5
Trauma**

**Lesson 5-3
Musculoskeletal Care**

OBJECTIVES

OBJECTIVES LEGEND

C = Cognitive P = Psychomotor A = Affective

1 = Knowledge level

2 = Application level

3 = Problem-solving level

COGNITIVE OBJECTIVES

At the completion of this lesson, the EMT-Basic student will be able to:

- 5-3.1 Describe the function of the muscular system.(C-1)
- 5-3.2 Describe the function of the skeletal system.(C-1)
- 5-3.3 List the major bones or bone groupings of the spinal column; the thorax; the upper extremities; the lower extremities.(C-1)
- 5-3.4 Differentiate between an open and a closed painful, swollen, deformed extremity.(C-1)
- 5-3.5 State the reasons for splinting.(C-1)
- 5-3.6 List devices used for splinting.
- 5-3.7 List the general rules of splinting.(C-1)
- 5-3.8 List the complications of splinting.(C-1)
- 5-3.9 List the emergency medical care for a patient with a painful, swollen, deformed extremity.(C-1)

AFFECTIVE OBJECTIVES

At the completion of this lesson, the EMT-Basic student will be able to:

- 5-3.10 Explain the rationale for splinting at the scene versus load and go.(A-3)
- 5-3.11 Explain the rationale for immobilization of the painful, swollen, deformed extremity.(A-3)

PSYCHOMOTOR OBJECTIVES

At the completion of this lesson, the EMT-Basic student will be able to:

- 5-3.12 Demonstrate the emergency medical care of a patient with a painful, swollen, deformed extremity.(P-1,2)
- 5-3.13 Demonstrate how to complete a prehospital care report for patients with musculoskeletal injuries.(P-2)

PREPARATION

Motivation:

Musculoskeletal injuries are one of the most common types of injuries encountered by the EMT-Basic. These injuries are largely non-life threatening in nature; however, some may be life threatening. Prompt identification and treatment of musculoskeletal injuries is crucial in reducing pain, preventing further injury and minimizing permanent damage.

Prerequisites: BLS, Preparatory, Airway and Patient Assessment.

MATERIALS

AV Equipment: Utilize various audio-visual materials relating to musculoskeletal care. The continuous design and development of new audio-visual materials relating to EMS requires careful review to determine which best meet the needs of the program. Materials should be edited to assure meeting the objectives of the curriculum.

EMS Equipment: Splints: Padded arm and leg, air, traction, cardboard, ladder, blanket, pillow, improvised splinting material, e.g., magazines, etc.

PERSONNEL

Primary Instructor: One EMT-Basic instructor knowledgeable in musculoskeletal injuries and splinting techniques.

Assistant Instructor: The instructor-to-student ratio should be 1:6 for psychomotor skill practice. Individuals used as assistant instructors should be knowledgeable in musculoskeletal care and splinting techniques.

Recommended Minimum
Time to Complete: Four hours

PRESENTATION

Declarative (What)

- I. Musculoskeletal Review
 - A. Anatomy review
 - B. Function of the Muscular system
 1. Muscle is a special form of tissue that contracts or shortens when stimulated.
 2. Muscles enable the body to move.
 - C. Functions of the skeletal system which normally has 206 bones.
 1. It gives form to the body.
 2. It supports the body and permits standing erect.
 3. Muscles attached to the skeleton by Tendons permit motion at most places (joints) where bones join together. There is no motion at a fused joint.
 4. It protects body organs, that is:
 - a. The brain is in the skull.
 - b. The heart and lungs are protected by the rib cage.
 - c. Much of the liver and spleen are protected by the lower ribs.
 - d. The spinal cord lies within the spinal canal. There is limited space between the walls of the canal and the cord.
 5. Production of red blood cells
 - D. The major bone groups and bones are:
 1. Skull. The skull has two main divisions:
 - a. Cranium
 - b. Face (facial bones and mandible)
 2. Spinal column. It has 33 bones, called vertebrae, and 5 sections
 - a. Cervical spine
 - b. Thoracic (Dorsal) spine
 - c. Lumbar spine
 - d. Sacral spine
 - e. Coccygeal spine
 3. Thorax. The thorax is made up of:
 - a. Twelve pairs of ribs.
 - b. Twelve thoracic vertebrae
 - c. Sternum
 4. The Upper Extremity. The upper extremities are designed as follows
 - a. Shoulder Girdle. The upper extremities are attached to the shoulder girdle which is formed largely by the shoulder blade (scapula) and the collarbone (clavicle).
 - b. Arm. The arm (shoulder to elbow) has one bone know as the humerus.
 - c. Forearm. The forearm (elbow to wrist) has two bones: the radius on the thumb side and the ulna on the little finger side.

- d. Hand. The hand has many bones including those of the wrist and fingers.
- 5. Pelvis and the Lower Extremities. The pelvis and lower extremities are designed as follows:
 - a. Pelvis. The pelvis is a bony ring formed by the sacrum and two pelvic bones.
 - b. Hip Joint. The lower extremity is attached to the pelvis at the hip joint.
 - c. Upper Leg (Thigh). The upper leg contains one bone known as the femur. It is the longest, heaviest and strongest bone of the body. Fractures of the femur are serious.
 - d. Lower Leg. The lower leg has two bones, the tibia in front and the fibula in back.
 - e. Foot. As with the hand, the foot has many bones.
 - f. Kneecap. The leg also has a bone at the kneecap known as the patella.

II. Injuries to bones

- A. Mechanism of injury
 - 1. Direct force
 - 2. Indirect force
 - 3. Twisting force
 - 4. Crushing
- B. Bone or joint injuries
 - 1. Types
 - a. Open - break in the continuity of the skin
 - b. Closed - no break in the continuity of the skin
 - 2. Signs and symptoms
 - a. Deformity or angulation
 - b. Pain and tenderness
 - c. Grating
 - d. Swelling
 - e. Bruising (discoloration)
 - f. Exposed bone ends
 - g. Joint locked into position
 - 3. Emergency medical care of bone or joint injuries
 - a. Body substance isolation
 - b. Administer oxygen if not already done and indicated.
 - c. After life threats have been controlled, splint injuries in preparation for transport.
 - d. Application of cold pack to area of painful, swollen, deformed extremity to reduce swelling.
 - e. Elevate the extremity.

III. Splinting

- A. Reasons

1. Prevent motion of bone fragments, bone ends or angulated joints.
 2. Minimize the following complications:
 - a. Damage to muscles, nerves, or blood vessels caused by broken bones.
 - b. Conversion of a closed painful, swollen, deformed extremity to an open painful, swollen, deformed extremity.
 - c. Restriction of blood flow as a result of bone ends compressing blood vessels.
 - d. Excessive bleeding due to tissue damage caused by bone ends.
 - e. Increased pain associated with movement of bone ends.
 - f. Paralysis of extremities due to a damaged spine.
- B. General rules of splinting
1. Assess pulse, motor, and sensation distal to the injury prior to and following splint application and record findings.
 2. Immobilize the joint above and below the injury.
 3. Remove or cut away clothing.
 4. Cover open wounds with a sterile dressing.
 5. If there is a severe deformity or the distal extremity is cyanotic or lacks pulses, align with gentle traction before splinting.
 6. Do not intentionally replace the protruding bones.
 7. Pad each splint to prevent pressure and discomfort to the patient.
 8. Splint the patient before moving when feasible and no threat to life is present.
 9. When in doubt, splint the injury when feasible and no life threats.
 10. If patient has signs of shock (hypoperfusion), align in normal anatomical position and transport (Total body immobilization. Example: Backboarding takes care of all immobilization on emergency basis).
- C. Equipment
1. Rigid splints
 2. Traction splints
 3. Pneumatic splints (air, vacuum)
 4. Improvised splints, pillow
 5. Long backboard
- D. Hazards of improper splinting
1. Compression of nerves, tissues and blood vessels from the splint
 2. Delay in transport of a patient with life threatening injury
 3. Splint applied too tight on the extremity reducing distal circulation
 4. Aggravation of the bone or joint injury
 5. Cause or aggravate tissue, nerve, vessel or muscle damage from excessive bone or joint movement
- E. Special considerations of splinting
1. Long bone splinting procedure
 - a. Body substance isolation

- b. Apply manual stabilization.
 - c. Assess pulse, motor and sensory function.
 - d. If there is a severe deformity or the distal extremity is cyanotic or lacks pulses, align with gentle traction before splinting.
 - e. Measure splint.
 - f. Apply splint immobilizing the bone and joint above and below the injury.
 - g. Secure entire injured extremity.
 - h. Immobilize hand/foot in position of function.
 - i. Reassess pulse, motor function, and sensation after application of the splint and record findings.
2. Splinting a joint injury
- a. Body substance isolation
 - b. Apply manual stabilization.
 - c. Assess pulse, motor and sensory function.
 - d. Align with gentle traction if distal extremity is cyanotic or lacks pulses and no resistance is met.
 - e. Immobilize the site of injury.
 - f. Immobilize bone above and below the site of injury.
 - g. Reassess pulse, motor function and sensation after application of splint and record findings.
3. Traction splinting
- a. Indications for use is a painful, swollen, deformed mid-thigh with no joint or lower leg injury.
 - b. Contraindications of the use of a traction splint
 - (1) Injury is close to the knee
 - (2) Injury to the knee exists
 - (3) Injury to the hip
 - (4) Injured pelvis
 - (5) Partial amputation or avulsion with bone separation, distal limb is connected only by marginal tissue. Traction would risk separation.
 - (6) Lower leg or ankle injury.

SUGGESTED APPLICATION

Procedural (How)

1. Show diagrams of the muscular system.
2. Show diagrams of the skeletal system.
3. Show audio-visual aids or materials of signs of open and closed type bone and joint injuries.
4. Demonstrate assessment of an injured extremity.
5. Demonstrate splinting procedures relevant to the general rules of splinting using: Rigid splints, traction splints, pneumatic splints, improvised splints.
6. Demonstrate procedure for splinting an injury with distal cyanosis or lacking a distal pulse.

Contextual (When, Where, Why)

Injuries to bones and joints require splinting prior to the movement of the patient unless life-threatening injuries are present. If life-threatening injuries are present, splinting should be done en route to the receiving facility when possible.

Failure to splint or improperly splinting a bone or joint injury can result in damage to soft tissue, organs, nerves, muscles; increased bleeding associated with the injury; permanent damage or disability; conversion of a closed injury to an open injury; and an increase in pain.

STUDENT ACTIVITIES

Auditory (Hear)

1. The student should hear simulations on various situations involving musculoskeletal injuries and the proper assessment and treatment.

Visual (See)

1. The student should see diagrams of the muscular system.
2. The student should see diagrams of the skeletal system.
3. The student should see audio-visual aids or materials of signs of open and closed bone and joint injuries.
4. The student should see a demonstration of an assessment of an injured extremity.
5. The student should see a demonstration of splinting procedures relevant to the general rules of splinting using: Rigid splints, traction splints, pneumatic splints, improvised splints.
6. The student should see a demonstration of the procedure for splinting an injury with distal cyanosis or lacking a distal pulse.

Kinesthetic (Do)

1. The student should practice assessment of an injured extremity.
2. The student should practice splinting procedures relevant to the general rules of splinting using: Rigid splints, traction splints, pneumatic splints, improvised splints.
3. The student should practice procedure for splinting an injury with distal cyanosis or lacking a distal pulse.
4. The student should practice how to complete a prehospital care report for patients with musculoskeletal injuries.

INSTRUCTOR ACTIVITIES

Supervise student practice.

Reinforce student progress in cognitive, affective, and psychomotor domains.

Redirect students having difficulty with content (complete remediation forms).

EVALUATION

Written: Develop evaluation instruments, e.g., examinations, verbal reviews, handouts, to determine if the students have met the cognitive and affective objectives of this lesson.

Practical: Evaluate the actions of the EMT-Basic students during role play, practice or other skill stations to determine their compliance with the cognitive and affective objectives and their mastery of the psychomotor objectives of this lesson.

REMEDIATION

Identify students or groups of students who are having difficulty with this subject content. Complete remediation sheet from the instructor's course guide.

SUGGESTED ENRICHMENT

What is unique in the local area concerning this topic? Complete enrichment sheets from the instructor's course guide and attach with lesson plan.

**MODULE 5
Trauma**

**Lesson 5-4
Injuries to the Head and
Spine**

OBJECTIVES

OBJECTIVES LEGEND

C = Cognitive P = Psychomotor A = Affective

1 = Knowledge level

2 = Application level

3 = Problem-solving level

COGNITIVE OBJECTIVES

At the completion of this lesson, the EMT-Basic student will be able to:

- 5-4.1 State the components of the nervous system.(C-1)
- 5-4.2 List the functions of the central nervous system.(C-1)
- 5-4.3 Define the structure of the skeletal system as it relates to the nervous system.(C-1)
- 5-4.4 Relate mechanism of injury to potential injuries of the head and spine.
- 5-4.5 Describe the implications of not properly caring for potential spine injuries.(C-1)
- 5-4.6 State the signs and symptoms of a potential spine injury.(C-1)
- 5-4.7 Describe the method of determining if a responsive patient may have a spine injury.(C-1)
- 5-4.8 Describe the method of determining if an unresponsive patient may have a spine injury.
- 5-4.9 Relate the airway emergency medical care techniques to the patient with a suspected spine injury.(C-3)
- 5-4.10 Describe the basic principals of emergency care for a spine injured patient.
- 5-4.11 Describe how to stabilize the cervical spine.(C-1)
- 5-4.12 Discuss indications for sizing and using a cervical spine immobilization device.(C-1)
- 5-4.13 Establish the relationship between airway management and the patient with head and spine injuries.(C-1)
- 5-4.14 Describe a method for sizing a cervical spine immobilization device.(C-1)
- 5-4.15 Describe how to log roll a patient with a suspected spine injury.(C-1)
- 5-4.16 Describe how to secure a patient to a long spine board.(C-1)
- 5-4.17 List instances when a short spine board should be used.(C-1)
- 5-4.18 Describe how to immobilize a patient using a short spine board.(C-1)
- 5-4.19 List the signs and symptoms of open and closed head/skull injuries.
- 5-4.20 Describe the emergency care for injuries to the brain and skull.
- 5-4.21 Describe the precautions which limit the use of cervical immobilization devices.
- 5-4.22 Describe the indications for the use of rapid extrication.(C-1)
- 5-4.23 Describe the special assessment needs for a patient wearing a helmet.
- 5-4.24 State the circumstances when a helmet should be left on the patient.(C-1)
- 5-4.25 Discuss the circumstances when a helmet should be removed.(C-1)

- 5-4.26 Identify different types of helmets.(C-1)
- 5-4.27 Describe the unique characteristics of sports helmets.(C-1)
- 5-4.28 Explain the preferred methods to remove a helmet.(C-1)
- 5-4.29 Discuss alternative methods for removal of a helmet.(C-1)
- 5-4.30 Describe how the patient's head is stabilized to remove the helmet.(C-1)
- 5-4.31 Differentiate how the head is stabilized with a helmet compared to without a helmet.(C-3)
- 5-4.32 Identify special consideration when immobilizing infants and children.

AFFECTIVE OBJECTIVES

At the completion of this lesson, the EMT-Basic student will be able to:

- 5-4.33 Explain the rationale for immobilization of the entire spine when a cervical spine injury is suspected.(A-3)
- 5-4.34 Explain the rationale for utilizing immobilization methods apart from the straps on the cots.(A-3)
- 5-4.35 Explain the rationale for utilizing a short spine immobilization device when moving a patient from the sitting to the supine position.(A-3)
- 5-4.36 Explain the rationale for utilizing rapid extrication approaches only when they indeed will make the difference between life and death.(A-3)
- 5-4.37 Defend the reasons for leaving a helmet in place for transport of a patient.(A-3)
- 5-4.38 Defend the reasons for removal of a helmet prior to transport of a patient.(A-3)

PSYCHOMOTOR OBJECTIVES

At the completion of this lesson, the EMT-Basic student will be able to:

- 5-4.39 Demonstrate the opening the airway in a patient with suspected spinal cord injury.(P-1,2)
- 5-4.40 Demonstrate the evaluation of a responsive patient with a suspected spinal cord injury.(P-1,2)
- 5-4.41 Demonstrate the stabilization of the cervical spine.(P-1,2)
- 5-4.42 Demonstrate the four person log roll for a patient with a suspected spinal cord injury.(P-1,2)
- 5-4.43 Demonstrate how to log roll a patient with a suspected spinal cord injury using two people.(P-1,2)
- 5-4.44 Demonstrate the securing a patient to a long spine board.(P-1,2)
- 5-4.45 Demonstrate using the short board immobilization technique.(P-1,2)
- 5-4.46 Demonstrate the procedure for rapid extrication.(P-1,2)
- 5-4.47 Demonstrate the preferred methods for stabilization of a helmet. (P-1,2)
- 5-4.48 Demonstrate the helmet removal techniques.(P-1,2)
- 5-4.49 Demonstrate an alternative methods for stabilization of a helmet.(P-1,2)
- 5-4.50 Demonstrate how to complete a prehospital care report for patients with head and spinal injuries.(P-2)

PREPARATION

Motivation: Injuries to the head and spine are extremely serious and may result in severe permanent disability or death if improperly treated or missed in the assessment.

Prerequisites: BLS, Preparatory, Airway and Patient Assessment.

MATERIALS

AV Equipment: Utilize various audio-visual materials relating to injuries of the head and spine. The continuous design and development of new audio-visual materials relating to EMS requires careful review to determine which best meet the needs of the program. Materials should be edited to assure meeting the objectives of the curriculum.

EMS Equipment: Long spine board, short spine immobilization device, cervical immobilization devices, helmet, head immobilization device, blanket roll, two inch tape.

PERSONNEL

Primary Instructor: One EMT-Basic instructor knowledgeable in head and spinal injuries.

Assistant Instructor: The instructor-to-student ratio should be 1:6 for psychomotor skill practice. Individuals used as assistant instructors should be knowledgeable in head and spinal emergencies and treatment.

Recommended Minimum
Time to Complete: Four hours

PRESENTATION

Declarative (What)

- I. The Nervous System Review
 - A. Components
 - 1. Brain
 - a. It is the controlling organ of the body and the center of consciousness.
 - b. It occupies the entire space within the cranium.
 - c. Each type of brain cell has a specific function and certain parts of the brain perform certain functions.
 - 2. Spinal Cord
 - a. The spinal cord consists of long tracts of nerves that join the brain with all body organs and parts.
 - b. It is protected by the spinal column.
 - 3. Nerves
 - a. Sensory nerves send information to the brain on what the different parts of the body are doing relative to their surroundings.
 - b. Motor nerves emanate from the brain and result in stimulation of a muscle or organ.
 - B. Actions
 - 1. The functions of the central nervous system are:
 - a. Automatic
 - b. Reflex
 - c. Conscious
 - d. Voluntary control of muscles
 - e. Involuntary control of muscles
- II. Injuries to the Spine
 - A. Mechanism of injury
 - 1. Compression
 - a. Falls
 - b. Diving accidents
 - c. Motor vehicle accidents
 - 2. Excessive flexion, extension, rotation
 - 3. Lateral bending
 - 4. Distraction
 - a. Pulling apart of the spine
 - b. Hangings
 - 5. Maintain a high index of suspicion
 - a. Motor vehicle crashes
 - b. Pedestrian - vehicle collisions
 - c. Falls
 - d. Blunt trauma
 - e. Penetrating trauma to head, neck, or torso

- f. Motorcycle crashes
 - g. Hangings
 - h. Diving accidents
 - i. Unconscious trauma victims
- B. Signs and symptoms
1. Ability to walk, move extremities or feel sensation; or lack of pain to spinal column does not rule out the possibility of spinal column or cord damage.
 2. Tenderness in the area of injury
 3. Pain associated with moving
 4. Pain independent of movement or palpation
 - a. Along spinal column
 - b. Lower legs
 - c. May be intermittent
 5. Obvious deformity of the spine upon palpation
 6. Soft tissue injuries associated with trauma
 - a. Head, neck and cervical spine
 - b. Shoulders, back or abdomen - thoracic, lumbar
 - c. Lower extremities - lumbar, sacral
 7. Numbness, weakness or tingling in the extremities
 8. Loss of sensation or paralysis below the suspected level of injury
 9. Loss of sensation or paralysis in the upper or lower extremities
 10. Incontinence
 11. Priapism
 12. Posturing
- C. Assessing the potential spine injured patient
1. Responsive patient
 - a. Mechanism of injury
 - b. Questions to ask

NOTE: Do not ask the patient to move to try to elicit a pain response. Do not move the patient to test for a pain response

 - (1) Does your neck or back hurt?
 - (2) What happened?
 - (3) Where does it hurt?
 - (4) Can you move your hands and feet?
 - (5) Can you feel me touching your fingers?
 - (6) Can you feel me touching your toes?
 - c. Inspect for contusions, deformities, lacerations, punctures, penetrations, swelling.
 - d. Palpate for areas of tenderness or deformity.
 - e. Assess quality of strength of extremities
 - (1) Hand grip
 - (2) Gently push feet against hands
 - f. Assess distal pulses
 2. Unresponsive patient
 - a. Mechanism of injury
 - b. Initial assessment

- c. Inspect for:
 - (1) Contusions
 - (2) Deformities
 - (3) Lacerations
 - (4) Punctures/penetrations
 - (5) Swelling
 - d. Palpate for areas of tenderness or deformity.
 - e. Obtain information from others at the scene to determine information relevant to mechanism of injury or patient mental status prior to the EMT-Basic's arrival.
- D. Complications
- 1. Inadequate breathing effort
 - a. Patients with head and spine injuries may be unable to maintain their own airway and breath on their own. Airway management is essential with every patient. Such patients require cervical spine precautions. Consider:
 - (1) Loss of consciousness
 - (2) Foreign materials
 - (3) Swelling
 - (4) Unstable bone structures
 - 2. Paralysis
- E. Emergency medical care
- 1. Body substance isolation
 - 2. Establish and maintain in-line immobilization.
 - a. Place the head in a neutral in-line position unless the patient complains of pain or the head is not easily moved into position.
 - b. Maintain constant manual in-line immobilization until the patient is properly secured to a backboard with the head immobilized.
 - 3. Perform initial assessment.
 - a. Whenever possible, airway control must be done with in-line immobilization.
 - b. Whenever possible, artificial ventilation must be done with in-line immobilization.
 - 4. Assess pulse, motor and sensation in all extremities.
 - 5. Assess the cervical region and neck.
 - 6. Apply a rigid, cervical immobilization device.
 - a. Properly size the cervical immobilization device. If it doesn't fit use a rolled towel and tape to the board and have rescuer hold the head manually.
 - b. An improperly fit immobilization device will do more harm than good.
 - 7. If found in a lying position, immobilize the patient to a long spine board.
 - a. Move the patient onto the device by log rolling.
 - (1) One EMT-Basic must maintain in-line immobilization

- of the head and spine.
 - (2) EMT-Basic at the head directs the movement of the patient.
 - (3) One to three other EMT-Basics control the movement of the rest of the body.
 - (4) Quickly assess posterior body if not already done in focused history and physical exam.
 - (5) Position the long spine board under the patient.
 - (6) Place patient onto the board at the command of the EMT-Basic holding in-line immobilization using a slide, proper lift, log roll or scoop stretcher so as to limit movement to the minimum amount possible. Which method to use must be decided based upon the situation, scene and available resources.
 - (7) Pad the void under the shoulders of the infant and child to establish a neutral position.
 - (8) Immobilize torso to the board.
 - (9) Immobilize the patient's head to the board.
 - (10) Secure the legs to the board.
 - (11) Reassess pulses, motor and sensation and record.
8. If the patient is found in a sitting position, immobilize with a short spine immobilization device. Exception: If the patient must be removed urgently because of his injuries, the need to gain access to others, or dangers at the scene, he must then be lowered directly onto a longboard and removed with manual immobilization provided.
- a. Position device behind the patient.
 - b. Secure the device to the patient's torso.
 - c. Evaluate torso fixation and adjust as necessary without excessive movement of the patient.
 - d. Secure the patient's head to the device.
 - e. Insert a longboard under the patient's buttocks and rotate and lower him to it. If not possible, lower him to the long spine board.
 - f. Reassess pulses, motor and sensory in all extremities and record.
9. If the patient is found in a standing position, immobilize the patient to a long spine board using the "standing takedown" method.
10. If the patient is critically injured, perform a rapid extrication.
11. Transport the patient immediately.

III. Injuries to the Brain and Skull

A. Head injuries

- 1. Injuries to the scalp
 - a. Very vascular, may bleed more than expected.
 - b. Control bleeding with direct pressure gently applied.
- 2. Injury to the brain - injury of brain tissue or bleeding into the skull

- will cause an increase of pressure within the skull.
- B. Related non-traumatic conditions
 - 1. Non-traumatic injuries to the brain may occur due to clots or hemorrhaging.
 - 2. Non-traumatic brain injuries can be a cause of altered mental status.
 - 3. Signs and symptoms may parallel those of traumatic injuries.
 - C. Skull injury - signs and symptoms
 - 1. Mechanism of trauma
 - 2. Contusions, lacerations, hematomas to the scalp
 - 3. Deformity to the skull
 - 4. Blood or fluid (cerebrospinal fluid) leakage from the ears or nose
 - 5. Bruising (discoloration) around the eyes
 - 6. Bruising (discoloration) behind the ears (mastoid process)
 - D. Brain injury
 - 1. Traumatic
 - 2. Signs and symptoms
 - a. Altered or decreasing mental status is the best indicator of a brain injury.
 - (1) Confusion, disorientation, or repetitive questioning
 - (2) Conscious - deteriorating mental status
 - (3) Unresponsive
 - b. Irregular breathing pattern
 - c. Elevated blood pressure with decreasing pulse
 - d. Consideration of mechanism of injury
 - (1) Deformity of windshield
 - (2) Deformity of helmet
 - e. Contusions, lacerations, hematomas to the scalp
 - f. Deformity to the skull
 - g. Blood or fluid (cerebrospinal fluid) leakage from the ears and nose
 - h. Bruising (discoloration) around the eyes
 - i. Bruising (discoloration) behind the ears (mastoid process)
 - j. Neurologic disability
 - k. Nausea and/or vomiting
 - l. Unequal pupil size with altered mental status
 - m. Seizure activity may be seen.
 - n. Incontinence
 - o. Priapism
 - p. Posturing
 - E. Open skull injury
 - 1. Signs and symptoms
 - a. Consideration of mechanism of injury
 - (1) Deformity of windshield
 - (2) Deformity of helmet
 - b. Contusions, lacerations, hematomas to the scalp
 - c. Deformity to the skull

- d. Penetrating injury - do not remove impaled objects in the skull
 - e. Soft area or depression upon palpation
 - f. Exposed brain tissue if open
 - g. Bleeding from the open bone injury
 - h. Blood or fluid (cerebrospinal fluid) leakage from the ears and nose
 - i. Bruising (discoloration) around the eyes
 - j. Bruising (discoloration) behind the ears (mastoid process)
 - k. Nausea and/or vomiting
 - l. Possible signs and symptoms of a closed head injury may exist if brain injury has occurred.
- F. Emergency medical care
- 1. Body substance isolation
 - 2. Maintain airway/artificial ventilation/oxygenation.
 - 3. Initial assessment with spinal immobilization should be done on scene with a complete detailed physical exam en route.
 - 4. With any head injury, the EMT-Basic must suspect spinal injury. Immobilize the spine.
 - 5. Closely monitor the airway, breathing, pulse, and mental status for deterioration.
 - 6. Control bleeding
 - a. Do not apply pressure to an open or depressed skull injury.
 - b. Dress and bandage open wound as indicated in the treatment of soft tissue injuries.
 - 7. If a medical condition exists, place patient on the left side.
 - 8. Be prepared for changes in patient condition.
 - 9. Immediately transport the patient.
 - 10. Complete a Prehospital Care Report. Document all pertinent findings of the patient assessment; treatment; and transport decisions.

IV. Immobilization

A. Cervical spine immobilization devices

- 1. Indications
 - a. Any suspected injury to the spine based on mechanism of injury, history or signs and symptoms.
 - b. Use in conjunction with short and long backboards.
- 2. Sizing
 - a. Various types of rigid cervical immobilization devices exist, therefore, sizing is based on the specific design of the device.
 - b. An improperly sized immobilization device has a potential for further injury.
 - c. Do not obstruct the airway with the placement of a cervical immobilization device.
 - d. If cervical immobilization device cannot be applied, consider

using a rolled towel and tape to the board and manually support the head. An improperly fitted device will do more harm than good.

3. Precautions
 - a. Cervical immobilization devices alone do not provide adequate in-line immobilization.
 - b. Manual immobilization must always be used with a cervical immobilization device until the head is secured to a board.
- B. Short backboards
 1. Several different types of short board immobilization devices exist.
 - a. Vest type devices
 - b. Rigid short board
 2. Provides stabilization and immobilization to the head, neck and torso.
 3. Used to immobilize non-critical sitting patients with suspected spinal injuries.
 4. General application
 - a. Start manual in-line immobilization.
 - b. Assess pulses, motor and sensory function in all extremities.
 - c. Assess the cervical area.
 - d. Apply a cervical immobilization device.
 - e. Position short board immobilization device behind the patient.
 - f. Secure the device to the patient's torso.
 - g. Evaluate torso and groin fixation and adjust as necessary without excessive movement of the patient.
 - h. Evaluate and pad behind the patient's head as necessary to maintain neutral in-line immobilization.
 - i. Secure the patient's head to the device.
 - j. Release manual immobilization of head.
 - k. Rotate or lift the patient to the long spine board.
 - l. Immobilize patient to long spine board.
 - m. Reassess pulses, motor and sensory function in all extremities.
- C. Long backboards (Full body spinal immobilization devices)
 1. Several different types of long board immobilization devices exist.
 2. Provide stabilization and immobilization to the head, neck and torso, pelvis and extremities.
 3. Used to immobilize patients found in a lying, standing, or sitting position.
 4. Used in conjunction with short backboards.
 5. General application
 - a. Start manual in-line immobilization.
 - b. Assess pulses, motor and sensory function in all extremities.
 - c. Assess the cervical area.
 - d. Apply a cervical immobilization device.
 - e. Position the device.

- f. Move the patient onto the device by log roll, suitable lift or slide, or scoop stretcher. A log roll is:
 - (1) One EMT-Basic must maintain in-line immobilization.
 - (2) EMT-Basic at the head directs the movement of the patient.
 - (3) One to three other EMT-Basics control the movement of the rest of the body.
 - (4) Quickly assess posterior body if not already done in initial assessment.
 - (5) Position the long spine board under the patient.
 - (6) Roll patient onto the board at the command of the EMT-Basic holding in-line immobilization.
- g. Pad the void under the shoulders of the infant and child to establish a neutral position.
- h. Immobilize torso to the board by applying straps across the chest and pelvis and adjust as needed.
- i. Immobilize the patient's head to the board.
- j. Fasten legs, proximal to and distal to the knees.
- k. Reassess pulses, motor function and sensation and record recording.

V. Special Considerations

A. Rapid extrication

1. Indications

- a. Unsafe scene
- b. Unstable patient condition warrants immediate movement and transport.
- c. Patient blocks the EMT-Basic's access to another, more seriously injured, patient.
- d. Rapid extrication is based on time and the patient, and not the EMT-Basic's preference.

2. Procedure - refer to section on Lifting and Moving the Patient.

B. Helmet removal

1. Special assessment needs for patients wearing helmets.

- a. Airway and breathing.
- b. Fit of the helmet and patient's movement within the helmet.
- c. Ability to gain access to airway and breathing.

2. Indications for leaving the helmet in place

- a. Good fit with little or no movement of the patient's head within the helmet.
- b. No impending airway or breathing problems.
- c. Removal would cause further injury to the patient.
- d. Proper spinal immobilization could be performed with helmet in place.
- e. No interference with the EMT-Basic's ability to assess and reassess airway and breathing.

3. Indications for removing the helmet

- a. Inability to assess and/or reassess airway and breathing.
 - b. Restriction of adequate management of the airway or breathing.
 - c. Improperly fitted helmet allowing for excessive patient head movement within the helmet.
 - d. Proper spinal immobilization cannot be performed due to helmet.
 - e. Cardiac arrest.
4. Types of helmets:
- a. Sports
 - (1) Typically open anteriorly
 - (2) Easier access to airway
 - b. Motorcycle
 - (1) Full face
 - (2) Shield
 - c. Other
5. General rules for removal of a helmet.
- a. The technique for removal of a helmet depends on the actual type of helmet worn by the patient.
 - b. Take eyeglasses off before removal of the helmet.
 - c. One EMT-Basic stabilizes the helmet by placing his hands on each side of the helmet with the fingers on the mandible to prevent movement.
 - d. Second EMT-Basic loosens the strap.
 - e. The second EMT-Basic places one hand on the mandible at the angle of the jaw and the other hand posteriorly at the occipital region.
 - f. The EMT-Basic holding the helmet pulls the sides of the helmet apart and gently slips the helmet halfway off the patient's head then stops.
 - g. The EMT-Basic maintaining stabilization of the neck repositions, slides the posterior hand superiorly to secure the head from falling back after complete helmet removal.
 - h. The helmet is removed completely.
 - i. The EMT-Basic then can proceed with spinal immobilization as indicated in the spinal immobilization section.
- C. Infants and children - immobilize the infant or child on a rigid board appropriate for size (short, long or padded splint), according to the procedure outline in the spinal immobilization section.
- 1. Infant and Child Seats - If infant or child is already in a child protective seat, and is stable immobilize in place.
 - 2. Special Considerations:
 - a. Pad from the shoulders to the heels of the infant or child, if necessary to maintain neutral immobilization.
 - b. If cervical immobilization device cannot be applied, consider use a rolled towel and tape to the board and manually support the head. An improperly fitted device will do more

harm than good.

- D. Cervical Spine Injury; Immobilize entire spine:
 - 1. Movement of the torso effects the stability of the cervical spine.
 - 2. Partial immobilization increases the risk of a torque effect.
 - 3. Cervical spine pain may mask injuries to the lower spine.
- E. Long Board Immobilization
 - 1. Cot mattress does not provide stability.
 - 2. Long board provides
 - a. Stability
 - b. Facilitates patient transfer
 - 3. Cot straps:
 - a. Do not immobilize patient to board.
 - b. Must be removed for patient transfers, losing all security.
 - c. Do not permit "rolling" an immobilized patient who might be vomiting.
- F. Rapid Extrication should be limited to life and death situations.
 - 1. Does not provide optimal spinal stabilization
 - 2. Use with "C" and "U" patients, or
 - 3. Use when the patient's safety is compromised.
- G. Leave helmet in place for transport when/if:
 - 1. There is only one trained rescuer.
 - 2. The patient's breathing is not compromised and immobilization in a neutral position is possible.
 - 3. Attempts to remove the helmet will compromise the patient's condition.
- H. Remove a helmet prior to transport when clinically indicated and more than one trained rescuer is present.
- I. Helmets may be stabilized using:
 - 1. Tape
 - 2. Head blocks
 - 3. Rolled blankets
 - 4. Commercial devices
- J. Opening the Airway with a suspected spinal cord injury; use the modified jaw thrust maneuver without head tilt.
- K. Use manufactures recommendations in the use of immobilization devices.
- L. Complete the Prehospital Care Report
 - 1. Document all pertinent findings of patient assessment; pre and post treatment; and transport decisions.

SUGGESTED APPLICATION

Procedural (How)

- 1. Show diagrams or illustrations of the nervous system anatomy.
- 2. Show diagrams or illustrations of the structure of the skeletal system as it relates to the nervous system.
- 3. Show audio-visual aids or materials related to mechanism of injury to injuries of

- the head and spine.
4. Show audio-visual aids or materials of the various signs and symptoms of a potential spine injury.
 5. Demonstrate the method of determining if a responsive patient may have a spine injury.
 6. Demonstrate the airway management techniques for the patient with a suspected spinal cord injury.
 7. Demonstrate methods for sizing various cervical spine immobilization devices.
 8. Demonstrate rapid extrication techniques.
 9. Demonstrate how to stabilize the cervical spine.
 10. Demonstrate how to immobilize a patient using a short spine board.
 11. Demonstrate how to log roll a patient with a suspected spine injury.
 12. Demonstrate how to secure a patient to a long spine board.
 13. Demonstrate the preferred methods for the removal of sports, motorcycle and various other helmets.
 14. Demonstrate alternative methods for removal of a helmet.
 15. Demonstrate how the head is stabilized with a helmet compared to without a helmet.
 16. Demonstrate how the patient's head is stabilized in order to remove a helmet.
 17. Demonstrate airway management for a patient with a helmet on.

Contextual (When, Where, Why)

For every patient who is involved in any type of traumatic incident in which the mechanism of injury and/or signs and symptoms indicate a possible spinal injury, complete spinal immobilization must be conducted. Critically injured or ill patients may be rapidly moved only with spinal immobilization techniques utilized. A short backboard or spinal immobilization device will be used on non-critically injured patients at the scene prior to movement of the patient. However, when patients present with life threats for the EMT-Basic, the patient is moved by a rapid extrication technique. Failure to immobilize the spine or treat the head injured patient will lead to increased patient morbidity and mortality.

STUDENT ACTIVITIES

Auditory (Hear)

1. Simulations in which immobilization techniques are needed and performed.
2. Simulations in which patients present with head injuries.

Visual (See)

1. The student should see audio-visual aids or materials of the nervous system anatomy.
2. The student should see audio-visual aids or materials of the structure of the skeletal system as it relates to the nervous system.
3. The student should see audio-visual aids or materials of mechanism of injury related to potential injuries of the head and spine.
4. The student should see audio-visual aids or materials of signs and symptoms of a potential spine injury.
5. The student should see a demonstration of the method of determining if a

- responsive patient may have a spine injury.
6. The student should see a demonstration of the airway emergency medical care techniques for the patient with a suspected spine injury.
 7. The student should see a demonstration of the methods for sizing various cervical spine immobilization devices.
 8. The student should see a demonstration of rapid extrication techniques.
 9. The student should see a demonstration of how to stabilize the cervical spine.
 10. The student should see a demonstration of how to immobilize a patient using a short spine board.
 11. The student should see a demonstration of how to log roll a patient with a suspected spinal injury.
 12. The student should see a demonstration of how to secure a patient to a long spine board.
 13. The student should see a demonstration of the preferred methods to remove sports, motorcycle and various other helmets.
 14. The student should see a demonstration of alternative methods for removal of a helmet.
 15. The student should see a demonstration of how the head is stabilized with a helmet compared to without a helmet.
 16. The student should see a demonstration of how the patient's head is stabilized in order to remove a helmet.
 17. The student should see various types of long backboards.
 18. The student should see various types of vest type immobilization devices.
 19. The student should see various types of short backboards.
 20. The student should see various types of helmets.
 21. The student should see a demonstration of immobilization of an infant or child patient on a long backboard.

Kinesthetic (Do)

1. The student should practice opening the airway in a patient with suspected spinal cord injury.
2. The student should practice evaluating a responsive patient with a suspected spinal cord injury.
3. The student should practice stabilization of the cervical spine.
4. The student should practice using the short board immobilization technique.
5. The student should practice the four person log roll for a patient with a suspected spinal cord injury.
6. The student should practice how to log roll a patient with a suspected spinal cord injury using two people.
7. The student should practice securing a patient to a long spine board.
8. The student should practice helmet removal techniques.
9. The student should practice the procedure for rapid extrication.
10. The student should practice the preferred methods for stabilization of the helmet.
11. The student should practice alternative methods for stabilization of the helmet.
12. The student should practice preferred methods for stabilization of the head.
13. The student should practice alternative methods for stabilization of the head.
14. The student should practice how to complete a prehospital care report for

- patients with head and spinal injuries.
15. The student should practice the use of cervical immobilization devices, rolls and short boards for immobilizing the infant or child patient.

INSTRUCTOR ACTIVITIES

Supervise student practice.

Reinforce student progress in cognitive, affective, and psychomotor domains.

Redirect students having difficulty with content (complete remediation forms).

EVALUATION

Written: Develop evaluation instruments, e.g., examinations, verbal reviews, handouts, to determine if the students have met the cognitive and affective objectives of this lesson.

Practical: Evaluate the actions of the EMT-Basic students during role play, practice or other skill stations to determine their compliance with the cognitive and affective objectives and their mastery of the psychomotor objectives of this lesson.

REMEDIATION

Identify students or groups of students who are having difficulty with this subject content. Complete remediation sheet from the instructor's course guide.

SUGGESTED ENRICHMENT

What is unique in the local area concerning this topic? Complete enrichment sheets from the instructor's course guide and attach with lesson plan.

MODULE 5

Trauma

Lesson 5-5

Practical Lab: Trauma

OBJECTIVES

COGNITIVE OBJECTIVES

At the completion of this lesson, the EMT-Basic student will be able to:

- Demonstrate the cognitive objectives of Lesson 5-1: Bleeding and Shock.
- Demonstrate the cognitive objectives of Lesson 5-2: Soft Tissue Injuries.
- Demonstrate the cognitive objectives of Lesson 5-3: Musculoskeletal Care.
- Demonstrate the cognitive objectives of Lesson 5-4: Injuries to the Head and Spine.

AFFECTIVE OBJECTIVES

At the completion of this lesson, the EMT-Basic student will be able to:

- Demonstrate the affective objectives of Lesson 5-1: Bleeding and Shock.
- Demonstrate the affective objectives of Lesson 5-3: Musculoskeletal Care.
- Demonstrate the affective objectives of Lesson 5-4: Injuries to the Head and Spine.

PSYCHOMOTOR OBJECTIVES

At the completion of this lesson, the EMT-Basic student will be able to:

- Demonstrate the psychomotor objectives of Lesson 5-1: Bleeding and Shock.
- Demonstrate the psychomotor objectives of Lesson 5-2: Soft Tissue Injuries.
- Demonstrate the psychomotor objectives of Lesson 5-3: Musculoskeletal Care.
- Demonstrate the psychomotor objectives of Lesson 5-4: Injuries to the Head and Spine.

PREPARATION

Motivation:

The practical lesson is designed to allow the students additional time to perfect skills. It is of utmost importance that the students demonstrate proficiency of the skill, cognitive knowledge of the steps to perform a skill, and a healthy attitude towards performing that skill on a patient.

This is an opportunity for the instructor and assistant instructors to praise progress and re-direct the students toward appropriate psychomotor skills. The material from all preceding lessons and basic life support should be incorporated into these practical skill sessions.

Prerequisites:

BLS, Preparatory, Airway, Patient Assessment and Medical/Behavioral and Obstetrics/Gynecology.

MATERIALS

AV Equipment:

Typically none required.

EMS Equipment: Equipment from the lists in Lessons 5-1 through 5-4.

PERSONNEL

Primary Instructor: One proctor for the written evaluation.

Assistant Instructor: The instructor-to-student ratio should be 1:6 for psychomotor skill practice. Individuals used as assistant instructors should be knowledgeable in trauma emergencies.

Recommended Minimum
Time to Complete: Six hours

SUGGESTED APPLICATION

Procedural (How)

Instructor should demonstrate the procedural activities from Lesson 5-1: Bleeding and Shock.

Instructor should demonstrate the procedural activities from Lesson 5-2: Soft Tissue Injuries.

Instructor should demonstrate the procedural activities from Lesson 5-3: Musculoskeletal Care.

Instructor should demonstrate the procedural activities from Lesson 5-4: Injuries to the Head and Spine.

Contextual (When, Where, Why)

Instructor should review contextual information from Lesson 5-1: Bleeding and Shock.

Instructor should review contextual information from Lesson 5-2: Soft Tissue Injuries.

Instructor should review contextual information from Lesson 5-3: Musculoskeletal Care.

Instructor should review contextual information from Lesson 5-4: Injuries to the Head and Spine.

STUDENT ACTIVITIES

Auditory (Hear)

The students should hear the auditory information from Lesson 5-1: Bleeding and Shock.

The students should hear the auditory information from Lesson 5-2: Soft Tissue Injuries.

The students should hear the auditory information from Lesson 5-3: Musculoskeletal Care.

The students should hear the auditory information from Lesson 5-4: Injuries to the Head and Spine.

Visual (See)

The students should see the visual material from Lesson 5-1: Bleeding and Shock.

The students should see the visual material from Lesson 5-2: Soft Tissue Injuries.

The students should see the visual material from Lesson 5-3: Musculoskeletal Care.

The students should see the visual material from Lesson 5-4: Injuries to the Head and Spine.

Kinesthetic (Do)

The students should practice the kinesthetic activities from Lesson 5-1: Bleeding and Shock.

The students should practice the kinesthetic activities from Lesson 5-2: Soft Tissue Injuries.

The students should practice the kinesthetic activities from Lesson 5-3: Musculoskeletal Care.

The students should practice the kinesthetic activities from Lesson 5-4: Injuries to the Head and Spine.

INSTRUCTOR ACTIVITIES

Supervise student practice.

Reinforce student progress in cognitive, affective, and psychomotor domains.

Redirect students having difficulty with content (complete remediation forms).

EVALUATION

Practical: Evaluate the actions of the EMT-Basic students during role play, practice or other skills stations to determine their compliance with the cognitive and affective objectives and their mastery of the psychomotor objectives of this lesson.

REMEDIATION

Identify students or groups of students who are having difficulty with this subject content. Complete remediation sheet from the instructor's course guide.

SUGGESTED ENRICHMENT

What is unique in the local area concerning this topic? Complete enrichment sheets from the instructor's course guide and attach with lesson plan.

**MODULE 5
Trauma
Lesson 5-6
Evaluation**

OBJECTIVES

COGNITIVE OBJECTIVES

At the completion of this lesson, the EMT-Basic student will be able to:

- Demonstrate knowledge of the cognitive objectives of Lesson 5-1: Bleeding and Shock.
- Demonstrate knowledge of the cognitive objectives of Lesson 5-2: Soft Tissue Injuries.
- Demonstrate knowledge of the cognitive objectives of Lesson 5-3: Musculoskeletal Care.
- Demonstrate knowledge of the cognitive objectives of Lesson 5-4: Injuries to the Head and Spine.

AFFECTIVE OBJECTIVES

At the completion of this lesson, the EMT-Basic student will be able to:

- Demonstrate knowledge of the affective objectives of Lesson 5-1: Bleeding and Shock.
- Demonstrate knowledge of the affective objectives of Lesson 5-3: Musculoskeletal Care.
- Demonstrate knowledge of the affective objectives of Lesson 5-4: Injuries to the Head and Spine.

PSYCHOMOTOR OBJECTIVES

At the completion of this lesson, the EMT-Basic student will be able to:

- Demonstrate knowledge of the psychomotor objectives of Lesson 5-1: Bleeding and Shock.
- Demonstrate knowledge of the psychomotor objectives of Lesson 5-2: Soft Tissue Injuries.
- Demonstrate knowledge of the psychomotor objectives of Lesson 5-3: Musculoskeletal Care.
- Demonstrate knowledge of the psychomotor objectives of Lesson 5-4: Injuries to the Head and Spine.

PREPARATION

Motivation:

Evaluation of the students attainment of the cognitive and

affective knowledge and psychomotor skills is an essential component of the EMT-Basic educational process. The modules are presented in a "building block" format. Once the students have demonstrated their knowledge and proficiency, the next lesson should be built upon that knowledge. This evaluation will help to identify students or groups of students having difficulty with a particular area. This is an opportunity for the instructor to evaluate his performance, and make appropriate modifications to the delivery of material.

Prerequisites: Completion of Lessons 5-1 through 5-4.

MATERIALS

AV Equipment: Typically none required.

EMS Equipment: Equipment required to evaluate the students proficiency in the psychomotor skills of this module.

PERSONNEL

Primary Instructor: One proctor for the written evaluation.

Assistant Instructor: One practical skills examiner for each 6 students.

Recommended Minimum
Time to Complete: One hour

PRESENTATION

Declarative (What)

- I. Purpose of the evaluation
- II. Items to be evaluated
- III. Feed back from evaluation

SUGGESTED APPLICATION

Procedural (How)

1. Written evaluation based on the cognitive and affective objectives of Lessons 5-1 through 5-4.
2. Practical evaluation stations based on the psychomotor objectives of Lessons 5-1 through 5-4.

Contextual (When, Where and Why)

The final lesson in this module is designed to bring closure to the module, and to assure that students are prepared to move to the next module.

This modular evaluation is given to determine the effectiveness of the presentation of materials and how well students have retained the material. This is an opportunity for the students to make necessary adjustments in study habits or for the instructor to adjust the manner in which material is presented.

INSTRUCTOR ACTIVITIES

Supervise student evaluation.

Reinforce student progress in cognitive, affective, and psychomotor domains.

Redirect students having difficulty with content (complete remediation forms).

REMEDIATION

Identify students and/or groups of students who are having difficulty with this subject content. Complete a remediation sheet from the instructor's course guide. If students continue to have difficulty demonstrating knowledge of the cognitive and affective objectives, or demonstrating proficiency in psychomotor skills, the students should be counseled, remediated and re-evaluated. If improvements in cognitive, affective or psychomotor skills are not achieved, consideration regarding the ability of the student to progress in the program should be taken into account.