

## Trauma

### EMR

**Uses simple knowledge to recognize and manage life threats based on assessment findings for an acutely injured patient while awaiting additional emergency medical response.**

- Identification and Categorization of Trauma Patients
  - Entry-level students need to be familiar with:
    - National Trauma Triage Protocol
      - Centers for Disease Control and Prevention. Guidelines for Field Triage of Injured Patients: Recommendations of the National Expert Panel on Field Triage. MMWR 2008:58 RR-1:1-35.
      - <http://cdc.gov/fieldtriage> contains the National Trauma Triage Protocols and additional instructional materials.

### EMT

**Applies fundamental knowledge to provide basic emergency care and transportation based on assessment findings for an acutely injured patient.**

The EMT Instructional Guidelines in this section include all the topics and material at the EMR level PLUS the following material:

- Identification and Categorization of Trauma Patients
  - Entry-level students need to be familiar with the National Trauma Triage Protocol
    - Centers for Disease Control and Prevention. Guidelines for Field Triage of Injured Patients: Recommendations of the National Expert Panel on Field Triage. MMWR 2008:58 RR-1:1-35.
    - <http://cdc.gov/fieldtriage> contains the National Trauma Triage Protocols and additional instructional materials.
- Pathophysiology of the Trauma Patient
  - Blunt Trauma
    - Non-bleeding
    - Multiple forces and conditions can cause blunt trauma
  - Penetrating Trauma -- high, medium, and low velocity
- Assessment of the Trauma Patient
  - Major Components of the Patient Assessment
    - Standard precautions
    - Scene size-up
    - General impression
    - Mechanism of injury
    - Primary assessment
    - Baseline vital signs
    - History
    - Secondary assessment
    - Re-assessment
  - Mechanism of Injury (MOI)
    - Significant MOI (including, but not limited to)

- Non-significant MOI (including, but not limited to)
  - Pediatric considerations
  - Re-evaluating the MOI
  - Special Considerations
- Primary Survey
  - Airway
  - Breathing
- Secondary Assessment - Head-to-Toe Physical Exam
  - Described in detail in Patient Assessment: Secondary Survey
- Secondary Assessment
  - Rapid Method
  - Modified secondary assessment
- Trauma Scoring
  - Glasgow Coma Score
  - Revised Trauma Score
- Management of the Trauma Patient
  - Rapid Transport and Destination Issues
    - Scene time
    - Air versus ground
  - Destination Selection
  - Trauma System Components
    - Hospital categorizations
    - Levels and qualifications
  - Transport Considerations

### **AEMT**

**Applies fundamental knowledge to provide basic and selected advanced emergency care and transportation based on assessment findings for an acutely injured patient.**

### **Paramedic**

**Integrates assessment findings with principles of epidemiology and pathophysiology to formulate a field impression to implement a comprehensive treatment/disposition plan for an acutely injured patient.**

### **Trauma Overview**

#### **EMR**

**No knowledge related to this competency is applicable at this level.**

#### **EMT**

Fundamental depth, foundational breadth

Pathophysiology, assessment, and management of the trauma patient

- Trauma scoring
- Rapid transport and destination issues
- Transport mode

## **AEMT: Same as Previous Level**

The AEMT Instructional Guidelines in this section include all the topics and material at the EMT level.

- Identification and Categorization of Trauma Patients
  - Entry-Level Students Need to Be Familiar With:
    - National Trauma Triage Protocol
      - Centers for Disease Control and Prevention. Guidelines for Field Triage of Injured Patients: Recommendations of the National Expert Panel on Field Triage. MMWR 2008:58 RR-1:1-35.
      - <http://cdc.gov/fieldtriage> contains the National Trauma Triage Protocols and additional instructional materials.

## **Paramedic: AEMT Material Plus:**

Complex depth, comprehensive breadth

Pathophysiology, assessment and management of the trauma patient

- Trauma scoring
- Transport and destination issues

The Paramedic Instructional Guidelines in this section include all the topics and material at the AEMT level PLUS the following material:

- Identification and Categorization of Trauma Patients
  - Entry-level students need to be familiar with:
    - National Trauma Triage Protocol
      - Centers for Disease Control and Prevention. Guidelines for Field Triage of Injured Patients: Recommendations of the National Expert Panel on Field Triage. MMWR 2008:58 RR-1:1-35.
      - <http://cdc.gov/fieldtriage> contains the National Trauma Triage Protocols and additional instructional materials.
- Incidence/significance of Trauma
  - Mortality -- Incidence of death
  - Morbidity -- New cases where death is not an outcome, nonfatal injury
  - Years of Life Lost -- Subtract age of death from life expectancy
  - Deaths due to trauma in the United States
    - All external causes of mortality
    - Motor-Vehicle Crashes
    - Pedestrian
    - Motorcycle
    - Falls
    - Mechanical forces (struck by object, machinery)
    - Drowning
    - Electrical current
    - Intentional self harm
    - Assaults (firearms)

- Trauma System
  - Components -- Hospital categorizations
  - Levels and qualifications
  - Transport considerations
- Types of Injury
  - Blunt Trauma
    - Non-bleeding
    - Multiple forces and conditions can cause blunt trauma
  - Penetrating trauma
    - High velocity
    - Medium velocity
    - Low velocity
- Trauma Assessment
  - Major components of the patient assessment
    - Standard Precautions
    - Scene Size-up
    - General Impression
    - Mechanism of Injury
    - Primary Assessment
    - Baseline Vital Signs
    - History
    - Secondary Assessment
    - Re-Assessment
  - Mechanism of Injury (MOI)
    - Significant MOI (including, but not limited to)
    - Non-Significant MOI (including, but not limited to)
    - Pediatric Considerations
    - Re-evaluating the MOI
    - Special Considerations
  - Primary Survey
    - Airway
    - Breathing
  - Secondary Assessment - Head-to-toe physical exam (Review)
    - Head/scalp – symmetry
    - Face – symmetry of facial muscles
    - Eyes – pupil size, equality and reactivity to light, pink moist conjunctiva
    - Ears – drainage, tympanic membrane rupture
    - Mouth – foreign body, loose/broken teeth, blood, pink and moist mucosa
    - Nose – drainage, singed nostrils, nasal flaring
    - Neck – accessory muscle use, tracheal deviation, jugular vein distention, medical jewelry, stoma, subcutaneous emphysema
    - Chest – equal rise and fall, guarding, paradoxical movement, breath sounds, scars, heart sounds
    - Abdomen – guarding, rigidity, distention, scars, wounds
    - Pelvis/genital – incontinence, stability
    - Arms – distal circulation, sensation, motor function, medical jewelry

- Legs – distal circulation, sensation, motor function, medical jewelry
    - Back – guarding, paradoxical movement, scars
  - Secondary Assessment
    - Rapid Method
    - Modified secondary assessment
- Role of Documentation in Trauma
  - Topical Anatomy
  - Scenario sections of Patient Care Reports
    - Mechanism of Injury with specifics
    - Response time
    - Time on scene
    - Initial findings
    - Changes in assessment findings
    - Care provided
    - Important negative findings
    - Recreate the scene
    - Bystander care provided prior to arrival
    - A complete report is essential and will be referred to by hospital personnel
- Trauma Scoring Scales
- Trauma Center Designations
- Transfer of patients to the most appropriate hospital

## Bleeding

### EMR

Simple depth, simple breadth

Recognition and management of bleeding

- Bleeding
  - General Considerations
    - Use standard precautions to reduce risk of exposure to blood or body fluids
    - Estimation of severity of blood loss based on
      - Signs and symptoms
      - General impression of the amount of blood loss
      - Usually unreliable
      - Uncontrolled bleeding or significant blood loss leads to shock and possibly death
  - Types of external bleeding
    - Arterial
    - Venous
    - Capillary
  - Internal Bleeding
    - Injured or damaged internal organs
    - Injuries to the extremities may lead to serious internal blood loss from long bone fractures
    - Signs and Symptoms
    - Specific Injuries (i.e. nosebleed)
    - Management of bleeding soft tissue injuries

### EMT: EMR Material Plus:

Fundamental depth, foundational breadth

Pathophysiology, assessment, and management of bleeding

The EMT Instructional Guidelines in this section include all the topics and material at the EMR level PLUS the following material:

- Pathophysiology
  - Type of Traumatic Bleeding
    - Internal
    - External
    - Arterial
    - Venous
    - Capillary – blood oozes from wound
  - Severity – Related to
    - Volume of blood loss
    - Rate of blood loss
    - Age and pre-existing health of patient
  - Physiological Response to Bleeding

- Clotting and clotting disorders
  - Factors that affect clotting
  - Localized vasoconstriction
- General Assessment
  - Mechanism of Injury
  - Primary Survey
    - Identify and manage life threats related to bleeding
    - Mental status
  - Physical Exam
    - Blood pressure is not a reliable indicator of early shock
    - Lung sounds
    - Peripheral perfusion
    - Skin parameters
  - History – Pre-Existing Illnesses
  - Pediatric Considerations
    - Vital sign variations
    - Total fluid volume less than adults
  - Geriatric Considerations
- Management Strategies
  - Body Substance Isolation
  - Airway Patency – May be obstructed if unconscious
  - Oxygenation and Ventilation
    - Pulse oximetry
    - Apply oxygen
  - Internal and External Bleeding Control
    - External bleeding
    - Internal bleeding
  - Stabilize Body Temperature
  - Psychological Support
  - Transport Considerations
    - Trauma center
    - Aeromedical transport
    - ALS mutual aid

**AEMT: EMT Material Plus:**

Complex depth, comprehensive breadth

- Fluid resuscitation

The AEMT Instructional Guidelines in this section include all the topics and material at the EMT level.

- Fluid Resuscitation in Bleeding and Shock
  - Pathophysiology of Shock
    - Cardiac control in homeostasis of blood pressure
    - Neurological/Autonomic control in homeostasis
    - Blood vessels in homeostasis of blood

- Blood Volume and Shock Stages
  - Class I
  - Class II
  - Class III
  - Class IV
- Management of Bleeding and Shock Using Fluid Resuscitation
  - Review of fluid physiology and special considerations in shock
  - Review of IV skills and special considerations in shock
  - General principles of shock management
  - Reassessment of fluid therapy after initial treatment
- Special Considerations in Fluid Resuscitation
  - Permissive Hypotension
  - Reperfusion Injury
  - Pediatrics
    - Temperature control is critical in maintaining perfusion
    - Use of IV is for known required fluid replacement
    - Consider use of IO if peripheral vein is not accessible and patient is in immediate need of fluid
  - Geriatrics
    - Patients with chronic hypertension may have higher blood pressure value needs to achieve the same level of end organ perfusion than other patients
  - Obstetrical Patients
    - Shock states lead to shunting of blood away from fetus
    - The closer the maternal blood pressure is to normal, the better the fetal Perfusion

**Paramedic: AEMT Material Plus:**

Complex depth, comprehensive breadth

Pathophysiology, assessment, and management of bleeding

The Paramedic Instructional Guidelines in this section include all the topics and material at the AEMT level PLUS the following material:

- Incidence
  - Mortality and morbidity
  - Populations at risk
- Anatomy and function
  - Respiratory system
  - Circulatory system
  - Central nervous system
    - Autonomic nervous system
    - Peripheral nervous system
- Pathophysiology
  - Review knowledge from previous levels
  - Centers around
    - Failure to deliver nutrients to tissues



- Failure to excrete metabolic waste products
    - Failure to excrete carbon dioxide
  - Organ involvement in shock
    - Heart
    - Blood vessels
    - Blood
    - Cellular metabolism
  - Classifications of Shock
    - Respiratory failure
    - Hypovolemic
    - Vascular failure
    - Cardiac failure
  - Compensatory Mechanisms in Shock
    - Respiratory Compensation
    - Sympathetic Nervous System
    - Neuroendocrine Response
    - Fluid shifts in shock
  - Decompensation in Shock
    - Life effects
    - Irreversible shock
    - Blood loss in shock
  - Complications of Shock
    - Acute Respiratory Distress Syndrome (ARDS)
    - Acute Renal Failure
    - Multiple Organ Failure Syndrome (MOFS)
- Assessment consideration in Shock
  - Review knowledge from previous levels
  - Scene size-up
    - Assure personal safety
    - Number of patients present
    - Significant MOI (including, but not limited to)
    - Crime scene considerations
    - Scene time consideration -- not exceed 10 minutes
    - Airway
    - Ventilation
    - Circulation
    - Vital signs
    - Disability
- Shock Management strategies and considerations
  - Scene safety
  - Body substance isolation precautions
  - Restore Tissue oxygenation
    - Airway – open throughout care
    - Ventilation – adequate minute volume
    - Oxygenation
    - Field impression of cause

- Transport decision
  - Improve stroke volume
- Bleeding considerations
  - Physiology and Pathophysiology
    - Review knowledge from previous levels
    - Products and characteristics of blood
    - Blood clotting
    - Arterial bleeding
    - Venous bleeding
    - Location of bleeding
  - Assessment of Bleeding
  - Management considerations in bleeding
  - Review knowledge from previous levels

### Chest Trauma

#### EMR

Simple depth, simple breadth

Recognition and management of

- Blunt versus penetrating mechanisms
- Open chest wound
- Impaled object
  
- Chest Trauma
  - Sucking Chest Wound
    - Open wounds of the chest
    - Apply an air tight (occlusive dressing)
    - Secure with tape on three sides
    - Position of comfort if no spinal injury suspected
  - Impaled Objects in Chest
    - Do not remove the impaled object unless it interferes with chest compressions
    - Manually secure the object
    - Expose the wound area
    - Control bleeding
    - Use a bulky dressing to stabilize the object

#### EMT: EMR Material Plus:

Fundamental depth, simple breadth

Pathophysiology, assessment and management

- Blunt versus penetrating mechanisms
- Hemothorax
- Pneumothorax
- Open
- Simple
- Tension

- Cardiac tamponade
- Rib fractures
- Flail chest
- Commotio cordis

The EMT Instructional Guidelines in this section include all the topics and material at the EMR level PLUS the following material:

- Incidence of Chest Trauma
  - Morbidity
  - Mortality
- Mechanism of Injury for Chest Trauma
  - Blunt
  - Penetrating
  - Energy and Injury
- Anatomy of the Chest
  - Skin
  - Muscles
  - Bones
  - Trachea
  - Bronchi
  - Lungs
  - Vessels
  - Heart
  - Esophagus
  - Mediastinum
- Physiology
  - Role of the Chest in Systemic Oxygenation
    - Musculoskeletal structure
    - Intercostal muscle
    - Diaphragm
    - Accessory muscle
    - Changes in intrathoracic pressure
  - Ventilation
    - Gas exchange depends on
      - Normal inspiration
      - Normal expiration – passive process
    - Chest wall movement – intact chest wall
    - Minute volume – volume of air exchanged between lungs and environment per minute
- Pathophysiology of Chest Trauma
  - Impaired Cardiac Output Related to
    - Trauma that affects the heart
    - Blood loss (external and internal)
  - Impaired Ventilation
    - Collapse of lung

- Multiple rib fractures
  - Impaired Gas Exchange
    - Blood in lungs
    - Bruising of lung tissue
- General Assessment Findings
  - Vital Signs
    - Blood pressure
    - Pulse
    - Respiratory rate and effort – respiratory distress
  - Skin – Color, Temperature, Moisture
  - Head, Neck, Chest, and Abdomen
    - Jugular vein distension
    - Paradoxical movement
  - Level of Consciousness
  - Medical History
    - Medications
    - Respiratory/cardiovascular diseases
  - Physical Exam
    - Inspection
    - Auscultation – breath sounds present or absent
    - Palpation
  - Associated Injuries
  - Blunt Injury
  - Penetrating Injury
- General Management
  - Airway and Ventilation
    - Occlusion of open wounds
    - Positive pressure ventilation – to support flail chest
  - Circulation
- Blunt Trauma or Closed Chest Injury
  - Closed Chest Injury
    - Specific injuries
- Open Chest Injury
  - Mechanism of Injury
    - Penetrating injury from weapons
    - Penetrating injury secondary to blunt chest wall trauma
    - Specific injuries
- Age-Related Variations for Pediatric and Geriatric Assessment and Management
  - Pediatric
  - Geriatric

### **AEMT: EMT Material Plus:**

Fundamental depth, foundational breadth

Pathophysiology, assessment and management of

- Traumatic aortic disruption
- Pulmonary contusion
- Blunt cardiac injury
- Hemothorax
- Pneumothorax
- Open
- Simple
- Tension
- Cardiac tamponade
- Rib fractures
- Flail chest
- Commotio cordis
- Traumatic asphyxia

The AEMT Instructional Guidelines in this section include all the topics and material at the EMT level PLUS the following material:

- Traumatic Aortic Disruption
  - Pathophysiology
    - Role of deceleration and speed as MOI
    - Partial tear
    - Complete tear
  - Assessment
    - Mechanism of injury
    - High percent have no signs of external chest trauma
    - Hypotension
    - Signs of Shock
    - Chest pain – tearing in nature
    - Suspicion raises with chest wall injury
    - Unusual pulses or blood pressure in upper extremities
    - Voice changes
    - Difficulty swallowing
  - Management
    - Review knowledge from previous levels
    - AVO management
    - High index of suspicion based upon MOI
    - Do not over-hydrate
- Pulmonary Contusion
  - Pathophysiology
    - Blunt trauma with associated injuries (rib fractures)
    - Capillary leakage into alveoli prevents gas exchange
    - Decrease lung compliance
    - Slowly developing process

- Diffuse vs localized
  - Assessment
    - Respiratory distress symptoms
    - Hemoptysis
    - Chest pain from blunt trauma
    - Cough
    - Rales or rhonchi
    - Hypoxia
    - High index of suspicion based on MOI
  - Management
    - AVO management
    - IV fluid administration – over hydration is contraindicated (see Trauma: Bleeding)
- Blunt Cardiac Injury
  - Pathophysiology
    - Cardiac arrhythmias sometimes occur
    - Heart failure may occur
  - Assessment
    - High index of suspicion with anterior blunt chest trauma
    - Clinical signs vary due to injury location in heart – vessels, muscle mass or conduction system
    - Tachycardia
    - May not exhibit external chest discoloration
    - Chest pain – retrosternal (MI type pain)
  - Management
    - High index of suspicion
    - AVO management
    - Limit fluids if signs of heart failure are present
    - Be prepared for deteriorations in patients with rapid or irregular pulses
- Hemothorax
  - Pathophysiology
    - Review knowledge from previous levels
    - Penetrating wounds
    - Clotting in the chest may release fibrinolysins – continue bleeding process
    - Loss of circulating blood in vessels
  - Assessment
    - Review knowledge from previous levels
    - Shock
    - Unequal breath sounds
    - Dullness on percussion
    - Jugular venous distention assessment
  - Management
    - Review knowledge from previous levels
    - AVO management
    - Fluid bolus and continued hypovolemia assessment (see Trauma: Bleeding)

- Rapid transport to appropriate facility
- Pneumothorax
  - Open
    - Pathophysiology
    - Assessment
    - Management
  - Simple
    - Pathophysiology
    - Assessment
    - Management
  - Tension
    - Pathophysiology
    - Assessment
    - Management
- Cardiac Tamponade
  - Pathophysiology
    - Review knowledge from previous levels
    - Mechanism of injury
    - Blood in the pericardial sac
  - Assessment
    - Jugular vein distention – increase in CVP
    - Increased diastolic pressure
    - Narrowed pulse pressure
  - Management
- Rib Fractures
  - Pathophysiology
  - Assessment
  - Management
- Flail Chest
  - Pathophysiology
  - Assessment
  - Management
- Commotio Cordis
  - Pathophysiology
  - Assessment
  - Management

**Paramedic: AEMT Material Plus:**

Complex depth, comprehensive breadth

Pathophysiology, assessment, and management of

- Traumatic aortic disruption
- Pulmonary contusion
- Blunt cardiac injury
- Hemothorax
- Pneumothorax
- Open

- Simple
- Tension
- Cardiac tamponade
- Rib fractures
- Flail chest
- Comotio cordis
- Tracheobronchial disruption
- Diaphragmatic rupture
- Traumatic asphyxia

The Paramedic Instructional Guidelines in this section include all the topics and material at the AEMT level PLUS the following material:

- Incidence of chest trauma
  - Morbidity/mortality
  - Prevention strategies
- Traumatic Aortic Disruption
  - Pathophysiology
    - Review knowledge from previous levels
    - Role of deceleration and speed as MOI
    - Partial tear
    - Complete tear – fatality likely on arrival
  - Specific Assessment considerations
    - Review knowledge from previous levels
    - Mechanism of Injury
    - High percent have no signs of external chest trauma
    - Hypotension
    - Signs of Shock
    - Chest pain – tearing in nature
    - Suspicion raises with chest wall injury
    - Unusual pulses or blood pressure in upper extremities
    - Voice changes
    - Difficulty swallowing
  - Management considerations
    - Review knowledge from previous levels
    - AVO management
    - High index of suspicion based upon MOI
    - Do not overhydrate
    - Do not use pressor agents
- Pulmonary Contusions
  - Pathophysiology
    - Review knowledge from previous levels
    - Blunt trauma with associated injuries (rib fractures)
    - Capillary leakage into alveoli prevents gas exchange
    - Decrease lung compliance
    - V/Q mismatch



- Slowly developing process
    - Diffuse vs localized
  - Assessment considerations
    - Review knowledge from previous levels
    - Respiratory distress symptoms
    - Hemoptysis
    - Chest pain from blunt trauma
    - Cough
    - Rales or rhonchi
    - Hypoxia
    - High index of suspicion based on MOI
  - Management Considerations
    - Review knowledge from previous levels
    - AVO
    - IV fluid administration – over hydration is contraindicated (see Trauma: Bleeding)
- Blunt Cardiac Injury
  - Pathophysiology
    - Review knowledge from previous levels
    - May not have histological findings - heart is “stunned”
    - Cardiac arrhythmias occur
    - Heart Failure may occur
  - Assessment considerations
    - Review knowledge from previous levels
    - High index of suspicion with anterior blunt chest trauma
    - Clinical signs vary due to injury location in heart – vessels, muscle mass or conduction system
    - Tachycardia
    - May not exhibit external chest discoloration
    - Chest pain – retrosternal (MI type pain)
  - Management Considerations
    - Review knowledge from previous levels
    - High index of suspicion
    - AVO
    - Limit fluids if signs of heart failure are present
    - Be prepared for deteriorations in patients with rapid or irregular pulses
- Hemothorax
  - Pathophysiology
    - Review knowledge from previous levels
    - Tears in lung parenchyma
    - Penetrating wounds – puncture great vessels or heart
    - Intercostal vessel wounds
    - Internal mammary artery wounds
    - Clotting in the chest may release fibrolyns – continue bleeding process
    - Loss of circulating blood in vessels
  - Specific Assessment considerations

- Review knowledge from previous levels
    - Shock
    - Unequal breath sounds
    - Dullness on percussion
    - JVD assessment
  - Specific Management consideration
    - Review knowledge from previous levels
    - AVO
    - Fluid bolus and continued hypovolemia assessment (see Trauma: Bleeding)
    - Rapid transport to appropriate facility
- Pneumothorax
  - Open
    - Pathophysiology
    - Specific Assessment considerations
    - Specific Management considerations for penetrating chest trauma
  - Simple
    - Pathophysiology
    - Specific Assessment considerations
    - Specific Management considerations
  - Tension
    - Pathophysiology
    - Specific Assessment considerations
    - Specific Management considerations
- Cardiac Tamponade
  - Pathophysiology
    - Review knowledge from previous levels
    - Blood in the pericardial sac
    - Knife wounds more frequently cause
    - Pericardial laceration seals and hemorrhage fills the sac
    - Sac is not elastic – no stretching
    - Small amounts (55cc) can cause reduction in cardiac output
    - Increased sac pressure puts pressure on coronary arteries
  - Specific Assessment considerations
    - Review knowledge from previous levels
    - Beck's triad
  - Specific Management considerations in cardiac tamponade
    - Review knowledge from previous levels
    - AVO
    - Rapid IV fluid bolus
    - Rapid Transport for pericardiocentesis
- Rib fractures
- Flail Chest
- Commotio cordis
- Tracheobronchial disruption
- Diaphragmatic rupture

- Traumatic asphyxia
- Pediatric considerations in chest trauma
  - Review of anatomical differences
  - Review of physiological differences
  - Review of differences in mechanism of injury
  - Specific management considerations
    - Airway management (see AVO: Pediatric considerations)
    - Fluid replacement (see Trauma: Bleeding: Pediatric considerations)
    - Respiratory distress symptoms
    - Hemoptysis
    - Chest pain from blunt trauma
    - Cough
    - Rales or rhonchi
    - Hypoxia
    - High index of suspicion based on MOI
  - Management Considerations
    - Review knowledge from previous levels
    - AVO
    - Intubation if indicated
    - Proper IV fluid administration – over hydration is contraindicated
  - Geriatric considerations in chest trauma

### **Abdominal and Genitourinary Trauma**

#### **EMR**

Simple depth, simple breadth

Recognition and management of

- Blunt versus penetrating mechanisms
- Evisceration
- Impaled object
  
- Abdominal Trauma
  - Eviscerations – Open Injury With Organs Sticking Out of the Wound
    - Do not replace organs
    - Cover with thick moist dressing
  - Impaled Objects in Abdomen
    - Do not remove the impaled object
    - Manually secure the object
    - Expose the wound
    - Control bleeding
    - Use bulky dressing to stabilize the object

#### **EMT: EMR Material Plus:**

Fundamental depth, simple breadth

Pathophysiology, assessment and management of

- Solid and hollow organ injuries
- Blunt versus penetrating mechanisms

- Evisceration
- Injuries to the external genitalia
- Vaginal bleeding due to trauma
- Sexual assault

The EMT Instructional Guidelines in this section include all the topics and material at the EMR level PLUS the following material:

- Incidence
  - Morbidity
  - Mortality
- Anatomy
  - Quadrants and Boundaries of the Abdomen
  - Surface Anatomy of the Abdomen
  - Intraperitoneal Structures
  - Retroperitoneal Structures
  - Reproductive Organs
- Physiology
  - Solid Organs
  - Hollow Organs
  - Vascular Structures
- Specific Injuries
  - Closed Abdominal Trauma
    - Mechanism of Injury
    - Signs and Symptoms
    - Assessment
    - Management
  - Penetrating/Open Abdominal Trauma
    - Low-velocity penetration – knife wound, tear of abdominal wall, consider injury to underlying organ
    - Medium velocity penetration – shot gun wound
    - High velocity penetration – gunshot wound
    - Signs and Symptoms of penetrating abdominal trauma
    - Assessment
    - Management
  - Considerations in Abdominal Trauma
    - Hollow organs injuries
    - Solid organ injuries
- General Assessment
  - High Index of Suspicion
  - Pain With Abdominal Trauma Is Often Masked Due to Other Injuries
  - Airway Patency
  - External and Internal Hemorrhage – Monitor Vital Signs Closely With Suspicion
  - Identification and Management of Life Threats
  - Spinal Immobilization
  - Physical Exam

- Inspection
  - Auscultation
  - Palpation
- Associated Trauma – Provide Emergency Staff With History of Events Causing Trauma
- Recognition and Prevention of Shock
- PASG for Pelvic Fracture Stabilization
- Transportation Decisions to Appropriate Facility
- General Management
  - Scene Safety / Standard Precautions
  - Airway Management
  - Oxygenation and Ventilation
  - Spinal Immobilization Considerations
  - Control External Hemorrhage
  - Identification of Life-Threatening Injury
  - Application and Inflation of PASG for Pelvic Fracture Stabilization
  - Abdominal Trauma May Be Masked by Other Body System Trauma
  - Transportation to Appropriate Facility
    - No transport decisions
    - Transport to acute care facility
    - Transport to trauma center
    - ALS mutual aid
  - Communication and Documentation
- Age-Related Variations for Pediatric and Geriatric Assessment and Management
  - Pediatric
    - Mechanism of injury as pedestrian
    - Use of PASG (fracture stabilization)
  - Geriatric
- Special Considerations of Abdominal Trauma
  - Sexual Assault
    - Criminal implications and evidence management
    - Patient confidentiality
    - Treat wounds as other soft tissue injuries
  - Vaginal Bleeding Due to Trauma
    - May be due to penetrating or blunt trauma
    - Assess to determine pregnancy
    - Apply sterile absorbent vaginal pad
    - Determine mechanism of injury
    - Do not insert gloved fingers for instruments in vagina

**AEMT: EMT Material Plus:**

Fundamental depth, foundational breadth

Pathophysiology, assessment, and management of

- Vascular injury
- Solid and hollow organs injuries
- Blunt versus penetrating mechanisms

- Evisceration
- Retroperitoneal injuries
- Injuries to the external genitalia
- Vaginal bleeding due to trauma
- Sexual assault

The AEMT Instructional Guidelines in this section include all the topics and material at the EMT level PLUS the following material:

- Incidence
  - Morbidity/Mortality
- Anatomy
  - Quadrants and Boundaries of the Abdomen
  - Surface Anatomy of the Abdomen
  - Intraperitoneal Structures
  - Retroperitoneal Structures
  - Reproductive Organs
- Physiology
  - Solid Organs
  - Hollow Organs
  - Vascular Structures
- Specific Injuries
  - Closed Abdominal Trauma
    - Mechanism of injury
    - Signs and Symptoms
    - Assessment
    - Management
  - Penetrating/Open Abdominal Trauma
    - Low velocity penetration – knife wound, tear of abdominal wall, consider injury to underlying organ
    - Medium velocity penetration – shot gun wound
    - High-velocity penetration – gunshot wound
    - Signs and Symptoms of penetrating abdominal trauma
    - Assessment
    - Management
  - Considerations in Abdominal Trauma
    - Hollow organs injuries
    - Solid organ injuries
- General Assessment
  - High Index of Suspicion
  - Pain With Abdominal Trauma Is Often Masked Due to Other Injuries
  - Airway Patency
  - External and Internal Hemorrhage
  - Identification and Management of Life Threats
  - Spinal Immobilization
  - Physical Exam

- Inspection
    - Auscultation
    - Palpation
  - Associated Trauma
  - Recognition and Prevention of Shock
  - PASG for Pelvic Fracture Stabilization
  - Transportation Decisions to Appropriate Facility
- General Management
  - Scene Safety/Standard Precautions
  - Airway Management
  - Oxygenation and Ventilation
  - Spinal Immobilization Considerations
  - Control External Hemorrhage
  - Identification of Life Threatening Injury
  - Application and Inflation of PASG for Pelvic Fracture Stabilization
  - Abdominal Trauma May Be Masked by Other Body System Trauma
  - Transportation to Appropriate Facility
    - No transport decisions
    - Transport to acute care facility
    - Transport to trauma center
    - ALS mutual aid
  - Communication and Documentation
- Age-Related Variations for Pediatric and Geriatric Assessment and Management
  - Pediatric
    - Mechanism of injury as pedestrian
    - Use of PASG (fracture stabilization)
  - Geriatric
- Special Considerations of Abdominal Trauma
  - Sexual Assault
    - Criminal implications and evidence management
    - Patient confidentiality
    - Treat wounds as other soft tissue injuries
  - Vaginal Bleeding Due to Trauma
    - May be due to penetrating or blunt trauma
    - Assess to determine pregnancy
    - Apply sterile absorbent vaginal pad
    - Determine mechanism of injury
    - Do not insert gloved fingers for instruments in vagina

**Paramedic: AEMT Material Plus:**

Complex depth, comprehensive breadth

Pathophysiology, assessment, and management of

- Vascular injury
- Solid and hollow organ injuries
- Blunt versus penetrating mechanisms
- Evisceration

- Retroperitoneal injuries
- Injuries to the external genitalia

The Paramedic Instructional Guidelines in this section include all the topics and material at the AEMT level PLUS the following material:

- Incidence
  - Morbidity/Mortality
  - Prevention strategies
- Vascular injury
  - Pathophysiology
    - Review knowledge from previous levels
    - Injuries may be blunt or penetrating
    - Structures
    - Internal bleeding – related to which and how many blood vessels injured
    - Potential bleeding space in the abdomen
    - Length time from injury to surgery
    - Often masked by other injuries
    - Internal venous bleeding may be more severe because arterial bleeds can occlude the lumen of the artery.
  - Special Assessment Findings
    - Review knowledge from previous levels
    - High level of suspicion with MOI
    - Solid organs injured with blunt trauma – liver spleen
    - Patient history of the injury pattern/cause
    - Seat belts – proper use of – in rapid deceleration
    - Entrance and Exit wounds
    - Abdominal tenders in four quadrants
    - Lower rib tenderness
    - Guarding
    - Presence of lower pulses
    - Kehr’s sign
    - Use of ultrasound
  - Special management considerations
    - Review knowledge from previous levels
    - AVO
    - Hypotension treatment – fluid bolus
    - Recognition of injury – others may mask
    - Rapid transport
    - Use of PASG
    - Do not hemodilute patients – disrupts clot formation
- Solid and hollow organ injuries
  - Pathophysiology
    - Review knowledge from previous levels
  - Special Assessment Findings
    - Review knowledge from previous levels



- Findings relate to
        - Solid vs hollow organ
        - Comorbid injuries that may mask
        - Time since injury
        - Vascularity of organ
        - Blunt vs penetrating trauma
        - How the organ is or is not attached to the abdominal wall
        - Size of the insult
      - Splenic and liver injuries have classifications
      - Patient history surrounding MOI is important
      - Inspection of the abdomen is critical
      - Stability of the pelvis
      - Seat belt use and fit across abdomen
      - Kehr's sign
      - Abdominal tenderness
    - Special management considerations
      - Review knowledge from previous levels
      - AVO
      - Circulation
      - High index of suspicion
      - Rapid transport
      - Role of ultrasound
      - Changes with repeated assessments
- Blunt vs. Penetrating Abdominal Injury
  - Pathophysiology
    - Review knowledge from previous levels
    - Hole in abdominal wall
    - Underlying solid and hollow organs is major concern
    - Route for infection
    - Cavitation
    - Abdominal wall bleeding
  - Special Assessment Findings
    - Review knowledge from previous levels
    - Most patients with penetrating abdominal injury have underlying solid and hollow organ injuries (cover elsewhere)
    - Inspection
    - Palpation
    - Patient affect
    - Referred pain to shoulder
    - Large amounts of intra-abdominal bleeding may occur without much external evidence
    - Field ultrasound
    - Hematuria
    - Grey-Turner's sign – flank discoloration
    - Rectal bleeding
  - Special management considerations

- Review knowledge from previous levels
  - AVO
  - Circulation
  - Cover exposed bowel with sterile saline dressings
  - Field ultrasound
- Evisceration
  - Pathophysiology
    - Review knowledge from previous levels
    - Open injury to abdominal wall which allows protrusion of abdominal contents
    - Strangulation of bowel by abdominal wall.
    - Loss fluid and temperature regulation of exposed bowel
  - Special Assessment Findings
    - Review knowledge from previous levels
    - Exposed bowel – may be large or small
    - Bowel protrudes with increase in abdominal pressure – cough
    - Maybe recent post-surgical patient at home – cough, straining
  - Special management considerations
    - Review knowledge from previous levels
    - AVO
    - Circulation
    - Pain relief considerations
    - Cover bowel with sterile saline gauze
    - Patient may find relief with knee bent
    - Avoid coughing
- Retroperitoneal injury
  - Pathophysiology
  - Special Assessment Findings
  - Special management considerations
- Injuries to external genitalia
  - Pathophysiology
    - Male
      - Scrotum
        - holds large volumes of blood or fluids
        - blunt, penetrating or crushing injury
      - Penis
        - blunt, penetration or crushing injury
        - amputation
        - urethra penetration
    - Female
  - Special Assessment Findings
    - Male external genitalia
      - Pain
      - Swelling
    - Female
      - Pain

- Bleeding
    - Clues of sexual assault
    - History of foreign object penetration
  - Review knowledge from previous levels
- Special management considerations
  - Review knowledge from previous levels
  - Male
    - Treat amputations as with other amputations
    - Do not relieve pressure in scrotum
    - Do not remove impaled objects
    - Provide pain management
    - Ice to reduce swelling
    - Emotional support
  - Female
    - Control external hemorrhage
    - Emotional considerations in assault/rape
    - Do not remove impaled objects
    - Reporting requirements with assault
    - Review sexual assault at lower levels
- Age-related variations
  - Pediatrics
  - Geriatrics

## Orthopedic Trauma

### EMR

Simple depth, simple breadth  
Recognition and management of

- Open fractures
- Closed fractures
- Dislocations
- Amputations
- Fractures and Dislocations
  - Fractures
    - Introduction
    - Types
      - Open – bone that is broken and a break in the continuity of the skin has occurred either as a result of the broken bone ends or by the forces which caused the fracture
      - Closed – bone that is broken but does not produce a break in the continuity of the skin
  - Dislocations
    - Definition – a dislocation occurs when a separation occurs between two bones at their joint
    - Can be extremely painful

- Signs and Symptoms -- may be extremely difficult to distinguish a fracture from a dislocation
  - Deformity or angulation
  - Pain and tenderness
  - Grating
  - Swelling
  - Bruising (discoloration)
  - Exposed bone ends
  - Joint locked into position
  - Impaired function or circulation
- Emergency Medical Care of Bone Injuries
  - After life threats have been controlled, allow patient to remain in a position of comfort
  - Apply cold pack to area of painful, swollen, deformed extremity to reduce swelling and pain
  - Manual extremity stabilization

**EMT: EMR Material Plus:**

Pathophysiology, assessment, and management of  
Fundamental depth, foundational breadth

- Upper and lower extremity orthopedic trauma
- Open fractures
- Closed fractures
- Dislocations
- Sprains/strains
- Pelvic fractures
- Amputations/replantation

The EMT Instructional Guidelines in this section include all the topics and material at the EMR level PLUS the following material:

- Incidence
  - Morbidity/Mortality
    - Upper extremity
    - Lower extremity
  - Pediatric Considerations
  - Geriatric Considerations
  - Mechanism of Injury
    - Direct force
    - Indirect force
    - Twisting force
- Anatomy
  - Skin Layers
  - Subcutaneous Layers
  - Extremity Structures
    - Vascular structure

- Muscles
    - Bony structure
  - Axial Structures
    - Skull
    - Vertebral column
  - Components of a Long Bone
    - Head
    - Shaft
- Physiology
  - Function of Musculoskeletal System
    - Support
    - Flexion
    - Extension
    - Rotation
- Mechanism of Injury
  - Upper Extremity
    - Structures
    - Direct
    - Indirect
    - Open – hemorrhage significance
    - Closed – hemorrhage significance
    - Sprains/strains
    - Amputations
  - Lower Extremity
    - Direct
    - Indirect
    - Open
    - Closed
    - Structures
- Complications
  - Hemorrhage
  - Instability
  - Loss of Tissue
  - Contamination
  - Long-Term Disability
  - Interruption of Blood Supply
  - Pregnancy With Pelvic Fracture
- Descriptions of Fractures
  - Greenstick
  - Oblique
  - Transverse
  - Comminuted
  - Spiral
- Dislocations
  - Specific Injuries
    - Acromio-clavicular

- Shoulder
    - Elbow
    - Wrist
    - Metacarpal-phalanx
    - Knee
    - Foot
    - Hand
    - Ankle
  - Management
    - Scene safety/standard precautions
    - Limb-threatening injury
    - Splinting
- Sprains/Strains
  - Mechanism of Injury
  - Assessment
  - Management
- Pelvic Fracture
  - Incidence
  - Mechanism of Injury
  - Signs and Symptoms
  - Assessment
  - Management – PASG (Pelvic Stabilization)
- General Assessment
  - Scene Safety/Standard Precautions
  - Mechanism of Injury
    - Primary injury
    - Secondary injury
  - Determine Life Threat
    - Life threatening
    - Limb threatening
  - Six P's of Assessment
    - Pain
    - Pallor
    - Paresthesia
    - Pulses
    - Paralysis
    - Pressure
  - Physical Exam
  - Bleeding
    - External
    - Internal
  - Guarding/Self-Splinting
  - Associated Injuries
- General Management
  - Control Hemorrhage
    - Internal

- External
  - General Considerations for Immobilization/Splinting
    - PASG for pelvic fracture
    - Traction for femur fracture
    - Neurologic exam before and after splinting
    - Bandage/dress wounds before immobilization
    - In position found
    - Remove jewelry
    - Above and below the joint for fractures
    - Bones above and below for joints
    - Complications of improper splinting
    - Equipment needed for splinting
  - Neurologic/Circulatory Examination
    - Motor/sensory
    - Distal pulses
    - Capillary refill
    - Color, temperature
  - Pain Management
    - Elevate
    - Cold
    - Immobilize injury
  - Associated Injuries
  - Transport to Appropriate Facility
  - Appropriate Communication and Documentation
- Specific Injuries
  - Amputation
    - Control bleeding of stump
    - Locate and Transport Amputate; Management
  - Sprains/Strains
    - Description
    - Difficult to differentiate from a fracture
    - Manage as fracture
  - Pelvic
    - Shock
    - Immobilize on long spine board
    - Apply PASG (pelvic stabilization)
  - Femur
    - Traction splint
    - Long spine board
    - Assess for soft tissue, vascular, and nerve damage
  - Tibia/Fibula
    - Pneumatic splint
    - Long spine board splint
    - Splint to opposite leg
  - Shoulder
    - Sling

- Swathe
  - Knee
    - Vascular and nerve damage
    - No traction splint
  - Clavicle – Sling
  - Humerus
  - Forearm
- Types of Splints
  - Rigid
  - Formable
  - Traction
  - Air
  - Vacuum
  - Pillow/Blanket
  - Short Spine Board
  - Long Spine Board
- Age-Related Variations for Pediatric and Geriatric Assessment and Management
  - Pediatric
  - Geriatric – Osteoporosis (Decreased Bone Density) Increases the Likelihood of Fractures With Minimal Trauma
- Sprains/Strains
  - Pathophysiology
    - Review previous knowledge
    - Strain – muscle pull
    - Sprain
  - Special Assessment Findings
    - Review previous knowledge
    - Strains
    - Sprains
  - Special Management Considerations
    - Review previous knowledge
    - Strains
    - Sprains



### **AEMT: EMT Material Plus:**

Pathophysiology, assessment, and management of  
Simple depth, simple breadth

- Compartment syndrome

Complex depth, foundational breadth

- Pelvic fractures
- Amputations/replantation

The AEMT Instructional Guidelines in this section include all the topics and material at the EMT level PLUS the following material:

- Amputations
  - Pathophysiology
    - Tear, retraction and spasm of blood vessels
    - Amputated extremity
    - Re-implantation opportunities
  - Special Assessment Finding
    - Location of amputation
    - Tearing versus cutting amputations
    - Assessment of amputated part
  - Special Management Considerations
    - Tourniquet
    - Fluid replacement
- Pelvic Fractures
  - Anatomy of the Pelvic Girdle
  - Pathophysiology
    - Type I fractures
    - Type II fractures
    - Type III fractures
    - Type IV fractures
    - Associated injuries
    - Significance of posterior fractures
  - Special Assessment Findings
    - Pelvic instability
    - Pain
    - Rectal bleeding
  - Management Considerations
    - Stabilize with PASG and long board to minimize movement
    - Specialized pelvic immobilization devices
    - Management of blood loss
- Compartment Syndrome
  - Pathophysiology
    - Review previous knowledge
    - Locally increased pressure compromises local circulation and neuromuscular function

- Occur with crush injuries
- Burns
- Tight casts as part of fracture management
- Occlusion of arterial blood supply
- Snake bites
- Rhabdomyolysis
- Special Assessment Findings
  - Review previous knowledge
  - Severe limb pain
  - Muscle compartment extremely tight
  - Decreased sensation to touch
  - Paresthesia
  - Loss of distal circulation
  - Paralysis
- Special Management Considerations
  - Review previous knowledge
  - Removal of plaster casts
  - Elevation
  - Ice
  - Rapid transport to appropriate facility
  - Treatment of academia
  - Treatment of Rhabdomyolysis
  - Pain Management

**Paramedic: AEMT Material Plus:**

Pathophysiology, assessment, and management of

- Fundamental depth, foundational breadth
  - Pediatric fractures
  - Tendon laceration/transection/ rupture (Achilles and patellar)
  - Compartment syndrome
- Complex depth, foundational breadth
  - Upper and lower extremity orthopedic trauma
  - Open fractures
  - Closed fractures
  - Dislocations

The Paramedic Instructional Guidelines in this section include all the topics and material at the AEMT level PLUS the following material:

- Incidence
  - Morbidity/Mortality
    - Upper extremity
    - Lower extremity
  - Prevention
- Pediatric fractures
  - Pathophysiology

- Review previous knowledge
    - Types of fractures
    - Immature growth of bones
    - Growth plates at end of bones and complications of epiphyseal fractures
  - Special assessment findings
    - Review previous knowledge
    - MOI – assess for abuse
    - Motor, sensory, pulse assessment distal to injury
    - Child/parent interaction
    - Age differences and reaction to trauma
    - Assess for comorbidity
  - Special management considerations
    - Review previous knowledge
    - AVO
    - Transport with family members
    - Consent issues when family not present, injury not serious
    - Inform family, teachers, guardians of transport location
    - Immobilization the same as adults
    - Ice will reduce swelling
- Tendon lacerations/transection/rupture (Achilles and patellar)
  - Pathophysiology
    - Review previous knowledge
    - Physiology of tendons
    - Achilles Tendon rupture
    - Patellar – knee
    - Shoulder
  - Special assessment findings
    - Review previous knowledge
    - Muscle weakness
    - Pain
    - Edema
    - Loss of range of motion
  - Special management considerations
    - Review previous knowledge
    - Ice
    - Elevation
    - Sensory, motor function
    - Inspection
    - Palpation – symmetry with other limbs
    - Tests to determine if mobility is normal or abnormal
    - Assess as soon after injury as possible
    - Psychological support
    - Immobilization if necessary
    - Support of other allied health professions – athletic trainers
- Open fractures
  - Pathophysiology

- Review previous knowledge
    - Bone disruption with opening in the skin
    - Role of osteoblasts
    - Method of fracture healing
    - Osteomyelitis
    - Fat embolism
  - Special assessment findings
    - Review previous knowledge
    - Open wounds over any injured bone
    - Bone involvement – does not have to be sticking out to be open
    - Motor, sensory, distal pulse/circulation evaluation
  - Special management considerations
    - Review previous knowledge
    - Control bleeding
    - Prevent infection
    - Immobilization techniques
    - Comorbidity – multi-system trauma
- Closed fractures
  - Pathophysiology
    - Review previous knowledge
    - Closed fractures contribute to internal vascular or nerve injuries
    - Muscle spasms surrounding fracture cause bone ends to rub
    - Fat embolism
  - Special assessment findings
    - Review previous knowledge
    - Edema
    - Pain
    - Motor, sensory, distal circulation
    - Isolated fracture – focus assessment and management
    - Comorbidity with multi-system trauma
  - Special management considerations
    - Review previous knowledge
    - Immobilization techniques
- Dislocations
  - Pathophysiology
    - Review previous knowledge
    - Joint involvement
    - Joint moved beyond its normal limits
    - Subluxations – partial dislocation
    - Luxations – complete dislocation
  - Special assessment findings
    - Loss of limb function
    - Deformity – almost always present
    - Immediate swelling and point tenderness
    - Review previous knowledge
  - Special management considerations

- Review previous knowledge
- Figure 8 splinting for shoulders (sternoclavicular joint)
- Sling and swath for acromioclavicular joint
- Elbow splinted in position found if distal circulation present
- Wrist – padded board or pillow splint with sling and swath
- Hip – position found with blankets or pillows for comfort
- Knee – true emergency – position found unless distal circulation compromised, then anatomical alignment
- Ice to reduce swelling
- Elevation
- Pain relief
- Compartment syndrome
  - Pathophysiology
    - Review previous knowledge
    - Locally increased pressure compromises local circulation and neuromuscular function
    - Occur with crush injuries
    - Burns
    - Tight casts as part of fracture management
    - Occlusion of arterial blood supply
    - Snake bites
    - Rhabdomyolysis
  - Special assessment findings
    - Review previous knowledge
    - Severe limb pain
    - Muscle compartment extremely tight
    - Decreased sensation to touch
    - Paresthesia
    - Loss of distal circulation
    - Paralysis
  - Special management considerations
    - Review previous knowledge
    - Removal of plaster casts
    - Elevation
    - Ice
    - Rapid transport to appropriate facility
    - Treatment of acidemia
    - Treatment of Rhabdomyolysis
    - Pain Management

### **Soft Tissue Trauma**

#### **EMR**

Simple depth, simple breadth  
Recognition and management of

- Wounds
- Burns

- Electrical
- Chemical
- Thermal
- Chemicals in the eye and on the skin
  
- Abrasion
  - Outermost layer of skin is scraped off
  - Painful
  - Superficial
  - No bleeding or small amount of blood oozes from wound
- Laceration
  - Cut or Break in Skin
  - May Occur Alone or With Other Soft Tissue Injuries
  - Caused by Forceful Impact With Sharp Object
  - Bleeding May Be Severe
- Penetration/Puncture
  - Caused by Sharp Pointed Object
  - May Be Little or No External Bleeding
  - Internal Bleeding May Be Severe
  - Exit Wound May Be Present
  - Examples
    - Gun shot wound
    - Stab wound
- Impaled Object
  - Object That Creates the Puncture Wound Remains Embedded
  - Leave in Place Unless It Is in the Cheek With Uncontrolled Bleeding
  - Apply Pressure Around the Object and Secure in Place
  - Avoid Movement
- Foreign Body in Eye
  - Dirt, Dust, or Chemical
  - Signs and Symptoms
    - Pain, tearing, redness
    - Vision may be blurred
  - Treatment
    - Standard precautions
    - Lay patient flat
    - Tilt head to affected side so debris or chemical does not flow into unaffected eye
    - Hold eye lid open with gloved hand
    - Flush for at least 15 minutes with water or normal saline
- Burns
  - Severity
    - Determined by several factors
    - Depth
    - Extent of burn
    - Special management considerations

- Dressings and Bandages
  - Function
    - Control bleeding
    - Absorb drainage
    - Prevent contamination
  - Dressings
    - Usually sterile
    - Types
  - Bandages
    - Hold dressings in place
    - Types
  - Application
    - Dressings
    - Bandages

**EMT: EMR Material Plus:**

Fundamental depth, foundational breadth

- Pathophysiology, assessment, and management
  - Wounds
  - Avulsions
  - Bite wounds
  - Lacerations
  - Puncture wounds
  - Incisions
  - Burns
  - Electrical
  - Chemical
  - Thermal
  - Radiation
- Simple depth, simple breadth
  - Crush syndrome

The EMT Instructional Guidelines in this section include all the topics and material at the EMR level PLUS the following material:

- Incidence of Soft Tissue Injury
  - Mortality
  - Morbidity
- Anatomy and Physiology of Soft Tissue Injury
  - Layers of the Skin
  - Function of the Skin
- Closed Soft Tissue Injury
  - Type of Injuries
    - Contusion
    - Hematoma

- Crush injuries
  - Signs and Symptoms
    - Discoloration
    - Swelling
    - Pain
  - Assessment
    - Mechanism of injury, suspect underlying organ trauma/injury
    - Diffuse or generalized soft tissue trauma can be critical
    - Pulse, movement, sensation distal to injury
  - Management
    - Cold
    - Splinting if necessary
- Open Soft Tissue Injury
  - Type of Injuries
    - Abrasions
    - Lacerations and incisions
    - Avulsions
    - Bites
    - Impaled objects
    - Amputations
    - Blast injuries/High Pressure
    - Penetrating/Punctures
  - Complications of Soft Tissue Injury
    - Bleeding – shock
    - Pain
    - Infection
  - Signs and Symptoms of Open Soft Tissue Injuries
    - Bleeding
    - Shock
    - Pain
    - Hemorrhage
    - Contaminated wounds
    - Impaled objects
    - Loss of extremity
    - Entrance and exit wounds
    - Flap of skin attached
- General Assessment
  - Safety of Environment / Standard Precautions
  - Airway Patency
  - Respiratory Distress
  - Concepts of Open Wound Dressings/Bandaging
    - Sterile
    - Non-sterile
    - Occlusive
    - Non-occlusive
    - Wet



- Dry
    - Tourniquet
    - Complications of dressings/bandages
  - Hemorrhage Control
    - Pressure dressing
    - Tourniquets
  - Associated Injuries
    - Airway
    - Face
    - Neck trauma – increased bleeding
- Management
  - Airway Management
  - Control Hemorrhage – Dress/Bandage Open Wounds
  - Prevention of Shock
  - Prevent Infection
  - Transport to the Appropriate Facility
  - Bites
    - Control hemorrhage
    - Bites often lead to serious infection
  - Avulsions
    - Never remove skin flap regardless of size
    - Complete avulsion often has serious infection concerns
    - Place skin in anatomic position if flat avulsion
- Incidence of Burn Injury
  - Morbidity/Mortality
  - Risk Factors
- Anatomy and Physiology of Burns
  - Types of Burns
    - Thermal
    - Inhalation
    - Chemical
    - Electrical
    - Radiation
  - Depth Classification of Burns
    - Superficial
    - Partial-thickness
    - Full-thickness
  - Body Surface Area of Burns
    - Rule of nines
    - Rule of ones (palm)
  - Severity of Burns
    - Minor
    - Moderate
    - Severe
- Complications of Burn Injuries
  - Infection

- Shock
- Hypoxia
- Airway Obstruction
- Hypothermia
- Hypovolemia
- Complications of Circumferential Burns
- General Assessment of Burn Injuries
  - Scene Safety/Standard Precautions
    - Identification of burn type
    - Possibility of inhalation injury
  - Airway Patency
  - Respiratory Distress
  - Classification of Burn Depth
  - Percentage of Body Surface Area Burned
  - Severity
- General Management
  - Stop the Burning
  - Airway Management
  - Respiratory Distress
    - Administer high concentration oxygen
    - Assist ventilation if indicated
    - Position with head elevated if spine injury not suspected
  - Circulatory
  - Dry, Sterile, Non-Adherent Dressing
    - After initial cooling of burn
    - Moist dressing if burn less than ten percent body surface area
  - Remove Jewelry and Clothing
  - Treat Shock
  - Prevent Hypothermia
  - Transportation to Appropriate Facility
    - ALS mutual aid
    - Criteria for burn center
  - Pediatric Considerations
    - Pediatric
    - Abuse
  - Geriatric Considerations
- Specific Burn Injury Management Considerations
  - Thermal
    - Complete general management
    - May be associated with an inhalation injury
    - Large burns may cause hypovolemia and hypothermia
    - Cool small burns or those remaining hot (patient who has just been rescued from fire)
    - Dry dressing help prevent infection and provide comfort
    - Time in contact with heat increases damage
  - Inhalation

- Complications are related to toxic chemicals within inhaled air
  - Edema of mucosa of airway can be rapid -- consider ALS backup if signs and symptoms of edema are present, such as:
    - Hoarseness
    - Singed nasal or facial hair
    - Burns of face
    - Carbon in sputum
  - Burns in enclosed spaces without ventilation cause inhalation injuries
- Chemical
  - Liquid chemicals – flush with water
  - Dry powder chemicals and need brushed off to remove chemicals
  - Chemical burns treatments can be specific to the burning agent and labels should be read
  - Burns at industrial sites may have experts available on scene
- Electrical
  - The type of electric current, amperage and volts, have effect on seriousness of burns
  - No patient should be touched while in contact with current
  - Sometimes electric current crosses the chest and causes cardiac arrest or arrhythmias
  - Many underlying injuries to organs and the nervous system may be present
- Radiation – radiation burns require special rescue techniques
- Age-Related Variations
  - Pediatric
    - Percentage of surface area in a burn patient
    - Alteration in calculating the burned area
  - Geriatrics

**AEMT: EMT Material Plus:**

- Fundamental depth, simple breadth
  - Crush syndrome

The AEMT Instructional Guidelines in this section include all the topics and material at the EMT level PLUS the following material:

- Incidence of Soft Tissue Injury
  - Mortality/Morbidity
- Anatomy and Physiology of Soft Tissue Injury
  - Layers of the Skin
  - Function of the Skin
- Closed Soft Tissue Injury
  - Type of Injuries
    - Contusion
    - Hematoma
    - Crush injuries

- Signs and Symptoms
  - Discoloration
  - Swelling
  - Pain
- Assessment
  - Mechanism of injury, suspect underlying organ trauma/injury
  - Diffuse or generalized soft tissue trauma can be critical
  - Pulse, movement, sensation
- Management
  - Ice
  - Splinting if necessary
- Open Soft Tissue Injury
  - Type of Injuries
    - Abrasions
    - Lacerations
    - Avulsions
    - Bites
    - Impaled objects
    - Amputations
    - Blast injuries/High Pressure
    - Penetrating/Punctures
  - Complications of Soft Tissue Injury
    - Blood loss – review bleeding and shock
    - Infection
  - Signs and Symptoms of Open Soft Tissue Injuries
    - Bleeding and Shock, Chest Trauma and other sections in trauma discuss many of the signs and symptoms of injuries to those areas that also include a soft tissue injury
    - Pain
    - Hemorrhage
    - Contaminated wounds
    - Impaled objects
    - Loss of extremity
    - Entrance and exit wounds
    - Flap of skin attached
- General Assessment
  - Safety of Environment/Standard Precautions
  - Airway Patency
  - Respiratory Distress
  - Concepts of Open Wound Dressings/Bandaging
    - Sterile
    - Non-sterile
    - Occlusive
    - Non-occlusive
    - Wet
    - Dry

- Tourniquet
    - Complications of dressings/bandages
  - Hemorrhage Control
    - Severity of injury
    - Elevation
    - Pressure dressing
    - Pressure points
    - Tourniquets
  - Associated Injuries
    - Airway
    - Face
    - Neck
- Management
  - Airway Management
  - Control Hemorrhage
  - Prevention of Shock
  - Prevent Infection
  - Transportation to the Appropriate Facility
  - Communication and Documentation
  - Bites
    - Control hemorrhage
    - Cat and human bites often lead to serious infection
- Avulsions
  - Never remove skin flap regardless of size
  - Complete avulsion often has serious infection concerns
  - Place skin in anatomic position if flat avulsion
- Incidence of Burn Injury
  - Morbidity/Mortality
  - Risk Factors
- Anatomy and Physiology of Burns
  - Types of Burns
    - Thermal
    - Inhalation
    - Chemical
    - Electrical
  - Complications of Burns
    - Thermal
    - Inhalation
    - Chemical
    - Electrical
  - Depth Classification of Burns
    - Superficial
    - Partial-thickness
    - Full-thickness
  - Body Surface Area of Burns
    - 'rule of nines'

- 'rule of ones'
  - Severity of Burns
    - Minor
    - Moderate
    - Severe
- Complications of Burn Injuries
  - Infection
  - Vasoconstriction
  - Hypoxia
  - Hypothermia
  - Hypovolemia
  - Complications With Circumferential Burns
  - Pediatric/Geriatric Abuse
- General Assessment of Burn Injuries
  - Safety/Standard Precautions
  - Airway Patency
  - Respiratory Distress
  - Hemorrhage Control
  - Classification of Burn Depth
  - Percentage of Body Surface Area Affected
  - Severity
- General Management
  - Stop the Burning
  - Airway Management
  - Respiratory Distress
  - Circulatory
  - Dry, Sterile, Non-Adherent Dressing
  - Remove Jewelry and Clothing
  - Prevent Shock
  - Prevent Hypothermia
  - Transportation to Appropriate Facility
    - ALS mutual aid
    - Criteria for burn unit
  - Pediatric Considerations
  - Geriatric Considerations
- Specific Burn Injury Management Considerations
  - Thermal
    - Complete general management
    - May be associated with an inhalation injury
    - Large BSB also have hypovolemia and hypothermia
    - Cool small or those remaining hot
    - Dry dressing help prevent infection and provide comfort
    - Time in contact with heat increases damage
  - Inhalation
    - Complications are related to chemicals within inhaled air

- Edema of mucosa of airway can be rapid – need ALS backup if signs and symptoms of edema are present, such as voice change, singed nasal hairs, etc
    - Percent of oxygen in ambient air is different so hypoxia, and carbon monoxide or other chemicals may enter the blood
    - Burns in enclosed spaces without ventilation cause inhalation injuries
  - Chemical
    - Some burns are liquid and need copious amounts of flushing with water
    - Some burns are powders and need brushed off to remove chemicals
    - Chemical burns treatments can be specific to the burning agent and labels should be read
    - Burns at industrial sites may have experts available on scene
  - Electrical
    - The type of electric current, amperage and volts, have effect on seriousness of burns
    - No patient should be touched while in contact with current
    - Sometimes electric current crosses the chest and causes cardiac arrest or arrhythmias
    - Many underlying injuries to organs and the nervous system may be present
    - Radiation burns require special rescue techniques
- Age-Related Variations
  - Pediatric
    - Percentage of surface area in a burn patient
    - Alteration in calculating the burned area
  - Geriatrics

## **Paramedic: AEMT Material Plus:**

Complex depth, comprehensive breadth

Pathophysiology, assessment, and management of

- Wounds
- Avulsions
- Bite wounds
- Lacerations
- Puncture wounds
- Burns
- Electrical
- Chemical
- Thermal
- High-pressure injection
- Crush syndrome

The Paramedic Instructional Guidelines in this section include all the topics and material at the AEMT level PLUS the following material:

- Incidence of soft tissue injury
  - Mortality/morbidity
- Anatomy and Physiology of soft tissue injury
  - Layers of the skin
  - Function of the skin
- Pathophysiology of wound healing
  - Hemostasis
  - Inflammation phase
  - Epithelialization
  - Neovascularization
  - Collagen synthesis
  - Alteration of wound healing
    - Anatomic factors
    - Concurrent drug use
    - Medical conditions/disease
    - High risk wounds
  - Abnormal scar formation
    - Keloid
    - Hypertrophic scar formation
    - Wounds requiring closure
- Wounds
  - Avulsions
    - Pathophysiology
    - Special assessment finding
    - Special management considerations
  - Bite Wounds
    - Pathophysiology



- Types
    - Special assessment finding
      - Animal
      - Human
      - Insect
    - Special management considerations
      - Animal
      - Human
      - Insect
  - Lacerations
    - Pathophysiology
    - Special assessment finding
    - Special management considerations
  - Puncture wounds
    - Pathophysiology
    - Special assessment finding
    - Special management considerations
- Burns
  - Electrical
    - Pathophysiology
    - Special assessment finding
    - Special management considerations
  - Chemical
    - Pathophysiology
    - Special assessment finding
    - Special management considerations
  - Thermal
    - Pathophysiology
    - Special assessment finding
    - Special management considerations
- High-pressure injection wounds
  - Pathophysiology
  - Special assessment finding
  - Special management considerations

### **Head, Facial, Neck, and Spine trauma**

#### **EMR**

Simple depth, simple breadth

- Recognition and management of
  - Life threats
  - Spine trauma
- Head, Face, Neck, and Spine Trauma
  - Injuries to the Brain and Skull
    - Head injuries
    - Scalp injuries

- Injury to the brain
- Special Management Considerations
- Injuries to the Spine
  - Mechanism of injury
  - Signs and symptoms
  - Assessing the patient with a possible spine injury
  - Special management consideration

**EMT: EMR Material Plus:**

Fundamental depth, foundational breadth

- Pathophysiology, assessment, and management of
  - Penetrating neck trauma
  - Laryngeotracheal injuries
  - Spine trauma
  - Simple depth, simple breadth
  - Facial fractures
  - Skull fractures
  - Foreign bodies in the eyes
  - Dental trauma

The EMT Instructional Guidelines in this section include all the topics and material at the EMR level PLUS the following material:

- Introduction
  - Incidence
    - Head/scalp
    - Face injury
    - Neck injury
  - Mechanisms of Head, Face, and Neck (Non-Spine) Injury
    - Motor vehicle crashes
    - Sports
    - Falls
    - Penetrating trauma
    - Blunt trauma
  - Morbidity and Mortality
  - Associated Injuries
    - Airway compromise
    - Cervical spine injury
- Review of Anatomy and Physiology of the Head, Face, and Neck
  - Arteries
  - Veins
  - Nerves
  - Bones
    - Nasal
    - Zygoma/Zygomatic arch

- Orbital
    - Maxilla
    - Mandible
    - Skull
  - Scalp
    - Hair
    - Subcutaneous tissue
    - Muscle
  - Mouth/Throat
    - Airway
  - Neck
    - Blood vessels
    - Airway – trachea
    - Gastrointestinal – esophagus
  - Eye
    - Bony orbit
    - Sclera
    - Cornea
    - Iris
    - Pupil
    - Lens
    - Retina
    - Optic nerve
- General Patient Assessment
  - Scene Size-Up
  - Primary Survey
    - Airway
    - Ventilation and oxygenation
    - Circulation
    - Disability
    - Expose
    - Identify and manage life threats
- Specific Injuries to Head, Face, and Neck
  - Scalp
    - Assessment
    - Signs and Symptoms
    - Management considerations
  - Facial Injuries
    - Types
    - Signs/symptoms
    - Assessment considerations in facial and eye injuries
    - Management considerations in facial and eye injuries
  - Neck Injuries (Non-Spinal)
    - Types of Injuries
    - Considerations in neck injuries'
    - Assessment considerations in neck injuries

- Management considerations in neck injuries
  - Nasal Fractures
    - Mechanism of Injury
    - Assessment – epistaxis
    - Management
  - Eye/Orbital
    - Types of Vision
    - Types of Injury
    - Assessment
    - Management
  - Dental
    - Mechanism of Injury
    - Assessment
    - Management – bring tooth with patient
  - Laryngeal Injuries
    - Definition
    - Mechanism of Injury
    - Signs/symptoms
    - Assessment
    - Associated Injuries
    - Management
  - Head Injury
    - Definition
    - Mechanism of injury
    - Signs/symptoms of fractures and other injuries
    - Assessment
    - Associated injuries
    - Management
  - Brain Injury
    - Definition
    - Signs/Symptoms
    - Mechanism of Injury
    - Pathophysiology of head/brain injury
    - Types of Injury
    - Assessment
    - Management
- Age-Related Variations
  - Pediatric -- modifications for Glasgow coma scale
  - Geriatric

## **AEMT: EMT Material Plus:**

Complex depth, foundational breadth

Pathophysiology, assessment, and management of

- Facial fractures
- Laryngeotracheal injuries

The AEMT Instructional Guidelines in this section include all the topics and material at the EMT level PLUS the following material:

- Facial Fractures
  - Types
    - Soft tissue injuries
    - Fractures of facial bones
    - Eye injuries
    - Oral/dental injuries
  - Unstable Facial Fractures
    - Pathophysiology
    - Specific assessment considerations
    - Specific management considerations
  - Signs/Symptoms
    - Soft tissue injuries are similar to others, but swelling may be more severe.
    - Facial bones may fracture causing airway and ventilation complications
    - Eye injuries suffer soft tissue type injuries, abrasions, lacerations, punctures, chemical burns, etc
    - Eye injuries may cause vision disturbances
    - Eyes injured with chemicals need flushing with copious amounts of water
    - Excessive pressure on the eye may “blow out” bones in the orbit
    - Nasal fractures may cause bleeding
    - Oral injuries may cause airway management complications
  - Assessment Considerations in Facial and Eye Injuries
    - Inspection
    - Palpation
    - Eye examination
  - Management Considerations in Facial and Eye Injuries
    - Airway must remain open throughout care
    - Nasopharyngeal airways are contraindicated
    - Suctioning may be frequent
    - Broken teeth need to be brought to hospital with patient
    - Eyes with chemical burns may need to be flushed with copious amounts of water
    - Simple nose bleeds can be controlled by pinching nostrils
    - Eye injuries require patching of both eyes
    - Impaled objects in the eye must be stabilized
    - Impaled objects in cheeks may be removed
    - Patients with these injuries may be more comfortable sitting up
    - Bandaging should not occlude the mouth

- Laryngeotracheal Injuries
  - Pathophysiology
    - Trauma directly to structures
    - Edema
    - Hemorrhage
  - Specific Assessment Considerations
    - Swelling
    - Voice changes
    - Hemoptysis
    - Subcutaneous emphysema
    - Structural irregularity
  - Specific Management Considerations
    - AVO
    - Combative patients
- Laryngeotracheal Injuries
  - Pathophysiology
    - Trauma directly to structures
    - Edema
    - Hemorrhage
  - Specific Assessment Considerations
    - Swelling
    - Voice changes
    - Hemoptysis
    - subcutaneous emphysema
    - structural irregularity
  - Specific Management Considerations
    - AVO
    - Supportive multi-system care

**Paramedic: AEMT Material Plus:**

Pathophysiology, assessment, and management of

Fundamental depth, foundational breadth

- Unstable facial fractures
- Orbital fractures
- Perforated tympanic membrane

Complex depth, comprehensive breadth

- Skull fractures
- Penetrating neck trauma
- Laryngeotracheal injuries
- Spine trauma
- Dislocations/subluxations
- Fractures
- Sprains/strains
- Mandibular fractures

The Paramedic Instructional Guidelines in this section include all the topics and material at the AEMT level PLUS the following material:

- Introduction
  - Incidence
    - Head injury
    - Brain injury
    - Face injury
  - Mechanisms of Injury
    - Motor vehicle crashes
    - Sports
    - Falls
    - Penetrating trauma
    - Blunt trauma
  - Morbidity and Mortality
  - Categories of Injury
    - Coup
    - Contrecoup
    - Diffuse axonal injury (DAI)
    - Focal
  - Causes of brain injury
    - Direct/primary
    - Indirect/secondary/tertiary
  - Associated Injuries
    - Airway compromise
    - Cervical spine injury
  - Prevention
- Unstable Facial Fractures
  - Pathophysiology
    - Categories of Unstable Facial Fractures
    - Blunt trauma to the facial area most frequent cause
  - Specific assessment considerations
    - Facial instability
    - Epistaxis
    - Edema
    - Pain
  - Specific management considerations
    - Simple airway maneuvers are difficult
    - Intubation is method of choice for airway protection
    - Ventilation without intubation is difficult
    - Manual in-line intubation
    - Bleeding into the oral cavity; suction
    - Cricothyroidotomy if indicated
    - Soft tissue bleeding
- Orbital Fractures

- Pathophysiology
  - Blunt trauma to the eye causes increased pressure to the globe of the eye. The pressure causes the weakest area (orbital floor) to give way, causing herniation of orbital contents (inferior oblique muscle entrapment) into the maxillary sinus.
- Specific assessment considerations
  - Mechanism of injury
  - Sports injury (balls)
  - Enophthalmos
  - impaired ocular mobility
  - diplopia
  - infraorbital hypoesthesia
- Specific management considerations
  - Assess for other injuries
  - Patching both eyes
  - Ice to reduce edema
- Perforated tympanic membrane
  - Pathophysiology
    - Pressure trauma – diving, water skiing
    - Direct blows
    - Explosion or barotraumas
    - Foreign objects
  - Specific assessment considerations
    - hemorrhagic otorrhea
    - hearing loss
  - Specific management considerations
    - Supportive care
- Skull fractures
  - Pathophysiology (fracture without brain injury)
    - Linear
    - Depressed
    - Basilar
    - Location and type of fracture is important
    - Suspicion of underlying brain injury
  - Specific assessment considerations
    - LOC
    - Hemorrhage control
    - Fracture lines that cross the middle meningeal artery can be serious
    - Underlying hematoma size can be significant
    - CSF leakage
  - Specific management considerations
    - Spinal cord precautions
    - AVO
    - Document neurological assessment
    - Transport to appropriate facility
    - Monitor vital signs



- Supportive care
- Penetrating neck trauma (non-cord involvement)
  - Pathophysiology
    - Blunt
    - Penetrating
    - Upper airway passages
    - Larynx
    - Vascular supply to brain
    - Upper GI system
    - Epiglottis
  - Specific assessment considerations
    - Changes in voice
    - Subcutaneous emphysema
    - Equal carotid pulse strength
    - Dysphagia
    - Hemorrhage
    - Hemoptysis
    - Tracheal ring fracture
  - Specific management considerations
    - Hemorrhage control (digital for carotid artery puncture)
    - Intubation to protect the airway
    - Voice rest (limited history)
- Laryngeotracheal injuries
  - Pathophysiology
    - Trauma directly to structures
    - Edema
    - Hemorrhage
  - Specific assessment considerations
    - Swelling
    - Voice changes
    - Hemoptysis
    - subcutaneous emphysema
    - structural irregularity
  - Specific management considerations
    - AVO
    - Supportive multi-system care
- Spine trauma (non-CNS involvement)
  - Pathophysiology
  - Specific assessment considerations
    - Pain
    - Point tenderness
    - Neurologically intact/normal
  - Specific management considerations
    - Spinal immobilization
    - AVO
    - Supportive multi-system care

- Mandibular fractures
  - Pathophysiology
  - Specific assessment considerations
    - Malocclusion of the teeth
    - Pain
    - Point tenderness
    - ecchymosis on the floor of the mouth
  - Specific management considerations
    - AVO
    - Non-use of nasal airways
    - Ice
    - monitor closely

### Nervous System Trauma

#### EMR

**No knowledge related to this competency is applicable at this level.**

#### EMT

Fundamental depth, foundational breadth

Pathophysiology, assessment, and management of

- Traumatic brain injury
- Spinal cord injury

The EMT Instructional Guidelines in this section include all the topics and material at the EMR level PLUS the following material:

- Incidence
  - Morbidity
  - Mortality
- Anatomy and Physiology of the Brain and Spine
  - Spine
    - Spinous process
    - Cervical
    - Thoracic
    - Lumbar
    - Spinal Fluid
  - Spinal Cord
  - Brain
    - Skull
    - Meninges
    - Gray matter – composed of nerve cells
    - White matter – covered nerve pathways that conduct messages of the brain
    - Brain stem – center for involuntary functions, temperature regulation, respiratory and heart rate, nerve function transmissions
    - Cerebrum – main part of brain, divided into two hemispheres, with four lobes

- Cerebellum – center for equilibrium and coordination
    - Meninges – coverings of the brain
    - Cerebral spinal fluid
  - Types of Skull Fractures
    - Basal
    - Compressed
    - Open
    - Linear
  - Types of Brain injuries
    - Concussion – temporary disruption to brain without injury due to closed trauma
    - Contusion – bruise of brain matter, may be diffuse or localized to one area
    - Cerebral laceration
    - Space occupying lesions
    - Penetrating wounds
- General Assessment Considerations for Brain Trauma Patients
  - Airway and Ventilation
    - Maintain airway
    - Assess for adequate ventilation
  - Mechanism of Injury
    - Consider the potential for blunt head trauma based on mechanism of injury
    - Assess the need to remove the helmet with proper spinal considerations if airway compromise or bleeding under the helmet is present
  - Spinal Immobilization
    - In patients with head injuries with altered mental status
    - Mechanism of injury that suggests the possibility of trauma to the spine
  - Respiratory Status -- brain injuries can cause irregular breathing patterns due to injuries affecting the brain stem
  - Complete a Neurological Exam
    - Appearance and behavior
    - Observe posture and motor behavior – appropriate movement
    - Facial expression
    - Speech and language
    - Thoughts and perceptions
    - Memory and attention
    - Pupils
    - Vital signs
  - Management Considerations With Brain Trauma
    - Maintain airway throughout care
    - Administer oxygen by non-rebreather mask – maintain oxygen saturation >90 percent at all times
    - Nasopharyngeal airways should not be used
    - Assist ventilation if indicated – avoid hyperventilation; except in specific circumstances
  - Transport Considerations

- Head trauma patients with impaired airway or ventilation, open wounds, abnormal vital signs, or who do not respond to painful stimuli may need rapid extrication
    - Head trauma patients must be transported to appropriate trauma centers
    - Head trauma patients may deteriorate rapidly and may need air medical transport
    - Adequate airway, ventilation, and oxygenation are critical to the outcome of head trauma patients
    - Head trauma patients frequently vomit – keep suction available
    - Head trauma patient frequently have seizures
  - Refer to Brain Injury Foundation Guidelines
- Age-Related Variations for Pediatric and Geriatric Assessment and Management of Brain Injury
  - Pediatric
  - Geriatric
- Spinal Cord Injuries
  - Types of Associated Spinal Injuries
    - Fractures
    - Dislocations
    - Open wounds
    - Flexion
    - Extension
  - General Assessment Considerations in Spinal Trauma
    - Often present with other injuries
    - Neurological examination considerations
    - History for patient with suspected spinal trauma
  - General Management Considerations With Spinal Trauma
    - Manual immobilization of spine when airway opened
    - Immobilization principles
    - Log-roll patient with suspected spinal trauma to move or examine back
    - Cervical collars
    - Seated patient spinal immobilization
    - Standing patient spinal immobilization
    - Lifting and moving patient with suspected spinal injury
    - Rapid moves for patient with suspected spinal injury
    - Helmet removal if present with airway complications
    - Consideration for pneumatic antishock garment use
- Age-Related Variations for Pediatric and Geriatric Assessment and Management of Spinal Injury
  - Pediatric
    - Head size and anatomical positioning during immobilization
    - Use of child safety seats
  - Geriatric
    - Unusual spinal anatomy due to aging
    - Special modifications of spinal immobilization techniques

### **AEMT: EMT Material Plus:**

Complex depth, foundational breadth

Pathophysiology, assessment, and management of

- Traumatic brain injury

The AEMT Instructional Guidelines in this section include all the topics and material at the EMT level PLUS the following material:

- Incidence of Traumatic Brain Injury
  - Morbidity/Mortality
  - Prevention Strategies
- Traumatic Brain Injury
  - Anatomy
    - Review of major structures of the brain
    - Review of circulation in the brain
  - Physiology
    - Review of function of brain
  - Pathophysiology
    - Normal oxygen demand of brain
    - Role of gas concentrations in vascular diameter
    - Brain injury categories
    - Increasing intracranial pressure
    - Coma
    - Brain herniation
    - Types of brain injuries
    - Associated Injuries -- Skull fractures
  - Specific Assessment Considerations
    - Level of Consciousness
    - AVO
    - Vital sign irregularities
    - Posturing
    - CSF presence
    - Coma assessment
  - Special Management Considerations
    - AVO with spinal precautions/immobilization
    - Ventilate/assist to maintain PaO<sub>2</sub> of 90mmHg
    - Seizure precautions
    - Fluid management
    - Role of hypothermia in coma

## **Paramedic: AEMT Material Plus:**

Pathophysiology, assessment, and management of

Fundamental depth, foundational breadth

- Cauda equina syndrome
- Nerve root injury
- Peripheral nerve injury

Complex depth, comprehensive breadth

- Traumatic brain injury
- Spinal cord injury
- Spinal shock

The Paramedic Instructional Guidelines in this section include all the topics and material at the AEMT level PLUS the following material:

- Incidence
  - Morbidity/mortality
  - Prevention strategies
- Cauda equine syndrome
  - Pathophysiology
    - Cauda equine are spinal nerves descending at the end of the spinal cord. Not part of the cord, but a series of nerves that appears like a tail at the end of the spinal cord.
    - The syndrome results from trauma to the lower back
  - Special assessment considerations (signs and symptoms are never root dependent)
    - weakness of lower muscles (depended upon which nerve root is injured)
    - loss of reflexes
    - hyperesthesia and later anesthesia in groin
    - incontinence
    - sexual dysfunction
  - Special management considerations
- Nerve root injury (To be reviewed for inclusion later)
  - Pathophysiology
  - Special assessment considerations
  - Special management considerations
- Peripheral nerve injury
  - Pathophysiology
    - Trauma damages a nerve, or nerve group between the ganglion and its intervention point.
    - Damage causes muscle or sections of the muscle not to function properly
    - Damage causes sensation on the skin to be lost
  - Special assessment considerations
    - MOI
    - Anesthesia
    - Numbness

- Muscle weakness
  - Special management considerations
    - Immobilize in anatomical position
    - Reduce swelling
- Traumatic brain injury
  - Pathophysiology
    - Brain is very oxygen dependent
    - Brain has very limited oxygen storing capacity
    - Loss of blood flow for 5-10 seconds causes unconsciousness
    - Low PacO<sub>2</sub> causes vasodilation
    - High PacO<sub>2</sub> causes vasoconstriction
    - Coup injury to the brain
    - Contrecoup injury to the brain
    - Primary brain injury
    - Secondary brain injury
    - Center of consciousness (reticular activating system)
    - Coma
    - Posturing (decerebrate, decorticate)
    - Normal intracranial pressure (2 – 12 mmHg)
    - Cushing's triad (increased blood pressure, decreased pulse and irregular respirations)
    - Brain herniation
    - Skull fractures
    - Concussion
    - Diffuse axonal injury
    - Contusion
    - Cerebral lacerations
    - Epidural hematoma
    - Subdural hematoma
    - Subarachnoid hemorrhages
    - Intracerebral hematomas
    - Penetrating Brain trauma
  - Specific assessment considerations
    - LOC
    - AVO
    - Spinal Concerns
    - Vital sign irregularities
    - Posturing
    - Pupil reactions
    - CSF presence
    - Cranial nerve damage signs
    - Bilateral strength of muscle groups
    - Doll's eyes
    - Coma assessment
    - Neurological exam
  - Special management considerations

- AVO with spinal precautions/immobilization
  - MOI
  - History
  - Vital signs
  - Pharmacological agents
  - Seizure precautions/treatment
  - Volume replacement in multi-system trauma
  - Role of Hypothermia
  - Role of neuroprotective agents
  - Role of steroids
- Spinal cord injury
  - Pathophysiology
    - Mechanism of injury
    - Complete cord lesions
    - Incomplete cord lesions
    - Neurogenic shock
    - Paralytic ileus
  - Special assessment considerations
    - Dermatome assessment
    - Complete
    - Incomplete
  - Special management considerations
    - Spinal immobilization
    - AVO
    - Pharmacological agents (anti-inflammatory)
    - Dermatome assessment and anatomical regional effects with spinal injury.
- Spinal shock
  - Pathophysiology
    - Loss of control between injury site and brain
    - Vasodilation
    - Loss of balance between parasympathetic and sympathetic nervous systems
    - Lasts 7 to 20 days
    - Autonomic hyperreflexia
  - Special assessment considerations
    - Flaccid muscles
    - Paralysis
    - Absence of sensation
    - Hypotension
    - Hypothermia
  - Special management considerations
    - AVO
    - IV bolus
    - Vasopressor considerations
    - Pharmacological assistance



## Special Considerations in Trauma

### EMR

Simple depth, simple breadth

Recognition and management of trauma in

- Pregnant patient
- Pediatric patient
- Geriatric patient
  
- Pregnant Patient
  - Recognition
    - Pregnant women who have suffered an injury should be evaluated by a physician in the emergency room
  - Management
    - If the woman is having any symptoms related to shock, high-concentration oxygen should be administered
    - Place pregnant patient in third trimester on her left side unless spinal injury suspected then tilt spine board to the left after patient is fully secured to the board
  
- Pediatric Patient
  - Recognition
    - Heavy head with weak neck muscles in children increase risk of cervical spine injury
    - Accessory muscle use more prominent during respiratory distress
    - Slow pulse rate indicates hypoxia
    - Normal blood pressure may be present in compensated shock
    - Shaken baby syndrome may cause brain trauma
  - Management
    - Manage hypovolemia and shock as for adults
    - Prevent hypothermia in shock
    - Transport to appropriate facility
    - Pad beneath child from shoulders to hips during cervical immobilization to prevent flexion of the neck
    - Ventilate bradycardic pediatric patient
  
- Elderly Patient
  - Recognition
    - Changes in pulmonary, cardiovascular, neurologic, and musculoskeletal systems make older patients susceptible to trauma
    - Circulation changes lead to inability to maintain normal vital signs during hemorrhage, blood pressure drops sooner
    - Multiple medications are more common and may affect:
      - Skeletal changes cause curvature of the upper spine that may require padding during spinal immobilization
      - Dentures may cause airway obstruction
      - Falls are often the result of medical conditions
  - Management
    - Suctioning is important in elderly patients due to decreased cough reflex

- Skeletal changes cause curvature of the upper spine that may require padding during spinal immobilization
- Prevent hypothermia
- Broken bones are common

**EMT: EMR Material Plus:**

Fundamental depth, foundational breadth

Pathophysiology, assessment, and management of trauma in the

- Pregnant patient
- Pediatric patient
- Geriatric patient
- Cognitively impaired patient

The EMT Instructional Guidelines in this section include all the topics and material at the EMR level PLUS the following material:

- Trauma in Pregnancy
  - Special Unique Considerations for Pregnant Patient Involved in Trauma
    - Mechanism of injury
    - Fetal considerations – trauma to an expectant mother can have effects on fetal health
  - Special Anatomy, Physiology, and Pathophysiology Considerations
    - Cardiovascular
  - Unique Types of Injuries and Conditions of Concern for Pregnant Patients Involved in Trauma
    - Fetal distress due to hypoxia or hypovolemia/shock
    - Separation of the placenta from the uterine wall
    - Fetal injury from penetrating trauma
    - Seat belts
    - Cardiac arrest due to trauma
  - Unique Assessment Considerations for Pregnant Patients Involved in Trauma
    - Two patients to consider
  - Unique Management Considerations for the Pregnant Patients Involved in Trauma
    - Airway, ventilation, and oxygenation
    - Circulation
    - Transport considerations
- Trauma in the Pediatric Patient
  - Special Unique Considerations for Pediatric Patient Involved in Trauma
    - Vehicle crashes
    - Pedestrian versus vehicle collisions
    - Drowning
    - Burns
    - Falls
    - Penetrating trauma
  - Unique Anatomy, Physiology, and Pathophysiology Considerations of Injured Pediatric Patients

- Heavy head with weak neck muscles in children increases risk of cervical spine injury
    - Chest wall flexibility produces flail chest
  - Unique Assessment Considerations for a Pediatric Patient Who Has Sustained Trauma
    - Pediatric assessment triangle
    - Airway, ventilation, oxygenation
    - Vital signs
  - Unique Management Considerations for Pediatric Patients Involved in Trauma
    - Manage hypovolemia and shock as for adults
    - Shaken baby syndrome may cause brain trauma
    - Prevent hypothermia in shock
    - Transport to appropriate facility
    - Pad beneath child from shoulders to hips during cervical immobilization to prevent flexion of the neck
    - Ventilate bradycardic pediatric patient
- Trauma in the Elderly Patient
  - Special Considerations for Geriatric Patients Involved in Trauma
    - Vehicle crashes
    - Pedestrian versus vehicle collisions
    - Fall
    - Burns
    - Penetrating trauma
    - Elder abuse
  - Unique Anatomy, Physiology, and Pathophysiology Considerations of Injured Geriatric Patients
    - Changes in pulmonary, cardiovascular, neurologic, and musculoskeletal systems make older patients susceptible to trauma
    - Circulation changes lead to inability to maintain normal vital signs during hemorrhage, blood pressure drops sooner
    - Multiple medications are more common and may affect
    - Brain shrinks leading to higher risk of cerebral bleeding following head trauma
    - Skeletal changes cause curvature of the upper spine that may require padding during spinal immobilization
    - Loss of strength, sensory impairment, and medical illness increase risk of falls
  - Unique Assessment Considerations for Injured Geriatric Patients
    - Airway
    - Breathing
    - Circulation
  - Unique Management Considerations for Injured Geriatric Patients
    - Suctioning is important in elderly due to decrease cough reflex
    - Decrease muscle size in the abdomen may mask abdominal trauma
    - Prevent hypothermia

- Broken bones are common – traction splints are not used to treat hip fractures
  - Falls leading to trauma must be investigated as to the reason for the fall
- Trauma in the Cognitively Impaired Patient
  - Unique Considerations for Injured Cognitively Impaired Patients
    - Types of cognitive impairment
    - Mechanism of injury – cognitively impaired patients are more susceptible to trauma
  - Unique Anatomy, Physiology, and Pathophysiology Considerations for Injured Cognitively Impaired Patients
    - Sensory loss related to aging and disease may increase risk of injury and alter the patient’s response to injury
    - Musculoskeletal strength due to aging or impairment
    - Memory loss with Alzheimer’s disease will alter patient assessment
    - Cardiovascular changes with dementia
  - Unique Assessment Consideration for Cognitive Impaired Patients Involved in Trauma
    - Poor historians of past medical history or events of trauma
    - Pain perception may be altered
    - Psychological implications of trauma may be different
    - Patient may be bed ridden or under nursing home care
  - Unique Management Consideration for Cognitively Impaired Patients Involved in Trauma
    - Cognitively impaired patient special care
    - Involve usual care givers in emergency treatment

**AEMT: EMT Material Plus:**

Complex depth, foundational breadth

Pathophysiology, assessment, and management of trauma in the

- Pregnant patient
- Pediatric patient
- Geriatric patient
- Cognitively impaired patient

The AEMT Instructional Guidelines in this section include all the topics and material at the EMT level PLUS the following material:

- Trauma in Pregnancy
  - Incidence
    - Mortality/morbidity
    - Risk factors
    - Prevention
  - Anatomy
    - Review of anatomical changes in pregnancy
  - Physiology
    - Review of physiological changes in pregnancy

- Pathophysiology
  - Shock in pregnancy
  - Traumatic abruptio placenta
  - Abdominal injuries
  - Pelvic fracture
  - Seat belt injuries
  - Sexual assault
- Special Considerations in Assessment
  - Increased heart rate is not an early sign of hypovolemic shock
  - Significant blood loss may not be reflective of usual signs of shock
  - Respiratory rate less than 20 should not be considered adequate ventilation
  - Loss of landmarks for chest compressions in arrest
  - Signs of abruption placentae
  - Estimating gestational age of fetus
- Special Considerations in Management
  - AVO
  - Circulation
  - Traumatic arrest
- Pediatric Trauma
  - Incidence
    - Mortality/morbidity
    - Risk factors
    - Prevention
  - Anatomy
    - Review of anatomical differences by age
    - Review of impact of differences on care
  - Physiology
    - Review of anatomical differences by age
  - Pathophysiology
    - Alterations to response of shock in the child
    - Alterations to response of head injury in the newborn/child
    - Alterations to response of spine to injury in the child (i.e. Spinal Cord Injury Without Radiographic Abnormality)
    - Alterations to response to chest injury in the child
    - Musculoskeletal
  - Special Considerations in Assessment
    - Airway, Breathing, and Circulation
    - Circulation
    - Neurological
    - Head
    - Chest
    - Abdomen
  - Special Considerations in Management
    - Airway, Breathing, and Circulation (improper management is the most common cause of preventable pediatric death)
    - Circulation

- Geriatric Trauma
  - Incidence
    - Mortality/morbidity
    - Risk factors
    - Prevention
  - Review of Anatomical Changes of Aging
  - Review of Physiological Changes of Aging Affecting Trauma
    - Respiratory
    - Cardiovascular
    - Neurological system
  - Special Considerations in Assessment
    - History
  - Special Considerations in Management
    - Airway, Breathing, And Circulation Review
    - Circulation
- Cognitively Impaired Patient Trauma
  - Incidence
    - Mortality/morbidity
    - Risk factors
    - Prevention
  - Types of Cognitive Impairment
  - Challenges With Cognitive Impaired Patients
    - Ability of individual to communicate complaints
    - Unreliable historian
    - Unusual presentation of common disorders
    - Reduced pain threshold
    - Consent to treat complications
  - Special Considerations in Assessment
    - Level of development
    - Communication ability assessment
    - Assess/determine hearing and sight problems
    - Take vital signs when patient is calm
    - Typically helpful to have a caregiver present during physical exam.

## **Paramedic: AEMT Material Plus:**

Complex depth, comprehensive breadth

Pathophysiology, assessment, and management of trauma in the

- Pregnant patient
- Pediatric patient
- Geriatric patient
- Cognitively impaired patient

The Paramedic Instructional Guidelines in this section include all the topics and material at the AEMT level PLUS the following material:

- Trauma in Pregnancy
  - Incidence
    - Mortality/morbidity
    - Risk factors
    - Prevention
  - Pathophysiology
    - Exhibit responses different due to physiologic changes during pregnancy
    - Mother
    - Fetus
    - Fetal death caused by
    - Abdominal injuries
    - Pelvic fracture
    - Traumatic arrest
    - Seat belt injuries
    - Sexual assault
  - Special Considerations in assessment
    - Increased heart rate is not an early sign of hypovolemic shock
    - Significant blood loss may not be reflective of usual signs of shock
    - RR less than 20 should not be considered adequate ventilation
    - loss of landmarks for chest compressions in arrest
    - MOI and signs of abruption placentae
    - Estimate gestational age of baby
    - Palpate uterine fundus
    - Attempt to listen to fetal heart tones – 4 o'clock position, about 2" from mother umbilicus
  - Special considerations in management
    - Airway, Breathing, and Circulation
    - Maternal management
    - Fetal Assessment
- Pediatric Trauma
  - Unique Pediatric Aspects of Trauma
    - Most common is motor vehicle-related
    - Blunt trauma most prevalent MOI
    - Intentional injuries
    - Suicide in adolescents

- Children in trauma more rapidly decompensate
    - Child abuse causes trauma
    - Strong catecholamine capabilities
  - Pathophysiology
    - Head – most common injured
    - Spine
    - Chest
    - Abdomen
    - Musculoskeletal
  - Special Considerations in assessment
    - Airway, Breathing, and Circulation
    - Circulation
    - Head
    - Chest
    - Abdomen
    - Musculoskeletal Trauma
  - Special considerations in management
    - Airway, Breathing, and Circulation (improper management is the most common cause of preventable pediatric death)
    - Circulation
    - Head
    - Spinal
    - Abdomen
    - Extremity
    - Transportation
- Geriatric Trauma
  - Unique Geriatric Aspects of Trauma
  - Pathophysiology
    - Most changes occur after age 80 if the patient is in general good health
    - Respiratory
    - Cardiovascular
    - Neurological system
    - Gastrointestinal
    - Renal
    - Musculoskeletal
    - Integumentary
    - Immune
  - Special considerations in assessment
    - History
    - Decreased tolerance to heat loss
  - Special considerations in management
    - Airway, Breathing, and Circulation
    - Circulation
  - Specific injuries/diseases management
    - Shock
    - Head injuries



- Musculoskeletal injuries
- Burns
- Abuse
- Cognitively impaired patient
  - Unique challenges with cognitive impaired patients
    - ability of individual to communicate complaints
    - unreliable historian's
    - unusual presentation of common disorders
    - reduced pain threshold
    - consent to treat complications
    - most commonly mental retardation (IQ less than 70)
    - 1 to 2.5% of population has mental retardation
    - Autism – differences in social, communication and ability to purposefully shift attention (may become agitated with touch)
  - Special considerations in assessment
    - Level of development
    - Use family and caregivers as part of history gathering
    - Assess/determine hearing and sight problems
    - Take vital signs when patient is calm
    - Typically helpful to have a caregiver present during physical exam
  - Special considerations in management
    - Treatment is the same
    - Suspect common disorders in the age population

### **Environmental Emergencies**

#### **EMR**

Simple depth, simple breadth

Recognition and management of

- Submersion incidents
- Temperature-related illness
- Environmental Emergencies
  - Exposure to Cold
    - Generalized cold emergency
    - Local cold emergencies
  - Exposure to Heat
    - Predisposing factors
    - Signs and symptoms
    - Special management considerations
  - Submersion
    - Definitions
    - Contributing factors
    - Severity
    - Signs and symptoms
    - Special management considerations

## **EMT: EMR Material Plus:**

Fundamental depth, foundational breadth

Pathophysiology, assessment, and management of

- Near drowning
- Temperature-related illness
- Bites and envenomations
- Dysbarism
- High-altitude
- Diving injuries
- Electrical injury
- Radiation exposure

The EMT Instructional Guidelines in this section include all the topics and material at the EMR level PLUS the following material:

- Submersion Incidents
  - Drowning
    - Definition
    - Incidence
    - Predictors of morbidity and mortality
  - Types
    - Fresh water
    - Salt water
  - Pathophysiology
    - Little difference in patient lungs regardless of what type of water submersion occurred
    - Submersion in cold water results in better survival than warm water
    - Age is a factor due to cardiovascular health
    - Duration under water effects outcome
    - Submersion in very cold water can produce cardiac disturbances
    - Hypoxia from submersion is major factor in death
    - Diving in shallow water can cause spinal trauma
    - Prolonged hypoxia causes death of brain tissue
  - Unique Signs and Symptoms
    - Airway – obstructed with water immediately after rescue
    - Breathing
    - Circulation
  - Assessment Considerations
    - Airway, ventilation, and oxygenation
    - Assess for presence of other injuries
    - Obtain past medical history
  - Management Considerations
    - Airway, ventilation, and oxygenation
    - Circulation
    - Transport Considerations

- Temperature-Related Illness
  - Incidents
    - Temperature-related illness
    - How the body loses heat
    - Type of temperature-related illness
  - Pathophysiology
    - Cold-related injuries
    - Heat-related illness
  - Signs and Symptoms
    - Cold-related illness – (generalized) hypothermia
    - Cold-related illness (localized)
    - Heat-related illness (moist, pale skin)
    - Heat-related illness (hot skin)
  - Management Considerations
    - Cold-related illness – (generalized) hypothermia
    - Cold-related illness (localized)
    - Heat-related illness, with moist, pale, cool skin
    - Heat-related illness with hot skin
- Bites and Envenomations
  - Injuries of Concern
    - Spider bites
    - Snake bites
    - Hymenoptera (bees, wasps, ants, yellow jackets)
  - Pathophysiology of Bites and Envenomations
    - Spider bites (black widow) -- inject neurotoxins
    - Snake bites -- rattlesnake is most common in United States
    - Hymenoptera
  - Signs and Symptoms
    - Spider bite (black widow)
    - Rattlesnake bite
    - Bee, wasp, and other stings
  - Unique Management Considers of Bites and Stings
    - Spider bite (black widow)
    - Rattlesnake bite
    - Bees, wasps, and other stings
- Diving Emergencies (Dysbarism)
  - Mechanism of Injury
    - SCUBA diving at greater depths for long periods of time
    - Repeated dives at depth on the same day
  - Pathophysiology
    - Diver remains at depth too long
    - Compressed air in blood at depth expands upon ascent, turning into bubbles in blood which obstruct blood flow
  - Signs and Symptoms
    - Occur after the patient raises to the surface too fast following dive at depths

- Cyanosis
  - Cough
  - Respiratory distress
  - Pain in joints
- Unique Management Considerations
  - Administer high-concentration oxygen
  - Transport rapidly for recompression therapy at the appropriate facility
- Electrical
  - Skin wounds may not indicate seriousness of burn
  - Entrance and exit wounds
  - May cause cardiac arrest
  - Lighting strikes may cause cardiac arrest
- Radiation
- Age-Related Variations for Pediatric and Geriatric Assessment and Management

### **AEMT: Same as Previous Level**

#### **Paramedic: AEMT Material Plus:**

Complex depth, comprehensive breadth

Pathophysiology, assessment, and management of

- Near-drowning
- Temperature-related illness
- Bites and envenomations
- Dysbarism
- High-altitude
- Diving injuries
- Electrical injury
- High altitude illness

The Paramedic Instructional Guidelines in this section include all the topics and material at the AEMT level PLUS the following material:

- Incidence
  - Morbidity/Mortality
  - Risk Factors
    - Pediatric considerations
    - Geriatric considerations
    - Fitness/Body Mass Index
    - Age
    - Gender
    - Medical conditions
    - Medications
    - Hydration
  - Prevention
    - Personal Protection Equipment (PPE)

- Climate acclimatization
  - Policies/procedures for work conditions
  - Hydration with food, beverage, electrolyte replacement
  - Measuring heat stress index
  - Minimize fatigue
  - Muscular strength and endurance training
- Submersion incidents
  - Pathophysiology
    - Near drowning
  - Special Assessment considerations
    - Diving emergencies
    - Near drowning
  - Special management considerations
    - Diving
    - Near-drowning
- Temperature-related illness
  - Pathophysiology
    - Heat Illness
    - Cold-related illness
  - Special Assessment considerations
    - Heat Illness
    - Frostbite
    - Accidental hypothermia
  - Special management considerations
    - Heat Illness
    - Heat Syncope
    - Heat exhaustion
    - Heat stroke
    - Frostbite
    - Accidental hypothermia
- Bites and Envenomations
  - Injuries of concern
    - Spider bites
    - Snake bites
    - Hymenoptera (bees, wasps, ants, yellow jackets)
  - Pathophysiology of bites and Envenomations
    - Spider bites (black widow)
    - Snake bites
    - Hymenoptera
  - Signs and Symptoms
    - Spider bite (black widow)
    - Rattlesnake bite
    - Bee, Wasp, and other stings
  - Unique management considers of bites and stings
    - Spider bite (black widow)
    - Rattlesnake bite

- Bees, wasps, and other stings
- Electrical injury – Lightning strikes
  - Pathophysiology
    - Pathophysiology similar to electrical burns
    - MOI
    - Major problem is cardiorespiratory arrest (massive DC countershock)
    - May cause head trauma, cardiac damage, burns, extremity vasospasm, paresis or paresthesias.
  - Special Assessment considerations
    - Scene safety
    - Assess for cardiac arrest
  - Special management considerations
    - AVO
    - Cardiac arrest management
    - Burn wound care
    - Transport
- High altitude illness
  - Pathophysiology
  - Special Assessment considerations
    - Vary depending on speed of ascent and time at elevation
    - HAPE (high altitude pulmonary edema)
    - High altitude retinal hemorrhage
  - Special management considerations
    - Reduce altitude as fast as possible
    - Mild cases are self limited
    - Moderate, aspirin, acetaminophen,
    - Severe requires diuretics, oxygen, steroids
    - Prevention is best, many patients take acetazolamide

### Multi-System Trauma

#### EMR

Simple depth, simple breadth  
Recognition and management of

- Multi-system trauma
- Multi-System Trauma
  - Patients Subjected to Significant Forces Have an Increased Risk for Injuries to Multiple Organs Within the Body at the Same Time
  - Multi-Trauma Patients Are at a Greater Risk of Developing Shock
  - Suspect Multi-Systems Trauma in Any Patient Subjected to Significant External Forces

#### EMT: EMR Material Plus:

Fundamental depth, foundational breadth  
Pathophysiology, assessment, and management of

- Multi-system trauma

- Blast injuries

The EMT Instructional Guidelines in this section include all the topics and material at the EMR level PLUS the following material:

- Kinematics of Trauma
  - Definition
    - Looking at a trauma scene and attempting to predict what injuries might have resulted based on an evaluation of the motion involved
    - Kinetic energy – function of weight of an item and its speed – speed is the most important variable
    - Blunt trauma
    - Deceleration Injuries
    - Penetrating Trauma
- Multi-System Trauma
  - Definition
    - Almost all trauma affects more than one system
    - Typically a patient considered to have “multi-system trauma” has more than one major system or organ involved
    - Multi-system trauma treatment involves a team of physicians to treat the patient. This may include specialists such as neurosurgeons, thoracic surgeons, and orthopedic surgeons
    - Multi-system trauma has a high level of morbidity and mortality
  - The Golden Principles of Out-of-Hospital Trauma Care
    - Safety of rescue personnel and patient
    - Determination of additional resources
    - Kinematics
    - Identify and manage life threats
    - Airway management while maintaining cervical spinal immobilization
    - Support ventilation and oxygenation – oxygen saturation greater than 95 percent
    - Control external hemorrhage
    - Basic shock therapy
    - Maintain spinal immobilization on long spine board
    - Transportation considerations
    - Obtain medical history
    - Secondary survey after treatment of life threats
  - Critical Thinking in Multi-System Trauma Care
    - Airway, ventilation, and oxygenation are key elements to success
    - Oxygenation cannot occur when patients are bleeding profusely
    - Sequence of treating patients
    - Rapid transport is essential
    - Backboards – serve as entire body splints when patients are appropriately secure in unstable patients
    - Personal safety
    - Experience

- Specific Injuries Related to Multi-System Trauma
  - Blast Injuries
    - Types of Blast Injuries (explosions)
    - Pathophysiology
    - Signs/symptoms
    - Management considerations in blast injuries

**AEMT: EMT Material Plus:**

Complex depth, foundational breadth

Pathophysiology, assessment and management of

- Multi-system trauma

The AEMT Instructional Guidelines in this section include all the topics and material at the EMT level PLUS the following material:

- Kinematics of Trauma
  - Definition
    - Looking a trauma scene and attempting to determine what injuries might have resulted
    - Kinetic energy – function of weight of an item and its speed.
    - Blunt trauma
    - Deceleration injuries
    - Penetrating trauma
- Multi-System Trauma
  - Definition
    - Almost all trauma effects more than one system
    - Typically a patient considered to have “multi-trauma” has more than one major system or organ involved
    - Multi-trauma treatment will involve a team of physicians to treat the patient such as neurosurgeons, thoracic surgeons, and orthopedic surgeons
    - Multi-trauma has a high level of morbidity and mortality
  - The Golden Principles of Out-of-Hospital Trauma Care
    - Safety of patient and rescue personnel
    - Determination of additional resources
    - Kinematics
    - Identify and manage life threats
    - Airway management while maintaining cervical spinal immobilization
    - Support ventilation and oxygenation
    - Control external hemorrhage
    - Basic shock therapy
    - Maintain spinal immobilization on long board
    - Transportation considerations
    - Obtain medical history
    - Secondary survey after maintenance of life threats
    - “Do No Further Harm”



- Critical Thinking in Multi-System Trauma Care
  - Airway, ventilation and oxygenation are key elements to success
  - Oxygenation cannot occur when patients are bleeding profusely
  - Sequence of treating patients
  - Rapid transport is essential
  - Backboards
  - Documentation and reporting
  - Personal safety
  - Experience
- Specific Injuries Related to Multi System Trauma
  - Blast Injuries
    - Types of blast injuries (explosions)
    - Pathophysiology
    - Signs/symptoms
    - Management considerations in blast injuries

**Paramedic: AEMT Material Plus:**

Complex depth, comprehensive breadth

Pathophysiology, assessment, and management of

- Multi-system trauma
- Blast injuries

The Paramedic Instructional Guidelines in this section include all the topics and material at the AEMT level PLUS the following material:

- Kinematics of trauma
  - Definition
    - Looking a trauma scene and attempting to determine what injuries might have resulted
    - Kinetic energy – function of weight of an item and its speed.
    - Blunt trauma
    - Deceleration Injuries
    - Penetrating Trauma
- Multi-System Trauma
  - Definition
    - Almost all trauma effects more than one system
    - Typically a patient considered to have “multi-trauma” has more than one major system or organ involved
    - Multi-trauma treatment will involve a team of physicians to treat the patient such as neurosurgeons, thoracic surgeons, and orthopedic surgeons
    - Multi-trauma has a high level of morbidity and mortality
  - The golden principles of out of hospital trauma care
    - Safety of patient and rescue personnel
    - Determination of additional resources
    - Kinematics
    - Identify and manage life threats

- Airway management while maintaining cervical spinal immobilization
  - Support ventilation and oxygenation
  - Control external hemorrhage
  - Basic shock therapy
  - Maintain spinal immobilization on long board
  - Transportation considerations
  - Obtain medical history
  - Secondary survey after maintenance of life threats
  - “Do No Further Harm”
- Critical Thinking in multi-system trauma care
  - Airway, ventilation and oxygenation are key elements to success
  - Oxygenation cannot occur when patients are bleeding profusely
  - Sequence of treating patients
  - Rapid transport is essential
  - Backboards
  - Documentation and Reporting
  - Personal safety
  - Experience
- Specific injuries related to multi system trauma
  - Blast injuries
    - Types of Blast Injuries (explosions)
    - Pathophysiology
    - Signs/symptoms
    - Management considerations in blast injuries