Section Three: **2007**

EMT-BASIC
LEARNING OBJECTIVES

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Rev. 9/07

2007

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CHEST TRAUMA

1. Describe how to assess for chest trauma in each of the following areas:

   - *Mechanism of injury: An extremely important assessment that can only be done by prehospital personnel. The speed, size, height, etc. should be evaluated depending upon the specific mechanism. MOI may give clues about possible injuries.*
   - *Inspection and palpation: Should include thorax as well as posterior ribs. Inspect for discolorations, deformities, wounds, paradoxical movement, and estimate depth of respirations. Palpate entire chest for deformity, crepitus, equality of chest expansion, tenderness, and SQ emphysema.*
   - *Respiratory status: Evaluate respirations for rate, depth, and effort. Breath sounds are auscultated for abnormal or absent sounds.*
   - *Evaluation of the neck: The trachea is felt at the suprasternal notch. It should be midline, not shifted to one side. Jugular vein distension is evident when examining the neck while the patient is sitting at a 45 degree angle and noting any bulging (this, however, is very difficult to assess).*

2. Differentiate between blunt and penetrating injuries:

   - *Blunt trauma does not break the skin. Penetrating trauma breaks the skin. It is important to realize that both blunt and penetrating traumas can cause hypoxic and hypovolemic life threats.*

3. Describe the pathophysiology, signs and symptoms and field management of an <u>upper airway traumatic obstruction:</u>

   - *Pathophysiology: Something blocks the upper airway: teeth, blood, crushed larynx. Main problem is airway obstruction.*
   - *SxS: Stridor or no air movement. Damage to neck/face.*
   - *Field management: Rapid transport, high flow O_2 with BVM assist prn, suction prn. ALS intercept for intubation or cricothyrotomy.*

4. Describe the pathophysiology, signs and symptoms and field management of simple rib fractures:

   - *Pathophysiology: A single fracture per rib.*
   - *SxS: Localized pain, especially during breathing or movement, resulting in shallow respirations. Other vital signs usually normal or slightly elevated.*
   - *Field management: Supplemental oxygen. Transport and reassess for possible pneumothorax.*

5. Describe the pathophysiology, signs and symptoms and field management of a flail chest:

   - *Pathophysiology: Two or more ribs fractured in two or more places, creating a free-floating segment of rib cage.*
   - *SxS: Intense localized pain with dyspnea, increased respiratory rate, decreased respiratory depth. Possible use of accessory muscles. Possible paradoxical movement, although this is usually masked by muscle spasm in the conscious or semi-conscious patient. Underlying injury to the lung is usually present, and rales may be auscultated.*
   - *Field management: Transport. High flow oxygen with BVM assist as needed. Flail segment may be stabilized, with a hand or dressing, enroute for patient comfort if time permits. Reassess for underlying injuries such as pneumothorax.*

6. Describe the pathophysiology, signs and symptoms and field management of a simple pneumothorax:

   - *Pathophysiology: An opening occurs in the visceral or parietal pleura allowing air into the pleural space. This in turn collapses the lung. Usually not a life threat in a healthy person with no other injuries/problems.*
   - *SxS: Increased respiratory rate, dyspnea, use of accessory muscles. Decreased breath sounds on affected side. In some instances, SQ emphysema.*
   - *Field management: Transport. High flow oxygen with BVM assist as needed. Reassess for development of tension pneumothorax.*

7. Describe the pathophysiology, signs and symptoms and field management of an open pneumothorax (penetrating chest wound):

   - *Pathophysiology: Similar to closed pneumothorax, but mechanism is a penetrating injury to the chest.*
   - *SxS: Similar to pneumothorax, with the addition of an identifiable wound.*
   - *Field management: Rapid transport is the main goal. High flow oxygen with BVM assist as needed in addition to the management of the wound. The wound is sealed with an occlusive dressing if time permits and the patient is periodically reassessed for the development of a tension pneumothorax. ALS intercept. The dressing is "burped" as needed to relieve air pressure. Remember that dressing wounds is a low priority, rapid transport is first!*

8. Describe the pathophysiology, signs and symptoms and field management of a tension pneumothorax:

   - *Pathophysiology: Air enters the pleural space but cannot escape. As a result, with each inhalation more and more air is trapped. Eventually, enough air pressure in the pleural space not only collapses the lung on the affected side, but compromises the function of the heart and the lung on the opposite side as well.*
   - *SxS: Increased pulse, decreased BP, skin pale/cyanotic/cool/diaphoretic, increased respiratory rate with extreme distress (or if patient being bagged, increasing difficulty in squeezing bag) and use of accessory muscles. No breath sounds on affected side and decreased sounds on unaffected side, jugular vein distension, tracheal shift (very late), SQ emphysema.*
   - *Field management: Rapid transport with ALS intercept for needle decompression. High flow oxygen with BVM enroute.*

9. Describe the pathophysiology, signs and symptoms and field management of a hemothorax:

   - *Pathophysiology: Similar to a pneumothorax except blood rather than air fills the pleural space. Hypoxia and hypovolemia are both potential problems as each lung space has a capacity of 3 liters.*
   - *SxS: Similar to pneumothorax, with signs of hypovolemia: increased heart rate, decreased BP, skin pale/cyanotic/cool/diaphoretic, decreased LOC.*
   - *Field management: Rapid transport, treat for shock, high flow oxygen with BVM assist as needed, ALS intercept.*

10. Describe the pathophysiology, signs and symptoms and field management of a cardiac tamponade:

    - *Pathophysiology: Mechanism (usually penetrating trauma) results in laceration of the heart with resulting hemorrhage into the pericardial sac. This results in decreased cardiac function.*
    - *SxS: Increased heart rate, decreased BP, increased respiratory rate but with clear and equal lung sounds, jugular vein distension, paradoxical pulses (BP drops 10-15 mmHg during inhalation resulting in radial pulses disappearing when patient inhales). Muffled heart tones are a classic sign, but difficult to distinguish in the field setting. Cardiac tamponade is difficult to diagnose, but should always be suspected with penetrating trauma to the anterior chest.*
    - *Field management: Rapid transport, high flow oxygen with BVM assist as needed. ALS intercept.*

11. Define the term "occlusive dressing" and give three (3) examples of items commonly found on an ambulance that can be used as such:

    - *An occlusive dressing is any dressing that prevents the passage of air.*

    Aluminum foil wrappers, saran wrap and petroleum impregnated gauze are possible occlusive dressings.

12. Explain the importance of a paramedic intercept in the case of a BLS unit transporting a patient with a deteriorating tension pneumothorax:

    - *Paramedics can perform a life-saving procedure in the event of a tension pneumothorax. This procedure, known as a needle decompression or "darting the chest" releases air pressure build-up in the pleural space and allows the patient increased survival time until chest tubes can be placed by an emergency physician.*

ABDOMINAL and GENITALIA INJURIES

1. Define and list three (3) examples of the following types of abdominal organs:

    - ***Solid organs:*** *Liver, kidneys, spleen*
    - ***Hollow organs:*** *Bladder, stomach, appendix*

2. List problems or concerns associated with injury to:

    - *Hollow organs: Rupture, spillage of contents leading to peritonitis.*
    - *Solid organs: Laceration, leading to hemorrhage.*

3. List the major structures in each of the following abdominal quadrants:

    - *RUQ: liver, gallbladder, part of pancreas, part of colon*
    - *LUQ: spleen, stomach, part of pancreas, part of colon*
    - *RLQ: appendix, intestines, right ovary/fallopian tube*
    - *LLQ: intestines, left ovary/fallopian tube*
    - *Midline: aorta, vena cave, bladder*
    - *Retroperitoneal space: kidneys*

4. Define the term "peritonitis" and explain what it indicates:

    - *Peritonitis is inflammation of the abdominal cavity, often from infection, and usually indicates rupture of a hollow organ.*

5. Define the term “evisceration” and describe its proper field treatment:

   - *Evisceration is exposure and protrusion of abdominal contents due to an opening in the abdominal wall. Treatment includes covering exposed abdominal contents with a moist sterile dressing covered by an occlusive dressing to retain moisture and heat. Rapid transport and treat for shock.*

6. Excluding mechanisms of injury, list five (5) signs and symptoms that may indicate the presence of abdominal trauma:

   - *Bruising*
   - *Distension*
   - *Redness*
   - *Rigidity*
   - *Guarding*
   - *Lacerations*
   - *Tenderness*
   - *SxS shock*

7. List the general steps associated with the treatment of abdominal trauma:

   - ***Rapid transport!*** *High flow oxygen and position of comfort (if possible). Assess and treat for shock, including MAST if indicated. **NOTE** MAST not advisable in eviscerations unless directed by Medical Control.*

8. Describe the problems or concerns associated with injuries to the pelvis:

   - *Injuries (i.e. fractures) to the pelvis may be accompanied by large amounts of blood loss. Hypovolemic shock should always be a concern. Furthermore, the force necessary to fracture the pelvis of a young, healthy adult will probably result in additional injuries such as spinal or femur fractures.*

9. Describe the appropriate field management of injuries to the pelvis. Indicate how and if your treatment will change if the patient is elderly:

   - *Pelvic fractures should be stabilized with plenty of padding with the patient on a gurney. If spinal injury is also suspected, then a well-padded long spineboard should be used. MAST may be used to stabilize pelvic fractures, with inflation only as necessary to stabilize the fracture (i.e. not necessarily up to 90 mm Hg). In a patient with relatively stable vital signs, consider inflating MAST at the scene, before lifting patient to spineboard or gurney. Elderly patients with pelvic fractures should not be immobilized on long spineboards if at all avoidable.*

10. Describe the treatment of injuries to the genitalia:

    - *Treat as you would any other soft tissue injury. Control any bleeding as needed with dressgings and direct pressure. On women, DO NOT pack the vaginal area with bandaging in an attempt to control bleeding.*

11. Describe the appropriate assessment and field management for the victim of a sexual assault:

    - *The victim of a sexual assault may be withdrawn or hysterical. Common emotional and physical responses to sexual assault include: inability to express emotions, sleeplessness, fear, feelings of grief and despair, drug/alcohol abuse, displaced anger, appetite loss/overeating, loss of self-confidence, inability to concentrate, nightmares, denial, suicide attempts, offending behavior, anxiety and stress-related illnesses. The victim should be approached calmly and professionally and if the victim is not completely clothed a cover should be offered. Psychological and emotional support is usually the most important help that an EMT can offer. If the need for a physical assessment exists, explain and obtain permission to do one, however examination of the genitalia region is NOT appropriate unless there is a life-threatening hemorrhage. Be sensitive to the patient's emotional state. If the patient is more comfortable with the same sex EMT, try to accommodate if possible, however an empathetic EMT of either gender can provide emotional support. Explanation of the necessity of preserving evidence should also be done.*

MUSCULOSKELETAL INJURIES

1. Compare and contrast the field treatment of extremity fractures in critical and non-critical patients:

    - *Extremity fractures may be splinted prior to transport in the non-critical patient.*
    - *Extremity fractures should <u>not</u> be splinted prior to transport in the critical patient, as this may delay transport. Minimal hand stabilization should facilitate movement of the patient, and splinting may take place enroute if time allows. However, management of all life threats should take precedence!*

2. Define the following terms and explain their significance in a patient with a musculoskeletal injury:

    - *Crepitus: Sound of bone ends grating together. A clear sign of a fracture.*
    - *Guarding: Patient protects injured part and restricts movement. A clear indicator of pain and probable injury.*
    - *Angulation: Any deviation from the normal, in-line anatomical position of the bone. A clear sign of a fracture.*
    - *Edema (swelling): Accumulation of fluid/blood in the tissues outside the vascular space. Indicates a disruption in the vasculature and/or damaged tissues.*

3. For each of the following terms list the structure involved, and the signs and symptoms of each injury to each:

- *Fracture: Break in a bone. Primary SxS includes pain, swelling and discoloration, possible deformity, inability to use limb, crepitus.*
- *Dislocation: Disruption of a joint. Primary SxS includes pain, swelling & discoloration, deformity, inability to use the joint.*
- *Sprain: Stretching and tearing of the ligaments that hold a joint together. Primary SxS include pain, swelling & discoloration, reduced function.*
- *Strain: Over-stretched muscle or tendon. Primary symptom is pain.*

***NOTE:** An easy way to remember the difference between a sprain and strain is that strain has a t in it, as does tendon.*

4. Briefly describe the splint/treatment of choice for injuries to the:

- *Clavicle: Sling & swathe*
- *Humerus: Rigid splint to humerus, sling & swathe*
- *Elbow: Ladder or SAM splint with padding at elbow, sling & swathe*
- *Dislocated shoulder: Sling & swathe or position of comfort*
- *Radius/Ulna: Rigid splint extending past wrist, sling & swathe*
- *Wrist: Rigid splint extending past wrist, hand immobilized in position of function*
- *Hand: Rigid splint extending proximal to wrist. Hand immobilized in position of function*
- *Femur:*
    - *proximal fx: Sager traction splint, long spineboard with padding*
    - *mid-shaft fx: Traction splint, Sager or Hare*
    - *distal fx: Long spineboard with padding*
- *Rib: Sling & swathe or position of function*
- *Knee: Vacuum splint or soft splint with knee immobilized in a slightly flexed position and padding under knee*
    - *patellar dislocation: Position of comfort*
    - *femur/tib dislocations: Same as knee/position of comfort*
- *Tibia/Fibula: Rigid splint extending past knee and ankle or vacuum splint*
- *Ankle: Vacuum splint or soft pillow splint*
- *Hip(dislocation): Well padded long spineboard if accompanying spinal injury suspected, but gurney with mattress is preferable*
- *Pelvic: Same as above. MAST may be used as a splint if accompanied by SxS of shock*

5. List the three (3) extremity assessments to be done distal to a fracture before and after splinting:

   - *Check for:* ***CSM:***
     Circulation (distal pulses and capillary refill)
     Sensation (patient can feel touch or responds to painful stimulus if unconscious)
     Movement (patient can wiggle toes and squeeze hands or moves after painful stimulus if unconscious)

   - *It is important to check these parameters bilaterally and simultaneously so that equality can be assessed.*

6. Describe the appropriate assessment and field management of severely angulated fractures:

   - *External bleeding should be controlled and distal neurovascular checks should be performed as described above. It is recommended that all severely angulated fractures be realigned to normal anatomical position by the use of gentle traction as this allows for effective splinting and immobilization. Repositioning should stop if the rescuer meets resistance or the patient feels extremely increased pain (obviously, some pain is to be expected on movement).*

7. Describe the purpose of traction splinting and list the indications and contraindications for application of a traction splint:

   - ***Hare*** *traction splints are indicated for mid-shaft femur fractures that are either closed or associated with an open wound that does not have bone ends projecting from the wound, as pulling bone ends back into a wound is inadvisable. Hare traction splints are not indicated for femur fractures that are near the knee or hip.*

   - ***Sager*** *traction splints are indicated for both mid-shaft and proximal femur fractures.*

   - *The purpose of traction splinting is to reduce muscle spasm in the thigh and thereby reduce pain.*

8. List six (6) general principles of splinting:

- *Manually stabilize* - *Pad splints*
- *Expose* - *Immobilize fracture site*
- *Immobilize joint above and joint below or*
- *Immobilize bone above and bone below (dislocation)*
- *Assess distal neurovascular function <u>before and after</u> splinting*
- *Ice/Cold packs* - *Elevation*

9. Describe the use of MAST in splinting:

- *MAST may be used in conjunction with traction splints. MAST may be applied over a traction splint (preferred), or a traction splint may be applied over MAST.*

BURNS

1. Describe the characteristics and depth of injury of the following types of burns:

- *First Degree:* ***Superficial*** *- Limited to the epidermis only. Painful, reddened skin that heals within 3-7 days without scarring.*

- *Second Degree:* ***Partial thickness*** *- burn involving destruction of all epidermal layers and damage to the underlying dermis. May be superficial or deep. Superficial 2nd degree burns usually involve reddened skin with blister formation. These burns usually heal within 10-18 days without permanent scarring. Deep 2nd degree burns involve destruction of the dermis at its deepest layers. Easily infected, these burns may present with blisters or whitish dry patches.*

- *Third Degree:* ***Full thickness*** *- burn which destroys all layers down through subcutaneous tissue. Appearance may be charred and leathery or pale, waxy and dry. Destruction of nerve endings in the dermis results in a characteristic absence of pain.*

2. Describe the appropriate prehospital treatment for each of the burns listed above.

   - *First Degree: Usually not a prehospital care issue. Local cooling with cold, wet compresses, or immersion in cool water. Prevent systemic heat loss.*
   - *Second Degree: Local cooling with cold, wet compress, or immersion in cool water. Prevent systemic heat loss. Do not puncture blisters.*
   - *Third Degree: Dress burns with dry, clean (preferably sterile) dressing or cover patient with clean (sterile) burn sheet and protect from systemic heat loss.*
   - *GENERAL TREATMENT FOR ALL BURNS: includes assuring that the burning process is stopped (put out the fire), removing jewelry and other constricting items and separating burned digits with sterile gauze.*

3. Explain why large body surface area burns should **not** be immersed in cold water. How do we provide pain relief for burns at the Basic level?

   - *Immersing a burn patient in cold water may induce systemic hypothermia as the body's thermoregulatory ability has been compromised. Pain relief at the basic level may include cold, wet compresses applied to large surface area burns. No more than 9% body surface area at a time should be cooled in this manner.*

   - *The goal is to STOP the burning process without inducing hypothermia.*

4. List eight determinants of a **critical** burn.

   - *Inhalation Burns: burns involving the face/neck due to potential airway involvement*
   - *Partial thickness burns over 30% of the body*
   - *Full thickness (3rd degree) burns over 10% of the body*
   - *Serious caustic substance burns*
   - *All electric burns*
   - *Burns associated with other underlying trauma (i.e. fractures)*
   - *Burns involving pediatric or geriatric patients*
   - *Burns involving patients with other underlying disease (i.e. diabetes)*
   - *Burns involving hands, feet, joints, genitalia (due to loss of function)*
   - *Any circumferential burns*

5. Some of the results of burns are immediate, some are delayed. List one immediate concern to the EMT, and one delayed concern.

   - *Immediate concerns include airway deterioration due to actual burning of the airway or rapid swelling.*
   - *Delayed concerns include hypovolemia and infection.*

6. Describe how the Rule of Nines is used to calculate the percentage of body surface area burned. Give the value for each part of the body in an adult and in a child.

- *Rule of Nines is a way of estimating the percentage of body surface area burned. Each part of the body is assigned a numerical percentage value. These values are totaled for an estimate of BSA involvement.*

ADULT	*CHILD*
head = 9%	*head = 18%*
anterior trunk = 18%	*anterior trunk = 18%*
posterior trunk = 18%	*posterior trunk = 18%*
each arm = 9%	*each arm = 9%*
each leg = 18%	*each leg = 13.5%*
genitalia = 1%	*genitalia = 1%*

- *As a general rule, the size of the patient's palm is equal to 1% BSA.*

7. Describe the appropriate treatment of a burn caused by chemicals. Describe what effect there will be on treatment if the chemical is a dry chemical such as dry lime.

- *Chemical burns are treated by dilution of the chemical with water. Aggressive flushing of the burned area should begin immediately. Contaminated clothing should be removed and irrigation should continue enroute (logistically difficult!). When a reactive dry chemical such as dry lime is involved, the chemical should be brushed off completely. Irrigation should take place only if these areas are already wet and the burning process is begun.*

8. Describe the possible consequences of an electrical burn.

- *Direct contact burns result in necrosis along the current's pathway and associated injury to nerves, bones, muscles, blood vessels and other organs along the route.*
- *Arc injuries caused by the arcing of electricity between two contact points on the skin may result in significant cutaneous burns as the skin may be exposed to temperatures of up to 5400 degrees F.*
- *Flash burns from close exposure to an open electrical source result in thermal burns.*
- *Electrocution may result in:*
    - *cardiac arrhythmias*
    - *cardiac arrest*
    - *respiratory arrest*
    - *seizure activity*
    - *trauma*

9. Describe the appropriate field management of an electrical burn.

- *Personal safety is paramount!*
- *Rapid transport*
- *Cover burns with dry, clean dressings, if time permits.*
- *Anticipate greater tissue damage than that visualized.*
- *Begin CPR in event of cardiac arrest with AED.*
- *ALS intercept*

10. Describe the emergency care for a patient struck by lightning.

- The treatment for this patient is similar to that of the patient that was electrocuted. The goal is to provide good ventilations and treat any trauma. Also remember that this patient can have some very lethal cardiac dysrhythmias, hence ALS should be intercepted with.

INHALATION INJURIES

1. List the sign and symptoms associated with a possible inhalation injury.

- *Soot in and around the mouth and nose*
- *Singed eyebrows*
- *Blistering inside mouth*
- *Sooty sputum*
- *Hoarseness, stridor and/or brassy cough (indicates development of laryngeal edema) pulmonary edema*

2. Describe the appropriate field management for an inhalation injury.

- *Rapid transport. Enroute administer high flow oxygen (humidified if possible) via partial or non-rebreather mask or BVM if assistance needed. ALS intercept.*

3. Describe the pathophysiology of carbon monoxide poisoning and list its signs and symptoms as well as field management.

Pathophysiology:

- *The affinity of hemoglobin for CO is 400 times that for oxygen, so even small amounts of CO can result in conversion of normal hemoglobin to carboxyhemoglobin which renders it ineffective as an oxygen carrier.*

- ***SxS** may include headache, nausea, vomiting and other flu-like symptoms, as well as the more serious SxS such as chest pain, confusion, and coma. Acute*

poisoning may result in confusion or an intoxicated appearance. Bounding pulses, dilated pupils and pallor or cyanosis may be present, but the cherry red skin mentioned in many texts is a rare occurrence

- *Field management:*

  Rapid transport to a hospital with a hyperbaric chamber. Enroute administer high flow oxygen (humidified if possible) via partial or non-rebreather mask or BVM if assistance is needed. ALS intercept, consider helicopter/fixed wing air ambulance if transport time to a hospital with hyperbaric chamber is deemed excessive by ground units.

CARDIOVASCULAR EMERGENCIES

1. Define the role of an EMT-B in the cardiac care system:

   - The role of an EMT-B in cardiac care is that of recognition and initial stabilization of the patient. It is important for an EMT-B to recognize any possible AMI and then rapidly transport that patient to an appropriate facility.

2. Describe the pathway of blood through the cardiovascular system; beginning with the vena cava and ending with the aorta:

   - *Unoxygenated blood flows from the Vena Cava into the Right Atrium.*
   - *From the Right Atrium, the unoxygenated blood travels through the Tricuspid Valve into the Right Ventricle.*
   - *When the Right Ventricle contracts, the unoxygenated blood is pumped through the Pulmonic Valve into the Pulmonary Artery, and to the lungs, where waste products are off-loaded and oxygen is taken on.*
   - *Oxygenated blood returns through the Pulmonary Vein, into the Left Atrium.*
   - *From the Left Atrium, the blood travels through the Mitral (Bicuspid) Valve into the Left Ventricle.*
   - *When the Left Ventricle contracts, the oxygenated blood is pumped through the Aortic Valve, into the Aorta, and then Systemic circulation.*

3. Define systemic circulation and list its major components:

   - *The systemic circulation is all of the blood vessels beyond the L. ventricle up to the R. atrium. It is made up of:*
     - *The aorta*
     - *The systemic arteries*
     - *The systemic arterioles*
     - *The systemic capillaries*
     - *The systemic venules*
     - *The systemic veins*
     - *The inferior and superior vena cava*

4. Define pulmonary circulation and list its major components:

   - *The pulmonary circulation comprises all of the blood vessels between the R. ventricle and the L. atrium. It is made up of:*
     - *The pulmonary artery*
     - *The lungs, which contain:* - *The pulmonary arterioles*
     - *The pulmonary capillaries, where oxygen and wastes are exchanged*
     - *The pulmonary venules*
     - *The pulmonary veins*

5. Identify the location and function of the coronary arteries:

   - *The left and right coronary arteries branch off of the aorta just above the aortic valve. They supply the tissues of the heart with oxygen and nutrients. The left main coronary artery divides into the left anterior descending and circumflex arteries, which both branch widely to supply oxygen to the left ventricle, the interventricular septum, and part of the right ventricle. The right coronary artery supplies the right atrium and ventricle, and part of the left ventricle.*

6. Describe the process and effects of coronary artery disease (arteriosclerosis):

   - *Arteriosclerosis is a thickening, loss of elasticity, and hardening of the walls of the arteries from the deposit of calcium. This can lead to hypertension and aneurysm. Arteriosclerosis usually results from atherosclerosis, which is the deposition of lipids and cholesterol under the inner layer of the medium sized and large arteries (aorta, cerebral, and coronary). An injury response occurs in the vessel, damaging and scarring the inner layer (tunica intima) of the arteries. Over time, calcium is deposited onto the roughened surface, causing the formation of plaque. Sometimes, the plaque lacerates the arterial wall, causing a hemorrhage, which in turn causes further scarring, fibrosis and enlargement of the plaques. The hemorrhaging can also cause the formation of blood clots, which blocks off the flow of blood through the artery. A blockage of blood flow can also result from the plaque building up to the point of occluding the artery.*

7. List at least 7 risk factors for coronary artery disease and indicate whether each is controllable or not:

   - *Heredity…a family history of coronary artery disease or heart disease.*
   - *Gender…males more at risk than females, until around age 40.*
   - *Race…African-Americans and Hispanics are more at risk.*
   - *Age…SxS generally develop after the age of forty.*
   - *Diabetes…especially uncontrolled.*
   - *Hypertension*

- *High fat diet*
- *Elevated cholesterol & triglycerides*
- *Smoking*
- *Sedentary lifestyle*
- *Birth control pills…especially in women over age 35.*
- ***NOTE:** Obviously the first four are uncontrollable, although for the next two it is true that a diabetic can control his/her disease, and a person with hypertension can take medications to control the blood pressure, they cannot rid themselves of the disease. The others can be addressed through behavior modification.*

8. Define angina pectoris and briefly describe the pathophysiology and eventual consequences of this condition:

- Angina pectoris is a set of SxS that occurs when the supply of oxygen to the myocardium is insufficient to meet the demand. As a result, the cardiac muscle becomes ischemic, switching to anaerobic metabolism, which leads to an accumulation of lactic acid and carbon dioxide. This insufficiency can be a result of several causes. Because of coronary arterial disease, the coronary arteries may be narrowed, and during times of stress, only a limited supply of oxygen rich blood can pass through them. Angina can also be caused by an abnormal spasm of the coronary arteries, and can also be a result of the decrease of the blood supply due to the formation of a thrombus. Finally, angina can rarely be caused by conditions in which the blood loses its oxygen carrying capacity, such as anemia.

- Like any muscle, the heart relies on a constant supply of oxygen to function. When the demand for oxygenated blood is greater than that being supplied by the diseased or constricted arteries, the patient experiences angina pectoris, a feeling of pain or discomfort that signals the heart's need for oxygen. This pain is often relieved over several minutes by the patient resting. Angina pectoris is indicative of CAD, and if left untreated, can lead to myocardial infarction.

9. Define the signs and symptoms of angina pectoris:

- *The most common complaint in a patient with angina is chest pain, which can present as a mild ache or a severe crushing sensation. It is usually substernal, but can radiate to the jaw, neck, arms, and shoulders. Other SxS include:*
  - *Dyspnea*
  - *Palpitations*
  - *Diaphoresis*
  - *Nausea & Vomiting*
  - *Lightheadedness*
  - *Pale, cool, clammy skin*

- The pain from angina usually comes on during physical activity or stress and is usually relieved by rest within 3-10 minutes or with the administration of 1-3 nitro tablets.

10. Describe the field management of angina pectoris, including nitroglycerin. Also, explain why nitroglycerin may be helpful to the patient with chest pain, and also the parameters that must be met prior to administration by an EMT-Basic:

    - *Administer oxygen, usually by NC at 2-4 lpm, place the patient in the position of comfort, and transport gently and quietly. Administer aspirin 81-324 mg. If the patient has a prescription for nitroglycerin, the EMT may contact an MCEP and, if the MCEP agrees with and orders the administration, the EMT may administer the patient's own prescribed nitro.*

    - *Nitroglycerin is a smooth muscle relaxant, and affects the cardiovascular system by relaxing the vascular smooth muscle, causing vasodilation. This provides relief of pain from angina by dilating the coronary arteries, increasing blood flow through them. Nitroglycerin can be in the form of little white tablets which are allowed to dissolve under the tongue. It may also come as an aerosol spray, an ointment that may use a patch system for delivery, and a sustained relief capsule.*

    - *Nitroglycerin is indicated for any patient with a previous history of angina, who has been prescribed nitro, and is having chest pain and other SxS of an episode of angina. Nitroglycerin should not be given to a patient with hypotension!!*

    - *Before administration of Nitroglycerin, the EMT-B must assure that the prescription belongs to the patient, and that the patient's vital signs support nitroglycerin administration (conscious & alert with a BP of at least 100 systolic with other signs of adequate perfusion and a heart rate between 60-120). Then, the EMT-B **MUST** have online contact with an MCEP who approves of the administration. If the EMT-B cannot contact an MCEP, then they cannot administer the nitroglycerin. Written protocol does not suffice in this instance.*

11. Define Acute Myocardial Infarction (AMI) and briefly describe the pathophysiology and at least 3 possible consequences of an AMI:

    - *AMI means death of heart tissue (necrosis), and results when the blood supply to part of the heart is significantly reduced or stopped completely. It is most often associated with coronary artery disease – most frequently with a thrombus in the coronary arteries diseased by CAD. It can also result from a spasm in the coronary arteries or reduction of overall blood flow from any cause (pulmonary embolism, shock, or dysrhythmia). Consequences may include sudden death, cardiogenic shock, CHF, and cardiac dysrhythmias.*

12. Describe the signs and symptoms of an AMI:

    - *Pain: substernal, radiating to the jaw, neck, back, L. and/or R. shoulders and arms, described as squeezing, crushing, etc., and lasting more than a few minutes. It may or may not be associated with physical or emotional stress.*

    - *Other SxS* *Dyspnea* *Diaphoresis* *Cool, pale, moist skin*
      Cyanosis *Nausea/Vomiting* *Weakness*
      Lightheadedness *Impending Doom*
      Anxiety *Variable B/P* *Syncope*

    - ***Remembe**r that up to approximately 25% of AMI's are "**silent**" MI's, presenting with little or no chest pain. Silent MI's may be more common in diabetics and the elderly. Also, there are studies that seem to indicate that women in general are less likely to have the "classic" signs and symptoms of an AMI, presenting instead with only weakness and shortness of breath as the primary complaints. A high index of suspicion is the key.*

13. Describe the differences in provoking, relieving, and time factors that may help differentiate AMI from angina in the field:

    - *Provoking factors for angina include extremes in weather (especially abnormally cold temperatures), exertion, stress and heavy meals. There may be no provoking factors at all in the MI patient. Relieving factors for angina include rest, the reduction of stress, and nitro. The AMI patient will often receive no relief from rest or nitro. The duration of anginal pain is usually around 3-8 minutes, while the pain associated with an AMI can last 30 minutes or longer.*

14. Describe the field management of an AMI:

    - *Assess for ABC's.*
    - *Administer oxygen at 2-4 lpm via nasal cannula or 10-15 lpm via NRB mask, depending on patient's level of SOB, cyanosis, or comfort.*
    - *Administer 81-324 mg of aspirin.*
    - *If the patient has a prescription for nitroglycerin, you may contact an MCEP for orders to administer the patient's nitro., assuming the patient meets the parameters for nitro.*
    - *If ischemia is suspected, transport should be initiated immediately, restrict patient movement, and comfort and reassure patient.*
    - *Place patient in position of comfort, usually sitting or semi-reclined.*
    - *Monitor vital signs closely throughout transport and contact and advise receiving hospital.*
    - *Treat any changes in patient, and transport to nearest appropriate facility ASAP. Consider ALS intercept.*

15. Describe the role of aspirin in the treatment of AMI:

    - *Aspirin is indicated for the treatment of AMI because of its **anticoagulant** effect. While aspirin cannot undo the damage already done by a clot, or dissolve a clot that has already formed, it can help prevent the formation of additional clots. If AMI is suspected, the EMT should administer aspirin according to local protocol. The usual dosage is 81-324 mg of baby aspirin. The aspirin should not be coated (this will inhibit absorption) and should be chewed by the patient. Baby aspirin is usually flavored, and therefore easier to tolerate when chewed.*

16. A patient with an AMI does not always present with chest pain/pressure. List 4 other "chief complaints" that should be investigated as possible AMI's:

    - *Syncope, particularly in the elderly*
    - *Palpitations (an uncomfortable awareness of rapid or "extra" heartbeats)*
    - *Shortness of breath*
    - *Epigastric pain*

17. Define Congestive Heart Failure (CHF):

    - *CHF occurs when the heart is unable to pump powerfully enough or fast enough to empty its chambers, as a result blood backs up into the systemic or pulmonary circuit or both.*

18. Explain the difference between chronic CHF and acute CHF resulting from AMI:

    - *Typically, the patient with chronic heart failure will complain of a gradual worsening of SOB along with other SxS of Right and Left sided heart failure. The patient may have a history consistent with paroxysmal nocturnal dyspnea (PND) (sudden nighttime SOB), usually 2-3 hours after going to sleep (Orthopnea).*

    - *A patient experiencing acute CHF after suffering an AMI is likely to present with an episode of acute substernal chest pain followed by other symptoms of CHF, including SOB and generalized weakness. The acute obstruction of blood flow to the myocardium causes the pain. As the damage to the myocardium occurs, the pumping ability of the heart is compromised and failure results.*

19. Differentiate left-sided heart failure versus right-sided heart failure and list the SxS of each:

- *If the right ventricle fails, the back-up of blood occurs in the R. atrium, and its connecting veins, the inferior and superior vena cava. The pressure resulting from this back-up then is transmitted to the capillaries in the systemic circulation, and fluid is driven out of the vascular space, causing tissue edema.*

- *When the left ventricle fails, the pressure backs up through the L. atrium and into the pulmonary veins. This pressure is transmitted through the pulmonary capillaries, and pulmonary edema can develop.*

SxS of R. sided CHF
- *Distended external jugulars*
- *Dependent edema; legs, feet, sacrum, etc.*
- *Painful, distended, RUQ, and sometimes LUQ, from engorgement and swelling of the liver and spleen as edema builds up in these organs.*

SxS of L. sided CHF
- *Orthopneic or upright patient position*
- *Extreme restlessness and agitation*
- *Changes in level of response, including confusion, stupor, or unconsciousness*
- *Severe dyspnea, tachypnea, cyanosis, and accessory muscle use*
- *Rales, rhonchi, occasionally wheezes are heard but these are generally rare in CHF*
- *Tachycardia, with hypertension or hypotension*
- *Coughing, with possible production of pink, frothy, sputum*

20. Describe the field management of CHF:

- *Assure patency of airway, maintaining as necessary.*
- *Administer the highest percentage oxygen possible, utilizing the BVM if necessary to assist ventilations.*
- *Position the patient sitting up if possible, avoiding lying the patient down unless absolutely necessary.*
- *Monitor the patient's vitals closely, and transport ASAP.*
- *ALS intercept*

21. Briefly explain the pathophysiology (including its effect on the formula BP=COxSVR), life threat, and field management of cardiogenic shock:

- *Pathophysiology: The reason shock occurs is that the heart cannot pump well. This may result in a decrease in the stroke volume or the heart may beat very slowly or extremely rapidly. Any of these can result in a decrease in cardiac*

output. When cardiac output decreases the result is a decrease in blood pressure.

- *Life Threat: Poor perfusion, resulting in hypoxia and tissue death*

- *Management: High flow oxygen with BVM assist if tolerated. Position of comfort depends on patient's symptoms and LOC. If pulmonary edema is present and patient is conscious, sit the patient upright and dangle feet if possible. If unconscious, place in the best position for dealing with the airway, and initiate rapid transport. ALS intercept.*

22. Briefly explain an aortic aneurysm, and identify the pathophysiology, SxS, and field management for this condition:

    - *Pathophysiology: An aneurysm is caused when a weakened section in the aortic wall dilates (balloons) out. When this weakened, dilated section bursts, there is a sudden and significant blood loss. In addition, areas below the area will now become ischemic due to a lack of blood flow.*

    - *SxS: Severe chest, back, flank, or abdominal pain, often described as an excruciating sharp or tearing pain. There may be a pulsating mass noted in the abdomen, although this is actually not a very common finding in the prehospital setting.*
    - *Other SxS may include neurological deficits below the aneurysm (prior to rupture), & nausea/vomiting*

    - *Treatment: Rapid recognition, rapid transport, and treating the patient for shock are all that can be done. ALS intercept*

ASPIRIN

1. Describe the following details about aspirin:

    GENERIC NAME: *Aspirin*

    TRADE NAME: *Bayer, Bufferin, Excedrin*

    TYPE OF DRUG: ***Anticoagulant (anti-clotting)***
    Analgesic (anti-pain)
    Antipyretic (anti-fever)
    Anti-inflammatory (anti-swelling)

MECHANISM OF ACTION:

Anticoagulant: Attaches irreversibly to platelets (platelets die in about a week) which prevent them from clumping.
Pain/Anti-inflammatory: Blocks the formation of certain chemicals called prostaglandins, which cause inflammation and pain.

PREHOSPITAL INDICATION:

Suspected Acute Myocardial Infarction

CONTRAINDICATIONS:

A known sensitivity/allergy to the drug
History of GI bleed, ulcers, stroke.
Patients taking oral blood thinners (i.e. Coumadin, Warfarin, etc.)
Children – due to Reyes Syndrome

PRECAUTIONS: *None*

ADMINISTRATION:

Use soluble or <u>chewable</u> aspirin, NOT coated. 81-324 mg.
Patient may chew and swallow (children's aspirin makes this more pleasant).

SIDE EFFECTS: *Stomach ache, heartburn, nausea*

TOXIC EFFECTS: *Ringing in the ears (tinnitus), Acidosis, GI bleeding, Lower blood sugar, Fever, Coma.*

OVERDOSE THERAPY:

Discontinue use of the drug. When encountered as the primary call (as an overdose), the acidosis is managed by immediate transport and airway management with hyperventilation. An isotonic IV should be started enroute.

SEMI-ATOMATIC DEFIBRILLATION

1. Differentiate between SAED's and AED's:

   - *An SAED is a semi-automatic defibrillator. This defibrillator requires a rescuer to actually make the decision to defibrillate the patient. An AED, automatic external defibrillator, will shock without the rescuer making the decision to do so. All external defibrillators used in New Mexico are SAED's.*

2. Describe the patient findings that indicate the need for use of the semi-automatic defibrillator;

   - *A patient that is unconscious/unresponsive, no breathing, no pulse.*

3. Describe realistic goals for resuscitation utilizing semi-automatic defibrillation:

   - *Defibrillation is most effective within a very narrow time frame, i.e. within 3-5 min. of medical cardiac arrest. It is not indicated for trauma arrest until after transport is initiated.*

4. Describe the components of a successful semi-automatic defibrillation program, according to the AHA "Chain of Survival":

   - *Early Access*
   - *Early CPR*
   - *Early defibrillation*
   - *Early ACLS*

5. Define resuscitation:

   - *Reversal of clinical death. Successful reversal of clinical death leads to the return of adequate pulse, respirations and neurological status as well as long term survival.*

6. Identify time frames compatible with good outcome:

   - *CPR within 4 minutes, defibrillation within 3-5 min., ALS within 20 min. (Remember the clock starts when the patient arrests).*

7. Briefly describe the normal sequence of cardiac events:

   - *The electrical stimulus of the heart generates a mechanical contraction of the heart, i.e. the ventricles contract and force blood out t the body, which results in blood circulation.*

8. Trace an electrical impulse through the heart:

   - *Normally a group of pacemaker cells called the Sinoatrial (SA) node, located near the top of the right atria are responsible for starting the pumping action of the heart. The SA node sends an electrical signal to the atria causing them to contract. This then forces blood into the ventricles. This same signal is then received and delayed at the Atrioventricular (AV) node, allowing the ventricles time to fill with the blood from the atria. This delayed electrical signal is then passed from the AV node to the muscle cells surrounding the ventricles, causing them to contract and force blood out of the ventricles. This electrical signal*

from the AV node to the ventricles generates a mechanical contraction of the heart. In turn, it is the mechanical response that you are measuring when you check a pulse.

9. Describe and demonstrate assessment of a pulseless, apneic patient:

   - *Open the Airway,*
   - *Look, Listen, and Feel for breathing for at least 5 seconds*
   - *If no breathing, deliver 2 ventilations, 1 sec. each*
   - *Check carotid pulse for at least 5 seconds*
   - *If no pulse, apply the defibrillation pads*

10. Describe the treatment of a patient with a pulse regardless of their cardiac rhythm:

    - *Patients with a pulse should receive supportive care. They should NOT receive electrical countershock, even if the machine advises you to.*

11. Be able to recognize Normal Sinus Rhythm and describe the appropriate care:

    - *This is the normal appearing EKG waveform, with defined PQRS and T waves. The normal rate is from 60 – 100 beats/minute in a resting patient. If the rate is above 100, it is called sinus tachycardia. If the rate is below 60, it is called sinus bradycardia. There is no electrical treatment for this rhythm.*
    - *The patient is treated for whatever symptoms they are having. i.e. O_2, ASA, etc.*

12. Be able to recognize Asystole and describe the appropriate care:

    - *Straight line, flat line, no electrical or mechanical activity present.*
    - *Treatment for Asystole includes rapid transport, airway management, ventilation and oxygenation, and CPR. Defibrillation is not indicated.*

13. Be able to recognize Ventricular Fibrillation (VF) and describe the appropriate care:

    - *This is a complete loss of organized activity within the heart's electrical system.*
    - *The definitive treatment for VF is defibrillation. The idea is to eliminate the disorganized electrical activity that is present in order to allow the heart's electrical system to reorganize its electrical activity back into a normal pattern. Additional treatment includes airway management, ventilation and oxygenation, and CPR, ALS intercept.*

14. Be able to recognize Ventricular Tachycardia (VT), with and without a pulse, and describe the appropriate care:

    - *Rapid (over 100), usually regular, electrical activity originating from the ventricles. VT may or may not result in a palpable pulse.*
    - *If the patient is in VT and has NO PULSE the definitive treatment is the same as for VF, i.e. electrical countershock. However, if the patient HAS A PULSE (even a weak pulse present only at the carotid artery) the treatment is supportive care, i.e. airway management, ventilation and oxygenation, and CONSTANT REASESSMENT. Electrical countershock and CPR are NOT appropriate for a patient WITH A PULSE. If the patient loses their pulse at any time, immediately treat the patient for VT with no pulse.*

15. Be able to recognize artifact and interference and explain how to eliminate these problems:

    - *Patient movement or nearby AC power sources may interfere with the operation of semi-automatic defibrillators. Refer to the manufacturer's guidelines.*
    - *Do not move your patient while the machine is analyzing, i.e. do NOT perform CPR or attempt to transfer the patient while the machine is analyzing.*
    - *If the machine is near an AC power source that is interfering with the machine's ability to analyze, i.e. refrigerator, either disconnect the power source (if this can be done quickly and safely) or move the patient to a different location.*

16. Explain the risk of using a semi-automatic defibrillator on a patient in ventricular tachycardia (VT) and explain how to manage it:

    - *As previously outlined VT may or may not result in a palpable pulse. Semi-automatic defibrillators assess the electrical activity of the heart, they DO NOT measure the mechanical activity of the heart, i.e. they DO NOT check for a pulse. Semi-automatic defibrillators will always advise you to shock VT whether or not your patient has a pulse. YOU MUST CHECK YOUR PATIENT"S PULSE. If your patient has a pulse, DO NOT shock them even if the machine advises you to. See treatment described in Objective #10.*

17. Describe PEA and list at least 3 possible causes:

    - *Pulseless electrical activity is simply the presence of organized electrical activity without a palpable pulse. Possible underlying causes include hypovolemia, tension pneumothorax, cardiac tamponade or hypoxemia.*
    - *To treat PEA you should treat the underlying cause.*

18. List the rhythms that a semi-automatic defibrillator will countershock:

    - They will shock VF and VT (with and without a pulse). They will NOT shock asystole.

19. Differentiate treatment priorities in patient care of medical and trauma arrest situations:

    - *For trauma arrest the priority is RAPID TRANSPORT, not defibrillation.*
    - *For medical arrest your priority is IMMEDIATE CPR/defibrillation. (Note: 2 minutes of CPR is performed before use of an AED in the unwitnessed cardiac arrest victim).*

20. Describe the **safe** delivery of an electrical shock:

    - *Place pads in the appropriate locations, and be certain that the leads are connected appropriately. Before countershocking the patient shout "CLEAR" and be certain that NO ONE (including the person that is operating the defibrillator) is touching the patient or any object that would allow a conduction path from the patient, such as the gurney, a dangling stethoscope, a puddle of water, etc. When pressing the button to "shock", watch the patient not the machine.*

21. Identify factors which may adversely affect the success of defibrillation:

    - *Down time, hypoxia, acidosis, age of patient, underlying medical problems, cause of the arrest, etc. The single most important factor is DOWN TIME.*

22. Describe the role of Medical Control:

    - *The Medical Director should be actively involved in the initial training, continuing education, and quality assurance. The medial director, or his/her designee, must sign each EMT off as to his/her competence on the services particular SAED prior to use by the EMT.*

23. Explain the *other* use a SAED with monitoring and recording capability may serve in the field:

    - *It is within the Scope of Practice for EMT's to use the SAED as a monitor in the field to document cardiac activity for physician interpretation. There are some drawbacks to doing this. One is the cost of using defibrillation pads as monitor pads. Defibrillation pads can range from $20 - $50 per set, so to put them on every chest pain patient is not practical. Some SAED units can use the small monitor patches, but these are not recommended because if the patient arrests, then the EMT will have to switch all of the leads and patches, and do it in a hurry. Another concern is that the EMT will use what they see on the monitor to make treatment decisions. This is* ***expressly forbidden!*** *EMT-B's do not have the background in cardiology to make any kind of treatment decision based on what the monitor is showing, except of course in the case of V-Fib and pulseless V-*

Tach. The third concern is that a patient might be accidentally defibrillated, although with the technology of today's SAED's, this is highly unlikely.

- *With these concerns in mind, it is the recommendation that SAED's be used for monitoring only on those patients who the EMT feels are critical and at a high risk for AMI and/or cardiac arrest. If the SAED has the capability of recording the patient's EKG onto paper, the EMT should make several "strips" for the receiving physician. If the SAED internally records and stores the information, then the correct computer hardware and software should be available at the receiving facility so the physician can access this information.*

24. Describe the care of a patient who has been successfully defibrillated:

    - *ABC's, supportive care, leave defibrillator in place and monitor the patient closely since they may arrest again. Arrange for ALS care as soon as possible and transport.*

25. State the reason for ensuring a patient is pulseless and apneic when using an SAED:

    - *Defibrillation of a patient with a pulse may result in the loss of that pulse.*

26. Explain how not all chest pain patient's result in cardiac arrest and do not need to be placed on an AED:

    - *It is possible for a patient to have chest pain from other sources beyond a heart attack. Trauma, rapid breathing, back strains, or other injuries can cause chest pain. Additional questioning of present illness and medical history will help establish the cause of the chest pain.*

27. Explain the considerations for interruption of CPR when using an AED:

    - *CPR must be halted to allow the AED to analyze the patient.*

28. Discuss the advantages and disadvantages of an AED:

    - *An AED can be used with minimal training without a complete understanding of all cardiac rhythms that can be present in a cardiac event. An external AED lacks many of the functions of a manual defibrillator.*

29. Summarize the speed at which an AED operates:

    - *An AED takes about 10 seconds to analyze and decide that it wishes to shock. It then charges for the shock. The shock itself is delivered in less than a second once the shock button is pushed.*

30. Discuss the use of remote defib through adhesive pads:

    - *Defibrillation through adhesive pads has become the preferred method to deliver a shock. This allows the rescuer to stand away from the patient to deliver the shock. This poses less risk to the rescuer.*

31. Discuss the special considerations for rhythm monitoring:

    - *Rhythm monitoring can be appropriate in chest pain situations. EMT's are not trained in rhythm recognition beyond Normal Sinus, V-fib., V-tach., and Asystole. However, it can be helpful for an EMT to give a receiving paramedic or MD a serial set of ECG strips that show changes. EMT's are not trained to make treatment decisions solely on ECG findings beyond V-fib. And V-tach.*

32. Discuss the standard of care that should be used to provide care to a patient with persistent v-fib and no available ALS:

    - *A patient in persistent V-fib continues to require defibrillation until the V-fib changes to another rhythm or until ALS is available.*

33. Discuss the standard of care that should be used to provide care to a patient with recurrent v-fib and no available ALS:

    - *A patient with recurrent V-fib should be defibrillated each time V-fib reoccurs, after 2 minutes of additional CPR.*

34. Differentiate between single rescuer and multi-rescuer care with an AED:

    - *In the case of a single rescuer the placement of the AED is of highest priority in the case of a **witnessed** cardiac arrest and should be performed before any other intervention. In multi-rescuer situations placement of the AED is still paramount, the increase in rescuers allows for other tasks to be performed simultaneously with placement of the AED.*

35. Discuss the importance of coordinating ACLS trained providers with personnel using an AED:

    - *The use of an AED is only the first step in the survival of a patient having a cardiac event. ACLS medications are frequently required for conversion and/or prolonged successful resuscitation of a patient.*

36. Discuss the importance of post resuscitation care:

    - *Patients who have been converted from V-fib or V-tach are at an increased risk of returning to V-fib or V-tach. Post resuscitation care is required to help prevent this.*

37. List the components of post resuscitation care:

    - *Oxygen, monitor of vital signs, ACLS intervention, and rapid transport to an appropriate facility.*

38. Explain the importance of frequent practice with an AED:

    - *Frequent practice with an AED will shorten the time a rescuer needs to apply the AED and use it in a cardiac arrest situation.*

39. Discuss the need to complete the AED operator shift checklist:

    - *It is necessary to complete the AED operator shift checklist to ensure all parts required for the AED to function are present and that the AED is in good working order.*

40. State the reasons why a case review should be completed following the use of an AED:

    - *A case review should be performed post each use of an AED to allow for the services medical director and those involved in the use of the AED to ensure the proper use of the AED and to improve service procedures in the use of the AED.*

41. Discuss the goal of QI in AED:

    - *The goal of QI concerning an AED is for proper recognition of situations requiring the use of the AED and the proper use of an AED in those situations.*

42. Describe the function of the controls, batteries, and event documentation on an AED:

    - *Each AED has different controls, batteries, and event documentation features. It is important for each EMT to be trained on their service's AED by the services medical director.*

43. Defend the reasons for obtaining initial training in the use of an AED and the continuing education thereof:

    - *The AED is a piece of equipment that is not frequently used. Initial education and continuing education is required for continued proficiency in the use of an AED.*

ADMINISTRATION OF MEDICATIONS

1. Define the term Pharmacokinetics:

   - *Pharmacokenetics is the study of the metabolism and action of drugs with particular emphasis on the time required for absorption, duration of action, distribution in the body, and method of excretion.*

2. Define the following terms in regards to medications:

   - *Generic Name: Is the first name given to a drug during it's invention. It is used by all manufacturers of a given drug (i.e. Ibuprofen)*

   - *Trade name: The name the manufacturer gives to a drug, the selling name. Identified by a ® after the name (i.e. Aleve® or Excedrin®).*

3. Describe the relationship of Medical Control and the EMT-B in administration of authorized medications such as Aspirin and Acetaminophen:

   - *The EMT-B must have direction from Medical Control in order to give medications. The orders may be in the form of voice authorization (on-line/direct) from the ER physician by phone or radio or via written protocols (offline/indirect) by the EMT's Medical Director.*

4. Identify the medications the EMT-B may administer under indirect (written) medical control, according to the New Mexico Scope of Practice:

   - *Acetaminophen*
   - *Acetylsalicylic Acid (Aspirin)*
   - *Activated Charcoal*
   - *Albuterol*
   - *Epinephrine 1:1000*
   - *Naloxone (Narcan)*
   - *Oral Glucose*
   - *Oxygen*
   - *Nerve Agent Antidote Kit (Atropine & Prilodoxamine)*

5. Identify three (3) medications that an EMT-B may administer under direct on-line medical control when available if the patient has it prescribed to them:

   - *Pre-Measured Bronchodilator inhalation device*
   - *Pre-Measured epinephrine Devices*
   - *Nitroglycerin*

6. Briefly describe each of the following approved routes of administration for EMT-B's including time of onset:

   - *Inhalation: Drugs delivered this way are delivered directly to the site of action. Metered Dose inhalers and Nebulizers can administer inhaled medications. Time of onset is about 3 minutes. Albuterol is the medication administered via this route.*

   - *Intra-Nasal: Absorption rates through this route are variable. The mediation is sprayed into the nares using a Mucosal Atomization Device. The only drug allowed by this route is Narcan.*

   - *Oral: The most convenient way of administering medication is often by mouth. Acetaminophen, Activated Charcoal, Aspirin, and Oral Glucose are all drugs administered by this route. The absorption rate is variable depending on the medication.*

   - *Sublingual: Certain drugs, such as Nitroglycerin, can be placed under the tongue for rapid absorption into the capillary bed, usually about 3-5 minutes.*

   - *Subcutaneous: With SQ administration, medications are injected directly into the fatty tissue under the skin that overlies the muscle. Absorption from this route is variable depending on the patients perfusion status, and can range from 10 – 30 minutes. (Narcan and Epi 1 :1000 are administered via this route)*

   - *Intramuscular: Very similar to SQ except that the medications are injected into the muscled layer beneath the fatty tissue. Absorption is variable again, taking from 5 to 15 minutes on average. (Narcan and Epi 1:1000 administered via this route)*

7. List other routes of medication administration that **are not** in the Basic Scope of Practice:

   - *Intravenous*
   - *Rectal*
   - *Itraosseous*
   - *Endotracheal*
   - *Intracardiac*

8. List the advantages and disadvantages of each of the following methods of medication administration approved for the BLS caregiver in New Mexico:

Inhalation/Nebulization

- *Advantages:*
  Rapid absorption --> quick onset of action
  Direct application of drug (e.g. in asthma) to the site of the problem
  Can be given by positive pressure ventilation
  Can be used with unconscious patient
- *Disadvantages:*
  Amount of drug actually being absorbed may be variable
  Cumbersome method of delivery

Oral:

- *Advantages:*
  Safest
  Most convenient
  Economical
- *Disadvantages:*
  Slow absorption --> slow onset of action
  Little control of absorption rate and amount
  Pt. must be conscious

Subcutaneous:

- *Advantages:*
  Easiest of injection methods to self-administer
  Can be used with unconscious pt.
- *Disadvantages:*
  Slow absorption --> slow onset of action
  May be painful
  Rate of absorption may be inconsistent
  Need adequate perfusion

Intramuscular:

- *Advantages:*
  Can be used on unconscious patients
  Faster, more predictable absorption with a prolonged action of medication
- *Disadvantages:*
  Still a relatively slow absorption rate
  Painful
  Need adequate perfusion

Sublingual:

- *Advantages:*
  Quick absorption
  Easy to administer
- *Disadvantages:*
  Difficult if patient is unconscious
  Need good perfusion

Intra-Nasal:

- *Advantages:*
  Easy to administer, and painless for the patient
  IV not necessary
- *Disadvantages:*
  Nasal mucosa should be unblocked and intact
  Dose of naloxone delivered is large! Patient can become combative
  Absorption is variable

9. Identify the following terms as they relate to medication administration in the pre-hospital setting:

- *Action*
  What the drug does

- *Antidotes*
  A substance that neutralizes an introduced agent or its effects

- *Contraindications*
  Conditions which prohibit the use of a drug

- *Dose*
  Amount of drug to be administered at one time

- *General or Systemic Effect*
  An effect that happens throughout the body

- *Indications and Use*
  The condition a drug is prescribed for

- *Precautions*
  Things to be careful of prior to using or while administering a drug

- *Side Effects*
  The action or effect of a drug other than that desired

- *Toxic Effects*
  The poisonous effect a drug can have on the body due to excessive dosing

10. List two (2) acceptable sites for injection of Epinephrine or Narcan:

    - *The posterior aspect of the upper arm*
    - *The anterolateral surface of the thigh midway between the knee and the hip*
      If using the Epi-Pen, follow the instructions for that specific device

11. Describe how to administer Epinephrine with a Preloaded Epinephrine Pen (Epi-Pen):

    - *See Teaching Skill Sheet*

12. Describe how to draw up naloxone, and administer with the MAD nasal device:

    - *See Teaching Skill Sheet*

13. List at least three dangers of drug administration in the field

    - *Side Effects --- Predictable*
    - *Allergic Reactions --- Unpredictable*
    - *Incorrect drug calculations or amount given*
    - *Incorrect patient diagnosis*
    - *Incorrect drug given*

14. List the six (6) "rights" of medication administration

    - *Right Patient*
    - *Right Drug*
    - *Right Amount/Concentration/Dose*
    - *Right Route*
    - *Right Time*
    - *Right Documentation*

15. State what information should be elicited from a patient prior to administration of a medication

    - ***Allergies***
    - *Current medications taken and amounts of each*
    - *Physical problems (such as liver or renal disease)*

16. Describe what explanation should be given to a patient prior to the administration of a medication

    - *Why you're giving the drug and possible side effects*
    - *Get informed consent*
    - *Advise them to tell you if they note any changes in the way they feel*

17. Explain and be able to calculate the **concentration** of drugs per milliliter.

$\frac{\#\ mg}{\#\ cc} = \#\ mg/1cc$

18. Calculate dosages of medications.

- The formula used, if one has already reduced to mg per cc as in LO #17 is:

$\frac{W}{H} = \#cc's$ or $\frac{Want\ (\#\ mg\ ordered)}{Have\ (your\ concentration)} = \#cc's\ to\ give\ to\ patient$

- If one has not reduced the drug concentration to mg per cc, then the formula becomes:

$$\frac{W}{H} \times \frac{\#\ cc's\ drug\ dissolved\ in}{1} = \#\ cc's\ to\ administer\ to\ patient$$

19. List at least eight safety guidelines to remember when administering drugs.

- *Concentrate on task*
- *Get all history that might affect the administration of the drug.*
- ***Allergies***
- *Other medications (that may interact)*
- *Physical problems (liver, kidney) that may interfere with drug metabolism*
- *Have a clear understanding of medication to be given: actions, indications, contraindications, dosage, route and rate of administration, side effects, toxic effects*
- *Repeat back any order given by a physician to confirm precision*
- ***Evaluate drug label (do not use unlabeled drug) for***
    - *Name*
    - *Concentration*
    - *Solution clarity*
    - *Expiration date*
- ***Recheck the drug and your calculations before administration***
- *Use appropriate, properly operating equipment*
- *Handle drugs carefully (to avoid dropping/breaking)*
- *Use aseptic technique and personal precautions*
- *Monitor patient for desired effect*
- *Watch for side effects and toxic effects*

20. List the elements that should be recorded when documenting any drug administration.

- *Route of administration*
- *Time*
- *Amount of medication (dosage)*
- *Patient's response (or lack of it)*
- *Origin of medical control (written protocol or verbal authorization from MCEP – note MD's name)*

21. Describe how a drug error should be managed

- *Stop administration*
- *Prepare for any side/toxic effects*
- *Report the error to medical control ASAP for consultation*
- *Document all details*

22. Students are responsible for the drug sheets that they may give:

- *See drug sheets*

23. Describe the legalities and responsibilities of the EMT-Basic with respect to administering a patient's own prescribed life-saving medication, such as: Nitroglycerin, Inhalation device, Epinephrine:

- *The EMT-B **is allowed** to administer a patient's own life-saving medication if it is a pre-measured inhalation device or is a pre-measured Epinephrine injection.*

- *The following guidelines should be followed:*

- *1. Establish that the medication is the patient's and that they are for the current complaint.*

- *2. Ask the patient if he/she has taken any of the medication as of yet and if so how much.*

- *3. Get a list of the other medications the patient takes.*

- *4. Contact Medical Control, tell the physician what information you have obtained.*

- *5. If the physician agrees the patient should take the medication, you may administer the drug.*

- *6. Medical Control **must** be attempted to be contacted. If unable to contact and the situation is in the written protocols, the EMT-B may then be able to administer per written protocol.*

- *The **exception** to this rule is with Nitroglycerin, if you cannot obtain voice authorization for administration, you **may not** administer the nitroglycerin.*