(1) Smooth muscle spasm
(a) Beta receptors
(2) Mucous
(a) Goblet cells
(b) Cilia
(3) Inflammation

c) Obstruction may be reversible or irreversible
d) Obstruction causes air trapping through the following mechanism
(1) Bronchioles dilate naturally on inspiration
(2) Dilation enables air to enter the alveoli despite the presence of obstruction
(3) Bronchioles naturally constrict on expiration
(4) Air becomes trapped distal to obstruction on exhalation

5. Pathophysiology varies slightly by disease
a) Asthma
(1) Reversible obstruction
(2) Obstruction caused by a combination of smooth muscle spasm, mucous, and edema
(3) Exacerbating factors tend to be extrinsic in children, intrinsic in adults
(4) Status asthmaticus - prolonged exacerbation which doesn't respond to therapy

b) Chronic bronchitis
(1) Reversible and irreversible obstruction
(2) Characterized by hyperplasia and hypertrophy of mucous-producing glands
(3) Clinical definition - productive cough for at least 3 months per year for 2 or more consecutive years
(4) Typically associated with cigarette smoking, but may also occur in non-smokers

c) Emphysema
(1) Irreversible airway obstruction
(2) Diffusion defect also exists because of the presence of blebs
(3) Because blebs have extremely thin walls, they are prone to collapse
(4) To prevent collapse, the patient often exhales through pursed lips, effectively maintaining a positive airway pressure
(5) Almost always associated with cigarette smoking or significant exposure to environmental toxins

6. Assessment findings
a) Signs of severe respiratory impairment
(1) Altered mentation
(2) 1-2 word dyspnea
(3) Absent breath sounds

b) Chief complaint
(1) Dyspnea
(2) Cough
(3) Nocturnal awakening with dyspnea and wheezing

c) History
(1) Personal or family history of asthma and/ or allergies
(2) History of acute exposure to pulmonary irritant

(3) History of prior similar episodes
d) Physical findings
(1) Wheezing may be present in ALL types of obstructive lung disease
(2) Retractions and/ or use of accessory muscles
e) Diagnostic testing
(1) Pulse oximeter to document degree of hypoxemia and response to therapy
(2) Peak flow to establish baseline airflow
7. Management
a) Airway and ventilation
(1) Intubation as required
(2) Assisted ventilation may be necessary
(3) High flow oxygen
b) Circulation
(1) Intravenous therapy may be necessary to
(a) Improve hydration
(b) Thin and loosen mucous
(2) Pharmacologic
(a) Adrenergic stimulants
(b) Albuterol
(c) Metaproterenol
(d) Terbutaline
(e) Atropine sulfate
(f) Magnesium
(g) Methylxanthines
(h) Corticosteroid
c) Supportive care
d) Transport considerations
(1) Appropriate mode
(2) Appropriate facility
(3) Continue monitoring
(4) Contact medical direction
e) Psychological support/ communication strategies

C. Pneumonia
1. Epidemiology
a) Incidence
(1) Fifth leading cause of death in the US
(2) Not a single disease, but a group of specific infections
b) Risk factors
(1) Cigarette smoking
(2) Alcoholism
(3) Exposure to cold
(4) Extremes of age (old or young)
c) Anatomy and physiology review
(1) Cilia
(2) Causes and process of mucous production
2. Pathophysiology
a) Ventilation disorder
b) Infection of lung parenchyma

(1) Most commonly bacterial
(2) May also be viral or fungal

c) May cause alveolar collapse (atelectasis)
d) Localized inflammation/ infection may become systemic, leading to sepsis and septic shock
e) Community acquired versus hospital acquired

3. Assessment findings
   a) Typical pneumonia
      (1) Acute onset of fever and chills
      (2) Cough productive of purulent sputum
      (3) Pleuritic chest pain (in some cases)
      (4) Pulmonary consolidation on auscultation
      (5) Location of bronchial breath sounds
      (6) Rales
      (7) Egophony
   b) Atypical pneumonia
      (1) Non-productive cough
      (2) Extra-pulmonary symptoms
      (3) Headache
      (4) Myalagias
      (5) Fatigue
      (6) Sore throat
      (7) Nausea, vomiting, diarrhea
      (8) Fever and chills
4. Management
   a) Airway and ventilation
      (1) Intubation may be required
      (2) Assisted ventilation as necessary
      (3) High flow oxygen
   b) Circulation
      (1) Intravenous access
      (2) Administration of IV fluids
      (3) Improve hydration
      (4) Thin and mobilize mucous
   c) Pharmacological
      (1) Bronchodilators may be required if airway obstruction is severe or if the patient has accompanying obstructive lung disease
      (2) Antibiotic therapy by prescription
      (3) Antipyretics
   d) Non-pharmacological
      (1) Cool if high fever
   e) Transport considerations
      (1) Elderly, over 65 years
         (a) Significant co-morbidity
         (b) Inability to take oral medications
         (c) Support complications
         (d) Appropriate facility
   f) Psychological support/ communication strategies

D. Pulmonary edema

1. Not a disease but a pathophysiological condition
   a) High pressure (cardiogenic)
   b) High permeability (non-cardiogenic)
2. Epidemiology
   a) Risk factors vary based on type
      (1) High pressure (cardiogenic)
         (a) Acute myocardial infarction
         (b) Chronic hypertension
         (c) Myocarditis
      (2) High permeability (non-cardiogenic)
         (a) Acute hypoxemia
         (b) Near-drowning
         (c) Post-cardiac arrest
         (d) Post shock
         (e) High altitude exposure
         (f) Inhalation of pulmonary irritants
         (g) Adult respiratory distress syndrome (ARDS)
3. Anatomy and physiology review
   a) Alveoli
   b) Pulmonary capillaries
   c) Interstitial space and fluid
   d) Pulmonary circulation
   e) Role of surfactant
   f) Hydrostatic pressure
   g) Colloid osmotic pressure
   h) Capillary wall damage
   i) Left sided heart failure
   j) Lymphatic drainage
   k) Pulmonary blood pressures
   l) Starling's law of the heart
   m) Hypoalbuminemic states (liver disease)
4. Pathophysiology
   a) Diffusion disorder
   b) High pressure (cardiogenic)
      (1) Left sided heart failure
      (2) Increase in pulmonary venous pressure
      (3) Increase in hydrostatic pressure
      (4) Engorgement of pulmonary vasculature
      (5) Failure of cough and lymphatics to drain fluids
      (6) Excessive accumulation of fluid in the interstitial space
      (7) Widening interstitial space impairs diffusion
      (8) In severe cases, fluid may accumulate in the alveoli
   c) High permeability (non-cardiogenic)
      (1) Disruption of the alveolar-capillary membranes caused by
         (a) Severe hypotension
         (b) Severe hypoxemia (post-drowning, post-cardiac arrest, severe seizure, prolonged hypoventilation)
         (c) High altitude
         (d) Environmental toxins

(e) Septic shock
(2) Disrupted membranes leak fluid into the interstitial space
(3) Widened interstitial space impairs diffusion

5. Assessment findings
   a) High pressure (cardiogenic)
      (1) Refer to cardiology unit
   b) High permeability (non-cardiogenic)
      (1) History of associated factors
         (a) Hypoxic episode
         (b) Shock (hypovolemic, septic, or neurogenic)
         (c) Chest trauma
         (d) Recent acute inhalation of toxic gases or particles
         (e) Recent ascent to high altitude without climatizing
      (2) Dyspnea
      (3) Orthopnea
      (4) Fatigue
      (5) Reduced exercise capacity
      (6) Pulmonary rales, particularly in severe cases
   c) Diagnostic testing
      (1) Pulse oximetry
6. Management
   a) High pressure (cardiogenic)
      (1) Refer to cardiology unit
   b) High permeability (non-cardiogenic)
      (1) Airway and ventilation
      (2) Intubation as necessary
         (a) Assisted ventilation may be required
         (b) High flow oxygen
   c) Circulation
      (1) Avoid fluid excess
      (2) Monitor IV flow rates carefully
   d) Pharmacological
      (1) Diuretics may be considered in severe cases, but are not usually appropriate since the etiology is NOT high pressure in the pulmonary capillary bed
      (2) Corticosteroid to stabilize pulmonary capillary and alveolar walls
   e) Non-pharmacological
      (1) Position the patient in an upright position with legs dangling
      (2) Rapid removal from any environmental toxins
      (3) Rapid descent in altitude if high altitude pulmonary edema (HAPE) is suspected
   f) Transport decisions
      (1) Appropriate mode
      (2) Appropriate facility
   g) Psychological support/ communication strategies

E. Pulmonary thromboembolism
   1. Epidemiology
      a) Incidence
         (1) Responsible for 50,000 death annually

(2) 5% of sudden deaths
b) Mortality/ morbidity
(1) Less than 10% of pulmonary emboli result in death
c) Risk factors
(1) Recent surgery
(2) Pregnancy
(3) Oral contraceptives
(4) Infection
(5) Cancer
(6) Sickle cell anemia
(7) Long bone fractures
(8) Prolonged inactivity
(9) Bedridden patients
d) Prevention strategies

2. Anatomy and physiology review
a) Deep veins in lower legs
b) Venous system
c) Coagulation of blood
d) Role of venous stasis
e) Venous wall injury
f) Venous valves
g) Pulmonary vasculature
h) Ventilation-perfusion mismatch

3. Pathophysiology
a) Perfusion disorder
b) Deep vein stasis
c) Injury to view wall
d) Hypercoagulability
e) Platelet aggregation
f) Embolism size
g) Embolism location in the legs
h) Embolism location in the lungs
i) Complete loss of perfusion in some area of lungs
j) Other causes of pulmonary circulation obstruction
(1) Air
(2) Fat
(3) Foreign objects
(4) Venous catheters
(5) Amniotic fluid

4. Assessment findings - depend on size of the clot
a) Evidence of significant life-threatening embolus in a proximal location
(1) Altered mentation
(2) Severe cyanosis
(3) Profound hypotension
(4) Cardiac arrest
b) Chief complaint
(1) Chest pain
(2) Dyspnea
(3) Cough (typically non-productive)

c) History
(1) Sudden onset
(2) Identification of risk factors
d) Physical findings
(1) Normal breath sounds or, in severe cases, rales
(2) Pleural fiction rub
(3) Tachycardia
(4) Clinical evidence of thrombophlebitis (found in less than 50%)
(5) Tachypnea
(6) Hemoptysis (fairly rare)
(7) Petechiae on upper thorax and arms

5. Management - prevention has major role in management
a) Depends on the size of the embolism
b) Airway and ventilation
(1) Intubation if necessary
(2) Positive pressure ventilation if required
(3) High flow oxygen
c) Circulation
(1) CPR if required
(2) IV therapy; hydration based on clinical symptoms
d) Pharmacological
(1) Thrombolytic therapy may be appropriate if the diagnosis of pulmonary embolus is confirmed, however, this is rare - especially in the out-of-hospital setting
e) Non-pharmacological therapy
(1) Support body systems
(2) Most severe cases will be managed as a cardiac arrest of unknown origin
f) Transport considerations
(1) Rapid transport
(2) Appropriate mode
(3) Appropriate facility
g) Psychological support/ communication strategies

F. Neoplasms of the lung
1. Epidemiology
a) Incidence
(1) 150,000 have cancer
(2) Typical age between 55 to 65
(3) Morbidity/ mortality
(a) Most die within one year
(b) 20% local lung involvement
(c) 25% spread to lymph
(d) 55% distant metastatic cancer
b) Prevention
(1) Prevent starting smoking in youth
(2) Smoking cessation in smokers
(3) Avoidance of environmental hazards, particularly asbestos
(4) Cancer screening programs

2. Anatomy and physiology review
3. Pathophysiology

a) Significant variety in the cell types, and the growth rates associated with each type

4. Assessment findings
   a) Signs of severe distress
      (1) Altered mentation
      (2) 1-2 word dyspnea
      (3) Severe or uncontrollable hemoptysis
   b) Chief complaints
      (1) Cough
      (2) Hemoptysis
      (3) Dyspnea
      (4) Hoarseness or voice change
      (5) Dysphagia
   c) History
      (1) Diagnosed history of cancer
   d) Physical findings
      (1) Signs and symptoms vary according to location of the tumor
5. Management
   a) Airway and ventilation
      (1) Intubation if required
      (2) Assisted ventilation if necessary
      (3) Oxygen - flow rate based on symptoms and pulse oximetry
      (4) Supportive care
   b) Circulation
      (1) Many patients with diagnosed lung cancer with have an indwelling catheter in place. Local protocols vary regarding whether this catheter may be used for IV infusion in the field.
      (2) IV infusion may be required to improve hydration or thin/ mobilize sputum
   c) Pharmacological
      (1) Out-of-hospital therapy for lung cancer patients is symptomatic, and may include the following
         (a) Bronchodilators
         (b) Corticosteroid
         (c) Continuation of hospital-initiated antibiotics
   d) Transport considerations
      (1) End stage patients may have advance directives or DNR
      (2) Supportive care
   e) Psychological support/ communication strategies
      (1) If diagnosed end stage
         (a) Death and dying patient
         (b) Family support

G. Upper respiratory infection
   1. Epidemiology
      a) Incidence
         (1) 80 million cases in 1975
      b) Morbidity/ mortality
         (1) Rarely life threatening
         (2) Often exacerbates underlying pulmonary conditions
         (3) Often become significant infections in patients with suppressed immune

function (such as HIV)
c) Risk factors
(1) Avoidance of exposure is nearly impossible because of the prevalence of causative agents
(2) Severity increases in patients with underlying pulmonary conditions
d) Prevention strategies
(1) Handwashing and covering the mouth during sneezing and coughing are essential in preventing spread

2. Anatomy and physiology review
a) Nasopharynx
b) Oropharynx
c) Paranasal sinus
d) Inner ear
e) Middle ear
f) Outer ear
g) Eustachian tubes
h) Epiglottis
i) Respiratory epithelium
j) Lymphatic system
k) Secretory antibody IgA

3. Pathophysiology
a) A variety of bacteria and virus cause URI
b) 20-30% are Group A streptococci
c) 50% of pharyngitis have no demonstrated bacterial or viral cause
d) Most are self-limiting diseases

4. Assessment findings
a) Chief complaints
(1) Sore throat
(2) Fever
(3) Chills
(4) Headache
b) Physical findings
(1) Cervical adenopathy
(2) Erthyematous pharynx
(3) Positive throat culture

5. Management
a) Airway and ventilation
(1) Typically no intervention required
(2) Oxygen administration may be appropriate in patients with underlying pulmonary conditions (administer based on symptoms and pulse oximetry)
b) Pharmacological
(1) Out-of-hospital care is symptomatic, and based in part on the presence of underlying pulmonary conditions
(2) Interventions which may be appropriate include
(a) Bronchodilators
(b) Continuation of prescribed antibiotics
(c) Corticosteroid
c) Non-pharmacological

d) Transport considerations
(1) Appropriate mode
(2) Appropriate facility
e) Psychological support/ communication strategies
(1) Collected throat cultures require family notification of results and follow-up care

H. Spontaneous pneumothorax
1. Epidemiology
a) Incidence
(1) 18 per 100,000
b) Morbidity/ mortality
(1) 15-20% partial pneumothorax may be well tolerated
c) Risk factors
(1) Males
(2) Younger age
(3) Thin body mass
(4) History of COPD (secondary spontaneous pneumothorax)
2. Assessment findings
a) Chief complaint
(1) Shortness of breath
(2) Chest pain
(3) Sudden onset
b) Physical findings
(1) Typically minor
(a) Pallor
(b) Diaphoresis
(c) Tachypnea
(2) Severe
(a) Altered mentation
(b) Cyanosis
(c) Tachycardia
(d) Decreased breath sounds
(e) Local hyperresonance to percussion
(f) Subcutaneous emphysema
3. Management
a) Airway and ventilation
(1) Intubation as required
(2) Assisted ventilation if necessary
(3) Oxygen - administration levels based on symptoms and pulse oximetry
b) Circulation
(1) IV initiation if severe symptoms present
c) Pharmacological
(1) Not typically necessary; treat symptomatically
d) Non-pharmacological
(1) Position of comfort/ best ventilation
e) Transport considerations
(1) Appropriate mode
(2) Appropriate facility
f) Psychological support/ communication strategies

I. Hyperventilation syndrome
  1. Multiple causes
    a) Hypoxia
    b) High altitude
    c) Pulmonary disease
    d) Pulmonary disorders
    e) Pneumonia
    f) Interstitial pneumonitis, fibrosis, edema
    g) Pulmonary emboli, vascular disease
    h) Bronchial asthma
    i) Cardiovascular disorders
    j) Congestive heart failure
    k) Hypotension
    l) Metabolic disorders
    m) Acidosis
    n) Hepatic failure
    o) Neurologic disorders
    p) Psychogenic or anxiety hypertension
    q) Central nervous system infection, tumors
    r) Drug-induced
    s) Salicylate
    t) Methylxanthine derivatives
    u) Beta-adrenergic agonists
    v) Progesterone
    w) Fever, sepsis
    x) Pain
    y) Pregnancy
  2. Assessment findings
    a) Chief complaint
      (1) Dyspnea
      (2) Chest pain
      (3) Other symptoms based on etiology
      (4) Carpopedal spasm
    b) Physical findings
      (1) Rapid breath with high minute volume
      (2) Varying depending on cause of syndrome
      (3) Carpopedal spasms
  3. Pathophysiology
    a) Depends on cause of syndrome
  4. Management
    a) Depends on cause of syndrome, discussed elsewhere
      (1) Airway and ventilation
        (a) Oxygen - rate of administration based on symptoms and pulse oximetry
      (2) If anxiety hyperventilation is confirmed (especially based on patient's prior history) coached ventilation/ rebreathing techniques might be considered
    b) Circulation
      (1) Intervention rarely required

c) Pharmacological
   (1) Intervention rarely required
d) Non-pharmacological
   (1) Intervention rarely required
   (2) Patients with anxiety hyperventilation will require psychological approaches to calm them
   (3) Have them mimic your respiratory rate and volume
   (4) Do not place bag over mouth and nose
e) Transport considerations
   (1) Appropriate mode
   (2) Appropriate facility
f) Psychological support/ communication strategies
   (1) Depend on cause of hyperventilation

UNIT TERMINAL OBJECTIVE

5-2 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement the treatment plan for the patient with cardiovascular disease.

COGNITIVE OBJECTIVES

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

5-2.1 Describe the incidence, morbidity and mortality of cardiovascular disease. (C-1)
5-2.2 Discuss prevention strategies that may reduce the morbidity and mortality of cardiovascular disease. (C-1)
5-2.3 Identify the risk factors most predisposing to coronary artery disease. (C-1)
5-2.4 Describe the anatomy of the heart, including the position in the thoracic cavity, layers of the heart, chambers of the heart, and location and function of cardiac valves. (C-1)
5-2.5 Identify the major structures of the vascular system. (C-1)
5-2.6 Identify the factors affecting venous return. (C-1)
5-2.7 Identify and define the components of cardiac output. (C-1)
5-2.8 Identify phases of the cardiac cycle. (C-1)
5-2.9 Identify the arterial blood supply to any given area of the myocardium. (C-1)
5-2.10 Compare and contrast the coronary arterial distribution to the major portions of the cardiac conduction system. (C-3)
5-2.11 Identify the structure and course of all divisions and subdivisions of the cardiac conduction system. (C-1)
5-2.12 Identify and describe how the heart's pacemaking control, rate, and rhythm are determined. (C-2)
5-2.13 Explain the physiological basis of conduction delay in the AV node. (C-3)
5-2.14 Define the functional properties of cardiac muscle. (C-1)
5-2.15 Define the events comprising electrical potential. (C-1)
5-2.16 List the most important ions involved in myocardial action potential and their primary function in this process. (C-2)
5-2.17 Describe the events involved in the steps from excitation to contraction of cardiac muscle fibers. (C-1)
5-2.18 Describe the clinical significance of Starling's law. (C-3)
5-2.19 Identify the structures of the autonomic nervous system (ANS). (C-1)
5-2.20 Identify the effect of the ANS on heart rate, rhythm and contractility. (C-1)
5-2.21 Define and give examples of positive and negative inotropism, chronotropism and dromotropism. (C-2)
5-2.22 Discuss the pathophysiology of cardiac disease and injury. (C-1)
5-2.23 Identify and describe the details of inspection, auscultation and palpation specific to the cardiovascular system. (C-1)
5-2.24 Define pulse deficit, pulsus paradoxus and pulsus alternans. (C-1)
5-2.25 Identify the normal characteristics of the point of maximal impulse (PMI). (C-1)
5-2.26 Identify and define the heart sounds. (C-1)
5-2.27 Relate heart sounds to hemodynamic events in the cardiac cycle. (C-2)
5-2.28 Describe the differences between normal and abnormal heart sounds. (C-2)
5-2.29 Identify and describe the components of the focused history as it relates to the patient with cardiovascular compromise. (C-1)
5-2.30 Explain the purpose of ECG monitoring. (C-1)
5-2.31 Describe how ECG wave forms are produced. (C-2)
5-2.32 Correlate the electrophysiological and hemodynamic events occurring throughout the entire cardiac cycle with the various ECG wave forms, segments and intervals. (C-2)
5-2.33 Identify how heart rates, durations, and amplitudes may be determined from ECG recordings. (C-3)
5-2.34 Relate the cardiac surfaces or areas represented by the ECG leads. (C-2)

5-2.35 Given an ECG, identify the arrhythmia. (C-3)
5-2.36 Identify the limitations to the ECG. (C-1)
5-2.37 Differentiate among the primary mechanisms responsible for producing cardiac arrhythmias. (C-1)
5-2.38 Describe a systematic approach to the analysis and interpretation of cardiac arrhythmias. (C-2)
5-2.39 Describe the arrhythmias originating in the sinus node, the AV junction, the atria, and the ventricles. (C-3)
5-2.40 Describe the arrhythmias originating or sustained in the AV junction. (C-3)
5-2.41 Describe the abnormalities originating within the bundle branch system. (C-3)
5-2.42 Describe the process of differentiating wide QRS complex tachycardias. (C-3)
5-2.43 Recognize the pitfalls in the differentiation of wide QRS complex tachycardias. (C-1)
5-2.44 Describe the conditions of pulseless electrical activity. (C-3)
5-2.45 Describe the phenomena of reentry, aberration and accessory pathways. (C-1)
5-2.46 Identify the ECG changes characteristically produced by electrolyte imbalances and specify the clinical implications. (C-2)
5-2.47 Identify patient situations where ECG rhythm analysis is indicated. (C-1)
5-2.48 Recognize the changes on the ECG that may reflect evidence of myocardial ischemia and injury. (C-1)
5-2.49 Recognize the limitations of the ECG in reflecting evidence of myocardial ischemia and injury. (C-1)
5-2.50 Correlate abnormal ECG findings with clinical interpretation. (C-2)
5-2.51 Identify the major therapeutic objectives in the treatment of the patient with any arrhythmia. (C-1)
5-2.52 Identify the major mechanical, pharmacological and electrical therapeutic interventions. (C-3)
5-2.53 Based on field impressions, identify the need for rapid intervention for the patient in cardiovascular compromise. (C-3)
5-2.54 Describe the incidence, morbidity and mortality associated with myocardial conduction defects. (C-1)
5-2.55 Identify the clinical indications for transcutaneous and permanent artificial cardiac pacing. (C-1)
5-2.56 Describe the components and the functions of a transcutaneous pacing system. (C-1)
5-2.57 Explain what each setting and indicator on a transcutaneous pacing system represents and how the settings may be adjusted. (C-2)
5-2.58 Describe the techniques of applying a transcutaneous pacing system. (C-1)
5-2.59 Describe the characteristics of an implanted pacemaking system. (C-1)
5-2.60 Describe artifacts that may cause confusion when evaluating the ECG of a patient with a pacemaker. (C-2)
5-2.61 List the possible complications of pacing. (C-3)
5-2.62 List the causes and implications of pacemaker failure. (C-2)
5-2.63 Identify additional hazards that interfere with artificial pacemaker function. (C-1)
5-2.64 Recognize the complications of artificial pacemakers as evidenced on ECG. (C-2)
5-2.65 Describe the epidemiology, morbidity and mortality, and pathophysiology of angina pectoris. (C-1)
5-2.66 List and describe the assessment parameters to be evaluated in a patient with angina pectoris. (C-1)
5-2.67 Identify what is meant by the OPQRST of chest pain assessment. (C-3)
5-2.68 List other clinical conditions that may mimic signs and symptoms of coronary artery disease and angina pectoris. (C-1)
5-2.69 Identify the ECG findings in patients with angina pectoris. (C-3)
5-2.70 Identify the paramedic responsibilities associated with management of the patient with angina pectoris. (C-2)
5-2.71 Based on the pathophysiology and clinical evaluation of the patient with chest pain, list the anticipated clinical problems according to their life-threatening potential. (C-3)
5-2.72 Describe the epidemiology, morbidity and mortality of myocardial infarction. (C-1)
5-2.73 List the mechanisms by which an MI may be produced by traumatic and non-traumatic events. (C-2)
5-2.74 Identify the primary hemodynamic changes produced in myocardial infarction. (C-1)
5-2.75 List and describe the assessment parameters to be evaluated in a patient with a suspected myocardial

infarction. (C-1)

5-2.76 Identify the anticipated clinical presentation of a patient with a suspected acute myocardial infarction. (C-3)
5-2.77 Differentiate the characteristics of the pain/ discomfort occurring in angina pectoris and acute myocardial infarction. (C-2)
5-2.78 Identify the ECG changes characteristically seen during evolution of an acute myocardial infarction. (C-2)
5-2.79 Identify the most common complications of an acute myocardial infarction. (C-3)
5-2.80 List the characteristics of a patient eligible for thrombolytic therapy. (C-2)
5-2.81 Describe the "window of opportunity" as it pertains to reperfusion of a myocardial injury or infarction. (C-3)
5-2.82 Based on the pathophysiology and clinical evaluation of the patient with a suspected acute myocardial infarction, list the anticipated clinical problems according to their life-threatening potential. (C-3)
5-2.83 Specify the measures that may be taken to prevent or minimize complications in the patient suspected of myocardial infarction. (C-3)
5-2.84 Describe the most commonly used cardiac drugs in terms of therapeutic effect and dosages, routes of administration, side effects and toxic effects. (C-3)
5-2.85 Describe the epidemiology, morbidity and mortality of heart failure. (C-1)
5-2.86 Define the principle causes and terminology associated with heart failure. (C-1)
5-2.87 Identify the factors that may precipitate or aggravate heart failure. (C-3)
5-2.88 Describe the physiological effects of heart failure. (C-2)
5-2.89 Define the term "acute pulmonary edema" and describe its relationship to left ventricular failure. (C-3)
5-2.90 Define preload, afterload and left ventricular end-diastolic pressure and relate each to the pathophysiology of heart failure. (C-3)
5-2.91 Differentiate between early and late signs and symptoms of left ventricular failure and those of right ventricular failure. (C-3)
5-2.92 Explain the clinical significance of paroxysmal nocturnal dyspnea. (C-1)
5-2.93 Explain the clinical significance of edema of the extremities and sacrum. (C-1)
5-2.94 List the interventions prescribed for the patient in acute congestive heart failure. (C-2)
5-2.95 Describe the most commonly used pharmacological agents in the management of congestive heart failure in terms of therapeutic effect, dosages, routes of administration, side effects and toxic effects. (C-1)
5-2.96 Define the term "cardiac tamponade". (C-1)
5-2.97 List the mechanisms by which cardiac tamponade may be produced by traumatic and non-traumatic events. (C-2)
5-2.98 Identify the limiting factor of pericardial anatomy that determines intrapericardiac pressure. (C-1)
5-2.99 Identify the clinical criteria specific to cardiac tamponade. (C-2)
5-2.100 Describe how to determine if pulsus paradoxus, pulsus alternans or electrical alternans is present. (C-2)
5-2.101 Identify the paramedic responsibilities associated with management of a patient with cardiac tamponade. (C-2)
5-2.102 Describe the incidence, morbidity and mortality of hypertensive emergencies. (C-1)
5-2.103 Define the term "hypertensive emergency". (C-1)
5-2.104 Identify the characteristics of the patient population at risk for developing a hypertensive emergency. (C-1)
5-2.105 Explain the essential pathophysiological defect of hypertension in terms of Starling's law of the heart. (C-3)
5-2.106 Identify the progressive vascular changes associate with sustained hypertension. (C-1)
5-2.107 Describe the clinical features of the patient in a hypertensive emergency. (C-3)
5-2.108 Rank the clinical problems of patients in hypertensive emergencies according to their sense of urgency. (C-3)
5-2.109 From the priority of clinical problems identified, state the management responsibilities for the patient with a hypertensive emergency. (C-2)
5-2.110 Identify the drugs of choice for hypertensive emergencies, rationale for use, clinical precautions and disadvantages of selected antihypertensive agents. (C-3)

5-2.111 Correlate abnormal findings with clinical interpretation of the patient with a hypertensive emergency. (C-3)
5-2.112 Define the term "cardiogenic shock". (C-1)
5-2.113 Describe the major systemic effects of reduced tissue perfusion caused by cardiogenic shock. (C-3)
5-2.114 Explain the primary mechanisms by which the heart may compensate for a diminished cardiac output and describe their efficiency in cardiogenic shock. (C-3)
5-2.115 Differentiate progressive stages of cardiogenic shock. (C-3)
5-2.116 Identify the clinical criteria for cardiogenic shock. (C-1)
5-2.117 Describe the characteristics of patients most likely to develop cardiogenic shock. (C-3)
5-2.118 Describe the most commonly used pharmacological agents in the management of cardiogenic shock in terms of therapeutic effects, dosages, routes of administration, side effects and toxic effects. (C-2)
5-2.119 Correlate abnormal findings with clinical assessment of the patient in cardiogenic shock. (C-3)
5-2.120 Identify the paramedic responsibilities associated with management of a patient in cardiogenic shock. (C-2)
5-2.121 Define the term "cardiac arrest". (C-1)
5-2.122 Identify the characteristics of patient population at risk for developing cardiac arrest from cardiac causes. (C-1)
5-2.123 Identify non-cardiac causes of cardiac arrest. (C-1)
5-2.124 Describe the arrhythmias seen in cardiac arrest. (C-3)
5-2.125 Identify the critical actions necessary in caring for the patient with cardiac arrest. (C-3)
5-2.126 Explain how to confirm asystole using the 3-lead ECG. (C-1)
5-2.127 Define the terms defibrillation and synchronized cardioversion. (C-1)
5-2.128 Specify the methods of supporting the patient with a suspected ineffective implanted defibrillation device. (C-2)
5-2.129 Describe the most commonly used pharmacological agents in the managements of cardiac arrest in terms of therapeutic effects. (C-3)
5-2.130 Identify resuscitation. (C-1)
5-2.131 Identify circumstances and situations where resuscitation efforts would not be initiated. (C-1)
5-2.132 Identify and list the inclusion and exclusion criteria for termination of resuscitation efforts. (C-1)
5-2.133 Identify communication and documentation protocols with medical direction and law enforcement used for termination of resuscitation efforts. (C-1)
5-2.134 Describe the incidence, morbidity and mortality of vascular disorders. (C-1)
5-2.135 Describe the pathophysiology of vascular disorders. (C-1)
5-2.136 List the traumatic and non-traumatic causes of vascular disorders. (C-1)
5-2.137 Define the terms "aneurysm", "claudication" and "phlebitis". (C-1)
5-2.138 Identify the peripheral arteries most commonly affected by occlusive disease. (C-1)
5-2.139 Identify the major factors involved in the pathophysiology of aortic aneurysm. (C-1)
5-2.140 Recognize the usual order of signs and symptoms that develop following peripheral artery occlusion. (C-3)
5-2.141 Identify the clinical significance of claudication and presence of arterial bruits in a patient with peripheral vascular disorders. (C-3)
5-2.142 Describe the clinical significance of unequal arterial blood pressure readings in the arms. (C-3)
5-2.143 Recognize and describe the signs and symptoms of dissecting thoracic or abdominal aneurysm. (C-3)
5-2.144 Describe the significant elements of the patient history in a patient with vascular disease. (C-2)
5-2.145 Identify the hemodynamic effects of vascular disorders. (C-1)
5-2.146 Identify the complications of vascular disorders. (C-1)
5-2.147 Identify the Paramedic's responsibilities associated with management of patients with vascular disorders. (C-2)
5-2.148 Develop, execute and evaluate a treatment plan based on the field impression for the patient with vascular disorders. (C-3)

5-2.149 Differentiate between signs and symptoms of cardiac tamponade, hypertensive emergencies, cardiogenic shock, and cardiac arrest. (C-3)
5-2.150 Based on the pathophysiology and clinical evaluation of the patient with chest pain, characterize the clinical problems according to their life-threatening potential. (C-3)
5-2.151 Apply knowledge of the epidemiology of cardiovascular disease to develop prevention strategies. (C-3)
5-2.152 Integrate pathophysiological principles into the assessment of a patient with cardiovascular disease. (C-3)
5-2.153 Apply knowledge of the epidemiology of cardiovascular disease to develop prevention strategies. (C-3)
5-2.154 Integrate pathophysiological principles into the assessment of a patient with cardiovascular disease. (C-3)
5-2.155 Synthesize patient history, assessment findings and ECG analysis to form a field impression for the patient with cardiovascular disease. (C-3)
5-2.156 Integrate pathophysiological principles to the assessment of a patient in need of a pacemaker. (C-1)
5-2.157 Synthesize patient history, assessment findings and ECG analysis to form a field impression for the patient in need of a pacemaker. (C-3)
5-2.158 Develop, execute, and evaluate a treatment plan based on field impression for the patient in need of a pacemaker. (C-3)
5-2.159 Based on the pathophysiology and clinical evaluation of the patient with chest pain, characterize the clinical problems according to their life-threatening potential. (C-3)
5-2.160 Integrate pathophysiological principles to the assessment of a patient with chest pain. (C-3)
5-2.161 Synthesize patient history, assessment findings and ECG analysis to form a field impression for the patient with angina pectoris. (C-3)
5-2.162 Develop, execute and evaluate a treatment plan based on the field impression for the patient with chest pain. (C-3)
5-2.163 Integrate pathophysiological principles to the assessment of a patient with a suspected myocardial infarction. (C-3)
5-2.164 Synthesize patient history, assessment findings and ECG analysis to form a field impression for the patient with a suspected myocardial infarction. (C-3)
5-2.165 Develop, execute and evaluate a treatment plan based on the field impression for the suspected myocardial infarction patient. (C-3)
5-2.166 Integrate pathophysiological principles to the assessment of the patient with heart failure. (C-3)
5-2.167 Synthesize assessment findings and patient history information to form a field impression of the patient with heart failure. (C-3)
5-2.168 Develop, execute, and evaluate a treatment plan based on the field impression for the heart failure patient. (C-3)
5-2.169 Integrate pathophysiological principles to the assessment of a patient with cardiac tamponade. (C-3)
5-2.170 Synthesize assessment findings and patient history information to form a field impression of the patient with cardiac tamponade. (C-3)
5-2.171 Develop, execute and evaluate a treatment plan based on the field impression for the patient with cardiac tamponade. (C-3)
5-2.172 Integrate pathophysiological principles to the assessment of the patient with a hypertensive emergency. (C-3)
5-2.173 Synthesize assessment findings and patient history information to form a field impression of the patient with a hypertensive emergency. (C-3)
5-2.174 Develop, execute and evaluate a treatment plan based on the field impression for the patient with a hypertensive emergency. (C-3)
5-2.175 Integrate pathophysiological principles to the assessment of the patient with cardiogenic shock. (C-3)
5-2.176 Synthesize assessment findings and patient history information to form a field impression of the patient with cardiogenic shock. (C-3)
5-2.177 Develop, execute, and evaluate a treatment plan based on the field impression for the patient with

cardiogenic shock. (C-3)
5-2.178 Integrate the pathophysiological principles to the assessment of the patient with cardiac arrest. (C-3)
5-2.179 Synthesize assessment findings to formulate a rapid intervention for a patient in cardiac arrest. (C-3)
5-2.180 Synthesize assessment findings to formulate the termination of resuscitative efforts for a patient in cardiac arrest. (C-3)
5-2.181 Integrate pathophysiological principles to the assessment of a patient with vascular disorders. (C-3)
5-2.182 Synthesize assessment findings and patient history to form a field impression for the patient with vascular disorders. (C-3)
5-2.183 Integrate pathophysiological principles to the assessment and field management of a patient with chest pain. (C-3)

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

5-2.184 Value the sense of urgency for initial assessment and intervention in the patient with cardiac compromise. (A-3)
5-2.185 Value and defend the sense of urgency necessary to protect the window of opportunity for reperfusion in the patient with suspected myocardial infarction. (A-3)
5-2.186 Defend patient situations where ECG rhythm analysis is indicated. (A-3)
5-2.187 Value and defend the application of transcutaneous pacing system. (A-3)
5-2.188 Value and defend the urgency in identifying pacemaker malfunction. (A-3)
5-2.189 Based on the pathophysiology and clinical evaluation of the patient with acute myocardial infarction, characterize the clinical problems according to their life-threatening potential. (A-3)
5-2.190 Defend the measures that may be taken to prevent or minimize complications in the patient with a suspected myocardial infarction. (A-3)
5-2.191 Defend the urgency based on the severity of the patient's clinical problems in a hypertensive emergency. (A-3)
5-2.192 From the priority of clinical problems identified, state the management responsibilities for the patient with a hypertensive emergency. (A-3)
5-2.193 Value and defend the urgency in rapid determination of and rapid intervention of patients in cardiac arrest. (A-3)
5-2.194 Value and defend the possibility of termination of resuscitative efforts in the out-of-hospital setting. (A-3)
5-2.195 Based on the pathophysiology and clinical evaluation of the patient with vascular disorders, characterize the clinical problems according to their life-threatening potential. (A-3)
5-2.196 Value and defend the sense of urgency in identifying peripheral vascular occlusion. (A-3)
5-2.197 Value and defend the sense of urgency in recognizing signs of aortic aneurysm. (A-3)

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

5-2.198 Demonstrate how to set and adjust the ECG monitor settings to varying patient situations. (P-3)
5-2.199 Demonstrate a working knowledge of various ECG lead systems. (P-3)
5-2.200 Demonstrate how to record an ECG. (P-2)
5-2.201 Perform, document and communicate a cardiovascular assessment. (P-1)
5-2.202 Set up and apply a transcutaneous pacing system. (P-3)
5-2.203 Given the model of a patient with signs and symptoms of heart failure, position the patient to afford comfort and relief. (P-2)
5-2.204 Demonstrate how to determine if pulsus paradoxus, pulsus alternans or electrical alternans is present. (P-

2)

5-2.205 Demonstrate satisfactory performance of psychomotor skills of basic and advanced life support techniques according to the current American Heart Association Standards and Guidelines, including: (P-3)

a. Cardiopulmonary resuscitation
b. Defibrillation
c. Synchronized cardioversion
d. Transcutaneous pacing

5-2.206 Complete a communication patch with medical direction and law enforcement used for termination of resuscitation efforts. (P-1)

5-2.207 Demonstrate how to evaluate major peripheral arterial pulses. (P-1)

DECLARATIVE

I. Introduction
  A. Epidemiology
    1. Incidence
      a. Prevalence of cardiac death outside of a hospital
        (1) Supportive statistics
      b. Prevalence of prodromal signs and symptoms
        (1) Supportive statistics
      c. Increased recognition of need for early reperfusion
    2. Morbidity/ mortality
      a. Reduced with early recognition
      b. Reduced with early access to EMS system
    3. Risk factors
      a. Age
      b. Family history
      c. Hypertension
      d. Lipids
        (1) Hypercholesterolemia
      e. Male sex
      f. Smoking
      g. Carbohydrate intolerance
    4. Possible contributing risks
      a. Diet
      b. Female sex
      c. Obesity
      d. Oral contraceptives
      e. Sedentary living
      f. Personality type
      g. Psychosocial tensions
    5. Prevention strategies
      a. Early recognition
      b. Education
      c. Alteration of life style
  B. Cardiovascular anatomy and physiology
    1. Anatomy of the heart
    2. Location
      a. Layers
        (1) Myocardium
        (2) Endocardium
        (3) Pericardium
          (a) Visceral (epicardium)
          (b) Parietal
      b. Chambers
        (1) Atria
        (2) Ventricles
      c. Valves
        (1) Atrioventricular (AV) valves

(a) Tricuspid (right)
(b) Mitral (left)
(2) Semilunar valves
(a) Pulmonary (right)
(b) Aortic (left)
d. Papillary muscles
e. Chordae tendineae
3. Cardiac cycle
a. Phases
(1) Systole
(a) Artrial
(b) Ventricular
(2) Diastole
(a) Atrial
(b) Ventricular
b. Cardiac output
(1) Stroke volume
(a) Heart rate
(b) Contractility
(c) Starling's law
4. Vascular system
a. Aorta
(1) Ascending
(2) Thoracic
(3) Abdominal
b. Arteries
c. Arterioles
d. Capillaries
e. Venule
f. Veins
g. Vena cava
(1) Superior
(2) Inferior
h. Venous return (preload)
(1) Skeletal muscle pump
(2) Thoracoabdominal pump
(3) Respiratory cycle
(4) Gravity
(5) IPPB, PEEP, CPAP, BiPAP
i. Resistance and capacitance (afterload)
j. Pulmonary veins
5. Coronary circulation
a. Arteries
(1) Left coronary artery
(a) Anterior descending branch (LAD)
i) Distribution to the conduction system
(b) Circumflex
i) Distribution to the conduction system

(2) Right coronary artery
(a) Distribution to the conduction system

b. Veins
(1) Coronary sinus
(2) Great cardiac vein

6. Electrophysiology
a. Conduction system overview
(1) Sinoatrial node or sinus node (SA node)
(2) Atrioventricular (AV) junction
(a) AV node
(b) Bundle of His
(3) His-Purkinje system
(a) Bundle branches
i) Right
ii) Left anterior fascicle
iii) Left posterior fascicle
(4) Characteristics of myocardial cells
(a) Automaticity
(b) Excitability
(c) Conductivity
(d) Contractility

b. Electrical potential
(1) Action potential
(a) Important electrolytes
i) Sodium
ii) Potassium
iii) Calcium
iv) Chloride
v) Magnesium
(2) Excitability
(a) Thresholds
(b) Depolarization
(c) Repolarization
i) Relative refractory period
ii) Absolute refractory period
(3) Neurotransmitters
(a) Acetylcholine
i) Effects on myocardium
ii) Effects on systemic blood vessels
(b) Cholinesterase
i) Effects on myocardium
ii) Effects on systemic blood vessels

c. Autonomic nervous system relationship to cardiovascular system
(1) Medulla
(2) Carotid sinus and baroreceptor
(a) Location
(b) Significance
(3) Parasympathetic system

(4) Sympathetic
(a) Alpha - vasoconstrictive effect on systemic blood vessels
(b) Beta
i) Inotropic effect on myocardium
ii) Dromotropic effect on myocardium
iii) Chronotropic effect on myocardium
(5) Systemic circulation

II. Initial cardiovascular assessment
A. Level of responsiveness
B. Airway
1. Patent
2. Debris, blood
C. Breathing
1. Absent
2. Present
a. Rate and depth
(1) Effort
(2) Breath sounds
(a) Characteristics
(b) Significance
D. Circulation
1. Pulse
a. Absent
b. Present
(1) Rate and quality
(a) Pulse deficit
(b) Pulsus paradoxus
(c) Pulsus alternans
2. Skin
a. Color
b. Temperature
c. Moisture
d. Turgor
e. Mobility
f. Edema
3. Blood pressure

III. Focused history
A. H and physical/ SAMPLE format
1. Chief complaint
2. Pain
a. OPQRST
(1) Onset/ origin
(a) Pertinent past history
(b) Time of onset
(2) Provocation
(a) Exertional

(b) Non-exertional
(3) Quality
(a) Patient's narrative description
i) For example - sharp, tearing, pressure, heaviness
(4) Region/ radiation
(a) For example - arms, neck, back
(5) Severity
(a) "1-10" scale
(6) Timing
(a) Duration
(b) Worsening or improving
(c) Continuous or intermittent
(d) At rest or with activity

3. Dyspnea
   a. Continuous or intermittent
   b. Exertional
   c. Non-exertional
   d. Orthopneic
4. Cough
   a. Dry
   b. Productive
5. Related signs and symptoms
   a. Level of consciousness
   b. Diaphoresis
   c. Restlessness, anxiety
   d. Feeling of impending doom
   e. Nausea/ vomiting
   f. Fatigue
   g. Palpitations
   h. Edema
      (1) Extremities
      (2) Sacral
   i. Headache
   j. Syncope
   k. Behavioral change
   l. Anguished facial expression
   m. Activity limitations
   n. Trauma
6. Past medical history
   a. Coronary artery disease (CAD)
   b. Atherosclerotic heart disease
      (1) Angina
      (2) Previous MI
      (3) Hypertension
      (4) Congestive heart failure (CHF)
   c. Valvular disease
   d. Aneurysm
   e. Pulmonary disease

f. Diabetes
g. Renal disease
h. Vascular disease
i. Inflammatory cardiac disease
j. Previous cardiac surgery
k. Congenital anomalies
l. Current/ past medications
(1) Prescribed
(a) Compliance
(b) Non-compliance
(2) Borrowed
(3) Over-the-counter
(4) Recreational
(a) For example - cocaine
m. Allergies
n. Family history
(1) Stroke, heart disease, diabetes, hypertension
(2) Age at death
o. Known cholesterol levels

IV. Detailed physical examination
A. Inspection
1. Tracheal position
a. Neck veins
(1) Appearance
(2) Pressure
(3) Clinical significance
b. Thorax
(1) Configuration
(a) A-P diameter
(b) Movement with respirations
(2) Clinical significance
c. Epigastrium
(a) Pulsation
(1) Distention
(2) Clinical significance
B. Auscultation
1. Neck
a. Normal
b. Abnormal
(1) Bruit
2. Breath sounds
a. Depth
b. Equality
c. Adventitious sounds
(1) Crackles
(2) Wheezes
(a) Gurgling

(b) Frothing (mouth and nose)
i) Blood tinged
ii) Foamy

3. Heart sounds
a. Auscultatory sites
b. Identify S_1, S_2

C. Palpation
1. Areas of crepitus or tenderness
2. Thorax
3. Epigastrium
a. Pulsation
b. Distention

V. Electrocardiographic (ECG) monitoring
A. Electrophysiology and wave forms
1. Origination
2. Production
3. Relationship of cardiac events to wave forms
4. Intervals
a. Normal
b. Clinical significance
5. Segments

B. Leads and electrodes
1. Electrode
2. Leads
a. Anatomic positions
b. Correct placement
3. Surfaces of heart and lead systems
a. Inferior
b. Left lateral
c. Anterior/ posterior
4. Artifact

C. Standardization
1. Amplitude
2. Height
3. Rate
a. Duration
b. Wave form
c. Segment
d. Complex
e. Interval

D. Wave form analysis
1. Isoelectric
2. Positive
3. Negative
4. Calculation of ECG heart rate
a. Regular rhythm
(1) ECG strip method
(2) "300" method

b. Irregular rhythm
(1) ECG strip method
(2) "300" method

E. Lead systems and heart surfaces
1. ECG rhythm analysis
a. Value
b. Limitations
2. Heart surfaces
a. Inferior
b. Left lateral
c. Precordial
3. Acute signs of ischemia, injury and necrosis
a. Rationale
(1) Possible early identification of patients with acute myocardial infarction for intervention (thrombolysis or PTCA)
(2) The role of out-of-hospital twelve-lead ECG is still unresolved and may not be appropriate in many EMS settings
(3) EMS medical directors will make decisions regarding the application and use of the 12-lead ECG in their specific EMS setting
b. Advantages/ disadvantages
c. ST segment elevation
(1) Height, depth and contour
(2) ST (acute changes)
(a) Anterior wall
i) Significant ST elevation in V_1- V_4 may indicate anterior involvement
(b) Inferior wall
i) Significant ST elevation in II, III and aVF may indicate inferior involvement
(3) ST segment depression in eight or more leads
(4) ST segment elevation in aVR and V_1
d. Q waves
(1) Depth, duration and significance
(a) Greater than 5 mm, greater than .04 seconds
(b) May indicate necrosis
(c) May indicate extensive transient ischemia

F. Cardiac arrhythmias
1. Approach to analysis
a. P wave
(1) Configuration
(2) Duration
(3) Atrial rate and rhythm
b. P-R (P-Q) interval
(1) Duration
c. QRS complex
(1) Configuration
(2) Duration
(3) Ventricular rate and rhythm

d. S-T segment
   (1) Contour
   (2) Elevation
   (3) Depression
e. Q-T interval
   (1) Duration
   (2) Implication of prolongation
f. Relationship of P waves to QRS complexes
   (1) Consistent
   (2) Progressive prolongation
   (3) No relationship
g. T waves
h. U waves

2. Interpretation of the ECG
   a. Origin of complex
   b. Rate
   c. Rhythm
   d. Clinical significance
3. Arrhythmia originating in the sinus node
   a. Sinus bradycardia
   b. Sinus tachycardia
   c. Sinus arrhythmia
   d. Sinus arrest
4. Arrhythmias originating in the atria
   a. Premature atrial complex
   b. Atrial (ectopic) tachycardia
   c. Re-entrant tachycardia
   d. Multifocal atrial tachycardia
   e. Atrial flutter
   f. Atrial fibrillation
   g. Atrial flutter or atrial fibrillation with junctional rhythm
   h. Atrial flutter or atrial fibrillation with pre-excitation syndromes
5. Arrhythmias originating within the AV junction
   a. First degree AV block
   b. Second degree AV block
      (1) Type I
      (2) Type II/ infranodal
   c. Complete AV block (third degree block)
6. Arrhythmias sustained or originating in the AV junction
   a. AV nodal re-entrant tachycardia
   b. AV reciprocating tachycardia
      (1) Narrow
      (2) Wide
   c. Junctional escape rhythm
   d. Premature junctional complex
   e. Accelerated junctional rhythm
   f. Junctional tachycardia
7. Arrhythmias originating in the ventricles

a. Idioventricular rhythm
b. Accelerated idioventricular rhythm
c. Premature ventricular complex (ventricular ectopic)
   (1) R on T phenomenon
   (2) Paired/ couplets
   (3) Multiformed
   (4) Frequent uniform
d. "Rule of bigeminy" pertaining to precipitating ventricular arrhythmias
e. Ventricular tachycardia
   (1) Monomorphic
   (2) Polymorphic (including torsades de pointes)
f. Ventricular fibrillation
g. Ventricular standstill
h. Asystole

8. Abnormalities originating within the bundle branch system
   a. Incomplete or complete
   b. Right bundle branch block
   c. Left bundle branch block

9. Differentiation of wide QRS complex tachycardia
   a. Potential causes
      (1) Supraventricular tachycardia with bundle branch block
      (2) Accessory pathways
   b. Differentiation
      (1) Physical evaluation
         (a) Cannon "A" waves
         (b) Vary intensity of first heart tone
         (c) Beat to beat changes in blood pressure
      (2) ECG differences
         (a) Aberration as a result of premature atrial complex
            i) Identify PAC in previous ST segment or T wave
            ii) Sudden change in rate with bundle branch aberration
            iii) Concealed retrograde conduction
            iv) Right bundle branch refractoriness - may be time dependent
            v) Compare with previous ECG, when available
         (b) RBBB aberration - V_1 - positive
            i) Biphasic lead I with a broad terminal S-wave
            ii) Triphasic QRS in V_1
         (c) LBBB aberration - V_1 - negative
            i) Monophasic notched lead I
            ii) Slurred, notched or RSr' in lead V_1, V_2, or V_6
         (d) Concordant precordial pattern
            i) Totally negative precordial pattern is diagnostic of ventricular tachycardia
            ii) Totally positive precordial pattern is suggestive of ventricular tachycardia
         (e) Preexisting BBB prior to onset of tachycardia (by history)
      (3) Other considerations

(a) When in doubt
  i) Cardioversion when hemodynamic state is compromised or changing
  ii) Never use verapamil
  iii) If hemodynamic state is stable - consider lidocaine
(b) Pitfalls
  i) Age is not a differential
  ii) Slower rates may present with stable hemodynamic
  iii) Preexisting BBB prior to onset of the tachycardia
(c) Regularity
  i) Monomorphic V-tach and SVT are usually very regular and SVT frequently is faster
  ii) Polymorphic V-tach is irregular

10. Pulseless electrical activity
  a. Electrical mechanical dissociation
  b. Mechanical impairments to pulsations/ cardiac output
  c. Other possible causes
11. Other ECG phenomena
  a. Accessory pathways
  b. Preexitation phenomenon
  c. Aberration versus ectopy
12. ECG changes due to electrolyte imbalances
  a. Hyperkalemia
  b. Hypokalemia
13. ECG changes in hypothermia

VI. Management of the patient with arrhythmias
  A. Assessment
    1. Symptomatic
    2. Hypotensive
    3. Hypoperfusion
    4. Mechanical
    5. Vagal maneuvers - if the heart rate is too fast
    6. Stimulation - If heart rate is too slow
    7. Precordial thump
    8. Cough
  B. Pharmacological
    1. Gases
      a. Such as oxygen
    2. Sympathetic
      a. Such as epinephrine
    3. Anticholinergic
      a. Such as atropine
    4. Antiarrhythmic
      a. Such as lidocaine
    5. Beta blocker
      a. Selective
        (1) Such as metoprolol

b. Non-selective
(1) Such as propranolol
6. Vasopressor
a. Such as dopamine
7. Calcium channel blocker
a. Such as verapamil
8. Purine nucleoside
a. Such as adenosine
9. Platelet aggregate inhibitor
a. Such as aspirin
10. Alkalinizing agents
a. Such as sodium bicarbonate
11. Cardiac glycoside
a. Such as digitalis
12. Narcotic/ analgesic
a. Such as morphine
13. Diuretic
a. Such as furosemide
14. Nitrate
a. Such as nitroglycerin
15. Antihypertensive
a. Such as sodium nitroprusside

C. Electrical
1. Purpose
2. Methods
a. Synchronized cardioversion
b. Defibrillation
c. Cardiac pacing
(1) Implanted pacemaker functions
(a) Characteristics
(b) Pacemaker artifact
(c) ECG tracing of capture
(d) Failure to sense
i) ECG indications
ii) Clinical significance
(e) Failure to capture
i) ECG indications
ii) Clinical significance
(f) Failure to pace
i) ECG indications
ii) Clinical significance
(g) Pacer-induced tachycardia
i) ECG findings
ii) Clinical significance
iii) Treatment
(2) Transcutaneous pacing
(a) Criteria for use
(b) Bradycardia

i) Patient is hypotensive/ hypoperfusing
ii) No change with pharmacologic intervention
(c) Second degree AV block
i) Patient is hypotensive/ hypoperfusing
ii) No change with pharmacologic intervention
(d) Complete AV block
i) Patient is hypotensive/ hypoperfusing
ii) No change with pharmacologic intervention
(e) Asystole
(f) Overdrive
i) Deter occurrence of recurrent tachycardia

d. Set-up
(1) Placement of electrodes
(2) Rate and milliampere (mA) settings
(3) Pacer artifact
(4) Capture
(5) Failure to sense
(a) Causes
(b) Implications
(c) Interventions
(6) Failure to capture
(a) Causes
(b) Implications
(c) Interventions
(7) Failure to pace
(a) Causes
(b) Implications
(c) Interventions
(8) Hazards
(9) Complications
(a) Interventions

D. Transport
1. Indications for rapid transport
2. Indications for no transport required
3. Indications for referral

E. Support and communications strategies
1. Explanation for patient, family, significant others
2. Communications and transfer of data to the physician

VII. Angina pectoris

A. Epidemiology
1. Precipitating causes
a. Atherosclerosis
b. Vasospastic (Prinzmetal's)

B. Morbidity/ mortality
1. Not a self-limiting disease
2. Chest pain may dissipate, but myocardial ischemia and injury can continue
3. A single anginal episode may be a precursor to myocardial infarction

4. May not be cardiac in origin
5. Must be diagnosed by a physician
6. Related terminology
   a. Defined as a brief discomfort, has predictable characteristics and is relieved promptly - no change in this pattern
   b. Stable
      (1) Occurs at a relative fixed frequency
      (2) Usually relieved by rest and/ or medication
   c. Unstable
      (1) Occurs without fixed frequency
      (2) May or may not be relieved by rest and/ or medication
   d. Initial - first episode
   e. Progressive - accelerating in frequency and duration
   f. Preinfarction angina
      (1) Pain at rest
      (2) Sitting or lying down
7. Differential diagnoses
   a. Cholecystitis
   b. Acute viral pericarditis or any other inflammatory cardiac disease
   c. Aneurysm
   d. Hiatal hernia
   e. Esophageal disease
   f. Gastric reflux
   g. Pulmonary embolism
   h. Peptic ulcer disease
   i. Pancreatitis
   j. Chest wall syndrome
   k. Costochondritis
   l. Acromioclavicular disease
   m. Pleural irritation
   n. Respiratory infections
   o. Aortic dissection
   p. Pneumothorax
   q. Dyspepsia
   r. Herpes zoster
   s. Chest wall tumors
   t. Chest wall trauma

C. Initial assessment findings
   1. Airway/ breathing
      a. Labored breathing may or may not be present
   2. Circulation
      a. Peripheral pulses
         (1) Quality
         (2) Rhythm
      b. Changes in skin
         (1) Color
         (2) Temperature
         (3) Moisture

D. Focused history
   1. Chief complaint
      a. Typical - sudden onset of discomfort, usually of brief duration, lasting three to five minutes, maybe five to 15 minutes; never 30 minutes to two hours
      b. Typical - usually relieved by rest and/ or medication
      c. Epigastric pain or discomfort
      d. Atypical
   2. Denial
   3. Contributing history
      a. Initial recognized event
      b. Recurrent event
      c. Increasing frequency and/ or duration of event

E. Detailed physical exam
   1. Airway
   2. Breathing
      a. May or may not be labored
         (1) Sounds
            (a) May be clear to auscultation
            (b) May be congested in the bases
   3. Circulation
      a. Alterations in heart rate and rhythm may occur
      b. Peripheral pulses are usually not affected
      c. Blood pressure may be elevated during the episode and normalize afterwards
      d. ECG Devices
         (1) Monitor
         (2) Transmission
         (3) Documentation
         (4) Computerized pattern identification
            (a) Pitfalls
            (b) Common errors
      e. Findings
         (1) ST segment changes are often not specific
         (2) Arrhythmias and ectopy may not be present

F. Management
   1. Position of comfort
   2. Pharmacological
      a. Gases
      b. Nitrates
      c. Analgesics
      d. Possible antiarrhythmic
      e. Possible antihypertensives
   3. ECG
      a. Whenever possible, and scene time is not delayed, record and transmit 3-lead and/ or 12-lead ECG during pain, since ECG may be normal during the pain-free period
      b. Measure, record and communicate ST segment changes
   4. Transport
      a. Indications for rapid transport

(1) Sense of urgency for reperfusion
(2) No relief with medications
(3) Hypotension/ hypoperfusion
(4) Significant changes in ECG

b. No transport
(1) Patient refusal
(2) Referral

G. Support and communications strategies
1. Explanation for patient, family, significant others
2. Communications and transfer of data to the physician

VIII. Myocardial infarction
A. Epidemiology
1. Precipitating causes (as with angina)
a. Atherosclerosis
b. Persistent angina
c. Occlusion
d. Non-traumatic
(1) Recreational drugs
e. Trauma

B. Morbidity/ mortality
1. Sudden death
2. Extensive myocardial damage
3. May result in ventricular fibrillation
a. Prevention strategies
(1) Relieve pain
(2) Effect reperfusion

C. Initial assessment findings
1. Airway/ breathing
a. Labored breathing may or may not be present
2. Circulation
a. Peripheral pulses
(1) Quality
(2) Rhythm
b. Changes in skin
(1) Color
(2) Temperature
(3) Moisture

D. Focused history
1. Chief complaint
a. Typical onset of discomfort, usually of long duration, over 30 minutes
b. Typically unrelieved by rest and/ or nitroglycerin preparation
c. Epigastric pain or discomfort
d. Atypical
2. Contributing history
a. First time
b. Recurrent
c. Increasing frequency and/ or duration

3. Denial

E. Detailed physical exam
   1. Airway
   2. Breath sounds
      a. May be clear to auscultation
      b. Congestion in bases may be present
   3. Circulation
      a. Skin
         (1) Pallor during the episode
         (2) Temperature may vary
         (3) Diaphoresis is usually present
      b. Alterations in heart rate and rhythm may occur
      c. Peripheral pulses are usually not affected
      d. Blood pressure may be elevated or lowered
      e. ECG findings
         (1) ST segment elevation
            (a) Height, depth and contour
            (b) ST changes
            (c) ST segment depression in reciprocal leads
         (2) Q waves
            (a) Depth, duration and significance
               i) Greater than 5 mm, greater than .04 seconds
               ii) May indicate necrosis
               iii) May indicate extensive transient ischemia
         (3) ECG Rhythm analysis
            (a) Criteria for patient selection for rapid transport and reperfusion
            (b) Value
            (c) Signs of acute ischemia, injury, and necrosis
            (d) Criteria for patient selection for rapid transport and reperfusion
               i) Time of onset of pain
               ii) Location of ischemia and infarction
               iii) ST segment elevation
         (4) Cardiac arrhythmias
            (a) Sinus tachycardia with or without ectopy
            (b) Narrow or wide QRS complex tachycardia
            (c) Sinus bradycardia
            (d) Heart blocks
            (e) Ventricular fibrillation
            (f) Pulseless electrical activity (PEA)
            (g) Asystole (confirmed in a second lead)

F. Management
   1. Position of comfort
   2. Pharmacological
      a. Gases
      b. Nitrates
      c. Platelet aggregate inhibitor
      d. Analgesia
      e. Increase or decrease heart rate

f. Possible antiarrhythmic
g. Possible antihypertensives

3. Electrical
   a. Constant ECG monitoring
   b. Defibrillation/ synchronized cardioversion
   c. Transcutaneous pacing
4. Transport
   a. Criteria for rapid transport
      (1) No relief with medications
         (a) Hypotension/ hypoperfusion
         (b) Significant changes in ECG
            i) Ectopy
            ii) Arrhythmias
   b. ECG criteria for rapid transport and reperfusion
      (1) Time of onset of pain
      (2) ECG rhythm abnormalities
   c. Indications for "no transport"
      (1) Refusal
      (2) No other indications for no-transport
5. Support and communications strategies
      (1) Explanation for patient, family, significant others
      (2) Communications and transfer of data to the physician

IX. Heart failure
   A. Epidemiology
      1. Precipitating causes
         a. Left sided failure
         b. Right sided failure
         b. Myocardial infarction
         c. Pulmonary embolism
         d. Hypertension
         e. Cardiomegaly
         f. High output failure
         g. Low output failure
      2. Related terminology
         a. Preload
         b. Afterload
         c. Congestive heart failure
            (1) Loss of contractile ability which results in fluid overload
         d. Chronic versus acute
            (1) First time event
            (2) Multiple events
   B. Morbidity/ mortality
      1. Pulmonary edema
      2. Respiratory failure
      3. Death
   C. Initial assessment
      1. Airway/ breathing

a. Labored breathing may or may not be present
2. Circulation
a. Peripheral pulses
(1) Quality
(2) Rhythm
b. Changes in skin
(1) Color
(2) Temperature
(3) Moisture

D. Focused history
1. Chief complaint
a. Progressive or acute SOB
b. Progressive accumulation of edema
c. Weight gain over short period of time
d. Episodes of paroxysmal nocturnal dyspnea
e. Medication history
(1) Prescribed
(a) Compliance
(b) Non-compliance
(2) Borrowed
(3) Over-the-counter
f. Home oxygen use

E. Detailed physical exam
1. Level of consciousness
a. Unconscious
b. Altered levels of consciousness
2. Airway/ breathing
a. Dyspnea
b. Productive cough
c. Labored breathing
(1) Most common, often with activity
(2) Paroxysmal nocturnal dyspnea (PND)
(3) Tripod position
(4) Adventitious sounds
(5) Retraction
3. Circulation
a. Heart rate/ rhythm
(1) Any tachycardia with ectopy
(2) Any bradycardia with ectopy
(3) Atrial arrhythmias
b. Changes in skin
(1) Color
(2) Temperature
(3) Moisture
c. Peripheral pulses
(1) Quality
(2) Rhythm
d. Edema

(1) Pitting versus non-pitting
(2) Extremities
(a) Localized in ankles
(b) To the midcalf
(c) To the knees
(d) Obliteration of pulses
(3) Ascites
(a) Engorged mass(es) in upper abdominal quadrants
(4) Sacral

F. Complications
1. Pulmonary edema
a. Signs and symptoms
(1) Tachypnea
(2) Wheezing
(3) Rales at both bases
(4) Elevated jugular venous pressure
(5) Pulsus paradoxus
(6) Rapid "thready" pulse
(7) Pulsus alternans
(8) Abnormalities of apical pulse
(a) Due to displaced cardiac apex
(b) Abnormal bulges
(9) Cyanosis in advanced stages
(10) Frothy sputum

G. Management
1. Position of comfort
2. Pharmacological
a. Gases
b. Afterload reduction
c. Analgesia
d. Diuresis
e. Other
3. Transport
a. Refusal
b. No other indications for no-transport

H. Support and communications strategies
1. Explanation for patient, family, significant others
2. Communications and transfer of data to the physician

X. Cardiac tamponade
A. Pathophysiology
1. Defined as impaired diastolic filling of the heart caused by increased intrapericardiac pressure
2. Precipitating causes
a. Gradual onset with neoplasm or infection
b. Acute onset with infarction
c. Trauma
(1) Can occur with CPR
(2) Penetrating injury

(3) Non-penetrating injury
d. Secondary to renal disease
e. Hypothyroidism

B. Morbidity/ mortality
1. Death if not relieved

C. Initial assessment
1. Airway/ breathing
a. Labored breathing may or may not be present
2. Circulation
a. Peripheral pulses
(1) Quality
(2) Rhythm
b. Changes in skin
(1) Color
(2) Temperature
(3) Moisture

D. Focused history (as in precipitating causes)

E. Detailed physical examination
1. Airway/ breathing
a. Dyspnea
b. Orthopnea
2. Circulation
a. Pulse rate and rhythm
b. Chest pain
c. Tachycardia
d. Ectopy
e. Elevated venous pressures (early sign)
f. Decreased systolic pressure (early sign)
g. Narrowing pulse pressure (early sign)
h. Pulsus paradoxus
i. Heart sounds normal early on, progressively faint or muffled
j. ECG changes
(1) Low voltage QRS and T waves
(2) ST elevation or non-specific T wave changes
(3) Electrical alternans of PQRST
(4) Usually inconclusive - should not be used as a diagnostic tool

F. Management
1. Airway management and ventilation
2. Circulation
3. Pharmacological
4. Non-pharmacological
5. Rapid transport for pericardiocentesis

G. Support and communications strategies
1. Explanation for patient, family, significant others
2. Communications and transfer of data to the physician

XI. Hypertensive emergencies
A. Epidemiology

1. Precipitating causes
    a. History of hypertension
    b. Non-compliance with medication or any other treatment
    c. Toxemia of pregnancy

B. Morbidity/ mortality
    a. Hypertensive encephalopathy
    b. Stroke

C. Initial assessment
    1. Airway/ breathing
        a. Labored breathing may or may not be present
    2. Circulation
        a. Peripheral pulses
            (1) Quality
            (2) Rhythm
        b. Changes in skin
            (1) Color
            (2) Temperature
            (3) Moisture

D. Focused history
    1. Chief complaint
        a. As in precipitating causes above
    2. Medication history
        a. Prescribed
            (1) Compliance
            (2) Non-compliance with medication or treatment
        b. Borrowed
        c. Over-the-counter
    3. Home oxygen use

E. Detailed physical examination
    1. Airway
    2. Breath sounds
    3. Circulation
        a. Pulse
        b. Vital signs
            (1) Blood pressure
                (a) Systolic greater than 160 mmHg
                (b) Diastolic greater than 94 mmHg
    4. Diagnostic signs/ symptoms
        a. General appearance
        b. Level of consciousness
            (1) Unconscious
            (2) Altered level of consciousness
            (3) Responsive
        c. Skin color
            (1) Can be pallor, flushed, or normal
        d. Skin hydration
            (1) Can be dry or moist
        e. Skin temperature

(1) Can be warm or cool
f. Peripheral pulses
(1) Can be strong
g. Edema
(1) Pitting versus non-pitting
h. Paroxysmal nocturnal dyspnea
i. Labored breathing (SOB)
j. Orthopnea
k. Vertigo
l. Epistaxis
m. Tinnitus
n. Changes in visual acuity
o. Nausea/ vomiting
p. Seizures
q. Lateralizing signs
r. ECG findings

F. Management
1. Non-pharmacologic
a. Position of comfort
b. Airway and ventilation
2. Pharmacological
a. Gases
b. Other
3. Rapid transport
a. Refusal
b. No other indications for no transport

G. Support and communications strategies
1. Explanation for patient, family, significant others
2. Communications and transfer of data to the physician

XII. Cardiogenic shock
A. Pathophysiology
1. Precipitating causes
a. Myocardial infarction
(1) Can be acute or progressive
b. Age
(1) Progressive
c. Trauma

B. Initial assessment
1. Airway/ breathing
a. Labored breathing may or may not be present
2. Circulation
a. Peripheral pulses
(1) Quality
(2) Rhythm
b. Changes in skin
(1) Color
(2) Temperature

(3) Moisture

C. Focused history
   1. Chief complaint
      a. As in precipitating causes above
   2. Medication history
      a. Prescribed
         (1) Compliance
         (2) Non-compliance
      b. Borrowed
      c. Over-the-counter

D. Detailed physical exam
   1. Critical findings
      a. Unconscious
      b. Altered levels of consciousness
      c. Airway
         (1) Dyspnea
         (2) Productive cough
         (3) Labored breathing
            (a) Paroxysmal nocturnal dyspnea (PND)
            (b) Tripod position
            (c) Adventitious sounds
            (d) Retraction
      d. ECG rhythm analysis
         (1) Any tachycardia
         (2) Atrial arrhythmias
         (3) Ectopics
      e. Changes in skin
         (1) Color
         (2) Temperature
         (3) Moisture
      f. Peripheral pulses
         (1) Quality
         (2) Rhythm
      g. Edema
         (1) Pitting versus non-pitting
         (2) Extremities
            (a) Obliteration of pulses
         (3) Sacral

E. Management
   1. Position of comfort
      a. May prefer sitting upright with legs in dependent position
   2. Pharmacological
      a. Gases
      b. Vasopressor
      c. Analgesia
      d. Diuretics
      e. Glycoside
      f. Sympathetic agonist

g. Alkalinizing agent
h. Other

F. Transport
1. Refusal
2. No other indications for no transport

G. Support and communications strategies
1. Explanation for patient, family, significant others
2. Communications and transfer of data to the physician

XIII. Cardiac arrest

A. Pathophysiology
1. Precipitating causes
a. Trauma
b. Medical conditions (for example)
(1) End stage renal disease
(2) Hyperkalemia with renal disease

B. Initial assessment
1. Critical findings
a. Unresponsive
b. Apneic
c. Heart rate/ rhythm
(1) Ventricular fibrillation
(2) Ventricular tachycardia
(3) Asystole
(4) PEA
d. Peripheral pulses
(1) None

C. Focused history
1. Witnessed event
2. Witnessed by EMS personnel
3. Bystander cardiopulmonary resuscitation (CPR)
4. Time from discovery to activation of CPR
5. Time from discovery to activation of EMS
6. Past medical history

D. Management
1. Related terminology
a. Resuscitation - to provide efforts to return spontaneous pulse and breathing to the patient in full cardiac arrest
b. Survival - patient is resuscitated and survives to hospital discharge
c. Return of spontaneous circulation (ROSC) - patient is resuscitated to the point of having pulse without CPR; may or may not have return of spontaneous respirations; patient may or may not go on to survive
2. Indications for NOT initiating resuscitative techniques
a. Signs of obvious death
(1) For example - rigor; fixed lividity; decapitation
b. Local protocol
(1) For example - out-of-hospital advance directives
3. Advanced airway management and ventilation

4. Circulation
    a. CPR in conjunction with defibrillation
    b. IV therapy
    c. Defibrillation
    d. Pharmacological
        (1) Gases (oxygen)
        (2) Sympathetic
        (3) Anticholinergic
        (4) Antiarrhythmic
        (5) Vasopressor
        (6) Alkalinizing agents
        (7) Parasympatholytic
5. Rapid transport
6. Support and communications strategies
    a. Explanation for patient, family, significant others
    b. Communications and transfer of data to the physician

E. Termination of resuscitation
1. Inclusion criteria (for example)
    a. 18 years old or older
    b. Arrest is presumed cardiac in origin and not associated with a condition potentially responsive to hospital treatment (for example - hypothermia, drug overdose, toxicologic exposure, etc.)
    c. Endotracheal intubation has been successfully accomplished and maintained
    d. Standard advanced cardiac life support (ACLS) measures have been applied throughout the resuscitative effort
    e. On-scene ALS resuscitation efforts have been sustained for 25 minutes or the patient remains in asystole through four rounds of appropriate ALS drugs
    f. Patient has a cardiac rhythm of asystole or agonal rhythm at the time the decision to terminate is made and this rhythm persists until the arrest is actually terminated
    g. Victims of blunt trauma in arrest whose presenting rhythm is asystole, or who develop asystole while on scene
2. Exclusion criteria - for example
    a. Under the age of 18 years
    b. Etiology for which specific in-hospital treatment may be beneficial
    c. Persistent or recurrent ventricular tachycardia or fibrillation
    d. Transient return of pulse
    e. Signs of neurological viability
    f. Arrest was witnessed by EMS personnel
    g. Family or responsible party opposed to termination
3. Criteria NOT to be considered as inclusionary or exclusionary
    a. Patient age - for example, geriatric
    b. Time of collapse prior to EMS arrival
    c. Presence of a non-official do-not-resuscitate (DNR) order
    d. "Quality of life" valuations
4. Procedures (according to local protocol)
    a. Direct communication with on-line medical direction
        (1) Medical condition of the patient
        (2) Known etiologic factors

(3) Therapy rendered
(4) Family present and apprised of the situation
(5) Communicate any resistance or uncertainty on the part of the family
(6) Maintain continuous documentation to include the ECG
(7) Mandatory review after the event
(a) Grief support (according to local protocol)
i) EMS assigned personnel
ii) Community agency referral
(b) Law enforcement (according to local protocol)
i) On-scene determination if the event/ patient requires assignment of the patient to the medical examiner
ii) On-scene law enforcement communicates with attending physician for the death certificate
iii) If there is any suspicion about the nature of the death, or if the physician refuses or hesitates to sign the death certificate
iv) No attending physician is identified (the patient will be assigned to the medical examiner)

XIV. Vascular disorders
A. Epidemiology
1. Trauma
2. Non-traumatic
a. Precipitating causes
(1) Atherosclerosis
(2) Aneurysm
(a) Atherosclerotic
(b) Dissecting
i) Cystic medial necrosis
(c) Infections
(d) Congenital
(3) Marfan's syndrome
(4) Inflammation
(a) Arterial
(b) Peripheral arterial atherosclerotic disease
(5) Occlusive disease
(a) Trauma
(b) Thrombosis
(c) Tumor
(d) Embolus
(e) Idiopathic
(6) Venous thrombosis
(a) Phlebitis
(b) Varicose veins
B. Morbidity/ mortality
1. Pulmonary occlusion
2. Cerebral occlusion
3. Mesenteric occlusion

4. Hypoperfusion state
5. Death

C. Initial assessment findings
   1. Airway/ breathing
      a. Usually not affected
   2. Circulation (distal to or over the affected area)
      a. Pain
      b. Pallor
      c. Pulselessness
      d. Paralysis
      e. Paresthesia
   3. Skin
      a. Pallor or mottled distal to or over the affected area
      b. Skin temperature may vary

D. Focused history
   1. Chief complaint
      a. Sudden or gradual onset of discomfort
      b. May be localized
      c. Pain
         (1) Chest, abdominal or involved extremity
            (a) Sudden or gradual
            (b) Radiating or localized
            (c) Claudication
         (2) Relief with rest or not
   2. Contributing history
      a. Initial recognized event
      b. Recurrent event
      c. Increasing frequency and/ or duration of event

E. Detailed physical exam
   1. Airway
   2. Breath sounds
      a. May be clear to auscultation
   3. Circulation
      a. Alterations in heart rate and rhythm may occur
      b. Peripheral pulses absent or diminished over the affected extremity
      c. Blood pressure
         (1) Unequal BP readings in each arm
            (a) May indicate high thoracic aneurysm
      d. Bruit over affected vessel(s)
      e. Skin
         (1) May be cool reflecting diminished circulation to the affected area or extremity
         (2) May be moist or dry reflecting diminished circulation to the affected area or extremity
      f. ECG findings may be non contributory
         (1) Arrhythmias and ectopy may not be present
   4. Management
      a. Position of comfort

b. Pharmacological
   (1) Gases
   (2) Analgesics
c. Transport
   (1) Indications for rapid transport
      (a) No relief with medications
      (b) Hypotension/ hypoperfusion
   (2) No transport
      (a) Refusal
      (b) Relief and refusal
d. Support and communications strategies
   (1) Explanation for patient, family, significant others
   (2) Communications and transfer of data to the physician

XV. Integration
   A. Apply pathophysiological principles to the assessment of a patient with cardiovascular disease
   B. Formulation of field impression; decisions based on
      1. Initial assessment
      2. Focused history
      3. Detailed physical examination
   C. Develop and execute a patient management plan based on field impression
      1. Initial management
         a. Airway support
         b. Ventilation support
         c. Circulation support
         d. Non-pharmacological
         e. Pharmacological
         f. Electrical
      2. On-going assessment
      3. Transport criteria
         a. Appropriate mode
         b. Appropriate facility
      4. Non-transport criteria
      5. Advocacy
      6. Communications
      7. Prevention
      8. Documentation
      9. Quality assurance

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UNIT TERMINAL OBJECTIVE

5-3 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement the treatment plan for the patient with a neurological problem.

COGNITIVE OBJECTIVES

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

5-3.1 Describe the incidence, morbidity and mortality of neurological emergencies. (C-1)
5-3.2 Identify the risk factors most predisposing to the nervous system. (C-1)
5-3.3 Discuss the anatomy and physiology of the organs and structures related to nervous system. (C-1)
5-3.4 Discuss the pathophysiology of non-traumatic neurologic emergencies. (C-1)
5-3.5 Discuss the assessment findings associated with non-traumatic neurologic emergencies. (C-1)
5-3.6 Identify the need for rapid intervention and the transport of the patient with non-traumatic emergencies. (C-1)
5-3.7 Discuss the management of non-traumatic neurological emergencies. (C-1)
5-3.8 Discuss the pathophysiology of coma and altered mental status. (C-1)
5-3.9 Discuss the assessment findings associated with coma and altered mental status. (C-1)
5-3.10 Discuss the management/ treatment plan of coma and altered mental status. (C-1)
5-3.11 Describe the epidemiology, including the morbidity/ mortality and prevention strategies, for seizures. (C-1)
5-3.12 Discuss the pathophysiology of seizures. (C-1)
5-3.13 Discuss the assessment findings associated with seizures. (C-1)
5-3.14 Define seizure. (C-1)
5-3.15 Describe and differentiate the major types of seizures. (C-3)
5-3.16 List the most common causes of seizures. (C-1)
5-3.17 Describe the phases of a generalized seizure. (C-1)
5-3.18 Discuss the pathophysiology of syncope. (C-1)
5-3.19 Discuss the assessment findings associated with syncope. (C-1)
5-3.20 Discuss the management/ treatment plan of syncope. (C-1)
5-3.21 Discuss the pathophysiology of headache. (C-1)
5-3.22 Discuss the assessment findings associated with headache. (C-1)
5-3.23 Discuss the management/ treatment plan of headache. (C-1)
5-3.24 Describe the epidemiology, including the morbidity/ mortality and prevention strategies, for neoplasms. (C-1)
5-3.25 Discuss the pathophysiology of neoplasms. (C-1)
5-3.26 Describe the types of neoplasms. (C-1)
5-3.27 Discuss the assessment findings associated with neoplasms. (C-1)
5-3.28 Discuss the management/ treatment plan of neoplasms. (C-1)
5-3.29 Define neoplasms. (C-1)
5-3.30 Recognize the signs and symptoms related to neoplasms. (C-1)
5-3.31 Correlate abnormal assessment findings with clinical significance in the patient with neoplasms. (C-3)
5-3.32 Differentiate among the various treatment and pharmacological interventions used in the management of neoplasms. (C-3)
5-3.33 Integrate the pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with neoplasms. (C-3)
5-3.34 Describe the epidemiology, including the morbidity/ mortality and prevention strategies, for abscess. (C-1)
5-3.35 Discuss the pathophysiology of abscess. (C-1)
5-3.36 Discuss the assessment findings associated with abscess. (C-1)
5-3.37 Discuss the management/ treatment plan of abscess. (C-1)

5-3.38 Define abscess. (C-1)
5-3.39 Recognize the signs and symptoms related to abscess. (C-1)
5-3.40 Correlate abnormal assessment findings with clinical significance in the patient with abscess. (C-3)
5-3.41 Differentiate among the various treatment and pharmacological interventions used in the management of abscess. (C-3)
5-3.42 Integrate the pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with abscess. (C-3)
5-3.43 Describe the epidemiology, including the morbidity/ mortality and prevention strategies, for stroke and intracranial hemorrhage. (C-1)
5-3.44 Discuss the pathophysiology of stroke and intracranial hemorrhage. (C-1)
5-3.45 Describe the types of stroke and intracranial hemorrhage. (C-1)
5-3.46 Discuss the assessment findings associated with stroke and intracranial hemorrhage. (C-1)
5-3.47 Discuss the management/ treatment plan of stroke and intracranial hemorrhage. (C-1)
5-3.48 Define stroke and intracranial hemorrhage. (C-1)
5-3.49 Recognize the signs and symptoms related to stroke and intracranial hemorrhage. (C-1)
5-3.50 Correlate abnormal assessment findings with clinical significance in the patient with stroke and intracranial hemorrhage. (C-3)
5-3.51 Differentiate among the various treatment and pharmacological interventions used in the management of stroke and intracranial hemorrhage. (C-3)
5-3.52 Integrate the pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with stroke and intracranial hemorrhage. (C-3)
5-3.53 Describe the epidemiology, including the morbidity/ mortality and prevention strategies, for transient ischemic attack. (C-3)
5-3.54 Discuss the pathophysiology of transient ischemic attack. (C-1)
5-3.55 Discuss the assessment findings associated with transient ischemic attack. (C-1)
5-3.56 Discuss the management/ treatment plan of transient ischemic attack. (C-1)
5-3.57 Define transient ischemic attack. (C-1)
5-3.58 Recognize the signs and symptoms related to transient ischemic attack. (C-1)
5-3.59 Correlate abnormal assessment findings with clinical significance in the patient with transient ischemic attack. (C-3)
5-3.60 Differentiate among the various treatment and pharmacological interventions used in the management of transient ischemic attack. (C-3)
5-3.61 Integrate the pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with transient ischemic attack. (C-3)
5-3.62 Describe the epidemiology, including the morbidity/ mortality and prevention strategies, for degenerative neurological diseases. (C-1)
5-3.63 Discuss the pathophysiology of degenerative neurological diseases. (C-1)
5-3.64 Discuss the assessment findings associated with degenerative neurological diseases. (C-1)
5-3.65 Discuss the management/ treatment plan of degenerative neurological diseases. (C-1)
5-3.66 Define the following: (C-1)
- a. Muscular dystrophy
- b. Multiple sclerosis
- c. Dystonia
- d. Parkinson's disease
- e. Trigeminal neuralgia
- f. Bell's palsy
- g. Amyotrophic lateral sclerosis

h. Peripheral neuropathy
i. Myoclonus
j. Spina bifida
k. Poliomyelitis

5-3.67 Recognize the signs and symptoms related to degenerative neurological diseases. (C-1)
5-3.68 Correlate abnormal assessment findings with clinical significance in the patient with degenerative neurological diseases. (C-3)
5-3.69 Differentiate among the various treatment and pharmacological interventions used in the management of degenerative neurological diseases. (C-3)
5-3.70 Integrate the pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with degenerative neurological diseases. (C-3)
5-3.71 Integrate the pathophysiological principles of the patient with a neurological emergency. (C-3)
5-3.72 Differentiate between neurological emergencies based on assessment findings. (C-3)
5-3.73 Correlate abnormal assessment findings with the clinical significance in the patient with neurological complaints. (C-3)
5-3.74 Develop a patient management plan based on field impression in the patient with neurological emergencies. (C-3)

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

5-3.75 Characterize the feelings of a patient who regains consciousness among strangers. (A-2)
5-3.76 Formulate means of conveying empathy to patients whose ability to communicate is limited by their condition. (A-3)

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

5-3.77 Perform an appropriate assessment of a patient with coma or altered mental status. (P-3)
5-3.78 Perform a complete neurological examination as part of the comprehensive physical examination of a patient with coma or altered mental status. (P-3)
5-3.79 Appropriately manage a patient with coma or altered mental status, including the administration of oxygen, oral glucose, 50% dextrose and narcotic reversal agents. (P-3)
5-3.80 Perform an appropriate assessment of a patient with syncope. (P-3)
5-3.81 Appropriately manage a patient with syncope. (P-3)
5-3.82 Perform an appropriate assessment of a patient with seizures. (P-3)
5-3.83 Appropriately manage a patient with seizures, including the administration of diazepam or lorazepam. (P-3)
5-3.84 Perform an appropriate assessment of a patient with stroke and intracranial hemorrhage or TIA. (P-3)
5-3.85 Appropriately manage a patient with stroke and intracranial hemorrhage or TIA. (P-3)
5-3.86 Demonstrate an appropriate assessment of a patient with a chief complaint of weakness. (P-3)

DECLARATIVE

I. Introduction
  A. Epidemiology
    1. Incidence
    2. Mortality/ morbidity
    3. Risk factors
    4. Prevention strategies
    5. Anatomy and physiology review

II. General system pathophysiology, assessment and management
  A. Physiology
    1. Alterations in cognitive systems
    2. Alterations in cerebral homeostasis
    3. Alterations in motor control
    4. Central nervous system disorders
      a. Trauma
      b. Cerebrovascular disorders
      c. Tumors
      d. Infection
      e. Inflammation
      f. Degenerative diseases
      g. Hydrocephalus
    5. Peripheral nervous system disorders
    6. Neuromuscular junction disorders
  B. Assessment findings
    1. History
      a. General health
      b. Previous medical conditions
      c. Medications
      d. Previous experience with complaint
      e. Time of onset
      f. Seizure activity
    2. Physical
      a. General appearance
      b. Assess for level of consciousness
        (1) Mood
        (2) Thought
        (3) Perceptions
        (4) Judgment
        (5) Memory and attention
      c. Speech
      d. Skin
      e. Posture and gait
      f. Vital signs
        (1) Hypertension
        (2) Hypotension

(3) Heart rate/ fast or slow
(4) Ventilation rate/ quality
(5) Temperature/ fever

g. Head/ neck
(1) Facial expression
(2) Eyes
(a) Acuity
(b) Fields
(c) Position & alignment
(d) Iris
(e) Pupils
(f) Extraocular muscles
(3) Ears
(a) Auditory acuity
(4) Nose
(5) Mouth
(a) Odors on breath

h. Thorax and lungs
(1) Auscultate

i. Cardiovascular
(1) Heart rate
(2) Rhythm
(3) Bruits
(4) Jugular vein pressure
(5) Auscultation
(6) ECG monitoring

j. Abdomen

k. Nervous
(1) Cranial nerves
(2) Motor system
(a) Muscle tone
(b) Muscle strength
(c) Flexion
(d) Extension
(e) Grip
(f) Coordination

l. Assessment tools
(1) Pulse oximetry
(2) End tidal CO_2
(3) Blood glucose

3. Ongoing assessment

C. Management
1. Airway and ventilatory support
a. Oxygen
b. Positioning
c. Assisted ventilation
d. Suction

e. Advanced airway device
2. Circulatory support
a. Venous access
b. Blood analysis
3. Non-pharmacological interventions
a. Positioning
b. Spinal precautions
4. Pharmacological interventions
a. Antianxiety agent
b. Anticonvulsant
c. Antiinflammatories
d. Diuretic
e. Sedative-hypnotic
f. Skeletal muscle relaxant
g. Hyperglycemic
h. Antihypoglycemic
i. Vitamin
j. Emetic
5. Psychological support
6. Transport considerations
a. Appropriate mode
b. Appropriate facility

III. Specific injuries/ illnesses
A. Stroke and intracranial hemorrhage
1. Epidemiology
a. Incidence
b. Mortality/ morbidity
c. Risk factors
d. Prevention strategies
e. Anatomy and physiology review
2. Pathophysiology of regional disruption of cerebral blood flow
a. Thrombus
b. Hemorrhage
(1) Subarachnoid
(2) Intracerebral
(3) Cerebellar
c. Embolus
3. Assessment findings
a. History
(1) General health
(2) Previous medical conditions
(3) Medications
(4) Previous experience with complaint
(5) Time of onset
(6) Seizure activity
(7) Headache

(8) Nose bleed
(9) Others

b. Physical
(1) Standard physical exam for the patient with potential neurological event

4. Management
a. Airway and ventilatory support
(1) Oxygen
(2) Positioning
(3) Assisted ventilation
(4) Suction
(5) Advanced airway device
b. Circulatory support
(1) Venous access
(2) Blood analysis
c. Non-pharmacological interventions
(1) Positioning
(2) Spinal precautions
d. Pharmacological interventions
(1) Anticonvulsants
(2) Antiinflammatories
(3) Vasodilator
(4) Diuretic
(5) Skeletal muscle relaxant
(6) Hyperglycemic
(7) Antihypoglycemic
(8) Vitamin
(9) Thrombolytics
(10) Neuroprotectives
e. Psychological support
f. Transport considerations
(1) Appropriate mode
(2) Appropriate facility

B. Transient ischemic attack
1. Epidemiology
a. Incidence
b. Mortality/ morbidity
c. Risk factors
d. Prevention strategies
e. Anatomy and physiology review
2. Pathophysiology
a. Transient neurological deficits
b. Partial disruptions of blood flow
(1) Hemorrhagic
(2) Vasospasm
(3) Subarachnoid
(4) Intracerebral
(5) Cerebellar

c. Partially occlusive
(1) Emboli
(2) Thrombi

3. Assessment findings
a. History
(1) General health
(2) Previous medical conditions
(3) Medications
(4) Previous experience with complaint
(5) Time of onset
(6) Seizures
(7) Headache
(8) Nosebleed
b. Physical
(1) Standard physical exam for patient with potential neurological event

4. Management
a. Airway and ventilatory support
(1) Oxygen
(2) Positioning
(3) Assisted ventilation
(4) Suction
(5) Advanced airway device
b. Circulatory support
(1) Venous access
(2) Blood analysis
c. Non-pharmacological interventions
(1) Positioning
(2) Spinal precautions
d. Pharmacological interventions
(1) Anticonvulsants
(2) Antiinflammatories
(3) Diuretic
(4) Skeletal muscle relaxant
(5) Hyperglycemic
(6) Anti-hypoglycemic
(7) Vitamin
e. Psychological support
f. Transport considerations
(1) Appropriate mode
(2) Appropriate facility

C. Epilepsy/ Seizures
1. Epidemiology
a. Incidence
b. Mortality/ morbidity
c. Risk factors
d. Prevention strategies
e. Anatomy and physiology review

2. Pathophysiology
   a. Unexpected electrical discharge of neurons in brain
   b. Types
      (1) Generalized
         (a) Grand mal (tonic-clonic)
            i) Preictal phase (aura)
            ii) Tonic phase
            iii) Clonic phase
            iv) Postictal phase
         (b) Tonic
         (c) Clonic
         (d) Petit mal
      (2) Partial
         (a) Simple partial (e.g., Jacksonian)
         (b) Complex partial (e.g., psychomotor or temporal lobe)
      (3) Status epilepticus
   c. Causes other than epilepsy
      (1) Idiopathic
      (2) Fever
      (3) Neoplasms
      (4) Infection
      (5) Metabolic
         (a) Hypoxia
         (b) Hypoglycemia
         (c) Thyrotoxicosis
         (d) Hypocalcemia
      (6) Drug intoxication
      (7) Drug withdrawal
      (8) Head trauma
      (9) Eclampsia
      (10) Cerebral degenerative diseases
3. Assessment findings
   a. History
      (1) General health
      (2) Previous medical conditions
      (3) Medications
      (4) Previous seizures
      (5) Time of onset
      (6) Seizure activity
         (a) Duration
         (b) Number of events
         (c) Consciousness between
   b. Physical
      (1) Standard physical exam for patient with potential neurological event
      (2) Pertinent findings
         (a) Tongue laceration(s)
         (b) Head

i) Hemorrhage
ii) Wounds
(c) GI/ GU
i) Incontinence of bladder
ii) Incontinence of bowel

4. Management
   a. Airway and ventilatory support
      (1) Oxygen
      (2) Positioning
      (3) Assisted ventilation
      (4) Suction
      (5) Advanced airway device
   b. Circulatory support
      (1) Venous access
      (2) Blood analysis
   c. Non-pharmacological interventions
      (1) Protection from injury
      (2) Positioning
      (3) Spinal precautions
   d. Pharmacological interventions
      (1) Anticonvulsants
      (2) Antiinflammatories
      (3) Skeletal muscle relaxant
      (4) Hyperglycemic
      (5) Anti-hypoglycemic
      (6) Vitamin
   e. Psychological support
   f. Transport considerations
      (1) Appropriate mode
      (2) Appropriate facility

D. Syncope
   1. Pathophysiology
      a. Brief loss of consciousness caused by transient cerebral hypoxia
      b. Caused by lack of oxygen, glucose or seizure activity in the brain
   2. Assessment findings
      a. Perceived as a sensation of light-headedness
   3. Management
      a. Differentiate possible causes
         (1) Seizure
         (2) Other
      b. Airway management
      c. Oxygen
      d. Reassure
      e. Treat underlying cause

E. Headache
   1. Epidemiology
      a. Incidence

b. Mortality/ morbidity
c. Risk factors
d. Prevention strategies
e. Anatomy and physiology review

2. Pathophysiology
   a. Primary
      (1) Continuum of tension and migraine
   b. Cluster
      (1) Unknown
   c. General thoughts
      (1) Central serotonergic transmission abnormalities
      (2) Vascular structure inflammation
      (3) Neurogenic inflammation
      (4) Platelet aggregation with release of vasoactive substances
3. Assessment findings
   a. History
      (1) General health
      (2) Previous medical conditions
      (3) Medications
      (4) Previous experience with complaint
      (5) Time of onset
   b. Physical
      (1) Standard exam for patient with potential neurological event
4. Management
   a. Airway and ventilatory support
      (1) Oxygen
      (2) Positioning
      (3) Suction
      (4) Assisted ventilation
      (5) Suction
      (6) Advanced airway device
   b. Circulatory support
      (1) Venous access
      (2) Blood analysis
   c. Non-pharmacological interventions
      (1) General comfort measures
   d. Pharmacological interventions
      (1) Antiemetics
      (2) Rehydration
      (3) Pain control
   e. Psychological support
   f. Transport considerations
      (1) Appropriate mode
      (2) Appropriate facility

F. Neoplasms
   1. Epidemiology
      a. Incidence

b. Mortality/ morbidity
c. Risk factors
    (1) Genetics
    (2) Exposure to radiation
    (3) Tobacco
    (4) Occupational
    (5) Pollution
    (6) Medications
    (7) Diet
    (8) Viruses
d. Prevention strategies
e. Anatomy and physiology review

2. Pathophysiology
    a. Tumors
    b. Metabolic disorders
    c. Hematologic disorders
    d. Immunosuppression
    e. Psychosocial effects
    f. Staging
    g. Types
3. Assessment findings
    a. History
        (1) General health
        (2) Previous medical conditions
        (3) Medications
        (4) Previous experience with complaint
        (5) Time of onset
        (6) Seizure activity
        (7) Headache
        (8) Nosebleed
        (9) Type and timing of prior treatment
            (a) Chemotherapy
            (b) Radiation therapy
            (c) Holistic and other nontraditional approaches
            (d) Experimental treatment
    b. Physical
        (1) Standard physical exam for patient with potential neurological event
4. Management
    a. Airway and ventilatory support
        (1) Oxygen
        (2) Positioning
        (3) Assisted ventilation
        (4) Suction
        (5) Advanced airway device
    b. Circulatory support
        (1) Venous access
        (2) Blood analysis

c. Non-pharmacological interventions
(1) Positioning
(2) Spinal precautions
d. Pharmacological interventions
(1) Anticonvulsants
(2) Antiinflammatories
(3) Diuretic
(4) Skeletal muscle relaxant
(5) Hyperglycemic
(6) Antihypoglycemic
(7) Vitamin
e. Psychological support
f. Transport considerations
(1) Appropriate mode
(2) Appropriate facility

G. Abscess
1. Epidemiology
a. Incidence
b. Mortality/ morbidity
c. Risk factors
d. Prevention strategies
e. Anatomy and physiology review
2. Pathophysiology
3. Assessment findings
a. History
(1) General health
(2) Previous medical conditions
(3) Medications
(4) Previous experience with complaint
(5) Time of onset
(6) Seizure activity
(7) Headache
b. Physical
(1) Standard physical exam for patient with potential neurological event
4. Management
a. Airway and ventilatory support
(1) Oxygen
(2) Positioning
(3) Assisted ventilation
(4) Suction
(5) Advanced airway device
b. Circulatory support
(1) Venous access
(2) Blood analysis
c. Non-pharmacological interventions
(1) Positioning
d. Pharmacological interventions

e. Psychological support
f. Transport considerations
(1) Appropriate mode
(2) Appropriate facility

H. Degenerative neurological diseases
1. Epidemiology
a. Incidents
b. Mortality/ morbidity
c. Risk factors
d. Prevention strategies
e. Anatomy and physiology review
2. Pathophysiology
a. Muscular dystrophy
(1) Genetic disease
(a) DNA
(2) Degeneration of muscle fibers
(3) Biochemical defect
(4) Types
(a) Duchenne
(b) Fascioscapulohumeral
(c) Limb girdle
(d) Myotonic
(5) Effects on CNS
(6) Incidence
(7) Characteristics
b. Multiple sclerosis
(1) Inflammatory disease
(2) Immune disorder/ CNS myelin
(3) Demyelination of nerve sheaths
(4) Progressively deteriorate
(5) Effects on CNS
(6) Incidence
(7) Characteristics
c. Dystonia
(1) Alterations in muscle tone
(2) Inhibition of muscle
(3) Types
(a) Focal
(b) Secondary
(c) Torsion
(d) Spasm
(e) Tic
(4) Incidence
(5) Characteristics
(6) Iatrogenic
d. Parkinson's disease
(1) Degenerative disease basal ganglia

(2) Dopaminergic nigrostriatal pathway
(3) Primary and secondary disorders
(4) Incidence
  (a) Occurs after 40 years
  (b) Leading cause of neurologic disability >60 years
  (c) 130 in 100,000 persons
  (d) Estimated 500,000 in United States
(5) Characteristics

e. Central pain syndrome
(1) Trigeminal nerve infection or disease
(2) Tic douloureux
(3) Causes
  (a) Tumor
  (b) Lesions
  (c) Medications (phenothiazine)
(4) Incidents
(5) Characteristics

f. Bell's palsy
(1) Facial paralysis
(2) Causes
  (a) Post-trauma
  (b) Herpes simplex
  (c) Lyme disease
  (d) Idiopathic
(3) Incidence
  (a) Most common form of facial paralysis
  (b) 23 in 100,000 or 1 in 60 to 70 persons in a lifetime
(4) Characteristics

g. Amyotrophic lateral sclerosis
(1) Progressive motor neuron disease
(2) Types
  (a) Spinal muscular atrophy
  (b) Bulbar palsy
  (c) Primary lateral sclerosis
  (d) Pseudobulbar palsy
(3) Incidence
(4) Characteristics

h. Peripheral neuropathy
(1) Axons/ spinal cord neurons injured
(2) Autonomic nerve fibers
(3) Incidence
(4) Characteristics

i. Myoclonus
(1) Involuntary random muscular contractions
(2) Fasciculation
(3) Metabolic and neurologic disorders
(4) Incidence

(5) Characteristics

j. Spina bifida
(1) Defects of neural tube closure
(a) Meningocele
(b) Myelomeningocele
(2) Vertebral defect
(3) Incidence
(4) Characteristics

k. Polio (poliomyelitis)
(1) Acute infectious inflammation of gray matter of spinal cord
(2) Enteroviruses
(3) Pathways
(a) Blood-CNS barrier
(b) Motor neuron
(4) Histopathologic findings
(5) Progressive
(6) Incidence
(7) Characteristics

3. Assessment findings
a. History
(1) Acute or chronic
(2) General health
(3) Previous medical conditions
(4) Medications
(5) Experience with complaint
(6) Time of onset
(7) Seizure activity
b. Physical
(1) Standard physical exam for patient with potential neurological event

4. Management
a. Airway and ventilatory support
(1) Oxygen
(2) Positioning
b. Circulatory support
(1) Venous access
(2) Blood analysis
c. Non-pharmacological interventions
(1) Positioning
d. Pharmacological interventions
(1) Hyperglycemic
(2) Antihypoglycemic
(3) Antihistamine (for medication-caused dystonic reactions)
(4) Analgesics
(5) Steroids
(6) Dopaminergics
e. Psychological support
f. Transport considerations

(1) Appropriate mode
(2) Appropriate facility

IV. Integration
A. Develop management strategies, based on the pathophysiological principles, for the following patient presentations
1. Coma/ decreased level of consciousness
2. Headache
3. Weakness
4. Vertigo
5. Seizure

UNIT TERMINAL OBJECTIVE

5-4 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with an endocrine problem.

COGNITIVE OBJECTIVE

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

5-4.1 Describe the incidence, morbidity and mortality of endocrinologic emergencies. (C-1)
5-4.2 Identify the risk factors most predisposing to endocrinologic disease. (C-1)
5-4.3 Discuss the anatomy and physiology of organs and structures related to endocrinologic diseases. (C-1)
5-4.4 Review the pathophysiology of endocrinologic emergencies. (C-1)
5-4.5 Discuss the general assessment findings associated with endocrinologic emergencies. (C-1)
5-4.6 Identify the need for rapid intervention of the patient with endocrinologic emergencies. (C-1)
5-4.7 Discuss the management of endocrinologic emergencies. (C-1)
5-4.8 Describe osmotic diuresis and its relationship to diabetes. (C-1)
5-4.9 Describe the pathophysiology of adult onset diabetes mellitus. (C-1)
5-4.10 Describe the pathophysiology of juvenile onset diabetes mellitus. (C-1)
5-4.11 Describe the effects of decreased levels of insulin on the body. (C-1)
5-4.12 Correlate abnormal findings in assessment with clinical significance in the patient with a diabetic emergency. (C-3)
5-4.13 Discuss the management of diabetic emergencies. (C-1)
5-4.14 Integrate the pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with a diabetic emergency. (C-3)
5-4.15 Differentiate between the pathophysiology of normal glucose metabolism and diabetic glucose metabolism. (C-3)
5-4.16 Describe the mechanism of ketone body formation and its relationship to ketoacidosis. (C-1)
5-4.17 Discuss the physiology of the excretion of potassium and ketone bodies by the kidneys. (C-1)
5-4.18 Describe the relationship of insulin to serum glucose levels. (C-1)
5-4.19 Describe the effects of decreased levels of insulin on the body. (C-1)
5-4.20 Describe the effects of increased serum glucose levels on the body. (C-1)
5-4.21 Discuss the pathophysiology of hypoglycemia. (C-1)
5-4.22 Discuss the utilization of glycogen by the human body as it relates to the pathophysiology of hypoglycemia. (C-3)
5-4.23 Describe the actions of epinephrine as it relates to the pathophysiology of hypoglycemia. (C-3)
5-4.24 Recognize the signs and symptoms of the patient with hypoglycemia. (C-1)
5-4.25 Describe the compensatory mechanisms utilized by the body to promote homeostasis relative to hypoglycemia. (C-1)
5-4.26 Describe the management of a responsive hypoglycemic patient. (C-1)
5-4.27 Correlate abnormal findings in assessment with clinical significance in the patient with hypoglycemia. (C-1)
5-4.28 Discuss the management of the hypoglycemic patient. (C-1)
5-4.29 Integrate the pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with hypoglycemia. (C-3)
5-4.30 Discuss the pathophysiology of hyperglycemia. (C-1)
5-4.31 Recognize the signs and symptoms of the patient with hyperglycemia. (C-1)
5-4.32 Describe the management of hyperglycemia. (C-1)
5-4.33 Correlate abnormal findings in assessment with clinical significance in the patient with hyperglycemia. (C-3)
5-4.34 Discuss the management of the patient with hyperglycemia. (C-1)
5-4.35 Integrate the pathophysiological principles and the assessment findings to formulate a field impression

and implement a treatment plan for the patient with hyperglycemia. (C-3)
5-4.36 Discuss the pathophysiology of nonketotic hyperosmolar coma. (C-1)
5-4.37 Recognize the signs and symptoms of the patient with nonketotic hyperosmolar coma. (C-1)
5-4.38 Describe the management of nonketotic hyperosmolar coma. (C-1)
5-4.39 Correlate abnormal findings in assessment with clinical significance in the patient with nonketotic hyperosmolar coma. (C-3)
5-4.40 Integrate the pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with nonketotic hyperosmolar coma. (C-3)
5-4.41 Discuss the management of the patient with hyperglycemia. (C-1)
5-4.42 Integrate the pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with hyperglycemia. (C-3)
5-4.43 Discuss the pathophysiology of diabetic ketoacidosis. (C-1)
5-4.44 Recognize the signs and symptoms of the patient with diabetic ketoacidosis. (C-1)
5-4.45 Describe the management of diabetic ketoacidosis. (C-1)
5-4.46 Correlate abnormal findings in assessment with clinical significance in the patient with diabetic ketoacidosis. (C-3)
5-4.47 Discuss the management of the patient with diabetic ketoacidosis. (C-1)
5-4.48 Integrate the pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with diabetic ketoacidosis. (C-3)
5-4.49 Discuss the pathophysiology of thyrotoxicosis. (C-1)
5-4.50 Recognize signs and symptoms of the patient with thyrotoxicosis. (C-1)
5-4.51 Describe the management of thyrotoxicosis. (C-1)
5-4.52 Correlate abnormal findings in assessment with clinical significance in the patient with thyrotoxicosis. (C-3)
5-4.53 Discuss the management of the patient with thyrotoxicosis. (C-1)
5-4.54 Integrate the pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with thyrotoxicosis. (C-3)
5-4.55 Discuss the pathophysiology of myxedema. (C-1)
5-4.56 Recognize signs and symptoms of the patient with myxedema. (C-1)
5-4.57 Describe the management of myxedema. (C-1)
5-4.58 Correlate abnormal findings in assessment with clinical significance in the patient with myxedema. (C-3)
5-4.59 Discuss the management of the patient with myxedema. (C-1)
5-4.60 Integrate the pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with myxedema. (C-3)
5-4.61 Discuss the pathophysiology of Cushing's syndrome. (C-1)
5-4.62 Recognize signs and symptoms of the patient with Cushing's syndrome. (C-1)
5-4.63 Describe the management of Cushing's syndrome. (C-1)
5-4.64 Correlate abnormal findings in assessment with clinical significance in the patient with Cushing's syndrome. (C-3)
5-4.65 Discuss the management of the patient with Cushing's syndrome. (C-1)
5-4.66 Integrate the pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with Cushing's syndrome. (C-3)
5-4.67 Discuss the pathophysiology of adrenal Insufficiency. (C-1)
5-4.68 Recognize signs and symptoms of the patient with adrenal insufficiency. (C-1)
5-4.69 Describe the management of adrenal insufficiency. (C-1)
5-4.70 Correlate abnormal findings in assessment with clinical significance in the patient with adrenal insufficiency. (C-3)
5-4.71 Discuss the management of the patient with adrenal insufficiency. (C-1)
5-4.72 Integrate the pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with adrenal insufficiency. (C-3)
5-4.73 Integrate the pathophysiological principles to the assessment of a patient with a endocrinological

emergency. (C-3)

5-4.74 Differentiate between endocrine emergencies based on assessment and history. (C-3)

5-4.75 Correlate abnormal findings in the assessment with clinical significance in the patient with endocrinologic emergencies. (C-3)

5-4.76 Develop a patient management plan based on field impression in the patient with an endocrinologic emergency. (C-3)

AFFECTIVE OBJECTIVES

None identified for this unit.

PSYCHOMOTOR OBJECTIVES

None identified for this unit.

DECLARATIVE

I. Introduction
- A. Epidemiology
  - 1. Incidence
  - 2. Mortality/ morbidity
  - 3. Risk factors
  - 4. Prevention strategies
- B. Anatomy and physiology

II. General pathophysiology, assessment and management
- A. Pathophysiology
  - 1. Endocrine system
    - a. Integrated chemical and coordination system enabling
      - (1) Reproduction
      - (2) Growth and development
      - (3) Regulation of energy
    - b. Works with the nervous system to help
      - (1) Maintain an internal homeostasis of the body
      - (2) Coordinate responses to environmental changes and stress
    - c. Composed of glands or glandular tissue that synthesize, store and secrete chemical messengers (hormones) that affect specific target organs and body tissues
    - d. Specificity of this system is determined by the affinity of receptors on target organs and body tissues to a particular hormone
  - 2. Endocrine glands
    - a. Ductless glands
      - (1) Highly vascular
      - (2) Synthesize and secrete hormones
      - (3) Specific glands
        - (a) Hypothalamus
        - (b) Pituitary
        - (c) Thyroid
        - (d) Parathyroid
        - (e) Adrenal
        - (f) Kidneys
        - (g) Pancreatic islets
        - (h) Ovaries
        - (i) Testes
        - (j) Hormones
      - (4) Common characteristics
        - (a) Circulation through the blood
        - (b) Secretion of minute but effective amounts at predictable but variable intervals bind to specific cellular receptors to change intercellular metabolism
      - (5) Structure
- B. Assessment findings
  - 1. Scene size-up
    - a. Scene safety
    - b. Personal protective equipment (PPE)

(1) General impression
(2) Trauma
(a) Responsive
(b) Unresponsive
(3) Medical
(a) Responsive
(b) Unresponsive

c. Nature of illness

2. Initial assessment
a. Airway
b. Breathing
c. Circulation
d. Disability
e. Chief complaint

3. Focused history
a. Onset
b. Provoking factors
c. Time
d. Nausea/ vomiting
e. Weight loss
f. Last meal
g. Non-specific
h. Changes in
(1) Energy level
(2) Alertness
(3) Sleep patterns
(4) Mood
(5) Affect
(6) Weight
(7) Skin
(8) Hair
(9) Personal appearance
(10) Sexual function
i. Specific history of
(1) Hypopituitarism
(2) Hypothyroidism
(3) Polydipsia
(4) Polyuria
(5) Polyphagia
(6) Diabetes
(7) Exophthalmus in hyperthyroidism

4. Focused physical examination
a. Appearance
b. Level of consciousness
c. Apparent state of health
d. Skin color
e. Vital signs

C. Management/ treatment plan
1. Airway and ventilatory support
a. Maintain an open airway

b. High flow oxygen
2. Circulatory support
   a. Monitor blood pressure
3. Pharmacological interventions
   a. Consider initiating intravenous line
   b. Avoid interventions which mask signs and symptoms
4. Non-pharmacological interventions
   a. Monitor LOC
   b. Monitor vital signs
5. Transport consideration
   a. Appropriate mode
   b. Appropriate facility
6. Psychological support
   a. All actions reflect a calm, caring, competent attitude
   b. Keep patient and significant others informed of your actions

III. Specific illnesses
A. Diabetes mellitus
1. Epidemiology
   a. Incidence
   b. Morbidity/ mortality
   c. Long term complications
   d. Risk factors
   e. Prevention strategies
2. Anatomy and physiology review
3. Pathophysiology
   a. Types
      (1) Type I-insulin dependent
      (2) Type II-non insulin dependent
   b. A chronic system syndrome characterized by hyperglycemia caused by a decrease in the secretion or activity of insulin
   c. Normal insulin metabolism
      (1) Produced by beta cells in the islets of Langerhans
      (2) Continuously released into the bloodstream
         (a) Insulin is released from the beta cells as proinsulin
         (b) Routed through the liver where 50-70 percent is extracted from the blood
         (c) The level of plasma insulin rises after a meal
            i) Stimulates storage of glucose as glycogen, liver and muscle tissue
            ii) Enhances fat deposition in adipose tissue
            iii) Inhibits protein degradation
            iv) Accelerates protein synthesis
         (d) The fall of plasma insulin levels during normal overnight fasting facilitates the release of
            i) Stored glucose from the liver
            ii) Protein from muscle tissue
            iii) Fat from adipose tissue
         (e) Average daily secretion is 0.6 units per kilogram of body weight
      (3) Activity of released insulin

(a) Lowers blood glucose levels
(b) Facilitates a stable, normal glucose range of approximately 70 to 120 mg/ dl

d. Ketone formation
(1) When insulin supply is insufficient, glucose cannot be used for cellular energy
(2) Response to cellular starvation
(3) Body releases and breaks down stored fats and protein to provide energy
(4) Free fatty acids from stored triglycerides are released and metabolized in the liver in such large quantities that ketones are formed
(5) Excess ketones upset the pH balance and acidosis develops
(6) Gluconeogenesis from protein is the last source used by the body as a compensatory response to provide cellular energy
(a) Results in an increase in glucose and nitrogen
(b) Due to prevailing insulin insufficiency, the glucose can not be used resulting in
i) Increased osmotic diuresis
ii) Dehydration and loss of electrolytes, particularly potassium

4. Assessment findings
a. History
(1) Has insulin dosage changed recently?
(2) Has the patient had a recent infection?
(3) Has the patient suffered any psychologic stress?
b. Signs and symptoms
(1) Altered mental status
(2) Abnormal respiratory pattern (Kussmaul's breathing)
(3) Tachycardia
(4) Hypotension
(5) Breath has a distinct fruity odor
(6) Polydipsia
(7) Polyphagia
(8) Warm dry skin
(9) Weight loss
(10) Weakness
(11) Dehydration

5. Management
a. Airway and ventilation
b. Circulation
c. Pharmacological interventions
d. Non-pharmacological interventions
e. Transport consideration
(1) Appropriate mode
(2) Appropriate facility
f. Psychological support/ communication strategies

B. Hypoglycemia
1. Epidemiology
a. Incidence
b. Morbidity/ mortality
c. Risk factors

d. Prevention strategies

2. Pathophysiology
   a. Blood glucose levels fall below that required for normal body functioning
   b. Combined effects of a decreased energy supply to the central nervous system and a hyperadrenergic state results from a compensatory increase in catecholamine secretion
      (1) Tremors
      (2) Diaphoresis
      (3) Palpitations
      (4) Tachycardia
      (5) Pale, cool skin
      (6) Low levels of blood glucose reaching the brain results in an altered mental status
      (7) Irritability
      (8) Confusion
      (9) Stupor
      (10) Coma
3. Assessment
   a. Known history of
      (1) Diabetes
      (2) Prolonged fasting
      (3) Alcoholism
   b. Signs and symptoms
      (1) Weakness
      (2) Irritability
      (3) Hunger
      (4) Confusion
      (5) Anxiety
      (6) Bizarre behavior
      (7) Tachycardia
      (8) Normal respiratory pattern
      (9) Cool, pale skin
      (10) Diaphoresis
4. Management
   a. Airway and ventilation
   b. Circulation
   c. Pharmacological interventions
   d. Non-pharmacological interventions
   e. Transport consideration
      (1) Appropriate mode
      (2) Appropriate facility
      (3) Psychological support/ communication strategies

C. Hyperglycemia (hyperglycemic hyperosmolar nonketosis)
1. Epidemiology
   a. Incidence
   b. Mortality/ morbidity
   c. Risk factors
   d. Prevention strategies
2. Pathophysiology
   a. Occurs in patients with diabetes who are able to produce enough insulin to

prevent DKA but not enough to prevent severe hyperglycemia, osmotic diuresis and extracellular fluid depletion
b. Increasing blood glucose levels causes a fluid shift from intracellular to extracellular spaces

3. Assessment
   a. Known history of
      (1) Diabetes
      (2) Inadequate fluid intake
   b. Signs and symptoms
      (1) Neurologic abnormalities
         (a) Somnolence
         (b) Coma
         (c) Seizures
         (d) Hemiparesis
         (e) Aphasia
         (f) Increasing mental depression
         (g) Dehydration
         (h) Polydipsia
         (i) Polyuria
         (j) Polyphagia
4. Management
   a. Airway and ventilatory support
   b. Circulation
   c. Pharmacological interventions
   d. Non-pharmacological interventions
   e. Transport consideration
      (1) Appropriate mode
      (2) Appropriate facility
   f. Psychological support/ communication strategies

D. Diabetic ketoacidosis
1. Epidemiology
   a. Incidence
   b. Mortality/ morbidity
   c. Risk factors
   d. Prevention strategies
   e. Anatomy and physiology review
2. Pathophysiology
   a. Hyperglycemia
   b. Ketonemia
   c. Relative insulin insufficiency
   d. Counterregulatory hormone excess
3. Assessment findings
   a. History
      (1) General health
      (2) Previous medical conditions
      (3) Medications
      (4) Previous experience with complaint
      (5) Time of onset
   b. Physical
      (1) Dehydration

(2) Hypotension
(3) Reflex tachycardia
(4) Acetone (fruity) odor on breath
(5) Nausea
(6) Vomiting
(7) Abdominal pain
(8) Hyperventilation
(9) Kussmall's respiration

4. Management
   a. Airway and ventilatory support
      (1) Oxygen
      (2) Positioning
      (3) Suction
      (4) Assisted ventilation
      (5) Suction
      (6) Advanced airway devices
   b. Circulatory support
      (1) Venous access
      (2) Blood analysis
   c. Non-pharmacological interventions
      (1) General comfort measures
   d. Pharmacological interventions
      (1) Rehydration
      (2) Bicarbonate
      (3) Potassium
      (4) Insulin
   e. Psychological support
   f. Transport considerations
      (1) Appropriate mode
      (2) Appropriate facility

E. Thyrotoxicosis (thyroid storm)
   1. Epidemiology
      a. Incidence
      b. Mortality/ morbidity
      c. Risk factors
      d. Prevention strategies
   2. Pathophysiology
      a. Acute manifestation of all hyperthyroid symptoms
      b. Excessive circulating level of thyroxine and triiodothyronine
         (1) Regulate metabolism
         (2) Regulate growth and development
   3. Assessment
      a. History
      b. Signs and symptoms
         (1) Severe tachycardia
         (2) Heart failure
         (3) Cardiac dysrhythmias
         (4) Shock
         (5) Hyperthermia
         (6) Restlessness

(7) Agitation
(8) Abdominal pain
(9) Delirium
(10) Coma

4. Management
   a. Airway and ventilation
   b. Circulation
   c. Pharmacological interventions
      (1) Anti-thyroid drugs - in hospital management
      (2) Beta adrenergic receptor blockers
   d. Non-pharmacological interventions
   e. Transport consideration
      (1) Appropriate mode
      (2) Appropriate facility
   f. Psychological support/ communication strategies

F. Myxedema (adult hypothyroidism)
   1. Epidemiology
      a. Incidence
      b. Mortality/ morbidity
      c. Risk factors
      d. Prevention strategies
   2. Pathophysiology
      a. A disease caused by hyposecretion of the thyroid gland during the adult years
   3. Assessment
      a. History
      b. Signs and symptoms
         (1) Edematous face
         (2) Periorbital edema
         (3) Mask-like effect
         (4) Impaired memory
         (5) Slowed speech
         (6) Decreased initiative
         (7) Somnolence
         (8) Cold intolerance
         (9) Dry, coarse skin
         (10) Muscle weakness and swelling
         (11) Constipation
         (12) Weight gain
         (13) Hair loss
         (14) Hoarseness
   4. Management
      a. Airway and ventilation
      b. Circulation
      c. Pharmacological interventions
      d. Non-pharmacological interventions
      e. Transport consideration
         (1) Appropriate mode
         (2) Appropriate facility
      f. Psychological support/ communication strategies

IV. Corticosteroid excess - Cushing's syndrome

A. Epidemiology
   1. Incidence
   2. Mortality/ morbidity
   3. Risk factors
   4. Prevention strategies

B. Pathophysiology
   1. A spectrum of clinical abnormalities caused by an excess of corticosteroids, especially glucocorticoids
   2. Causes
      a. Corticotropin secreting pituitary tumor
      b. Cortical secreting neoplasm within the adrenal cortex
      c. Excess secretion of corticotropin by a malignant growth outside the adrenal
      d. Prolongs administration of high dose corticosteroids

C. Assessment
   1. History
   2. Signs and symptoms
      a. Thinning hair
      b. Acnes
      c. Hump on back of neck (buffalo hump)
      d. Supraclavicular fat pad
      e. Thin extremities
      f. Ecchymosis
      g. Slow healing
      h. Pendulous abdomen
      i. Weight gain
      j. Increased body and facial hair

D. Management
   1. Airway and ventilation
   2. Circulation
   3. Pharmacological interventions
   4. Non-pharmacological interventions
   5. Transport consideration
      a. Appropriate mode
      b. Appropriate facility
   6. Psychological support/ communication strategies

V. Adrenal insufficiency - Addison's disease

A. Epidemiology
   1. Incidence
   2. Mortality/ morbidity
   3. Risk factors
   4. Prevention strategies

B. Pathophysiology
   1. Adrenal insufficiency
      a. Adrenal steroids are reduced
         (1) Glucocorticoids
         (2) Mineralocorticoids
         (3) Androgens
   2. Most common cause is idiopathic atrophy of adrenal tissue
   3. Less common caused include hemorrhage, infarctions, fungal infections and acquired

immune deficiency disease

C. Assessment
   1. History
   2. Signs and symptoms
      a. Progressive weakness
      b. Progressive weight loss
      c. Progressive anorexia
      d. Skin hyperpigmentation
         (1) Areas exposed to the sun
         (2) Areas exposed to pressure points
         (3) Joints and creases
      e. Hypotension
      f. Hyponatremia
      g. Hyperkalemia
      h. Nausea
      i. Vomiting
      j. Diarrhea

D. Management
   1. Airway and ventilation
   2. Circulation
   3. Pharmacological interventions
   4. Non-pharmacological interventions
   5. Transport consideration
      a. Appropriate mode
      b. Appropriate facility
   6. Psychological support/ communication strategies

VI. Integration

UNIT TERMINAL OBJECTIVE

5-5 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with an allergic or anaphylactic reaction.

COGNITIVE OBJECTIVES

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

5-5.1 Define allergic reaction. (C-1)
5-5.2 Define anaphylaxis. (C-1)
5-5.3 Describe the incidence, morbidity and mortality of anaphylaxis. (C-1)
5-5.4 Identify the risk factors most predisposing to anaphylaxis. (C-1)
5-5.5 Discuss the anatomy and physiology of the organs and structures related to anaphylaxis. (C-1)
5-5.6 Describe the prevention of anaphylaxis and appropriate patient education. (C-1)
5-5.7 Discuss the pathophysiology of allergy and anaphylaxis. (C-1)
5-5.8 Describe the common methods of entry of substances into the body. (C-1)
5-5.9 Define natural and acquired immunity. (C-1)
5-5.10 Define antigens and antibodies. (C-1)
5-5.11 List common antigens most frequently associated with anaphylaxis. (C-1)
5-5.12 Discuss the formation of antibodies in the body. (C-1)
5-5.13 Describe physical manifestations in anaphylaxis. (C-1)
5-5.14 Differentiate manifestations of an allergic reaction from anaphylaxis. (C-3)
5-5.15 Recognize the signs and symptoms related to anaphylaxis. (C-1)
5-5.16 Differentiate among the various treatment and pharmacological interventions used in the management of anaphylaxis. (C-3)
5-5.17 Integrate the pathophysiological principles of the patient with anaphylaxis. (C-3)
5-5.18 Correlate abnormal findings in assessment with the clinical significance in the patient with anaphylaxis. (C-3)
5-5.19 Develop a treatment plan based on field impression in the patient with allergic reaction and anaphylaxis. (C-3)

AFFECTIVE OBJECTIVES

None identified for this unit.

PSYCHOMOTOR OBJECTIVES

None identified for this unit.

DECLARATIVE

I. Introduction
- A. Epidemiology
  1. Incidence
  2. Morbidity/ mortality
  3. Risk factors
  4. Prevention
- B. Anatomy
  1. Review of cardiovascular system
  2. Review of respiratory system
  3. Review of nervous system
  4. Review of gastrointestinal system
- C. Physiology
  1. Antigens
  2. Antibodies
     a. IgE
- D. Terminology
  1. Allergic reaction
  2. Anaphylaxis

II. Pathophysiology
- A. Allergen
- B. Routes of entry
  1. Oral ingestion
  2. Injected/ envenomation
  3. Inhaled
  4. Topical
- C. Common allergens
  1. Drugs
  2. Insects
  3. Foods
  4. Animals
  5. Other
- D. Allergic response
  1. Histamine or histamine-like substance release
  2. Biphasic response
     a. Acute reaction
     b. Delayed reaction
  3. Immunity
  4. Sensitivity
  5. Hypersensitivity
- E. Urticaria
  1. Redness of skin
- F. Angioneurotic
  1. Swelling/ edema of the skin
- G. Anaphylactic shock
  1. Cardiovascular system

2. Respiratory system
3. Gastrointestinal system
4. Nervous system

III. Assessment findings
- A. Not all signs and symptoms are present in every case
- B. History
  1. Previous exposure
  2. Previous experience to exposure
  3. Onset of symptoms
  4. Dyspnea
- C. Level of consciousness
  1. Unable to speak
  2. Restless
  3. Decreased level of consciousness
  4. Unresponsive
- D. Upper airway
  1. Hoarseness
  2. Stridor
  3. Pharyngeal edema/ spasm
- E. Lower airway
  1. Tachypnea
  2. Hypoventilation
  3. Labored - accessory muscle use
  4. Abnormal retractions
  5. Prolonged expirations
  6. Wheezes
  7. Diminished lung sounds
- F. Skin
  1. Redness
  2. Rashes
  3. Edema
  4. Moisture
  5. Itching
  6. Urticaria
  7. Pallor
  8. Cyanotic
- G. Vital signs
  1. Tachycardia
  2. Hypotension
- H. Gastrointestinal
  1. Abnormal crampings
  2. Nausea/ vomiting
  3. Diarrhea
- I. Assessment tools
  1. Cardiac monitor
  2. Pulse oximetry low
  3. End tidal CO_2 high

IV. Management of anaphylaxis
- A. Remove offending agent (i.e. remove stinger)
- B. Airway and ventilation
  1. Positioning
  2. Oxygen
  3. Assist ventilation
  4. Advanced airway
- C. Circulation
  1. Venous access
  2. Fluid resuscitation
- D. Pharmacological
  1. Oxygen
  2. Epinephrine - main stay of treatment
     a. Bronchodilator
     b. Decrease vascular permeability
  3. Antihistamine
  4. Antiinflammatory/ immunosuppressant
  5. Vasopressor
- E. Psychological support
- F. Transport considerations

V. Management of allergic reaction
- A. Without dyspnea
  1. Antihistamine
- B. With dyspnea
  1. Oxygen
  2. Subcutaneous epinephrine
  3. Antihistamine

VI. Patient Education

UNIT TERMINAL OBJECTIVE

5-6 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement the treatment plan for the patient with a gastroenterologic problem.

COGNITIVE OBJECTIVE

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

5-6.1 Describe the incidence, morbidity and mortality of gastrointestinal emergencies. (C-1)
5-6.2 Identify the risk factors most predisposing to gastrointestinal emergencies. (C-1)
5-6.3 Discuss the anatomy and physiology of the organs and structures related to gastrointestinal diseases. (C-1)
5-6.4 Discuss the pathophysiology of inflammation and its relationship to acute abdominal pain. (C-1)
5-6.5 Define somatic pain as it relates to gastroenterology. (C-1)
5-6.6 Define visceral pain as it relates to gastroenterology. (C-1)
5-6.7 Define referred pain as it relates to gastroenterology. (C-1)
5-6.8 Differentiate between hemorrhagic and non-hemorrhagic abdominal pain. (C-3)
5-6.9 Discuss the signs and symptoms of local inflammation relative to acute abdominal pain. (C-1)
5-6.10 Discuss the signs and symptoms of peritoneal inflammation relative to acute abdominal pain. (C-1)
5-6.11 List the signs and symptoms of general inflammation relative to acute abdominal pain. (C-1)
5-6.12 Based on assessment findings, differentiate between local, peritoneal and general inflammation as they relate to acute abdominal pain. (C-3)
5-6.13 Describe the questioning technique and specific questions the paramedic should ask when gathering a focused history in a patient with abdominal pain. (C-1)
5-6.14 Describe the technique for performing a comprehensive physical examination on a patient complaining of abdominal pain. (C-1)
5-6.15 Define upper gastrointestinal bleeding. (C-1)
5-6.16 Discuss the pathophysiology of upper gastrointestinal bleeding. (C-1)
5-6.17 Recognize the signs and symptoms related to upper gastrointestinal bleeding. (C-1)
5-6.18 Describe the management for upper gastrointestinal bleeding. (C-1)
5-6.19 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with upper GI bleeding. (C-3)
5-6.20 Define lower gastrointestinal bleeding. (C-1)
5-6.21 Discuss the pathophysiology of lower gastrointestinal bleeding. (C-1)
5-6.22 Recognize the signs and symptoms related to lower gastrointestinal bleeding. (C-1)
5-6.23 Describe the management for lower gastrointestinal bleeding. (C-1)
5-6.24 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with lower GI bleeding. (C-3)
5-6.25 Define acute gastroenteritis. (C-1)
5-6.26 Discuss the pathophysiology of acute gastroenteritis. (C-1)
5-6.27 Recognize the signs and symptoms related to acute gastroenteritis. (C-1)
5-6.28 Describe the management for acute gastroenteritis. (C-1)
5-6.29 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with acute gastroenteritis. (C-3)
5-6.30 Define colitis. (C-1)
5-6.31 Discuss the pathophysiology of colitis. (C-1)
5-6.32 Recognize the signs and symptoms related to colitis. (C-1)
5-6.33 Describe the management for colitis. (C-1)
5-6.34 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with colitis. (C-3)

5-6.35 Define gastroenteritis. (C-1)
5-6.36 Discuss the pathophysiology of gastroenteritis. (C-1)
5-6.37 Recognize the signs and symptoms related to gastroenteritis. (C-1)
5-6.38 Describe the management for gastroenteritis. (C-1)
5-6.39 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with gastroenteritis. (C-3)
5-6.40 Define diverticulitis. (C-1)
5-6.41 Discuss the pathophysiology of diverticulitis. (C-1)
5-6.42 Recognize the signs and symptoms related to diverticulitis. (C-1)
5-6.43 Describe the management for diverticulitis. (C-1)
5-6.44 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with diverticulitis. (C-3)
5-6.45 Define appendicitis. (C-1)
5-6.46 Discuss the pathophysiology of appendicitis. (C-1)
5-6.47 Recognize the signs and symptoms related to appendicitis. (C-1)
5-6.48 Describe the management for appendicitis. (C-1)
5-6.49 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with appendicitis. (C-3)
5-6.50 Define peptic ulcer disease. (C-1)
5-6.51 Discuss the pathophysiology of peptic ulcer disease. (C-1)
5-6.52 Recognize the signs and symptoms related to peptic ulcer disease. (C-1)
5-6.53 Describe the management for peptic ulcer disease. (C-1)
5-6.54 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with peptic ulcer disease. (C-3)
5-6.55 Define bowel obstruction. (C-1)
5-6.56 Discuss the pathophysiology of bowel obstruction. (C-1)
5-6.57 Recognize the signs and symptoms related to bowel obstruction. (C-1)
5-6.58 Describe the management for bowel obstruction. (C-1)
5-6.59 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with bowel obstruction. (C-3)
5-6.60 Define Crohn's disease. (C-1)
5-6.61 Discuss the pathophysiology of Crohn's disease. (C-1)
5-6.62 Recognize the signs and symptoms related to Crohn's disease. (C-1)
5-6.63 Describe the management for Crohn's disease. (C-1)
5-6.64 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with Crohn's disease. (C-3)
5-6.65 Define pancreatitis. (C-1)
5-6.66 Discuss the pathophysiology of pancreatitis. (C-1)
5-6.67 Recognize the signs and symptoms related to pancreatitis. (C-1)
5-6.68 Describe the management for pancreatitis. (C-1)
5-6.69 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with pancreatitis. (C-3)
5-6.70 Define esophageal varices. (C-1)
5-6.71 Discuss the pathophysiology of esophageal varices. (C-1)
5-6.72 Recognize the signs and symptoms related to esophageal varices. (C-1)
5-6.73 Describe the management for esophageal varices. (C-1)
5-6.74 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with esophageal varices. (C-3)
5-6.75 Define hemorrhoids. (C-1)
5-6.76 Discuss the pathophysiology of hemorrhoids. (C-1)

5-6.77 Recognize the signs and symptoms related to hemorrhoids. (C-1)
5-6.78 Describe the management for hemorrhoids. (C-1)
5-6.79 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with hemorrhoids. (C-3)
5-6.80 Define cholecystitis. (C-1)
5-6.81 Discuss the pathophysiology of cholecystitis. (C-1)
5-6.82 Recognize the signs and symptoms related to cholecystitis. (C-1)
5-6.83 Describe the management for cholecystitis. (C-1)
5-6.84 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with cholecystitis. (C-3)
5-6.85 Define acute hepatitis. (C-1)
5-6.86 Discuss the pathophysiology of acute hepatitis. (C-1)
5-6.87 Recognize the signs and symptoms related to acute hepatitis. (C-1)
5-6.88 Describe the management for acute hepatitis. (C-1)
5-6.89 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with acute hepatitis. (C-3)
5-6.90 Integrate pathophysiological principles of the patient with a gastrointestinal emergency. (C-3)
5-6.91 Differentiate between gastrointestinal emergencies based on assessment findings. (C-3)
5-6.92 Correlate abnormal findings in the assessment with the clinical significance in the patient with abdominal pain. (C-3)
5-6.93 Develop a patient management plan based on field impression in the patient with abdominal pain. (C-3)

AFFECTIVE OBJECTIVES
None identified for this unit.

PSYCHOMOTOR OBJECTIVES
None identified for this unit.

DECLARATIVE

I. Introduction
  A. Epidemiology
    1. Incidence
    2. Mortality/ morbidity
    3. Risk factors
    4. Prevention strategies

II. General pathophysiology, assessment and management
  A. Pathophysiology of abdominal pain
    1. Bacterial contamination
      a. Perforated appendix
      b. Pelvic inflammatory disease
    2. Chemical irritation
      a. Perforated ulcer
      b. Pancreatitis
    3. Types of abdominal pain
      a. Somatic pain
        (1) Appendicitis
        (2) Pancreatitis
        (3) Perforated viscus
          (a) Gallbladder
          (b) Ulcer
          (c) Intestine
      b. Visceral pain
        (1) Appendicitis
        (2) Pancreatitis
        (3) Cholecystitis
        (4) Obstruction of hollow viscera
          (a) Intestines
          (b) Biliary tree
      c. Referred pain
      d. Hemorrhagic abdominal pain
      e. Non hemorrhagic abdominal pain
  B. Assessment findings
    1. Scene size-up
      a. Scene safety
      b. Personal protective equipment (PPE)
      c. General impression
        (1) Trauma
          (a) Responsive
          (b) Unresponsive
        (2) Medical
          (a) Responsive
          (b) Unresponsive
    2. Initial assessment
      a. Airway
      b. Breathing
      c. Circulation

d. Disability
e. Chief complaint

3. Focused history
   a. Onset
   b. Provoking factors
   c. Quality
   d. Region/ radiation
   e. Severity
   f. Time
   g. Previous history of same event
   h. Nausea/ vomiting
   i. Change in bowel habits/ stool
      (1) Constipation
      (2) Diarrhea
   j. Weight loss
   k. Last meal
   l. Chest pain
4. Focused physical examination
   a. Appearance
   b. Posture
   c. Level of consciousness
   d. Apparent state of health
   e. Skin color
   f. Vital signs
   g. Inspect abdomen
   h. Auscultate abdomen
   i. Percuss abdomen
   j. Palpate abdomen
   k. Female abdominal exam
   l. Male abdominal exam
5. Assessment tools
   a. Hematocrit

C. Management/ treatment plan
1. Airway and ventilatory support
   a. Maintain an open airway
   b. High flow oxygen
2. Circulatory support
   a. Electrocardiogram
   b. Monitor blood pressure
3. Pharmacological interventions
   a. Consider initiating intravenous line
   b. Avoid intervention which mask signs and symptoms
4. Non-pharmacological interventions
   a. Nothing by mouth
   b. Monitor LOC
   c. Monitor vital signs
   d. Position of comfort
5. Transport consideration
   a. Persistent pain for greater than six hours requires transport
   b. Gentle but rapid transport

6. Psychological support
   a. All actions reflect a calm, caring, competent attitude
   b. Keep patient and significant others informed of your actions

III. Specific Injuries/ illness
   A. Upper gastrointestinal bleeding
      1. Epidemiology
         a. Incidence
         b. Mortality/ morbidity
         c. Risk factors
         d. Prevention
         e. Anatomy and physiology review
         f. Pathophysiology
            (1) Lesions
            (2) Peptic ulceration
            (3) Erosive gastritis
            (4) Esophagogastric varices
      2. Assessment findings
         a. History
            (1) Acute/ chronic
            (2) Vomiting/ hematemesis
            (3) Stool/ melena
         b. Physical
            (1) Altered level of consciousness
            (2) Skin
               (a) Pale
               (b) Cool
               (c) Moist
            (3) Inspect abdomen
               (a) Scars
               (b) Ecchymosis
               (c) Contour
                  i) Bulges
                  ii) Symmetry
            (4) Auscultate
               (a) Bowel sounds
            (5) Percuss
            (6) Palpate
         c. Assessment tools
            (1) Hematocrit
      3. Management
         a. Airway and ventilatory support
            (1) High flow oxygen
         b. Circulatory support
            (1) Positioning
            (2) Consider MAST
            (3) Consider fluid bolus or resuscitation
            (4) Consider fluid lavage
         c. Psychological support
         d. Transport consideration

B. Lower gastrointestinal bleeding
  1. Epidemiology
    a. Incidence
    b. Mortality/ morbidity
    c. Risk factors
    d. Prevention strategies
    e. Pathophysiology
      (1) Lesions
      (2) Anal and rectal lesions
        (a) Hemorrhoids
        (b) Anal fissures
        (c) Fistulas
      (3) Colonic lesions
        (a) Carcinoma
        (b) Polyps
      (4) Diverticula
  2. Assessment findings
    a. History
      (1) Acute/ chronic
      (2) Vomiting/ hematemesis
      (3) Stool/ melena
      (4) Meal history
      (5) Chest pain/ "gas pain"
    b. Physical
      (1) Altered level of consciousness
      (2) Skin
        (a) Pale
        (b) Cool
        (c) Moist
      (3) Inspect abdomen
        (a) Scars
        (b) Ecchymosis
        (c) Contour
          i) Bulges
          ii) Symmetry
      (4) Auscultate
      (5) Percuss
      (6) Palpate
    c. Assessment tools
      (1) Hematocrit
  3. Management
    a. Airway and ventilatory support
      (1) High flow oxygen
    b. Circulatory support
      (1) Positioning
      (2) Consider MAST
      (3) Consider fluid bolus or resuscitation
      (4) Consider fluid lavage
    c. Psychological support
    d. Transport consideration

C. Acute gastroenteritis
  1. Epidemiology
    a. Incidence
    b. Mortality/ morbidity
    c. Risk factors
    d. Prevention strategies
    e. Anatomy and physiology review
    f. Pathophysiology
      (1) Gastric mucosa
      (2) Inflammatory process
      (3) Pathogenesis
  2. Assessment
    a. History
      (1) Quality of pain
      (2) Onset of pain
      (3) Location of pain
      (4) Blood in the stool
      (5) Epigastric pain
      (6) Nausea
      (7) Vomiting
    b. Physical
      (1) Restless
      (2) Skin
        (a) Pale
        (b) Cool
        (c) Moist
      (3) Vital Signs
        (a) Hypotension
      (4) Abdominal Exam
        (a) Inspect
          i) Contour
            a) Bulges
            b) Symmetry
        (b) Auscultate
        (c) Percuss
        (d) Palpate
  3. Management
      (1) Positioning
      (2) Airway and ventilatory support
        (a) Oxygen
      (3) Circulatory support
        (a) Fluid bolus
      (4) Pharmacological interventions
      (5) Non-pharmacological interventions
      (6) Transport consideration

D. Colitis
  1. Epidemiology
    a. Incidence
    b. Morbidity/ mortality
    c. Risk factors

d. Anatomy and physiology review
e. Pathophysiology
(1) inflammatory bowel disease
(2) inflammatory action of colonic mucosa

2. Assessment
a. History
(1) Quality of pain
(2) Onset of pain
(3) Location of pain
(4) Bloody diarrhea
(5) Fever
(6) Weight loss
b. Physical
(1) Restless
(2) Skin
(a) Pale
(b) Cool
(c) Moist
(d) Warm
(3) Fever
(4) Vital signs
(a) Hypotension
(5) Abdominal exam
(a) Inspect
i) Contour
a) Bulges
b) Symmetry
(b) Auscultate
(c) Percuss
i) Dull over bladder
(d) Palpate

3. Management
(1) Positioning
(2) Airway and ventilatory support
(a) Oxygen
(3) Circulatory support
(a) Fluid bolus
(4) Pharmacological interventions
(5) Non-pharmacological interventions
(6) Transport consideration

E. Gastroenteritis
1. Causative organisms
a. Rotavirus, Norwalk virus, and many others
b. Parasites
(1) Protozoa giardia lamblia
(2) Crypto sporidium parvum
(3) Cyclosporidium cayetensis
c. Contracted via fecal-oral transmission, contaminated food and water
d. Cyclosporidium reported to be contracted by swimming in contaminated waters
2. Bacteria

a. Escherichia coli
b. Klebsiella pneumonia
c. Enterobacter
d. Campylobacter jejuni
e. Vibrio cholera
f. Shigella
(1) Not part of normal intestinal flora
g. Salmonella
(1) Not part of normal intestinal flora

3. System affected - GI system
4. Modes of transmission
   a. Fecal-oral
   b. Ingestion of infected food or non-potable water
5. Susceptibility and resistance
   a. Travelers into endemic areas are more susceptible
   b. Populations in disaster areas, where water supplies are contaminated, are susceptible
   c. Native populations in endemic areas are generally resistant
6. Signs and symptoms - nausea, vomiting, fever, abdominal pain and cramping, anorexia, lassitude, and frank shock
   a. Diarrhea of enteric bacteria - different clinical pictures depending on the degree of intestinal invasion
   b. Chronic gastritis and ulcers with abdominal pain, nausea, and "heartburn" are caused by Helicobacter pylori infection
7. Patient management and protective measures
   a. EMS personnel - do not work when ill if your job involves patient contact
   b. Focused on environmental health and development/ availability of clean water reservoirs, food preparation and sanitation
   c. Disaster workers and travelers to endemic areas must be vigilant in knowing the sources of their water supplies or drink hot beverages that have been brisk-boiled or disinfected
   d. Health care workers treating gastroenteritis patients must be careful to avoid habits that facilitate fecal-oral/ mucous membrane transmission, observe BSI and effective hand washing
   e. Selected organisms may be sensitive to antibiotics
   f. Epidemic treatment is normally symptomatic
8. Immunizations are unavailable for many of the enteric bacteria, which are part of the normal intestinal flora

F. Diverticulitis
1. Epidemiology
   a. Incidence
   b. Mortality/ morbidity
   c. Risk factors
   d. Prevention strategies
   e. Anatomy and physiology review
   f. Pathophysiology
      (1) Inflammation in or around the diverticula
      (2) Retention of undigested food residue and bacteria
2. Assessment
   a. History

(1) Quality of pain
(2) Onset of pain
(3) Location of pain
(4) Dark stool

b. Physical
(1) Altered level of consciousness
(2) Skin
(a) Pale
(b) Cool
(c) Moist
(3) Inspect abdomen
(a) Scars
(b) Ecchymosis
(c) Contour
i) Bulges
ii) Symmetry
(4) Auscultate
(a) Bowel sounds
(5) Percuss
(6) Palpate

c. Assessment tools
(1) Hematocrit

3. Management/ treatment plan
a. Airway and ventilatory support
(1) Oxygen
b. Circulatory support
(1) Positioning
(2) Consider fluid bolus
c. Pharmacological interventions
d. Non-pharmacological interventions
e. Psychological support
f. Transport consideration

G. Appendicitis
1. Epidemiology
a. Incidence
b. Mortality/ morbidity
c. Risk factors
d. Anatomy and physiology review
e. Pathophysiology
(1) Obstruction appendiceal lumen
(2) Ulceration of appendiceal mucosa
(a) Viral
(b) Bacterial

2. Assessment findings
a. History
(1) Quality of pain
(2) Onset of pain
(3) Location of pain
(4) Anorexia
(5) Nausea/ vomiting

b. Physical
(1) Skin
(a) Pale
(b) Cool
(c) Moist
(d) Warm
(2) Fever
(3) Inspect abdomen
(a) Scars
(b) Ecchymosis
(c) Contour
i) Bulges
ii) Symmetry
(4) Auscultate
(a) Bowel sounds
(5) Percuss
(6) Palpate

3. Management/ treatment plan
a. Airway and ventilatory support
(1) Oxygen
b. Circulatory support
(1) Positioning
(2) Consider fluid bolus
c. Pharmacological interventions
d. Non-pharmacological interventions
e. Psychological support
f. Transport consideration

H. Peptic ulcer disease
1. Epidemiology
a. Incidence
b. Mortality/ morbidity
c. Risk factors
d. Prevention strategies
e. Anatomy and physiology review
f. Pathophysiology
(1) Ulcerative disorder
(2) Acid-pepsin formation
(3) Loss of protective effects
(a) Gastric mucosa
(b) Bicarbonate ions
(c) Prostoglandins

2. Assessment findings
a. History
(1) Acute/ chronic
(2) Quality of pain
(3) Onset of pain
(4) Location of pain
(5) Last meal
(6) Nausea
(7) Stool/ melena

(8) Vomiting/ hematemesis
b. Physical
(1) Altered level of consciousness
(2) Cardiovascular
(a) Hypotension
(b) Tachycardia
(3) Skin
(a) Pale
(b) Cool
(c) Moist
(4) Inspect abdomen
(a) Scars
(b) Ecchymosis
(c) Contour
i) Bulges
ii) Symmetry
(5) Auscultate
(a) Bowel sounds
(6) Percuss
(7) Palpate
c. Assessment tools
(1) Hematocrit
3. Management
a. Airway and ventilatory support
(1) High flow oxygen
b. Circulatory support
(1) Positioning
(2) Consider fluid bolus or resuscitation
c. Pharmacological
(1) Antacid
(2) H_2 Blockers
d. Psychological support
e. Transport consideration

I. Bowel obstruction
1. Epidemiology
a. Incidence
b. Mortality/ morbidity
c. Risk factors
d. Anatomy and physiology review
e. Pathophysiology
(1) Mechanical
(2) Non-mechanical
(3) Lesions
(4) Obturation of the lumen
(5) Small/ large bowel
(6) Adhesions
(7) Hernias
2. Assessment findings
a. History
(1) Acute/ chronic

(2) Quality of pain/ paroxysms
(3) Onset of pain
(4) Location of pain
(5) Nausea
(6) Vomiting/ odor/ bile
(7) Stool/ diarrhea/ unable

b. Physical
(1) Altered level of consciousness
(2) Cardiovascular
(a) Hypotension
(b) Tachycardia
(3) Skin
(a) Pale
(b) Cool
(c) Moist
(4) Inspect abdomen
(a) Scars
(b) Ecchymosis
(c) Contour
i) Bulges
ii) Symmetry
(5) Auscultate
(a) Bowel sounds/ absent
(6) Percuss
(7) Palpate

3. Management
a. Airway and ventilatory support
(1) High flow oxygen
b. Circulatory support
(1) Positioning
(2) Consider fluid bolus or resuscitation
c. Psychological support
d. Transport consideration

J. Crohn's disease
1. Epidemiology
a. Incidence
b. Mortality/ morbidity
c. Risk factors
(1) Positive family history same disorder
(2) Stress
d. Prevention strategies
e. Anatomy and physiology review
f. Pathophysiology
(1) Inflammatory disorder
(a) Small bowel
(b) Large bowel
(2) Increased suppressor T-cell activity
(3) Intestinal submucosa
(4) Lesions
(5) Fistulas

2. Assessment findings
   a. History
      (1) Acute/ chronic
      (2) Quality of pain
      (3) Onset of pain
      (4) Location of pain
      (5) "Irritable bowel"
      (6) Stool/ diarrhea
      (7) Weight loss
   b. Physical
      (1) Skin
         (a) Pale
         (b) Cool
         (c) Moist
      (2) Inspect abdomen
         (a) Scars
         (b) Ecchymosis
         (c) Contour
            i) Bulges
            ii) Symmetry
      (3) Auscultate
         (a) Bowel sounds
      (4) Percuss
      (5) Palpate
3. Management
   a. Airway and ventilatory support
      (1) High flow oxygen
   b. Circulatory support
      (1) Positioning
   c. Psychological support
   d. Transport consideration

K. Pancreatitis
1. Epidemiology
   a. Incidence
   b. Mortality/ morbidity
   c. Risk factors
      (1) Gallstones
      (2) Alcohol
   d. Prevention strategies
   e. Anatomy and physiology review
2. Pathophysiology
   a. Inflammation
   b. Injury or disruption of pancreatic ducts or acini
   c. Leaked enzymes
3. Assessment findings
   a. History
      (1) Acute/ chronic
      (2) Quality of pain
      (3) Onset of pain
      (4) Location of pain

(5) Nausea/ vomiting
b. Physical
(1) Cardiovascular
(a) Hypotension
(b) Tachycardia
(2) Lungs
(a) Pulmonary edema
(3) Skin
(a) Pale
(b) Cool
(c) Moist
(4) Edema
(5) Inspect abdomen
(a) Scars
(b) Ecchymosis
(c) Contour
i) Bulges
ii) Symmetry
(6) Auscultate
(a) Bowel sounds
(7) Percuss
(8) Palpate
4. Management
a. Airway and ventilatory support
(1) High flow oxygen
b. Circulatory support
(1) Positioning
(2) Fluid bolus
c. Psychological support
d. Transport considerations

L. Esophageal varices
1. Epidemiology
a. Incidence
b. Mortality/ morbidity
c. Risk factors
d. Prevention strategies
e. Anatomy and physiology review
f. Pathophysiology
(1) Portal hypertension
(2) Esophagitis with erosion
(3) Ingestion caustic substance
2. Assessment findings
a. History
(1) Acute
(2) Painless
(3) Nausea
(4) Vomiting/ hematemesis
b. Physical
(1) Cardiovascular
(a) Hypotension

(b) Tachycardia
(2) Skin
(a) Pale
(b) Cool
(c) Moist

3. Management
a. Airway and ventilatory support
(1) High flow oxygen
(2) Suction
b. Circulatory support
(1) Positioning
(2) Fluid bolus or resuscitation
c. Transport consideration

M. Hemorrhoids
1. Epidemiology
a. Incidence
b. Mortality/ morbidity
c. Risk factors
d. Prevention strategies
e. Anatomy and physiology review
f. Pathophysiology
(1) Internal/ external hemorrhoid
(2) Increased portal vein pressure
(3) Mucosal surface
(a) Thrombosis
(b) Infection
(c) Erosion

2. Assessment findings
a. History
(1) Rectal pain
(2) Increased pain with bowel movement
(3) Stool/ blood
b. Physical

3. Management
a. Psychological support
b. Transport consideration

N. Cholecystitis
1. Epidemiology
a. Incidence
b. Mortality/ morbidity
c. Risk factors
d. Prevention strategies
e. Anatomy and physiology review
f. Pathophysiology
(1) Gallstones in cystic duct

2. Assessment findings
a. History
(1) Acute/ chronic
(2) Quality of pain
(3) Onset of pain

(4) Location of pain
b. Physical
(1) Skin
(a) Pale
(b) Cool
(c) Moist
(d) Warm
(2) Fever
(3) Inspect abdomen
(a) Scars
(b) Ecchymosis
(c) Contour
i) Bulges
ii) Symmetry
(4) Auscultate
(a) Bowel sounds
(5) Percuss
(6) Palpate
3. Management/ treatment plan
a. Pharmacological interventions
(1) Consider pain medication
b. Transport consideration

O. Acute hepatitis
1. Epidemiology
a. Incidence
b. Mortality/ morbidity
c. Risk factors
d. Prevention strategies
e. Anatomy and physiology review
f. Pathophysiology
(1) Systemic infection of the liver
(2) Types
(3) Chronic liver disease
(4) Cirrhosis
(5) Pathogenesis
2. Assessment findings
a. History
(1) Acute/ chronic onset
(2) Quality of abdominal pain
(3) Location of pain
(4) Anorexia
(5) Nausea
(6) Vomiting
(7) Fatigue
(8) Headache
(9) Malaise
(10) Photophobia
(11) Pharyngitis
(12) Cough
b. Physical

(1) Skin
(a) Warm
(b) Rash
(2) Fever
(3) Inspect abdomen
(a) Scars
(b) Ecchymosis
(c) Contour
i) Bulges
ii) Symmetry
(4) Auscultate
(a) Bowel sounds
(5) Percuss
(6) Palpate

3. Management
a. Psychological support
b. Transport consideration

IV. Integration

UNIT TERMINAL OBJECTIVE

5-7 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with a renal or urologic problem.

COGNITIVE OBJECTIVES

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

5-7.1 Describe the incidence, morbidity, mortality, and risk factors predisposing to urological emergencies. (C-1)
5-7.2 Discuss the anatomy and physiology of the organs and structures related to urogenital diseases. (C-1)
5-7.3 Define referred pain and visceral pain as it relates to urology. (C-1)
5-7.4 Describe the questioning technique and specific questions the paramedic should utilize when gathering a focused history in a patient with abdominal pain. (C-1)
5-7.5 Describe the technique for performing a comprehensive physical examination of a patient complaining of abdominal pain. (C-1)
5-7.6 Define acute renal failure. (C-1)
5-7.7 Discuss the pathophysiology of acute renal failure. (C-1)
5-7.8 Recognize the signs and symptoms related to acute renal failure. (C-1)
5-7.9 Describe the management for acute renal failure. (C-1)
5-7.10 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with acute renal failure. (C-3)
5-7.11 Define chronic renal failure. (C-1)
5-7.12 Discuss the pathophysiology of chronic renal failure. (C-1)
5-7.13 Recognize the signs and symptoms related to chronic renal failure. (C-1)
5-7.14 Describe the management for chronic renal failure. (C-1)
5-7.15 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with chronic renal failure. (C-3)
5-7.16 Define renal dialysis. (C-1)
5-7.17 Discuss the common complication of renal dialysis. (C-1)
5-7.18 Define renal calculi. (C-1)
5-7.19 Discuss the pathophysiology of renal calculi. (C-1)
5-7.20 Recognize the signs and symptoms related to renal calculi. (C-1)
5-7.21 Describe the management for renal calculi. (C-1)
5-7.22 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with renal calculi. (C-3)
5-7.23 Define urinary tract infection. (C-1)
5-7.24 Discuss the pathophysiology of urinary tract infection. (C-1)
5-7.25 Recognize the signs and symptoms related to urinary tract infection. (C-1)
5-7.26 Describe the management for a urinary tract infection. (C-1)
5-7.27 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with a urinary tract infection. (C-3)
5-7.28 Apply the epidemiology to develop prevention strategies for urological emergencies. (C-2)
5-7.29 Integrate pathophysiological principles to the assessment of a patient with abdominal pain. (C-3)
5-7.30 Synthesize assessment findings and patient history information to accurately differentiate between pain of a urogenital emergency and that of other origins. (C-3)
5-7.31 Develop, execute, and evaluate a treatment plan based on the field impression made in the assessment. (C-3)

AFFECTIVE OBJECTIVES

None identified for this unit.

PSYCHOMOTOR OBJECTIVES
None identified for this unit.

DECLARATIVE

I. Introduction
- A. Epidemiology
  - 1. Incidence
  - 2. Mortality/ morbidity
  - 3. Risk factors
  - 4. Prevention strategies
- B. Anatomy and physiology review
- C. Mechanisms of injuries/ illness

II. General pathophysiology, assessment and management
- A. Pathophysiology of abdominal pain
  - 1. Bacterial contamination
    - a. Urinary tract infection
  - 2. Types of abdominal pain
    - a. Visceral pain
      - (1) Obstruction of hollow viscera (ureters, urethra, etc.)
    - b. Referred pain
- B. Assessment findings
  - 1. Scene size-up
  - 2. Initial assessment
    - a. Airway
    - b. Breathing
    - c. Circulation
    - d. Disability
    - e. Chief complaint
  - 3. Focused history
    - a. Onset
    - b. Provoking factors
    - c. Quality
    - d. Region/ radiation
    - e. Severity
    - f. Time
    - g. Previous history of same event
    - h. Nausea / vomiting
    - i. Change in bowel habits/ stool
      - (1) Constipation
      - (2) Diarrhea
    - j. Weight loss
    - k. Last meal
    - l. Chest pain
  - 4. Focused physical examination
    - a. Appearance
    - b. Posture
    - c. Level of consciousness
    - d. Apparent state of health
    - e. Skin color
    - f. Vital signs
    - g. Inspect abdomen

h. Auscultate abdomen
i. Percuss abdomen
j. Palpate abdomen
k. Female abdominal exam
l. Male abdominal exam

5. Assessment tools
   a. Hematocrit

C. Management/ treatment plan
1. Airway and ventilatory support
   a. Maintain an open airway
   b. High flow oxygen
2. Circulatory support
   a. Electrocardiogram
   b. Monitor blood pressure
3. Pharmacological interventions
   a. Consider initiating intravenous line
   b. Avoid intervention which mask signs and symptoms
4. Non-pharmacological interventions
   a. Nothing by mouth
   b. Monitor LOC
   c. Monitor vital signs
   d. Position of comfort
5. Transport consideration
   a. Persistent pain for greater than six hours requires transport
   b. Gentle but rapid transport
6. Psychological support
   a. All actions reflect a calm, caring, competent attitude
   b. Keep patient and significant others informed of your actions

III. Specific injuries/ illness
A. Acute renal failure
1. Epidemiology
   a. Incidence
   b. Mortality/ morbidity
      (1) Overall mortality 50%
   c. Risk factors
      (1) Prerenal
      (2) Postrenal
      (3) Renal
   d. Prevention strategies
      (1) Protection of cardiovascular function and volume
      (2) Reduce exposure to nephrotoxic drugs
   e. Anatomy and physiology review
   f. Pathophysiology
      (1) Function of the nephron and glomerular filtration rate
      (2) Retention of nitrogenous waste products and electrolytes
      (3) Aberrations in glucose reabsorption
      (4) Disorders of renal hypoperfusion
         (a) Hypovolemia
         (b) Low cardiac output

(c) Increased renal systemic vascular resistance ratio
(d) Diseases of renal parenchyma
i) Renovascular obstruction
ii) Glomerular renal microvasculature
iii) Acute tubular necrosis
iv) Interstitial nephritis
(e) Acute obstruction of the urinary tract
i) Ureter
ii) Bladder neck
iii) Urethra
(f) Hyperkalemia
(g) Metabolic acidosis

2. Assessment findings
a. History
(1) Oliguria/ anuria
(2) Edema
(3) Acidosis
b. Physical
(1) Altered level of consciousness
(2) Skin
(a) Pale
(b) Cool
(c) Moist
(3) Cardiovascular
(a) Hypotension
(b) Tachycardia
(c) ECG findings
(4) Inspect abdomen
(a) Scars
(b) Ecchymosis
(c) Contour
i) Bulges
ii) Symmetry
(5) Auscultate
(6) Palpate
c. Assessment tools
(1) Hematocrit
(2) Urinalysis
3. Management
a. Airway and ventilatory support
(1) High flow oxygen
b. Circulatory support
(1) Positioning
(2) Consider fluid bolus or resuscitation
(3) Consider fluid lavage
c. Psychological support
d. Transport consideration

B. Chronic renal failure
1. Epidemiology
a. Incidence

b. Mortality/ morbidity
c. Risk factors
   (1) Diabetes mellitus
   (2) Hypertension
d. Prevention strategies
e. Anatomy and physiology review
f. Pathophysiology
   (1) Reduction of renal mass
   (2) Reduction of nephron mass
   (3) Glucose intolerance
   (4) Electrolyte imbalance
   (5) Anemia

2. Assessment findings
   a. History
      (1) Anorexia
      (2) Nausea
      (3) Vomiting
      (4) Anxiety
      (5) Seizure activity
   b. Physical
      (1) Altered level of consciousness
         (a) Delirium
      (2) Skin
         (a) Pale
         (b) Cool
         (c) Moist
         (d) Jaundice
         (e) Uremic frost
      (3) Cardiovascular
         (a) Hypotension
         (b) Tachycardia
         (c) ECG findings
         (d) Pericarditis rub
         (e) Edema
      (4) Lungs
         (a) Pulmonary edema
      (5) Neurological
         (a) Seizure
         (b) Muscle twitching
      (6) Inspect abdomen
         (a) Scars
         (b) Ecchymosis
         (c) Contour
         (d) Bulges
      (7) Symmetry
      (8) Auscultate
      (9) Percuss
      (10) Palpate
   c. Assessment tools
      (1) Hematocrit

(2) Urinalysis

3. Management
   a. Airway and ventilatory support
      (1) High flow oxygen
   b. Circulatory support
      (1) Positioning
      (2) Consider fluid bolus or resuscitation
      (3) Consider fluid lavage
   c. Pharmacological
      (1) Vasopressor
   d. Non-pharmacological
      (1) Renal dialysis
         (a) Definition
            i) Process of diffusing blood across a semi-permeable membrane to remove substances that normally the kidney would eliminate
            ii) May restore electrolyte and acid base imbalances
         (b) Complications
            i) Vascular-access related - most common
               a) Bleeding from dialysis puncture site
               b) Thrill in access has been lost
               c) Infection
            ii) Non-vascular access related
               a) Hypotension
               b) Shortness of breath
               c) Chest pain
               d) Neurologic abnormalities
   e. Psychological support
   f. Transport considerations
      (1) Appropriate mode
      (2) Appropriate facility

C. Renal calculi
   1. Epidemiology
      a. Incidence
      b. Mortality/ morbidity
      c. Risk factors
         (1) Absent sensory/ motor impulses
         (2) Medications
            (a) Anesthetics
            (b) Opiates
            (c) Psychotropic
         (3) Postoperative
      d. Prevention strategies
      e. Anatomy and physiology review
      f. Pathophysiology
         (1) Urinary stones
            (a) Calcium salts
            (b) Uric acid
            (c) Cystine
            (d) Struvite

2. Assessment findings
   a. History
      (1) Quality of pain
      (2) Onset of pain
      (3) Location of pain
      (4) Dysuria
      (5) Hematuria
      (6) Nocturia
      (7) Frequent urination
      (8) History of same condition
   b. Physical
      (1) Restless
      (2) Skin
         (a) Pale
         (b) Cool
         (c) Moist
      (3) Vital signs
         (a) Vary considerably
      (4) Abdominal exam
         (a) Inspect
            i) Contour
               a) Bulges
               b) Symmetry
         (b) Auscultate
         (c) Palpate
3. Management
   a. Airway and ventilatory support
   b. Circulatory support
      (1) Positioning
   c. Pharmacological
      (1) Consider pain management
   d. Non-pharmacological
      (1) Pain management
   e. Transport considerations
      (1) Appropriate mode
      (2) Appropriate facility

D. Urinary tract infection
1. Epidemiology
   a. Incidence
   b. Mortality/ morbidity
   c. Risk factors
      (1) Nerve disruption
      (2) Diabetes
   d. Prevention strategies
   e. Anatomy and physiology review
   f. Pathophysiology
      (1) Lower tract infection
         (a) Urethritis
         (b) Cystitis
         (c) Prostatitis

(2) Upper tract infection
(a) Pyelonephritis
(b) Intrarenal and perinephric abscesses
(3) Pathogenic microorganisms

2. Assessment findings
a. History
(1) Quality of pain
(2) Onset of pain
(3) Location of pain
(4) Dysuria
(5) Urgency to urinate
(6) Strong urine odor
(7) History of same condition
b. Physical
(1) Restless
(2) Skin
(a) Pale
(b) Cool
(c) Moist
(d) Warm
(3) Fever
(4) Vital signs
(a) Vary considerably
(5) Abdominal exam
(a) Inspect
i) Contour
a) Bulges
b) Symmetry
(b) Auscultate
(c) Palpate

3. Management
a. Airway and ventilatory support
b. Circulatory support
(1) Positioning
c. Pharmacological
(1) Consider pain management
d. Non-pharmacological
(1) Pain management
e. Transport considerations
(1) Appropriate mode
(2) Appropriate facility

IV. Integration

UNIT TERMINAL OBJECTIVE

5-8 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with a toxic exposure.

COGNITIVE OBJECTIVES

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

5-8.1 Describe the incidence, morbidity and mortality of toxic emergencies. (C-1)
5-8.2 Identify the risk factors most predisposing to toxic emergencies. (C-1)
5-8.3 Discuss the anatomy and physiology of the organs and structures related to toxic emergencies. (C-1)
5-8.4 Describe the routes of entry of toxic substances into the body. (C-1)
5-8.5 Discuss the role of the Poison Control Center in the United States. (C-1)
5-8.6 List the toxic substances that are specific to your region. (C-1)
5-8.7 Discuss the pathophysiology of the entry of toxic substances into the body. (C-1)
5-8.8 Discuss the assessment findings associated with various toxidromes. (C-1)
5-8.9 Identify the need for rapid intervention and transport of the patient with a toxic substance emergency. (C-1)
5-8.10 Discuss the management of toxic substances. (C-1)
5-8.11 Define poisoning by ingestion. (C-1)
5-8.12 List the most common poisonings by ingestion. (C-1)
5-8.13 Describe the pathophysiology of poisoning by ingestion. (C-1)
5-8.14 Recognize the signs and symptoms related to the most common poisonings by ingestion. (C-1)
5-8.15 Correlate the abnormal findings in assessment with the clinical significance in the patient with the most common poisonings by ingestion. (C-1)
5-8.16 Differentiate among the various treatments and pharmacological interventions in the management of the most common poisonings by ingestion. (C-3)
5-8.17 Discuss the factors affecting the decision to induce vomiting in a patient with ingested poison. (C-1)
5-8.18 Integrate pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with the most common poisonings by ingestion. (C-3)
5-8.19 Define poisoning by inhalation. (C-1)
5-8.20 List the most common poisonings by inhalation. (C-1)
5-8.21 Describe the pathophysiology of poisoning by inhalation. (C-1)
5-8.22 Recognize the signs and symptoms related to the most common poisonings by inhalation. (C-1)
5-8.23 Correlate the abnormal findings in assessment with the clinical significance in patients with the most common poisonings by inhalation. (C-1)
5-8.24 Differentiate among the various treatments and pharmacological interventions in the management of the most common poisonings by inhalation. (C-3)
5-8.25 Integrate pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with the most common poisonings by inhalation. (C-3)
5-8.26 Define poisoning by injection. (C-1)
5-8.27 List the most common poisonings by injection. (C-1)
5-8.28 Describe the pathophysiology of poisoning by injection. (C-1)
5-8.29 Recognize the signs and symptoms related to the most common poisonings by injection. (C-1)
5-8.30 Correlate the abnormal findings in assessment with the clinical significance in the patient with the most common poisonings by injection. (C-3)
5-8.31 Differentiate among the various treatments and pharmacological interventions in the management of the most common poisonings by injection. (C-3)

5-8.32 Integrate pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with the most common poisonings by injection. (C-3)
5-8.33 Define poisoning by surface absorption. (C-1)
5-8.34 List the most common poisonings by surface absorption. (C-1)
5-8.35 Describe the pathophysiology of poisoning by surface absorption. (C-1)
5-8.36 Recognize the signs and symptoms related to the most common poisonings by surface absorption. (C-1)
5-8.37 Correlate the abnormal findings in assessment with the clinical significance in patients with the most common poisonings by surface absorption. (C-3)
5-8.38 Differentiate among the various treatments and pharmacological interventions in the management of the most common poisonings by surface absorption. (C-3)
5-8.39 Integrate pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for patients with the most common poisonings by surface absorption. (C-3)
5-8.40 Define poisoning by overdose. (C-1)
5-8.41 List the most common poisonings by overdose. (C-1)
5-8.42 Describe the pathophysiology of poisoning by overdose. (C-1)
5-8.43 Recognize the signs and symptoms related to the most common poisonings by overdose. (C-1)
5-8.44 Correlate the abnormal findings in assessment with the clinical significance in patients with the most common poisonings by overdose. (C-3)
5-8.45 Differentiate among the various treatments and pharmacological interventions in the management of the most common poisonings by overdose. (C-3)
5-8.46 Integrate pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for patients with the most common poisonings by overdose. (C-3)
5-8.47 Define drug abuse. (C-1)
5-8.48 Discuss the incidence of drug abuse in the United States. (C-1)
5-8.49 Define the following terms: (C-1)
- a. Substance or drug abuse
- b. Substance or drug dependence
- c. Tolerance
- d. Withdrawal
- e. Addiction

5-8.50 List the most commonly abused drugs (both by chemical name and street names). (C-1)
5-8.51 Describe the pathophysiology of commonly used drugs. (C-1)
5-8.52 Recognize the signs and symptoms related to the most commonly abused drugs. (C-1)
5-8.53 Correlate the abnormal findings in assessment with the clinical significance in patients using the most commonly abused drugs. (C-3)
5-8.54 Differentiate among the various treatments and pharmacological interventions in the management of the most commonly abused drugs. (C-3)
5-8.55 Integrate pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for patients using the most commonly abused drugs. (C-3)
5-8.56 List the clinical uses, street names, pharmacology, assessment finding and management for patient who have taken the following drugs or been exposed to the following substances: (C-1)
1. Cocaine
2. Marijuana and cannabis compounds
3. Amphetamines and amphetamine-like drugs
4. Barbiturates
5. Sedative-hypnotics
6. Cyanide

7. Narcotics/ opiates
8. Cardiac medications
9. Caustics
10. Common household substances
11. Drugs abused for sexual purposes/ sexual gratification
12. Carbon monoxide
13. Alcohols
14. Hydrocarbons
15. Psychiatric medications
16. Newer anti-depressants and serotonin syndromes
17. Lithium
18. MAO inhibitors
19. Non-prescription pain medications
    (1) Nonsteroidal anitinflammatory agents
    (2) Salicylates
    (3) Acetaminophen
20. Theophylline
21. Metals
22. Plants and mushrooms

5-8.57 Discuss common causative agents, pharmacology, assessment findings and management for a patient with food poisoning. (C-1)

5-8.58 Discuss common offending organisms, pharmacology, assessment findings and management for a patient with a bite or sting. (C-1)

5-8.59 Integrate pathophysiological principles of the patient with a toxic substance exposure. (C-1)

5-8.60 Differentiate between toxic substance emergencies based on assessment findings. (C-3)

5-8.61 Correlate abnormal findings in the assessment with the clinical significance in the patient exposed to a toxic substance. (C-3)

5-8.62 Develop a patient management plan based on field impression in the patient exposed to a toxic substance. (C-3)

AFFECTIVE OBJECTIVES

None identified for this unit.

PSYCHOMOTOR OBJECTIVES

None identified for this unit.

DECLARATIVE

I. General toxicology, assessment and management
  A. Types of toxicological emergencies
    1. Unintentional poisoning
      a. Dosage errors
      b. Idiosyncratic reactions
      c. Childhood poisoning
      d. Environmental exposure
      e. Occupational exposures
      f. Neglect and Abuse
    2. Drug/ alcohol abuse
    3. Intentional poisoning/ overdose
      a. Chemical warfare
      b. Assault/ homicide
      c. Suicide attempts
  B. Use of poison control centers
  C. Routes of absorption
    1. Ingestion
    2. Inhalation
    3. Injection
    4. Absorption
  D. Poisoning by ingestion
    1. Examples
    2. Anatomy and physiology review
      a. Absorption
      b. Distribution
    3. Assessment findings
    4. General management considerations
  E. Poisoning by inhalation
    1. Examples
    2. Anatomy and physiology review
      a. Absorption
      b. Distribution
    3. Assessment findings
    4. General management considerations
  F. Poisoning by injection
    1. Examples
      a. IV drug abuse
      b. Venomous bites and stings
    2. Anatomy and physiology review
      a. Absorption
      b. Distribution

3. Assessment findings
4. General management considerations

G. Poisoning by absorption
   1. Examples
   2. Anatomy and physiology review
      a. Absorption
      b. Distribution
   3. Assessment findings
   4. General management considerations

H. Drugs abuse
   1. Epidemiology
      a. Incidence
      b. Morbidity/ mortality
      c. Risk factors
      d. Prevention
   2. Psychological issues
   3. Psycho-social issues
   4. Pathophysiology of long term drug abuse
      a. End organ damage
         (1) Brain
         (2) Liver
         (3) Heart
      b. Malnutrition
   5. Basic concepts
      a. Habituation/ dependence/ addiction
         (1) Physical
         (2) Psychological
      b. Tolerance
      c. Antagonist
      d. Potentiating
      e. Synergism
      f. Withdrawal syndromes
   6. Assessment finding

I. Alcoholism
   1. Epidemiology
      a. Incidence
      b. Morbidity/ mortality
      c. Risk factors
      d. Prevention
   2. Psychological issues
   3. Psycho-social issues
   4. Pathophysiology of long term alcohol abuse

a. End organ damage
(1) Brain
(2) Liver
(3) Heart
(4) Bone
(5) Pancreas
b. Malnutrition
c. Withdrawal syndrome
5. Assessment findings
J. Toxic syndromes
1. Definition/ advantages
a. Grouping of toxiologically similar agents
b. Useful for remembering the assessment and management of toxicological emergencies
c. Does not consider how or why the toxin has been introduced to the body
d. Be sure to include the general management based or route of entry in addition to specific treatments
2. Cholinergics
a. Common causative agents - pesticides (organophosphates, carbamates) and nerve agents (sarin, Soman)

b. Assessment findings
(1) Headache
(2) Dizziness
(3) Weakness
(4) Nausea
(5) SLUDGE (salivation, lacrimation, urination, defecation, GI Upset, Emesis)
(6) Bardycardia, wheezing, bronchoconstriction, myosis, coma, convulsions
(7) Diaphoresis, seizures
c. Management
(1) Decontamination
(2) Airway and ventilation
(a) Aggressive airway management
(3) Circulation
(4) Pharmacological
(a) Atropine

(b) Pralidoxime chloride (2-PAM)
(c) Diazepam
(d) Activated charcoal
(5) Non-pharmacological
(6) Transport considerations
(a) Appropriate mode
(b) Appropriate facility
(7) Psychological/ communication strategies

3. Anticholinergic
   a. Common causative agents
   b. Assessment findings
   c. Management
      (1) Airway and ventilation
      (2) Circulation
      (3) Pharmacological
      (4) Non-pharmacological
      (5) Transport considerations
         (a) Appropriate mode
         (b) Appropriate facility
      (6) Psychological/communication strategies
4. Hallucinogens
   a. Common causative agents - lysergic acid diethylamide (LSD), phenyclicidine (PCP), peyote, mushrooms, jimson weed, mescaline
   b. Assessment findings
      (1) Chest pain
   c. Management
      (1) Airway and ventilation
      (2) Circulation
      (3) Pharmacological
      (4) Non-pharmacological
      (5) Transport considerations
         (a) Appropriate mode
         (b) Appropriate facility
      (6) Psychological/ communication strategies
5. Narcotics/ opiates
   a. Common causative agents - heroin, morphine, codeine, meperidine, propoxyphene, fentanyl
   b. Assessment findings
      (1) Euphoria
      (2) Hypotension
      (3) Respiratory depression/ arrest
      (4) Nausea

(5) Pinpoint pupils
(6) Seizures
(7) Coma

c. Management
(1) Airway and ventilation
(2) Circulation
(3) Pharmacological
(a) Naloxone- opiate specific antidotal therapy
(4) Non-pharmacological
(5) Transport considerations
(a) Appropriate mode
(b) Appropriate facility
(6) Psychological/ communication strategies

6. Sympathomimetics
a. Common causative agents
b. Assessment findings
c. Management
(1) Airway and ventilation
(2) Circulation
(3) Pharmacological
(4) Non-pharmacological
(5) Transport considerations
(a) Appropriate mode
(b) Appropriate facility
(6) Psychological/ communication strategies

II. Specific toxicology, assessment and management
A. Cocaine
1. Clinical uses
2. Common causative agents
3. Common street names
4. Pharmacodynamics
5. Pharmacokinetics
6. Assessment findings
7. Management
a. Airway and ventilation
b. Circulation
c. Pharmacological
d. Non-pharmacological
e. Transport considerations
(1) Appropriate mode
(2) Appropriate facility

f. Psychological/ communication strategies

B. Marijuana and cannabis compounds
1. Clinical uses
2. Common causative agents
3. Common street names
4. Pharmacodynamics
5. Pharmacokinetics
6. Assessment findings
7. Management
a. Airway and ventilation
b. Circulation
c. Pharmacological
d. Non-pharmacological
e. Transport considerations
(1) Appropriate mode
(2) Appropriate facility
f. Psychological/ communication strategies

C. Amphetamines and amphetamine-like drugs
1. Clinical uses
2. Common causative agents
3. Common street names
4. Pharmacodynamics
5. Pharmacokinetics
6. Assessment findings
7. Management
a. Airway and ventilation
b. Circulation
c. Pharmacological
d. Non-pharmacological
e. Transport considerations
(1) Appropriate mode
(2) Appropriate facility
f. Psychological/communication strategies

D. Barbiturates
1. Clinical uses
2. Common causative agents
3. Common street names
4. Pharmacodynamics
5. Pharmacokinetics
6. Assessment findings
7. Management
a. Airway and ventilation
b. Circulation

c. Pharmacological
d. Non-pharmacological
e. Transport considerations
(1) Appropriate mode
(2) Appropriate facility
f. Psychological/ communication strategies

E. Sedative-hypnotics
1. Clinical use
2. Common causative agents - benzodiazepines (diazepam, chlordiazepoxide, midazolam)
3. Common street names
4. Pharmacodynamics
5. Pharmacokinetics
6. Assessment findings
a. Respiratory depression/ respiratory arrest
b. Hypotension
7. Management
a. Airway and ventilation
b. Circulation
c. Pharmacological
(1) Antidote
d. Non-pharmacological
e. Transport considerations
(1) Appropriate mode
(2) Appropriate facility
f. Psychological/ communication strategies

F. Cyanide
1. Sources
2. Common causative agents
a. Used in industry (electroplating, ore extraction, fumigation of structures)
b. Product of combustion of nylon or polyurethane
c. Ingestion of seeds (apricot, cherry, pears)
d. Nitroprusside administration
3. Pharmacodynamics
4. Pharmacokinetics
5. Assessment findings
a. History of cyanide exposure
b. Early findings (anxiety, dyspnea, confusion, hypertension, agitation)
c. Late findings (hypotension, acidosis , seizures, pulmonary edema, dysrhythmias, coma)
6. Management

a. Personal protective equipment
(1) Remove patient from the source of poison
b. Airway and ventilation
c. Circulation
(1) Monitoring for hypotension as a result of therapy
d. Pharmacological
(1) Antidotes
(2) Cyanide antidote kit
e. Non-pharmacological
f. Transport considerations
(1) Appropriate mode
(2) Appropriate facility
g. Psychological/ communication strategies

G. Narcotics/ opiates
1. Clinical uses
2. Common causative agents - heroin, morphine, codeine, meperidine, propoxyphene, fentanyl
3. Phamacodynamics
4. Pharmcokinetics
5. Assessment findings
a. Euphoria
b. Hypotension
c. Respiratory depression/ arrest
d. Nausea
e. Pinpoint pupils
f. Seizures
g. Coma
6. Management
a. Airway and ventilation
b. Circulation
c. Pharmacological
(1) Naloxone - opiate specific antidotal therapy
d. Non-pharmacological
e. Transport considerations
(1) Appropriate mode
(2) Appropriate facility
f. Psychological/ communication strategies

H. Cardiac medications
1. Clinical use
2. Common causative agents - antidysrythmics, beta blockers, calcium channel blockers, glycosides

3. Pharmacodynamics
4. Pharmacokinetics
5. Assessment findings
6. Management
    a. Airway and ventilation
    b. Circulation
    c. Pharmacological
    d. Non-pharmacological
    e. Transport considerations
        (1) Appropriate mode
        (2) Appropriate facility
    f. Psychological/ communication strategies

I. Caustics
1. Source
2. Common causative agents - acids and alkali
3. Pharmacodynamics
4. Pharmacokinetics
5. Assessment findings
6. Management
    a. Airway and ventilation
    b. Circulation
    c. Pharmacological
    d. Non-pharmacological
    e. Transport considerations
        (1) Appropriate mode
        (2) Appropriate facility
    f. Psychological/ communication strategies

J. Common household poisonings
1. Sources
2. Common causative agents - bleach, cleaning agents
3. Pharmacodynamics
4. Pharmacokinetics
5. Assessment findings
6. Management
    a. Airway and ventilation
    b. Circulation
    c. Pharmacological
    d. Non-pharmacological
    e. Transport considerations
        (1) Appropriate mode
        (2) Appropriate facility
    f. Psychological/ communication strategies

K. Drugs abused for sexual purposes/ sexual gratification
    1. Sources
    2. Common causative agents
    3. Pharmacodynamics
    4. Pharmacokinetics
    5. Assessment findings
    6. Management
        a. Airway and ventilation
        b. Circulation
        c. Pharmacological
        d. Non-pharmacological
        e. Transport considerations
            (1) Appropriate mode
            (2) Appropriate facility
        f. Psychological/ communication strategies

L. Carbon monoxide
    1. Source
    2. Common causative agents
    3. Pharmacodynamics
    4. Pharmacokinetics
    5. Assessment findings
    6. Management
        a. Airway and ventilation
        b. Circulation
        c. Pharmacological
        d. Non-pharmacological
            (1) Hyperbaric treatment
        e. Transport considerations
            (1) Appropriate mode
            (2) Appropriate facility
        f. Psychological/ communication strategies

M. Alcohols
    1. Clinical use/ sources
    2. Common causative agents - ethylene glycol, methanol, isopropyl alcohol, ethanol
    3. Pharmacodynamics
    4. Pharmacokinetics
    5. Assessment findings
    6. Management
        a. Airway and ventilation
        b. Circulation
        c. Pharmacological
            (1) Antidote

d. Non-pharmacological
e. Transport considerations
(1) Appropriate mode
(2) Appropriate facility
f. Psychological/ communication strategies

N. Hydrocarbons
1. Source
2. Common causative agents - gasoline
3. Pharmacodynamics
a. Aspiration pneumonia
b. CNS depression
c. Acute gastritis
4. Pharmacokinetics
5. Assessment findings
6. Management
a. Airway and ventilation
b. Circulation
c. Pharmacological
d. Non-pharmacological
e. Transport considerations
(1) Appropriate mode
(2) Appropriate facility
f. Psychological/ communication strategies

O. Psychiatric medications
1. Tricyclic antidepressants
a. Clinical use
b. Common causative agents - amitriptyline amoxapine, clomipramine, doxepin, imipramine, nortptyline
c. Phamacodynamics
d. Pharmacokinetics
e. Assessment findings
(1) Early findings (dry mouth, confusion, hallucinations)
(2) Late findings (delirium, respiratory depression, hypotension, hyperthermia, seizures, coma)
(3) Cardiotoxicity - dysrhythmias
f. Management
(1) Airway and ventilation
(2) Circulation
(3) Pharmacological
(a) Antidote

(b) Sodium bicarbonate may reverse the cardiotoxic effects
(4) Non-pharmacological
(5) Transport considerations
(a) Appropriate mode
(b) Appropriate facility
(6) Psychological/ communication strategies

2. Newer anti-depressants and serotonin syndromes
a. Clinical uses
b. Common causative agents
c. Common street names
d. Pharmacodynamics
e. Pharmacokinetics
f. Assessment findings
g. Management
(1) Airway and ventilation
(2) Circulation
(3) Pharmacological
(4) Non-pharmacological
(5) Transport considerations
(a) Appropriate mode
(b) Appropriate facility
(6) Psychological/ communication strategies

3. Lithium
a. Clinical uses
b. Common causative agents
c. Common street names
d. Pharmacodynamics
e. Pharmacokinetics
f. Assessment findings
g. Management
(1) Airway and ventilation
(2) Circulation
(3) Pharmacological
(4) Non-pharmacological
(5) Transport considerations
(a) Appropriate mode
(b) Appropriate facility
(6) Psychological/ communication strategies

4. MAO inhibiters
a. Clinical use
b. Common causative agents
c. Pharmacodynamics

- d. Pharmacokinetics
- e. Assessment findings
- f. Management
  - (1) Airway and ventilation
  - (2) Circulation
  - (3) Pharmacological
  - (4) Non-pharmacological
  - (5) Transport considerations
    - (a) Appropriate mode
    - (b) Appropriate facility
  - (6) Psychological/ communication strategies

5. Other

P. Non-prescription pain medications

1. Nonsteroidal anti-inflammatory agents
   - a. Clinical uses
   - b. Common causative agents
   - c. Common street names
   - d. Pharmacodynamics
   - e. Pharmacokinetics
   - f. Assessment findings
   - g. Management
     - (1) Airway and ventilation
     - (2) Circulation
     - (3) Pharmacological
     - (4) Non-pharmacological
     - (5) Transport considerations
       - (a) Appropriate mode
       - (b) Appropriate facility
     - (6) Psychological/ communication strategies

2. Salicylates
   - a. Clinical uses
   - b. Common causative agents
   - c. Common street names
   - d. Pharmacodynamics
   - e. Pharmacokinetics
   - f. Assessment findings
   - g. Management
     - (1) Airway and ventilation
     - (2) Circulation
     - (3) Pharmacological
     - (4) Non-pharmacological
     - (5) Transport considerations
       - (a) Appropriate mode

(b) Appropriate facility
(6) Psychological/ communication strategies
3. Acetaminophine
a. Clinical use
b. Common causative agents
c. Pharmacodynamics
d. Pharmacokinetics
e. Assessment findings
f. Management
(1) Airway and ventilation
(2) Circulation
(3) Pharmacological
(4) Non-pharmacological
(5) Transport considerations
(a) Appropriate mode
(b) Appropriate facility
(6) Psychological/ communication strategies

Q. Theophylline
1. Clinical use
2. Common causative agents
3. Pharmacodynamics
4. Pharmacokinetics
5. Assessment findings
6. Management
a. Airway and ventilation
b. Circulation
c. Pharmacological
d. Non-pharmacological
e. Transport considerations
(1) Appropriate mode
(2) Appropriate facility
f. Psychological/ communication strategies

R. Metals
1. Clinical use
2. Common causative agents - iron, lead, mercury
3. Pharmacodynamics
4. Pharmacokinetics
5. Assessment findings
6. Management
a. Airway and ventilation
b. Circulation
c. Pharmacological
(1) Antidote

- d. Non-pharmacological
- e. Transport considerations
  - (1) Appropriate mode
  - (2) Appropriate facility
- f. Psychological/ communication strategies

S. Plants and mushrooms
1. Clinical use
2. Common causative agents
3. Common street names
4. Pharmacodynamics
5. Pharmacokinetics
6. Assessment findings
7. Management
   - a. Airway and ventilation
   - b. Circulation
   - c. Pharmacological
   - d. Non-pharmacological
   - e. Transport considerations
     - (1) Appropriate mode
     - (2) Appropriate facility
   - f. Psychological/ communication strategies

T. Food poisoning
1. Common causative agents
2. Pharmacodynamics
   - a. Type I reaction
   - b. Gastrointestinal allergy
   - c. Bacterial toxins
     - (1) Exotoxins
     - (2) Enterotoxins
   - d. Neurotoxins
     - (1) Paralytic shellfish poisoning
3. Pharmacokinetics
4. Assessment findings
5. Management
   - a. Airway and ventilation
   - b. Circulation
   - c. Pharmacological
   - d. Non-pharmacological
   - e. Transport considerations
     - (1) Appropriate mode
     - (2) Appropriate facility
   - f. Psychological/ communication strategies

U. Bites and stings

1. Common offending organisms - hymenoptera, spider bites, other arthropods, snake bites, marine animal
2. Pharmacodynamics
3. Pharmacokinetics
4. Assessment findings
5. Management
    a. Airway and ventilation
    b. Circulation
    c. Pharmacological
    d. Non-pharmacological
    e. Transport considerations
        (1) Appropriate mode
        (2) Appropriate facility
    f. Psychological/ communication strategies

UNIT TERMINAL OBJECTIVE

5-9 At the completion of this unit, the paramedic student will be able to integrate the pathophysiological principles of the hematopoietic system to formulate a field impression and implement a treatment plan.

COGNITIVE OBJECTIVES

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

5-9.1 Identify the anatomy of the hematopoietic system. (C-1)
5-9.2 Describe volume and volume-control related to the hematopoietic system. (C-1)
5-9.3 Identify and describe the blood-forming organs. (C-1)
5-9.4 Describe normal red blood cell (RBC) production, function and destruction. (C-1)
5-9.5 Explain the significance of the hematocrit with respect to red cell size and number. (C-1)
5-9.6 Explain the correlation of the RBC count, hematocrit and hemoglobin values. (C-1)
5-9.7 Define anemia. (C-1)
5-9.8 Describe normal white blood cell (WBC) production, function and destruction. (C-1)
5-9.9 Identify the characteristics of the inflammatory process. (C-1)
5-9.10 Identify the difference between cellular and humoral immunity. (C-1)
5-9.11 Identify alterations in immunologic response. (C-1)
5-9.12 Describe the number, normal function, types and life span of leukocytes. (C-1)
5-9.13 List the leukocyte disorders. (C-1)
5-9.14 Describe platelets with respect to normal function, life span and numbers. (C-1)
5-9.15 Describe the components of the hemostatic mechanism. (C-1)
5-9.16 Describe the function of coagulation factors, platelets and blood vessels necessary for normal coagulation. (C-1)
5-9.17 Describe the intrinsic and extrinsic clotting systems with respect to identification of factor deficiencies in each stage. (C-3)
5-9.18 Identify blood groups. (C-1)
5-9.19 Describe how acquired factor deficiencies may occur. (C-3)
5-9.20 Define fibrinolysis. (C-1)
5-9.21 Identify the components of physical assessment as they relate to the hematologic system. (C-1)
5-9.22 Describe the pathology and clinical manifestations and prognosis associated with: (C-3)

1. Anemia
2. Leukemia
3. Lymphomas
4. Polycythemia
5. Disseminated intravascular coagulopathy
6. Hemophilia
7. Sickle cell disease
8. Multiple myeloma

5-9.23 Integrate pathophysiological principles into the assessment of a patient with hematologic disease. (C-3)

AFFECTIVE OBJECTIVES

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

5-9.24 Value the sense of urgency for initial assessment and

interventions for patients with hematologic crises.

PSYCHOMOTOR OBJECTIVES

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

5-9.25 Perform an assessment of the patient with hematologic disorder. (P-1)

DECLARATIVE

I. Introduction
  A. Epidemiology
    1. Incidence
      a. Prevalence of hematologic disorders
      b. Supportive statistics
      c. Prevalence of warning signs and symptoms
    2. Morbidity/ mortality
      a. Reduced with early recognition
      b. Reduced with early access to EMS system
    3. Risk factors
    4. Prevention strategies
  B. Anatomy and physiology review
    1. Blood
      a. Components
      b. Color, specific gravity, pH
      c. Function
      d. Volume and volume control
    2. Plasma
      a. Components
      b. Color
      c. Function
      d. Volume control
    3. Blood-forming organs
      a. Bone marrow
      b. Liver
      c. Spleen
    4. Normal red cell production, function and destruction
      a. Erythrocytes
      b. Hemoglobin
      c. Production stimulus
      d. Destruction
    5. Normal white cell production and function
    6. The inflammatory process
    7. Immunity
      a. Cellular immunity
      b. Humoral immunity
      c. Autoimmune diseases
      d. Alterations in immunologic response
    8. Blood groups
    9. Hemostasis
      a. Vascular components

b. Coagulation mechanisms
(1) Intrinsic and extrinsic pathways

II. General pathophysiology, assessment and management
A. Pathophysiology
B. Assessment of the hematopoietic system
1. General signs and symptoms
2. Specific signs and symptoms
a. Vital signs
b. Laboratory values
C. Focused history
1. SAMPLE
2. Chief complaint
3. Pertinent past history
4. Related signs and symptoms
D. Detailed physical examination
1. Levels of consciousness
a. Vertigo
b. Fatigue
c. Syncopal episode(s)
2. Skin
a. Prolonged bleeding
b. Bruising
c. Itching
d. Pallor
e. Jaundice
3. Visual disturbances
4. Gastrointestinal
a. Epistaxis
b. Bleeding gums
c. Infections of the gums
d. Ulcerations
e. Melena
f. Liver disease
g. Pain
5. Skeletal
a. Arthralgia
b. Nuchal rigidity
6. Cardiorespiratory
a. Dyspnea
b. Chest pain
c. Hemoptysis
d. Tachycardia

7. Genitourinary
    a. Hematuria
    b. Menorrhagia
    c. Infections

E. Management
1. Airway and ventilation
    a. Oxygen
2. Circulation
    a. Fluid volume replacement
    b. Manage dysrhythmias
3. Pharmacological
    a. Oxygen
    b. Platelet aggregate inhibitor
    c. Alkalinizing agents
    d. Narcotic/ analgesic
    e. Diuretic
4. Non-pharmacological
5. Transport considerations
    a. Appropriate mode
    b. Appropriate facility
6. Psychological/ communication strategies

III. Specific illnesses/ injuries
A. Anemia
1. Epidemiology
    a. Reduction below normal levels of hemoglobin or erythrocytes and is a symptom of an underlying disease process
2. Pathophysiology
    a. Morbidity/ mortality
        (1) Can be self-limiting disease
        (2) Must be confirmed by laboratory diagnosis
    b. Precipitating causes
        (1) Blood loss (acute or chronic)
        (2) Decreased production of erythrocytes
        (3) Increased destruction of erythrocytes
    c. Hemolytic
        (1) Hereditary
            (a) Sickle cell
            (b) Thalassemia
            (c) Glucose-6-phosphate dehydrogenase deficiency
        (2) Acquired

(a) Immune
(b) Drug

3. Initial assessment findings
   a. Airway/ breathing
      (1) Labored breathing may or may not be present
   b. Circulation
      (1) Peripheral pulses
         (a) Quality
         (b) Rhythm
      (2) Changes in skin
         (a) Color
         (b) Temperature
         (c) Moisture
4. Focused history
   a. Complaints
      (1) Complaints secondary to anemia
         (a) Fatigue
         (b) Lethargy
         (c) Hypoxia
         (d) Dyspnea
      (2) Complaints secondary to leukopenia
         (a) Infections
         (b) Fevers
      (3) Complaints secondary to thrombocytopenia
         (a) Cutaneous bleeding
         (b) Bleeding from mucous membranes
5. Detailed physical exam
   a. Airway
   b. Breathing
   c. Circulation
      (1) Alterations in heart rate and rhythm may occur
      (2) Peripheral pulses
      (3) Blood pressure
      (4) ECG findings
         (a) Arrhythmias and ectopy
6. Management
   a. Airway and ventilation
   b. Circulatory support
   c. Pharmacological
      (1) Analgesics
      (2) Fluid volume replacement
      (3) Control of bleeding

d. Non-pharmacological
(1) Position of comfort
e. Transport considerations
(1) Appropriate mode
(a) Indications for rapid transport
i) Significant changes in LOC
ii) Hypotension/ hypoperfusion
(2) Appropriate facility
f. Support and communication strategies
(1) Explanation for patient, family, significant others
(2) Communications and transfer of data to the physician

B. Leukemia
1. Epidemiology
2. Pathophysiology
a. Morbidity/ mortality
(1) Blood loss
(2) Death
b. Neoplastic disease
(1) Acute versus chronic
c. Precipitating causes
(1) Radiation exposure
(2) Viral infections
(3) Chemicals
(4) Immune defects
(5) Chromosomal changes
3. Initial assessment findings
a. Levels of consciousness
b. Airway/ breathing
(1) Labored breathing may or may not be present
c. Circulation
(1) Peripheral pulses
(a) Quality
(b) Tachycardia
(2) Changes in skin
(a) Color
(b) Temperature
(c) Moisture
4. Focused history
a. Complaints
(1) Fatigue, bone pain, diaphoresis
(2) Elevated body temperature

(3) Sternal tenderness
(4) Heat intolerance
(5) Abdominal fullness
(6) Bleeding

b. Contributing history
(1) Recurrent bleeding
(2) Increasing frequency and/ or duration

5. Detailed physical exam
a. Airway
b. Breath sounds
c. Circulation
(1) Skin
(2) Blood pressure may low
(3) ECG findings
(a) Tachycardia
(b) Ectopic

6. Management
a. Position of comfort
b. Pharmacological
(1) Analgesia
(2) Increase or decrease heart rate
(3) Fluid volume replacement
c. Electrical
(1) Constant ECG monitoring
d. Transport
(1) Criteria for rapid transport
(a) No relief with medications
i) Hypotension/ hypoperfusion
ii) Significant changes in ECG
(2) Indications for no transport
(a) Refusal
(b) Referral
e. Support and communication strategies
(a) Explanation for patient, family, significant others
(b) Communications and transfer of data to the physician

C. Lymphomas
1. Epidemiology
a. Hyperplasia of the lymphoreticular system
2. Pathophysiology
a. Morbidity/ mortality
(1) Blood loss

(2) Pain
(3) Death

3. Initial assessment findings
   a. Levels of consciousness
   b. Airway/ breathing
   c. Circulation
4. Focused history
   a. Complaints
      (1) Fever
      (2) Night sweats
      (3) Generalized pruritus
      (4) Anorexia
      (5) Weight loss
      (6) Fatigue, bone pain, diaphoresis
5. Detailed physical exam
   a. Airway
   b. Breath sounds
      (1) May be clear to auscultation
      (2) Congestion in bases may be present
   c. Circulation
      (1) Skin
         (a) Pallor during the episode
         (b) Temperature may vary
         (c) Diaphoresis is usually present
      (2) Blood pressure may low
      (3) ECG findings
         (a) Tachycardia
         (b) Ectopic
6. Management
   a. Position of comfort
   b. Pharmacological
      (1) Analgesia
      (2) Increase or decrease heart rate
      (3) Fluid volume replacement
   c. Electrical
      (1) Constant ECG monitoring
   d. Transport
      (1) Criteria for rapid transport
         (a) No relief with medications
            i) Hypotension/ hypoperfusion
            ii) Significant changes in ECG
      (2) Indications for no transport
         (a) Refusal

(b) Referral
e. Support and communication strategies
(a) Explanation for patient, family, significant others
(b) Communications and transfer of data to the physician

D. Polycythemia
1. Epidemiology
a. Overabundant production of red blood cells, white blood cells and platelets
b. Rare disorder seen in persons over 50 years of age
2. Pathophysiology
a. Morbidity/ mortality
(1) Thrombosis
(2) Death from thrombosis
3. Initial assessment findings
a. Levels of consciousness
b. Airway/ breathing
(1) Labored breathing is common
c. Circulation
(1) Peripheral pulses
(a) Quality
(b) Tachycardia
(2) Changes in skin
(a) Color - red-purple complexion
(b) Red hands and feet
(c) Pruritic
4. Focused history
a. Complaints
(1) Dyspnea
(2) Generalized pruritus
5. Detailed physical exam
a. Airway
b. Breath sounds
c. Circulation
(1) Skin
(a) As above
(b) Temperature may vary
(2) ECG findings
(a) Tachycardia
6. Management
a. Position of comfort
b. Pharmacological

(1) Analgesia
(2) Increase or decrease heart rate

c. Non-pharmacological
(1) Phlebotomy

d. Transport for
(1) Indications for no transport
(a) Refusal
(b) Referral

e. Support and communication strategies
(a) Explanation for patient, family, significant others
(b) Communications and transfer of data to the physician

E. Disseminated intravascular coagulopathy

1. Epidemiology
a. A complication of severe injury, trauma or disease; acute bleeding disorder resulting from defibrination
b. First phase characterized by free thrombin in the blood, fibrin deposits and aggregation of platelets
c. Phase two is hemorrhage caused by depletion of clotting factors

2. Pathophysiology
a. Morbidity/ mortality
(1) Uncontrolled bleeding
(2) Shock
(3) Death

3. Initial assessment findings
a. Level of consciousness
b. Airway/ breathing
(1) Labored breathing is common
c. Circulation
(1) Peripheral pulses
(a) Weak and thready
(2) Tachycardia
d. Changes in skin
(1) Pallor
(2) Purpura over chest and abdomen
(3) Cool, clammy
(4) Bleeding
(5) Hypotension/ hypoperfusion

4. Focused history

a. Complaints
(1) Dyspnea
(2) Bleeding

5. Detailed physical exam
a. Airway
b. Breath sounds
(1) May be clear to auscultation
(2) Congestion in bases may be present
c. Circulation
(1) Skin
(a) As above
(b) Temperature may vary
(2) ECG findings
(a) Tachycardia
(b) Ectopic

6. Management
a. Position of comfort
b. Pharmacological
(1) Analgesia
(2) Increase or decrease heart rate
(3) Fluid volume replacement
c. Support and communication strategies
(a) Explanation for patient, family, significant others
(b) Communications and transfer of data to the physician

F. Hemophilia
1. Epidemiology
a. A hereditary disorder transmitted by the female to the male
b. In true hemophilia A factor VIII is nearly absent
c. In hemophilia B there is a deficiency in factor IX
d. The ability to produce thrombin is severely impaired by deficiency or absence of these factors

2. Pathophysiology
a. Morbidity/ mortality
(1) Uncontrolled bleeding
(2) Shock
(3) Death

3. Initial assessment findings
a. Levels of consciousness
b. Airway/ breathing
(1) Labored breathing is common

c. Circulation
(1) Peripheral pulses
(a) Weak and thready
(2) Tachycardia
d. Changes in skin
(1) Pallor
(2) Cool, clammy
(3) Bleeding
(a) From body orifices
(b) Knees
(c) Wrists
(d) Elbows
(e) Hematuria
(f) Epistaxis
(g) Hemoptysis
(h) Hematemesis
(i) Melena
(4) Hypotension/ hypoperfusion

4. Focused history
a. Complaints
(1) Dyspnea
(2) Bleeding

5. Detailed physical exam
a. Airway
b. Breath sounds
(1) May be clear to auscultation
(2) Congestion in bases may be present
c. Circulation
(1) ECG findings
(2) Tachycardia
(3) Ectopy
d. Skin
(1) As above
(2) Temperature may vary

6. Management
a. Position of comfort
b. Pharmacological
(1) Analgesia
(2) Fluid volume replacement
c. Transport for reperfusion
(1) Indications for no transport
(a) Refusal
d. Support and communication strategies

(a) Explanation for patient, family, significant others
(b) Communications and transfer of data to the physician

G. Sickle cell disease
1. Epidemiology
a. Highest incidence in blacks, Puerto Ricans and persons of Spanish, French, Italian, Greek and Turkish origin
2. Pathophysiology
a. A congenital hemolytic anemia
b. A chemical defect within the hemoglobin of red blood cells
c. Morbidity/ mortality
(1) Sepsis
(2) Shock
(3) Death
3. Initial assessment findings
a. Levels of consciousness
b. Airway/ breathing
c. Circulation
(1) Peripheral pulses
(2) Changes in skin
(a) Pallor
(b) Cool; clammy
(3) Hypotension/ hypoperfusion
4. Focused history
a. Chief complaint
(1) Sudden onset develops into a condition called "crisis"
(a) Thrombotic crisis (painful)
(b) Aplastic
(c) Hemolytic
5. Detailed physical exam
a. Airway
b. Breath sounds
c. Circulation
(1) Skin
(a) As above
(b) Temperature may vary
(2) ECG findings
(a) Tachycardia
(b) Ectopy

d. Increased weakness
e. Aching
f. Chest pain
g. Sudden, severe abdominal pain
h. Bony deformities
i. Icteric sclera
j. Abdominal pain
k. Fever
l. Arthralgia

6. Management
   a. Position of comfort
   b. Pharmacological
      (1) Analgesia
      (2) Fluid volume replacement
   c. Transport for reperfusion
      (1) Indications for no transport
         (a) Refusal
   d. Support and communication strategies
         (a) Explanation for patient, family, significant others
         (b) Communications and transfer of data to the physician

H. Multiple myeloma
   1. Epidemiology
      a. A plasma cell dyscrasia characterized by neoplastic cells that infiltrate bone marrow
      b. Eventually plasma cells become malignant leading to tumor formation within the bone
   2. Pathophysiology
      a. Morbidity/ mortality
         (1) Fractures
         (2) Bleeding
         (3) Shock
         (4) Death
   3. Initial assessment findings
      a. Levels of consciousness
      b. Airway/ breathing
         (1) Labored breathing is common
      c. Circulation
         (1) Peripheral pulses
            (a) Weak and thready
            (b) Tachycardia
         (2) Changes in skin

(a) Pallor
(b) Cool, clammy
(3) Bleeding
(4) Hypotension/ hypoperfusion

4. Focused history
   a. Complaints
      (1) Weakness
      (2) Skeletal pain
      (3) Hemorrhage
      (4) Hematuria
      (5) Lethargy
      (6) Weight loss
      (7) Frequent fractures
5. Detailed physical exam
   a. Airway
   b. Breath sounds
   c. Circulation
      (1) Skin
         (a) As above
         (b) Temperature may vary
      (2) ECG findings
         (a) Tachycardia
         (b) Ectopy
   d. Increased weakness
   e. Aching
   f. Chest pain
   g. Sudden severe abdominal pain
   h. Bony deformities
   i. Arthralgia
6. Management
   a. Position of comfort
   b. Pharmacological
      (1) Analgesia
      (2) Fluid volume replacement
   c. Transport for reperfusion
      (1) Indications for no transport
         (a) Refusal
   d. Support and communication strategies
      (a) Explanation for patient, family, significant others
      (b) Communications and transfer of data to the physician

IV. Integration
- A. Apply pathophysiological principles and the assessment findings to a patient with a hematologic disorder
- B. Formulation of field impression - decisions based on
  1. Initial assessment
  2. Focused history
  3. Detailed physical examination
- C. Develop and execute a patient management plan based on field impression
  1. Initial management
     a. Airway support
     b. Ventilation support
     c. Circulation support
     d. Non-pharmacological
     e. Pharmacological
  2. On-going assessment
  3. Transport criteria
     a. Appropriate mode
     b. Appropriate facility
  4. Non-transport criteria
  5. Advocacy
  6. Communications
  7. Prevention
  8. Documentation
  9. Quality assurance

UNIT TERMINAL OBJECTIVE

5-10 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement the treatment plan for the patient with an environmentally induced or exacerbated medical or traumatic condition.

COGNITIVE OBJECTIVES

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

5-10.1 Define "environmental emergency." (C-1)
5-10.2 Describe the incidence, morbidity and mortality associated with environmental emergencies. (C-1)
5-10.3 Identify risk factors most predisposing to environmental emergencies. (C-1)
5-10.4 Identify environmental factors that may cause illness or exacerbate a preexisting illness. (C-1)
5-10.5 Identify environmental factors that may complicate treatment or transport decisions. (C-1)
5-10.6 List the principal types of environmental illnesses. (C-1)
5-10.7 Define "homeostasis" and relate the concept to environmental influences. (C-1)
5-10.8 Identify normal, critically high and critically low body temperatures. (C-1)
5-10.9 Describe several methods of temperature monitoring. (C-1)
5-10.10 Identify the components of the body's thermoregulatory mechanism. (C-1)
5-10.11 Describe the general process of thermal regulation, including substances used and wastes generated. (C-1)
5-10.12 Describe the body's compensatory process for over heating. (C-1)
5-10.13 Describe the body's compensatory process for excess heat loss. (C-1)
5-10.14 List the common forms of heat and cold disorders. (C-1)
5-10.15 List the common predisposing factors associated with heat and cold disorders. (C-1)
5-10.16 List the common preventative measures associated with heat and cold disorders. (C-1)
5-10.17 Integrate the pathophysiological principles and complicating factors common to environmental emergencies and discuss differentiating features between emergent and urgent presentations. (C-3)
5-10.18 Define heat illness. (C-1)
5-10.19 Describe the pathophysiology of heat illness. (C-1)
5-10.20 Identify signs and symptoms of heat illness. (C-1)
5-10.21 List the predisposing factors for heat illness. (C-1)
5-10.22 List measures to prevent heat illness. (C-1)
5-10.23 Discuss the symptomatic variations presented in progressive heat disorders. (C-1)
5-10.24 Relate symptomatic findings to the commonly used terms: heat cramps, heat exhaustion, and heatstroke. (C-3)
5-10.25 Correlate the abnormal findings in assessment with their clinical significance in the patient with heat illness. (C-3)
5-10.26 Describe the contribution of dehydration to the development of heat disorders. (C-1)
5-10.27 Describe the differences between classical and exertional heatstroke. (C-1)
5-10.28 Define fever and discuss its pathophysiologic mechanism. (C-1)
5-10.29 Identify the fundamental thermoregulatory difference between fever and heatstroke. (C-1)
5-10.30 Discuss how one may differentiate between fever and heatstroke. (C-1)
5-10.31 Discuss the role of fluid therapy in the treatment of heat disorders. (C-1)
5-10.32 Differentiate among the various treatments and interventions in the management of heat disorders. (C-3)
5-10.33 Integrate the pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient who has dehydration, heat exhaustion, or heatstroke. (C-3)
5-10.34 Define hypothermia. (C-1)

5-10.35 Describe the pathophysiology of hypothermia. (C-1)
5-10.36 List predisposing factors for hypothermia. (C-1)
5-10.37 List measures to prevent hypothermia. (C-1)
5-10.38 Identify differences between mild and severe hypothermia. (C-1)
5-10.39 Describe differences between chronic and acute hypothermia. (C-1)
5-10.40 List signs and symptoms of hypothermia. (C-1)
5-10.41 Correlate abnormal findings in assessment with their clinical significance in the patient with hypothermia. (C-3)
5-10.42 Discuss the impact of severe hypothermia on standard BCLS and ACLS algorithms and transport considerations. (C-1)
5-10.43 Integrate pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient who has either mild or severe hypothermia. (C-3)
5-10.44 Define frostbite. (C-1)
5-10.45 Define superficial frostbite (frostnip). (C-1)
5-10.46 Differentiate between superficial frostbite and deep frostbite. (C-3)
5-10.47 List predisposing factors for frostbite. (C-1)
5-10.48 List measures to prevent frostbite. (C-1)
5-10.49 Correlate abnormal findings in assessment with their clinical significance in the patient with frostbite. (C-3)
5-10.50 Differentiate among the various treatments and interventions in the management of frostbite. (C-3)
5-10.51 Integrate pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with superficial or deep frostbite. (C-3)
5-10.52 Define near-drowning. (C-1)
5-10.53 Describe the pathophysiology of near-drowning. (C-1)
5-10.54 List signs and symptoms of near-drowning. (C-1)
5-10.55 Describe the lack of significance of fresh versus saltwater immersion, as it relates to near-drowning. (C-3)
5-10.56 Discuss the incidence of "wet" versus "dry" drownings and the differences in their management. (C-3)
5-10.57 Discuss the complications and protective role of hypothermia in the context of near-drowning. (C-1)
5-10.58 Correlate the abnormal findings in assessment with the clinical significance in the patient with near-drowning. (C-3)
5-10.59 Differentiate among the various treatments and interventions in the management of near-drowning. (C-3)
5-10.60 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the near-drowning patient. (C-3)
5-10.61 Define self contained underwater breathing apparatus (SCUBA). (C-1)
5-10.62 Describe the laws of gasses and relate them to diving emergencies. (C-1)
5-10.63 Describe the pathophysiology of diving emergencies. (C-1)
5-10.64 Define decompression illness (DCI). (C-1)
5-10.65 Identify the various forms of DCI. (C-1)
5-10.66 Identify the various conditions that may result from pulmonary over-pressure accidents. (C-1)
5-10.67 Differentiate between the various diving emergencies. (C-3)
5-10.68 List signs and symptoms of diving emergencies. (C-1)
5-10.69 Correlate abnormal findings in assessment with their clinical significance in the patient with a diving related illness. (C-3)
5-10.70 Describe the function of the Divers Alert Network (DAN) and how its members may aid in the management of diving related illnesses. (C-1)
5-10.71 Differentiate among the various treatments and interventions for the management of diving accidents. (C-3)
5-10.72 Describe the specific function and benefit of hyperbaric oxygen therapy for the management of diving

accidents. (C-1)
5-10.73 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a management plan for the patient who has had a diving accident. (C-3)
5-10.74 Define altitude illness. (C-1)
5-10.75 Describe the application of gas laws to altitude illness. (C-2)
5-10.76 Describe the etiology and epidemiology of altitude illness. (C-1)
5-10.77 List predisposing factors for altitude illness. (C-1)
5-10.78 List measures to prevent altitude illness. (C-1)
5-10.79 Define acute mountain sickness (AMS). (C-1)
5-10.80 Define high altitude pulmonary edema (HAPE). (C-1)
5-10.81 Define high altitude cerebral edema (HACE). (C-1)
5-10.82 Discuss the symptomatic variations presented in progressive altitude illnesses. (C-1)
5-10.83 List signs and symptoms of altitude illnesses. (C-1)
5-10.84 Correlate abnormal findings in assessment with their clinical significance in the patient with altitude illness. (C-3)
5-10.85 Discuss the pharmacology appropriate for the treatment of altitude illnesses. (C-1)
5-10.86 Differentiate among the various treatments and interventions for the management of altitude illness. (C-3)
5-10.87 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient who has altitude illness. (C-1)
5-10.88 Integrate the pathophysiological principles of the patient affected by an environmental emergency. (C-3)
5-10.89 Differentiate between environmental emergencies based on assessment findings. (C-3)
5-10.90 Correlate abnormal findings in the assessment with their clinical significance in the patient affected by an environmental emergency. (C-3)
5-10.91 Develop a patient management plan based on the field impression of the patient affected by an environmental emergency. (C-3)

AFFECTIVE OBJECTIVES
None identified for this unit.

PSYCHOMOTOR OBJECTIVES
None identified for this unit.

DECLARATIVE

I. Environmental emergency
  A. A medical condition caused or exacerbated by the weather, terrain, atmospheric pressure or other local factors
    1. Instances of environmental emergencies
    2. Environmental impact on morbidity and mortality
      (1) Environmental stressors that induce or exacerbate other medical or traumatic conditions
    3. Role of special rescue resources
      a. Mountain
      b. Cave
      c. Swift water
      d. Dive
  B. Risk factors
    1. Age
    2. General health
    3. Fatigue
    4. Predisposing medical conditions
    5. Medications
      a. Prescription
      b. Over the counter (OTC)
  C. Environmental factors
    1. Climate
      a. Localized prevailing weather norms
      b. Breadth of deviation from mean
      c. Effect of deviation from mean
    2. Season
      a. Annual variation of climate
      b. Localized characteristics of seasonal variation to climate
    3. Weather
      a. Wind
      b. Rain
      c. Snow
      d. Humidity
      e. Temperature
      f. Radiation
      g. Heat
      h. Cold
    4. Atmospheric pressure
      a. At altitude
      b. Underwater
    5. Terrain
      a. Injury
      b. Complications to rescue
  D. Types of environmental illnesses

1. Heat illnesses
2. Cold illnesses
3. Pressurization illnesses
   a. Over-pressurization illnesses
   b. Under-pressurization illnesses
4. Localized injuries
   a. Frostbite
   b. Radiation burns, e.g., sunburn

II. General pathophysiology, assessment and management
   A. Homeostasis
      1. "Normal" body temperatures
         a. Core
         b. Periphery
      2. Evaluation of body temperatures
         a. Oral
         b. Axillary
         c. Tympanic
         d. Rectal
         e. Tactile
   B. Thermoregulation
      1. Regulatory center
      2. Peripheral thermoreceptors
      3. Central thermoreceptors
      4. Metabolic rate
         a. Basal
         b. Exertional
         c. Caloric requirements
      5. Heat balancing
         a. Core versus periphery
         b. Deep versus superficial veins
            (1) Counter-current heat exchange
            (2) Effects of vascular constriction and dilation
         c. Effect of common drugs on thermoregulation
            (1) Alcohol
            (2) Nicotine
            (3) Aspirin and acetaminophen
   C. Thermogenesis
      1. Muscular
         a. Baseline muscular activity
         b. Exertion
         c. Shivering
      2. Metabolic
         a. Processing of food and nutrients
            (1) Carbohydrates - sugars and starches
            (2) Fats
            (3) Proteins

b. Glycogen
3. Endocrine
a. Role of hormones in setting basal metabolic rate
D. Thermolysis
1. Conduction
2. Convection
3. Radiation
4. Evaporation
5. Respiration

III. Specific pathology, assessment, and management - heat disorders
A. Heat illness
1. Definition
a. Increased core body temperature (CBT) due to inadequate thermolysis
2. General signs and symptoms
a. Signs of thermolysis
(1) Diaphoresis
(2) Posture
(3) Increased skin temperature
(4) Flushing
b. Signs of thermolytic inadequacy
(1) Altered mentation
(2) Altered level of consciousness
B. Physiology of heat gain and loss
1. Heat gain
a. Metabolic heat production
(1) Thermogenesis through increased metabolic activity
b. Environmental heat gain
(1) Heat transfer from the environment
2. Heat loss
a. Metabolic heat loss
(1) Increased thermolysis from vasodilation
b. Environmental heat loss
(1) Increased thermolysis from heat transfer to the environment
C. Predisposing factors
1. Age
a. Pediatric age groups
b. Geriatric age groups
2. General health and medications
a. Diabetes
(1) Autonomic neuropathy interferes with vasodilation and perspiration
(2) Autonomic neuropathy may interfere with thermoregulatory input
b. Antihypertensive medications
(1) Diuretics
(a) Predispose to dehydration
(2) Beta blockers
(a) Interfere with vasodilation

(b) Reduce capacity to increase heart rate in response to volume loss
(c) May interfere with thermoregulatory input

c. Psychotropic medications and antihistamines
(1) All interfere with central thermoregulation
(2) Antipsychotics
(3) Antihistamines
(4) Phenothiazines

d. Acclimatization

3. Length of exposure
4. Intensity of exposure
5. Environmental
a. Humidity
b. Wind

D. Preventative measures
1. Maintain adequate fluid intake
a. Thirst is an inadequate indicator of dehydration
2. Acclimatize
a. Acclimatization results in more perspiration with lower salt concentration
b. Increases fluid volume in body
3. Limit exposure

E. Heat disorders
1. Heat cramps
a. Muscle cramps due to dehydration and overexertion
b. Not specifically related to heat illness
2. Heat exhaustion (mild heat illness)
a. Ill-defined term referring to milder forms of heat illness
b. Increased CBT with some neurologic deficit
c. Signs of active thermolysis usually present
d. Symptoms may be due solely to simple dehydration, combined with overexertion
(1) Result is orthostatic hypotension
(2) Symptoms resolve with rest and supine positioning
(a) Fluids and elevation of knees beneficial
e. Symptoms that do not resolve with rest and supine positioning may be due to increased CBT, are predictive of impending heatstroke and must be treated aggressively
3. Heatstroke
a. Increased CBT with significant neurologic deficit
b. Organ damage
(1) Brain
(2) Liver
(3) Kidneys
c. Signs of active thermolysis may be present or absent
(1) Classic
(a) Commonly presents in those with chronic illnesses
(b) Increased CBT due to deficient thermoregulatory function
(c) Predisposing conditions include age, diabetes and other medical

conditions
(d) "Hot, red, dry" common
(2) Exertional
(a) Commonly presents in those who are in good general health
(c) Excessive ambient temperature
(d) Excessive exertion
(e) Prolonged exposure
(f) Poor acclimatization
(g) "Moist, pale" common

F. Role of dehydration in heat disorders
1. Common concomitant syndrome
2. Inhibits vasodilatation and therefore thermolysis
3. Leads to orthostatic hypotension and subsequent symptoms
a. Nausea, vomiting, abdominal distress
b. Vision disturbances
c. Decreased urine output
d. Poor skin turgor
e. Signs of hypovolemic shock
f. May occur with signs or symptoms of heatstroke

G. Fever
1. Pathophysiology
2. Differentiation from heatstroke
a. History of infection or illness
b. Neurological symptoms may present with either
c. If unsure, treat for heatstroke

H. Treatment
1. Remove from environment
2. Active cooling
a. Misting and fanning
b. Moist wraps
c. Risks of over-cooling
(1) Reflex hypothermia
d. Use of tepid water for cooling
(1) Ice packs and cold water immersion may produce reflex vasoconstriction and shivering due to effect on peripheral thermoreceptors

I. Fluid therapy
1. Oral
a. Some salt additive is beneficial
b. Limited need for other electrolytes in oral rehydration
c. Salt tablets
(1) May cause GI irritation and ulceration
(2) May cause hypernatremia
(3) Should be avoided
2. Intravenous
a. Normal saline solution preferred

IV. Specific pathology, assessment, and management - cold disorders

A. Hypothermia
   1. Definition
      a. Decreased CBT due to
         (1) Inadequate thermogenesis
         (2) Excess cold stress
         (3) A combination of both

B. Mechanisms of heat loss
   1. Physiological
   2. Environmental

C. Predisposing factors
   1. Age
      a. Pediatric age group
      b. Geriatric age group
   2. General health and medications
      a. Hypothyroidism
      b. Malnutrition
      c. Hypoglycemia
      d. Medications that interfere with thermogenesis
         (1) Narcotics, phenothiazine, alcohol, and barbiturates
         (2) Antiseizure medications
         (3) Antihistamines and other allergy medications
         (4) Antipsychotics, sedatives, and antidepressants
         (5) Various pain medications, including aspirin, acetaminophen, and NSAIDs
   3. Fatigue and exhaustion
   4. Length of exposure
   5. Intensity of exposure
   6. Environmental
      a. Humidity
      b. Wind
      c. Temperature

D. Preventative measures
   1. Dress
   2. Rest
   3. Food
   4. Limit exposure

E. Categories of hypothermia
   1. Severity
      a. Mild
         (1) Presence of signs and symptoms with a CBT that is greater than 90° F
      b. Severe
         (1) Presence of signs and symptoms with a CBT that is less than 90° F
      c. Compensated
         (1) Presence of signs and symptoms with a normal CBT
         (2) CBT being maintained by thermogenesis
         (3) As energy stores (liver and muscle glycogen) are exhausted, CBT will drop
   2. Onset

a. Acute (immersion)
b. Subacute (exposure)
c. Chronic (urban)

3. Primary vs. secondary hypothermia
   a. Cold exposure may be primary cause of hypothermia
   b. Hypothermia may be secondary to other problems

F. Principal signs and symptoms
1. No reliable correlation between signs or symptoms and specific CBT
2. Signs of thermogenesis efforts
3. Diminished coordination and psychomotor function
4. Altered mentation
5. Altered level of consciousness
6. Cardiac irritability
   a. Presence of "J" wave on ECG; not useful, diagnostically

G. Specific treatment
1. Stop heat loss
   a. Remove from environment
   b. Dry
   c. Wind/ vapor/ moisture barrier
   d. Insulate
2. Rewarming
   a. Passive external
      (1) Insulation
      (2) Wind/ vapor/ moisture barrier
   b. Active external
      (1) Heat packs
         (a) Placed over areas of high heat transfer with core
            i) Base of neck
            ii) Axilla
            iii) Groin
         (b) Insulate underneath to prevent burning
      (2) Heat guns
      (3) Lights
      (4) Warm water immersion
         (a) 102° F to 104° F
         (b) Can induce rewarming shock
         (c) Little application in out-of-hospital setting
   c. Active internal
      (1) Warmed (102° F to 104° F) humidified oxygen
      (2) Warmed (102° F to 104° F) intravenous administration
      (3) Role of warmed administration
         (a) Crucial, to prevent further heat loss
      (4) Limitations of warmed administration
         (a) Actual heat transferred is minimal
         (b) limited contribution to rewarming
3. Rewarming shock
   a. Active external rewarming causes reflex vasodilation

b. Requires more heat transference than is possible with methods available in out-of-hospital setting
c. Easily prevented by IV fluid administration during rewarming

4. Cold diuresis and the need for fluid resuscitation
   a. Oral
   b. Intravenous
5. Resuscitation considerations
   a. BCLS considerations
      (1) Increased time to evaluate vital signs
      (2) Use of normal chest compression and ventilation rates
      (3) Use of oxygen
      (4) AED recommendations
   b. ACLS considerations
      (1) Effects of cold on cardiac medications
      (2) Considerations for airway management
         (a) No increased risk of inducing ventricular fibrillation (V-fib) from orotracheal or nasotracheal intubation
      (3) AHA recommendations
      (4) Risks and management of V-fib
         (a) Risks of V-fib related both to depth and duration of hypothermia
         (b) Rough handling can induce V-fib
         (c) It is generally impossible to electrically defibrillate a hypothermic heart that is colder than 86° F
         (d) Lidocaine and procainamide paradoxically lower fibrillatory threshold in a hypothermic heart and increase resistance to defibrillation
         (e) Bretylium and magnesium sulfate may be effective even in hypothermic hearts
6. Transport considerations
   a. Gentle transportation necessary due to myocardial irritability
   b. Transport with patient level or head slightly head down
   c. General rewarming options of destination
   d. Availability of cardiac bypass rewarming preferable in destination consideration

H. Local cold injuries
   1. Frostbite
      a. Classifications
         (1) Superficial
            (a) Also referred to as frostnip
            (b) Some freezing of epidermal tissue
            (c) Initial redness followed by blanching
            (d) Diminished sensation
         (2) Deep
            (a) Freezing of epidermal and subcutaneous layers
            (b) White appearance
            (c) Hard (frozen) to palpation
            (d) Loss of sensation
      b. Treatment

(1) Transport to hospital for rewarming by immersion
(2) Rewarm rapidly, by immersion, if transport will be delayed
(a) 104° F max
(b) Do not rewarm if there is risk of re-freezing
(c) Consider analgesics
(3) Transport considerations
(a) Immobilize
(b) Do not rewarm extremities if needed for transport (walking)

2. Trench foot (immersion foot)
a. Similar to frostbite but occurs at temperatures above freezing
(1) Associated with prolonged exposure to moisture
b. Principal signs and symptoms
(1) Similar to frostbite
(2) Blisters may form upon spontaneous rewarming
(3) Pain
c. Specific treatment
(1) Dry and warm
(2) Aerate

V. Specific pathology, assessment, and management - near-drowning
A. Definition
1. Submersion episode with at least transient recovery
B. Pathophysiology
1. Wet versus dry drownings
a. Fluid in posterior oropharynx stimulates laryngospasm
b. Aspiration occurs after muscular relaxation
c. Suffocation occurs with or without aspiration
d. Aspiration presents as airway obstruction
2. Fresh versus saltwater considerations
a. Despite mechanistic differences, there is no difference in metabolic result
b. No difference in out-of-hospital treatment
3. Hypothermic considerations in near-drownings
a. Common concomitant syndrome
b. May be organ protective in cold-water near-drownings
c. Always treat hypoxia first
d. Treat all near-drowning patients for hypothermia
C. Treatment
1. Establish airway
a. Conflicting recommendations regarding prophylactic abdominal thrusts
b. Questionable scientific data to support prophylactic abdominal thrusts
2. Ventilation
3. Oxygen
D. Trauma considerations
1. Immersion episode of unknown etiology warrants trauma management
E. Post-resuscitation complications
1. Adult respiratory distress syndrome (ARDS) or renal failure often occur post-resuscitation
2. Symptoms may not appear for 24 hours or more, post-resuscitation

3. All near-drowning patients should be transported for evaluation

VI. Specific pathology, assessment, and management - diving emergencies
- A. Application of gas laws
  1. Boyle's law
  2. Dalton's law
  3. Henry's law
- B. Pathophysiology
  1. Increased pressure dissolves gasses into blood
     - a. Oxygen metabolizes
     - b. Nitrogen dissolves
  2. Primary etiology is too rapid an ascent from depth
- C. Classification of diving emergencies
  1. Decompression illnesses
     - a. Excess nitrogen bubbles out of solution on depressurization
     - b. Occurs in joints, tendons, spinal cord, skin, brain, inner ear
     - c. Occludes circulation
     - d. Principal signs and symptoms
       - (1) Joint pain
       - (2) Fatigue
       - (3) Paresthesias
       - (4) CNS disturbances
     - e. Specific treatment
       - (1) High flow oxygen
       - (2) Treat for shock
       - (3) IV initiation
       - (4) Place patient in supine position
       - (5) Transport to emergency department
       - (6) Definitive care is typically hyperbaric oxygen therapy (HBO)
  2. Pulmonary over-pressure accidents
     - a. Air trapped in lungs by
       - (1) Breath holding
       - (2) Bronchospasm
       - (3) Mucous plug
     - b. Shallow depths (<6') most dangerous
     - c. Pressure decreases and volume increases on ascent
     - d. Lung tissue ruptures in severe cases, producing a pneumothorax
     - e. Principal signs and symptoms
       - (1) Respiratory distress
       - (2) Substernal chest pain
       - (3) Diminished breath sounds
     - f. Specific treatment
       - (1) Rest
       - (2) Supplemental oxygen
       - (3) Hyperbaric oxygen not usually required
       - (4) Treatment is the same as for pneumothorax of any etiology
  3. Arterial Gas Embolism (AGE)

a. Air in bloodstream secondary to pulmonary over-pressure
   (1) Access to pulmonary circulation from ruptured alveoli
   (2) Entrance to central circulation via left atrium
b. Occlusion of small vessels occurs
   (1) Cardiac compromise
   (2) Pulmonary compromise
   (3) Cerebral compromise
c. Principal signs and symptoms
   (1) Usually appear within 10 minutes of surfacing (most commonly within 2 minutes)
   (2) Varies according to organ system that is primarily affected
   (3) Most common presentation is similar to cerebral vascular accident
      (a) Hemispheric presentations are rare
      (b) Vertigo
      (c) Confusion
      (d) Loss of consciousness
      (e) Visual disturbances
d. Specific treatment
   (1) High flow oxygen
   (2) Transport supine, not in Trendelenburg
   (3) Best treatment may be immediate hyperbaric oxygen
   (4) Treat as for near-drowning
   (5) Treat according to other symptoms
   (6) Attempt to keep the patient at or below the altitude of the injury during transport

4. Nitrogen narcosis
   a. Excess nitrogen dissolved in bloodstream under pressure
      (1) Most common appearance is at depths of 70-100 feet
   b. Gas anesthetic effect due to lipid solubility
   c. Result is intoxication
      (1) Accidents at depth often result from impaired judgement
   d. Principal signs and symptoms
      (1) Intoxication, impaired judgement
      (2) Altered level of consciousness
   e. Specific treatment
      (1) Self-resolving upon ascent
      (2) Return to shallow depths
5. Other diving related illnesses
   a. Oxygen toxicity
      (1) Usually seen only with prolonged exposure or excess concentration
   b. Contaminated gases
   c. Hypercapnia
   d. Hyperventilation

D. Divers Alert Network (DAN)
   1. Non-profit organization affiliated with Duke University Medical Center
   2. Specializes in diving related illnesses
   3. Available for consultation and referral

4. (919) 684-8111 for emergencies
5. (919) 684-2948 for non-emergency consultation and referral

VII. Specific pathology, assessment, and management - altitude illness
- A. Application of gas laws
- B. Exposure to high altitude may exacerbate chronic medical conditions, even without inducing altitude illness
  1. Angina pectoris
  2. Congestive heart failure
  3. Chronic obstructive pulmonary disease
  4. Hypertension
- C. Etiology and epidemiology of altitude illnesses
  1. Principal occurrence over 8000 feet above sea level
  2. Hypoxic basis
  3. Incidence
- D. Predisposing factors
  1. None
  2. Typically presents in otherwise healthy individuals
  3. Only predictor is hypoxic ventilatory response
- E. Preventative measures
  1. Gradual ascent
  2. Limited exertion
  3. Decreased sleeping altitude
  4. High carbohydrate diet
  5. Acetazolamide
     a. Speeds acclimatization and decreases incidence of acute mountain sickness
  6. Nifedipine
     a. Used solely by those with a previous history of high altitude pulmonary edema to prevent re-occurrence upon ascent
  7. Steroids - efficacy is controversial
- F. Signs and symptoms
  1. Malaise
  2. Anorexia
  3. Headache
  4. Sleep disturbances
  5. Respiratory distress that increases with exertion
- G. Categorization of altitude illnesses
  1. Acute mountain sickness (AMS)
     a. Mild
     b. Severe
  2. High altitude pulmonary edema (HAPE)
     a. Pulmonary edema develops from increased pulmonary artery pressure
  3. High altitude cerebral edema (HACE)
     a. Cerebral edema develops from unknown causes and produces increased intracranial pressure
- H. Treatment
  1. Descent

2. Oxygen
3. Portable hyperbaric chamber
4. Medications
   a. Acetazolamide for AMS, HAPE, or HACE
   b. Nifedipine for HAPE only
   c. Steroids for severe AMS or HACE only
   d. Adjunctive medications
      (1) Prochlorperazine for AMS or HACE
      (2) Furosemide for HAPE
      (3) Morphine for HAPE

VIII. Integration
   A. Impact of the environment on human metabolism
      1. Heat gain or loss that exceeds the body's capacity to compensate
      2. Pressure changes that exceed the body's capacity to compensate
   B. Assessment findings in patients with environmentally induced illnesses
      1. Abnormal core body temperatures
      2. Signs of metabolic decompensation
      3. Development of shock state
   C. Patient management
      1. Field stabilization
         a. Removal of environmental influence
         b. Support of metabolic compensation
         c. Selection of definitive care location

Dave.Bryson

http://www.nhtsa.gov/people/injury/ems/E
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UNIT TERMINAL OBJECTIVE

5-11 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement a management plan for the patient with infectious and communicable diseases.

COGNITIVE OBJECTIVES

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

5-11.1 Review the specific anatomy and physiology pertinent to infectious and communicable diseases. (C-1)
5-11.2 Define specific terminology identified with infectious/ communicable diseases. (C-1)
5-11.3 Discuss public health principles relevant to infectious/ communicable disease. (C-1)
5-11.4 Identify public health agencies involved in the prevention and management of disease outbreaks. (C-1)
5-11.5 List and describe the steps of an infectious process. (C-1)
5-11.6 Discuss the risks associated with infection. (C-1)
5-11.7 List and describe the stages of infectious diseases. (C-1)
5-11.8 List and describe infectious agents, including bacteria, viruses, fungi, protozoans, and helminths (worms). (C-1)
5-11.9 Describe host defense mechanisms against infection. (C-1)
5-11.10 Describe characteristics of the immune system, including the categories of white blood cells, the reticuloendothelial system (RES), and the complement system. (C-1)
5-11.11 Describe the processes of the immune system defenses, to include humoral and cell-mediated immunity. (C-1)
5-11.12 In specific diseases, identify and discuss the issues of personal isolation. (C-1)
5-11.13 Describe and discuss the rationale for the various types of PPE. (C-1)
5-11.14 Discuss what constitutes a significant exposure to an infectious agent. (C-1)
5-11.15 Describe the assessment of a patient suspected of, or identified as having, an infectious/ communicable disease. (C-1)
5-11.16 Discuss the proper disposal of contaminated supplies (sharps, gauze sponges, tourniquets, etc.). (C-1)
5-11.17 Discuss disinfection of patient care equipment, and areas in which care of the patient occurred. (C-1)
5-11.18 Discuss the following relative to HIV - causative agent, body systems affected and potential secondary complications, modes of transmission, the seroconversion rate after direct significant exposure, susceptibility and resistance, signs and symptoms, specific patient management and personal protective measures, and immunization. (C-1)
5-11.19 Discuss Hepatitis A (infectious hepatitis), including the causative agent, body systems affected and potential secondary complications, routes of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization. (C-1)
5-11.20 Discuss Hepatitis B (serum hepatitis), including the causative agent, the organ affected and potential secondary complications, routes of transmission, signs and symptoms, patient management and protective measures, and immunization. (C-1)
5-11.21 Discuss the susceptibility and resistance to Hepatits B. (C-1)
5-11.22 Discuss Hepatitis C, including the causative agent, the organ affected, routes of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization and control measures. (C-1)
5-11.23 Discuss Hepatitis D (Hepatitis delta virus), including the causative agent, the organ affected, routes of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization and control measures. (C-1)
5-11.24 Discuss Hepatitis E, including the causative agent, the organ affected, routes of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and

immunization and control measures. (C-1)

5-11.25 Discuss tuberculosis, including the causative agent, body systems affected and secondary complications, routes of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization and control measures. (C-1)

5-11.26 Discuss meningococcal meningitis (spinal meningitis), including causative organisms, tissues affected, modes of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization and control measures. (C-1)

5-11.27 Discuss other infectious agents known to cause meningitis including streptococcus pneumonia, hemophilus influenza type b, and other varieties of viruses. (C-1)

5-11.28 Discuss pneumonia, including causative organisms, body systems affected, routes of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization. (C-1)

5-11.29 Discuss tetanus, including the causative organism, the body system affected, modes of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization. (C-1)

5-11.30 Discuss rabies and hantavirus as they apply to regional environmental exposures, including the causative organisms, the body systems affected, routes of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization and control measures. (C-1)

5-11.31 Identify pediatric viral diseases. (C-3)

5-11.32 Discuss chickenpox, including the causative organism, the body system affected, mode of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization and control measures. (C-1)

5-11.33 Discuss mumps, including the causative organism, the body organs and systems affected, mode of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization. (C-1)

5-11.34 Discuss rubella (German measles), including the causative agent, the body tissues and systems affected, modes of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization. (C-1)

5-11.35 Discuss measles (rubeola, hard measles), including the causative organism, the body tissues, organs, and systems affected, mode of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization. (C-1)

5-11.36 Discuss the importance of immunization, and those diseases, especially in the pediatric population, which warrant widespread immunization (MMR). (C-1)

5-11.37 Discuss pertussis (whooping cough), including the causative organism, the body organs affected, mode of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization. (C-1)

5-11.38 Discuss influenza, including causative organisms, the body system affected, mode of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization. (C-1)

5-11.39 Discuss mononucleosis, including the causative organisms, the body regions, organs, and systems affected, modes of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization. (C-1)

5-11.40 Discuss herpes simplex type 1, including the causative organism, the body regions and system affected, modes of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization. (C-1)

5-11.41 Discuss the characteristics of, and organisms associated with, febrile and afebrile respiratory disease, to include bronchiolitis, bronchitis, laryngitis, croup, epiglottitis, and the common cold. (C-1)

5-11.42 Discuss syphilis, including the causative organism, the body regions, organs, and systems affected,

modes of transmission, susceptibility and resistance, stages of signs and symptoms, patient management and protective measures, and immunization. (C-1)

5-11.43 Discuss gonorrhea, including the causative organism, the body organs and associated structures affected, mode of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization. (C-1)

5-11.44 Discuss chlamydia, including the causative organism, the body regions, organs, and systems affected, modes of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization. (C-1)

5-11.45 Discuss herpes simplex 2 (genital herpes), including the causative organism, the body regions, tissues, and structures affected, mode of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization. (C-1)

5-11.46 Discuss scabies, including the etiologic agent, the body organs affected, modes of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization. (C-1)

5-11.47 Discuss lice, including the infesting agents, the body regions affected, modes of transmission and host factors, susceptibility and resistance, signs and symptoms, patient management and protective measures, and prevention. (C-1)

5-11.48 Describe lyme disease, including the causative organism, the body organs and systems affected, mode of transmission, susceptibility and resistance, phases of signs and symptoms, patient management and control measures, and immunization. (C-1)

5-11.49 Discuss gastroenteritis, including the causative organisms, the body system affected, modes of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization. (C-1)

5-11.50 Discuss the local protocol for reporting and documenting an infectious/ communicable disease exposure. (C-1)

5-11.51 Articulate the pathophysiological principles of an infectious process given a case study of a patient with an infectious/ communicable disease. (C-3)

5-11.52 Articulate the field assessment and management, to include safety considerations, of a patient presenting with signs and symptoms suggestive of an infectious/ communicable disease. (C-3)

AFFECTIVE OBJECTIVES

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

5-11.53 Advocate compliance with standards and guidelines by role modeling adherence to universal/ standard precautions and BSI. (A-1)

5-11.54 Value the importance of immunization, especially in children and populations at risk. (A-1)

5-11.55 Value the safe management of a patient with an infectious/ communicable disease. (A-2)

5-11.56 Advocate respect for the feelings of patients, family, and others at the scene of an infectious/ communicable disease. (A-2)

5-11.57 Advocate empathy for a patient with an infectious/ communicable disease. (A-2)

5-11.58 Value the importance of infectious/ communicable disease control. (A-2)

5-11.59 Consistently demonstrate the use of body substance isolation. (A-2)

PSYCHOMOTOR OBJECTIVES

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

5-11.60 Demonstrate the ability to comply with body substance isolation guidelines. (P-2)

5-11.61 Perform an assessment of a patient with an infectious/ communicable disease. (P-2)

5-11.62 Effectively and safely manage a patient with an infectious/ communicable disease, including airway and ventilation care, support of circulation, pharmacological intervention, transport considerations, psychological support/ communication strategies, and other considerations as mandated by local protocol. (P-2)

DECLARATIVE

I. Public health principles relative to infectious (communicable) diseases
   - A. Infectious diseases affect entire populations of humans
   - B. Important to understand the demographic characteristics of the population
   - C. The relationships between populations is important when studying the dynamics of infectious diseases
   - D. The study of an infectious disease cluster (a discrete population which is infected in a defined span of time in a defined geographical area) is, by its nature, regional; however, the consequences of that cluster becoming infected may be international
   - E. Populations display varying susceptibilities to infection, and conversely, varying degrees of susceptibility
   - F. When dealing with infectious diseases, the paramedic needs to consider the needs of the patient and the potential consequence on public health
   - G. Paramedics should think of the consequences of their person-to-person contacts with family members and friends

II. Public health agencies involved in the prevention/ management of disease outbreaks
   - A. Local (municipal, city, county) health agencies
     1. First line of defense in disease surveillance
     2. First line of defense in disease outbreaks
   - B. State agencies
     1. Frequently involved in regulation and enforcement of federal guidelines
     2. They frequently are, by statute or public law, obliged to meet or exceed federal guidelines and recommendations
   - C. Private sector
     1. Regional and national health care providers and local and national health maintenance organizations
     2. Influence protocols and guidelines for dealing with disease surveillance/ response to outbreaks
   - D. Federal and national organizations
     1. U.S. Congress plays an integral role in national health policy through public laws and by drafting of the federal budget
     2. U.S. Department of Labor
        a. Occupational Safety and Health Administration (OSHA)
     3. U.S. Department of Health and Human Services
        (1) Centers for Disease Control
        (2) National Institute for Occupational Safety and Health (NIOSH)
     4. U.S. Department of Defense and Federal Emergency Management Agency (FEMA)
     5. National Fire Protection Association (NFPA), U.S. Fire Protection Administration and International Association of Firefighters (IAFF)

III. Infection, pathogenicity, and infectious agents
   - A. Steps of infectious process
     1. Infectious agent resident in reservoir (animal, man, environment)
     2. Infectious agent may be present in the ecosystem, affected by
        a. Life-cycle of the infectious agent
        b. Environmental factors which dictate presence of endemic species outside of the

host
c. Climatic conditions
3. Transmission of infectious agent to the host
4. Development and/ or manifestations of clinical disease dependent on several factors
a. Virulence (degree of pathogenicity) of the agent - strength of the microorganisms to infect the host
b. Number of infectious agents (dose)
c. Resistance (immune status) of the host
d. Correct mode of entry
e. Virulence, dose, resistance, and correct mode of entry must all exist to create a risk of exposure
(1) Does not mean a person will become infected
(2) Exposure, with all necessary risk factors, does not necessarily equal infection
5. Life-cycle of the infectious agent
a. Demographics of host
(1) Populations and their ability to move internationally
(2) Age distributions
(3) Socioeconomic considerations
(4) Population settling and migration dictated by religion
b. Genetic factors
c. Efficacy of therapeutic interventions once infection has been established
6. Risk of infection is
a. Theoretical - the possibility of transmission is acknowledged to have the potential to occur, but has not been reported
b. Measurable - some factors of infectious agent transmission, and the risks associated with those factors, are known or deduced from reported data

B. Stages of an infectious disease (NOTE - The numerical order does not imply that this is a chronological progression)
1. Latent period
a. Period after infection of a host when the infectious agent cannot be transmitted to another host or cause clinically significant symptoms
2. Communicable period
a. Period after an infection when the infectious agent can be transmitted to another host
b. Clinically significant symptoms from the infection may be manifested during this period
3. Incubation period
a. Time interval between exposure to an infectious agent and the first appearance of symptoms associated with the infection
4. Window phase
a. A period after infection in which antigen is present, but no detectable antibody
5. Disease period
a. Time interval between the first appearance of symptoms associated with the infection and resolution of those symptoms, or death
b. Resolution of symptoms does not mean that the infectious agent is destroyed

C. Infectious agents - an overview
1. Bacteria

a. Procaryotic - nuclear material not contained within a distinct envelope
b. Self-reproducing without host cell
c. Signs and symptoms depend on cells and tissues that are infected
d. Toxins - often more lethal than the bacterium itself
(1) Endotoxins
(a) Chemicals, usually proteins
(b) Integral parts of a bacteria's outer membrane and steadily shed from living bacteria
(2) Exotoxin
(a) Proteins released by bacteria that can cause disease symptoms by acting as neurotoxins or enterotoxins
e. Lysis of bacteria may release endotoxins
f. Can be localized or systemic infection

2. Viruses
a. Must invade host cells to reproduce
b. Cannot survive outside of host cell
c. Other microorganisms
d. Eukaryotic - nuclear material contained within a distinct envelope

3. Fungi
a. Protective capsules surround the cell wall and protect the fungi from phagocytes

4. Protozoans

5. Helminths (worms) - not necessarily microorganisms

IV. Host defense mechanisms

A. Nonspecific and surface defense mechanisms (the body's own PPE)

1. Skin
a. First line of defense against infection

2. Respiratory system
a. Turbinates
(1) Create turbulent air flow
(2) Nasal hairs trap foreign material
b. Mucous can trap and kill alien material and is eliminated as sputum (from pharynx) or phlegm (generally from larynx and below)
c. Mucociliary escalator - moves pollutants trapped by mucous up the respiratory system and prevents inhalation into alveoli

3. Normal bacterial flora
a. In GI and GU systems, competition between colonies of microorganisms for nutrients and space helps to prevent proliferation of pathogenic organisms
b. Create environmental conditions that are not conducive to pathogens
c. Stomach acids may destroy some microorganisms or deactivate their toxic products

4. GI and GU systems also facilitate elimination of pathogens via feces and urine

5. Inflammatory response
a. Local reaction to cellular injury
b. Injury may be physical, thermal, or chemical, or result from invasion by microorganisms
c. Like the immune response, the inflammatory response may initiate destruction of the body's own tissue if it overreacts, the so-called autoinflammatory or

autoimmune response

B. The immune system - an overview
  1. White blood cells are the backbone of the immune system
    a. Humoral immunity component
      (1) Time-consuming response
      (2) Specialized white blood cells, called B-cells, eventually differentiate into antibodies
    b. Cell-mediated immunity component
      (1) Time-consuming response
      (2) Specialized white blood cells, called T-cells, that coordinate the activity of other components of the immune system to deal with foreign material
      (3) Helper T-cells
      (4) Suppressor T-cells
      (5) Killer T-cells
      (6) Inflammatory T-cells
    c. Nonspecific effector cells without a specialized function
      (1) Monocytes
      (2) Neutrophils
      (3) Eosinophils
      (4) Basophils
      (5) NK or natural killer cells
  2. Reticuloendothelial system (RES)
    a. Composed of immune cells in the spleen, lymph nodes, liver, bone marrow, lungs, and intestines
    b. RES works in conjunction with the lymphatic system to dispose of "garbage" material that results from immune system attack of intruders
    c. RES structures serve as sites where mature B- and T-cells are stored until the immune system is activated by presence of intruders
  3. Complement system
    a. Part of the immune system that can recognize and kill invaders on first sight
    b. Doesn't take time to mobilize specialized responses like the humoral and cell-mediated components of white blood cells
C. Specific immune system defenses
  1. Humoral immunity
  2. Cell-mediated immunity
  3. Complement
    a. Necessary because
      (1) Humoral and cell-mediated immunity processes are time-consuming
      (2) Both cell-mediated and humoral processes depend on previous exposure

V. Agency and personal responsibility relative to isolation from infectious agent exposure
  A. Components of a healthcare agency's exposure plan
    1. Health maintenance and surveillance
    2. Appointing a Designated Officer (DO) to serve as the liaison between the agency and community health agencies involved in monitoring/ response to communicable diseases
    3. Identification of job classifications, and in some cases, specific tasks where possibility exists for exposure to bloodborne pathogens
    4. A schedule of when and how the provisions of bloodborne pathogen standards will be

implemented, to include
   a. Engineering and work practice controls
   b. Personal protective equipment
   c. Baseline employee evaluations, immunizations, and follow up
   d. Training of employees
5. Personal protective equipment (PPE)
   a. Includes, but is not limited to gowns, gloves, face shields, masks, protective eyewear, aprons, and similar items
   b. Considered appropriate only when they do not allow blood or other potentially infectious body fluids to reach the emergency responder's work clothes, undergarments, skin, eyes, mouth, or other mucous membranes under normal conditions of use
   c. Emergency responders may decide to not wear protective clothing for short periods of time when it interferes with patient care
6. Body substance isolation
   a. Standard precautions are more inclusive than BSI
   b. BSI is more inclusive than universal
7. Procedures for evaluating the circumstances of an exposure and postexposure counselling, to include rights to know of emergency response employees exposed to patients with communicable diseases (per Ryan White Act)
8. Interfacing with, and notification of, local health authorities, state and federal agencies
9. Personal, building, vehicular, and equipment disinfection and storage
10. HazComm education for employees regarding disinfection agents
11. After-action analysis of agency response
12. Correct disposal of needles into containers which meet specific criteria of being rigid, puncture resistant, leak proof, closeable, and have the bio-hazard label
13. Correct handling of body-fluid tinged linens and supplies used in patient care
14. Identification of agency and/ or contracted personnel for counselling, authorization of acute medical care, and documentation

B. Individual responsibilities
1. Develop a proactive attitude relative to infection control
2. Maintenance of personal hygiene and prevention of offensive body odors (aesthetics of patient care)
3. Attention to wounds and maintenance of integument (external barrier to infection)
4. Effective hand washing after every patient contact with warm water and antiseptic cleanser or waterless antiseptic cleanser when potable water is not available
5. Removal or disposal of work garments when leaving work station/ site; do not expose others to contaminated garments
6. Handling uniforms in accordance with their her agency's definition of PPE
7. Proper handling and laundering of work clothes soiled with body fluids, with consideration for bathing/ showering after work shift, and before returning home
8. Preparing food and eating in appropriate areas
9. Maintenance of general physiological and psychological health to prevent distress, which can immunocompromise a healthy individual
10. Correct disposal of needles and sharps into appropriate containers
11. Correct disposal of body-fluid tinged linens and supplies used in patient care
12. Become aware of, and avoid tendencies to wipe face and/ or rub eyes, nose, mouth with gloved hands

13. Knowledge of general classifications of exposure since the type of exposure will determine the extent of the infection control measures applied to the health care worker

VI. Approach to the call, and patient, with a suspected infectious or communicable disease
- A. Suspecting infectious diseases
- B. Acknowledge visceral or intuitive hunches that the dispatched call may involve an infectious disease
- C. Gloves are worn according to the task to be performed (OSHA and CDC recommendations)
- D. Protective eye wear
- E. Patient assessment
  1. Body substance isolation
  2. Focused history and physical
     - a. History of present illness
       - (1) Onset - gradual or sudden
       - (2) Fever
       - (3) Antipyretic usage (ASA, APAP)
       - (4) Neck pain or rigidity
       - (5) Difficulty swallowing, secretions
       - (6) How did the most bothersome symptom change over time
     - b. Past medical history
       - (1) Chronic infections, inflammation
       - (2) Use of steroids, antibiotics
       - (3) Organ transplant and associated medicines
       - (4) Diabetes or other endocrine disorders
       - (5) COPD or respiratory complications
  3. Detailed history and physical
     - a. Assess skin for temperature, hydration, color (jaundice), mottling, rashes, and petechiae
     - b. Assess sclera for icterus
     - c. Assess patient reaction to neck flexion
     - d. Assess for lymphadenopathy in the neck
     - e. Assess breath sounds for consolidation
     - f. Assess for hepatomegaly, RUQ tenderness
     - g. Assess digits and extremities for purulent lesions
- F. Upon disposition of the patient, dispose of supplies, especially sharps, appropriately, bag linen, disinfect ambulance and patient care equipment
  1. Reprocessing methods for EMS durable medical equipment
     - a. Sterilization
     - b. High-level disinfection
     - c. Intermediate-level disinfection
     - d. Low-level disinfection

VII. Human immunodeficiency virus (HIV)
- A. Causative agent - human immunodeficiency virus (types 1 and 2), referred to as HIV-1 and HIV-2, retroviruses
  1. Both types are serologically and geographically distinct, but share similar epidemiological characteristics

2. HIV-1 is far more pathogenic than HIV-2, and most cases worldwide and in the U.S. are of HIV-1, Group M
   a. The first case in the U.S. of an HIV-1, Group O infection was identified in the U.S. in June of 1996 (MMWR Synopsis, July 5, 1996)
      (1) HIV-antibody tests in U.S. detect HIV-1, Group M with 99% accuracy, and 50-90% for HIV-1, Group O
      (2) Increasing sensitivity to Group O would be most important for blood donor screening
3. HIV-2 seems to be more restricted to W. Africa

B. Body systems affected and potential secondary complications - generally related to opportunistic infections that arise as immune system compromise develops
   1. Initial case definition was established by CDC in 1982
   2. In 1987 and 1993, case definition was expanded to include indicator diseases extra pulmonary and pulmonary tuberculosis, recurrent pneumonia, wasting syndrome, HIV dementia, and sensory neuropathy
   3. Nervous system - toxoplasmosis of CNS
   4. Immune system - major site of compromise
   5. Respiratory system - pneumocystis carinii pneumonia
   6. Integumentary system - Kaposi's sarcoma
   7. Modes of transmission
      a. Sexual contact, sharing of HIV-contaminated needles and syringes, and the infusion of blood and blood products in transmission of HIV are well documented
      b. Contact with semen, blood, vaginal fluids, and associated tissues is generally accepted as high risk
      c. 13-30% transmission to infants born to HIV-infected mothers is estimated
      d. Breastfeeding can result in HIV transmission
      e. Virus has on occasion been found in saliva, tears, urine, and bronchial secretions, but no known cases have been documented relative to contact with these body fluids
      f. Vector transmission by biting insects has not been known to occur
      g. Risk of oral sex is not quantified, but believed to be low
   8. Health care workers - probability of infection following a very direct and specific exposure to blood containing the virus is 0.2 - 0.44% (Gerberding, NEJM, 1995)
      a. Through June of 1995, number of paramedics infected globally reported to be 9 undocumented cases
      b. A documented case would be defined by
         (1) A positive source
         (2) A worker testing positive after the generally recognized incubation phase, with consideration for the window phase
      c. Health care worker risk increased when
         (1) The exposure involves a large quantity of blood as when a device is visibly contaminated with blood, when care of the patient involves placing a needle in a vein or artery, and in deep injuries
         (2) Needle size, type (hollow bore versus suture), and depth of penetration influence volume transferred to skin of health care worker (Mast et. al., J Infec Dis 1992)
         (3) The exposure involved a source patient with a terminal illness, possibly

reflecting a higher dose of HIV in the late course of AIDS
- d. Risk needs to be understood in terms of how the exposure occurred, and what factors were involved
- e. Potential may appear to be high, but the probability may actually be quite low

C. Susceptibility and resistance
1. Infectiousness may be high during initial period after infection and at end-stage
2. Race and gender do not appear to be risk factors for susceptibility
3. Coexisting STDs, especially with ulceration, appear to increase risk
4. Penile foreskin may increase susceptibility
5. No recovered cases have been documented

D. Signs and symptoms
1. For out-of-hospital workers, HIV-infected patients generally relay that information to health care providers
2. Within 4 -6 weeks after infection, infected people present with a mononucleosis-like illness which includes fever, sore throat, lymphadenopathy, splenomegaly, and fatigue lasting for a week or two
3. Infected people often are asymptomatic for months or years, but may test positive
4. Clinical manifestations of opportunistic and neurologic symptoms then appear gradually, often with seemingly benign symptoms similar to the initial mononucleosis-like illness

E. Patient management and personal protective measures
1. Out-of-hospital care - supportive
2. Isolation is unnecessary, ineffective and unjustified
3. Body substance isolation (including gloves being worn according to the task being performed)
4. Effective handwashing
5. Use of eye protection, masks and gowns are highly recommended in situations where exposures to large volume of body fluids is possible
6. Care in use of diagnostic and therapeutic equipment and supplies is mandatory, especially with sharps
7. Disinfection of diagnostic/ therapeutic equipment and supplies is mandatory
8. Early diagnosis of infection, treatment, and counselling for health care providers, as part of a comprehensive exposure control plan, is mandatory

F. No immunization yet exists for HIV infection

VIII. Hepatitis A

A. Causative agent - hepatitis A virus

B. Body systems affected and potential secondary complications
1. Many infections are asymptomatic
2. Liver may be affected
   - a. Often occurs without jaundice, especially in children
   - b. Only recognizable by liver function studies

C. Routes of transmission
1. Found in the stool of persons with hepatitis A
2. Contaminated water, ice or food
3. Sexual and household contact can spread the virus
4. Can survive on unwashed hands for 4 hours

D. Susceptibility and resistance

1. No clearly defined populations at increased risk
2. 75% of persons infected with hepatitis A virus have symptoms
3. In developing nations where sanitation is poor, infection and subsequent immunity is common; travelers from developed countries are therefore susceptible
4. In developed nations, often associated with day care in which diaper changing occurs

E. Signs and symptoms
1. Onset is abrupt with fever, weakness, anorexia, abdominal discomfort, nausea, and darkening of the urine, sometimes followed within a few days by jaundice/ icterus
2. Mild severity lasting 2-6 weeks
3. Rarely serious

F. Patient management and protective measures
1. Care is supportive for maintenance of fluid status and prevention of shock
2. A person is most infectious during the first week of symptoms
3. BSI and gloves, combined with attention to not placing gloved hand close to the mouth, are mandatory
4. Hand washing after each patient contact and safe/ effective disposal of items contaminated with feces

G. Immunization
1. An inactivated hepatitis A vaccine is available
2. Prophylactic IG may be administered within two weeks after exposure to hepatitis A
3. Persons traveling to Africa, the Middle East, Central and South America, and Asia should be immunized
4. FEMA team personnel should be offered vaccine if they travel out of the United States

IX. Hepatitis B

A. Causative agent - hepatitis B virus

B. Organ affected and potential secondary complication - liver necrosis

C. Routes of transmission
1. Blood, semen, vaginal fluids, and saliva are infectious
2. Transmission has been known to occur during transfusion of blood and blood products, dialysis, needle and syringe sharing in IV drug use, tattooing, sexual contact, and acupuncture, and communally-used razors and toothbrushes
3. HBV is stable on environmental surfaces with dried, visible blood for > 7 days
4. Infection has also been demonstrated in household contacts in toddler-aged children who live in a family with members who carry certain HB antigens
5. Transmission by biting insects and the fecal-oral route of hepatitis B has not been demonstrated

D. Susceptibility and resistance
1. No populations appear to be at increased risk for infection
2. Protective immunity develops if the HBV antigen disappears and HBV antibody is demonstrated in serum
3. Probability of infection following exposure to blood containing the virus is 1.9 - 40%

E. Signs and symptoms
1. Within 2-3 months, infected persons gradually develop non-specific symptoms such as anorexia, nausea and vomiting, fever, joint pain, generalized rashes, sometimes progressing to jaundice
2. Risk of developing chronic infection varies inversely with age

3. 1% of hospitalized patients develop a full-blown liver crisis and die, with the mortality increasing > 40 years of age
4. 5-10% of infected individuals become asymptomatic carriers

F. Patient management and protective measures
1. Out-of-hospital care is supportive measures
2. Body substance isolation
3. Effective hand washing
4. Care in use of diagnostic and therapeutic equipment and supplies is mandatory
5. Careful handling of sharps
6. High-level disinfection of diagnostic/ therapeutic equipment, especially laryngoscopy blades, is mandatory

G. Immunization
1. Recombinant vaccines (Recombivax HB® and Engerix B®) are as effective as the previously available Heptavax® (derived from plasma) and do not carry the theoretical risk of HIV transmission or other viral illnesses
2. Vaccines are given as initial, 1-month, and 6-month doses, and provide long lasting immunity 95-98% of the time
3. Adverse reactions of vaccine include local injection site pain 15-20%, and rare fever, rash, or muscle pain (<3%)

X. Hepatitis C
A. Causative organism - hepatitis C virus
B. Organ affected - liver
C. Routes of transmission
1. Health care workers - 2.7 to 10% probability of infection when exposed to blood containing the virus
2. Transmission by household and sexual contact appear to be low
3. Transmission cannot occur from food and water

D. Susceptibility and resistance
1. General susceptibility
2. Degree of immunity following infection is unknown, but a high percentage of infected individuals become carriers

E. Signs and symptoms
1. Same as for hepatitis B, but with less progression to jaundice
2. Chronic liver disease with elevated enzyme profile is common, with 80-85% developing chronic liver disease
3. Apparent association between HCV infection and liver cell cancer

F. Patient management and protective measures
1. Same as for hepatitis B
2. BSI
3. Effective hand washing
4. Alpha-interferon (an experimental treatment) has been shown to be effective in 20% of cases

G. Immunization and control measures
1. Prophylactic administration of IG is not supported by current data
2. Post exposure testing is important
3. Blood bank operations - blood with elevated liver enzymes and antibody against HCV is

not banked in most U.S. centers

XI. Hepatitis non-ABC
- A. Causative agent
  1. Hepatitis D - the delta virus is not complete, but infects a cell with other hepatitis virus
  2. Hepatitis E (not bloodborne; is spread like Hepatitis A)
  3. Hepatitis G - newly identified hepatitis viruses
- B. Organ affected - liver
- C. Routes of transmission - similar to HBV
- D. Susceptibility and resistance
  1. Hepatitis D - when the virus becomes active in people infected with hepatitis B virus, the resulting disease becomes extremely pathogenic
  2. Major epidemics have been documented in young adults, even in areas where enteric viruses are endemic (underdeveloped nations)
  3. Women in third trimester of pregnancy are particularly susceptible to fulminating liver disease
  4. Resistance unknown
  5. Presence of epidemics in young adults (see D1 above), who should have immunity, is paradoxical
- E. Signs and symptoms
  1. Onset is abrupt, with signs and symptoms resembling HBV infection
  2. Always associated with HBV infection
  3. Often (25-50% of cases in U.S. and Europe) mistaken for HBV infection
- F. Patient management and protective measures
  1. BSI
  2. Effective hand washing
  3. Particular attention to be paid to having clean potable water and disinfection procedures after exposure to flood waters
- G. Immunization and control measures
  1. Hepatitis B vaccine can indirectly prevent Hepatitis D, but has no effect on Hepatitis E
  2. If you are effectively vaccinated against HBV, with a documented protective titer, then you are vaccinated against HDV

XII. Tuberculosis
- A. Causative agent - mycobacterium tuberculosis
- B. Body systems affected and secondary complications
  1. Initially affects respiratory system, including the larynx, which is a highly contagious form
  2. Left untreated, tuberculosis can spread to other organ systems and cause secondary and tertiary complications
- C. Routes of transmission
  1. Exposure to causative agent in airborne droplet nuclei
  2. Prolonged close exposure to a person with active TB
  3. Direct invasion through mucous membranes or breaks in skin are known, but not common
  4. Reservoirs include some primates, cattle, badgers, and swine
- D. Susceptibility and resistance
  1. Period of incubation is 4-12 weeks (CDC)
  2. Period for development of clinical disease is 6-12 months after infection

3. Risk of developing disease is highest in children < 3, lowest in later childhood, and high among adolescents, young adults, and aged
4. High in immunocompromised patients, e.g. HIV-infected, underweight, and undernourished
5. Incidence of reactivation of latent infections (seen in geriatric patients) implies that immune system is incapable of dealing with complex M. tuberculosis infection

E. Signs and symptoms
1. First infection of mycobacterium tuberculosis is called primary tuberculosis and is usually a subclinical infection
   a. Cell-mediated immunity walls off the bacteria and suppresses them
   b. These bacteria lie dormant, but can reactivate into secondary tuberculosis
   c. Symptomatic primary tuberculosis is rare and more commonly occurs in elderly, children, and immunocompromised
2. Most common site of secondary or reactivation TB is in the apices of the lungs (M. tuberculosis is an aerobic organism and the oxygen tension is highest in the apices)
   a. Patients present with chronic productive/ non- productive cough (persistent for 2-3 weeks), low-grade fevers, night sweats, weight loss, and symptoms related to the organ system involved
   b. Hemoptysis often accompanies lung infection
   c. Other organ systems
      (1) Cardiovascular
         (a) Pericardial effusions may develop
         (b) Lymphatics - cervical nodes are usually involved
      (2) Skeletal
         (a) Generally affects the thoracic and lumbar spine, destroying intervertebral discs and adjacent vertebral bodies
         (b) Chronic arthritis of one joint is common
      (3) CNS - TB causes a subacute meningitis and forms granulomas in the brain
      (4) Systemic - miliary tuberculosis

F. Patient care and protective measures
1. Identification and early intervention are key
2. Related to public education and routine evaluation of health care workers consisting of
   a. PPD (Purified Protein Derivative)
   b. Chest x-ray (CXR)
   c. Sputum acid-fast stain and culture of bacteria
   d. PCR testing provides a diagnosis in 6 hours with no need to wait for cultures
3. EMS workers should remember that TB infection is communicable with prolonged exposures to infected individuals who discharge droplets into the air by coughing
4. EMS workers should be alert to those populations that have significant prevalence of active TB in their jurisdictions (as reported by local public health authorities) and utilize NIOSH approved particulate filter respirators
   a. Post-call disinfection should be at appropriate levels
5. Drug therapy
   a. Prophylactic (INH)
      (1) Recommended routinely for persons < 35, who are PPD positive skin test boosters

(2) Not routinely recommended for persons > 35 due to hepatic complications with INH unless one or more of the following is present
(a) Recent infection as evidenced by PPD skin test conversion
(b) Close or household contact with a current case
(c) Abnormal CXR
(d) Prolonged therapy with immunosuppressive drugs
(e) HIV or other immunosuppressive disease
(3) Avoid alcohol when taking INH
(4) Side effects include paresthesias, seizures (toxic reaction), orthostatic hypotension, nausea and vomiting, hepatitis, and hypersensitivity

b. Therapeutic
(1) For pulmonary TB, positive to negative sputum conversion and results of culture are usually available 3-8 weeks after initiation of therapy
(2) In most areas of the U.S., a combination of drugs
(a) Isoniazid
(b) Rifampin
(c) Pyrazinamide
(d) Ethambutol
(e) Streptomycin may be used after antibiotic sensitivity tests

G. EMS workers must be aware that the greatest danger from TB is from multidrug resistant strains of the bacterium, which can render antibiotics ineffective, and prolong the infectiousness of a patient

XIII. Meningococcal meningitis (spinal meningitis)
A. Causative organism
1. Neisseria meningitidis, meningococcus
2. Other organisms are known to cause meningitis, but N. meningitidis is specifically identified at the beginning of this section because, like M. tuberculosis, it is an airborne pathogen
B. Tissues affected
1. Colonize the lining of the throat and spread easily through respiratory secretions
2. Estimated that 2 -10% of the population may carry meningococci at any one time, but are prevented from invading the meninges, and gaining access to the rich culture medium of the CSF by the throat's epithelial lining
C. Modes of transmission
1. Direct contact with a patient's secretions during intubation, suctioning, CPR, etc.
2. Prolonged, direct contact
a. Respiratory droplets from nose and throat of affected individuals
D. Susceptibility and resistance
1. Almost every human has been a carrier at some point in their life
2. Conversion from carrier to clinical disease is rare in developed countries (3 in 100,000 in the U.S.), and occurs in clusters in developing nations
a Risk factors for an epidemic affect an entire population, not just scattered individuals
b General level of immunity in these populations, called herd immunity, might change in the population over time
c One theory - non-pathogenic Neisseria lactamica, which is a relative of N.

meningitidis, causes antibody production which may also be protective against N. meningitidis

d. Population studies in the meningitis belt in Africa have yielded seasonal variations in meningitis epidemics, implying that environmental factors are involved

e. Researchers in England and France have noted that illness is most prevalent in midwinter months, when cold viruses are common (noted in spring and fall in high schools and colleges)

E. Signs and symptoms
   1. Onset is rapid and typical symptoms include fever, chills, joint pain, neck stiffness or nuchal rigidity (pronounced on flexion), petechial rash, projectile vomiting, and headache
   2. Roughly 10% of patients may develop septic shock (Waterhouse-Friderichsen Syndrome)
      a. Acute adrenal insufficiency, DIC and coma may result
      b. Death can ensue in 6-8 hours
   3. Pediatric patients - infants 6 months to 2 years are especially susceptible; maternal antibodies protect neonates to 6 months
      a. Infants display nonspecific signs such as fever, vomiting, irritability, and lethargy
      b. Bulging of an open anterior fontanelle may be found in neonates
      c. In older children, positive Kernig's and Brudzinski's signs may be found

F. Patient management and protective measures
   1. Protective measures should include BSI with surgical masks applied to patients displaying suggestive signs/ symptoms
   2. Effective prophylactic drug treatments of intimate contacts are available, and include rifampin, minocycline, ciprofloxacin, ceftriaxone, and spiramycin to prevent infection from the patient's nasal discharges

G. Immunization and control measures
   1. Vaccines are effective, especially for older children and adults, and have been instrumental in preventing outbreaks among military recruits in the U.S., which, prior to 1971, was a common occurrence
   2. Vaccines have been developed which are effective against the A, C, Y, and W-135 strains of meningococcus
   3. Outbreaks in the U.S. have primarily been of the A, B, and C strains
   4. Duration of protection is limited in children aged 1-3
      a. An effective vaccine has not been developed for the B strain since it is not known to generate a strong enough antibody response
      b. Routine vaccination is not recommended
      c. Should be considered in a discrete population exposed to a serogroup for which an effective vaccine exists, i.e. not serogroup B
   5. Post EMS exposure activities should be addressed as part of an agency Exposure Control Plan

H. Other infectious agents known to cause meningitis
   1. Streptococcus pneumoniae (bacteria)
      a. Second most common cause of meningitis in adults
      b. Most common cause of pneumonia in adults
      c. Most common cause of otitis media in children
      d. Spread by droplets, prolonged personal contact, or contact with linen soiled with respiratory discharges
      e. Episodic contact by EMS personnel should rarely result in infection, however, BSI

applies since causative organism is never known by EMS
f. Protective measures for EMS workers
2. Hemophilus influenza type B (bacteria)
a. Gram-negative rods
b. Mode of transmission same as for N. meningitidis (therefore, same considerations for BSI)
c. Prior to introduction of vaccination for children in 1981, it was the leading cause of meningitis in children aged 6 months to 3 years
d. Although treatment with antibiotics is very effective, over 50% of all infected children will have long-term neurologic sequelae
e. Also implicated in pediatric epiglottitis, septic arthritis, and generalized sepsis
3. Viruses (causes syndromes sometimes referred to as aseptic meningitis)
a. There are a variety of viruses known to cause meningeal signs and symptoms
(1) Most associated with other specific diseases
(2) Seasonal variations may occur
b. Not considered communicable

XIV. Pneumonia
A. Etiologic agents/ causative organisms
1. Bacterial (Streptococcus pneumoniae, Mycoplasma pneumoniae, Staphylococcus aureus, H. influenzae, Klebsiella pneumoniae, Moraxella catarrhalis, Legionella)
2. Viral
3. Fungal
B. Systems affected
1. Respiratory - pneumonia
2. CNS - meningitis
3. ENT - otitis, pharyngitis media
C. Routes of transmission
1. Droplet spread
2. Direct contact
3. Contact with linens soiled by respiratory secretions
D. Susceptibility and resistance
1. Susceptibility is increased by processes that adversely affect the status of respiratory tissues, i.e., pulmonary edema, influenza, exposure to inhaled toxins, chronic lung disease, and aspiration of any form (post alcohol ingestion, near-drowning, gastric distension from BVM ventilation)
2. Geriatric patients are highly susceptible
3. Pediatric patients with low birth weight and malnourishment are very susceptible
4. Patients with the following diseases have increased susceptibility
a. Sickle cell disease
b. Cardiovascular disease
c. Anatomic or functional asplenia
d. Diabetes mellitus
e. Chronic renal failure or other kidney disease
f. HIV infection
g. Organ transplantation
h. Multiple myeloma, lymphoma, Hodgkin's disease

E. Signs and symptoms
   1. Onset of pneumonia may be sudden with chills, high-grade fevers, chest pain with respirations, and dyspnea
   2. In children, fever, tachypnea, and chest retractions are ominous signs
   3. Purulent alveolar exudates may develop in one or more lobes
   4. Patient may cough up yellow-green phlegm

F. Patient management and protective measures
   1. Several effective antibiotics exist to treat bacterial pneumonia
   2. Multi-drug resistant strains have been reported
   3. Patient isolation generally not warranted except in clinical facilities where patient with a resistant strain may be in contact with other patients who have increased susceptibility to infection
   4. Protective measures for EMS workers

G. Immunization
   1. Vaccine exists for some causes of pneumonia
   2. Immunization of contacts, i.e., exposed EMS workers, is generally not recommended

XV. Tetanus

A. Causative organism - Clostridium tetani

B. System affected - musculoskeletal

C. Mode of transmission
   1. Tetanus spores introduced into the body through wounds, burns, or other disruptions in the integument
   2. Puncture wounds introducing soil, street dust, and animal or human feces
   3. Dead or necrotic tissue is an indication of a favorable environment for C. tetani
   4. Infection has often developed in wounds considered too trivial for medical consultation

D. Susceptibility and resistance
   1. Susceptibility is general, which is why tetanus immunization is recommended for the general population
   2. Subsequent recovery from infection does not confer immunity

E. Signs and symptoms
   1. Muscular tetany
   2. Painful contractions, particularly of the masseter (trismus or lockjaw) and neck muscles, secondarily of trunk muscles
   3. In pediatrics, abdominal rigidity may be the first sign
   4. Painful spasms often occur, with a characteristic facial contortion known as risus sardonicus, a grotesque grinning expression
   5. Tetanus can lead to respiratory failure

F. Patient management and protective measures
   1. Temporary passive immunity is provided by post-exposure administration of tetanus immune globulin or tetanus antitoxin (equine origin)
   2. Generally followed by active tetanus immunization with a booster
      a. EMS workers - keep immunizations up to date
   3. EMS providers, when dealing with patients who have wounds, counsel them and document warnings about post-injury tetanus prophylaxis and effective debriding of tissue at the site of the wound
      a. Ask patient about immunization status

G. Immunization
   1. Generally begun during childhood
   2. Booster before entry into elementary school
   3. Booster every ten years thereafter
   4. Administered as a DPT, with immunization against diphtheria (laryngitis, pharyngitis with discharges) and pertussis (whooping cough)
   5. Booster administered every 10 years confers effective active immunity

XVI. Rabies
   A. Causative organism - rabies virus of the genus Lyssavirus
   B. System affected - nervous system
   C. Route of transmission
      1. Virus-laden saliva from a bite or scratch of an infected animal
      2. Transmission from person-to-person is theoretically possible, but has never been documented
      3. Airborne spread has been documented in bat caves, but these are rare
      4. Hawaii is the only area in the U.S. that is rabies free
      5. Transmission from vampire bats to domestic animals is common in Latin America, less common in U.S.
      6. In U.S., wildlife rabies is common in skunks, raccoons, bats, foxes, dogs, wolves, jackals, mongoose, and coyotes
   D. Susceptibility and resistance
      1. Mammals are highly susceptible
      2. Humans are especially susceptible when bitten by infected animals
      3. Incubation period is usually 3-8 weeks, as short as 9 days (rare), and as long as 7 years
      4. Infectivity governed by severity of the wound, richness of nerve supply close to the wound, distance to CNS, amount and strain of virus, degree of protective clothing, and other factors
   E. Signs and symptoms
      1. Onset is heralded by a sense of apprehension, headache, fever, malaise, and poorly-defined sensory changes
      2. Disease progresses to weakness or paralysis, spasm of swallowing muscles (causing hydrophobia or fear of water), delirium, and convulsions
      3. Without medical intervention, the disease lasts 2-6 days, often resulting from death due to respiratory failure
   F. Patient management and protective measures
      1. EMS workers - transmission from human patients to health care workers has never been documented
      2. Health care workers should protect themselves with BSI
      3. Prevention of rabies after bite
         a. Thorough debridement of wound without sutures unless necessary for tissue-support
         b. Free bleeding and drainage is necessary
         c. Vigorously clean the wound with soap and water (saliva is a risk from the infected animal) and irrigate with 70% alcohol
         d. Administration of human rabies immune globulin
         e. Immunization with Human Diploid Cell Rabies Vaccine, or Rabies Vaccine

f. Tetanus prophylaxis and antibiotics as needed

G. Immunization and control measures
1. Immunization of contacts with open wounds or exposure of mucous membranes to saliva should receive treatment
2. Immunization should be directed towards individuals with high probability of contacting animal reservoirs (animal care workers, animal shelter personnel, outdoor workers)

XVII. Viral diseases of childhood
A. Chickenpox
1. Causative organism - varicella- zoster virus, a member of the Herpesvirus group
2. System affected - primarily integumentary
a. Herpes zoster (shingles) is a local manifestation of reactivation of latent viral infection of dorsal root ganglia and displays distribution along nerve fibers on the skin
3. Mode of transmission - mainly airborne
a. Exposure to linen tainted with vesicle or mucous membrane discharges of infected persons has been implicated
4. Susceptibility and resistance - general
a. Incubation period - 10 to 21 days
b. Most people develop immunity for life after recovery
c. More severe form of disease in adults
5. Signs and symptoms
a. Begins with respiratory symptoms, malaise and low-grade fever
b. Rash begins as small red spots that become raised blisters on a red base These fluid-filled vesicles eventually collapse and dry into scabs
(1) Rash is profuse on trunk, and less so on extremities and scalp
6. Patient management and protective measures
a. Isolation of children from school, medical offices, emergency departments, and public places until all lesions are crusted and dry
b. Antiviral drugs exist that shortens the duration of symptoms and pain in the older patient
c. EMS workers should observe BSI, pay attention to handling soiled linen, and hand washing
d. EMS workers who have not had chickenpox should inquire with their agency about receiving the chickenpox vaccine
(1) Data indicate adult antibody production in 82% after one dose, and 92% after two doses
(2) Vaccine should not be given to individuals receiving high doses of systemic steroids in the past month
(3) 5% of patients develop rash and some develop frank chickenpox, which is very debilitating in adults
e. VZIG (Varicella Zoster immune globulin) is recommended for pregnant women with a substantial exposure (household contact, close indoor contact > 1 hour, or prolonged direct face-to-face contact with infected person) to chickenpox with no history of previous exposure to chickenpox

B. Mumps
1. Causative organism - mumps virus, a member of the genus Paramyxovirus

2. Organs/ systems affected
   a. Salivary glands - usually parotid, sometimes sublingual and submaxillary
   b. CNS as aseptic meningitis
3. Mode of transmission
   a. By droplet spread and direct contact with saliva of infected persons
   b. Incubation period - 12 to 25 days
4. Susceptibility and resistance
   a. Susceptibility - general
   b. Immunity is generally conferred after recovery or even after subclinical infection
5. Signs and symptoms
   a. Fever, swelling and tenderness of salivary glands, especially parotid
6. Patient management and protective measures
   a. EMS workers should not be working without an established MMR immunity
   b. EMS workers should have patients wear surgical mask and be scrupulous with hand and arm washing after patient contact
   c. Contact with soiled linen and objects that come into contact with the patient's respiratory mucous membranes (i.e., thermometers, inhalation supplies) should be handled with appropriate caution
7. Effective immunization against mumps is available as either a single vaccine or in combination with rubella and measles (MMR)

C. Rubella
1. Causative agent - rubella virus, of the genus Rubivirus
2. Systems/ tissues affected - RES, integumentary, musculoskeletal, lymph nodes
3. Modes of transmission
   a. From public health standpoint, maternal transmission to fetus is the gravest risk because the rubella virus can cause developmental defects such as congenital heart diseases, eye inflammations, retardation, and deafness ; 90% of neonates born to mothers infected in the first trimester develop congenital rubella syndrome (CRS)
   b. Person-to-person contact is via nasopharyngeal secretions
   c. Infants with CRS shed large quantities of virus in their secretions
4. Susceptibility and resistance
   a. Susceptibility is general after loss of maternal antibodies
   b. Natural infection and immunization generally confer active immunity which is generally lifelong
5. Signs and symptoms
   a. Rubella is generally mild, beginning with fever and flu symptoms, followed by the development of a red maculopapular
   b. A rash that spreads from forehead to face to torso to extremities, and lasts 3 days, not 6
   c. Serious complications, such as encephalitis, which occur in measles, do not occur in Rubella
   d Younger females sometimes develop a self-limiting arthritis
6. Patient management and protective measures
   a. BSI, including mask
   b. Effective hand washing
   c. All EMS workers, especially females, should be screened for immunity to rubella,

and be effectively immunized before working
d. Unimmunized pregnant females exposed to rubella during the first trimester are at risk for abnormal fetal development
e. There is no specific treatment for rubella

7. Immunization
a. Immunization is known to be 98-99% effective
b. Frequently combined with mumps and measles vaccine
c. Immunization is not recommended for pregnant women; possibility of vaccine causing developmental defects is theoretical only

D. Measles (rubeola, hard measles)
1. Causative organism - measles virus, of the genus Morbilli virus, family Paramyxoviridae
2. Systems, organs, tissues affected - respiratory, CNS, pharynx, eyes, systemic
3. Mode of transmission - nasopharyngeal air droplets and direct contact
4. Susceptibility and resistance - general
a. Period of communicability is before the prodromal period to four days after appearance of the rash
b. Immunity acquired after illness is permanent
5. Signs and symptoms
a. Prodrome - conjunctivitis, swelling of the eyelids, photophobia, high fevers to 105 degrees, hacking cough, and malaise
b. A day or 2 before the rash, patients develop small, red-based lesions with blue-white centers in the mouth, called Koplik's spots, sometimes disappearing with the eruption of generalized skin rash
c. The rash is red, slightly bumpy (maculopapular) and spreads from the forehead to the face, neck, torso, and hits the feet by the third day
d. The rash, which usually lasts for six days, initially appears thicker over the heads and shoulder, clears up, and follows that pattern towards the feet
e. Pneumonia, eye damage and myocarditis are all possible sequelae, but the most life-threatening is subacute sclerosing panencephalitis in which a child or adolescent may develop slowly progressing neurological disease with deterioration of mental capacity and coordination
6. Patient management and protective measures
a. BSI, including mask
b. Effective hand washing
c. EMS and other health care workers should be effectively immunized to prevent transmission to pediatric patients
d. There is no specific treatment
7. Immunization
a. Effective immunization should be instituted for every person, and is available for combination with other vaccines and/ or toxoids (MMR)
b. Immunization in children is believed to confer 99% immunogenicity

E. Pertussis (Whooping cough)
1. Causative organism - Bordetella pertussis
2. What affected - oropharynx
3. Mode of transmission - direct contact with discharges mucous membranes contained in airborne droplets
4. Susceptibility and resistance

a. General susceptibility
b. Infection generally confers immunity
c. Subsequent attacks after immunization in older children and adults in U.S. indicates that immunity may wane over time

5. Signs and symptoms
   a. Insidious onset of cough which becomes paroxysmal in 1-2 weeks, and lasts 1-2 months
   b. Paroxysms are violent, sometimes without an intervening inhalation, causing the crowing or high-pitched inspiratory whoop and end with expulsion of clear mucous and vomiting
   c. Whoop often not present in infants < 6 months and adults
6. Patient management and protective measures
   a. EMS and other health care workers should be cautious about handling linens, supplies and equipment on patients, both pediatric and adult, with a recent onset of paroxysmal cough; observe BSI and mask patient with surgical mask
   b. Communicable period is thought to be greatest before the onset of paroxysmal, violent coughing
   c. Incubation period - 6 to 20 days
   d. Erythromycin is known to decrease the period of communicability, but can only reduce symptoms if given during the incubation period, before the onset of paroxysmal coughing
7. Immunization
   a. Generally given with tetanus and diphtheria vaccines (DTP)
   b. Booster doses are recommended

XVIII. Other viral diseases
A. Influenza
1. Causative organism - influenza viruses types A, B, and C
   a. These types have subtypes based on several different antigenic sites (determinants) and mutate so often that the variants are named by geographical site of isolation/ the culture number/ year of isolation, e.g., A/Japan/305/57
2. System affected - primarily respiratory
3. Mode of transmission
   a. Airborne spread in crowded spaces, i.e., public transportation
   b. Direct contact
   c. Influenza virus can persist for hours, especially in low humidity, cold temperatures
   d. Incubation period - 1 to 3 days
4. Susceptibility and resistance
   a. Susceptibility - general
   b. Resistance is normally conferred after recovery, but only to specific strain or variant
   c. Influenza viruses mutate often, so immunity is a relative concept insofar as they are concerned
5. Signs and symptoms
   a. URI-type symptoms which last 2-7 days
   b. Cough is often severe and protracted
6. Patient management and protective measures

a. Patient treatment is supportive, generally untreated
b. EMS workers observe BSI, have patient wear surgical mask, and be scrupulous with hand washing after patient contact
c. Contact with soiled linen and objects that come into contact with the patient's respiratory mucous membranes (e.g., thermometers, inhalation supplies) should be handled with appropriate caution

7. Immunization
   a. Health care workers are urged to be immunized by mid-September with current influenza vaccine before flu season (November to March in U.S.)
   b. Amantadine (Symmetrel®, Symadine®) or rimantadine (Flumadine®) may be given to institutionalized patients for effective protection against influenza A, by preventing the uncoating of influenza A

B. Mononucleosis
   1. Causative organism - Epstein-Barr virus
   2. Body regions/ organs/ systems affected - oropharynx, tonsils, RES
   3. Modes of transmission
      a. Person-to-person spread by oropharyngeal route and saliva
         (1) Kissing implicated in spread among adults
         (2) Transmission from care providers to young children is common
      b. Blood transfusions can be mode of transmission , but resultant clinical disease is uncommon
   4. Susceptibility and resistance
      a. General
      b. Infection by EBV generally confers a high degree of resistance
   5. Signs and symptoms
      a. Mononucleosis is characterized by fever, sore throat, oropharyngeal discharges, lymphadenopathy (especially posterior cervical), and splenomegaly
         (1) Recovery usually occurs in a few weeks but some people take months to regain their former level of energy
   6. Patient management and protective measures
      a. No specific treatment is recommended for EBV symptoms; NSAIDs may be of value in symptomatic relief only
      b. EMS workers should observe BSI
      c. Effective hand washing
   7. Immunization unavailable

C. Herpes simplex virus type 1
   1. Causative organism - Herpes simplex virus type 1g (HSV 1)
   2. What affected - oropharynx, face, lips, skin, fingers, and toes, CNS in infants
   3. Modes of transmission
      a. From saliva of carriers
      b. Infection on the hands, fingers of health care workers from patients shedding HSV 1 can result in herpetic whitlow
   4. Susceptibility and resistance
      a. Universal
   5. Signs and symptoms
      a. Often manifested by cold sores and fever blisters, which are generally found on the lips, face, conjunctiva, or oropharynx

b. In a small number of newborns, a meningoencephalitis may occur, with a similar adult syndrome of aseptic meningitis (5% of cases)

6. Patient management and protective measures
   a. BSI, including a mask
   b. Lesions are highly contagious so wearing of gloves, even at home and especially when skin is not intact, is mandatory to prevent development of herpetic whitlow
   c. Treatment with acyclovir (Zovirax®) is of benefit when used topically, IV, or orally
7. No immunization available

D. Other viral respiratory diseases
   1. Acute afebrile viral respiratory disease (excluding influenza)
      a. Disease entities
         (1) Viral rhinitis, pharyngitis (common cold or URI), laryngitis
         (2) Lower respiratory tract (below the epiglottis) - croup, bronchitis, bronchiolitis
      b. Can cause bacterial complications, which has contributed to the non-judicious use of antibiotics and emergence of multi-drug resistant strains of bacteria
      c. Children are most adversely affected
      d. Large number of viruses involved, but bacterial infections (legionellosis, Q fever, Group A Streptococcus, mycoplasmal pneumonia), for which specific treatments may be available, must be considered
   2. Acute febrile respiratory disease
      a. Pharyngitis, tonsillitis, laryngitis, croup, bronchitis, bronchiolitis, pneumonitis, with fever
      b. Caused by
         (1) Parainfluenza virus, types 1, 2, 3
            (a) Major cause of croup and one of the major viral agents responsible for bronchiolitis
         (2) Respiratory syncytial virus (RSV)
            (a) Major viral respiratory pathogen of infants < 2
            (b) Usually spread from November - April
            (c) RespiGam® (RSV immune globulin) is a consideration
   3. BSI when handling patients, with consideration for applying surgical mask to patients

XIX. Sexually transmitted diseases
   A. Syphilis
      1. Causative organism - Treponema pallidum, a spirochete
      2. What affected - skin, CNS, eyes, joints & skeletal system, kidneys, cardiovascular
      3. Modes of transmission
         a. By direct contact with exudates from moist, early, obvious or concealed lesions of skin and mucous membranes, or semen, blood, saliva, vaginal discharges
         b. Via blood transfusion and needlestick injury (low risk)
      4. Susceptibility and resistance
         a. Susceptibility is general, and it is estimated that 30% of exposures result in infection
         b. Infection results in development of gradual immunity, however, aggressive treatment of primary and secondary stages interferes with natural antibody development

5. Signs and symptoms - occurs in 4 stages
   a. Primary stage - painless lesion develops at point of entry called a chancre, 3-6 weeks after the initial contact
   b. Secondary stage - bacteremia stage begins approximately 6 weeks after the chancre has healed
      (1) Rash (small, red, flat lesions) on palms and soles of feet, lasts about 6 weeks
      (2) Condyloma latum - painless, wart-like lesion found in moist, warm sites like the inguinal area; this lesion is extremely infectious, lasts about 6 weeks
      (3) Skin infection in areas of hair growth results in bald spots and/ or loss of eyebrows
      (4) CNS, eyes, bone and joints, or kidneys may become involved
   c. Third stage - latent syphilis
      (1) 25% may relapse and develop secondary stage symptoms again
      (2) After 4 years, there are generally no more relapses
      (3) 33% of patients will progress to tertiary syphilis, the rest will remain asymptomatic
   d. Tertiary syphilis
      (1) Granulomatous lesions called gummas found on skin and bones; skin gummas are painless with sharp borders; bone lesions cause a deep, gnawing pain
      (2) Cardiovascular syphilis
         (a) Occurs 10 years after primary infection
         (b) Generally results in dissecting aneurysm of ascending aorta or aortic arch; antibiotics do not reverse this disease process
      (3) Neurosyphilis
         (a) Asymptomatic
         (b) Develop meningitis
         (c) Develop spinal cord disease that results in loss of reflexes and loss of pain and temperature sensation
      (4) Spirochetes attack cerebral blood vessels and cause a cerebrovascular occlusion
         (a) Develop general paresis (of the insane) - progressive disease of cerebral cells leading to mental deterioration and psychiatric symptoms
6. Patient management and protective measures
   a. EMS personnel should observe BSI so as to avoid contact with syphilis lesions
   b. Continuation of BSI during equipment cleaning is highly recommended, with effective hand washing
   c. T pallidum is extremely fragile and is easily killed by heat, drying, or soap and water
   d. Treatment is effective with penicillin, erythromycin, and doxycycline
7. No immunization is available

B. Gonorrhea
   1. Causative organism - Neisseria gonorrheae
   2. What affected - genital organs and associated structures

3. Mode of transmission - direct contact with exudates of mucous membranes, almost always from unprotected sexual intercourse
4. Susceptibility and resistance
   a. Susceptibility is general
   b. Antibodies develop after exposure, but only to the specific strains of N. gonorrhoeae that have infected the patient
   c. Subsequent reinfection by other strains can therefore occur
5. Signs and symptoms
   a. In males
      (1) An initial inflammation of the urethra, with dysuria and a purulent urinary discharge, sometimes from the urinary meatus in the absence of urine
      (2) This, left untreated, can progress to an epididymitis, prostatitis, and strictures of the urethra
   b. In females
      (1) Dysuria and purulent vaginal discharge may occur
      (2) The majority of females have no pain and minimal urethral discharge
      (3) Gonococcal infection of the cervix can progress to pelvic inflammatory disease, causing fever, lower abdominal pain, abnormal menstrual bleeding, and cervical motion tenderness upon vaginal exam
      (4) Menstruation allows the bacteria to spread from the cervix to the upper genital tract, and results in 50% of PID cases occurring within 1 week of the onset of menstruation
      (5) Females are at increased risk for sterility, ectopic pregnancy, abscesses of the fallopian tubes, ovaries, or peritoneum, and peritonitis after gonococcal infection
   c. In rare instances, a systemic bacteremia can occur
   d. A septic arthritis with fever, pain, and swelling of 1 or 2 joints can occur, which, left untreated, can cause progressive deterioration of the joints
6. Patient management and protective measures
   a. EMS personnel must observe BSI when handling linen, supplies and equipment used in the care of patients with suspected N. gonorrhoeae infection (i.e. females with PID, patients with dysuria) and further appreciate that many are asymptomatic
   b. Effective hand washing is mandatory
   c. Effective antibiotic regimens exist for the treatment of infection
7. No immunization available

C. Chlamydia
1. Causative organism - Chlamydia trachomatis a gram-negative bacterium that can only survive inside a host cell by using the host's ATP
2. What affected - eyes, genital area and associated organs, respiratory system
3. Modes of transmission
   a. Sexual activity
   b. Hand-to-hand transfer of infected eye secretions; children are therefore the major reservoir
   c. Sharing of contaminated clothing or towels
4. Susceptibility and resistance
   a. Susceptibility is general; estimated that up to 25% of men may be carriers

b. No acquired immunity after infection has been reported

5. Signs and symptoms
   a. Similar to gonorrhea
   b. Symptomatology often makes differentiation from gonorrhea difficult
   c. Conjunctivitis known to occur from C. trachomatis infection; it is the leading cause of preventable blindness in the world
   d. Infant pneumonia is known to occur from C. trachomatis infection after transit through an infected birth canal
   e. Gynecological sequelae of C. trachomatis infection are same as N. gonorrhea
6. Patient management and protective measures
   a. EMS personnel must observe BSI and effective hand washing
   b. Effective antibiotic regimens exist for the treatment of infection and include tetracycline, doxycycline, and erythromycin, and p.o. azithromycin
7. No immunization available

D. Herpes simplex virus type 2 (genital herpes)
1. Causative organism - Herpes simplex virus type 2 (HSV 2)
2. What affected - regions, tissues, and structures associated with intimate contact
3. Mode of transmission - sexual activity
4. Susceptibility and resistance - general susceptibility
5. Signs and symptoms
   a. Males - lesions of the penis, anus, rectum, and/ or mouth depending on sexual practices
   b. Females - Sometimes asymptomatic; lesions of the cervix, vulva, anus, rectum and mouth depending on sexual practices; recurrent disease generally affects the vulva, buttocks, legs, and perineal skin
   c. Infants - via the birth canal
6. Patient management and protective measures
   a. EMS personnel should observe BSI when handling linen, supplies, and equipment used in the care of patients with possibility of infection; this is a negligible risk if the skin is intact; treatment with acyclovir (Zovirax®) is of benefit when used topically, IV, or orally for genital herpes
7. No immunization available

XX. Scabies and Lice

A. Scabies
1. Etiologic agent - Sarcoptes scabiei, a mite; Norwegian scabies the most severe variety
2. What affected - skin
3. Modes of transmission
   a. Direct skin-to-skin contact, including sexual contact
   b. Bedding is infectious only if it has been in contact with infected person immediately beforehand (last 24 hours)
   c. Mite can burrow into the skin in 2.5 minutes
4. Susceptibility and host factors
   a. Susceptibility is general, but people with previous exposure
      (1) Develop less mites on successive exposures
      (2) Develop symptoms 1-4 days after exposure, as opposed to 2-6 weeks for people without previous exposure

b. Mites are communicable until all mites and eggs are destroyed, normally after one, probably two treatments, spaced one week apart

5. Signs and symptoms
   a. Intense itching, especially at night, with vesicles, papules, and linear burrows which contain the mites and eggs
   b. Males - lesions prominent around finger webs, anterior surfaces of wrists and elbows, armpits, belt line, thighs and external genitalia
   c. Females - lesions prominent on nipples, abdomen, and lower portion of buttocks
   d. Infants - head, neck, palms, and soles may be involved, and are generally not seen in older adults
   e. Complications generally due to infection of lesions that are broken from scratching
6. Patient management and protective measures
   a. EMS personnel should handle patients, underclothing, and home bedding observing BSI, separate bagging of exposed ambulance linen
   b. Personal - laundering of underwear, clothing, and bed sheets used in the 48 hours prior to treatment in hot cycles of washer/ dryer is of questionable benefit, unlike head lice infestation; more important in Norwegian scabies infestation
   c. Treatment normally consists of Kwell®, lindane, or other agents selected based on patient age, with specific instructions for concurrent cleansing of linen and clothing; over treatment should be avoided out of concern for toxicity
   d. Family education important relative to use of insecticides and emphasis on environmental issues of washing bedding and clothing
7. No immunization is available

B. Lice (pediculosis and phthiriasis)
1. Infesting agents
   a. Pediculus humanus capitis (head louse)
   b. Pediculus humanus corporis (body louse) - involved in outbreaks of epidemic typhus, trench fever (WWI), and relapsing fever
   c. Pthirus pubis (crab louse)
2. What infested - as in description of infesting agents above
3. Modes of transmission and host factors
   a. Head lice and body lice - direct contact with an infested person and objects used by them
   b. Body lice - indirect contact with their personal belongings, especially shared clothing and headwear
   c. Crab lice - sexual contact
   d. Lice leave febrile hosts; therefore, fever and overcrowding favor transmission
   e. Eggs of head lice do not hatch at temperatures < 72° F
   f. 3-stage life cycle - eggs, nymphs, adults
      (1) Eggs hatch in 7-10 days
      (2) Nymph stage lasts about 7-13 days, depending on temperature
      (3) Egg-to-egg cycle lasts 3 weeks
4. Susceptibility is general; repeated skin infestations may result in hypersensitivity
5. Signs and symptoms - itching
   a. Infestation of head lice is of hair, eyebrows, and eyelashes, mustache, and beards

b. Infestation of body lice is of clothing, especially along the seams of the inner surfaces of clothing

6. Patient management and protective measures
   a. Personal treatment - use of appropriate body/ hair pediculicide is recommended, repeated 7-10 days later
   b. EMS personnel should observe BSI and bag linen separately
   c. EMS workers should spray the patient compartment of the ambulance with an insecticide that is known to be effective for lice and mites
      (1) Most of the commercially available sprays that contain pyrethrins, Malathion, or carbamates are adequate
      (2) Lice and mites are not known to jump great distances like fleas so spraying the floor, stretcher and immediate area around the head of the stretcher, where the patient's head was, should be sufficient
      (3) Clean all areas sprayed with an appropriate solution to remove insecticide residues
      (4) Wear gloves during all steps above and practice effective hand washing when finished
7. Prevention - personal hygiene + environmental sanitation

XXI. Lyme disease
   A. Causative organism - Borrelia burgdorferi, a spirochete like the causative organism of syphilis
   B. What affected - skin, CNS, cardiovascular system, joints
   C. Mode of transmission - tick (vector) borne, with reservoirs in mice and deer
   D. Susceptibility and resistance
      1. Susceptibility - all persons are susceptible
      2. Reinfection has occurred in those treated with antibiotics for early disease, so probably no immunity occurs
   E. Signs and symptoms - stages that, like syphilis, occurs in phases
      1. An early localized stage with a painless skin lesion at the site of the bite, called erythema migrans (EM), and a flu-like syndrome with malaise, myalgia, and stiff neck
         a. EM starts off as a red, flat, round rash which spreads out; the outer border remains bright red, with the center becoming clear, blue, or even necrose and turn black
         b. Incubation period until EM - 3 to 32 days post tick exposure
      2. Early disseminated stage in which B. burgdorferi invades the skin, nervous system, heart, and joints
         a. Skin - multiple EM lesions
         b. Nervous system
            (1) Invades brain, causing meningitis
            (2) Invades cranial nerves, especially the 7th, and creates a Bell's palsy
            (3) Invades motor/ sensory nerves and creates a peripheral neuropathy
         c. Cardiac abnormalities
            (1) Atrioventricular block
            (2) Myocarditis and left ventricular dysfunction are less common
         d. Joint and muscle pain - arthritis can occur 6 months after infection
      3. Late stage
         a. About 10% of untreated patients develop a chronic arthritis that lasts for more

than a year, and involves large joints such as the knee
b. An encephalopathy can develop characterized by cognitive deficits, depression, and sleep disorders

F. Patient management and control measures
1. EMS personnel who work, or treat/ transport patients in a wilderness environment, should be vigilant to the presence of ticks on themselves and their patients
a. EMS workers should spray the patient compartment of the ambulance with an insecticide that is known to be effective for ticks
2. There is no evidence of natural transmission from person-to-person
3. Effective antibiotic regimens exist for treatment of EM, neurologic abnormalities, and arthritis associated with B. burgdorferi infection

G. No immunization is available

XXII. Gastroenteritis
A. Causative organisms
1. Rotavirus, Norwalk virus, and many others
2. Parasites - Protozoa Giardia lamblia, Cryptosporidium parvum, and Cyclospora cayetanensis
a. Contracted via fecal-oral transmission, contaminated food and water
b. Cyclosporidium reported to be contracted by swimming in contaminated waters
3. Bacteria
a. Escherichia coli
b. Klebsiella pneumoniae
c. Enterobacter
d. Campylobacter jejuni
e. Vibrio cholerae
f. Shigella - not part of normal intestinal flora
g. Salmonella - not part of normal intestinal flora

B. System affected - GI system
C. Modes of transmission
1. Fecal-oral
2. Ingestion of infected food or non-potable water
D. Susceptibility and resistance
1. Travelers into endemic areas are more susceptible
2. Populations in disaster areas, where water supplies are contaminated, are susceptible
3. Native populations in endemic areas are generally resistant
E. Signs and symptoms - nausea, vomiting, fever, abdominal pain and cramping, anorexia, lassitude, and frank shock
1. Diarrhea of enteric bacteria - December 17, 1997 intestinal invasion
2. Chronic gastritis and ulcers with abdominal pain, nausea, and "heartburn" are caused by Helicobacter pylori infection
F. Patient management and protective measures
1. EMS personnel - do not work when ill if your job involves patient contact
2. Focused on environmental health and development/ availability of clean water reservoirs, food preparation and sanitation
3. Disaster workers and travelers to endemic areas must be vigilant in knowing the sources of their water supplies or drink hot beverages that have been brisk-boiled or disinfected

4. Health care workers treating gastroenteritis patients must be careful to avoid habits that facilitate fecal-oral/ mucous membrane transmission, observe BSI and effective hand washing
5. Selected organisms may be sensitive to antibiotics; epidemic treatment is normally symptomatic

G. Immunizations are unavailable for many of the enteric bacteria, which are part of the normal intestinal flora

XXIII. Reporting an exposure to an infectious/ communicable disease

A. What constitutes an exposure - any specific eye, mouth, other mucous membrane, non-intact skin, parenteral contact with blood, blood products, or other potentially infectious materials should be considered an exposure incident

B. Why it is important to report
   1. Permits immediate medical follow up, permitting identification of infection and immediate intervention
   2. Enables the Designated Officer (DO) to evaluate the circumstances surrounding the incident and implement engineering or procedural changes to avoid a future exposure
   3. Facilitates follow up testing of the source individual if permission for testing can be obtained
      a. Under provisions of the Ryan White Act, the exposed employee has the right to request the infection status of the source patient from the patient's health care provider, but neither the agency nor the employee can force testing of the source individual
      b. Employers must, and should as part of an effective Exposure Control Plan, tell the employee what to do if an exposure incident occurs

C. Who to report to
   1. Ryan White Act stipulates that an employer will designate a person or officer within the organization to whom exposed employees will report
   2. That officer will then initiate those elements of the Exposure Control Plan to comply with standards and guidelines relative to the exposure
   3. Local reporting requirements

D. Medical evaluation and follow up
   1. Employers must, by law, provide free medical evaluation and treatment to exposed employees, to include
      a. Counseling about the risks, signs and symptoms, probability of developing clinical disease, and how to prevent further spread of the potential infection
      b. Prescribe appropriate treatment in line with current U.S. Public Health Service recommendations
      c. Discuss medications offered, side effects, contraindications
      d. Evaluate any reported illnesses to determine if the symptoms could be related to HIV or hepatitis
   2. Steps involved
      a. Blood test of exposed employee, contingent upon employee agreement
         (1) Employee has the option to give blood sample, but refuse permission for HIV testing at the time the sample is drawn
         (2) Employer must maintain the blood sample for 90 days in case the employee changes his/ her mind about testing, should HIV or hepatitis-

like symptoms develop

b. A health care provider, acting as an agent of the employer, must provide counseling to the employee based on test results, provide informed consent about prophylaxis or therapeutic regimens, and implement those regimens with the approval of the employee

c. Vaccines should be made available to the employee, and all employees who have occupational exposure to blood and other potentially infectious materials

E. Written opinion and confidentiality

1. The health care provider will provide a written report to the Designated Officer (DO) of the employer, and simply identifies whether vaccination was recommended to the exposed employee, and whether or not the employee received vaccination

2. The written report from the employee's health care provider must also note that the employee was informed of the results of the evaluation and told of any medical conditions resulting from the occupational exposure which may require further evaluation or treatment

a. A copy must be provided to the employee, and to the Designated Officer for the agency's files

3. Any other elements of the medical record are confidential, and cannot be supplied to the employer

a. Employee must give written consent for anyone to see the records

b. Records must be maintained for the duration of employment plus 30 years to comply with OSHA standards on access to employee exposure and medical records

F. Preventing disease transmission

1. Don't go to work

a. If you have diarrhea

b. If you have a draining wound or any type of wet lesions; wait until lesions are crusted and dry

c. If you are jaundiced

d. If you have been told you have mononucleosis

e. If you have not been treated with a medication and/ or shampoo for lice and scabies

f. Until you have been taking antibiotics for at least 24 hours for a step throat

g. If you have a cold; if you must go to work, wear a surgical mask to protect your patients

h. Ensure that your immunization status is current relative to

(1) MMR
(2) Hepatitis B, A (if deemed appropriate by your agency)
(3) DPT
(4) Polio
(5) Chickenpox
(6) Influenza (seasonally)
(7) Rabies, if appropriate to your occupational/ recreational risk

i. Approach with caution, and the right attitude

j. Control the scene - an uncontrolled scene increases the likelihood for transmission of body fluids

k. Observe BSI

(1) Always wear gloves
(2) If chance of splash, wear protective eyewear or face shield
(3) If large volumes of blood are possibility, go one step further and wear gown
(4) When contacting a possible TB patient, wear appropriate particulate mask

l. Patients with coughs, headaches, general weakness, recent weight loss, stiff necks, high fevers, and taking medications suggestive of an infectious process are tipoffs in history-taking, with experience, the list will get longer for you
m. Develop your cognitive base so that you can recognize patients who may be immunocompromised
n. Don't treat your patient differently because you think there is the possibility of an infectious process
o. Don't avoid doing things for your patient because you think there is the possibility of an infectious process
p. After the call, disinfect your equipment and patient compartment of the ambulance with a disinfectant (1:100 Lysol®) that claims bactericidal activity against M. tuberculosis, which will kill the hepatitis viruses
(1) Any soap kills HIV
(2) Use high level disinfection on laryngoscope blades
q. If after a call with lice, scabies, ticks or other insect vectors
(1) Spray the stretcher and patient compartment with an insecticide, then wipe off/ mop up insecticide residue
(2) Bag the linen separately, and ensure that it not be taken home; bottom line is that it needs to be washed separately
(3) Report any infectious exposure to the designated officer/ manager of your agency identified as such

2. Effective hand washing, to include the webs of the hands
3. The major infectious diseases that EMS personnel should have in-depth knowledge of for purposes of regulatory compliance
a. HIV
b. Hepatitis (all types that are bloodborne)
c. Tuberculosis
d. Meningococcal meningitis
4. The major points of each infectious/ communicable disease
a. Identify causative organisms as bacteria, virus, or parasite, without necessarily knowing genus and species
b. Modes of transmission
c. Signs and symptoms
d. How to avoid infection
e. Understand the concept of occupational risk
(1) Appreciate that infectious agent mode of entry, virulence, dose, and host resistance factors combine to define risk, or potential for infection
(2) Just because there is risk, doesn't mean that you will become infected
(3) Not all infectious diseases are communicable and do not always pose risks to family members
(4) Risk and potential does not necessarily equate to probability; HIV is a

good example - risks for infection may appear to be high, but the probability of occupational exposure is very low (0.2-0.44%)

5. Identify what constitutes an exposure
6. Identify the local protocols associated with reporting and recording an exposure
7. Identify the paramedic's role and responsibility in reporting and documenting an exposure
8. Identify other individuals' roles and responsibilities associated with the local protocols for reporting and recording an exposure

G. Medical and legal aspects of reporting and recording an exposure

XXIV. Integration

A. Out-of-hospital personnel deal with very few infectious disease emergencies, but must be vigilant about consequences to themselves, as well as their patients and coworkers, based on daily, often unknown exposures to infectious agents

B. Universal/ standard precautions (applicable mostly to clinical and research facilities) for EMS personnel are superseded by body substance isolation guidelines, based upon the premise that all body fluids, in any situation, may be infectious

UNIT TERMINAL OBJECTIVE

5-12 At the end of this unit, the paramedic student will be able to describe and demonstrate safe, empathetic competence in caring for patients with behavioral emergencies.

COGNITIVE OBJECTIVES

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

5-12.1 Define behavior and distinguish between normal and abnormal behavior. (C-1)
5-12.2 Define behavioral emergency. (C-1)
5-12.3 Discuss the prevalence of behavior and psychiatric disorders. (C-1)
5-12.4 Discuss the factors that may alter the behavior or emotional status of an ill or injured individual. (C-1)
5-12.5 Describe the medical legal considerations for management of emotionally disturbed patients. (C-1)
5-12.6 Discuss the pathophysiology of behavioral and psychiatric disorders. (C-1)
5-12.7 Describe the overt behaviors associated with behavioral and psychiatric disorders. (C-1)
5-12.8 Define the following terms: (C-1)
a. Affect
2. Anger
3. Anxiety
4. Confusion
5. Depression
6. Fear
7. Mental status
8. Open-ended question
9. Posture

5-12.9 Describe the verbal techniques useful in managing the emotionally disturbed patient. (C-1)
5-12.10 List the reasons for taking appropriate measures to ensure the safety of the patient, paramedic and others. (C-1)
5-12.11 Describe the circumstances when relatives, bystanders and others should be removed from the scene. (C-1)
5-12.12 Describe the techniques that facilitate the systematic gathering of information from the disturbed patient. (C-1)
5-12.13 List situations in which the EMT-P is expected to transport a patient forcibly and against his will. (C-1)
5-12.14 Identify techniques for physical assessment in a patient with behavioral problems. (C-1)
5-12.15 Describe methods of restraint that may be necessary in managing the emotionally disturbed patient. (C-1)
5-12.16 List the risk factors for suicide. (C-1)
5-12.17 List the behaviors that may be seen indicating that patient may be at risk for suicide. (C-1)
5-12.18 Integrate the pathophysiological principles with the assessment of the patient with behavioral and psychiatric disorders. (C-3)
5-12.19 Differentiate between the various behavioral and psychiatric disorders based on the assessment and history. (C-3)
5-12.20 Formulate a field impression based on the assessment findings. (C-3)
5-12.21 Develop a patient management plan based on the field impressions. (C-3)

AFFECTIVE OBJECTIVES

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

5-12.22 Advocate for empathetic and respectful treatment for individuals experiencing behavioral emergencies. (A-3)

PSYCHOMOTOR OBJECTIVES

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

5-12.23 Demonstrate safe techniques for managing and restraining a violent patient. (P-1)

DECLARATIVE

I. Introduction
  A. Behavior
    1. Concept of normal behavior
      a. Disagreement over what is "normal"
      b. No clear definition or ideal model
      c. Ideas of normal vary by culture/ ethnic group
      d. Society accepts it
    2. Concept of abnormal behavior
      a. Maladaptive behavior is more useful term
      b. Deviates from society's norms and expectations
      c. Interferes with well being and ability to function
      d. Harmful to individual or group
    3. Concept of behavioral emergencies
      a. Unanticipated behavioral episode
      b. Behavior that is threatening to patient or others
      c. Requires immediate intervention by emergency responders (police, EMS, etc.)
  B. Behavioral and psychiatric disorders
    1. Description
      a. Covers a broad range of conditions of varying severity
      b. Group of disorders characterized by abnormal or maladaptive behavior
        (1) Disturbance in normal functioning
        (2) May be caused by emotional or physiologic conditions
        (3) Create undesirable consequences
    2. Recognized types/ classifications
      a. Cognitive disorders
      b. Schizophrenia and other psychotic disorders
      c. Mood disorders
      d. Anxiety disorders
      e. Substance related disorders
      f. Somatoform disorders
      g. Factitious disorders
      h. Dissociative disorders
      i. Eating disorders
      j. Impulse control disorders
      k. Personality disorders
  C. Epidemiology
    1. Incidence/ magnitude of mental health problem
      a. Estimates vary with some as high as 20% of population
      b. Incapacitates more people than all other health problems combined
      c. Some researchers estimate that 1 person out of every 7 will require treatment for an emotional disturbance
    2. Common misconceptions
      a. Abnormal behavior is always bizarre
      b. All mental patients are unstable and dangerous
      c. Mental disorders are incurable
      d. Having a mental disorder is cause for embarrassment and shame

II. General psychopathology, assessment and management
  A. Psychopathology
    1. Biological/ organic
      a. Diseases/ toxins
        (1) Metabolic diseases
        (2) Infections, tumors
        (3) Alcohol, drugs
      b. Heredity
    2. Psychosocial
      a. Childhood trauma
      b. Parental deprivation
      c. Dysfunctional family structure
    3. Socio-cultural
      a. Environmental violence
        (1) War, riots
        (2) Rape, assault
      b. Death of a loved one
      c. Economic/ employment problems
      d. Prejudice and discrimination
      e. Cultural norms and expectations
  B. Assessment
    1. Scene size-up
      a. Determine if a violent or potentially unsafe situation exists
        (1) Highest priority
        (2) Consider need for assistance from public safety personnel
        (3) Avoid becoming a victim
      b. In the absence of obvious danger, observe scene for information to assist with patient assessment and care
        (1) Signs of violence
        (2) Evidence of substance abuse
        (3) General environmental condition
    2. Initial assessment
      a. Limit number of people around patient, isolate patient if necessary
      b. Maintain alertness to danger
      c. Determine presence of life threatening medical conditions
      d. Rapid assessment of ABCs with intervention if required
      e. Observe overt behavior (affect) of patient and body language (posture, gestures, etc.)
      f. Note evidence of rage, elation, hostility, depression, fear, anger, anxiety, confusion, etc.
    3. Focused history and physical examination
      a. Remove patient from crisis or disturbing situation
      b. Center questions on immediate problem
      c. Establish rapport
        (1) Utilize therapeutic interviewing techniques
          (a) Engage in active listening
          (b) Be supportive and empathetic
          (c) Limit interruptions

(d) Respect patient's territory, limit physical touch
(2) Avoid threatening actions, statements and questions
(3) Approach slowly and purposefully
d. Note assessment findings
(1) Physical/ somatic complaints
(2) Intellectual functioning
(a) Orientation
(b) Memory
(c) Concentration
(d) Judgement
(3) Thought content
(a) Disordered thoughts
(b) Delusions, hallucinations
(c) Unusual worries, fears
(4) Language
(a) Speech pattern and content
(b) Garbled or unintelligible
(5) Mood
(a) Anxiety, depression, elation, agitation
(b) Level of alertness, distractibility
(6) Appearance, hygiene, dress
(7) Psychomotor activity
4. Management considerations
a. Treat existing medical problems
b. Maintain safety
c. Control violent situations
d. Medical legal considerations
(1) Standard of care
(2) Consent
(3) Limitations of legal authority
(4) Restraints
e. Remain with patient at all times
f. Avoid challenging personal space
g. Avoid judgements
h. Transport against patient's will when
(1) Patient presents threat to self or others
(2) Ordered by medical direction
(3) Implemented by law enforcement authorities, if at all possible
i. Types of restraints
(1) Wrist/ waist/ ankle leather or velcro straps
(2) Full jacket restraint
(3) Other

III. Specific behavioral/ psychiatric disorders
A. Cognitive disorders
1. Psychopathology
a. Organic etiology
(1) Disease processes
(a) Metabolic disorders
(b) Infections

(c) Neoplastic disease/ tumors
(d) Endocrine disorders
(e) Degenerative diseases
(f) Cardiovascular disease
(2) Physical/ chemical injury
(a) Trauma
(b) Drug abuse
(c) Drug reaction
b. Disturbance of cognitive functioning
c. Types
(1) Delirium
(2) Dementia
2. Delirium
a. Inattention
b. Memory impairment
c. Disorientation
d. Clouding of consciousness
e. Vivid visual hallucinations
3. Dementia
a. Pervasive disturbance in cognitive functions
(1) Abstract thinking
(2) Judgement
b. Aphasia
c. Social impairments
4. General management for cognitive disorders
a. Protect and support
b. Assess and treat co-existing emergency medical problems
c. Transport to appropriate facility

B. Schizophrenia
1. Psychopathology
a. Gross distortions of reality
b. Withdrawal form social interaction
c. Disorganized thought, perception and emotion
d. Sub-types
(1) Schizophrenia
(2) Paranoia
(3) Others
2. Assessment findings
a. Delusions
b. Hallucinations
c. Disorganized speech
d. High risk for suicidal and homicidal behavior
3. Management
a. Protect patient and others
b. Maintain alertness for aggressive/ violent behavior
c. Appropriately restrain if needed
d. Manage existing medical emergencies

C. Anxiety disorders
1. General psychopathology
a. Apprehension, fears and worry dominate psychological life
b. Affects 2-4% of population
c. Increased autonomic activity

d. Types
(1) Panic disorders
(2) Phobias
(3) Posttraumatic syndrome

2. Panic disorders
a. Assessment findings
(1) Recurrent attacks of sudden anxiety
(a) Surges of extreme dread
(b) Symptoms develop over a few minutes
(c) Unprovoked or related to particular stimulus
(2) Autonomic signs and symptoms
(a) Chest tightness, shortness of breath, hyperventilation
(b) Palpitations, dizziness, sweating
(3) May mimic a variety of medical emergencies
b. Management
(1) Assess for organic causes
(2) Provide empathetic reassurance
(3) Treat hyperventilation
(4) Consult medical direction for pharmacological intervention

3. Phobias - exaggerated, sometimes disabling, frequently inexplicable fear
a. Assessment findings
b. Management

4. Posttraumatic syndrome
a. Assessment findings
(1) Anxiety reaction to a severe psychosocial event
(a) Usually life threatening, i.e., military service, rape
(b) Repetitive, intrusive memories
(2) Depression, sleep disturbances, nightmares
(3) Survivor guilt
(4) Frequently complicated by substance abuse
b. Management
(1) Support and protect
(2) Transport for psychiatric assistance

D. Mood disorders
1. Psychopathology and assessment
a. Depression
(1) Impaired normal functioning
(2) One of the most prevalent major psychiatric condition - affects 10-15% of general population
(3) Episodic with periods of remission
(a) Gradual or rapid onset
(b) Clustering of episodes
(4) Major cause of suicide - 15% risk
(5) Signs and symptoms of depression
(a) Persistent, unrelenting sadness
(b) Inability to experience pleasure
(c) Loss of normal activity
(d) Sleep disturbances, loss of appetite

(e) Psychomotor agitation or retardation
(6) Potential for suicide
(a) Recent depression
(b) Recent loss (example - family member death, financial setback, divorce, etc.)
(c) One of the leading causes of death in 15-45 year olds
(d) Women attempt suicide more frequently than men
(e) Men actually commit suicide more frequently than women
(f) Older men - over 55 years of age - are most likely to succeed at suicide
(g) Thoughts about and plans for suicide
(h) The more detailed a plan for suicide, the greater the risk
(i) Alcohol ingestion frequently occurs with suicide gestures

b. Bipolar
(1) Alternating periods of depression with manic behavior
(2) Elation or irritability
(3) Expansive, energetic, gregarious
(4) Quickly becomes argumentative and hostile if thwarted
(5) Depressive periods greater than manic episodes
(6) Decreased need to sleep
(7) Racing thoughts, speech
(8) Delusional
(a) Grandiose ideas
(b) Unrealistic plans

2. Management
a. Protect and support
b. Maintain supportive, calm environment
c. Avoid confrontational comments if patient is manic
d. Do not leave alone if patient is depressed or suicidal
e. Treat existing medical emergencies

E. Substance related disorders
1. Dependence
2. Abuse
3. Intoxication

F. Somatoform disorders
1. Somatization
2. Conversion disorder

G. Factitious disorders

H. Dissociative disorders

I. Eating disorders
1. Anorexia nervosa
2. Bulimia nervosa

J. Impulse control disorders

K. Personality disorders

IV. Special behavioral problems
A. The suicidal patient
B. The violent patient

C. Behavioral problems in children

UNIT TERMINAL OBJECTIVE

5-13 At the end of this unit, the paramedic student will be able to utilize gynecological principles and assessment findings to formulate a field impression and implement the management plan for the patient experiencing a gynecological emergency.

COGNITIVE OBJECTIVES

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

5-13.1 Review the anatomic structures and physiology of the female reproductive system. (C-1)
5-13.2 Identify the normal events of the menstrual cycle. (C-1)
5-13.3 Describe how to assess a patient with a gynecological complaint. (C-1)
5-13.4 Explain how to recognize a gynecological emergency. (C-1)
5-13.5 Describe the general care for any patient experiencing a gynecological emergency. (C-1)
5-13.6 Describe the pathophysiology, assessment, and management of specific gynecological emergencies. (C-1)

AFFECTIVE OBJECTIVES

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

5-13.7 Value the importance of maintaining a patient's modesty and privacy while still being able to obtain necessary information. (A-2)
5-13.8 Defend the need to provide care for a patient of sexual assault, while still preventing destruction of crime scene information. (A-3)
5-13.9 Serve as a role model for other EMS providers when discussing or caring for patients with gynecological emergencies. (A-3)

PSYCHOMOTOR OBJECTIVES

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

5-13.10 Demonstrate how to assess a patient with a gynecological complaint. (P-2)
5-13.11 Demonstrate how to provide care for a patient with: (P-2)
1. Excessive vaginal bleeding
a. Abdominal pain
b. Sexual assault

DECLARATIVE

I. Introduction
   A. Disorders in the female reproductive system can lead to gynecological emergencies
   B. Etiology
      1. Acute or chronic infection
      2. Hemorrhage
      3. Rupture
      4. Ectopic pregnancy
   C. Some conditions can be life-threatening without prompt intervention

II. Review of the anatomy and physiology of the female reproductive system
   A. Identification and physiology of specific body parts
      1. External genitalia (vulva)
         a. Mons pubis
         b. Labia
            (1) Majora
            (2) Minora
         c. Prepuce
         d. Clitoris
         e. Vestibule
         f. Urinary meatus
         g. Orifice of urethra
         h. Vaginal orifice
         i. Hymen
         j. Perineum
         k. Anus
      2. Internal genitalia
         a. Vagina
         b. Cervix
            (1) Cervical canal
         c. Uterus
            (1) Fundus
            (2) Body
            (3) Uterine cavity
            (4) Endometrium
            (5) Myometrium
         d. Fallopian tubes
         e. Ovaries
            (1) Corpus luteum
            (2) Follicles

(3) Oocytes

B. Normal physiology
  1. Menstruation
    a. Normal discharge
      (1) Blood, mucous, cellular debris from uterine mucosa
    b. Approximately every 28 days
    c. Menarche
      (1) Initial onset occurring during puberty
    d. Menopause
      (1) Cessation of ovarian function
      (2) Cessation of menstrual activity
      (3) Average age late 40s
  2. Ovulation
    a. Egg (ovum) released from ovary following breaking of follicle
    b. Usually occurs 14 days after the beginning of the menstrual cycle
  3. Menstrual and ovarian cycles
    a. Proliferative phase
      (1) Increase in endometrium thickness
        (a) Stimulated by estrogen increase
      (2) Anterior pituitary hormones released
        (a) Stimulates cells producing estrogen
        (b) Initiates ovarian cycle
      (3) Phase maintained by increased estrogen production
    b. Secretory phase
      (1) Follows ovulation
      (2) Influenced by estrogen and progesterone
      (3) Prepares the endometrium for gestation
        (a) Gestation - period from fertilization until birth
    c. Menstrual phase
      (1) Occurs when ovum is not fertilized
      (2) Discharge lasts on average 4-6 days
      (3) Flow averages 25-60 ml
      (4) Absent during pregnancy

III. General assessment findings of the patient with a gynecological emergency
  A. History of present illness
    1. SAMPLE
      a. Associated symptoms

(1) Febrile
(2) Diaphoresis
(3) Syncope
(4) Diarrhea
(5) Constipation
(6) Urinary cramping

2. Check for pain or discomfort
   a. OPQRST
   b. Abdominal
   c. Dysmenorrhea - painful menstruation
   d. Aggravation
      (1) During ambulation
      (2) Dyspareunia - pain during intercourse
      (3) Defecation
   e. Alleviation
      (1) Positioning
      (2) Ceasing activity
3. Present health
   a. Note any preexisting conditions

B. Obstetric history
1. Gravida
   a. Number of pregnancies
2. Para
   a. Number of pregnancies carried to term
3. Previous cesarean sections
4. Last menstrual period
   a. Date
   b. Duration
   c. Normalcy
   d. Bleeding between periods
   e. Regularity
5. Possibility of pregnancy
   a. Missed or late period
   b. Breast tenderness
   c. Urinary frequency
   d. Morning sickness
      (1) Nausea and/ or vomiting
   e. Sexually active
      (1) Unprotected sex
6. History of previous gynecological problems
   a. Infections
   b. Bleeding
   c. Miscarriage
   d. Abortion

e. Ectopic pregnancy
7. Present blood loss
a. Color
b. Amount
(1) Pads per hour
c. Duration
8. Vaginal discharge
a. Color
b. Amount
c. Odor
9. Use and type of contraceptive
a. Birth control pills
b. Intrauterine device
c. Spermacides
d. Condoms
e. Diaphragm
f. Withdrawal
g. Rhythm
h. Tubal ligation
i. Depo-provera
j. Norplant
10. History of trauma to the reproductive system
11. Emotional distress
a. Degree

C. Physical examination
1. Comforting attitude
a. Protect modesty
b. Maintain privacy
c. Be considerate of reasons for patient discomfort
2. Level of consciousness
3. General appearance
a. Skin and mucous membrane color
(1) Cyanosis
(2) Pallor
(3) Flushed
b. Vital signs
(1) Orthostatic measurement discrepancies
c. Check for bleeding and discharge
(1) Color
(2) Amount
(3) Evidence of clots and/ or tissue
d. Auscultate the abdomen
(1) Absence of bowel sounds
(2) Hyperactive bowel sounds

e. Palpate the abdomen
(1) Masses
(2) Areas of tenderness
(3) Guarding
(4) Distention
(5) Rebound tenderness

IV. General management
A. Support airway, breathing
1. Oxygen
a. High flow PRN
b. Ventilate as necessary
2. Circulation
a. Intravenous access
(1) Typically not necessary
(2) If patient is demonstrating signs of impending shock or has excessive vaginal bleeding
(a) Large bore IV in a large vein
(b) Normal saline or lactated Ringers
(c) Flow rate based on patient presentation
(d) Consider a second line
b. Monitor and evaluate for serious bleeding
(1) Do not pack dressings in vagina
(2) Discourage use of tampon
(3) Keep count of pads used
c. Shock impending
(1) Trendelenburg
(2) Consider use of PASG
3. Non-pharmacological intervention
a. Position of comfort and care
(1) Based on patient's presentation
(2) Left lateral recumbent
(3) Knee/ chest
(4) Hips raised/ knees bent
b. Cardiac monitoring PRN
c. Consider possibility of pregnancy
(1) Be prepared for delivery
(2) Consider ectopic pregnancy
4. Pharmacological intervention
a. Analgesia typically not appropriate
(1) Masks symptoms for medical diagnosis
(2) May mask deteriorating condition (e.g. emergent shock)

5. Transport consideration
    a. Physician evaluation necessary
    b. Surgical intervention may be necessary
    c. Consider emergency transport to an appropriate facility
6. Psychological support
    a. Calm approach
    b. Maintain modesty/ privacy
    c. Gentle care

V. Specific gynecological emergencies
  A. Non traumatic abdominal pain
    1. Pelvic inflammatory disease
      a. Incidence
        (1) Affects about 1 million women annually
      b. Cause
        (1) Acute or chronic infection
          (a) Gonorrhea
          (b) C. Trachomatis
          (c) Chlamydia
          (d) Staphylococci
          (e) Streptococci
      c. Organs affected by PID
        (1) Initial access through vagina, ascends to other organs
          (a) Cervix
          (b) Uterus/ endometrium
          (c) Fallopian tubes
          (d) Ovaries
          (e) Uterine and ovarian support structures
          (f) Liver
      d. Complications
        (1) Sepsis
        (2) Infertility
      e. Specific assessment findings
        (1) Lower abdominal pain
        (2) Fever may be present
        (3) Vaginal discharge
        (4) Dyspareunia
        (5) Patient doubled over when ambulating
        (6) Abdominal guarding
        (7) Acute onset typically within approximately one week of menstrual period
        (8) Ill appearance

f. Management
(1) See "general management"

2. Ruptured ovarian cyst
a. Incidence
(1) Typically spontaneous
(2) May be associated with mild abdominal injury, intercourse, or exercise
b. Cause
(1) Typically a benign cyst
(2) Thin walled fluid filled sac
c. Organs affected
(1) Develops on ovary
d. Complications
(1) Significant internal bleeding could occur, but is rare
e. Specific assessment findings
(1) May have sudden onset of severe lower abdominal pain
(2) Typically affects one side, may radiate to back
(3) Rupture may result in some vaginal bleeding
f. Management
(1) See "general management"

3. Cystitis
a. Incidence
(1) Frequent
b. Cause
(1) Infection (usually bacterial)
c. Organs affected
(1) Bladder and ureters
d. Complications
(1) If untreated, may lead to pyelonephritis
e. Specific assessment findings
(1) Suprapubic tenderness
(2) Frequency of urination
(3) Dysuria - painful urination
(4) Blood in urine
f. Management
(1) See "general management"

4. Mittelschmerz
a. Incidence
(1) Typically midway into menstrual cycle
b. Cause
(1) Pain occurring at time of ovulation

(2) Possibly related to peritoneal irritation secondary to follicular leakage/ bleeding during ovulation

c. Organs affected
(1) Ovary
(2) Follicles

d. Complications
(1) Typically not immediate life-threat
(2) Requires physician evaluation

e. Specific assessment findings
(1) Unilateral lower quadrant abdominal pain
(2) Low grade fever
(3) Symptoms similar to ruptured ovarian cyst

f. Management
(1) See "general management"

5. Endometritis

a. Incidence
(1) Occurs most often after childbirth or abortion

b. Cause
(1) Infection, resulting in inflammation of the endometrial lining

c. Organs affected
(1) Uterus
(2) Fallopian tubes

d. Complications
(1) If untreated, may lead to sepsis and death
(2) Sterility

e. Specific assessment findings
(1) Lower abdominal pain
(2) Purulent vaginal discharge

f. Management
(1) See section "management of non-traumatic abdominal pain"

6. Endometriosis

a. Incidence
(1) Most common in women who defer pregnancy
(2) Average women in her late 30s

b. Cause
(1) Growth of endometrial tissue outside of uterus

c. Organs affected
(1) Fallopian tubes
(2) Pelvic organs

(3) Bowel
(4) Bladder
(5) Ligaments

d. Complications
(1) Painful intercourse
(2) Painful menstruation
(3) Painful bowel movements

e. Specific assessment findings
(1) Severe pain during and immediately following intercourse and bowel movement

f. Management
(1) See "general management"

7. Ectopic pregnancy
a. Incidence
(1) Consider possibility for any female of reproductive age with abdominal pain (see obstetrics unit for detail)

8. Vaginal bleeding
a. Incidence
(1) Rarely a 9-1-1 call unless severe

b. Causes
(1) Menstruation
(a) Never assume that your emergency call for vaginal hemorrhage is due to normal menstruation
(b) Menorrhagia (heavy vaginal bleeding)
(2) Abortion/ miscarriage
(a) Assume always during first and second trimester of known or possible pregnancy
(b) Consider if last menstrual period > 60 days
(c) May have history of similar events
(d) Note particularly any tissue or large clots
i) If possible, collect material for pathological review
(e) Emotional support extremely important
(3) Placenta previa/ placenta abruption
(a) Vaginal bleeding in third trimester
(b) Always a serious emergency
(4) Other causes
(a) Lesion
(b) PID

(c) Trauma
(d) Onset of labor
c. Organs affected
(1) Female sexual organs
d. Complications
(1) May be life-threatening
(2) May lead to hypovolemic shock and death
e. Specific assessment findings
(1) Onset of symptoms
(2) Additional physical examination
(a) Check for impending shock; orthostatic vital signs
(b) Presence and volume of vaginal blood
f. Management
(1) See "general management"

B. Traumatic abdominal pain
1. Vaginal bleeding
a. Incidence
(1) Increasing
b. Causes
(1) Straddle injuries
(2) Blows to the perineum
(3) Blunt force to lower abdomen
(a) Assault
(b) Seat belt injuries
(4) Foreign bodies inserted into the vagina
(5) Abortion attempts
(6) Soft tissue injury
c. Organs affected
(1) Any or all of the pelvic organs
d. Complications
(1) Severe bleeding
(2) Organ rupture
(3) Hypovolemic shock
e. Specific assessment findings
(1) Consistent with severe internal injuries
f. Management
(1) See "general management"

VI. Sexual assault
A. General findings and management
1. History
a. Do not inquire regarding the patient's sexual history or practices

b. Do not ask questions that may cause patient to have guilt feelings

2. Common reactions
   a. May range from anxiety to withdrawal and silence
   b. Denial, anger and fear are normal behavior patterns
3. Assessment
   a. Examine the genitalia only if necessary
      (1) Presence of severe injury
   b. Explain all procedures before doing an examination
   c. Avoid touching the patient without permission
   d. Maintain the patient's privacy/ modesty
   e. Check for other physical injury
4. Management
   a. Psychological support is very important
   b. Provide a safe environment
   c. Respond to victim's wishes to talk or not to talk
   d. Do not use invasive procedures unless the situation is critical
   e. This is a crime scene - preserve any evidence
      (1) Handle clothing as little as possible
      (2) Paper bag each item separately
      (3) Ask the patient not to change clothes, bathe, or douche
      (4) Do not disturb the scene if possible
      (5) Do not clean wounds unless absolutely necessary
      (6) Do not allow the patient to drink or brush their teeth
   f. Maintain a non-judgmental/ professional attitude
      (1) Be aware of your own feelings and prejudices
   g. Have female personnel attend to the female patient whenever possible
      (1) Ask if female personnel are preferred
   h. Provide reassurance to patient of such
      (1) Confidentiality is critical

UNIT TERMINAL OBJECTIVE

5-14 At the completion of this unit, the paramedic student will be able to apply an understanding of the anatomy and physiology of the female reproductive system to the assessment and management of a patient experiencing normal or abnormal labor.

COGNITIVE OBJECTIVES

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

5-14.1 Review the anatomic structures and physiology of the reproductive system. (C-1)
5-14.2 Identify the normal events of pregnancy. (C-1)
5-14.3 Describe how to assess an obstetrical patient. (C-1)
5-14.4 Identify the stages of labor and the paramedic's role in each stage. (C-1)
5-14.5 Differentiate between normal and abnormal delivery. (C-3)
5-14.6 Identify and describe complications associated with pregnancy and delivery. (C-1)
5-14.7 Identify predelivery emergencies. (C-1)
5-14.8 State indications of an imminent delivery. (C-1)
5-14.9 Explain the use of the contents of an obstetrics kit. (C-2)
5-14.10 Differentiate the management of a patient with predelivery emergencies from a normal delivery. (C-3)
5-14.11 State the steps in the predelivery preparation of the mother. (C-1)
5-14.12 Establish the relationship between body substance isolation and childbirth. (C-3)
5-14.13 State the steps to assist in the delivery of a newborn. (C-1)
5-14.14 Describe how to care for the newborn. (C-1)
5-14.15 Describe how and when to cut the umbilical cord. (C-1)
5-14.16 Discuss the steps in the delivery of the placenta. (C-1)
5-14.17 Describe the management of the mother post-delivery. (C-1)
5-14.18 Summarize neonatal resuscitation procedures. (C-1)
5-14.19 Describe the procedures for handling abnormal deliveries. (C-1)
5-14.20 Describe the procedures for handling complications of pregnancy. (C-1)
5-14.21 Describe the procedures for handling maternal complications of labor. (C-1)
5-14.22 Describe special considerations when meconium is present in amniotic fluid or during delivery. (C-1)
5-14.23 Describe special considerations of a premature baby. (C-1)

AFFECTIVE OBJECTIVES

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

5-14.24 Advocate the need for treating two patients (mother and baby). (A-2)
5-14.25 Value the importance of maintaining a patient's modesty and privacy during assessment and management. (A-2)
5-14.26 Serve as a role model for other EMS providers when discussing or performing the steps of childbirth. (A-3)

PSYCHOMOTOR OBJECTIVES

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

5-14.27 Demonstrate how to assess an obstetric patient. (P-2)
5-14.28 Demonstrate how to provide care for a patient with: (P-2)
1. Excessive vaginal bleeding
2. Abdominal pain
3. Hypertensive crisis

5-14.29 Demonstrate how to prepare the obstetric patient for

delivery. (P-2)

5-14.30 Demonstrate how to assist in the normal cephalic delivery of the fetus. (P-2)

5-14.31 Demonstrate how to deliver the placenta. (P-2)

5-14.32 Demonstrate how to provide post-delivery care of the mother. (P-2)

5-14.33 Demonstrate how to assist with abnormal deliveries. (P-2)

5-14.34 Demonstrate how to care for the mother with delivery complications. (P-2)

DECLARATIVE

I. Introduction
   A. Pregnancy results from ovulation and fertilization
      1. Most pregnancies are uncomplicated
      2. Complications can occur
         a. Eclampsia/ pre-eclampsia
         b. Diabetes
         c. Hypotension/ hypertension
         d. Cardiac disorders
         e. Abortion
         f. Trauma
         g. Placenta abnormalities
   B. Childbirth involves labor and delivery
      1. Childbirth is a natural process, often only requiring basic assistance
      2. Throughout the process, the paramedic is caring for two patients, not one
      3. Complications can occur
         a. Breech/ limb presentation
         b. Multiple births
         c. Umbilical cord problems
         d. Disproportion
         e. Excessive bleeding
         f. Pulmonary embolism
         g. Neonate requiring resuscitation
         h. Preterm labor

II. Review of the anatomy and physiology of the female reproductive system
   A. Normal events of pregnancy
      1. Ovulation
      2. Fertilization
         a. Occurs in distal third of fallopian tube
      3. Implantation
         a. Occurs in the uterus
   B. Accessory structures of pregnancy
      1. Placenta
         a. Transfer of gases
            (1) Oxygen and carbon dioxide
         b. Transport other nutrients
            (1) Glucose
            (2) Potassium, sodium, chloride
         c. Excretion of wastes

(1) Urea, uric acid, creatine diffuse into maternal blood

d. Hormone production
(1) Placenta acts as temporary endocrine gland
(2) Secretes estrogen, progesterone, etc.
(a) Prevents menses
(b) Causes anatomical changes in preparation of childbirth

e. Protection
(1) Provides partial barrier against harmful substances
(2) Does not protect against steroids, narcotics, some antibiotics

2. Umbilical cord
a. Connects placenta to fetus
b. Contains two arteries and one vein

3. Amniotic sac and fluid
a. Membrane surrounding fetus
b. Fluid originates from fetal sources - urine, secretions
c. Between 500 and 1000 ccs of fluid after 20 weeks
d. Rupture of the membrane produces watery discharge

C. Fetal growth process
1. End of 3rd month
a. Sex may be distinguished
b. Heart is beating
c. Every structure found at birth is present

2. End of 5th month
a. Fetal heart tones can be detected
b. Fetal movement may be felt by the mother

3. End of 6th month
a. May be capable of survival if born prematurely

4. Approximately middle of 10th month
a. Considered to have reached full term
b. Expected date of confinement (EDC)

D. Obstetric terminology
1. Antepartum - before delivery
2. Postpartum - after delivery
3. Prenatal - existing or occurring before birth
4. Natal - connected with birth
5. Gravida - number of pregnancies
6. Para - number of pregnancies carried to full term
7. Primigravida - a woman who is pregnant for the first time

8. Primipara - a woman who has given birth to her first child
9. Multiparous - a woman who has given birth multiple times
10. Gestation - period of time for intrauterine fetal development

III. General assessment of the obstetric patient
- A. Initial assessment
- B. History of present illness
  1. SAMPLE
     - a. Pertinent medical history
       - (1) Diabetes
       - (2) Heart disease
       - (3) Hypertension/ hypotension
       - (4) Seizures
  2. Current health of patient
     - a. Pre-existing conditions
     - b. Prenatal care
       - (1) None
       - (2) Physician
       - (3) Nurse midwife
- C. Obstetrical history
  1. Length of gestation
  2. Primipara or multiparous
  3. Previous cesarean sections
  4. Previous gynecologic or obstetric complications
  5. Contractions
  6. Patient states that "the baby is coming"
  7. Anticipating normal delivery (versus multiple births, etc.)
  8. Pain
     - a. OPQRST
  9. Vaginal bleeding
     - a. Presence
     - b. Amount
     - c. Color
     - d. Duration
  10. Vaginal discharge
     - a. Presence
     - b. Amount
     - c. Color
     - d. Duration
- D. Physical examination

1. Comforting attitude and approach
   a. Protect patient modesty
   b. Maintain privacy
   c. Be considerate of reasons for patient discomfort
2. Recognition of pregnancy
   a. Breast tenderness
   b. Urinary frequency
   c. Amenorrhea
   d. Nausea, vomiting (morning sickness)
   e. Uterine
3. Evaluating uterine size
   a. Between weeks 12 and 16
      (1) Visually and by palpation to be above the symphysis pubis
   b. 20 weeks
      (1) At the level of the umbilicus
   c. At term
      (1) Near the xiphoid process
4. Presence of fetal movements
   a. By observation
   b. By questioning the patient
5. Presence of fetal heart tones
   a. Audible at approximately the 20th week
   b. May be detected earlier with fetal doppler
   c. Normal rate 120 to 160 beats per minute
6. Vital signs
   a. Consider orthostatic
7. Genital inspection
   a. When indicated
   b. Visually inspect for crowning and/ or vaginal bleeding

IV. General management of the obstetric patient
   A. Basic treatment modalities
      1. Airway, breathing, circulation
      2. Administer oxygen
         a. High-flow, high-concentration PRN
      3. Non-pharmacologic intervention
         a. Position of comfort and care
            (1) Left lateral recumbent after the 24th week, if not in active labor
         b. Monitor cardiac rhythm
         c. Evaluate the fetus status if possible
         d. Treat for hypotension if necessary

4. Pharmacological intervention
    a. IV access
        (1) Large bore
        (2) Volume expander
        (3) Consider second line
    b. Analgesia may be appropriate
        (1) Consider the possibility of masking symptoms or a deteriorating condition
        (2) Consider potential fetal impact
        (3) Nitrous oxide is the analgesia of choice
5. Transport the patient emergently
6. Psychological support
    a. Calm approach
    b. Maintain modesty/ privacy

V. Specific complications of pregnancy
  A. Trauma
    1. Minor trauma common in the obstetric patient
        a. Reasons
            (1) Syncopal episodes
            (2) Diminished coordination
            (3) Loosening of the joints
    2. Major trauma
        a. Susceptible to a life-threatening episode due to increased vascularity
            (1) May deteriorate suddenly
    3. Abdominal trauma
        a. Premature separation of the placenta
        b. Premature labor
        c. Abortion
        d. Rupture of the uterus
        e. Fetal death
            (1) Death of the mother
            (2) Separation of the placenta
            (3) Maternal shock
            (4) Uterine rupture
            (5) Fetal head injury
  B. Vaginal bleeding
    1. Abortion/ miscarriage
        a. Classifications
            (1) Complete
                (a) Uterus completely evacuates fetus, placenta, and decidual lining
            (2) Incomplete

(a) Some placental tissue remaining in uterus after expulsion of fetus

(3) Spontaneous

(a) Occur before 20th week, due to maternal or ovular defects

(4) Criminal

(a) Intentional ending of pregnancy under any condition not allowed by law

(5) Therapeutic

(a) End pregnancy as thought necessary by a physician

(6) Threatened

(a) Vaginal bleeding during first half of pregnancy

(7) Inevitable

(a) Severe cramping and cervix effacement and dilation

(b) Attempts to maintain pregnancy are useless; changes are irreversible

b. Incidence

(1) Assume during first and second trimester of known pregnancy

c. Specific assessment findings

(1) Additional history

(a) Statement that she has recently passed tissue vaginally

(b) Complaint of abdominal pain and cramping

(c) History of similar events

(2) Additional physical examination

(a) Evaluate impending shock - check orthostatic vital signs

(b) Presence and volume of vaginal blood

(c) Presence of tissue or large clots

d. Additional management

(1) Collect and transport any passed tissue, if possible

(2) Emotional support extremely important

2. Ectopic pregnancy

a. Incidence

(1) Approximately 1 of every 200 pregnancies

(2) Most are symptomatic and/or detected 2-12 weeks gestation

b. Cause

(1) Ovum develops outside the uterus
(a) Previous surgical adhesions
(b) Pelvic inflammatory disease
(c) Tubal ligation
(d) Use of an IUD

c. Organs affected
(1) Fallopian tube

d. Complications
(1) May be life-threatening
(2) May lead to hypovolemic shock and death

e. Specific assessment findings
(1) Severe abdominal pain, may radiate to back
(2) Amenorrhea - absence of monthly blood flow and discharge
(3) Vaginal bleeding absent or minimal
(4) Upon rupture, bleeding may be excessive
(5) Shock signs and symptoms
(6) Additional history
(a) Previous surgical adhesions
(b) Pelvic inflammatory disease
(c) Tubal ligation
(d) Use of an IUD
(e) Previous ectopic pregnancy
(7) Additional physical examination
(a) Check for impending shock - orthostatic vital signs
(b) Presence and volume of vaginal blood

f. Additional management:
(1) See "general management"
(2) Second large bore IV line
(3) Trendelenburg, if shock impending
(4) Emergency transport to nearest surgically capable facility

3. Placenta previa
a. Incidence
(1) About 1 in 300
(2) Higher in preterm births

b. Cause
(1) Placenta implantation in lower uterus; covering cervix opening
(2) Associate with increasing age, multiparity, previous cesarean sections, intercourse

c. Organs affected
(1) Placenta, uterus

d. Complications
(1) Placental insufficiency and fetal hypoxia
e. Specific assessment findings
(1) Bright red blood flow without pain or uterine contractions
f. Additional management
(1) Emergency transport to appropriate facility
(2) Definitive treatment is cesarean section

4. Abruptio placenta
a. Incidence
(1) Occurs in up to 2% of pregnancies
(2) Occurs in 1 in 200 deliveries
(3) 1 out of 400 fetal deaths
(4) Typically a third trimester complication
(5) Associated with hypertension, preeclampsia, trauma, multiparity
b. Cause
(1) Premature separation of placenta from uterus
c. Organs affected
(1) Placenta, uterus
d. Complications
(1) Fetal hypoxia and death
e. Specific assessment findings
(1) Third trimester bleeding
(2) Acute alteration in the contraction pattern
(3) Uterus becomes tender
(4) Uterus becomes board-like if hemorrhage retained
(5) Symptoms of shock inconsistent with amount of visible bleeding
f. Additional management
(1) Assess fetal heart tones often
(2) Transport in LLR position unless Trendelenburg is indicated
(3) Emergency transport of patient to an appropriate facility
(a) Definitive treatment is a cesarean section

C. Complications of pregnancy
1. Exacerbation of pre-existing medical conditions
a. Diabetes
(1) May become unstable during pregnancy
(2) Higher incidence of coma
b. Hypertension

(1) May be complicated by pre-eclampsia/ eclampsia
(2) More susceptible to additional complications
(a) Cerebral hemorrhage
(b) Cardiac failure
(c) Renal failure

c. Neuromuscular disorders
(1) May be aggravated by pregnancy

d. Cardiac disorders
(1) Additional stress on the heart
(a) Cardiac output increases 30% by week 34

2. Medical complications of pregnancy

a. Toxemia (pre-eclampsia/ eclampsia)
(1) Incidence
(a) Serious condition
(b) Pregnancy induced hypertension (PIH)
i) Hypertension, with albuminuria and/ or edema
ii) After the 20th week of gestation
(2) Cause
(a) Associated with first birth, multiple births, excessive amniotic fluid
(b) Pre-existing conditions
i) Hypertension
ii) Renal disease
iii) Diabetes
(3) Organs affected
(4) Complications
(a) Convulsions seriously threaten the fetus by abruptio placenta
(5) Specific assessment findings
(a) Occurs in the last trimester of pregnancy
(b) Pre-eclampsia is non-convulsive state of toxemia
(c) Pre-eclampsia has two of the following three signs
i) Hypertension (B/P > 140/90 - acute systolic rise > 20 and diastolic rise > 10)
ii) Fluid retention with excessive weight gain
iii) Proteinuria
(d) Eclampsia includes convulsions

(e) Additional history
i) Hypertension
ii) Excessive weight gain with edema and/ or seizures
(f) Additional physical exam
i) Headaches and/ or epigastric pain; possible seizure
ii) Visual problems
(6) Additional management
(a) If a seizure has not occurred
i) Keep patient calm and quiet
ii) IV access
iii) Darken ambulance
iv) Position patient left lateral recumbent
v) Transport gently
vi) Minimize stimuli to avoid precipitating seizure
vii) Consider magnesium sulfate
(b) If a seizure is occurring
i) IV access
ii) Consider the administration of 5 to 10 mg of diazepam IV push
iii) Administer 2 to 5 grams of magnesium sulfate diluted in 50 to 100 ccs of D_5W, slow IV push
(c) If a seizure has recently occurred, but no longer active
i) Consider magnesium sulfate
(d) Definitive treatment is cesarean section

b. Diabetes
(1) Can be caused by pregnancy
c. Supine-hypotensive syndrome
(1) Incidence
(a) Occurs near term
(2) Cause
(a) Abdominal mass compresses the inferior vena cava
i) Reduces pre-load, and thereby cardiac output
(3) Organs affected
(4) Complications
(5) Specific assessment findings

(a) Check to see if volume depletion is the problem
(b) Additional history
i) Recent medical history including diarrhea, vomiting
ii) Problem coincidental to supine positioning
(c) Additional physical exam
i) Orthostatic vital signs
ii) Tenting of skin
(6) Additional management
(a) If not volume depletion
i) Transport left lateral recumbent
(b) If possibility of volume depletion
i) Consider 2 large bore IVs
ii) Volume replacement
iii) Transport left lateral recumbent as precaution

3. Braxton-Hicks contractions
a. Incidence
(1) Benign phenomenon that simulates labor
(2) Usually occurs after the third month of pregnancy
b. Specific assessment findings
(1) Contractions are generally painless and may be helped by walking
c. Additional management
(1) None

4. Preterm labor
a. Incidence
(1) Labor that begins prior to 38 weeks gestation
(2) Incidence varies with age, presence of multiple gestations and other risk factors
b. Causes
(1) Physiologic abnormalities (multiple factors)
(2) Uterine or cervical anatomical abnormalities
(3) Premature rupture of membranes
(4) Multiple gestations
(5) Intrauterine infections
c. Complications
(1) Premature delivery of infant
d. Specific assessment findings
(1) Contractions that result in the progressive

dilation or effacement of the cervix (not a field assessment)
(2) May be difficult to differentiate labor from Braxton-Hicks contractions (false labor)
e. Additional management
(1) Requires transport for evaluation and treatment by an appropriate health care provider
(2) Consideration of tocolysis if not contraindicated
(a) Rest
(b) Fluids (IV or even PO in some cases)
(c) Sedation
(d) May require administration of a tocolytic at the receiving facility (magnesium sulfate, a beta agonist or indocin)

VI. VI Normal childbirth
A. Characteristics of labor
1. Discomfort in the back and/ or the abdomen
2. Contractions occurring at regular intervals
a. Increasing frequency and intensity of contractions
b. Time from the beginning of one contraction to the beginning of the next
B. Stages of labor
1. Stage I (Dilatation Stage)
a. Onset of regular uterine contractions to complete cervical dilation
b. Average time
(1) 12.5 hours in primipara
(2) 7 hours in multipara
2. Stage II (Expulsion Stage)
a. Full dilatation of the cervix to the delivery of the newborn
b. Average time
(1) 80 minutes in a primipara
(2) 30 minutes in a multipara
3. Stage III (Placental Stage)
a. Immediately following delivery of the baby until expulsion of the placenta
b. Average time
(1) 5 to 20 minutes

C. Progression of labor
  1. First stage of labor
    a. Contractions
      (1) Typically begin short and gently
      (2) Occur at intervals of ten to fifteen minutes
    b. Effacement
      (1) Thinning and shortening of the cervix
    c. Cervical dilation
      (1) Stretching of the opening of the cervix to accommodate baby
  2. Second stage of labor
    a. Contractions
      (1) Stronger and longer
      (2) Lasting 50-70 seconds
      (3) Occurring at intervals of 2-3 minutes
    b. Amniotic sac typically ruptures
    c. Urge to bear down or push becomes very strong
    d. Crowning
      (1) Largest part of the fetal head is visible

D. Delivery process
  1. The decision to transport
    a. Related to the imminence of delivery
      (1) Number of pregnancies
        (a) Labor is shortened with multiparity
      (2) Frequency of contractions
        (a) Two minutes apart may signal imminent delivery
      (3) Maternal urge to push
        (a) Desire to push signals imminent delivery
      (4) Crowning of the presenting part
        (a) Imminent delivery
    b. Related to the presence of complications
      (1) Abnormal presentations
      (2) Fetal distress
      (3) Multiple births
  2. Delivery of the newborn
    a. Prepare a delivery area
      (1) Clean, adequate space
    b. Provide oxygen to the mother
      (1) Nonrebreather or nasal cannula
    c. Establish an IV
      (1) KVO/ TKO rate
    d. Position mother on her back and drape

appropriately
e. Monitor the fetal heart rate, if time allows
f. Coach the mother in breathing patterns
g. Encourage mother to push with contractions
h. Establish body substance isolation practices
i. Control the delivery of the fetal head
(1) Apply gentle hand pressure on the head
(2) Beware of fontanelle
(3) Support the head as it delivers
j. Tear amniotic sac if it continues to cover the baby's head
(1) Permits escape of amniotic fluid
(2) Allows the newborn to start breathing
k. Check for the presence of the umbilical cord wrapped amount the neck
(1) Carefully remove it
l. Suction the neonate's mouth and nose
m. Provide support as the head rotates and the shoulders deliver
(1) Keep the neonate's head above the level of the vagina
n. Clamp the umbilical cord
(1) First clamp approximately 4 inches from neonate
(2) Second clamp approximately 6 inches from the neonate
(3) Cut the cord between the two clamps
o. Support and evaluate the neonate following delivery

3. Delivery of the placenta
a. Usually occurs 5-20 minutes after delivery of neonate
b. Do not delay transport to wait for the delivery of the placenta
c. If it delivers, place the placenta in a plastic bag

E. Additional care
1. Care for the mother
a. Excessive bleeding
(1) Perform fundal massage of the uterus
(a) Stimulates contraction
(b) Breast feeding stimulates contraction of the uterus
(2) Manage any perineal tears by direct pressure

b. Observe and monitor the mother
(1) Signs of hemorrhage and stability of pulse and blood pressure

2. Neonate care

VII. Routine care of the neonate (for more detail, see neonatology unit)

A. Care within first minute following delivery

1. Support
a. Newborns are slippery
b. Use both hands to support the head and torso
c. Work closely to surface of the stretcher, bed, floor

2. Dry

3. Maintain warmth
a. Hypothermia is a major concern
b. Prevent heat loss by quickly drying and then covering the newborn, especially the head

4. Positioning
a. Position the newborn on his/her side
b. Place on warm clean object, such as sterile towels

5. Clear airway
a. Repeat suction of the nose and mouth
b. Wipe away secretions with sterile gauze

6. Tactile stimulation
a. Usually adequately done through drying and clearing the airway
b. Purpose to initiate respirations
c. Slap or flick soles of feet or rub newborn's back for additional stimulation

B. Care following first minute

1. Evaluation
a. Apgar scoring
(1) Completed at 1 and 5 minute intervals
(2) Based on assigning 0-2 values for 5 elements
(a) Appearance (color)
i) Blue/ pale
ii) Pink body/ blue extremities
iii) Completely pink
(b) Pulse
i) Absent
ii) Slow (< 100 bpm)
iii) Over 100 bpm

(c) Grimace (reflex irritability to stimulation)
i) No response
ii) Grimace
iii) Cries
(d) Activity (muscle tone)
i) Limp
ii) Some extremity flexion
iii) Active movement
(e) Respiration
i) Absent
ii) Slow/ irregular
iii) Good strong cry
(3) Scores average 8-10
(4) Score of less than 6 requires resuscitation
(5) Do not delay any resuscitation efforts to assign Apgar scores

2. Resuscitation
a. Incidence
(1) Approximately 6% of hospital newborns require resuscitation
(2) Believed to be higher for out-of-hospital deliveries
b. Causes
(1) Premature birth
(2) Pregnancy and delivery complications
(3) Inadequate prenatal care
(4) Maternal health problems
c. Begun when tactile stimulation fails to initiate adequate respirations
(1) Do not need to wait to complete Apgar
d. Positive pressure ventilation
(1) Pediatric BVM and supplemental oxygen
(2) 40-60 ventilations per minute
e. Assess heart rate
(1) Stethoscope
(2) Palpate brachial artery/ umbilical cord
f. Circulatory support
(1) Chest compressions if rate <80 bpm, and not responding to ventilations
g. Fluid and medication access
(1) Umbilical
(2) Peripheral IV
(3) Intraosseous

(4) Endotracheal (not for fluid administration)
h. Common medications and fluids
(1) Epinephrine
(2) Naloxone
(3) Volume expanders
(a) Normal saline/ lactated Ringers

C. Continued care
1. Neonatal transport
a. Manage airway, breathing, circulation
b. Maintain warmth

VIII. Abnormal deliveries
A. Breech presentation
1. Incidence
a. Most common in premature births and uterine abnormalities
2. Assessment
a. Feet or buttocks are presenting part
3. Management
a. Shoulders, not the head are normally the difficult part to deliver
b. If delivering
(1) Allow neonate to deliver to the umbilicus
(2) With the legs clear, support the body in palm
(3) Extract approximately 4-6 inch loop of umbilical cord
(4) Rotate neonate for anterior-posterior shoulder positioning
(5) Apply gentle traction until axilla visible
(6) Guide neonate upward and deliver posterior shoulder
(7) Guide neonate downward to deliver anterior shoulder
(8) Ease the head out, do not apply excessive manipulation
c. If head does not deliver
(1) Form "V" with fingers on sides of neonate's nose
(a) Creates airway

B. Umbilical cord presentation
1. Incidence
a. Approximately 1 in 200 pregnancies
b. Suspect when fetal distress present

c. Contributing factors include breech birth, multiple births, large fetus

2. Assessment
   a. Portion of cord visible, protruding through vagina
3. Management
   a. Position mother with hips elevated
      (1) Trendelenburg
      (2) Knee-chest
   b. Mother should pant with contractions to avoid bearing down
   c. Use gloved hand to hold fetus in vagina
   d. Keep pressure off cord

C. Limb presentation
1. Incidence
2. Assessment
   a. Limb presents through vagina
3. Management
   a. Emergency transport
   b. Cesarean section delivery

D. Multiple births
1. Incidence
   a. Twins occur in about 1 in every 90 births
   b. Approximately 40% of twin deliveries are premature
2. Assessment
   a. Mother may not know
   b. First sign may be additional contractions and need to push
3. Management
   a. Deliver in same manner as individual delivery
   b. Need additional supplies

E. Cephalopelvic disproportion
1. Incidence
   a. Small pelvis
   b. Fetal abnormalities
   c. Mother often primigravida
2. Assessment
   a. Lack of progress through stages of delivery
   b. Frequent, prolonged contractions
3. Management
   a. Cesarean delivery necessary to avoid uterine rupture
   b. Oxygenation, ventilation, circulatory support

c. Emergency transport

F. Meconium staining
1. Incidence
a. Between 8 and 30% of deliveries
b. Increased perinatal mortality
c. Meconium in amniotic fluid
(1) Could be aspirated
2. Assessment
a. Color varies from yellow, light green, or dark green ("pea soup")
b. The thicker and darker the fluid, the higher the risk of morbidity
3. Management
a. Prepare for intubation
b. Clear airway/ thoroughly suction
(1) Mouth, pharynx, nose
(2) Direct visualization and suction of hypopharynx
c. Intubate
(1) Suction proximal end of endotracheal tube

G. Maternal complications of labor and delivery
1. Postpartum hemorrhage
a. Incidence
(1) Loss of more than 500 ccs of blood immediately following delivery
(2) May be caused by
(a) Lack of uterine tone
(b) Vaginal or cervical tears
(c) Retained pieces of the placenta
(d) Clotting disorders
b. Assessment
(1) History to include
(a) Large infant
(b) Multiple births have occurred
(c) The patient has had placenta previa
(d) The patient has had abruptio placenta
(e) The patient has had prolonged labor
(2) Physical examination
(a) Treat the patient The paramedic must rely on the patient's clinical appearance and vital signs
(b) The uterus feels soft on palpation
(c) Inspect the external genitalia for injury resulting in excessive bleeding

(d) Observe signs and symptoms of hypovolemic shock

c. Management
(1) ABCs
(2) High flow, high concentration oxygen
(3) Place the infant at the mother's breast if just delivered
(4) Provide uterine massage
(5) Consider 2 large-bore IVs for volume replacement
(6) Administer oxytocin per physician's order
(a) Indications
i) To stimulate immediate postpartum contraction of the uterus and to control postpartum uterine bleeding, especially if uterine massage is ineffective or the patient is in shock
(b) Administration - injectable oxytocin contains 10 USP units (20mg) per milliliter
i) IV dosage
a) Ten to twenty USP units in 1000 ccs crystalloid (normal saline)
b) Flow rate of 100-125 cc/hr., titrated to the severity of hemorrhage and uterine response
ii) IM dosage
a) Ten USP units (1 ml) IM
b) Only if unable to start an IV
(7) Do not attempt to force delivery of the placenta
(8) Do not pack the vagina
(9) Emergent transport of the patient

2. Uterine rupture
a. Incidence
(1) Rare, but serious
(2) Extremely high mortality for mother and fetus
(3) Most common after labor onset
(4) Associated with previous cesarean, operative scar, obstructed labor, fetal abnormalities

(5) Partial or complete

b. Assessment
(1) Severe, sudden, shearing pain during strong contraction
(2) Absent fetal heart tones or movement
(3) Complete rupture - pain subsides
(4) Uterus palpated as hard mass next to fetus
(5) Rapid shock onset
(6) Minimal external bleeding do to concealed bleeding

c. Management
(1) Treat for shock
(2) Emergency transport

3. Uterine inversion
a. Incidence
(1) Infrequent, but serious
(2) 1 in approximately 2100 deliveries
(3) Turning the uterus inside out
(4) Occurs following contraction or with abdominal pressure
(a) Coughing, sneezing
(b) Improper fundal massage
(5) Occurs as a result of umbilical cord traction
(6) Protrusion of uterine fundus beyond cervix

b. Assessment
(1) Profuse postpartum bleeding
(2) Severe, sudden lower abdominal pain

c. Management
(1) Oxygenation, ventilation, circulatory support
(2) Emergency transport
(3) Do not attempt to deliver placenta
(4) Cover protruding tissue with moist, sterile dressings
(5) Replace protruding tissue upward into cervix
(a) Discuss with medical direction physician

4. Pulmonary embolism
a. Incidence
(1) Most common cause of maternal death
(2) Result of blood clot in pelvic circulation
(3) More common with cesarean

b. Assessment

(1) Sudden dyspnea
(2) Sharp, localized chest pain

c. Management
(1) Oxygenation, ventilation
(2) Positioning
(3) Cardiac monitoring
(4) Emergency transport

UNIT TERMINAL OBJECTIVE

6-1.1 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for a neonatal patient.

COGNITIVE OBJECTIVES

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

6-1.2 Define the term newborn.(C-1)
6-1.3 Define the term neonate. (C-1)
6-1.4 Identify important antepartum factors that can affect childbirth. (C-1)
6-1.5 Identify important intrapartum factors that can term the newborn high risk. (C-1)
6-1.6 Identify the factors that lead to premature birth and low birth weight newborns. (C-1)
6-1.7 Distinguish between primary and secondary apnea. (C-3)
6-1.8 Discuss pulmonary perfusion and asphyxia. (C-1)
6-1.9 Identify the primary signs utilized for evaluating a newborn during resuscitation. (C-1)
6-1.10 Formulate an appropriate treatment plan for providing initial care to a newborn. (C-3)
6-1.11 Identify the appropriate use of the APGAR score in caring for a newborn.(C-1)
6-1.12 Calculate the APGAR score given various newborn situations. (C-3)
6-1.13 Determine when ventilatory assistance is appropriate for a newborn. (C-1)
6-1.14 Prepare appropriate ventilation equipment, adjuncts and technique for a newborn. (C-1)
6-1.15 Determine when chest compressions are appropriate for a newborn. (C-1)
6-1.16 Discuss appropriate chest compression techniques for a newborn. (C-1)
6-1.17 Assess patient improvement due to chest compressions and ventilations. (C-1)
6-1.18 Determine when endotracheal intubation is appropriate for a newborn. (C-1)
6-1.19 Discuss appropriate endotracheal intubation techniques for a newborn. (C-1)
6-1.20 Assess patient improvement due to endotracheal intubation. (C-1)
6-1.21 Identify complications related to endotracheal intubation for a newborn. (C-1)
6-1.22 Determine when vascular access is indicated for a newborn. (C-1)
6-1.23 Discuss the routes of medication administration for a newborn. (C-1)
6-1.24 Determine when blow-by oxygen delivery is appropriate for a newborn. (C-1)
6-1.25 Discuss appropriate blow-by oxygen delivery devices and technique for a newborn. (C-1)
6-1.26 Assess patient improvement due to assisted ventilations. (C-1)
6-1.27 Determine when an orogastric tube should be inserted during positive-pressure ventilation. (C-1)
6-1.28 Discuss the signs of hypovolemia in a newborn. (C-1)
6-1.29 Discuss the initial steps in resuscitation of a newborn. (C-1)
6-1.30 Assess patient improvement due to blow-by oxygen delivery. (C-1)
6-1.31 Discuss the effects maternal narcotic usage has on the newborn. (C-1)
6-1.32 Determine the appropriate treatment for the newborn with narcotic depression. (C-1)
6-1.33 Discuss appropriate transport guidelines for a newborn. (C-1)
6-1.34 Determine appropriate receiving facilities for low and high risk newborns. (C-1)
6-1.35 Describe the epidemiology, including the incidence, morbidity/ mortality, risk factors and prevention strategies for meconium aspiration. (C-1)
6-1.36 Discuss the pathophysiology of meconium aspiration. (C-1)
6-1.37 Discuss the assessment findings associated with meconium aspiration. (C-1)
6-1.38 Discuss the management/ treatment plan for meconium aspiration. (C-1)
6-1.39 Describe the epidemiology, including the incidence, morbidity/ mortality, risk factors and prevention strategies for apnea in the neonate. (C-1)
6-1.40 Discuss the pathophysiology of apnea in the neonate. (C-1)

6-1.41 Discuss the assessment findings associated with apnea in the neonate. (C-1)
6-1.42 Discuss the management/ treatment plan for apnea in the neonate. (C-1)
6-1.43 Describe the epidemiology, pathophysiology, assessment findings, management/ treatment plan for diaphragmatic hernia. (C-1)
6-1.44 Describe the epidemiology, including the incidence, morbidity/ mortality and risk factors for bradycardia in the neonate. (C-1)
6-1.45 Discuss the pathophysiology of bradycardia in the neonate. (C-1)
6-1.46 Discuss the assessment findings associated with bradycardia in the neonate. (C-1)
6-1.47 Discuss the management/ treatment plan for bradycardia in the neonate. (C-1)
6-1.48 Describe the epidemiology, including the incidence, morbidity/ mortality and risk factors for premature infants
6-1.49 Discuss the pathophysiology of premature infants. (C-1)
6-1.50 Discuss the assessment findings associated with premature infants. (C-1)
6-1.51 Discuss the management/ treatment plan for premature infants. (C-1)
6-1.52 Describe the epidemiology, including the incidence, morbidity/ mortality and risk factors for respiratory distress/ cyanosis in the neonate. (C-1)
6-1.53 Discuss the pathophysiology of respiratory distress/ cyanosis in the neonate. (C-1)
6-1.54 Discuss the assessment findings associated with respiratory distress/ cyanosis in the neonate. (C-1)
6-1.55 Discuss the management/ treatment plan for respiratory distress/ cyanosis in the neonate.(C-1)
6-1.56 Describe the epidemiology, including the incidence, morbidity/ mortality and risk factors for seizures in the neonate. (C-1)
6-1.57 Discuss the pathophysiology of seizures in the neonate. (C-1)
6-1.58 Discuss the assessment findings associated with seizures in the neonate. (C-1)
6-1.59 Discuss the management/ treatment plan for seizures in the neonate. (C-1)
6-1.60 Describe the epidemiology, including the incidence, morbidity/ mortality and risk factors for fever in the neonate. (C-1)
6-1.61 Discuss the pathophysiology of fever in the neonate. (C-1)
6-1.62 Discuss the assessment findings associated with fever in the neonate. (C-1)
6-1.63 Discuss the management/ treatment plan for fever in the neonate. (C-1)
6-1.64 Describe the epidemiology, including the incidence, morbidity/ mortality and risk factors for hypothermia in the neonate. (C-1)
6-1.65 Discuss the pathophysiology of hypothermia in the neonate. (C-1)
6-1.66 Discuss the assessment findings associated with hypothermia in the neonate. (C-1)
6-1.67 Discuss the management/ treatment plan for hypothermia in the neonate. (C-1)
6-1.68 Describe the epidemiology, including the incidence, morbidity/ mortality and risk factors for hypoglycemia in the neonate. (C-1)
6-1.69 Discuss the pathophysiology of hypoglycemia in the neonate. (C-1)
6-1.70 Discuss the assessment findings associated with hypoglycemia in the neonate. (C-1)
6-1.71 Discuss the management/ treatment plan for hypoglycemia in the neonate. (C-1)
6-1.72 Describe the epidemiology, including the incidence, morbidity/ mortality and risk factors for vomiting in the neonate (C-1)
6-1.73 Discuss the pathophysiology of vomiting in the neonate. (C-1)
6-1.74 Discuss the assessment findings associated with vomiting in the neonate. (C-1)
6-1.75 Discuss the management/ treatment plan for vomiting in the neonate. (C-1)
6-1.76 Describe the epidemiology, including the incidence, morbidity/ mortality and risk factors for diarrhea in the neonate. (C-1)
6-1.77 Discuss the pathophysiology of in diarrhea the neonate. (C-1)
6-1.78 Discuss the assessment findings associated with diarrhea in the neonate. (C-1)

6-1.79 Discuss the management/ treatment plan for diarrhea in the neonate. (C-1)
6-1.80 Describe the epidemiology, including the incidence, morbidity/ mortality and risk factors for common birth injuries in the neonate. (C-1)
6-1.81 Discuss the pathophysiology of common birth injuries in the neonate. (C-1)
6-1.82 Discuss the assessment findings associated with common birth injuries in the neonate. (C-1)
6-1.83 Discuss the management/ treatment plan for common birth injuries in the neonate. (C-1)
6-1.84 Describe the epidemiology, including the incidence, morbidity/ mortality and risk factors for cardiac arrest in the neonate. (C-1)
6-1.85 Discuss the pathophysiology of cardiac arrest in the neonate. (C-1)
6-1.86 Discuss the assessment findings associated with cardiac arrest in the neonate. (C-1)
6-1.87 Discuss the management/ treatment plan for cardiac arrest in the neonate. (C-1)
6-1.88 Discuss the pathophysiology of post arrest management of the neonate. (C-1)
6-1.89 Discuss the assessment findings associated with post arrest situations in the neonate. (C-1)
6-1.90 Discuss the management/ treatment plan to stabilize the post arrest neonate. (C-1)

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

6-1.91 Demonstrate and advocate appropriate interaction with a newborn/ neonate that conveys respect for their position in life. (A-3)
6-1.92 Recognize the emotional impact of newborn/ neonate injuries/ illnesses on parents/ guardians. (A-1)
6-1.93 Recognize and appreciate the physical and emotional difficulties associated with separation of the parent/ guardian and a newborn/ neonate. (A-3)
6-1.94 Listen to the concerns expressed by parents/ guardians. (A-1)
6-1.95 Attend to the need for reassurance, empathy and compassion for the parent/ guardian. (A-1)

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

6-1.96 Demonstrate preparation of a newborn resuscitation area. (P-2)
6-1.97 Demonstrate appropriate assessment technique for examining a newborn. (P-2)
6-1.98 Demonstrate appropriate assisted ventilations for a newborn. (P-2)
6-1.99 Demonstrate appropriate endotracheal intubation technique for a newborn. (P-2)
6-1.100 Demonstrate appropriate meconium aspiration suctioning technique for a newborn. (P-2)
6-1.101 Demonstrate appropriate insertion of an orogastric tube. (P-2)
6-1.102 Demonstrate needle chest decompression for a newborn or neonate. (P-2)
6-1.103 Demonstrate appropriate chest compression and ventilation technique for a newborn. (P-2)
6-1.104 Demonstrate appropriate techniques to improve or eliminate endotracheal intubation complications. (P-2)
6-1.105 Demonstrate vascular access cannulation techniques for a newborn. (P-2)
6-1.106 Demonstrate the initial steps in resuscitation of a newborn. (P-2)
6-1.107 Demonstrate blow-by oxygen delivery for a newborn. (P-2)

DECLARATIVE

I. Introduction
- A. Newborn
  - 1. A recently born infant; usually considered the first few hours of life
- B. Neonate
  - 1. Considered the first 28 days of life

II. General pathophysiology, assessment and management
- A. Epidemiology
  - 1. Incidence
    - a. Approximately 6% of deliveries require life support
    - b. Incidence of complications increases as birth weight decreases
  - 2. Morbidity/ mortality
    - a. Neonatal mortality risk can be determined via graphs based on birth weight and gestational age
    - b. Resuscitation is required for about 80% of the 30,000 babies who weigh less than 1500 grams at birth
  - 3. Risk factors
    - a. Antepartum factors
      - (1) Multiple gestation
      - (2) Inadequate prenatal care
      - (3) Mother's age <16 or >35
      - (4) History of perinatal morbidity or mortality
      - (5) Post-term gestation
      - (6) Drugs/ medications
      - (7) Toxemia, hypertension, diabetes
    - b. Intrapartum factors
      - (1) Premature labor
      - (2) Meconium-stained amniotic fluid
      - (3) Rupture of membranes greater than 24 hours prior to delivery
      - (4) Use of narcotics within four hours of delivery
      - (5) Abnormal presentation
      - (6) Prolonged labor or precipitous delivery
      - (7) Prolapsed cord
      - (8) Bleeding
  - 4. Treatment strategies
    - a. Preparation of resuscitation equipment
    - b. Determine appropriate destination
- B. Pathophysiology
  - 1. Transition from fetal to neonatal circulation
  - 2. Respiratory system must suddenly initiate and maintain oxygenation
  - 3. Infants are very sensitive to hypoxia
  - 4. Permanent brain damage will occur with hypoxemia
  - 5. Apnea in newborns
  - 6. Congenital anomalies
    - a. Diaphragmatic hernia
    - b. Choanal atresia