Chapter 26 Infectious Diseases

Unit Summary

Upon completion of this chapter and related course assignments, students will be able to define communicable disease and understand how they are transmitted. They will be able to identify agencies responsible for protecting the public health and discuss the paramedic’s obligation to protect the public including what steps they can take in order to meet it. Students will understand the standard precautions necessary for all patients as well as what additional precautions may be needed depending on the communicable disease present and how it is transmitted. They will be able to discuss the epidemiology, pathophysiology, psychosocial impact, presentations, prognosis, and management of various communicable diseases. Students will be able to discuss principles of assessment and management of these diseases as well as any age-related variations that may affect patients with communicable or other infectious diseases. Students will understand how to properly follow up after exposure to a patient’s blood or body fluids including the documentation required for reporting. Students will be able to demonstrate how to clean and disinfect the ambulance and equipment following transport of a patient with an infectious or communicable disease.

National EMS Education Standard Competencies

**Medicine**

Integrates assessment findings with principles of epidemiology and pathophysiology to formulate a field impression and implement a comprehensive treatment/disposition plan for a patient with a medical complaint.

***Infectious Diseases***

Awareness, assessment, and management of

• A patient who may have an infectious disease ( pp 1288-1289, 1295-1296)

• How to decontaminate equipment after treating a patient (p 1289)

Assessment and management of

• How to decontaminate the ambulance and equipment after treating a patient (p 1289)

• A patient who may be infected with a blood-borne pathogen (pp 1290, 1292)

- Human immunodeficiency virus (HIV) (pp 1305-1306)

- Hepatitis B (pp 1304-1305)

• Antibiotic-resistant infections (pp 1311-1313)

• Current infectious diseases prevalent in the community (pp 1288-1290, 1296)

Anatomy, physiology, epidemiology, pathophysiology, psychosocial impact, presentations, prognosis, and management of

• HIV-related disease (pp 1305-1307)

• Hepatitis (pp 1303-1305, 1308)

• Pneumonia (pp 1298-1299)

• Meningococcal meningitis (p 1297)

• Tuberculosis (pp 1297-1298)

• Tetanus (p 1311)

• Viral diseases (pp 1307-1309)

• Sexually transmitted diseases (pp 1301-1303)

• Gastroenteritis (p 1307)

• Fungal infections (p 1296)

• Rabies (p 1310)

• Scabies and lice (p 1303)

• Lyme disease (p 1309)

• Rocky Mountain spotted fever (pp 1309-1310)

• Antibiotic-resistant infections (pp 1311-1313)

Knowledge Objectives

1. Define communicable disease. (p 1288)
2. Name the agencies responsible for protecting the public health in the United States, and outline their functions at the national, state, and local levels. (pp 1288-1289)
3. Describe the paramedic’s obligation to protect the public from infection and what steps the paramedic can take in order to meet it. (p 1289)
4. Describe how communicable diseases are transmitted by direct and indirect contact, droplet transmission, and airborne transmission. (pp 1289-1290)
5. List the personal protective equipment a paramedic may need in specific circumstances to prevent exposure to communicable and other infectious diseases. (pp 1290-1292)
6. Describe the steps to take for personal protection from airborne and blood-borne pathogens. (pp 1290-1292)
7. Explain proper follow-up after exposure to a patient’s blood or body fluids, including documentation of the event and communication with an infection control officer and public health authorities. (pp 1292-1293)
8. Understand the standard precautions the paramedic must follow in order to prevent infection during patient care activities. (p 1294)
9. List the general assessment and management principles for a patient with an infectious disease. (pp 1295-1296)
10. Describe the cycle of infection, and list factors that affect susceptibility to infectious disease. (pp 1295-1296)
11. Discuss the pathophysiology, assessment, and management of a patient with meningitis. (p 1297)
12. Discuss the pathophysiology, assessment, and management of a patient with tuberculosis. (pp 1297-1298)
13. Discuss precautions paramedics should take to protect themselves from exposure to tuberculosis. (pp 1297-1298)
14. Compare the types of pneumonia caused by viruses, bacteria, and fungi in terms of their pathophysiology, risk factors, and complications. (pp 1298-1299)
15. Discuss general principles of assessment and management for a patient with pneumonia. (pp 1298-1299)
16. Discuss the pathophysiology, assessment, and management of a patient with respiratory syncytial virus. (p 1299)
17. Discuss the pathophysiology, assessment, and management of patients with bronchitis, laryngitis, and epiglottitis. (pp 1299-1300)
18. Discuss the pathophysiology, assessment, and management of a patient with mononucleosis. (p 1300)
19. Discuss the pathophysiology, assessment, and management of a patient with influenza. (pp 1300-1301)
20. Discuss general principles of assessment and management for a patient with a sexually transmitted disease. (pp 1301-1303)
21. Discuss the pathophysiology, assessment, and management of patients with gonorrhea, syphilis, genital herpes, and chlamydia. (pp 1301-1303)
22. Describe the risk factors, incidence, pathophysiology, assessment, and management of scabies and lice infestation. (p 1303)
23. Compare the types of viral hepatitis, and outline general assessment findings and management principles for the patient with hepatitis. (pp 1303-1305)
24. Discuss precautions paramedics should take to protect themselves from exposure to hepatitis, and describe postexposure follow-up. (pp 1303-1305)
25. Discuss the pathophysiology, assessment, and management of a patient with human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS). (pp 1305-1307)
26. Discuss precautions paramedics should take to protect themselves from exposure to HIV, and describe postexposure follow-up. (pp 1305-1307)
27. Discuss the pathophysiology, assessment, and management of a patient with gastroenteritis. (p 1307)
28. Discuss general principles of assessment and management for a patient with a fungal infection. (p 1296)
29. Discuss the pathophysiology, assessment, and management of patients with West Nile virus, Lyme disease, Rocky Mountain spotted fever, hantavirus, rabies, and tetanus. (pp 1308-1311)
30. Compare the most common antibiotic-resistant organisms, and explain what steps paramedics and patients can take to curb their spread. (pp 1311-1313)
31. Discuss the pathophysiology, assessment, and management of bronchiolitis, croup, measles, rubella, mumps, and chickenpox. (pp 1313-1316)
32. Discuss general principles of assessment and management for patients with severe acute respiratory syndrome (SARS) and avian flu. (p 1317)
33. Describe age-related variations that affect patients with communicable and other infectious diseases. (pp 1297, 1300, 1306, 1311, 1315-1317)

Skills Objectives

1. Clean and disinfect the ambulance interior and equipment. (p 1289)

Readings and Preparation

• Review all instructional materials including Chapter 26 of *Nancy Caroline’s Emergency Care in the Streets*, Seventh Edition, and all related presentation support materials.

• Review local protocols for treatment and transport of the patient with a known infectious or communicable disease.

• Obtain reporting requirements for any infectious or communicable diseases as required by the Centers for Disease Control and Prevention (CDC), state public health agencies, and local public health departments.

• Visit the CDC website to identify evidence-based research articles relevant to common infectious diseases and current outbreaks, treatment, and prevention. This may include the current year’s anticipated flu strains and vaccines.

• Contact clinical sites for reporting requirements expected of students when completing rotations in their facilities. If not previously done, it may be a good time to determine what current vaccines are recommended for health care providers to encourage students to verify or become current with their own immunizations.

• Research your state’s public health website for guidelines for pandemic planning. Incorporate the role of EMS as students consider the epidemiological predictions and prevalence of various infectious diseases.

• Review the article, “Infectious Diseases: Annual, Recurrent, and Emerging” by S. R. Snyder, D. A. Vitberg, & K. T. Collopy (Feb. 1, 2011) found online at: http://www.emsworld.com/article/10318978/infectious-diseases-annual-recurrent-and-emerging.

Support Materials

• Lecture PowerPoint presentation

• Case Study PowerPoint presentation

• Download fact sheets or direct students to the CDC website for various infectious or communicable diseases, http://www.cdc.gov/niosh/topics/diseases.html

• Download current vaccine schedule recommendations from the CDC website at http://www.cdc.gov/vaccines/recs/schedules/. Compare these to your state’s requirements under public health. Students should be familiar with these for use with assessment of the patient with signs/symptoms of potential infectious or communicable diseases specific to their age group.

• Obtain copies of local reporting forms for exposures and recommendations or postexposure protocols for the EMS professional.

Enhancements

• Direct students to visit the companion website to *Nancy Caroline’s Emergency Care in the Streets*, Seventh Edition, at http://www.paramedic.emszone.com for online activities.

• Contact the local health department to identify the common infectious or communicable diseases seen in your community. Identify an infectious disease nurse to be a guest speaker for the class.

• Contact local support groups for prevalent infectious or communicable diseases to learn how EMS can assist in providing psychosocial support for these patients. Identify a social worker or expert who may be willing to be a guest speaker for the class.

• **Content connections:** The presence of sexually transmitted infectious diseases can complicate pregnancy and childbirth and increase the risk of transmission to the fetus or infant as well as cause an increase in the risk of stillbirth. Emphasize the importance of this during assessment of the potentially pregnant or pregnant patient. Children who are not current on immunizations may be susceptible to infectious diseases and can transmit these to the provider. Encourage the students to be familiar with vaccine recommendations for the various age groups and to ask when assessing the pediatric patient whether the child is current on vaccines. History of some infectious or communicable diseases can result in cardiovascular or other system abnormalities/damage. Consider this when patients indicate a history of these diseases. Remind students to be familiar with pharmacological agents used to treat patients with communicable or infectious diseases in case patients are not forthcoming with preexisting diseases. This can alert the paramedic to the need to employ additional personal protective equipment specific to the disease. With the increase in travel and exposure to populations abroad, the student should be reminded to consider this when assessing the patient presenting with signs/symptoms of infectious or communicable diseases even if they are not common in the United States. Students should be encouraged to ask about recent travel or exposure risks.

• **Cultural considerations:** Vaccine compliance in other countries is not the same as it is in the United States. Encourage students to ask about recent travel outside of the United States and vaccine compliance in immigrant or foreign populations. Students should be reminded not to be insensitive and to avoid bias while obtaining this information. Many immigrants are fearful of being reported and may conceal their status. Paramedics should consider diseases prevalent in these societies or countries when assessing the patient with presentations consistent with infectious diseases not normally seen in the United States. Populations of individuals such as those in prisons, mental health facilities, college dormatories, nursing homes, day care centers, and other group living situations may be at greater risk due to proximity and ease of spread of disease. Consider potential implications when assessing these patients.

Teaching Tips

Emphasize the importance of protecting yourself and reducing risk of exposure by encouraging students to wear appropriate personal protective equipment for all patient encounters.

Discuss the implications of disease transmission to students’ family members, co-workers, and friends if an exposure occurs and there is not appropriate reporting and postexposure follow-up.

Explain and share local reporting protocols and forms to familiarize students with what is expected should an exposure occur.

Provide common disinfectants and bacteriocides used to clean and disinfect the ambulance and its equipment to familiarize students with proper methods for decontamination.

Remind students that patients of any age may contract infectious or communicable diseases regardless of vaccine status. Advise them not to rule out the presence of an infectious or communicable disease if signs/symptoms are consistent due to decreased immunity or failed immunity following vaccine administration.

Incorporate CDC and OSHA guidelines where appropriate as each disease is covered throughout the chapter.

Unit Activities

**Writing activities:** Assign each student an infectious or communicable disease. Have them research the disease, identify areas where the disease is prevalent, identify vaccines available to prevent the disease, explain the proper infection control precautions when treating patients with this disease, common treatment for the disease, and long-term effects or mortality associated with the disease.

**Student presentations:** Have students provide a presentation of their research done during the writing activity. Alternate assignment: Have students present on historical and geographical epidemiology or prevalence and outcomes for an assigned infectious or communicable disease.

**Group activities:** Designate groups of three to four students and have them identify the proper protective precautions for a specific mode of disease transmission. Have them wear the attire and allow the other students to identify the mode they are seeking to protect against as well as what infectious or communicable diseases it would apply to.

**Visual thinking:** Obtain pictures of patients with various infectious or communicable diseases. Project these images, have students identify the signs/symptoms present, and then identify the disease. Alternate assignment: Display posters of various countries around the room. Have students list diseases prevalent in the areas on the posters to encourage familiarity with potential exposure locations.

**Medical terminology:** Develop or identify interactive games or puzzles that allow students to practice spelling and terminology recognition for the various diseases, diagnostic tests, vaccines, and treatments. Alternate: Have students develop cards with various diseases on one side and the causative agent for the disease on the other. Using the matching game format, have them practice pairing or matching these correctly as they are turned over.

Pre-Lecture

### You are the Medic

“You are the Medic” is a progressive case study that encourages critical-thinking skills.

### Instructor Directions

Direct students to read the “You are the Medic” scenario found throughout Chapter 26.

• You may want to assign students to a partner or a group. Direct them to review the discussion questions at the end of the scenario and prepare a response to each question. Facilitate a class dialogue centered on the discussion questions and the Patient Care Report.

• You may also use this as an individual activity and ask students to turn in their comments on a separate piece of paper.

Lecture

I. Introduction

A. A communicable disease is an infectious disease that can be passed from one person to another.

1. If a paramedic does not understand how communicable diseases are transmitted, then he or she may be hesitant to care for some patients.

II. Protecting Public Health

A. Responsibilities of public health agencies

1. National agencies and laws

a. Occupational Health and Safety Administration (OSHA)

i. Spreads rules and regulations designed to protect the employees of public and private organizations

ii. The Bloodborne Pathogen Standard (CFR 1910.1030)

b. Centers for Disease Control and Prevention (CDC)

i. Collects and assembles data on the numbers of patients infected and research and guidance for health care providers and the general public

c. Ryan White Comprehensive AIDS Resources Emergency (CARE) Act

i. Requires that medical facilities notify emergency response personnel of airborne- and droplet-transmitted disease involving patients they transported

(a) Notification must happen as soon as possible, and no longer than 48 hours from the time they have a “suspect” case.

ii. Diseases included:

(a) HIV

(b) Hepatitis B

(c) Tuberculosis

(d) Meningococcal disease

(e) Diphtheria

(f) Pneumonic plague

(g) Viral hemorrhagic fevers

(h) Rabies

(i) Hepatitis C

(j) Measles

(k) Rubella

(l) SARS-CoV

(m) Pertussis

(n) Cutaneous anthrax

(o) Chickenpox

(p) Mumps

(q) Vaccinia

(r) Novel influenza A viruses

(s) Potentially life-threatening diseases caused by biologic agents

(t) Hepatitis C

2. State and local public health departments

a. Bear the responsibility for protection of the public from disease, prevention of epidemics, and management of outbreaks

b. Responsible for many activities related to infectious diseases

i. Collecting data on the incidence of diseases

ii. Performing contact follow-up

iii. Running TB and immunization clinics

3. Public health departments monitor reportable disease weekly, monthly, and annually.

a. Endemic: Incidence of cases of a specific disease in a particular geographic area remains steady over time

b. Epidemic: May be indicated by a rising case load

c. Pandemic: When a disease infects large numbers of people and spreads all over the world

4. Public health department collects all disease statistics.

a. Shares data with the state health department

b. State health departments share data with the CDC.

B. Responsibilities of paramedics

1. Obligation to protect patients from health care-associated infections

a. Comply with work restriction guidelines

b. Keep the ambulance interior and equipment clean and disinfected.

i. Critical equipment

(a) Items that come in contact with mucous membranes

(1) Laryngoscope blades

(2) Endotracheal tubes

(3) Combitubes

(b) High-level disinfection—use of EPA-registered chemical “sterilants”

ii. Semicritical equipment

(a) Items that come in direct contact with intact skin

(1) Stethoscopes

(2) Blood pressure cuffs

(3) Splints

(4) Uniforms

(5) Personal protection equipment

(6) Pneumatic antishock garments

(b) Clean with solutions that have a label claiming to kill hepatitis B virus.

(c) Bleach and water at a 1:100 dilution

iii. Noncritical equipment

(a) Cleaning surfaces, floors, ambulance seats, and work surfaces

(b) Mixture of EPA-registered hospital-grade cleaner or bleach and water

2. General cleaning routines need to be listed in the department’s exposure control plan.

a. Strip used linens from the stretcher immediately after use and place in a designated bag or receptacle.

b. Appropriately discard all disposable equipment that meets your state’s definition of medical waste.

c. Wash contaminated areas with soap and water.

d. Disinfect all nondisposable equipment used in the care of the patient.

e. Clean the stretcher with an EPA-registered germicidal-virucidal solution or bleach and water at a 1:100 dilution.

f. If any spillage or contamination occurred in the ambulance, clean it with the same germicidal-virucidal or bleach-water solution.

g. Create a schedule for routine cleaning for the vehicle, and named the brands of solution to be used.

h. Have a written policy and procedure for cleaning each piece of equipment.

III. Protecting Health Care Providers

A. Communicable disease transmission

1. Diseases that can be transmitted from one person to another under certain conditions

a. Depend on:

i. Dose

ii. Virulence

iii. Mode of entry

iv. Health status of the host

2. Infectious diseases are caused by pathogenic microorganisms.

a. Bacteria

b. Viruses

c. Fungi

d. Parasites

3. Spread from person to person by several mechanisms:

a. Contact transmission

i. Direct contact with an infected person which may include:

(a) Puncture by a contaminated needle or other sharp instrument

(b) Transfusion of contaminated blood products from one patient to another

(1) Screening procedures have reduced the risk, but donated blood is not 100% safe from blood-borne pathogens.

ii. Indirect contact occurs by:

(a) Touching or handling an infected object

(b) Coming into contact with a person who is contaminated with pathogens from an infected person or his or her secretions

(1) Fomites: Objects that harbor microorganisms and can transmit them to others

b. Droplet transmission

i. Occurs with inhalation of infected droplets

ii. Droplets fall after traveling about 3 to 6 feet.

c. Airborne transmission

i. Pathogens are carried in microscopic particles that become aerosolized when an infected person coughs, sneezes, or exhales.

(a) These particles can remain suspended in the air for long periods of time and can drift to new locations.

4. Vector: An organism that harbors pathogens that are harmless to the organism but cause disease when transmitted to a human host

a. Example: A mosquito infected with West Nile virus

B. Personal protective equipment and practices

1. The selection and use of PPE depends on the task at hand.

a. Your department’s exposure control plan and respiratory protection plan should contain a listing of its risk procedures and the recommended use of PPE.

b. The CDC has developed guidelines for PPE.

2. Hand hygiene is the primary protective measure.

a. Use antimicrobial, alcohol-based foams or gels for handwashing.

i. Use of antibacterial products is not recommended.

b. Health care providers who have open cuts or sores on their hands should cover the area with a dressing.

i. If the area is too large to cover, the provider should not perform high-risk tasks.

c. Health care providers caring for high-risk patients are not permitted to wear artificial nails or nail extensions.

i. Studies document the transmission of bacterial and fungal infections from health care workers wearing these nails.

3. PPE should include, but not be limited to:

a. Disposable gloves

b. Protective eyewear

c. Gowns

d. Surgical masks

e. N95 respirators (P100 respirators required in California under certain circumstances)

f. Waterless handwashing alcohol-based foam or gel

g. Needle-safe or needleless devices

h. Biohazard bags

i. Resuscitative equipment

4. Particulate respirator

a. Filters particles that come in through the mask

b. Never place one on a patient.

c. If N95 or P100 respirators are on an EMS vehicle, a full respiratory protection program must be in place.

5. Gloves

a. Recommended for:

i. Starting IVs

ii. Suctioning

iii. Intubation

iv. Contact with blood or other potentially infectious materials (OPIM)

v. Contact with mucous membranes or nonintact skin

b. Utility-style gloves are required for cleaning activities.

c. Hands should be washed after removal.

6. Protective eyewear

a. Blocks splatter into the eye

b. Prescription glasses may be worn with side shields.

i. Goggles should not be worn over glasses.

7. Cover garments

a. Recommended for large-splash situations

b. Should be washable or disposable

c. Pocket masks and/or respiratory devices must be available.

8. Needlestick Safety and Prevention Act

a. Passed by Congress in 2000

b. Requires all sharps be needle-safe or needleless systems

c. Sharps must be placed into sharps containers that are puncture-resistant, closeable, leak-proof, and contain the biohazard symbol.

C. Postexposure medical follow-up

1. Third line of defense against the effects of communicable diseases

2. Following exposure, the designated infection control officer (DICO) will ensure that you receive proper treatment.

3. Exposure to blood-borne pathogens can occur in a number of different ways, including:

a. Contaminated needlestick injury

b. Blood or other potentially infected material (OPIM) splattered into the eye, nose, or mouth

c. Blood or OPIM in contact with an open area of the skin

d. Cuts with a sharp object covered with blood or OPIM

e. Human bites involving blood exposure

4. For airborne- and/or droplet-transmissible disease, the DICO will review:

a. The organism involved

b. The amount of time spent with the patient

c. The provider’s distance from the patient

d. The procedure or task being performed

e. The ventilation present

5. Postexposure medical management begins with the source individual.

a. Employers must pay for all costs related to exposure events, including testing the source individual.

b. Blood work for the source patient should include rapid testing for:

i. HIV virus

ii. HBV antigen

iii. HCV antibody

iv. Syphilis (if the HIV or HCV test is positive)

c. The testing facility must release the source patient’s test results to the DICO.

i. Required by the Ryan White Comprehensive AIDS Resources Emergency (CARE) Act

ii. Not considered a violation of HIPAA

iii. Facilities are also required to notify the DICO if a patient is transported who is suspected of having or known to have TB or meningitis.

d. Information is shared with the exposed employee.

i. Proper care and counseling should begin within 24-48 hours.

(a) Unless testing yields information that necessitates more rapid follow-up

6. Designated infection control officer (DICO)

a. Required for every emergency response agency

b. Charged with ensuring that proper postexposure medical treatment and counseling are provided

i. Reduces the chances that an exposed provider will contract disease to which exposed

ii. Should begin within 24 to 48 hours following exposure

c. Responsibilities include:

i. Tracking and monitoring compliance with the correct time frames

ii. Serving as a liaison between the exposed employee and the medical facility

iii. Ensuring that confidentiality is maintained

iv. Ensuring that documentation adheres to guidelines

d. Communication network for exposure reporting involves three people:

i. The exposed paramedic

ii. The DICO

iii. The treating physician

e. The public health department acts as a backup for exposure notification and determination of the need for medical follow-up treatment.

i. Director serves as a liaison for problems that arise regarding exposure notification and sharing

7. Standard precautions

a. Infection control practices that reduce the opportunity for an exposure to occur in the daily care of patients

b. Replaces the terms “universal precautions” and “body substance isolation (BSI)”

c. Apply to all body substances except sweat

8. CDC-recommended immunizations and vaccinations

a. Vaccines: Suspensions of whole or fractionated bacteria or viruses that have been rendered nonpathogenic

i. Bring about immunity by causing the immune system to produce antibodies

ii. Keeping current with recommended vaccinations boosts host resistance and the immune response.

b. In 1997, the CDC published an immunization schedule for health care providers.

i. Employers must offer and pay for the recommended vaccinations to staff.

(a) Paramedics have the right to decline, but they must sign a declination form.

c. Employees and volunteers must obtain their vaccination records by directly requesting them from one of the following:

i. Personal physician

ii. High school

iii. College

iv. Training program

v. Previous employer

9. Department responsibilities

a. Each EMS department is required to have a comprehensive exposure control plan.

i. Document that lays out how the department plans to reduce the risk of exposure to infectious agents and provide postexposure medical follow-up if needed

ii. Key elements include:

(a) Proper education and training related to blood-borne pathogens and TB

(b) Establishment of postexposure medical follow-up procedures

(c) Compliance monitoring

(1) Spot checks to ensure that staff follows the plan

(d) Work restriction guidelines

(1) Indicate when employees with various illnesses may or may not be at work

(2) Requires employees to use sick time unless the illness results from occupational exposure

b. Contaminated versus infected

i. Contaminated: An object that has microorganisms on or in it

ii. Infected: Microorganisms actually produce an illness in a person

iii. Carriers: Persons who have a disease but have no signs or symptoms and are not ill

(a) Can pass the disease to others through their blood and sexual contact

IV. Patient Assessment

A. Assessment of a patient suspected of having an infectious disease should be approached much like that of any other medical patient.

1. Size up the scene, and take standard precautions.

2. Assess ABCs and mental status, and prioritize treatment.

3. Take the patient’s history.

a. OPQRST

i. Typical complaints include:

(a) Fever

(b) Nausea

(c) Rash

(d) Pleuritic chest pain

(e) Difficulty breathing

b. SAMPLE and baseline vital signs

i. Medications currently taken

ii. Events leading up to problem

iii. Recent travel

4. Proceed to the secondary assessment, including the physical exam.

V. Pathophysiology, Assessment, and Management of Common Infectious Diseases

A. Chain of infection

1. Infection involves a chain of events through which the communicable disease spreads.

a. May be as simple as retracing steps or may take experts years to find a pattern

2. The study of infectious diseases considers population demographics, including:

a. Age distributions

b. Genetic factors

c. Income levels

d. Ethnic groups

e. Workplaces

f. Schools

g. Geographic boundaries

h. Expansion, decline, or movement of the disease

B. Exposure and the risk of infection

1. Several factors determine the risk of contracting an infection following an exposure:

a. Type of organism

i. Include:

(a) Bacteria

(b) Viruses

(c) Fungi

(d) Parasites

ii. Differ in the way they:

(a) Infect the host

(b) Grow and reproduce

(c) Cause illnesses

b. Dose of the organism

c. Virulence of the organism

i. Virulence: Ability to invade and create disease in a host

ii. Includes organism’s ability to survive outside the host

d. Mode of entry

i. If the organism does not enter by the “correct” route, infection cannot occur.

e. Host resistance

i. Ability to fight off infection

ii. Incubation period: The period between exposure to the organism and the first symptoms of illness

iii. Communicable period: The period during which a person can transmit the illness to someone else

iv. Reservoir: Place where organisms may live and multiply

f. Host defense mechanisms

i. Skin provides a protective barrier blocking pathogens’ ability to enter.

ii. Secretions of the skin provide an antibacterial property.

iii. Mucous membranes offer another protective barrier.

(a) Eyes produce tears that dilute and remove foreign substances.

(b) Membranes of the urinary, respiratory, and GI tract trap and remove organisms.

iv. Immune system contains proteins that kill viruses

C. General management principles

1. Focus first on life-threatening conditions identified in the primary assessment.

2. Be empathetic.

3. Place the patient in a position of comfort.

a. Keep the patient warm.

4. Treat for dehydration if indicated.

5. Use standard precautions.

6. Dispose of sharps properly.

7. Follow your agency’s exposure control plan for cleaning reusable equipment.

8. Properly discard any disposable supplies and linens.

D. Meningitis

1. An inflammation of the membranes that cover the brain and spinal cord, called the meninges

a. Bacterial

i. Communicable

ii. Most common organisms:

(a) *Neisseria meningitidis*

(b) *Streptococcus pneumoniae*

(c) *Haemophilus influenzae*

(d) Group B Streptococcus

(e) *Listeria monocytogenes*

b. Viral

i. Not communicable

c. Meningococcal meningitis is the type most often involved in epidemic outbreaks.

i. Caused by *N. meningitidis*

2. Pathophysiology

a. Transmission occurs following:

i. Direct contact with the nasopharyngeal secretions of an infected person

ii. Prolonged contact time of 8 or more hours

b. Incubation period is between 2 and 10 days.

c. Communicable period is variable.

i. Microorganisms generally disappear from the upper respiratory tract within 24 hours after antibiotic treatment begins.

3. Assessment

a. Signs and symptoms include:

i. Sudden-onset fever

ii. Severe headache

iii. Stiff neck

iv. Kernig sign (patient cannot extend leg at knee when the thigh is flexed)

v. Brudzinski sign (passive flexion of the leg on one side causes a similar movement in opposite leg)

vi. Photosensitivity

vii. A pink rash that becomes purple

viii. Changes in mental status

ix. Projectile vomiting

b. Diagnosis is made by Gram stain.

i. CSF is placed on a slide, and crystal violet stain is added.

4. Management

a. Ask the patient to wear a surgical mask or nonrebreathing mask.

i. If not possible, you should wear a surgical mask.

b. Use routine standard precautions.

c. Additional treatment will depend on symptoms and may include:

i. Oxygen therapy

ii. Airway management

iii. Ventilation support

iv. IV fluids

v. Medications

vi. Rapid transport to a medical facility

d. Postexposure treatment typically includes ciprofloxacin or rifampin.

i. Not appropriate for:

(a) Persons taking birth control pills

(b) Pregnant patients

e. The meningitis vaccine is not recommended for any health care provider group.

f. Only offer postexposure treatment if an actual exposure has occurred.

E. Tuberculosis

1. An important cause of disability and death in much of the developing world

a. Was once widespread in the United States, but no longer

2. Pathophysiology

a. Not a highly communicable disease

b. Three types exist:

i. Typical—communicable

ii. Atypical—not communicable

iii. Extrapulmonary—not communicable

c. Persons at risk include:

i. Malnourished

ii. Incarcerated persons

iii. Immunocompromised

d. TB infection

i. A person has tested positive for exposure to TB but does not have, and may never develop, active disease.

ii. Do not pose a risk to others

e. TB disease

i. A person has active TB disease verified by laboratory testing and a positive chest radiograph.

f. Multidrug-resistant TB (MDR-TB)

i. Therapies are now available.

ii. The bacterium is resistant to two or more of the first-line drugs used to treat TB.

iii. Occurs in immunocompromised people who have not completed the full course of treatment

g. Extensively drug-resistant TB (XDR-TB)

i. Bacterium is resistant to two of the first-line oral medications and two of the first-line injectable medications.

h. Transmission occurs by large, airborne particles from a person with active untreated disease.

i. Paramedics are not likely to have intense exposure unless mouth-to-mouth ventilation is given to a patient with active untreated TB.

i. Incubation period is 4 to 12 weeks.

j. Disease is communicable only when an active lesion develops in the lungs and bacteria are expelled into the air by coughing.

i. 10% of patients treated are no longer communicable after 2 days.

ii. Virtually all patients are no longer communicable after 14 days of treatment.

k. Early infection can be detected by a tuberculin skin test or the QuantiFERON-TB Gold blood test.

i. All health care workers should be tested at the beginning of employment and periodically based on risk assessment.

l. TB develops in only 10% of persons with a positive TB test.

3. Assessment

a. Signs and symptoms include a persistent cough for more than 3 weeks plus one or more of the following:

i. Night sweats

ii. Headache

iii. Fever

iv. Fatigue

v. Weight loss

vi. Hemoptysis

vii. Hoarseness

viii. Chest pain

4. Management

a. Place a surgical mask on a patient suspected of having TB.

i. If the patient cannot be masked, wear a mask yourself.

ii. N95 or HEPA respirators are not needed or required.

b. The patient may require oxygen administration or ventilatory support.

c. Report the incident to your DICO if preventive measures were not taken.

i. A paramedic who suspects exposure should assess the need for baseline testing and be retested in 8 to 10 weeks.

(a) If test is positive, paramedic needs a chest radiograph and a course of antibiotic therapy.

d. Clean the vehicle as usual following transport.

F. Pneumonia

1. Pathophysiology

a. An inflammation of the lungs

b. May be caused by bacteria, viruses, fungi, or other organisms

c. More than 50 types have been identified

d. Most cases are not communicable

i. Cases caused by *Staphylococcus* or *Streptococcus* may be communicable via respiratory secretions.

2. Assessment

a. Those most susceptible to pneumonia include:

i. Older adults

ii. People who smoke heavily

iii. People with alcoholism

iv. People with chronic illnesses

v. People who are immunodepressed

vi. Pediatric patients

b. Signs and symptoms may include:

i. High fever

ii. Chest pain

iii. Productive cough

iv. Respiratory distress

c. Check for diminished breath sounds.

i. Airway management and ventilation support may be indicated.

ii. Oxygen and IV treatment should be administered.

3. Management

a. Antibiotics are used to treat the most common forms of bacterial pneumonia.

b. Some antibiotic-resistant strains pose a serious therapeutic challenge.

c. A mask on the patient or paramedic reduces exposure.

G. Respiratory syncytial virus (RSV)

1. Pathophysiology

a. The leading cause of lower respiratory tract infections in infants, older people, and immunocompromised people

b. Spreads in the hospital environment and in the community

c. Transmission occurs in two ways:

i. Direct contact with large droplets that do not extend more than 3 feet

ii. Indirect contact with contaminated hands or contaminated items

d. Incubation period ranges from 2 to 8 days.

2. Assessment

a. Signs and symptoms include:

i. Sneezing

ii. Runny nose

iii. Nasal congestion

iv. Cough

v. Fever

b. Disease progresses to the lower respiratory tract, leading to:

i. Pneumonia

ii. Bronchiolitis

iii. Tracheobronchitis

c. Hypoxemia and apnea are often seen in infants.

3. Management

a. Prevention relies on proper use of PPE.

i. Wear gloves, and follow with good handwashing.

b. Post-transport cleaning of the vehicle is important.

i. Special cleaning solutions are not required.

c. Postexposure treatment consists of supportive care.

H. Other respiratory conditions

1. Bronchitis

a. Arises when the inner walls of the bronchioles become inflamed, usually due to infection.

b. Symptoms include:

i. Soreness in the chest and throat

ii. Congestion

iii. Wheezing

iv. Dyspnea

v. Slight fever

c. May be caused by:

i. Same virus that causes the common cold and gastric reflux disease

ii. Common pollutants

iii. Smoking or second-hand smoke

d. Chronic bronchitis: Patients cough most days for spans of 3 months or more a year, for 2 or more consecutive years

2. Laryngitis

a. An inflammation of the voice box due to overuse, irritation, or infection

b. Cause is usually viral but can be bacterial

c. Symptoms include:

i. Hoarseness

ii. Weak voice

iii. Sore throat

iv. Dry throat

v. Cough

3. Epiglottitis

a. A life-threatening condition that causes the epiglottis and supraglottic tissues to swell

i. Partially or completely occludes the glottic opening

ii. Most prevalent in 2- to 7-year-olds

b. Symptoms include:

i. Difficulty breathing and swallowing

ii. Stridor

iii. Drooling

iv. Anxiety

v. Cyanosis

vi. Muffled voice

vii. Fever

c. Caused by the Hib bacteria

d. Contagious by the droplet route

4. Common cold

a. Infection of the upper respiratory system

b. Characterized by:

i. Runny nose

ii. Sore throat

iii. Cough

iv. Congestion

v. Watery eyes

vi. No fever

c. Usually lasts about a week

d. Spread by droplets, coughing, hand-to-hand contact, and shared utensils

I. Mononucleosis

1. Pathophysiology

a. Caused by the Epstein-Barr virus (EBV), a herpes virus

i. Grows in the epithelium of the oropharynx and sheds into saliva

b. There are no symptoms in most cases (subclinical).

c. Transmission occurs via direct contact with the saliva of an infected person.

d. Incubation period is 4 to 6 weeks following exposure.

e. Communicable period is prolonged.

2. Assessment

a. Signs and symptoms include:

i. Sore throat

ii. Fever

iii. Secretions from the pharynx

iv. Swollen lymph glands

v. Malaise

vi. Anorexia

vii. Headache

viii. Muscle pain

ix. Enlarged liver and spleen

b. Pharyngeal secretions may persist for 1 year or more after infection.

c. Complications in severe cases may include:

i. Anemia

ii. Dehydration

iii. Spleen rupture

iv. Seizures

v. Pneumonia

3. Management

a. Prevention includes the use of gloves and good handwashing techniques.

b. No special cleaning solutions are required following transport of a patient.

J. Seasonal influenza

1. Flu viruses cause acute respiratory illness generally presenting as winter epidemics.

a. 36,000 people die of seasonal flu in the United States each year.

2. Pathophysiology

a. Droplet-transmitted

i. Hand-to-nose-to-mouth-to-eye

b. Incubation period is 1 to 4 days following exposure.

c. Communicable period lasts from the day before symptoms begin until about 5 days after the onset of the illness.

3. Assessment

a. Signs and symptoms include:

i. Systemic fever

ii. Shaking chills

iii. Headache

iv. Muscle pain

v. Malaise

vi. Loss of appetite

vii. Respiratory symptoms

b. Duration of illness is about 3 to 4 days.

c. Complications may include viral or bacterial pneumonia.

4. Management

a. Prevention involves placing a surgical mask or nonrebreathing mask on the patient.

b. Very few patients require IV fluids or ventilation assistance.

c. Key preventive measure is an annual “flu shot.”

i. Each year a new vaccine is developed based on anticipated strains for that year.

ii. Paramedics who do not take a flu shot must sign a declination form.

d. If you have not been vaccinated and have an exposure, antiviral drugs may be offered within 48 hours to reduce the severity of the flu should you contract it.

VI. Pathophysiology, Assessment, and Management of Sexually Transmitted Diseases

A. Gonorrhea

1. Pathophysiology

a. An infection caused by the gonococcal bacteria, *Neisseria gonorrhoeae*

b. Transmission occurs sexually, by contact with pus-containing fluid from mucous membranes of infected persons.

i. Anyone who engages in unprotected sexual contact is at risk.

c. Incubation period is usually 2 to 7 days but may be longer.

d. Remains communicable for months if not treated

i. Becomes noncommunicable within hours if treated

2. Assessment

a. Signs and symptoms in males:

i. Pus-containing discharge from the urethra

ii. Pain on urination

b. Signs and symptoms in women:

i. Mild inflammation of the urethra or cervix that may not be noticed

ii. May progress to pelvic inflammatory disease

c. Infection may also involve the anus and throat.

3. Management

a. Prevention includes glove use if touching drainage from the genital area.

B. Syphilis

1. Pathophysiology

a. Caused by the spiral-shaped bacterium *Treponema pallidum*

b. Considered to be an acute and a chronic disease

i. Progresses in three stages

c. Incidence has been increasing in the United States for the past several years

i. CDC has published a plan to eliminate this disease in the United States by 2015.

d. Transmission occurs by direct contact with the infectious fluids of the primary lesion(s).

i. Across the placenta from an infected mother to her fetus

ii. By sexual contact

iii. Through blood transfusions

e. Incubation period is 10 days to 3 months.

f. Communicable period is variable.

i. A person is considered noncontagious within 48 hours of treatment with penicillin.

2. Assessment

a. Primary infection produces an ulcerative lesion (chancre) of the skin or mucous membrane at the site of infection.

i. Most commonly located in the genital region.

b. Secondary infection produces skin rash, patchy hair loss, and swollen lymph glands

c. Tertiary stage

i. Complications can include:

(a) Cardiac complications

(b) Ophthalmic complications

(c) Auditory complications

(d) Central nervous system complications

(e) Lesions of the tissues and bone

3. Management

a. Prevention measures include use of gloves and good handwashing techniques.

C. Genital herpes

1. Pathophysiology

a. A chronic, recurrent illness produced by infection with the herpes simplex virus

b. Further classified into two types:

i. Type 1 is generally transmitted via contact with oral secretions.

ii. Type 2 is spread through sexual contact.

c. Type 1 is usually activated from a dormant status by stress and febrile illness.

i. Causes a blisterlike sore, usually on the lips or inside the mouth

d. Use of gloves and good handwashing practices are important.

i. A paramedic with an open cut on the hand or finger who comes in contact with drainage may develop herpetic whitlow (herpes infection of the finger).

e. There is no postexposure treatment for this infection.

2. Assessment

a. Characterized by vesicular lesions

i. In females, lesions may occur initially on the cervix and around the vulva, legs, and buttocks during recurrent infections.

ii. In men, lesions commonly occur on the penis, as well as around the anus.

iii. Lesions may also be present on the mouth as the result of oral sex.

b. Transmission usually occurs through sexual contact.

i. Infants may become infected if delivered through the birth canal of a woman with active disease.

c. Incubation period is 2 to 12 days.

d. Secretion of the virus in saliva has been noted to persist for up to 7 weeks following the appearance of a lesion.

e. Genital lesions are infectious for 4 to 7 days.

f. Can suddenly become reactivated, often repeatedly, over many years.

i. Outbreaks are often stress-related.

3. Management

a. There is no cure.

i. Can be treated with acyclovir, valacyclovir, or famciclovir for 7 to 10 days to reduce outbreaks

b. Preventive measures include the use of gloves and good handwashing techniques.

D. Chlamydia

1. Pathophysiology

a. Have the highest incidence of all STDs

b. Transmission occurs through sexual contact.

i. Perinatal infections may result in premature rupture of membranes, premature birth, or stillbirth.

c. Incubation period is believed to be 7 to 14 days or longer.

d. The communicable period is unknown.

2. Assessment

a. In most women, the infection initially remains asymptomatic.

i. Many women infected with *Chlamydia trachomatis* develop pelvic inflammatory disease.

b. In men, infection may lead to:

i. Epididymitis

ii. Prostatitis

iii. Proctitis

iv. Proctocolitis

c. Signs and symptoms include:

i. Inflammation of the urethra, epididymis, cervix, and fallopian tubes

ii. Gray or white urethral discharge

3. Management

a. Treated with antibiotics

b. Preventive measures include gloves and good handwashing techniques.

E. Scabies

1. Pathophysiology

a. Caused by infection with *Sarcoptes scabiei*

b. Commonly affects:

i. Families

ii. Children

iii. Sexual partners

iv. Chronically ill patients

v. People in group homes

c. Transmission occurs via direct skin-to-skin contact and by sharing undergarments, towels, and linens.

d. Incubation period is 4 to 6 weeks for persons with no prior exposure to the pathogen.

i. A second or subsequent infestation may appear in as little as a few days.

e. Communicable period lasts until the mites and eggs are destroyed by treatment.

2. Assessment

a. Signs and symptoms include:

i. A rash of small, raised red bumps where the mite has burrowed into the skin

ii. Intense itching, especially at night

iii. Sores from scratching the rash

3. Management

a. Prevention consists of wearing gloves and practicing good handwashing techniques.

b. Routine cleaning of vehicle and linens

c. Lindane is a topical treatment for scabies.

i. Should not be used routinely because of reports of toxicity

F. Lice

1. Pathophysiology

a. Small insects that crawl through the hair and feed on blood through the skin

i. Cannot hop or fly

b. Three types:

i. Head louse (*Pediculus humanus capitis*)

ii. Body louse (*Pediculus humanus corporis*)

iii. Pubic louse (*Phthirus pubis*)

c. All types are acquired through direct contact with an infested person.

i. Head and body lice can also be acquired from objects.

d. Lice eggs look like small white or tan dots on the skin.

i. Eggs hatch after about 1 week.

ii. New lice mature in 1 to 2 weeks.

e. When discussing lice as an STD, the focus is on pubic or crab lice.

i. A parasite that is usually grayish

ii. Transmission occurs through intimate physical or sexual contact.

iii. Incubation period lasts approximately 8 to 10 days after the eggs hatch.

iv. The communicable period ends when all lice and eggs are destroyed by treatment.

2. Assessment

a. Signs and symptoms include:

i. Slight to severe itching and irritation

ii. Possibly sores

iii. Nits (eggs) seen clinging to the pubic, perianal, or perineal hair

(a) Can also infest eyelashes, eyebrows, axillae, scalp, and other body hairs

3. Management

a. Preventive measures include wearing gloves and practicing good handwashing techniques.

b. Routine cleaning of the vehicle is sufficient.

c. In cases of exposure, treatment with permethrin cream may be prescribed.

VII. Pathophysiology, Assessment, and Management of Common Blood-Borne Diseases

A. Types of viral hepatitis

1. Viral hepatitis is an inflammation of the liver produced by a virus.

a. Five distinct forms of exist (A, B, C, D, and E)

i. Produced by different viruses

ii. Vary somewhat in their means of transmission

iii. Present with the same signs and symptoms

iv. Hepatitis A and hepatitis E are not blood-borne infections.

B. Hepatitis B virus infection

1. Also known as serum hepatitis

a. Transmitted through:

i. Sexual contact

ii. Blood transfusion

iii. Puncture of the skin with contaminated needles

2. Pathophysiology

a. Needles and occasionally other objects are implicated in transmission.

i. Particularly common among intravenous drug users who share needles

b. Limited data suggest that the HBV can survive outside the body in the medium of dried blood for as long as 7 days.

c. Incubation period varies widely—from 45 to 200 days.

d. Communicable period starts weeks before the first symptoms appear and may persist for years in chronic carriers.

i. An estimated 2% to 10% will become chronic carriers.

e. About 3% to 5% of people infected will develop cirrhosis of the liver or liver cancer.

3. Assessment

a. Signs and symptoms include:

i. Loss of appetite

ii. Nausea and vomiting

iii. General fatigue and malaise

iv. Low-grade fever

v. Vague abdominal discomfort

vi. Aching in the joints

b. Signs and symptoms may disappear for 50% to 60% of those infected.

c. In the second phase, signs and symptoms include:

i. Dark urine

ii. Jaundice (yellowing of the skin)

iii. Scleral icterus (yellowing of the sclera)

d. Usually lasts several weeks

i. Complete recovery may take 3 to 4 months.

4. Management

a. Prevention focuses on using gloves when handling blood, OPIM, or materials containing blood.

i. Good handwashing technique is essential.

b. Paramedics should be immunized against HBV.

i. OSHA requires that employers offer the immunization at no cost to at-risk staff members.

ii. The vaccine is administered in a three-dose series.

c. Practice standard precautions.

d. If you are exposed, notify your DICO.

i. Treatment will depend on titer testing.

ii. Risk of infection is 6% to 30% only if you were not vaccinated and did not report the exposure event.

C. Hepatitis C virus infection

1. The most common chronic blood-borne infection and the leading cause of liver transplantation in the United States

a. Occupational risk is related to:

i. Contaminated deep needlestick with visible blood on the sharp

ii. A sharp that has been in the patient’s vein or artery

iii. A hollow-bore needle

iv. A source patient with a high viral load

2. Pathophysiology

a. Transmission may occur by:

i. Blood-to-blood contact with an open area of the skin

ii. Sexual contact

iii. Blood transfusion

iv. Organ donation

v. Unsafe medical practices

vi. An infected mother to her infant

b. The disease progresses to long-term chronic infection in 75% to 80% of those infected.

c. Incubation period ranges from 2 to 24 weeks.

i. Average of 6-7 weeks

3. Assessment

a. Signs and symptoms are the same as for the HBV infection

i. Phase 2 signs and symptoms do not develop.

b. “Baby boomers” are at risk due to experimenting with drugs during the 60s and 70s.

4. Management

a. Use gloves when in direct contact with blood or OPIM, and use needle-safe or needleless devices.

b. If a paramedic is exposed, testing begins with the source patient.

i. If source is positive, a baseline HCV antibody test and liver function test will be given to the paramedic.

(a) Followed by an HCV-RNA test 2 weeks later

c. Newly diagnosed persons are offered 24 weeks of treatment with a three-drug “cocktail.”

i. This treatment results in a 75% cure rate.

d. A vaccine for prevention is currently in clinical trials in Sweden.

D. Hepatitis D virus infection

1. Requires that the host be infected with hepatitis B for infection to occur

a. HDV is considered a parasite for HBV.

2. Pathophysiology

a. Transmission is generally by percutaneous exposure.

b. Incubation period ranges from 30 to 180 days.

c. Blood is considered to be infectious during all phases of the illness.

3. Assessment

a. Signs and symptoms are the same as those associated with HBV.

4. Management

a. Use gloves when in contact with blood or OPIM.

b. Use needle-safe or needleless devices.

c. Perform routine cleaning of the vehicle following patient transport.

d. Do not go through the pockets of known IV drug users.

e. Testing begins with the source patient.

E. Human immunodeficiency virus (HIV) infection

1. Pathophysiology

a. Transmitted through blood and body fluids

i. Sexual transmission

ii. Blood transfusions

(a) P24 (protein present from the beginning of HIV life cycle) testing can detect virus 1 to 6 days after infection.

iii. Not transmitted through casual or household contact

iv. Not transmitted by airborne or droplet means

b. Pathogen envelops infected cells and attacks the immune system and other body organs.

i. Takes about 7 days

ii. May occur 4 to 6 weeks after exposure

c. Communicable period is unknown.

2. Assessment

a. Signs and symptoms may include:

i. Acute febrile illness

ii. Malaise

iii. Swollen lymph glands

iv. Headache

v. Rash

b. If infection is left untreated, the number of T-helper lymphocytes gradually decline.

c. Seroconversion (antibodies can be detected in the blood) occurs usually within the first 3 months following exposure.

i. Persons who are seropositive are prescribed antiretroviral drug treatment.

3. Management

a. Prevention focuses on:

i. The use of gloves when in direct contact with blood or OPIM

ii. The use of needle-safe or needleless devices

iii. Good handwashing technique

iv. Routine cleaning of the vehicle

b. Risk for health care providers is related to handling and disposal of sharps.

i. High-risk exposure includes:

(a) A deep stick with a large-gauge hollow-bore needle

(b) Visible blood on the device

(c) An HIV-positive patient with a high viral load

(d) A device that had been in the patient’s vein or artery

F. Acquired immunodeficiency syndrome (AIDS)

1. The end-stage disease process caused by HIV

a. Patient is vulnerable to numerous opportunistic infections

b. Patients who respond to the drug treatment render the virus unable to multiply.

i. 96% cannot transmit the disease.

2. Pathophysiology

a. Incubation period spans the time between documented infection and development of end-stage disease.

i. Determined by the CD4 cell count and the presence of opportunistic infections

b. Communicable period is presumed to last as long as the patient is seropositive.

i. Even before development of one of the clinically apparent AIDS-defining conditions

3. Assessment

a. AIDS-defining or AIDS-related conditions: Development of specific opportunistic bacterial, viral, and fungal infections

i. PCP pneumonia

ii. Cytomegalovirus

iii. Kaposi sarcoma (reddish or purple skin cancers)

iv. Atypical TB

v. Cryptococcal meningitis

4. Management

a. Prevention involves following standard precautions.

i. Use gloves when in contact with blood or OPIM.

ii. Use needle-safe or needleless devices.

iii. Perform routine cleaning of the vehicle and equipment.

b. If an exposure occurs, testing proceeds according to state law.

i. The rapid HIV testing method produces accurate results in less than 1 hour.

ii. The paramedic may be given antiretroviral drugs for a period of 4 weeks.

(a) Criteria are published by the CDC; not given automatically

(b) These drugs are toxic, and a physician knowledgeable in the use of these drugs should be consulted.

(c) Before initiating, baseline lab testing should be done.

VIII. Pathophysiology, Assessment, and Management of Enteric (Intestinal) Diseases

A. Norovirus infection

1. Pathophysiology

a. Causes about 90% of epidemic nonbacterial outbreaks of gastroenteritis in the world

b. Multiplies within the small intestines once in the body

c. Transmission can be:

i. Person to person

ii. Ingestion of food or water that has been contaminated by infected feces

iii. Aerosols created when a person vomits or has diarrhea

d. Symptoms may appear within 1 to 2 days.

e. Virus can be shed for weeks after infection.

2. Assessment

a. Signs and symptoms include:

i. Nausea

ii. Forceful vomiting

iii. Watery diarrhea

iv. Abdominal pain

v. Weakness

vi. Low-grade fever

3. Management

a. Wear gloves and practice good handwashing technique.

b. Clean after transport using a chlorine-based product.

B. Hepatitis A virus infection

1. Pathophysiology

a. Known as infectious hepatitis

b. The most common type of hepatitis in the United States

c. Transmission is by the fecal-oral route.

d. Infection is often described as a “benign” disease.

i. Acquiring it provides lifelong immunity

e. Children are usually immunized between ages 12 and 23 months.

f. Incubation period is about 2 to 4 weeks

g. Communicable period probably starts toward the end of the incubation period and continues for a few days after the patient becomes jaundiced

2. Assessment

a. Signs and symptoms in phase 1 include:

i. Fatigue

ii. Loss of appetite

iii. Fever

iv. Nausea

v. Abdominal pain

vi. Smokers will lose interest in smoking.

b. Signs and symptoms in phase 2 include:

i. Jaundice

ii. Dark-colored urine

iii. Whitish stools

c. Resolves after several weeks

3. Management

a. Prevention includes the use of good handwashing technique and gloves.

b. A vaccine is recommended for FEMA response team members who work outside the United States.

C. Hepatitis D virus infection

1. Pathophysiology

a. Only occurs among people who are infected with HBV

b. Transmitted through percutaneous or mucosal contact with infected blood

c. Can be acquired either as a coinfection with HBV or as a superinfection in persons with HBV

d. Not common in the United States

2. Management

a. No vaccine available

b. Can be prevented by administration of a hepatitis B vaccination in persons who are not already infected

D. Hepatitis E virus infection

1. Pathophysiology

a. Also referred to as enterically transmitted non-A, non-B hepatitis (ET-NANB)

b. Transmission typically occurs via the fecal-oral route by ingestion of contaminated water.

i. Rare cases of transmission have been documented via blood transfusion and sexual transmission.

c. Not chronic

d. Incubation period is approximately 15 to 64 days.

e. Communicable period is believed to be the same as for HAV infection.

2. Assessment

a. Signs and symptoms are the same as for other forms of hepatitis.

3. Management

a. Prevention includes:

i. Use gloves when in contact with stool.

ii. Use good handwashing technique.

iii. Clean contaminated equipment.

IX. Pathophysiology, Assessment, and Management of Vector-Borne and Zoonotic (Animal-Borne) Diseases

A. Introduction

1. Diseases that are transmitted through a vector are usually transmitted by ticks or mosquitoes.

a. May also be called zoonotic diseases

B. West Nile virus (WNV)

1. First identified in Uganda in 1930s

a. Identified in Western hemisphere for the first time in 1999

i. Since then, the number of cases has been dropping

2. Pathophysiology

a. Transmission occurs via a bite from a mosquito carrying the virus.

b. No period of communicability—not transmitted from person to person

c. Has been transmitted via donated blood and organs and during hemodialysis

d. Incubation period is 3-14 days after transmission.

3. Assessment

a. 80% of people who acquire WNV remain unaware that they have it.

b. The 20% who are symptomatic exhibit:

i. Fever

ii. Headache

iii. Body rash

iv. Swollen lymph glands

c. Severe reactions (neurologic complications and death) occur in about 1 in 150 symptomatic people.

4. Management

a. Use needle-safe devices.

b. Notify DICO if exposure occurs.

i. There is no recommended follow-up treatment.

C. Lyme disease

1. The most common tick-borne disease in the United States

a. Deer tick can be a vector for the bacterium *Borrelia burgdorferi*.

b. Highest prevalence is found:

i. Along the Atlantic coast

ii. In upper Midwest

iii. Along Pacific coast

c. Peak season is between June and August.

2. Pathophysiology

a. Occurs more often in children younger than 10 years and in middle-aged adults

b. Not transmitted form person to person

c. Incubation period ranges from 3 to 32 days.

3. Assessment

a. Some patients remain asymptomatic.

b. For patients with signs and symptoms, disease is usually in three stages:

i. Early localized stage

(a) Characterized by a round, red skin lesion most commonly found in the area of the groin, thigh, or axilla

ii. Early disseminated stage

(a) Secondary lesions may develop within days.

(b) Patient may report flulike symptoms.

(c) Other symptoms may include:

(1) Nonproductive cough

(2) Testicular swelling

(3) Sore throat

(4) Enlarged spleen

(5) Enlarged lymph nodes

(d) Neurologic involvement occurs in 15% to 20% of untreated patients within 2 to 8 weeks.

(e) Cardiac involvement occurs in 10% of untreated patients.

iii. Late manifestations

(a) Arthritis occurs in about 60% of untreated patients.

(b) Intermittent joint pain affects about 50% of patients.

(c) Most common symptoms in the United States are:

(1) Memory impairment

(2) Depressed mood

(3) Severe fatigue

D. Rocky Mountain spotted fever (RMSF)

1. Transmission occurs by the bite of tick species infected with *Rickettsia rickettsia* bacterium.

a. American dog tick

b. Rocky Mountain wood tick

c. Brown dog tick

2. Pathophysiology

a. Can be severe or even fatal if not treated in the first few days of symptoms

3. Assessment

a. Symptoms include:

i. Fever

ii. Headache

iii. Abdominal pain

iv. Vomiting

v. Muscle pain

vi. Rash (may or may not develop)

b. Initial diagnosis is based on clinical signs and symptoms and medical history

i. Can be confirmed by laboratory tests

4. Management

a. Doxycycline is the first-line treatment

i. Most effective if started before the fifth day of symptoms

b. Not a communicable disease

E. Hantavirus infection

1. Also known as hemorrhagic fever with pulmonary syndrome

a. Associated with the deer mouse, white-footed mouse, and cotton rat

b. Hantavirus pulmonary syndrome may also occur.

i. Flulike symptoms can progress rapidly to potentially life-threatening breathing problems.

2. Pathophysiology

a. Found in the urine, feces, and saliva of chronically infected rodents

b. Transmission occurs via direct contact with rodent waste matter.

i. Often occurs through aerosol inhalation, which can occur when cleaning up infested areas

c. Incubation period usually lasts 12 to 16 days following exposure, but has been noted to range from 5 to 42 days.

d. There is no period of communicability.

3. Assessment

a. Signs and symptoms include:

i. Sudden onset of fever lasting 3 to 8 days

ii. Headache

iii. Abdominal pain

iv. Loss of appetite

v. Vomiting

b. For pulmonary syndrome, signs and symptoms present in two stages.

i. Stage 1

(a) Fever

(b) Chills

(c) Headaches

(d) Muscle aches

(e) Vomiting

(f) Diarrhea

(g) Abdominal pain

ii. Stage 2

(a) Cough with secretions

(b) Shortness of breath

(c) Fluid accumulation within the lungs

(d) Low blood pressure

(e) Cardiac insufficiency

4. Management

a. Prevention focuses on standard precautions.

b. Routine cleaning of the vehicle is sufficient.

c. Supportive measures may be needed:

i. Assisted respiration

(a) Intubation

(b) Mechanical ventilation

ii. Oxygen therapy

d. Rapid transport is important.

F. Rabies

1. Account for about 300,000 deaths each year in developing countries

a. Cases have declined in the United States since 1940s when control programs began

i. Vaccination of domestic animals

ii. Vaccine and rabies immunoglobulin

2. Pathophysiology

a. Transmission is primarily related to the direct bite of an infected animal.

i. Animals most commonly identified include:

(a) Raccoons

(b) Skunks

(c) Foxes

(d) Coyotes

(e) Insectivorous bats

b. Another route of transmission is contamination of mucous membranes (eyes and mouth).

i. Rare

ii. There are no documented cases of human-to-human transmission.

c. Incubation period is usually 2 to 8 weeks.

3. Assessment

a. Signs and symptoms are usually nonspecific:

i. Fevers

ii. Chills

iii. Sore throat

iv. Malaise

v. Headache

vi. Weakness

vii. Paresthesia near the site of exposure

b. Neurologic phase follows and includes:

i. Hyperactivity

ii. Seizures

iii. Bizarre behavior

iv. Hydrophobia

c. As the disease progresses, paralysis may develop and mental status may deteriorate.

d. Several cases of survival have been reported recently even after symptoms had appeared.

4. Management

a. Follow standard precautions for patient care and cleaning of the vehicle.

b. If you are bitten or scratched by a suspect animal, you will be offered human rabies vaccine if deemed appropriate.

i. The CDC does not recommend the vaccination for fire and EMS personnel on a routine basis.

G. Tetanus (lockjaw)

1. Pathophysiology

a. The tetanus bacillus is found in the intestines of horses and other animals, but some cases have been linked to IV drug use.

b. Transmission occurs when tetanus spores enter the body by either:

i. A puncture wound contaminated with animal feces, street dust, or soil

ii. Contaminated street drugs

c. Not transmitted from person to person

d. Incubation period is usually about 14 days from the exposure but has been documented to be as short as 3 days.

2. Assessment

a. Signs and symptoms begin at the site of the wound.

i. Followed by painful muscle contractions or rigidity (tetany) in the neck, face, jaw, and trunk muscles

ii. Key sign is abdominal rigidity.

iii. Other signs and symptoms include:

(a) Dysphagia

(b) Hydrophobia

(c) Drooling

(d) Respiratory distress

3. Management

a. Prevention includes the use of gloves when treating wounds and managing drainage.

b. Patient may require airway and ventilation support.

i. Oxygen and IV fluids may be indicated.

c. Tetanus immune globulin (TIG) is recommended for treatment of tetanus.

i. A single intramuscular dose of 3000 to 5000 units is generally recommended.

d. Paramedics should receive tetanus booster doses every 10 years.

X. Pathophysiology, Assessment, and Management of Infection with Antibiotic-Resistant Organisms

A. The overuse and misuse of antibiotics have led some pathogens to develop resistance to them.

1. Medical facility pharmacies and the CDC now restrict the use of many antibiotics.

2. Patients infected with some types of antibiotic-resistant organisms may be protected by the Americans With Disabilities Act.

B. Methicillin-resistant *Staphylococcus aureus*

1. *Staphylococcus aureus* became resistant to penicillin in the late 1950s.

a. Methicillin then became available in the early 1960s.

b. By 1970s MRSA became present in US hospitals, and has since moved into the community.

i. Number of health care associated cases is declining due to focus on infection control

c. Strains of MRSA are also resistant to other antibiotics.

i. Vancomycin treats MRSA effectively, but mild strains have shown resistance.

d. Other drugs used to treat include:

i. Quinupristin-dalfopristin combination (Synercid)

ii. Linezolid (Zyvox)

iii. Daptomycin (Cubicin)

2. Pathophysiology

a. Believed to be transmitted from patient to patient via unwashed hands of health care providers

i. Studies have shown that 50% to 90% of health care providers carry MRSA in the nares.

ii. Pathogen can be transferred through a break in the skin

b. Factors that increase risk include:

i. Antibiotic therapy

ii. Prolonged hospital stays

iii. A stay in an intensive care or burn unit

iv. Exposure to an infected patient

3. Assessment

a. Patients may be colonized with this organism or infected

b. Incubation period seems to be between 5 and 45 days.

c. Communicable period varies.

d. Manifestations may include:

i. Localized skin abscesses and cellulites

ii. Empyemas

iii. Endocarditis

e. Secondary infections can occur after blood infection.

4. Management

a. Patients will undergo incision and drainage for soft-tissue infections.

i. No antibiotics need to be prescribed.

ii. Estimated that more than 90% of infections will clear following incision and drainage alone.

b. To prevent transmission, use standard precautions.

c. If you have an exposure, no postexposure treatment is recommended.

C. Vancomycin-resistant *Staphylococcus aureus*

1. Pathophysiology

a. Persons at risk include those with:

i. Severe underlying health conditions

ii. Previous MRSA infections

iii. Indwelling catheters

iv. Recent hospitalizations

v. Recent exposure to vancomycin or other antimicrobial agents

2. Assessment

a. Signs and symptoms include:

i. Localized skin abscesses

ii. Cellulitis

iii. Pneumonia

iv. Bloodstream infections

v. Meningitis

vi. Osteomyelitis

vii. Fever

viii. Chills

ix. Body weakness and pain

x. Cough

xi. Chest pain

xii. Trouble breathing

3. Management

a. Treatable with antibiotics

b. Standard precautions and routine cleaning of the vehicle and patient care equipment are indicated.

c. Make sure all open cuts are covered.

d. No postexposure treatment is recommended.

D. Vancomycin-resistant enterococci

1. Enterococcus is a normal organism of the GI tract, urinary tract, and genitourinary tract.

a. Grow under reduced oxygen and oxygenated conditions

b. Remain in the top three most common pathogens that cause nosocomial infections in the United States

2. Pathophysiology

a. Primarily a nosocomial infection (a health care-associated infection)

b. People are not susceptible unless they are already ill or immunocompromised.

c. VRE may be found in urinary traction infections and bloodstream infections.

d. Infectious organisms can live on surfaces for long periods.

i. Transmission may occur by direct contact with contaminated surfaces.

e. Only infected patients can transmit the organism.

f. Infection can be treated with a new synthetic antibiotic, linezolid.

3. Assessment

a. Can cause UTIs

b. Catheters can serve as a port of entry.

i. Bacteremia sometimes evolves into sepsis.

c. Surgical wounds may become infected.

4. Management

a. Use standard precautions, gloves, and good handwashing techniques.

b. Post-transport cleaning of all areas that came in contact with the patient is important.

i. No special cleaning is required.

c. Notify your DICO if you come in direct contact with an open wound or body fluids from an infected patient.

i. No postexposure treatment is required.

E. *Clostridium difficile*

1. Not a multidrug-resistant organism, but it is treated like one.

2. Pathophysiology

a. Spore-forming bacterium that produces two endotoxins that cause watery diarrhea

b. Transmission occurs by contact with surfaces contaminated with feces.

i. Can be transmitted to patients by contact with the unwashed hands of health care providers

c. Resolves 2 to 3 days after discontinuing antibiotics

3. Assessment

a. Signs and symptoms include:

i. Frequent, watery, green foul-smelling diarrhea

ii. Nausea and vomiting

iii. Fever

iv. Loss of appetite

v. Abdominal discomfort

b. Diseases associated with *C. difficile* infection include:

i. Pseudomembranous colitis

ii. Sepsis

iii. Colonic perforation

4. Management

a. Use gloves and good handwashing techniques.

b. Clean contaminated surfaces using a chlorine-based cleaning solution.

c. Report contamination of open skin areas to your DICO.

i. No medical follow-up is required.

XI. Pathophysiology, Assessment, and Management of Common Communicable Diseases of Childhood

A. There are increased numbers of cases of preventable communicable diseases across the United States.

1. The United States has a goal to vaccinate all children against disease preventable by vaccine.

B. Bronchiolitis

1. Infection of the lungs and airways

a. Usually occurs in children ages 3 to 6 months

2. Pathophysiology

a. Usually viral

b. Transmission generally occurs by inhaling droplets of infected mucus or respiratory secretions.

3. Assessment

a. Use standard precautions.

b. Initial symptoms include:

i. Runny nose

ii. Slight fever

c. After 2 to 3 days, symptoms may include:

i. Wheezing

ii. Coughing

iii. Tachypnea

iv. Tachycardia

d. Obtain a thorough history.

e. Assess the respiratory rate.

4. Management

a. Management is supportive, and may include:

i. Oxygen

ii. IV fluids

iii. Assisted ventilations

iv. Intubation

C. Croup

1. Inflammation of the larynx and airway just below it

a. Usually occurs in children 5 years and younger

2. Pathophysiology

a. Caused by a virus similar to the virus that causes the common cold and by other viruses

b. Spread by respiratory secretions or droplets from coughing, sneezing, and breathing

3. Assessment

a. Comes on strongest in the nighttime

b. May last 3 to 7 days

c. Symptoms include:

i. Loud, harsh, barking cough

ii. Fever

iii. Noisy inhalations

iv. Hoarse voice

v. Mild to moderate dyspnea

4. Management

a. Prehospital management is the same as for most respiratory emergencies.

i. Nebulized epinephrine administration may be effective.

ii. Assisted ventilation may be necessary.

b. No definitive treatment for the viruses that cause croup.

c. Supportive care is directed toward respiratory support and hydration.

D. Measles

1. Pathophysiology

a. A highly communicable viral disease transmitted by either:

i. Airborne aerosolized droplets

ii. Direct contact with the nasal or pharyngeal secretions of an infected person

iii. Indirect contact with articles soiled by a patient’s nasal or throat secretions (less common)

b. Incubation period is about 10 days.

i. Onset of fever is generally between days 7 and 18 after exposure.

ii. Rash appears about 14 days after exposure.

c. The communicable period begins when the first symptoms appear and ends about 2 days after the rash appears.

d. About 30% of cases develop complications.

i. Pneumonia

ii. Ear infections

iii. Diarrhea

2. Assessment

a. Early phase is characterized by:

i. Fever

ii. Conjunctivitis

iii. Coryza (acute rhinitis)

b. Symptoms that may follow include:

i. Coughing

ii. Blotchy red rash

iii. Whitish gray spots on the buccal (mouth) mucosa (Koplik’s spots)

3. Management

a. Care is supportive.

b. A mask may decrease risk of infection.

i. The only certain protection is immunity.

ii. Exposure includes the transport of a patient or being in the same room as the patient.

c. Anyone who has had measles or who received live virus measles vaccine after 1968 should be immune.

i. Important to assess the immunity status of all new hires.

ii. Postexposure treatment includes vaccination if you are not immune.

d. Wash patient contact areas, and launder any soiled linens.

E. Rubella

1. Pathophysiology

a. Known as German measles or 3-day measles

b. Caused by a virus

c. Occurs most commonly during the winter and spring

d. Highly communicable to susceptible people

e. Transmission occurs by direct contact with the nasopharyngeal secretions of an infected person.

f. Incubation period is 14 to 23 days.

g. Communicable period starts about a week before the rash appears and continues until 4 days after the rash appears.

2. Assessment

a. Characterized by:

i. Low-grade fever

ii. Headache

iii. Runny nose

iv. Swollen lymph glands

v. Diffuse maculopapular rash

vi. May cause severe abnormalities in a developing fetus if contracted during the first 3 to 4 months of pregnancy.

3. Management

a. There is no treatment for rubella.

b. Offer supportive care.

c. The only certain protection is immunity.

i. All paramedics except women who are pregnant or planning to become pregnant within 3 months should be vaccinated before starting employment

d. Preventative measures include placing a surgical mask on the patient.

e. Practice standard precautions and routine cleaning after transport.

F. Mumps

1. Viral disease that occurs most commonly in winter and spring

a. Anyone who has not been vaccinated is at risk

2. Pathophysiology

a. Transmission occurs by droplet spread or direct contact with the saliva of an infected person.

b. Incubation period is 12 to 26 days.

c. The communicable period lasts 9 days after the salivary glands swell.

3. Assessment

a. Signs and symptoms in children include:

i. Fever

ii. Swelling and tenderness of one of the salivary glands

b. Mumps in males past the age of puberty may have an inflammation of the testicles.

c. All paramedics should be vaccinated if they are not already immune.

i. Females should not become pregnant for 4 weeks following each dose.

4. Management

a. Place a surgical mask on a patient.

b. Wear gloves when in contact, and carry out routine cleaning.

c. Only supportive care is needed for transport.

d. Postexposure vaccine is not recommended.

G. Chickenpox (varicella zoster)

1. Pathophysiology

a. A viral illness that produces a distinctive rash of itchy, fluid-filled vesicles

b. Transmitted by direct contact or droplet spread of respiratory secretions

i. Airborne

ii. Direct contact

c. Incubation period is 10 to 21 days.

d. Communicable period starts 1 to 2 days before the appearance of the rash and lasts about 5 days after the appearance of the rash.

e. Having chickenpox as a child usually provides lifelong immunity.

2. Assessment

a. A highly contagious viral disease

b. Signs and symptoms include:

i. Listlessness

ii. Slight fever

iii. Photosensitivity

iv. Vesicular rash

3. Management

a. Place a surgical mask on the patient.

b. Treatment is supportive.

c. Wear gloves when in contact with discharges or drainage.

d. Postexposure treatment includes vaccination if not immune.

e. All paramedics not immune should be offered the vaccination when hired.

i. Pregnant females cannot be vaccinated until after delivery.

H. Pertussis (whooping cough)

1. Infection caused by the bacterium *Bordetella pertussis*

2. Assessment

a. Characterized by a cough that becomes paroxysmal in about 1 to 2 weeks

i. Cough may last 1 to 2 months.

ii. A high-pitched “whoop” sound occurs on inspiration.

3. Pathophysiology

a. Transmission takes place through direct contact with discharge from mucous membranes and/or airborne droplets.

b. Incubation period is 7 to 14 days.

c. Highly communicable in the early stages

i. Effects become negligible in about 3 weeks.

d. Complications include apnea and pneumonia.

i. Pulmonary hypertension is common in children younger than 1 year.

ii. Encephalopathy occurs in approximately 20% of cases.

4. Management

a. Place a mask on the patient.

b. Provide supportive care.

c. Postexposure care may include antibiotic treatment.

d. Good handwashing and routine cleaning of the vehicle are required after patient transport.

e. All paramedics should be assessed for immunity.

i. A one-time booster vaccine is recommended for health care workers.

XII. Pathophysiology, Assessment, and Management of New and Emerging Diseases

A. Severe acute respiratory syndrome

1. Arose from the merger of two viruses (one from mammals and one from birds)

a. Source was identified as bats from Hong Kong

2. Pathophysiology

a. Transmission is by close personal contact.

b. Incubation period is about 10 days from the date of exposure.

c. Communicable period has not been well defined.

3. Assessment

a. Signs and symptoms include:

i. Fever of greater than 100.4°F

ii. Headache

iii. Overall feeling of discomfort

iv. Body aches

v. After 7 days, a dry cough appears.

(a) Severe cases may progress to pneumonia.

(b) Patients may need respiratory support.

4. Management

a. Use adequate PPE.

i. N95 or P100 respirator

b. Notify DICO.

c. Complete an exposure form.

d. Possibly place patient on a 10-day quarantine.

B. Avian (bird) flu

1. Pathophysiology

a. Caused by a virus that occurs naturally in the bird population

i. Carried in the intestinal tract of wild birds

ii. Very contagious in domestic bird populations

iii. No rapidly spread human-to-human cases have been reported.

iv. Transmission risk for humans is low.

2. Assessment

a. Signs and symptoms include:

i. Fever

ii. Sore throat

iii. Cough

iv. Muscle aches

v. Eye infections

3. Management

a. Place a surgical mask on the patient or yourself.

b. Follow current CDC guidelines regarding protection for health care providers.

c. An antiviral drug may be offered within 48 hours following exposure.

d. Get an annual flu shot.

XIII. Summary

A. Government agencies such as the Occupational Safety and Health Administration (OSHA), the Centers for Disease Control and Prevention (CDC), and state and county public health departments bear the responsibility for protection of the public health, prevention of epidemics, and management of outbreaks.

B. Clean and disinfect the ambulance and your equipment to protect patients from infection.

C. A patient suspected of having an infectious disease is assessed like any other medical patient.

D. Infection involves a typical chain of events through which a communicable disease spreads.

E. Communicable diseases can be transmitted from one person to another under certain conditions.

F. The risk of infection depends on the type and dose of the organism, its virulence, its mode of entry, and the host’s resistance.

G. The human body offers several defenses to protect against infection, such as skin, the mucous membranes, and the immune system.

H. Protection against and reduction of the occurrence of communicable diseases involve the designated infection control officer (DICO), the public health department, standard precautions, immunizations and vaccinations, personal protective equipment (PPE), postexposure medical follow-up, and an exposure control plan.

I. Sexually transmitted diseases (STDs) are usually acquired by sexual contact and are caused by a wide range of organisms.

J. Enteric diseases are infectious diseases that affect the gastrointestinal tract. The organisms that cause enteric infections include rotaviruses, parasites, and bacteria.

K. Blood-borne diseases include viral hepatitis, HIV, and AIDS.

L. A vector is a living organism, such as an insect or rodent, that carries a disease-causing human pathogen. This pathogen does not harm the organism itself, but it can be transmitted to humans by means of a bite, inhalation of contaminated animal feces, or other means.

M. The overuse and misuse of antibiotics has made some pathogens resistant to the antibiotic drugs commonly prescribed to eradicate them.

N. Serious communicable childhood diseases that had become uncommon in recent decades are making a resurgence because some parents refuse to have their children vaccinated. Research showing a link between vaccines and the development of autism in children has been discredited.

O. New and emerging diseases of concern include severe acute respiratory syndrome (SARS) and the avian flu.

Post-Lecture

This section contains various student-centered end-of-chapter activities designed as enhancements to the instructor’s presentation. As time permits, these activities may be presented in class. They are also designed to be used as homework activities.

***Assessment in Action***

This activity is designed to assist the student in gaining a further understanding of issues surrounding the provision of prehospital care. The activity incorporates both critical thinking and application of paramedic knowledge.

**Instructor Directions**

**1.** Direct students to read the “Assessment in Action” scenario located in the Prep Kit at the end of Chapter 26.

**2.** Direct students to read and individually answer the quiz questions at the end of the scenario. Allow approximately 10 minutes for this part of the activity. Facilitate a class review and dialogue of the answers, allowing students to correct responses as may be needed. Use the quiz question answers noted below to assist in building this review. Allow approximately 10 minutes for this part of the activity.

**3.** You may wish to ask students to complete the activity on their own and turn in their answers on a separate piece of paper.

**Answers to Assessment in Action Questions**

1. **Answer:** A. standard precautions

**Rationale:** The term “standard precautions” is used to describe infection control practices that reduce the opportunity for an exposure to occur in the daily care of patients. It replaces the older terms “universal precautions” and “body substance isolation (BSI)”. BSI precautions were taught to EMS providers during the past decade; this approach assumes that all blood and body fluids are infectious. Standard precautions add another element—protection from moist body substances that may transmit other bacterial or viral infections. For example, a paramedic with a cut on his or her finger who suctions a patient with oral herpes lesions and does not wear a glove could become infected with herpes. These precautions apply to all body substances except sweat.

2. **Answer:** B. an increase in the bilirubin level in the blood

**Rationale:** The yellow coloring to the skin is known as jaundice. Jaundice is caused by an increase in the amount of bilirubin in the blood. The excess bilirubin is produced when cellular damage occurs in the liver.

3. **Answer:** C. hepatitis C

**Rationale:** The hepatitis C virus (HCV) is the most common chronic blood-borne infection and the leading reason for liver transplantation in the United States. An estimated 1% to 4% of health care providers are antibody-positive for HCV. However, this disease is not efficiently transmitted through occupational exposure, and no health care provider group is at increased risk for occupationally acquired HCV infection. Instead, occupational risk is related to a contaminated deep needlestick with visible blood on the sharp, a sharp that has been in the patient’s vein or artery, a hollow-bore needle, and a source patient with a high viral load. Risk from this type of exposure is 1.5%.

4. **Answer:** B. none because you show immunity to HBV

**Rationale:** If you have a positive titer on file, no follow-up treatment is needed. If you do not have a titer report on file and the patient is positive for HBV infection, titer testing will be ordered for you. Treatment will depend on the results of that titer report. If you have not been vaccinated and the patient is positive for HBV, you will be offered hepatitis B immune globulin and the vaccine series. The risk of infection is 6% to 30% only if you were not vaccinated and did not report the exposure event.

5. **Answer:** A. A

**Rationale:** Hepatitis type A, or infectious hepatitis, is the most common type of hepatitis in the United States. In the past, outbreaks of this disease have been reported in several states. Transmission is by the fecal-oral route—that is, by ingestion of food or water that has been contaminated by infected feces. Epidemic outbreaks are most often traced to contaminated drinking water, milk, sliced meats, and undercooked shellfish. Hepatitis A is often described as a benign disease because acquiring it provides lifelong immunity.

6. **Answer:** D. virulence

**Rationale:** Virulence is the ability of an organism to invade and create disease in a host. It also encompasses the organism’s ability to survive outside the living host. For example, HIV does not pose a risk outside the human body because it dies when exposed to light and air.

**Additional Questions**

7. **Rationale:** The federal Ryan White Law, Part G (2009), requires that every emergency response agency have a DICO. This person is charged with ensuring that proper postexposure medical treatment and counseling are provided to exposed employees and volunteers. The DICO tracks and monitors compliance with the correct time frames, serves as a liaison between exposed employees and the medical facility, ensures that confidentiality is maintained, and makes sure that documentation adheres to guidelines, which is important for workers’ compensation issues and, in some states, presumption issues.

8. **Rationale:** Public health departments (PHDs) have a major role in investigations of epidemics and pandemics. The PHD monitors reportable disease weekly, monthly, and annually. This monitoring assists in the identification of any increases in disease occurrence. If disease case numbers for a given area remain the same over time, that figure is said to be the endemic number of cases for that area. A rising case load may signal the beginning of an epidemic. When a disease infects large numbers of people and spreads all over the world, it is considered a pandemic.

***Assignments***

**A. Review all materials from this lesson and be prepared for a lesson quiz to be administered (date to be determined by instructor).**

B. Read Chapter 27, *Toxicology*, for the next class session.

## Unit Assessment Keyed for Instructors

1. Define and differentiate the following epidemiological terms: endemic, pandemic, and epidemic. Discuss their relevance for monitoring and surveillance as well as planning.

**Answer:** Endemic refers to the incidence of cases of a specific disease in a particular geographic area that remains steady over time. These figures are the endemic number of cases for that area. Pandemic refers to when a disease infects large numbers of people and spreads all over the world. Epidemics are said to occur when there is a rising case load of a specific disease. State and local health departments are responsible for collection data on the incidence of specific infecious or communicable diseases and play a major role in investigating and planning for epidemics and pandemics. This data and statistical information is ultimately shared with the CDC.

(p 1289)

2. Identify and describe the four mechanisms for spreading communicable or infectious diseases.

**Answer:** Infectious diseases are caused by pathogenic microorganisms that are spread through specific mechanisms including contact transmission, droplet transmission, airborne transmission, and vector transmission. In contact transmission, direct contact with the infected person or through specific fluid contact can result in disease spread. Examples include sexually transmitted diseases, punctures with contaminated needles, and transfusion of contaminated blood products. It may also include splashes of contaminated body fluids to areas of mucosal membranes. Indirect contact including the touching or handling of an infected object or contact with a person who is contaminated may also allow for spread of the microorganisms. This may include blood left on a stretcher or other equipment or with a patient’s hands or clothing. Droplet transmission occurs when infected droplets are inhaled after a person coughs or sneezes. There is generally a limit of 3 to 6 feet for this to occur due to droplets falling after traveling over a distance. Airborne transmission is similar in contact but pathogens are transmitted in aerosolized particles when the infected person coughs, sneezes, or exhales. These vapors with the pathogens may remain suspended in the air for long periods and can drift to other locations. Some diseases may also be transmitted by vectors or carriers of the pathogen not harmful to the host but able to cause disease when transmitted to a human such as with the West Nile virus through mosquitoes.

(pp 1289-1290)

3. Compare and contrast the four primary pathogenic organisms.

**Answer:** Bacteria are able to grow and reproduce outside of a human cell in an environment that has appropriate temperature and nutrients. They can cause disease when invading and multiplying within the host tissues. Viruses are much smaller than bacteria and only multiply within a host cell. They typically die when exposed to the outside environment. They cause disease when invading and multiplying within the host tissues similar to bacteria. Fungi are similar to bacteria in that they are able to rapidly grow in the presence of adequate nutrients and organic materials. Most viral infectious occur when the patient is exposed to decaying organic matter or airborne spores in the environment. They may cause opportunistic infections in the host with a compromised immune system. Parasites live in or on other living creaters and take advantage of their host by feeding off host cells and tissues. They may be single-celled organisms such as protozoan or invertebrates such as worms.

(p 1296)

4. Define meningitis and identify the two types of pathogenic causes as well as any differences in presentation, incubation period, or outcomes.

**Answer:** Meningitis is an inflammation of the membranes covering the brain and spinal cord or the meninges. Bacterial meningitis is a communicable disease but viral meningitis is not. Meningitis is transmitted through droplets. The most common type of meningitis involved in epidemic outbreaks is meningococcal meningitis. It occurs most frequently during winter and spring and is more prevalent in places where people live together in crowded conditions. Prolonged contact of eight or more hours is more likely to result in transmission of the disesase. Incubation period is between two and 10 days with a variable communicable period. The microorganisms usually disappear from the respiratory tract within 24 hours after initiating antibiotic treatment. Classic signs and symptoms for both forms are the same: sudden-onset fever, severe headache, stiff neck, Kernig sign, Brudzinski sign, photosensitivity, and a pink rash that becomes purple. Changes in mental status and projectile vomiting are common.

(p 1297)

5. Describe tuberculosis (TB), including the classic presentation of the TB patient and appropriate protective equipment when TB is suspected.

**Answer:** Tuberculosis (TB) is not a highly communicable disease. It is a greater risk for people who are malnourished, immunocompromised, or those with poor health care. This is particularly true in homeless populations and among those who are incarcerated. There is a difference between patients who are said to be infected with TB and those who have the disease. Those infected have tested possible but do not have and may never have the active disease. Those who have the disease mean it is has been verified by diagnostic testing. Classic presentation includes sudden weight loss, night sweats, fever, and cough with a blood-tinged sputum. Patients with this clinical presentation should be suspected of TB until it is ruled out through diagnostic testing. Appropriate protective equipment includes wearing a high-efficiency particulate air (HEPA) filter mask also known as an N-95 mask. Consider using an oxygen mask for the patient needing supplemental oxygen instead of a cannula and do not allow the patient to cough in your face. Open windows in the ambulance when weather permits, and use the exhaust fan. If the patient is able to wear a mask as well, this is also a good protective option.

(pp 1297-1298)

6. Discuss the pathophysiology, assessment, and management of the flu patient.

**Answer:** Influenza (flu) is caused by viruses generally presenting as winter epidemics. In susceptible populations, death may occur. Infection rates are higher in the pediatric population, but the greater risk of death is among adults over 65 years of age and those with preexisting medical conditions such as chronic pulmonary or heart disease. It is transmitted through droplets and may occur through both direct and indirect exposures. Incubation periods are 1 to 4 days, and patients are communicable until approximately 5 days after onset of the illness. Patients may present with systemic fever, shaking chills, muscle pain, malaise, and loss of appetite. Respiratory symptoms may include dry coughing, hoarseness, and nasal discharge. Duration of illness ranges from 3 to 4 days with risk of viral or bacterial pneumonia as a complication. Patients should be managed based on symptom presentation, but the best treament is prevention. Patients who are dehydrated may require IV fluids, and those with severe respiratory symptoms may require ventilatory support.

(pp 1300-1301)

7. Identify and describe three sexually transmitted diseases, including signs and symptoms.

**Answer:** Gonorrhea is an infection caused by the gonococcal bacteria, *Neisseria gonorrhoeae*. It is transmitted through sexual contact with the pus-containing fluid from mucous membranes of an infected person. Incubation typically is 2-7 days typically but may be longer. If untreated, it is communicable for months. If treated, it is noncommunicable within hours. Signs and symptoms vary between males and females. Males usually have a pus-containing discharge from the uretha and have pain on urination while women may have symptoms so mild that they are unnoticed. It may progress to pelvic inflammatory disease. This infection may also be present in the anus or throat depending on sexual exposure. Syphilis is caused by a spiral-shaped bacterium, *Treponema pallidum*. It may be acute or chronic. In the primary infection there is an ulcerative lesion called a chancre at the site of the infection on the skin or mucous membrane, most commonly in the genital region. It may produce a skin rash, patchy hair loss, and swollen lymph glands during the secondary infection phase. The third stage is the chronic phase and may result in complications including the cardiac, ophthalmic, auditory, and central nervous systems. Genital herpes is a chronic and recurrent illness caused by infection with the herpes simplex virus. The sexually transmitted type is generally type 2 herpes. It is characterized by vesicular lesions found initially on the cervix in women and also around the vulva, legs, and buttocks. In men, the lesions commonly occur on the penis and around the anus or on the mouth, depending on sexual practices. Type 1 herpes is typically seen as blisterlike sores around the lips or inside the mouth. There is no cure for genital herpes. Chlamydia has the highest incidence and is caused by the *chlamydia trachomatis* pathogen. Most women are initially asymptomatic but may later develop pelvic inflammatory disease. In men, the infection may lead to epididymitis, prostatitis, proctitis, and proctocolitis. There may also be urethral discharge. Scabies is caused by infection of the parasite, *Sarcoptes scabiei*. It may be spread via direct skin-to-skin contact as well as by sexual contact. Communicable periods last until the mites and eggs are destroyed by treatment. Signs and symptoms include a rash of small, raised bumps where the mite is burrowed into the skin and itching is present. It may be seen over various areas of the body.

(pp 1301-1303)

8. Compare and contrast the three types of blood-borne hepatitis virus infections including pathophysiology, modes of transmission, and signs and symptoms.

**Answer:** Hepatitis B Virus (HBV) is also known as serum hepatitis. It is transmitted through a variety of ways including sexual transmission, blood transfusions, and punctures with contaminated needles. There is a vaccine for this virus. Sharing of other objects such as razors and needles for tattooing and acupuncture have also been noted for transmission of the virus. Some data suggests it can survive outside the body in dried blood for as long as 7 days. Some infected individuals may become chronic carriers. Signs and symptoms may include loss of apetite, nausea/vomiting, general fatigue or malaise, low-grade fever, abdominal discomfort, and aching in the joints. Many people may not know they have the disease because symptoms may subside. In the second phase, urine may darken and jaundice may develop as the liver is affected. Hepatitis C virus (HCV) is the most common chronic blood-borne infection and leading cuase of liver transplantation in the United States. It is spread by blood-to-blood contact with an open area of the skin, through sexual contact, blood transfusions, organ donations, unsafe medical practices, and from mother to baby. It typically cannot survive in the environment. Signs and symptoms are the same as those for HBV. Hepatitis D virus (HDV) or delta hepatitis requires that the patient already be infected with HBV. It is generally transmitted by percutaneous exposure. Signs and symptoms are the same as those for HBV.

(pp 1304-1305)

9. Identify four vector-borne and zoonotic (animal-borne) diseases as well as the responsible vectors.

**Answer:** West Nile virus (WNV) is a vector-borne disease transmitted via a bite from a mosquito carrying the virus. It is not transmissible from person to person. It has been transmitted via donated blood and organs as well as during hemodialysis. Lyme disease is the most common tick-borne disease and is transmitted via the bite of a deer tick. It occurs most often in young children and middle-aged adults but is not transmissible from person to person. Rocky Mountain spotted fever (RMSF) is also a tick-borne disease transmitted by the American dog tick, Rocky Mountain wood tick, and brown dog tick. It is not communicable but may be severe or fatal if not treated within the first few days of symptoms. The hantavirus infection is transmitted by the deer mouse, white-footed mouse, and cotton rat. It has been found in rats in urban areas as well. The virus is in the urine, feces, and saliva of infected rodents. Trasmission is via direct contact with the rodent waste or through aerosol inhalation while cleaning infested areas, but it is not communicable among humans. Respiratory or flulike symptoms are common and may lead to life-threatening breathing problmes if not identified rapidly. Rabies is transmitted primarily from a bite from an infected anmial. It may also result from contamination of mucous membranes. No human-to-human transmission is documented. Tetanus is caused by a bacillus found in the intestines of horses and other animals. The tetanus spores enter the body either through a puncture wound contaminated with animal feces, street dust, or soil or contaminated street drugs.

(pp 1308-1311)

10. Identify three antibiotic resistant organisms. Describe the pathophysiology, and discuss common routes of transmission.

**Answer:** Methicillin-resistant *Staphylococcus aureus* (MRSA) is resistant to the antibiotic methicillin. It is most commonly community-acquired and was initially associated with nosocomial spread. It may be transmitted by patient-to-patient contact as a result of poor handwashing. Many healthcare providers have MRSA in their nares, and it may be transferred to skin and other areas of the body. Increased risk of developing the infection has been associated with antibiotic therapy, prolonged hospital stays, ICU or burn unit stays, and exposure to an infected patient. Vancomycin-resistant *Staphylococcus aureus* (VRSA) is similar to MRSA in that it is also the result of an antibiotic resistance to vancomycin, which is one of the leading drugs for treating Staph infections. Those at risk are patients with several underlying health conditions, previous infections, indwelling catheters, recent hospitalizations, and recent exposure to vancomycin. Vancomycin-resistent enterococci (VRE) is also resistant to vancomycin, which was commonly used to treat enterococcal (GI bacteria) infections. It is one of the top three most common pathogens causing nosocomial infections in the United States. Those who develop it outside of the hospital are usually nursing home residents or visit hemodialysis centers. Those in the ICU or transplant recipients are especially vulnerable. *Clostridium difficile* (*C.* *diff*) is not a multi-drug resistant organism, but it is treated like one because it can occur after antibiotic treatment when normal flora in the intestine have been destroyed. This bacterium forms spores that produce two endotoxins. It is transmitted as a nosocomial infection from contact with feces-contaminated surfaces and poor handwashing.

(pp 1311-1313)

## Unit Assessment

1. Define and differentiate the following epidemiological terms: endemic, pandemic, and epidemic. Discuss their relevance for monitoring and surveillance as well as planning.

2. Identify and describe the four mechanisms for spreading communicable or infectious diseases.

3. Compare and contrast the four primary pathogenic organisms.

4. Define meningitis and identify the two types of pathogenic causes as well as any differences in presentation, incubation period, or outcomes.

5. Describe tuberculosis (TB), including the classic presentation of the TB patient and appropriate protective equipment when TB is suspected.

6. Discuss the pathophysiology, assessment, and management of the flu patient.

7. Identify and describe three sexually transmitted diseases, including signs and symptoms.

8. Compare and contrast the three types of blood-borne hepatitis virus infections including pathophysiology, modes of transmission, and signs and symptoms.

9. Identify four vector-borne and zoonotic (animal-borne) diseases as well as the responsible vectors.

10. Identify three antibiotic resistant organisms. Describe the pathophysiology, and discuss common routes of transmission.