Infectious Disease

Health care workers have a professional responsibility to prevent the spread of infection and communicable diseases. This includes stopping (or minimizing) the spread of infection to and from patients, coworkers, themselves and their families and friends. To fulfill this obligation, it is incumbent on every health care professional to be knowledgeable about the principles of infection control and the recognition and treatment of those infectious diseases that they may come in contact with.

What makes a disease infectious?

In order for a disease to be infectious or capable of being transmitted three basic elements must be present: a source of infection, a susceptible host and a means to transmit the infectious organism from the source to the host.

**Source:** includes persons with acute illnesses, asymptomatic carriers of pathogenic microorganisms, diseases during incubation periods, one’s on endogenous (originating or growing within an organism) flora and/or contaminated inanimate objects.

**Susceptible host:** anyone who is capable of becoming infected with the disease being transmitted. Susceptibility is dependent on several factors including, but not limited to, their general health, hygiene, immune status, age, and any break in the first line of defense.

**Routes of Transmission:** means by which the microorganisms are transmitted from the source to the host. They include:

- **Contact:** Direct contact is the ability of a pathogen to be transmitted from one person to another through direct personal contact, such as touching or kissing. Indirect contact occurs when a susceptible host becomes infected after contact with an object contaminated by a source organism, such as a contaminated needle or dressing.

- **Droplet Transmission:** Occurs when an infected individual sprays moist droplets into the air during coughing, sneezing, speaking, and suctioning. These organisms infect a susceptible host when the droplet comes into contact with the mucous membrane of the host’s mouth, nose or eyes. It is possible for a host to facilitate the transmission by receiving the droplets on their hands and then immediately putting their hands in their mouth or eyes. Organisms spread on droplets are propelled for about 2 – 3 ft and will only remain in the air for a brief period of time before falling to the ground or other surface. The droplets dry up quickly and then are no longer considered a source of infection.

- **Vehicles Transmission:** As the name sounds these organisms are spread by one or more mediums which include food, water, blood, drugs and contaminated instruments. Examples include Hepatitis A, typhoid and giardia.

- **Vector-borne:** Diseases that are transmitted through an intermediate host such as a fly, mosquito or tick.

- **Airborne:** Diseases transmitted by microorganisms capable of being transmitted as droplet nuclei or dust particles through the atmosphere. These organisms are very small
and are capable of surviving in the air for longer periods of time and may be dispersed through air currents. These include tuberculosis, chicken pox and measles.

All pre-hospital providers are very familiar with Body Substance Isolation, and the importance of good hand washing. As a result we will not be spending time of the specifics of those in this CE, but rather look at the recommendations for airborne precautions, droplet precautions and contact precautions. We will also discuss specific infectious diseases you may come in contact with.

**Airborne Precautions**: should be followed when caring for a patient with a known or suspected infectious disease that can be transmitted by airborne droplets. These include measles, chicken pox, tuberculosis and disseminated (defined as more than twenty skin lesions outside the primary or adjacent dermatomes) varicella (shingles). These precautions include:

- **Transport**: The CDC recommendations for transporting such patients in an ambulance include minimum 6 – 12 air exchanges per hour, venting to the outdoors or high-efficiency filtration of recirculated air, separate air circulation between cab and patient compartment, keeping door/window closed between cab and patient compartment and airing out of vehicle after transporting.
- **Respiratory protection**: Wear respiratory protection (N95 respirators) when entering the location of a patient with known or suspected infectious pulmonary tuberculosis. Susceptible persons should not enter the room of patients known or suspected to have measles or varicella if other caregivers are available. If must enter, wear respiratory protection (N95 respirators).
- **Patient transport**: Have patient wear surgical mask if possible and tolerated.

**Droplet Precautions**: Used when caring for a patient with a suspected infectious disease that are spread through droplets. Some of the more common ones include: influenza (the flu), meningitis, RSV and pertussis.

- **Positioning**: Placement of patient to avoid contact within 3 ft of other persons
- **Mask**: Wear a mask when working within 3 ft of the patient
- **Patient transport**: Place a surgical mask on the patient if possible and tolerated.

**Contact Precautions**: Used with patients who are infected with or colonized with organisms capable of being transmitted by contact including direct or indirect contact. Some of the more common ones you will see are: Clostridium difficile (C-Diff), MRSA, Lice, Scabies, Gastroenteritis, RSV, and infected wounds.

- **Gloves and Hand washing**: Wear gloves when entering the patient’s room. Change gloves when ever grossly contaminated or between procedures to prevent cross contamination. Wash hands with an antimicrobial agent or waterless antiseptic agent immediately upon removal of gloves and whenever hands touch a potentially contaminated surface.
- **Gown or outerwear**: Worn when entering the patient’s room if substantial contact with patient or potentially contaminated surfaces or objects in the room is anticipated. Properly dispose of or decontaminate gown or outerwear.
- **Patient care equipment**: Dispose of nonreusable equipment appropriately. Nondisposable equipment must be cleaned and disinfected prior to being placed back in service.
Specific Infectious Diseases

Influenza
Influenza virus causes and acute upper respiratory illness lasting between 7 and 14 days, depending on the severity of symptoms. It is spread by droplet transmission. Infection occurs in the upper and lower respiratory tract when the virus enters respiratory epithelial cells in the trachea and bronchi. The virus is spread in respiratory secretions for 5 to 10 days. Symptoms include headache, myalgia, sore throat, dry cough, chills, fever, rhinorrhea, wheezing and rhonchi. Complications in the elderly and very young include the development of primary or secondary pneumonia. Droplet precautions as well as standard precautions should be followed.

Respiratory Syncytial virus (RSV)
RSV is caused by an RNA paramyxovirus. The virus is called syncytial virus because it causes cells to fuse and form multinucleated giant cells. It is a seasonal virus that causes acute respiratory distress. RSV season in the United States occurs in the winter months, with the peak of season in January and February. It accounts for more than 100,000 hospitalizations of children early year. Clinical manifestations are dependent on the age and health of the individual affected. Signs and symptoms may include: runny nose, congestion, cough, sore throat, headache and malaise. In infants and young children you may see listlessness, decreased appetite, fever, wheezing, tachypnea and cyanosis. For infants one year of age or less, the virus usually causes a lower respiratory tract infection, either bronchiolitis or pneumonia. Apnea is a risk for 20% of all infants hospitalized with RSV and puts them at risk for sudden death. There is currently no vaccine to prevent RSV. Transmission occurs via respiratory droplets and via direct contact with hands that been contaminated with mucus from the nose or mouth of an infected individual. Therefore droplet and contact precautions should be followed when ever transporting a patient with confirmed or suspected RSV.

Clostridium Difficile (C-Diff)
Clostridium difficile (C-Diff) is a spore forming, Gram-positive anaerobic bacillus that produces two exotoxins (a toxin secreted by bacteria). It is a common cause of antibiotic-associated diarrhea (AAD). It accounts for 15-25% of all episodes of AAD. Clinical symptoms include watery diarrhea, fever, loss of appetite, nausea and abdominal pain and tenderness. The risk for C-Diff increases in patients with:

- Antibiotic exposure
- Proton pump inhibitors
- Gastrointestinal surgery/manipulation
- Long length of stay in healthcare settings
- A serious underlying illness
- Immunocompromising conditions
- Advanced age

C-Diff is shed in feces. Any surface, device or material (e.g. commodes, bathing tubs, electronic rectal thermometers) that becomes contaminated with feces may serve as a reservoir for the C-Diff spores. C-Diff spores are transferred to patients mainly via the hands of healthcare providers who have touched a contaminated surface or item. Contact precautions must be used for all patients with diagnosed or suspected C-Diff. Gloves and gowns must be used when entering a patient’s room and during any patient care. Because
Meningitis:
There are various etiologies of meningitis including, viral, fungal, bacterial (associated with the highest mortality), parasitic and from medications. It is an inflammation of the meninges and underlying CSF. Depending on the onset of symptoms, meningitis can be classified as acute or chronic. Acute meningitis, usually bacterial in origin, evolves over hours to days. Chronic meningitis has an onset of weeks to months. Common Signs and Symptoms: Bacterial meningitis may develop within hours. Viral meningitis symptoms may also develop quickly or over several days. Not all symptoms may appear or appear in the same order but the hallmark signs and symptoms of meningitis are fever, headache and neck stiffness.

- Sudden high fever
- Severe, persistent headache
- Neck stiffness and pain that makes it difficult to touch your chin to your chest
- Nausea and vomiting, sometimes along with diarrhea
- Confusion and disorientation (acting goofy)
- Drowsiness or sluggishness
- Eye pain or sensitivity to bright light
- Muscle or joint pain or weakness

Other Potential Signs and Symptoms of Meningitis
- Abnormal skin color
- Stomach cramps
- Ice-cold hands and feet
- Dizziness
- Reddish or brownish skin rash or purple spots
- Numbness and tingling
- Seizures

Transmission may occur via the droplet, contact or airborne routes. Therefore droplet, contact and airborne precautions should be followed.
1. In order for a disease to be infectious three basic elements must be present: ____________________________, ___________________________ and ____________________________________.

2. Explain how indirect contact occurs in the spread of infectious diseases.

3. Examples of diseases transmitted by airborne transmission include ____________________, ____________________, and ____________________.

4. Respiratory precaution that must be used when transporting a patient with a suspected airborne disease must include
   A. Provider and patient should wear a surgical mask
   B. Provider should wear a N95 respirator and patient wear a surgical mask
   C. Provider wear a surgical mask and patient wear a N95 mask
   D. Provider need not wear a mask, patient wear a surgical mask

5. Pertussis is spread via
   A. Airborne transmission
   B. Droplet transmission
   C. Contact transmission
   D. Vector-borne transmission

6. Contact precautions include:
   A. Gloves and handwashing
   B. Gown when substantial contact with patient is expected
   C. Nonreusable equipment cleaned and disinfected prior to being placed back in service.
   D. All of the above

7. Precautions that should be taken for a patient with suspected influenza are
   A. Contact
   B. Airborne
   C. Droplet
   D. Contact and Droplet
8. Precautions that should be taken for patient with suspected RSV include:
   A. Contact
   B. Airborne
   C. Droplet
   D. Contact and Droplet precautions

9. Alcohol-based hand rubs kill the spores responsible for C-Diff infections
   A. True
   B. False

10. Transmission of meningitis may occur via droplet, contact or airborne routes depending on the causative agent.
    A. True
    B. False

If you are NOT a member of the McHenry Western Lake County EMS System, Please include your address on each optional quiz turned into our office. Our mailing address is: Northwestern Medicine – McHenry Hospital EMS, 4201 Medical Center Drive, McHenry, Illinois 60050. We will forward to your home address verification of your continuing education hours.

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