



## **Infection Control Fundamentals**

### **Overview**

There is increasing concern about preventing the spread of infectious diseases in today's healthcare environment. Serious diseases such as HIV, hepatitis B and C, and tuberculosis are some of the most commonly transmitted. Therefore, there is an urgent need for healthcare providers to review safe work practices to prevent the spread of these and other infectious diseases. This material is designed to help healthcare workers learn about these infectious diseases, and how to safely treat patients while minimizing the risk of unwanted transmission to workers and other patients.

### **Purpose**

This course is designed to educate healthcare workers on the chain of infection and how to prevent the spread of infectious diseases.

### **Introduction**

As a healthcare worker, you are in contact with people of all ages and backgrounds, providing a service that makes a real difference in people's lives. One of your most important responsibilities is to prevent and control the spread of infectious diseases. There are many ways infectious diseases can be spread. For example, patients have developed infection because healthcare workers have failed to wash their hands, or because reusable equipment was not properly cleaned, disinfected or sterilized. It is not only the patient who is at risk; healthcare workers have acquired infections, such as HIV, hepatitis B and hepatitis C from accidental needle sticks, and become infected with tuberculosis by breathing air contaminated with tubercular bacterium. Because of the growing number of cases of HIV, hepatitis B and hepatitis C, the resurgence of tuberculosis, and the development of multi-drug resistant bacteria, it is more essential than ever that you take precautions to protect your patients and yourself from infection. This course will provide you with the information you need to prevent and control these infectious diseases.

### **The Chain of Infection**

The chain of infection is the process by which infectious disease is spread or transmitted. The process begins with a causative agent or pathogen. A pathogen may be a bacterium, such as staphylococcus, streptococcus, or Salmonella. It may be a virus, such as HIV, hepatitis B, or herpes simplex. It may be a fungus like Candida, or a parasite such as a tapeworm or scabies.

#### **Modes of Transmission**

The mode of transmission is the mechanism by which the pathogen is transmitted from the reservoir to a susceptible host who may then become infected. A pathogen may be transmitted by contact with an infected person, through airborne transmission of contaminated droplets, or common vehicle transmission, such as from contaminated objects, like food, water, reusable equipment or multi-dose vials.

#### **Portal of Entry**

The portal of entry is the path by which a pathogen enters the susceptible host. The portal of entry may be the respiratory tract, such as when pathogens are inhaled. Pathogens may enter the gastrointestinal or genitourinary tract by contaminated food, water, or objects. Non-intact



skin, such as a lesion or wound, and mucous membranes may also be a portal of entry. Entry may also occur by insertion of needles or other devices.

### **Blood Borne Infections- HIV and Hepatitis B and C**

AIDS and hepatitis B and C are blood borne infections caused by blood borne pathogens, (disease-causing agents found in the blood). The human immunodeficiency virus (HIV) is the pathogen that causes AIDS. The hepatitis B virus (HBV) causes hepatitis B, and the hepatitis C virus (HCV) causes hepatitis C. There are many other blood borne infections, such as syphilis. However, AIDS and hepatitis B and C are the main concern. HIV, HBV and HCV are found not only in the blood, but also in body fluids that contain blood, and in certain other body fluids of those who are infected. You can only get AIDS or hepatitis B or C if you are exposed—if the virus from the blood or body fluid of an infected person gets into your body. For example, unless precautions are taken, you could become infected by getting an accidental puncture from a device or other sharp that has been contaminated with the blood or fluid of an infected person. HIV and hepatitis B and C are all serious diseases that can be life threatening if not properly identified and treated. Although there is an effective vaccine for hepatitis B, unfortunately, vaccines do not exist for either HIV or hepatitis C. The CDC does not currently recommend a post exposure prophylaxis treatment for HCV exposure, but recent studies indicate that interferon treatment early in the course of HCV infection is associated with a higher rate of resolved infection. Attention should be given to the rapidly changing therapies for HCV. Blood borne infections and their prevention will be covered more thoroughly in another course.

### **Hand Hygiene**

Routine hand hygiene is considered the single most important preventive measure in reducing the risk of health care-acquired infections, also known as "nosocomial infections." Many of the resident skin microorganisms are not highly virulent and are not implicated in infections other than skin infections. However, some of these microorganisms can cause infections when invasive allow pathogens to enter deep tissues. By contrast, the transient microorganisms on the hands of hospital personnel may be acquired from colonized or infected patients, and may cause health care-acquired infections. It is the removal of this population of pathogens that makes routine hand hygiene imperative. Indications for routine hand hygiene are:

- Before and after using gloves
- Before performing invasive procedures
- Before taking care of particularly susceptible patients
- Before providing wound care

After any activity in which microbial contamination is likely to occur. This includes contact with mucous membranes, blood and body fluids, excretions or secretions, and after touching equipment and devices that are likely to be contaminated, such as a urinal or a bedpan. The most recent CDC guideline states that when hands are visibly dirty or contaminated, they should be washed with soap and water. The recommended technique is wetting the hands first, then rubbing hands together vigorously for at least 15 seconds, covering all surfaces of the hands and fingers, followed by thorough rinsing under a stream of warm water. Hands should be dried with a disposable towel, and a towel should be used to turn off the faucet.



If hands are not visibly soiled, they should be decontaminated with an alcohol-based antiseptic agent. An amount of the agent recommended by the manufacturer should be applied to the palm of one hand, and then the hands should be rubbed together so the agent covers all surfaces of the hands and fingers until the hands are dry. Remember that hand hygiene remains important both before and after gloved procedures.

### **Personal Protective Measures**

Another important preventive measure is putting a barrier between you and the possible source of infection through the use of personal protective equipment such as gloves, a mask and protective eyewear or a protective face shield and protective clothing. Your employer must provide you with clean protective equipment for each patient, and you should know where the equipment can be obtained. You should know when to use it, how to put it on correctly, how to take it off safely, and what to do with it after use.

### **Gloves**

Gloves are the most commonly used type of personal protective equipment. Gloves must be worn whenever there is a danger of touching or handling blood or other potentially infectious materials. For example, gloves must be worn when performing or assisting in surgery, when changing a dressing, and when cleaning up and decontaminating a blood spill. Gloves must also be worn when drawing blood or performing any other invasive procedure. You should wear gloves during patient contact if you or the patient has sores, skin rashes, broken skin, bleeding, or open wounds. However, to prevent chapping and other skin irritations, only wear gloves when there is a risk of exposure. When putting on gloves, examine them to make sure they are free of holes or tears. Remember to change gloves as soon as is practical if they become contaminated or no longer effective due to sweat from your hands, or if they have holes or tears. Be sure to wash your hands before re-gloving. When taking off gloves, avoid skin contact with the outside of the glove by grasping the other glove at the cuff and pulling it off inside out. Disposable latex or vinyl gloves should always be thrown away after each patient, and should never be washed and re-used.

### **Face Mask and Protective Eyewear**

Facemasks, face shields, and protective eyewear are used to protect the mucous membranes of your eyes, nose, and mouth. They should be worn whenever there is a chance that blood or other infectious materials will splash, spatter, or spray. Use your best judgment in determining when to wear them. Facemasks are ineffective when they become wet during long procedures and should be replaced as soon as is practical. Facemasks and eyewear should only be removed after washing hands. To avoid possible broken skin contact, the eyewear should be handled by the arms, and the facemasks should be handled by the ties or strings. Used facemasks should be properly discarded, and used eyewear should be cleaned and disinfected. Also, protective resuscitation equipment-preferably the kind with one-way valves to prevent fluids from entering the rescuer's mouth-should be readily available for emergencies where mouth-to-mouth resuscitation is anticipated.



### **Protective Clothing**

In addition to face masks and eyewear, protective clothing with long sleeves, such as disposable gowns, must also be worn when there is a risk of splashes of potentially infectious materials. Use your best judgment in selecting the necessary equipment. Keep in mind that protective clothing must prevent blood or other body fluids from passing through to your clothing. Protective clothing must be removed as soon as is practical if it becomes soiled with blood or other body fluids. To remove a soiled disposable gown, be careful not to touch the outside of the gown. Keep it away from your body and roll the gown into a ball so that the contaminated side is in the center. Dispose of the gown and be sure to wash your hands.

### **Additional Work Practice Controls**

In addition to the appropriate use of personal protective equipment, OSHA requires that other work practice controls be observed. Precautions must be taken when handling sharps, working with lab materials, decontaminating care areas and equipment, handling laundry, and disposing of regulated waste.

#### **Safer Needle Devices**

In 2000, the CDC estimated that 600,000 to 800,000 needle stick or other percutaneous injuries occur annually among healthcare workers in all healthcare fields. However, it is said that this number could be reduced by 62 to 88 percent through the use of safer medical devices. These will be discussed in another course.

#### **Respirators**

There are two forms of respirators that can be used to reduce the potential of airborne contaminants:

**Powered Air-Purifying Respirators (PAPR)** - A PAPR uses a HEPA filter, which removes the contaminant and supplies purified air to a face-piece, hood or helmet. PAPRs should be used when disposable and reusable half-masks do not provide adequate protection.

**Positive-Pressure Supplied-Air Respirator** - This type of respirator uses compressed air from a dependent source and delivers air under pressure to a half-mask or full face-piece. This should be used when disposable, reusable respirators or PAPRs do not provide adequate protection.

### **Conclusion**

There are many ways to protect yourself and others from infections. Be sure to learn the specific precautions you should take for your particular job. If you apply what you have learned on a daily basis, you should be able to prevent the transmission of infectious diseases and perform your job safely and with confidence.