

## essential terms

aerosols  
 airborne transmission  
 assigned protection factor (APF)  
 bloodborne pathogens  
 chain of infection  
 contact transmission  
 double-bagging  
 droplet transmission  
 elastomeric facepiece respirator (EFR)  
 filtering facepiece respirator (FFR)  
 fomite  
 hand hygiene  
 healthcare-associated infections (HAIs)  
 high-efficiency particulate air (HEPA)  
 isolation precautions  
 personal protective equipment (PPE)  
 powered air-purifying respirators (PAPR)  
 standard precautions  
 transmission-based precautions  
 vector-borne transmission  
 vehicle-borne transmission



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## Learning Outcomes

- 3.1** Identify the elements in the chain of infection and the ways in which disease can be transmitted.
- 3.2** Demonstrate knowledge of infection control practices and guidelines related to phlebotomy.

## Related NAACLS Competencies

- 2.1** Demonstrate knowledge of infection control and safety.
- 2.2** Identify policies and procedures for maintaining laboratory safety.
- 2.3** Demonstrate accepted practices for infection control, isolation techniques, aseptic techniques, and methods for disease prevention.
  - 2.3.1** Identify and discuss the modes of transmission of infection and methods for prevention.
  - 2.3.2** Identify and properly label bio hazardous specimens.
  - 2.3.3** Discuss in detail and perform proper infection control techniques, such as hand hygiene, gowning, gloving, masking, and double-bagging.
  - 2.3.4** Define and discuss the term "healthcare-acquired infection".

2.4 Comply with federal, state, and locally mandated regulations regarding safety practices.

2.4.1 Observe the OSHA Bloodborne Pathogens Standard and Needle Safety Precaution Act.

2.5 Describe measures used to ensure patient safety in various patient settings, e.g., Inpatient, outpatient, pediatrics, etc.

## Introduction

All healthcare personnel must help prevent the spread of infection by providing a clean environment while caring for patients. Doing so reduces the chances of infecting patients, visitors, and healthcare workers.

## 3.1 Disease Transmission

Diseases are transmitted in many different ways. For example, they can be passed from person to person through direct contact or can be transmitted through the air. Understanding the elements needed for infections to occur and how diseases are transmitted is the first step in learning to control infections.

### Chain of Infection

Most infections can be prevented by hand hygiene and other precautions that break any of the links in the **chain of infection**. The chain of infection contains these six factors (links) that must be present for an infection to occur:

1. An infectious agent
2. A reservoir
3. A portal of exit
4. A mode of transmission
5. A portal of entry
6. A susceptible host

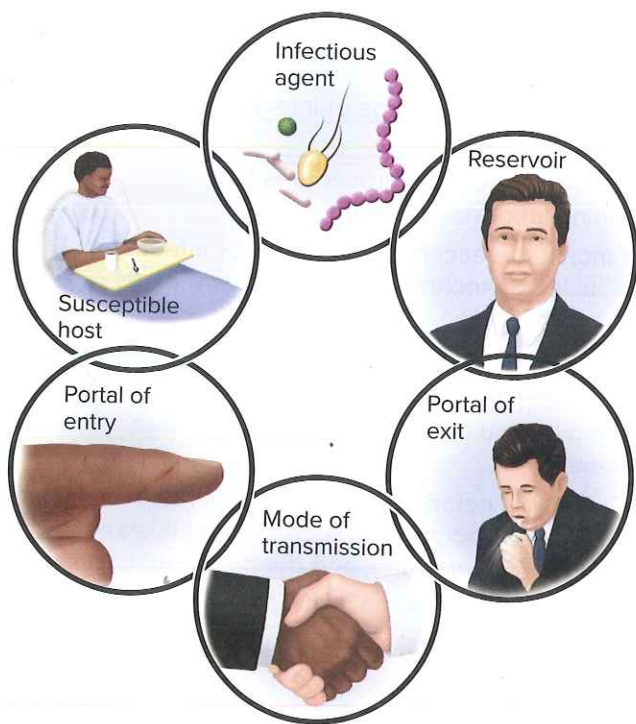
Infectious organisms can easily be passed from one link in the chain of infection to the next. If the chain is broken at any of the links, an infection will not develop (see Figure 3-1 and Table 3-1).

### Modes of Transmission

**Contact transmission** is the most frequent source of healthcare-associated infections and can occur by either direct or indirect contact. Direct contact requires a physical transfer of pathogens from reservoir to susceptible host (person to person). This transfer can take place by something as simple as a touch.

Indirect contact occurs when a **fomite**, a nonliving item such as a soiled dressing, is handled prior to contact with a susceptible host (person to contaminated item to person). Indirect contact most often occurs when healthcare employees fail to wash their hands and change their gloves between patients.

**Droplet transmission** is a form of contact transmission, but the method of transfer is different. This form



**Figure 3-1** If one of the links in the chain of infection is broken, infection can be prevented.



**TABLE 3-1 Chain of Infection**

Link	Description	How the Phlebotomist Can Break the Links
Infectious agent	Pathogen or disease-producing microorganism	<ul style="list-style-type: none"><li>• Perform hand hygiene.</li></ul>
Reservoir	Site where the organism grows and multiplies, such as humans, animals, water, food, or air	<ul style="list-style-type: none"><li>• Wear gloves when obtaining and handling any specimens.</li></ul>
Portal of exit	Skin, respiratory tract, gastrointestinal tract, eyes, ears, mouth, urinary tract, and reproductive tract	<ul style="list-style-type: none"><li>• Dispose of contaminated materials properly.</li></ul>
Mode of transmission	How the pathogen travels; most commonly by contact, droplet, or air, either direct or indirect	<ul style="list-style-type: none"><li>• Use required personal protective equipment, including mask, gloves, and eye protection.</li></ul>
Portal of entry	Respiratory system, eyes, ears, urinary tract, reproductive tract, or break in skin	<ul style="list-style-type: none"><li>• Perform aseptic technique when required.</li></ul>
Susceptible host	Person at risk for developing an infection from the pathogen, such as one who is immunocompromised; has wounds or drain tubes, poor nutrition, underlying diseases, stress, or lack of sleep; is very young or elderly; or is undergoing invasive procedures	<ul style="list-style-type: none"><li>• Follow isolation precautions when required.</li></ul>

occurs when droplets from an infected person are propelled short distances (3 to 6 feet) and enter the susceptible host through the nasal mucosa, the mouth, or the conjunctiva of the eye. Examples of infections spread by droplet transmission are influenza, mumps, and rubella. Droplets are propelled by coughing, sneezing, breathing, and talking. The droplets are not suspended in the air, as they are with airborne transmission. Droplet transmission can also occur with blood or body fluids and during specimen handling.

In **airborne transmission**, small particles carry the pathogens. These particles can be widely dispersed by air currents before being inhaled by a host. Legionnaires' disease, varicella (chickenpox or shingles), and tuberculosis (TB) are examples of infections spread by airborne transmission. Airborne transmission can also occur when **aerosols** are created during the removal of caps from tubes of blood, urine, or other body fluid specimens. Aerosols are tiny, airborne droplets of fluid that are often so small they go unnoticed because you cannot smell or feel them, yet they can carry microorganisms. You should always use appropriate personal protective equipment (PPE), which will be discussed later in this chapter. Use a specimen shield or an approved ventilation hood when opening specimens during processing (see Figure 3-2).

**Vehicle-borne transmission** occurs when a fomite comes in contact with contaminated items, such as food, linen, or equipment. The fomite becomes a vehicle for spreading disease when it is touched or ingested by a susceptible host. To prevent this mode of transmission, soiled linen and equipment must be cleaned or disposed of properly.

**Vector-borne transmission** occurs when a living host, such as an animal or insect, comes in contact with a contaminated item, such as food, linen, or equipment. The animal or insect becomes a vector that carries and transmits disease to a susceptible host. A mosquito that carries and spreads the West Nile virus is an example of vector-borne transmission.



**Figure 3-2** A phlebotomist prepares a specimen behind a protective shield.

Sandra Mesrine/McGraw-Hill Education



## Drug-Resistant Bacteria

Several bacteria have become resistant to antibiotics, making infection control more difficult. Extra precautions are often taken with patients who are infected with or serve as reservoirs of these bacteria.

Methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant enterococci (VRE), multidrug-resistant *Acinetobacter baumannii* (MDRAB), *Clostridium difficile* (C-diff) enteritis, and *Pseudomonas aeruginosa* are examples of infectious agents that are spread by contact transmission. MRSA is a type of bacterium that is resistant to methicillin and other common antibiotics. MRSA and other staphylococci (staph) infections occur most frequently among patients in hospitals, dialysis centers, and nursing homes who have weakened immune systems.

MRSA infections are difficult to treat and can lead to tissue loss and sepsis. **Sepsis** is a life-threatening response of the body to infection. MRSA can be transmitted from person to person (Figure 3-3). Hands, shoes, and clothing are easily contaminated during the process of caregiving or from contact with environmental surfaces, such as beds, countertops, and doorknobs. To identify potential reservoirs, some hospitals require healthcare workers to swab the nasal passages of newly admitted patients to determine if MRSA is present.

MDRAB is found in soil and water. It is able to become drug resistant from genetic materials of other resistant bacteria. It can cause infections that range from pneumonia to serious blood and wound infections. Enterococci are bacteria that are normally found in human intestines. These bacteria can cause infections. Sometimes the bacteria are resistant to the antibiotic vancomycin, which is used to treat enterococcal infections. VRE are often passed by direct contact from person to person and by people who touch contaminated surfaces. The infection is also spread from the hands of healthcare providers to other people or surfaces.

*C-diff* is a spore-forming bacterium that can cause diarrhea and can live outside the human body for a very long time. It can spread from person to



**Figure 3-3** Signs of a probable MRSA infection. Protecting your patient from MRSA is a necessary part of infection control.  
Centers for Disease Control and Prevention

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person and can be found on bed linens, bedrails, and medical equipment. The infection can spread from the hands of healthcare providers to other people or surfaces. Some strains of *C-diff* have formed resistance to antibiotics such as ciprofloxacin (Cipro) and levofloxacin (Levaquin).

*Pseudomonas aeruginosa* causes many healthcare-associated infections. Preventing exposure to this bacterium is difficult because it is found on nearly every fomite from hospital room furniture and bathroom surfaces (such as sinks, faucets, and toilets) to various forms of patient care equipment. Although *Pseudomonas* does not typically cause a rapid, severe infection, its increasing resistance to multiple drugs causes significant health risks.

1. List the links in the chain of infection.
2. Explain the difference between airborne transmission and droplet transmission.



## Checkpoint Questions 3.1

## 3.2 Controlling Infection

As a healthcare worker, you will come across the concept of infection control on a daily basis. Working safely in any healthcare setting requires careful attention to detail, from routine hand hygiene to more complex infection prevention measures. Protecting the safety of patients, colleagues, and yourself is a key aspect of your career as a phlebotomist.

Standards have been developed by the Centers for Disease Control and Prevention (CDC) to prevent healthcare-associated infections. **Healthcare-associated infections (HAIs)**, sometimes called *healthcare-acquired* and previously known as *nosocomial infections*, are infections that occur while a patient is hospitalized or is receiving treatment for another condition in any type of healthcare facility. According to the CDC, about 1 in every 25 hospital patients will develop a healthcare-associated infection. Phlebotomists come in contact with many patients and can contribute to these infections if they do not follow infection control standards.

### Hand Hygiene

Correct **hand hygiene** is one of the most critical steps in preventing HAIs. Hand hygiene includes both handwashing and the use of alcohol-based hand rubs. Handwashing is the best method of cleaning your hands, but the use of alcohol-based hand rubs is acceptable in many circumstances, such as when you have no visible soilage on your hands (see Table 3-2 and Figure 3-4). Follow the steps in Learn How 3-1 when performing hand hygiene. Use the competency checklist *Hand Hygiene* at the end of this chapter to review and practice the procedure.

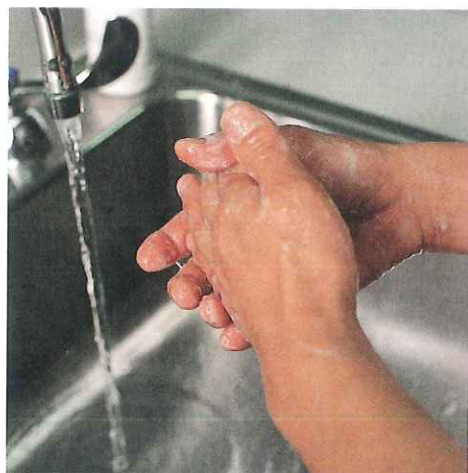
### Respiratory Hygiene and Cough Etiquette

Because of the potential for an outbreak of respiratory illness, such as Flu, RSV, and COVID-19, the CDC recommends the respiratory hygiene and cough etiquette standard. This standard applies to everyone and is added to the standard precautions for healthcare settings. Individuals should cover their cough or sneeze, use the flu salute (coughing or sneezing into your upper sleeve), and clean their hands frequently. The specifics of the standard are shown in Figure 3-5.



**TABLE 3-2** Hand Hygiene Procedures for Phlebotomists

Recommended Practices
<ul style="list-style-type: none"><li>• Wash your hands at the beginning of the workday.</li><li>• Wash your hands with soap and water whenever they are visibly contaminated with blood or other body fluids.</li><li>• If your hands are not visibly contaminated, you can use an alcohol-based hand rub.</li><li>• Wash your hands at the end of the workday before leaving the facility.</li></ul>
Indications for Hand Hygiene
<ul style="list-style-type: none"><li>• Before putting on and after removing gloves</li><li>• Between patient contacts; between different procedures on the same patient</li><li>• After touching blood, body fluids, secretions, excretions, or contaminated objects</li><li>• After handling specimen containers or tubes</li><li>• Before inserting any invasive device</li><li>• After contact with the patient's skin</li><li>• After contact with wound dressings (bandages)</li><li>• After contact with inanimate objects near a patient</li><li>• Before eating, applying cosmetics, or manipulating contact lenses</li><li>• After restroom visits, eating, combing hair, handling money, and any other time hands get contaminated</li></ul>
Advantages of Alcohol-Based Hand Rubs (Foam or Gel)
<ul style="list-style-type: none"><li>• They kill more effectively and more quickly than handwashing with soap and water (only when there is not visible contamination).</li><li>• They are less damaging to the skin than soap and water, resulting in less skin irritation.</li><li>• They require less time.</li><li>• Dispensers can be placed in more accessible areas.</li></ul>

**A****B****Figure 3-4** (A) Handwashing. (B) Alcohol-based hand rub.

A: Jill Braaten/McGraw-Hill Education; B: Lillian Mundt

## Disinfecting Surfaces and Equipment

Surfaces and equipment can act as a source of infection if not kept clean. The CDC recommends “cleaning high-touch surfaces at least once a day or as often as determined is necessary.” In the medical setting, a list of such surfaces includes, but is not limited to, counter tops, writing instruments, phlebotomy carts and trays, computer keyboards, point-of-care testing equipment, phones, pagers and rover devices.

Disinfectants may include 10% bleach, 3% hydrogen peroxide, 70% isopropyl alcohol, or specialized chemical disinfectant wipes (Figure 3-6). The surface is either wiped or sprayed with the disinfectant and left to remain on the surface for a period of time (contact time as indicated on the label). Some procedures include wiping off the residue with a clean cloth.

In the medical laboratory, surfaces are decontaminated/disinfected at least every shift or more often with a 10% bleach solution made fresh daily by mixing 1 part household bleach (5% sodium hypochlorite) with 9 parts tap water. Because bleach is corrosive, equipment is usually cleaned with peroxide or alcohol at least daily. Equipment that is used for infectious disease testing



**Handwashing**

1. Remove all rings and jewelry.
2. Turn on the water and adjust the temperature to warm.
3. Wet your hands liberally with the fingertips pointing down and without leaning your body against the sink area.
4. Apply soap and work up a good lather. Use circular motions while applying friction, being sure to interlace your fingers to clean between them, for 2 minutes at the start of your workday, a minimum of 20 seconds between patients and between procedures on the same patient, and 1 to 2 minutes when your hands are soiled.
5. Rinse each hand, allowing water to run from your wrist toward your fingertips, pointing your fingers downward.
6. Remove contamination from under your fingernails with a tool designed for that purpose, such as an orange stick. If a cleaning tool is not available, scratch the nails of one hand against the palm of the other hand to get the soap worked under the nails.
7. Repeat the preceding steps if your hands are very soiled.
8. Thoroughly wash the wrists.
9. Dry your hands thoroughly by patting them with paper towels and discard the paper towels into a waste receptacle without touching the receptacle.
10. Turn off the water with a clean, dry paper towel, if indicated. Many facilities have sensors that turn the water on automatically when hands are lowered to the faucet. Other facilities have a knee or foot device to turn the water on when depressed and off when released.
11. Clean the area using dry paper towels as needed.

**Alcohol-Based Hand Rubs**

1. Make sure there is no visible dirt or contamination.
2. Apply 1/2 to 1 teaspoon of alcohol cleanser (either foam or gel) to hands. Check the manufacturer's directions for the proper amount.
3. Rub your hands together vigorously, making sure all surfaces are covered including the fronts and backs of your hands and between your fingers.
4. Continue rubbing until your hands are dry. The drying of the alcohol kills microorganisms.

is usually is cleaned after every use with peroxide or alcohol. Disinfectants should only be used in a manner consistent with the use for which they were designed and never used on skin or for hand hygiene.

## Personal Protective Equipment (PPE)

The process of blood collection is an invasive procedure. Whenever blood or body fluid from one person comes in contact with another person, there is a major risk of exposure to **bloodborne pathogens**, such as human immunodeficiency virus (HIV), hepatitis C virus (HCV), and hepatitis B virus (HBV).

The use of **personal protective equipment (PPE)** is mandated by the Occupational Safety and Health Administration (OSHA) to minimize exposure to bloodborne pathogens. PPE includes gloves, gowns, masks, and protective eyewear (Figure 3-7). In addition, a face shield (Figure 3-8) can be worn over masks and glasses for another layer of protection when splashes may occur.

Stop the spread of germs that make you and others sick!

# Cover your Cough



MINNESOTA  
MDH  
DEPARTMENT OF HEALTH

Minnesota Department of Health  
625 N Robert Street  
St. Paul, MN 55105  
651-201-5414 or 1-877-676-5414  
www.health.state.mn.us

**Figure 3-5** Respiratory hygiene and cough etiquette.

Source: "Cover Your Cough Poster for Health Care," Minnesota Department of Health, <http://www.health.state.mn.us>. Copyright by MDH. All rights reserved. Used with permission.

Specialized PPE such as a **filtering facepiece respirator (FFR)**, **elastomeric facepiece respirator (EFR)**, or **powered air-purifying respirator (PAPR)** may be required when caring for patients with respiratory illnesses or contagious diseases. The level of protection a respirator provides is designated by an **assigned protection factor (APF)**. For example an APF of 10 means that





**Figure 3-6** Surface disinfectants include specialized chemical disinfectant wipes, 70% isopropyl alcohol, 3% hydrogen peroxide, and 10% bleach.

Lillian Mundt



**Figure 3-7** Personal protective equipment needed by healthcare workers may include gloves, masks and protective eyewear or face shields, gowns, and other protective clothing.



**Figure 3-8** Face shields can be worn over masks and glasses to provide protection when splashes and splatters are possible.

theskaman306/Shutterstock



**Figure 3-9** Filtering facepiece respirators (FFR): (A) N95, (B) KN95.

3M

there are one-tenth the number of particles inside the respirator as compared to air outside the respirator.

FFRs, also known as N95 and KN95 masks (Figure 3-9), have an APF of 10, are more form-fitting than surgical masks and should be fit tested. Both types of FFRs (N95 and KN95) include multiple layers of synthetic material and must be worn over the mouth and nose to be effective at filtering out 95 percent of airborne particle that are 0.3 microns or larger. FFRs are single use only and are not designed for use by children or people with significant facial hair. Both N95 and KN95 respirators can be made anywhere in the world, but the difference between them lies in the standards by which each is manufactured. N95 manufacturers use U.S. standards, while KN95 manufacturers use China standards. One word of caution: both types of FFRs should display certification by the CDC or National Institute for Occupational Safety and Health (NIOSH) and a lot number. If they do not, they are most likely fakes and may not provide the same level of protection.





**Figure 3-10** Elastomeric facepiece respirator (EFR).  
3M



**Figure 3-11** Powered air-purifying respirator (PAPR).  
3M



**Figure 3-12** (A) Poorly fitting glove. (B) Well-fitting glove.  
Sandra Mesrine/McGraw-Hill Education

Elastomeric facepiece respirators (EFRs) are made of synthetic or rubber, are reusable, and have filters or cartridges that are replicable (Figure 3-10). EFRs are designed to fit tightly on the face and must be fit tested. EFRs may be full-face, or half-face that can be used with glasses or goggles. EFRs provide the same level of protection as FFRs—an APF of 10. Disinfecting, cleaning and storage protocols must be followed.

A powered air-purifying respirator (PAPR) (Figure 3-11) offers the highest level of respiratory protection—APF of 25-100, and must be used when caring for patients with active respiratory diseases such as COVID-19. PAPRs are reusable and are battery powered to force air through replaceable **high-efficiency particulate air (HEPA)** filters or cartridges, providing the wearer with safe breathable air. PAPRs are approved for use with facial hair. Loose fitting PAPRs do not need to be fit tested but require that a mask be worn so that exhaled air is also filtered, because PAPR filters only filter inhaled air. Tight fitting PAPRs do not allow exhale air to return outside of the PAPR and do require fit testing. Disinfecting, cleaning and storage protocols must be followed.

In general, when using PPE, you should do the following:

- Don (put on) the PPE before contact with the patient, generally before entering the room.
- Apply PPE in correct sequence: gown, mask or respirator, goggles or face shield, then gloves.
- Use PPE carefully to avoid spreading contamination.
- Remove and discard PPE carefully, either at the doorway or immediately outside the patient's room; remove the respirator outside the room.
- Remove PPE in correct sequence: gloves, face shield or goggles, gown, then mask or respirator.
- Immediately perform hand hygiene.

When gloves are required, be sure to wear gloves that fit you properly. Proper fit is important for safety. If your gloves are too small, they may tear. If your gloves are too large, you may drop items or the glove material might interfere with the safe performance of procedures (see Figure 3-12 1). Follow the steps in Learn How 3-2 when donning and removing personal protective equipment. Use the competency checklist *Gowning, Gloving, and Masking* at the end of this chapter to review and practice the procedure. See Table 3-3 for more information about personal protective equipment and its applications.



**TABLE 3-3** Personal Protective Equipment

Type	When Used	Rules for Use
Gloves	For hand contact with blood, mucous membranes, and other potentially infectious materials or when non-intact skin is anticipated; when performing vascular access procedures; or when handling contaminated items or surfaces	<ul style="list-style-type: none"> <li>Gloves do not replace handwashing.</li> <li>Perform hand hygiene before applying and after removing gloves.</li> <li>When removing gloves, do not touch the outside (contaminated) area of the gloves (see Figure 3-13).</li> <li>Keep gloved hands away from your face.</li> <li>Avoid touching or adjusting other PPE.</li> <li>Remove gloves if they are torn and perform hand hygiene before putting on new gloves.</li> <li>Limit surfaces and items touched.</li> <li>Extend gloves over isolation gown cuffs.</li> </ul>
Gown	During procedures and patient care activities when contact of clothing/exposed skin with blood, body fluids, secretions, or excretions is anticipated	<ul style="list-style-type: none"> <li>Always avoid touching the contaminated outside the gown when removing it.</li> </ul>
Mask	During patient care activities likely to generate splashes or sprays of blood, body fluids, secretions, or excretions During mask mandates required by pandemics	<ul style="list-style-type: none"> <li>Fully cover your nose and mouth.</li> <li>Respirator masks, such as N95, N99, or N100, must be used for airborne precautions.</li> </ul>
Respirator	During care activities for patients with contagious respiratory diseases	Respirator masks such as N95, N99 or N100, EFRs or PAPRs must be used for airborne precautions; and may need to be fit tested prior to entering patient room.
Eye protection	During patient care activities likely to generate splashes or sprays of blood, body fluids, secretions, or excretions	<ul style="list-style-type: none"> <li>Goggles should fit snugly over and around the eyes.</li> <li>Personal glasses are not an acceptable substitute.</li> <li>You can use a face shield that protects the face, nose, mouth, and eyes.</li> <li>Face shield should cover your forehead, extend below your chin, and wrap around the side of your face.</li> <li>Position goggles over the eyes and secure to the head using the earpieces or headband.</li> <li>Position the face shield over your face and secure it on your brow with the headband.</li> </ul>

## Standard Precautions

Two levels of precautions are implemented by the CDC: **standard precautions** and **isolation precautions**. The first level is standard precautions applies to healthcare employees, combining hand hygiene and personal protective equipment use when working with blood and body fluids, non-intact skin, or mucous membranes. Standard precautions apply when are exposed to all body fluids, secretions, and excretions, except sweat, regardless of whether they contain visible blood. The use of standard precautions reduces the risk of microorganism transmission from both recognized and unrecognized sources of infection. (See the appendix *Standard Precautions*.)

In addition, the CDC advises that healthcare employees not wear artificial nails because they are more likely to harbor gram-negative and other pathogens, both before and after handwashing, than natural nails. Natural nails



## Using Personal Protective Equipment

**Gloves**

1. Wash your hands before putting on gloves.
2. Remove gloves by using your dominant hand to grasp the palm of the glove of your nondominant hand.
3. Gently pull the glove off the nondominant hand, turning it inside out and holding it in your dominant hand.
4. Encase the removed glove completely in the dominant hand to prevent the spread of contaminants.
5. Place the thumb or two fingers of the ungloved hand under the cuff of the remaining glove, being careful not to touch the contaminated outside of the glove with your bare hand.
6. Pull the glove over your hand, turning it inside out over the other glove, leaving none of the outside surface exposed.
7. Throw the gloves away in the appropriate waste container.
8. Wash your hands.

**Gown**

1. Put on a gown with the opening in the back.
2. Secure at the neck and waist.
3. Remove the gown by unfastening the ties.
4. Peel the gown away from the neck and shoulder and do not touch the outside.
5. Turn the contaminated gown outside toward the inside.
6. Fold or roll the gown into a bundle.
7. Discard the contaminated gown.

**Mask**

1. To put on the mask, place it over the nose, mouth, and chin.
2. Fit the flexible nose piece over the nose bridge.
3. Secure the mask on the head with ties or elastic.
4. Adjust the mask to fit.
5. To remove the mask, untie the bottom, then top tie.
6. Remove the mask from the face without touching the outside.
7. Discard the mask.

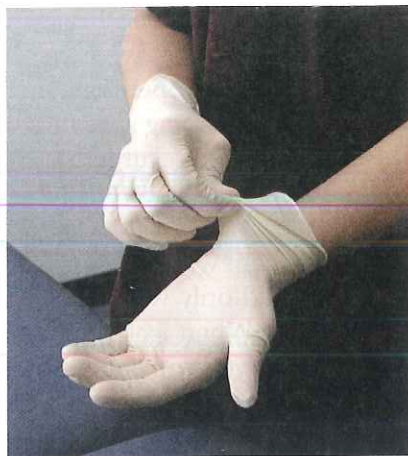
**Eye Protection**

1. To remove goggles or face shield, grasp the ear or headpieces with ungloved hands.
2. Lift them away from the face without touching the outside.
3. Place in designated receptacle for reprocessing or disposal.

**Communicate  
& Connect****Using Gloves**

When describing the phlebotomy procedure to the patient, explain that you are required to wear gloves to prevent the spread of infection, so they will feel more comfortable. Be certain to ask the patient if they have had any problems with allergies to gloves or tourniquets. Never expose patients to latex products.





(A) Grasp the outside edge near the wrist. Peel away from the hand, turning the glove inside out. Hold the glove in the opposite gloved hand.



(B) Hold the contaminated glove in the gloved hand while removing the second glove.



(C) Slide the ungloved finger under the wrist of the remaining glove. Peel off from inside, creating a bag for both gloves, and then discard.

**Figure 3-13** Removing gloves properly.  
A-C: © McGraw-Hill Education/Jan L. Saeger

should be clean, unpolished, and extend no more than one-fourth of an inch beyond the fingertips.

## Isolation Precautions

**Isolation precautions**, the CDC's second level of precautions, are based on how infectious agents are transmitted. For this reason, they are often called **transmission-based precautions**. The isolation categories include the following:

- Airborne precautions that require special air handling, ventilation, and additional respiratory protection (HEPA or N95 respirators).
- Droplet precautions that require mucous membrane protection (goggles and masks).
- Contact precautions that require gloves and gowns during direct skin-to-skin contact or contact with contaminated linen, equipment, and other fomites.
- Protective environment (PE) precautions that are used for patients who may have a compromised immune system. A healthcare worker could easily transmit disease to these patients. Therefore, healthcare workers should wear gown, gloves, and mask when interacting with patients in PE.

When entering the room of a patient on isolation precautions, always wear appropriate PPE. Remove your lab coat when required. If you are not certain what PPE to wear, consult a licensed practitioner caring for the patient, such as a nurse.

*Never* take a tray of phlebotomy equipment into an isolation room. Take only the equipment needed for the particular draw. If you need additional equipment, you must remove all PPE before leaving the room, collect the needed supplies, and then don new PPE before reentering the room. Similarly, you must leave all unused equipment or supplies in the room. For these reasons, it is very important to review the order and take only the necessary supplies into the room.

A special procedure called **double-bagging** is used to dispose of contaminated waste and equipment from an isolation room. Two biohazard-labeled



bags are used for this procedure. One person, wearing appropriate PPE, is in the room and places all items for disposal into the first bag. A second person remains at the doorway, with a second biohazard bag held wide open. The first person carefully places the closed bag into the second bag, making sure not to contaminate the outside of the second bag. The second bag is secured by the person outside the isolation room and can now be safely transported to the disposal area.

You should follow standard precautions with every patient when performing phlebotomy. Isolation precautions are used less often and only with patients who have or are suspected of having specific infections. When isolation precautions are mandated for a patient receiving phlebotomy, you will be required to follow the specific guidelines for the type of precautions implemented (see the appendix *Transmission-Based Precautions*). When point-of-care devices or other non-consumable equipment must be taken into an isolation room, it must be properly decontaminated upon leaving the room with manufacturer approved cleaning solution or wipes to avoid spreading infection. Always follow standard cleaning and disinfection procedures required by your facility.

### Checkpoint Questions 3.2

1. You have been asked to perform phlebotomy on a patient with an unknown respiratory disease. The patient has not been placed on isolation precautions, but as you approach the room, you can hear the patient coughing. What PPE would you use while drawing blood from this patient?
2. Briefly explain the differences between universal precautions, standard precautions, and isolation precautions.

## Chapter Summary

Learning Outcome	Key Concepts/Examples	Related NAACLS Competency
<b>3.1</b> Identify the elements in the chain of infection and the ways in which disease can be transmitted.	The chain of infection consists of the infectious agent, reservoir, portal of exit, mode of transmission, portal of entry, and susceptible host. Infection can occur if any of these links become compromised. Modes of transmission include contact, droplet, airborne, vehicle-borne, and vector-borne transmission.	2.1, 2.3, 2.3.1
<b>3.2</b> Demonstrate knowledge of infection control practices and guidelines related to phlebotomy.	Infection control practices include using appropriate hand hygiene, following respiratory hygiene and cough etiquette, wearing personal protective equipment (PPE), following standard precautions, and following appropriate isolation precautions when indicated.	2.2, 2.3, 2.3.2, 2.3.3, 2.3.4, 2.4, 2.4.1, 2.5



# Chapter Review

## A: Labeling

Label each of these links in the chain of infection.  
[LO 3.1]

1. infectious agent
2. mode of transmission
3. portal of entry
4. portal of exit
5. reservoir
6. susceptible host



## B: Matching

Match each link in the chain of infection with its description.

- |                                       |   |
|---------------------------------------|---|
| ___ 7. [LO 3.1] infectious agent      | a. break in skin, nose, mouth, and so on      |
| ___ 8. [LO 3.1] reservoir             | b. disease-producing microorganism            |
| ___ 9. [LO 3.1] portal of exit        | c. droplet, airborne, or direct contact       |
| ___ 10. [LO 3.1] mode of transmission | d. oozing skin, cough, urine specimen         |
| ___ 11. [LO 3.1] portal of entry      | e. person at risk for developing infection    |
| ___ 12. [LO 3.1] susceptible host     | f. site or person in which the pathogen grows |

## C: Fill in the Blank

Write in the word(s) to complete the statement.

13. [LO 3.2] One of the most critical steps in preventing HAIs is correct \_\_\_\_\_.
14. [LO 3.2] When entering a room that has airborne precautions, you should wear a(n) \_\_\_\_\_.
15. [LO 3.2] Three actions of the phlebotomist that can prevent the spread of infection include:

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## D: Sequencing

Place the items when donning PPE in the correct order (from 1 to 3).

- \_\_\_\_\_ 16. [LO 3.2] gloves
- \_\_\_\_\_ 17. [LO 3.2] goggles
- \_\_\_\_\_ 18. [LO 3.2] gown

Place the items when removing PPE in the correct order (from 1 to 3).

- \_\_\_\_\_ 19. [LO 3.2] gloves
- \_\_\_\_\_ 20. [LO 3.2] goggles
- \_\_\_\_\_ 21. [LO 3.2] gown

## E: Case Studies/Critical Thinking

- 22. [LO 3.1] A patient in an isolation room asks the phlebotomist to take a magazine the patient has just finished reading and return it to the visitor's lounge, where the patient's friend originally found it. How should the phlebotomist handle this request?
- 23. [LO 3.2] You are asked to give an infection control talk to children at a community outreach event. How should you instruct them to contain a cough or sneeze when a tissue is not available?

## F: Exam Prep

Choose the best answer for each question.

- 24. [LO 3.1] A phlebotomist enters a room to draw blood on a patient undergoing care for an infected wound. The site of the wound and its bandages are considered which link in the chain of infection?
  - a. Infectious agent
  - b. Mode of transmission
  - c. Portal of exit
  - d. Susceptible host
- 25. [LO 3.1] A fomite is a(n)
  - a. alcohol-based foam hand sanitizer.
  - b. contaminated object.
  - c. sterile container.
  - d. type of pathogenic bacterium.
- 26. [LO 3.1] Which of the following is an example of a healthcare-associated infection (HAI)?
  - a. A patient enters the emergency department with suspected food poisoning after eating at a local restaurant.
  - b. A patient admitted for a bleeding problem is found to have acute leukemia two days after admission.
  - c. A phlebotomist develops high blood pressure after having been working at a hospital for three months.
  - d. A phlebotomist who has a staph infection does a point-of-care blood draw from a hospital patient, who later develops a staph infection.



27. [LO 3.2] A patient in which type of isolation is the *least* likely to transmit disease to the phlebotomist?
- Airborne
  - Contact
  - Droplet
  - Protective
28. [LO 3.1] For which of the following diseases or conditions might a hospital routinely test patients being admitted to the hospital?
- Cancer
  - MRSA
  - Ulcer
  - Arthritis
29. [LO 3.1] Which of the following is not part of the double-bagging procedure?
- The first bag is closed and placed into a second bag while still in the isolation room.
  - The first bag is closed and placed into a second bag at the doorway to the isolation room.
  - The two bags are used for double-bagging must both be labeled as biohazard.
  - The bags must be handled in such a way as to not contaminate the outside of the second bag.
30. [LO 3.2] Double-bagging is
- using a bag inside a bag to transport specimens.
  - placing normal waste into two separate bags.
  - placing biohazardous material into a bag and then that bag into another bag.
  - wearing two pairs of gloves while working with biohazardous materials.
31. [LO 3.2] Personal protective equipment includes all of the following *except*
- eyewash.
  - face shields.
  - gloves.
  - gown.
32. [LO 3.1] A phlebotomist has been collecting specimens from the same patient on a daily basis for almost two weeks. On the current day, the phlebotomist notices that the patient has an oozing ulcer on his arm. This may be an example of what occurrence?
- From multiple blood collections.
  - Hospital acquired MRSA infection.
  - Patient response to a respiratory infection.
  - A normal skin condition that occurs in bed-ridden patients.
33. [LO 3.1] A woman who has a cold wipes her hands on a dinner napkin and leaves the napkin on the table when she leaves the restaurant. The server who clears the table touches the napkin and later develops a cold. What type of transmission has occurred?
- Airborne transmission
  - Vector-borne transmission
  - Vehicle-borne transmission
  - Droplet transmission
34. [LO 3.1] HAI is a term that was used to describe infections from
- Nasal passages.
  - A communal setting such as a school.
  - A healthcare facility.
  - A patient's home.
35. [LO 3.2] Which of the following can be used for proper hand hygiene? (choose all that apply)
- Alcohol-based gel.
  - Bleach.
  - Chemical disinfectant wipe.
  - Sodium hypochlorite.
36. [LO 3.2] Work surfaces and equipment are best disinfected with: (choose all that apply)
- chemical disinfectant wipes.
  - isopropyl alcohol.
  - sodium hypochlorite.
  - warm soapy water.

37. [LO 3.2] What should be done with a point-of-care device that has been used in an isolation room?
- Discard the device.
  - Take it back to the lab for cleaning.
  - Send it via pneumatic tube to housekeeping for cleaning.
  - Clean it just outside the isolation unit.
38. [LO 3.2] Which respiratory PPE is best used in daily routine care of non-infectious patients?
- Surgical mask
  - N95
  - EFR
  - PAPR
39. [LO 3.2] Which respiratory PPE is best used in care of patients with highly contagious respiratory illness?
- Surgical mask
  - N95
  - EFR
  - PAPR
40. [LO 3.2] Which PPE is known as filtering facepiece respirators?
- Surgical mask
  - N95
  - EFR
  - PAPR
41. [LO 3.2] Which PPE does not need fit testing prior to use?
- Surgical masks
  - Filtering facepiece respirators
  - Elastomeric facepiece respirators
  - Tight fitting powered air-purifying respirators
42. [LO 3.2] Which respirator is equipped with a HEPA filter?
- EFR
  - KN95
  - N95
  - PAPR



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NAME: \_\_\_\_\_ DATE: \_\_\_\_\_

## COMPETENCY CHECKLIST: HAND HYGIENE

Procedure Steps	Practice			Performed		
	1	2	3	Yes	No	Master
1. Assembles equipment and removes jewelry.						
2. Determines appropriate hand hygiene technique.						
3. Uses alcohol-based hand cleaner correctly.						
4. Washes hands by using paper towel to turn on the water supply.						
5. Adjusts the water temperature.						
6. Discards the paper towel.						
7. Dispenses an appropriate amount of soap into the hand.						
8. Creates a sufficient amount of lather.						
9. Sufficiently removes gross contamination from all skin surfaces.						
10. Cleanses the nail beds of each finger.						
11. Cleanses underneath the nails in an appropriate fashion.						
12. Rinses off the soap.						
13. Appropriately positions the hands while rinsing them.						
14. Dispenses soap into the palm of the hand.						
15. Ensures that all surfaces of the hands are washed.						
16. Rinses off the soap.						
17. Appropriately positions the hands while rinsing.						
18. Dries the hands, using paper towels.						
19. Uses paper towel to turn off the water supply.						

COMMENTS: \_\_\_\_\_

SIGNED

EVALUATOR: \_\_\_\_\_

STUDENT: \_\_\_\_\_

NAME: \_\_\_\_\_ DATE: \_\_\_\_\_

## COMPETENCY CHECKLIST: GOWNING, GLOVING, AND MASKING

Procedure Steps	Practice			Performed		
	1	2	3	Yes	No	Master
<b>Donning PPE</b>						
1. Removes the lab coat.						
2. Washes hands before putting on the protective clothing.						
3. Dons the gown, tying the ties at the neck and waist.						
4. Dons a mask.						
5. Positions the mask with the appropriate side facing out.						
6. Securely fastens the wire at the top of the mask around the nose.						
7. Secures the mask high on the head.						
8. Dons gloves.						
9. Positions the gloves with the cuff pulled over the sleeve of the gown.						
<b>Removing PPE</b>						
10. Removes the gloves.						
11. Removes the gloves inside out without contaminating the hands.						
12. Deposits the gloves in the appropriate receptacle.						
13. Removes goggles and/or face shield.						
14. Touches only the handles or head band when removing the mask.						
15. Deposits the goggles and/or face shield in the appropriate receptacle.						
16. Unties the gown at the waist if ties are at the back of the gown.						
17. Unties the gown at the neck.						
18. Removes the gown inside out.						
19. Does not touch the front of the gown with either the hands or the uniform during removal.						
20. Removes the mask by touching only the ties.						
21. Discards the mask.						
22. Properly washes the hands.						

COMMENTS: \_\_\_\_\_

SIGNED

EVALUATOR: \_\_\_\_\_

STUDENT: \_\_\_\_\_