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Section 1: Introduction

About This Course

People in your care are dependent on you for their health, safety, and well-being. But their health, safety, and well-being are also affected by healthcare-associated infections. Sadly, these infections are all too common. The good news is they are preventable. You must be familiar with infection control and prevention to prevent these infections. This course will teach you about healthcare-associated infections and how to prevent them.

About Infection Control and Prevention

The goal of this course is to familiarize non-licensed direct care staff in all settings with infection control and prevention for healthcare-associated infections.

Learning Objectives

After completing this course, you will be able to:

- Describe how infectious agents are transmitted and the chain of infection.
- Identify at least three ways to break the chain of infection.
- Explain additional infection control considerations.

Section 2: The Chain of Infection

The Six Links

An infection is an illness caused by harmful microorganisms. **Healthcare-associated infections** are infections a person contracts in a healthcare setting when receiving treatment.

These settings include:

- Hospitals
- Nursing facilities
- Home health
- Hospice
- Ambulatory care

These infections can affect any body system, but they most commonly involve the urinary tract, skin, bloodstream, gastrointestinal tract, and lungs.

A person can encounter hundreds of microorganisms on a daily basis. That does not mean that an infection will develop every time. In order for an infection to occur, a specific set of conditions must exist in a specific sequence (Peate, 2017). This is called **the chain of infection**.

Let's look closer at each link of the chain of infection.

Infectious Agent

An infection cannot occur without the presence of an infectious agent. This may be a bacterium, virus, parasite, or fungus. Whether exposure to a microorganism results in infection depends on different factors, including:

- The number of microorganisms
- The ability of the microorganisms to enter the body
- The susceptibility of the host
- The ability of the microorganisms to live in the host's body

Each infectious agent can live in its environment for different amounts of time. For example, the flu virus can live on an object's surface for up to 48 hours. But the spores of *Clostridioides difficile*, also called *C. diff*, can live on an object's surface for months to years if the surface is not cleaned correctly (Centers for Disease Control and Prevention [CDC], 2021).

Reservoir

This is the place where the infectious agent lives, grows, and multiplies. Reservoirs and an example of each type include:

- Humans: A person who has the flu virus.
- Animals: A raccoon who has the rabies virus.

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- Insects: A mosquito carrying malaria.
- Food: An undercooked chicken breast that has salmonella.
- Soil: Tetanus bacteria that is in the soil.
- Water: A freshwater lake that has *Legionella* bacteria.

The microorganisms must leave the reservoir before they may infect a host. The most common reservoirs within the human body include:

- Blood
- Body tissues
- GI tract
- The respiratory tract
- Urinary tract
- Reproductive tract

Keep in mind the reservoir may or may not have signs of being infectious. A **carrier** is a person or animal who carries the microorganism but does not have any clinical symptoms.

Portal of Exit

The infectious agent must leave its reservoir through a path or portal of exit. For example, when a pathogen causes respiratory disease and coughing or sneezing, it usually escapes through the respiratory tract. Portals of exit include the (Peate, 2017):

- Nose
- Mouth
- Open wounds
- Rectum
- Urethra
- Blood
- Body fluids

Method of Transmission

The infectious agent needs a way to travel from the reservoir to a new host. Transmission is how it spreads.

Portal of Entry

Once the infectious agent reaches the new host, it must enter the host. The portal of entry is the point where the infectious agent enters the body of the new host. This may be through:

- Non-intact skin, such as wounds
- Mucous membranes, such as the eyes, nose, or mouth
- Indwelling tubes, such as urinary catheters and feeding tubes

The portal of entry is often the same as the portal of exit. For example, when a person exhales infectious droplets and a person is close enough to inhale the droplets through their nose or mouth.

Susceptible Host

Last, the susceptible host is the person at risk of getting an infection. There is often some factor that causes the new host to be unable to resist the invading infectious agent.

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How Infection Spreads

It is important to understand how infectious agents are transmitted and spread from one person to another. Some infectious agents are transmitted only one way. Others can be transmitted in more than one way.

Contact transmission is the most common form of transmission. It involves both direct and indirect contact with the infectious agent.

Direct contact is the direct physical contact with the infected person, blood, or body fluids.

Examples of direct contact include:

- Contact with oral secretions
- Physical touch
- Sexual contact
- Contact with body lesions

The infectious agents transmitted this way include:

- Hepatitis B and C
- Staph
- MRSA

Indirect contact is the contact with a contaminated object. For example, a thermometer, doorknob, or a light switch that is contaminated with microorganisms.

Indirect contact also occurs when a healthcare worker touches an infected person or object and does not perform hand hygiene after.

Many infectious agents are transmitted by indirect contact. These include:

- MRSA
- *C. diff*
- VRE

Droplet transmission involves the spray of droplets by coughing or sneezing. Transmission can also occur during certain medical procedures. For example, when performing oral and nasal suctioning or during CPR. The droplets travel a short distance from the respiratory tract of the infected person into the nose, mouth, and/or eyes of the susceptible host.

Infectious agents transmitted this way include:

- The common cold
- Influenza
- COVID-19

Keep in mind viruses transmitted by droplets can also be transmitted through direct or indirect contact.

Airborne transmission is the transmission of an infectious agent through the air. This includes short and long distances. The susceptible host does not have to have direct face-to-face contact for transmission to occur. They do not even need to be in the same room with the infected person. Luckily, only a few infectious agents are transmitted this way. They include:

- Tuberculosis

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- Measles
- Chickenpox

Keep in mind some procedures may cause airborne transmission of COVID-19 (Palmore & Smith, 2022). You should stay updated and follow current recommendations on COVID-19 precautions as more becomes known.

Vehicle transmission is the transmission of an infectious agent through a “vehicle” such as food, water, or air. For example, when water becomes contaminated, the infectious agent can spread through the water.

Another example is food. When food is contaminated due to poor storage or handling, and a human eats that food, a foodborne illness can occur. Most foodborne illness is caused by bacteria, viruses, and parasites. Foodborne illness can also come from toxins and chemicals.

The air can also transport pathogens and aid in disease transmission. Aerosols are dust and small particles that can float in the air. The hantavirus, for example, is an infectious agent that can be found in mouse saliva, urine, and feces. When these substances dry, they disintegrate into fine particles. If humans inhale these fine dust particles, they can get a serious and potentially fatal respiratory infection.

Vector transmission occurs when an infection is passed from a living organism, such as mosquitoes, fleas, or ticks. The vectors are blood-sucking and they eat from an infected host, such as a human or animal. They then go on to bite another host and infect them. One example of this is Lyme disease.

Keep in mind the vector is contagious with an infectious pathogen for the rest of its life (World Health Organization [WHO], 2020). This means they can pass the disease onto many different hosts.

Risk Factors for Infection

It is important to understand that the body has several defenses to fight infectious agents. Some of these defenses stop the chain of infection at the portal of entry. This is done by preventing the infectious agent from getting into the body. But if this defense is not working well, it puts the body at risk for infection.

One of these defenses is the skin. Some reasons that the skin's integrity is at risk of infection include:

- Surgical incisions
- Wounds
- Cuts

Open skin can make it easier for an infectious agent to enter the body. Also, if an invasive medical device is used, it puts the person at risk. This is because medical devices bypass the skin, creating an easier portal of entry for the infectious agent. Some examples of invasive medical devices include:

- Urinary catheters
- Feeding tubes
- IV lines

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The body's immune system is another defense mechanism. It helps the body resist an infectious agent if the agent enters the body. But many factors can weaken or impair a person's immune system. This impairment makes them a more susceptible host for infectious agents.

Some of these factors include:

- Advanced age
- Chronic illnesses, such as diabetes, kidney disease, cancer, HIV/AIDS, and heart disease
- Medications, such as chemotherapy and steroids
- Poor nutrition
- History of organ transplant
- Radiation
- Surgery

Your Role

It is everyone's responsibility to take infection prevention and control measures, especially when providing care to people (Hughes et al., 2021).

By keeping your infection control and prevention knowledge current, you can:

- Decrease the spread of infection
- Role-model infection control skills
- Reduce people's health challenges

No matter your role, it is your responsibility to stay current on new policies and changes to existing policies. This helps make sure you are competent.

You are also responsible for helping your coworkers maintain their competency. You can do this by reinforcing good practice and sharing any changes in policy.

Review

What is the area where an infectious agent can live, grow, and multiply?

A. Portal of entry

Feedback [The portal of entry is the point where the infectious agent enters the body of its host.]

B. Susceptible host

Feedback [A susceptible host is a person who is at risk of getting an infection.]

C. **Reservoir**

Feedback [A reservoir is a place where the infectious agent lives, grows, and multiplies.]

D. Portal of exit

Feedback [A portal of exit is where the infectious agent leaves its reservoir.]

Summary

Understanding how infections spread is an important part of infection control and prevention. The chain of infection describes the specific set of conditions that must exist for an infection to develop. Infectious agents can be spread through several types of transmission. There are also different factors that increase a person's risk of developing an infection.

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Section 3: Breaking the Chain of Infection

What Can You Do?

Many infections are preventable. Stopping infection requires disruption of the chain of infection.

There are many ways for you to break the links in the chain of infection. However, some links are more difficult to break than others.

Not everyone infected with a microorganism will become unwell or show any symptoms. So, you must always interact with them in ways that will prevent infection.

Standard Precautions

Standard precautions are a set of strategies created by the CDC. Healthcare workers must use standard precautions when caring for anyone (CDC, 2016b). This is regardless of whether you suspect or know the person has an infection.

You must use standard precautions every time you think you may encounter:

- Blood
- Body fluids
- Secretions
- Excretions, except sweat
- Non-intact skin
- Mucous membranes of the mouth, nose, and eyes

Hand Hygiene and PPE

Proper hand hygiene is one component of standard precautions. It refers to hand washing with soap and water or using an alcohol-based hand rub, also called ABHR.

The most important way to break the chain of infection is by having clean hands (CDC, 2020). Clean hands stop the spread of infectious agents through direct and indirect contact.

You should perform hand hygiene with either hand washing or the use of an alcohol-based hand rub:

- When you arrive at work and when you leave for the day.
- Before you touch your mouth, nose, or eyes.
- After you blow or wipe your nose.
- Before you put on and remove personal protective equipment.
- Before and after you have direct contact with someone.
- Before and after you provide any care.
- After contact with soiled or potentially contaminated room surfaces or items, medical equipment, linen, or environmental surfaces.
- After contact with any blood, body fluid, mucous membrane, non-intact skin, or intact skin.
- Before and after you enter isolation care areas.

So, when should you wash your hands instead of using ABHR? You should wash your hands with soap and water in certain circumstances, including (CDC, 2020):

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- If your hands are visibly dirty
- If you contaminate your hands with blood or other infectious materials
- Before you eat, prepare, handle, or serve food
- After you use the restroom
- After you help someone use the restroom or change a diaper or brief
- After you perform your personal hygiene
- After you provide care to someone with infectious diarrhea

If a sink is not close by, you may decontaminate your hands with an ABHR. But you must then wash your hands with soap and water as soon as possible. This would likely be a very unusual and rare situation.

How to Perform Hand Hygiene

To be effective, you must follow the proper procedure when washing your hands. First, check that you have enough soap and disposable towels. Next, turn on the faucet and make sure the water temperature is warm, but not hot. This preserves the oils on the skin. Keep the water running so you do not contaminate your hands by turning the faucet on and off.

You should stand back from the sink to avoid splashing water or touching the side of the sink. Wet your hands thoroughly. Apply the amount of soap recommended by the manufacturer to your hands.

Lather the soap over the top and bottom of your hands, fingers, and wrists using quick motions. Interlace your fingers to clean between them. Clean your fingernails by rubbing them against the palm of your other hand to force soap under the nails.

You should lather the soap over all surfaces of your hands and fingers (CDC, 2022). This should last 15 to 20 seconds. However, follow your organization's policy on the required time for hand washing. Rinse your hands well under running water, keeping your fingertips pointed downward. Do not shake the water from your hands.

Dry your hands thoroughly with a disposable towel. Drop the towel in a trashcan without touching the container. Then use another disposable towel to turn off the faucet. This entire hand washing process should take 40 to 60 seconds to complete.

As with hand washing, it is important to follow the proper procedure when using ABHRs as well. First, make sure that the product you are using is approved by your organization. Some ABHRs on the market are not alcohol-based and should not be used.

Next, use the amount of product recommended by the manufacturer. Apply it to the palm of one hand then spread the product by rubbing your hands together until your hands are dry. Be sure to cover all surfaces of the hands and fingers, as you do with hand washing. Make sure you include between your fingers.

Even after careful hand hygiene, infectious agents can remain under your nails if they are longer than 1/4 of an inch. In addition, employees with artificial nails are more likely to have germs on their fingertips than employees who have natural nails.

So, be sure to keep your nails cut short. Also, if you provide direct care, you should not wear artificial nails.

Personal Protective Equipment

Wearing personal protective equipment, or PPE, is another part of standard precautions that is

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used to break the chain of infection. PPE provides an extra barrier between you and potentially infectious material. But PPE use is not a substitute for proper hand hygiene. Remember to always perform hand hygiene before applying and after removing PPE.

Be sure to change your PPE between tasks and procedures that involve the same person when going from more soiled to less soiled areas of their body. For example, if you need to help someone use the toilet and brush their teeth, you should remove your gloves, perform hand hygiene, and apply new gloves after you assist with toileting.

Keep in mind you must also always change your PPE:

- Before providing care to another person.
- If the PPE becomes soiled or torn.

Make sure you also follow these additional tips:

- Remove your PPE in a way that avoids contaminating your clothing and skin.
- Never wash and reuse PPE.
- Always check your PPE for tears or damage before using.
- Make sure your PPE fits properly.
- Always dispose of PPE according to your organization's policy.

Types of PPE

When using PPE, be sure to select the type of PPE that is most appropriate for the task you are completing.

Gloves:

- Disposable gloves are the most widely used type of PPE in healthcare. You should wear gloves anytime your hands may encounter:
 - Blood
 - Body fluids
 - Secretions
 - Excretions, except sweat
 - Non-intact skin
 - Mucous membranes
- Only wear one pair of gloves at a time. Also, be sure to limit opportunities for touch contamination. For example, never touch your face or environmental surfaces with contaminated gloves.

Masks, Goggles, and Face Shields:

- Face shields, goggles, and masks protect your nose, mouth, and eyes from blood, body fluids, secretions, and excretions. You may choose to use a face shield or the combination of a mask and goggles. Keep in mind that personal eyeglasses do not offer an adequate amount of eye protection.
- Masks can protect you from infectious agents transmitted by droplets transmission. They can also protect against infectious agents during certain procedures.

Gowns

Disposable gowns protect your clothing and exposed body areas from contamination by certain

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infectious agents.

You should wear a gown whenever there is a chance your clothing or body may be exposed to:

- Blood
- Body fluids
- Secretions
- Excretions, except sweat
- Non-intact skin
- Mucous membranes

Respiratory Hygiene/Cough Etiquette

Practicing respiratory hygiene and cough etiquette is another standard infection control strategy. It aims to reduce airborne or droplet transmission of respiratory infections. Everyone, not just healthcare workers, should use respiratory hygiene and cough etiquette (CDC, 2016a).

To practice respiratory hygiene and cough etiquette, you should do the following:

- When coughing or sneezing, cover your mouth and nose with a tissue. If you do not have a tissue, cough or sneeze into your elbow or upper arm instead of your hands. Throw away any used tissues in a trash receptacle.
- Perform hand hygiene after coughing, sneezing, or blowing your nose.

Additional Standard Precautions

Proper use of sharps is another component of standard precautions. Using sharps properly can help protect you and those under your care from infectious agents. Sharps include:

- Needles
- Razors
- Broken glass
- Lancets
- IV systems

Some sharps have controls designed to reduce the risk of an accidental stick. For example, some needles have safety shields or needles that retract back into the syringe. Whenever possible, you should only use these types of sharps. Make sure you activate the safety mechanism immediately after you use the sharp.

If you use or come across a sharp, you should dispose of the sharp in a puncture- and leak-proof container. This is commonly referred to as a **sharps container**. Make sure you avoid overfilling these containers. Also, you should avoid:

- Reaching into the container.
- Emptying the container into another container.
- Bending, recapping, or removing needles before disposal.

Broken glass is a potential hazard that most healthcare workers do not consider. If you encounter broken glass, you should use something mechanical to clean it up, such as a dustpan or brush. Then place the glass in a sharps container. You should avoid picking up broken glass with your hands, even if they are gloved.

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When you use sharps, you are more likely to transmit bloodborne pathogens such as HIV or Hepatitis B and C (Peate, 2017). To prevent the transmission of bloodborne pathogens during sharps use, you should:

- Handle sharps carefully.
- Select sharps that are single use.
- Keep your hands behind sharps at all times.
- Dispose of sharps in the appropriate sharps containers.

Report sharp injury hazards according to your organization's policy.

Medical Equipment

Another component of standard precautions is using and handling medical equipment properly. The CDC uses a method that categorizes medical equipment into three levels of risk for contamination. Let's look at each level.

Critical Items

These items have a high risk of causing infection if contaminated with an infectious agent. This includes any object that enters sterile tissue or the bloodstream. For example:

- Needles
- IV catheters
- Surgical instruments
- Urinary catheters

These items must be sterile when used because of the high risk of infection.

Semi-Critical Items

These are items that will have contact with non-intact skin or mucous membranes. This includes equipment such as:

- Thermometers
- Ear, nose, and throat instruments
- Equipment used during medical procedures

These types of items first require thorough cleaning. After cleaning, they go through high-level disinfection using an agent approved by the Food and Drug Administration. Your organization most likely has certain approved disinfectants, so make sure you use the appropriate one when disinfecting semi-critical items.

Some of the semi-critical items that you will use are disposable. For example, thermometer probe covers are disposable and help prevent the need to clean and disinfect the probe after each use. It is important that you never reuse or clean a single-use, disposable item such as probe covers and gloves. You must always discard these items after use.

Non-Critical Items

These are items that will have contact with intact skin only. These include:

- Stethoscopes
- Blood pressure cuffs
- IV pumps
- Environmental surfaces

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This type of equipment requires low-level disinfection with an EPA-registered disinfectant. The items should be disinfected between use and after visibly soiled. Be sure to follow the manufacturer's instructions for proper use of the disinfectant. For small surfaces, such as a stethoscope, you can use an alcohol pad to achieve low-level disinfection.

Infection control is important when using point-of-care devices such as blood glucose meters. The CDC recommends only using these devices for one person (CDC, 2011). If you must reuse them, you must clean and disinfect the device after each use.

Also, make sure you clean and disinfect the device as directed by the manufacturer. If the manufacturer does not specify how to clean and disinfect the device, do not use it for more than one person.

Make sure with these types of devices that you also:

- Wear gloves to prevent exposure to blood or body fluids.
- Change your gloves between each person.
- Remove your gloves once you are done.
- Perform hand hygiene before touching any other supplies.

Environmental Considerations

Proper environmental cleaning is another component of standard precautions. Your workplace has an environmental cleaning policy. It should define how you handle different types of waste. Make sure that you understand and follow this policy at all times.

Many infectious agents are transmitted from touching environmental surfaces. **High-touch areas** are surfaces that are handled by people frequently. Examples of high-touch surfaces include:

- Light switches
- Bed rails
- Door handles
- Soap and sanitizer dispensers

High-touch surfaces should be cleaned and disinfected often for infection control and prevention.

Low-touch areas are surfaces that are not touched very often by people's hands. Examples of low-touch areas include:

- Walls
- Floors
- Mirrors
- Windows
- Ceilings

Keep in mind that low-touch areas still need to be cleaned regularly.

When in your workplace, you should identify the high and low-touch areas. Also, make sure you follow the cleaning policies of your healthcare setting. Besides cleaning these locations regularly, you should follow basic practices such as hand hygiene.

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Each environment is different depending on where you work. But there are some general guidelines you can follow for environmental cleaning:

- Clean surfaces immediately after exposure to blood, body fluids, secretions, and excretions.
- Place all potentially infectious waste in a color-coded or biohazard-labeled container. Then put the container in its designated area.
- Make sure you dispose of single-use items in their appropriate waste receptacle.

Linen and Laundry

Mattresses and pillows are also at risk for exposure to blood, body fluids, and other substances. Therefore, they should be covered with a fitted, protective material. Keep in mind that linen sheets and pillowcases do not provide this type of protection.

Mattresses and pillows with tears or holes should be replaced, not patched. If you notice any tears or holes, notify environmental services or the proper supervisor. These items should be replaced as soon as possible.

Soiled linen can be a source for the transmission of infectious agents. Linen that is often used includes gowns, towels, and sheets. When soiled linen is mishandled, surfaces, people, and the air can be contaminated.

Therefore, you must consider all soiled linen as potentially contaminated. You must handle soiled linen using standard precautions. Here are some additional tips on handling soiled linens (Peate, 2017):

- Make sure you place the linen in the marked linen hamper.
- Wear PPE and change the linen hamper if it is overflowing or contact your environmental services department.
- Avoid shaking or fanning the linen.
- Avoid placing soiled linens on the floor, chairs, or countertops.
- Place all linens in a leak-resistant bag at the point of use.
- Double bag any linen that is visibly contaminated or wet.
- Wear a gown as needed when handling soiled linen.
- Avoid overfilling linen bags and tie them securely for transport.
- Make sure linen bags are closed before placing them in chutes.

Keep in mind, if someone is on transmission-based precautions, you will need to follow your organization's policies on how to handle their soiled linen.

Medical Equipment

When medical equipment comes into contact with intact skin, but not mucous membranes, you should clean it between individuals (CDC, 2019a). Examples include:

- Blood pressure cuffs
- Wheelchairs
- Stethoscopes
- Pulse oximeters

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When equipment must be cleaned, disinfected, and sterilized, you must follow your organization's best practices and policies. These include the:

- Type of cleaning solution
- Required frequency of cleaning
- Length of time the solution should remain on the equipment before wiping it off or reusing the equipment

If the person has certain precautions, your organization may require that you assign items to that person. For example, you may need to use the same blood pressure cuff or stethoscope each time for someone on contact precautions.

Room Placement

In situations where room placement applies, you should follow certain guidelines. If there is a potential to transmit an infectious agent, the person should be placed in a private room (Hughes et al., 2021). But there are times when this is not always possible.

If private rooms are limited, people with easily transmitted infections should be prioritized. For example, if a person has infectious secretions or diarrhea, they would be appropriate for a private room.

If no private rooms are available, you should use extra infection control measures. For example, use a dedicated commode for a person with infectious diarrhea.

People should also be grouped based on the type of infection to help prevent transmission. An example of this is when a hospital groups COVID-19 positive people in the same unit.

If you have any questions about room placement for people with infections, you should contact your infection control coordinator or supervisor.

Review

In which scenario should you wash your hands instead of using an alcohol-based hand rub?

- A. After you blow or wipe your nose
Feedback [This is a scenario where you can perform hand hygiene with either hand washing OR the use of an alcohol-based hand rub.]
- B. **If your hands are visibly dirty**
Feedback [The CDC recommends hand washing with soap and water in certain circumstances, such as when you have visibly dirty hands.]
- C. When you arrive at work
Feedback [This is a scenario where you can perform hand hygiene with either hand washing OR the use of an alcohol-based hand rub.]
- D. Before you put on PPE
Feedback [This is a scenario where you can perform hand hygiene with either hand washing OR the use of an alcohol-based hand rub.]

Summary

It is important to prevent and control infections. Standard precautions are an effective way to break the chain of infection. Whether an infection is confirmed or suspected, everyone should

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follow standard precautions to break the chain of infection.

Section 4: Additional Infection Control Considerations

Transmission-Based Precautions

It is important to take extra precautions if a person has or is suspected of having an infection that can be easily spread (CDC, 2016c). These precautions are called **transmission-based precautions**. Transmission-based precautions are steps that healthcare workers must take to prevent the transmission of infections.

Taking these extra precautions helps prevent the spread of the infection to healthcare workers, patients, and visitors. They include:

- Contact precautions
- Droplet precautions
- Airborne precautions

The type of transmission-based precaution used depends on the infectious agent. The CDC recommends specific PPE for each kind of precaution in addition to using standard precautions. A sign showing the type of precaution the person is on and what PPE is needed must also be posted at the entry of the person's room.

Also, depending on the type of infectious agent, you may need to use more than one type of precaution.

Contact Precautions

Contact precautions are used for people who have or are suspected to have an infection transmitted by direct or indirect contact. Some reasons that contact precautions are used include if the person has:

- An infection that is transmitted by the oral-fecal route, such as *C. diff*
- A wound or skin infection
- An infection with a multi-drug resistant organism, such as MRSA or VRE

If you are caring for someone on contact precautions, you must put on gloves and a gown before entering the care area. If you suspect you may come into contact with bodily secretions, you should wear a mask and eye protection, such as goggles. Remember, glasses are not considered adequate eye protection. You must then discard the gown and gloves before exiting the person's room.

Droplet Precautions

Droplet precautions prevent illnesses spread through close respiratory contact or contact with mucous membranes. Droplets are spread by:

- Coughing
- Sneezing
- Close contact with someone's breathing

Infectious agents spread by droplet transmission are not contagious over large distances. Therefore, special air treatment and ventilation are not needed.

However, you will need to apply gloves and a surgical mask before being in close contact with a

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person on droplet precautions. Close contact means you will be within 3 to 6 feet of the person. A respirator is not required.

The person on droplet precautions will also need to wear a surgical mask when around others outside their environment. They should also practice respiratory hygiene and cough etiquette if able.

Airborne Precautions

Airborne precautions are required for infectious agents transmitted through the air over long distances.

If the person is suspected of having an infectious agent capable of airborne transmission, they must be placed in an airborne infection isolation room. These rooms have special ventilation to prevent the spread of the infectious agent.

When caring for someone on airborne precautions, the CDC requires that healthcare workers wear:

- Gloves
- Gown
- N95 respirator

You must put these items on before entering the room. Keep in mind that you must be properly fitted before wearing an N95 respirator.

Multidrug-Resistant Organisms

You should be aware of issues related to antibiotic-resistant infectious agents. Antibiotic-resistant infectious agents are often resistant to more than one antibiotic. These are called **multidrug-resistant organisms, or MDROs**. MDROs are becoming more widespread than ever (WHO, 2021). This is especially true in hospitals and long-term care facilities.

Three different MDROs that you may already be familiar with include:

- Methicillin-resistant *Staphylococcus aureus* (MRSA)
 - MRSA is one of the most common MDROs. MRSA occurs when staph bacteria become resistant to the antibiotics used to treat staph infections.
 - MRSA infections often involve the skin. But they can also occur in the urinary and respiratory tract as well as the bloodstream.
 - Some individuals carry MRSA in their nostrils and on their skin. For carriers, the bacteria do not cause infection. But the person can still spread the bacteria and cause infection in others.
- Vancomycin-resistant *Enterococci* (VRE)
 - VRE is another common MDRO. Enterococci are bacteria that live in our intestines and genital tract. They are also found in the environment. But enterococci find ways to avoid the effects of the antibiotics used to treat the infections they cause. Resistance occurs when the enterococci no longer respond to the antibiotics.
 - VRE is spread from one person to another. This occurs through contact with contaminated surfaces or equipment and people's hands.

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- Carbapenem-resistant Enterobacterales (CRE)
 - Another MDRO that is a concern is carbapenem-resistant Enterobacterales or CRE. CRE is a group of bacteria that are resistant to certain antibiotics, the carbapenems. These antibiotics are used to treat severe infections.
 - They are often called superbugs because they are also resistant to most other commonly used antibiotics. In some cases, CRE are resistant to most of the antibiotics on the market today. This makes CRE infections very difficult to treat and leads to a high death rate.

In healthcare settings, MDROs are often spread from person to person by the hands of healthcare workers.

You can help reduce the spread of MDROs to other people by following aggressive infection control measures. Of which, strict hand washing is of utmost importance.

Also, people who have an active MDRO infection should be placed on the proper transmission-based precautions. Most often, they are placed on contact precautions. This is due to the difficulty of treating these infectious agents.

C. Diff

Your body has what is called "normal flora". **Normal flora** are microorganisms that live in and on your body without causing disease.

***Clostridioides difficile*, or C. diff**, is a spore-forming bacteria that some people may have present in their intestines but without symptoms. Normal microorganisms in the intestines may keep *C. diff* from causing infection. However, this normal intestinal flora can be destroyed when a person is taking antibiotics. This destruction causes *C. diff* to become active. It produces a toxin that causes watery, foul-smelling infectious diarrhea.

When a person has a *C. diff* infection, the *C. diff* is shed in their stool. *C. diff* spreads when a person touches items or surfaces contaminated with infected stool. This includes the hands of healthcare workers.

C. diff spores can live on surfaces for months or even years, increasing the likelihood of transmission (CDC, 2021). This makes cleaning an important part of infection control for this disease.

It is important to clean and disinfect the person's room or environment using a specific cleaning agent. The type of cleaning agent depends on your healthcare organization's policy and procedure for *C. diff* infections.

Cleaning should include all surfaces that are likely to be touched. Also, any shared equipment must be cleaned and disinfected before another person can use it.

The CDC requires that people with *C. diff* infection be placed on contact precautions. Doing so will decrease the chance of spreading it to others.

Unfortunately, alcohol-based hand rubs are not effective in killing *C. diff*. So, you must wash your hands thoroughly with soap and water after caring for someone with *C. diff*. This reduces

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the risk of cross-contamination. You should also educate people in your care and their families on the importance of proper hand washing.

Legionella

Legionella is a bacterium naturally found in freshwater habitats such as lakes and streams. These bacteria become a concern when they spread into human-made water systems, such as:

- Hot tubs
- Showerheads
- Sink faucets
- Cooling towers for water
- Water fountains
- Tanks and heaters for hot water
- Large plumbing systems

If the water is carrying *Legionella*, it can infect a person if they inhale mist or droplets from that water. They could accidentally inhale the contaminated water as they are drinking it. The infection leads to Legionnaires' disease, which is a severe type of pneumonia or lung infection. Those infected may get seriously ill or die from Legionnaire's disease.

The risk of Legionnaire's disease is greater in hospitals (CDC, 2017). This is because many people have illnesses that make them more vulnerable to infection.

Healthcare organizations can protect people from getting Legionnaire's disease with early recognition and prevention. It is important to know what your organization should be doing to prevent Legionnaire's disease, regardless of how limited your involvement may be.

Your organization should:

- Create a team dedicated to ensuring the safety of their facility's water.
- Create and put in place a water management program.
- Train medical providers to detect Legionnaire's disease cases as soon as possible.
- Report Legionnaire's disease cases as soon as possible to local public health officials.
- Collaborate with public health officials to investigate and prevent further infections.

Review

What should you wear when working with someone who is on contact precautions?

A. Surgical mask

Feedback [A surgical mask is required for people on droplet precautions.]

B. Gloves only

Feedback [Gloves are used for standard precautions. Transmission-based precautions require the use of additional PPE.]

C. N95 respirator

Feedback [An N95 respirator is required for people with airborne precautions.]

D. **Gown and gloves**

Feedback [If you are caring for someone on contact precautions, you must put on gloves and a gown before entering the care area.]

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Summary

In some situations, you may need to use more precautions to prevent the transmission of infectious agents. These are called transmission-based precautions. If you use these precautions and standard precautions, you can help prevent infection.

Section 5: Conclusion

Course Summary

Now that you have finished viewing the course content, you should have learned the following:

- How infectious agents are transmitted and the chain of infection
- At least three ways to break the chain of infection
- Additional infection control considerations

Course Contributor

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Resource

Sequence for Putting on and Removing PPE

<https://www.cdc.gov/hai/pdfs/ppe/ppe-sequence.pdf>

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Exam and BrainSparks

CE (y)	LO	Q #	Question	BS (y)	Response
	1	1	True or False: It is everyone's responsibility to take infection prevention and control measures, especially when providing care to people.	Y	True
					False
	1	2	What sequence of events leads to an infection occurring within healthcare settings?	Y	Chain of command
					Chain of infection
					Chain of transmission
					Chain of illness
	2	3	True or False: Breaking the chain of infection is critical to stopping the spread of infectious organisms.	Y	True
					False
	2	4	If your hands are NOT visibly soiled, in which situation MUST you wash your hands with soap and water rather than using an alcohol-based hand rub?	Y	After removing personal protective equipment
					Before providing care
					At the end of your workday
					Before preparing, handling, or serving food
	3	5	What PPE should you wear when caring for someone on droplet precautions?	Y	Gloves only
					Gloves and a gown
					Gloves and a surgical mask
					Gloves and an N95 mask
	3	6	People with an active infection from a multidrug-resistant organism (MDRO) would typically require what type of transmission-based precautions?	Y	Standard precautions
					Airborne precautions

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					Droplet precautions
					Contact precautions
	1	7	What is an example of an illness that is transmitted by droplet transmission?		Influenza
					Measles
					Hepatitis
					Tuberculosis
	1	8	What is an example of an illness or disease that is transmitted by airborne transmission?		HIV
					Common cold
					Tuberculosis
					MRSA
	1	9	Nick fails to perform hand hygiene after caring for Jesse, who has MRSA. Nick then moves on to care for Murphy, who then contracts MRSA. What method of transmission does this represent?		Direct
					Indirect
					Droplet
					Airborne
	2	10	A nurse leaves for their lunch break. They go straight to the elevator, thinking only of their lunch. They press multiple buttons in the elevator. When the nurse arrives at the cafeteria, they chat with another nurse waiting in line. The nurse proceeds to pay for the food, handling cash, and eats their lunch before returning to the unit. How many times should the nurse have performed hand hygiene in this scenario?		2
					4
					6
					10

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	2	11	Which of the following is an appropriate guideline for maintaining safety when using sharps?		Activating the safety mechanism immediately after use
					Emptying small sharps containers into larger containers when full
					Bending or removing needles before disposing of them
					Picking up broken glass with gloved hands
	2	12	Which of the following is an appropriate guideline to follow when using personal protective equipment, or PPE?		Wash your PPE after each use and perform hand hygiene.
					Change PPE and perform hand hygiene before providing care to another person.
					Use gloves as a substitute for performing hand hygiene.
					Perform hand hygiene but reuse your PPE.
	3	13	True or False: Airborne precautions require the use of an N95 or higher respirator.		True
					False
	3	14	What organisms are considered "super bugs" because they are resistant to most commonly used antibiotics?		C. diff
					MRSA
					VRE
					CRE
	3	15	What organism is found in freshwater habitats and can infect a person if they inhale mist or droplets?		C. diff
					Hepatitis
					Influenza
					Legionella