

Infection Control: The Basics

Section 1: Introduction

About This Course

Healthcare-associated infections are a serious issue in healthcare. On any given day, approximately 1 in 25 hospitalized patients have a healthcare-associated infection, and over 750,000 of these infections result in death (Magill et al., 2014). Astounding, isn't it? And these numbers don't account for infections acquired in other healthcare settings. Preventing the transmission of infections from one person to another is critical. In this course, you will learn about the basics of infection control.

Learning Objectives

After taking this course, you should be able to:

- Sequence the components in the chain of infection.
- Differentiate between each of the four methods of transmission.
- Apply standard and transmission-based precautions.

Section 2: Concepts of Infection Control

To prevent the spread of infection, you must be familiar with the chain of infection and the steps to break this chain.

The Chain of Infection

A specific set of conditions must exist in a specific sequence for an infection to spread.

Agent = The chain begins with an infectious agent, such as bacteria, fungi, parasites, or viruses.

Reservoir = The place where the agent lives, grows, and multiplies. It may be a human, animal, or even the environment.

Portal of exit = The path by which the infectious agent leaves its host. This could be through the nose, mouth, or in blood or body fluids.

Method of transmission = The way the agent travels from the reservoir to the host, which may include direct and indirect contact, droplet, and airborne transmission.

Portal of entry = The manner in which the agent enters the host. This may be through a mucous membrane, such as the eyes, nose, or mouth, or through non-intact skin.

Susceptible host = A person who is unable to resist the invasion of an infectious agent.

Source: Centers for Disease Control and Prevention (CDC), 2011

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The following scenario illustrates the chain of infection. Can you identify each of the six links?

Mary wakes up this morning feeling a bit under the weather. Not knowing that she has the rhinovirus, a virus that causes the common cold, she goes to work as usual. She doesn't want to miss her interview with Samantha from HR about the open position she applied for. Before her interview, Mary blows her runny nose one last time then heads to Samantha's office. Mary enthusiastically shakes Samantha's hand while thanking her for the interview. After the interview, Samantha decides to eat lunch while reviewing the candidates for the new position. Engrossed in the decision ahead of her, Samantha fails to wash her hands before eating. Three days later, Samantha is sick at home with a sore throat, runny nose, and a fever.

- Infectious agent = Rhinovirus
- Reservoir = Mary
- Portal of Exit = Nose
- Method of Transmission: Contact with the infected person
- Portal of Entry = Mouth
- Susceptible Host = Samantha

Feedback: The rhinovirus is the infectious agent. Mary is the reservoir. Mary's nose is the portal of exit. The handshake between Mary and Samantha is the method of transmission. Samantha is the susceptible host and Samantha's mouth is the portal of entry.

Methods of Transmission

Infection control involves implementing steps to break the chain of infection, usually by stopping transmission of the infectious agent. The CDC (2007) identifies four methods of transmission – direct contact, indirect contact, droplet, and airborne.

Q1: Remember Mary and Samantha? How was the rhinovirus transmitted from Mary to Samantha?

- A) Direct contact
- B) Indirect contact
- C) Droplet
- D) Airborne

Feedback: This scenario represents **direct contact**. It requires direct physical contact with an infected person or infected blood or body fluids. Infectious diseases transmitted this way include MRSA, HIV, Hepatitis B and C, and gonorrhea.

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Q2: What if Mary sneezed during her interview with Samantha? How would the rhinovirus have been transmitted?

- A) Direct contact
- B) Indirect contact
- C) Droplet
- D) Airborne

Feedback: This scenario represents **droplet** transmission. It involves the travel of respiratory droplets over a short distance to the mucosal surfaces of the susceptible host. It's usually the result of someone sneezing, coughing, or talking, but could also occur during certain medical procedures such as suctioning and CPR. In addition to the common cold, other infectious diseases transmitted this way include influenza and pertussis. Remember, the proper way to sneeze is to do so in your elbow, not your hands. This is one way to break the chain of infection.

Q3: What if Samantha contracted the rhinovirus after Mary coughed into her hands then used Samantha's pen? How would the rhinovirus have been transmitted?

- A) Direct contact
- B) Indirect contact
- C) Droplet
- D) Airborne

Feedback: This scenario represents **indirect contact**. It involves contact with a contaminated object or surface, or contact with a person other than the infected person (for example, contact with the hands of a healthcare worker who did not perform hand hygiene after touching an infected person or object). Remember, the proper way to cough is to do so in your elbow, not your hands. This is one way to break the chain of infection.

Q4: What if Mary had active tuberculosis instead of the common cold? How is tuberculosis spread?

- A) Direct contact
- B) Indirect contact
- C) Droplet
- D) Airborne

Feedback: Tuberculosis is transmitted by airborne transmission. Airborne transmission is different from droplet transmission in that a person does not have to have close contact with the infected person to be exposed to the infectious agent. Infectious agents spread through airborne transmission can travel through the air over long distances before being inhaled by the susceptible host. Thankfully, few infectious diseases are transmitted this way, but included are the measles and chickenpox.

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Standard Precautions

Remember, breaking any one of the links in the chain of infection will stop the spread of the infection. The measures that you take to stop the transmission of infectious agents, thereby breaking the chain of infection, are called standard precautions.

Standard precautions are based on the principle that **all** blood, body fluids, secretions, excretions, non-intact skin, and mucous membranes may contain transmissible infectious agents (CDC, 2007).

Standard precautions include proper hand hygiene, the use of personal protective equipment, and the appropriate cleaning and handling of equipment, environmental surfaces, and laundry.

Transmission-Based Precautions

Sometimes, the use of standard precautions alone is not enough to prevent the spread of infection. In these cases, the addition of transmission-based precautions is needed. The three transmission-based precautions, which correlate to the method of transmission of an infectious agent, are contact, droplet, and airborne. Persons requiring transmission-based precautions should be placed in a private room if possible.

Q1: Your co-worker Nathan asks you what precautions he should take if he has to take the temperature of someone on contact precautions because of infectious diarrhea. How should you respond?

A) You must wear a mask and face shield.

Feedback: Contact precautions do not require the use of a mask and face shield except when performing a procedure that may generate splashes or sprays. Rather, they require the use of gloves and a gown for all interactions that may involve contact with the individual or potentially contaminated areas in the environment.

B) You must wear gloves and a gown.

Feedback: The use of gloves and a gown is required for all interactions that may involve contact with the individual or potentially contaminated areas in the environment.

C) No special precautions are needed.

Feedback: Contact precautions require the use of gloves and a gown for all interactions that may involve contact with the individual or potentially contaminated areas in the environment.

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Q2: Nathan comes to you yet again asking what precautions he should take for someone on droplet precautions due to influenza. How should you respond?

A) You must put on a mask upon entering the room.

Feedback: If the individual were on airborne precautions, Nathan would need to put on a respirator before entering the room.

B) You must put on a respirator before entering the room.

Feedback: A respirator put on before entering the room is necessary for airborne precautions not droplet precautions. Droplet precautions require Nathan to put on a mask upon entering the room.

C) You must put on a mask before entering the room.

Feedback: While droplet precautions require a mask, Nathan can wait to put on the mask until he enters the room. If the individual were on airborne precautions, Nathan would need to put on a respirator before entering the room.

D) You must put on a respirator upon entering the room.

Feedback: If the individual were on airborne precautions, Nathan would need to put on a respirator before entering the room. Droplet precautions do not require a respirator, but rather a mask upon entering the room.

Note: In some healthcare settings, a respirator may not be available for use in treating those individuals on airborne precautions. In these situations, a mask applied before entering the room is sufficient.

Section 3: Conclusion

Summary

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

Through the simple understanding of the chain of infection and appropriate precautions, you are now armed to help prevent the transmission of infectious organisms and in doing so prevent illness, disease, and even death.

Course Contributor

Jennifer Moore, RN-BC started working in the senior care industry in 2000 and is a certified Gerontological Nurse. She has held positions including MDS Coordinator, Director of Nursing, Medicare Nurse Coordinator, Nurse Consultant, Area Manager, and Director of Quality Assurance. Her overall responsibility within each of these positions was to ensure residents received the highest quality of care. This included active participation in quality improvement initiatives, review of clinical records to identify areas of weakness, corroboration with the medical director to institute policies and procedures for resident care, and staff education/training. Additionally, she was responsible for maintaining an effective compliance program under a Quality of Care Corporate Integrity Agreement with the Office of Inspector General for a period of five years. She currently serves as a content developer for Relias

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Learning. Within this position, her responsibility is to develop and review online training modules for the senior care industry. She has served as the subject matter expert for courses on re-hospitalization, clinical skill reviews, and various OSHA and regulatory compliance topics. In addition, she has presented at various state conferences on mandatory compliance, quality assessment and assurance (QA&A), and quality assessment and performance improvement (QAPI).

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