

Educational Module for Nursing Assistants in Long-term Care Facilities: Antibiotic Use and Antibiotic Resistance

Antibiotic resistance is an increasing concern for everyone.

This module:

- Defines antibiotic resistance
- Describes how antibiotic-resistant germs develop
- Describes how antibiotic resistance effects you, your family, and long-term care facility residents
- Provides action steps to manage the development and spread of antibiotic-resistant germs

This module complements your facility's infection control guidance, so be sure to review other infection control modules.

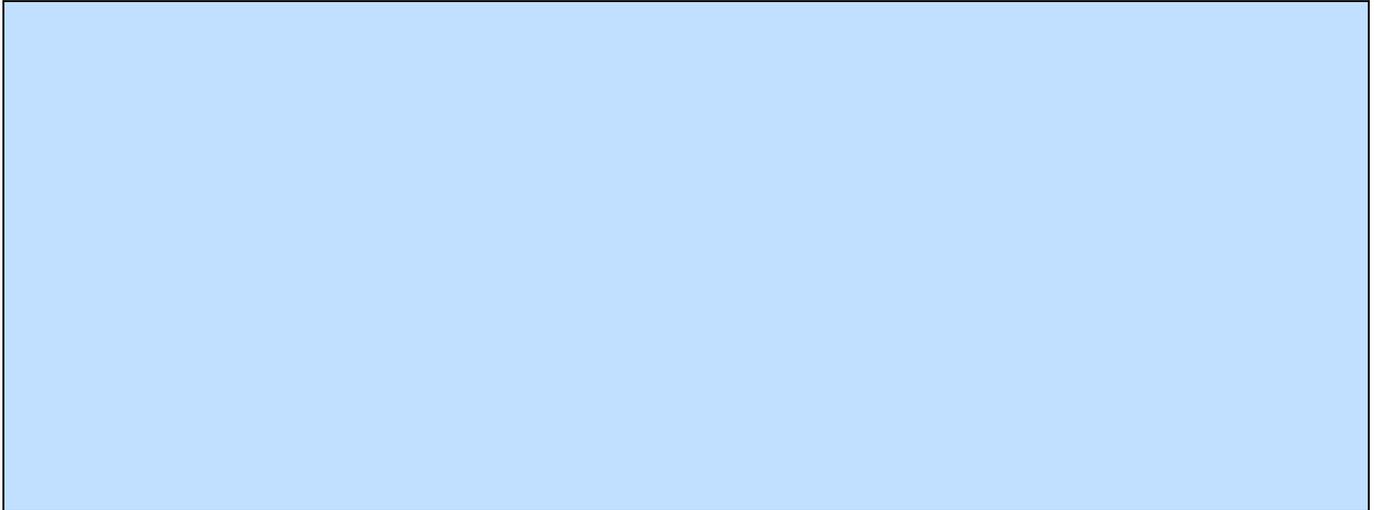


Pre-test

1. Define the term "antibiotic resistance".
2. Describe at least one way germs become resistant to antibiotics.
3. Define at least three factors that can lead to antibiotic resistance in long-term care facility residents.
4. List at least three action steps that you can take to prevent antibiotic resistance and the spread of antibiotic-resistant germs in long-term care facilities.

Objectives

After completion of this module you will be able to:



Antibiotic resistance is one of the most important public health threats that we face today. Infections caused by antibiotic-resistant organisms (also known as bacteria or germs) require treatment with more toxic and expensive antibiotics, and often result in increased rates of hospitalization and healthcare costs.

Antibiotic use is the biggest driving factor in the development of antibiotic-resistant germs. This is particularly a concern in long-term care facilities (LTCF) where antibiotic use is very common. LTCF residents are frequently given antibiotics. Infections caused by viruses and bacteria can have the same kinds of symptoms (like fever and tiredness). Unfortunately, antibiotics are often given for symptoms that seem like a bacterial infection but actually may be caused by viruses, or even non-infectious causes (like medication side effects). When this happens, antibiotics are not only ineffective in treating the symptoms but also increase the resident's chance of developing a future infection caused by antibiotic-resistant bacteria. Once antibiotic-resistant bacteria are present in an individual or in a healthcare facility, these germs can spread easily due to inadequate infection control - often as a result of poor hand hygiene.

Antibiotic Resistance

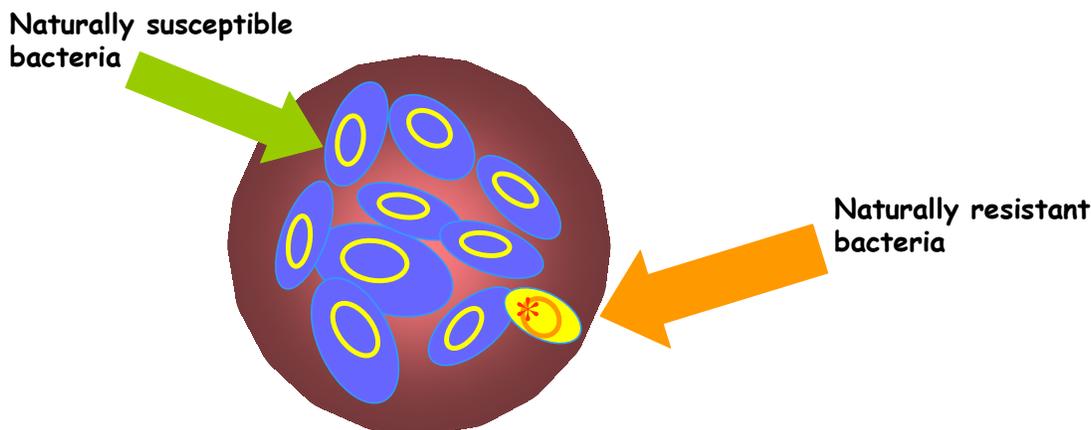
What is antibiotic resistance?

Antibiotic resistance is the ability of a germ to mutate or change so that antibiotics can't kill it.

Ways that germs become resistant to antibiotics

Antibiotic use is the biggest reason that bacteria become resistant to antibiotics. To help prevent antibiotic resistance, antibiotics should not be misused.

The ways that bacteria become resistant to antibiotics are different depending on the germ. Bacteria can become resistant through changes in genes (mutations) or bacteria can pick up new genes from other bacteria (gene transfer).



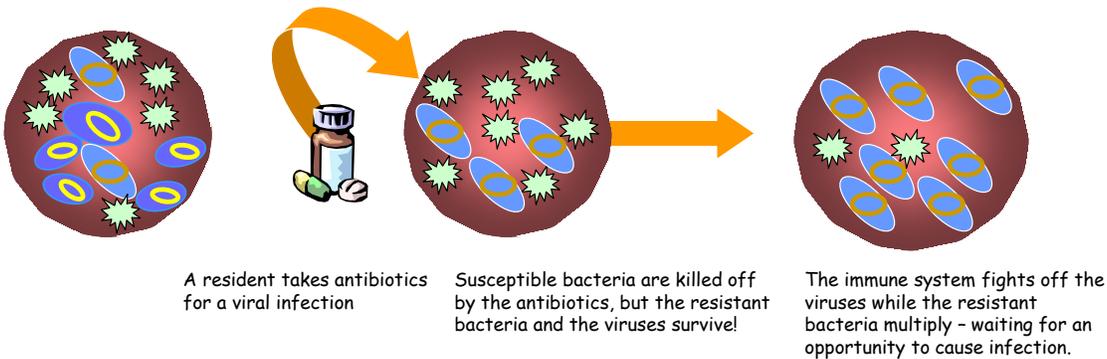
Often, people's bodies have a combination of bacteria; some of these bacteria can be killed by (are susceptible to) antibiotics and other bacteria might be resistant to being killed by antibiotics. If a person with antibiotic-resistant bacteria is exposed to antibiotics, the antibiotics will kill the susceptible bacteria, allowing the resistant bacteria to survive and multiply. If these antibiotic-resistant bacteria cause an infection, the infection may be more serious and difficult to treat with routine antibiotics.

The following diagram shows how misusing antibiotics (not finishing a prescription or taking antibiotics for a viral infection) can cause antibiotic-resistant bacteria to multiply.

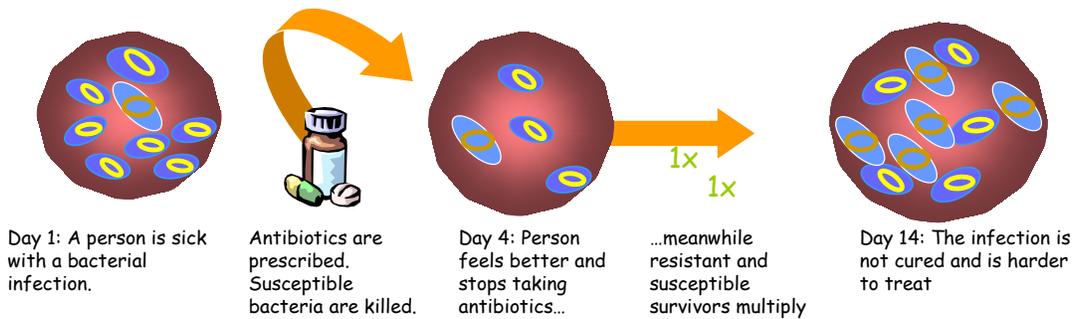
Here are the players:

-  Virus
-  Naturally Resistant Bacteria
-  Susceptible Bacteria

Taking antibiotics for a viral infection:



Not finishing the full course of antibiotics can also lead to antibiotic resistance:



Examples of antibiotic misuse

Here are more examples of antibiotic misuse that can lead to the development of resistant bacteria.

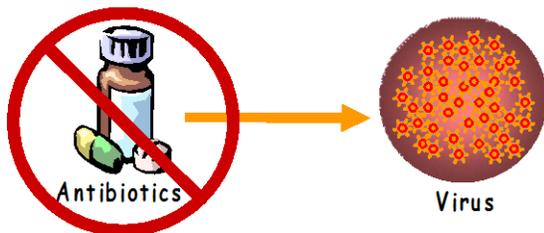
- Use of broad-spectrum antibiotics when a narrow-spectrum antibiotic would be effective.
 - Broad-spectrum antibiotics work against many different kinds of bacteria. As a result, these drugs kill infection-causing bacteria and bacteria that live in the intestinal tract (gut) or other parts of the body but do not cause disease ("normal bacterial flora"). Broad-spectrum antibiotics are stronger medications than narrow-spectrum antibiotics and can often cause more severe side effects. Narrow-spectrum antibiotics, on the other hand, kill a smaller range of bacteria but are generally better tolerated.
- Prescribing antibiotics for too many days.
 - An example is giving a resident a prescription for a 14-day course when a 7-day course is enough to treat the infection.
- Not completing an antibiotic prescription.
 - The person stops taking the antibiotic when they feel better instead of when their prescription is gone. Even when symptoms improve, bacteria remain and multiply. The infection returns a few weeks later, and this time a different antibiotic may be needed to treat it.

Misuse of antibiotics

Antibiotics do not work against viral infections

Antibiotics will not:

- Cure viral infections
- Stop the spread of viruses
- Make you feel better if you have a viral infection



Antibiotics have NO EFFECT on viruses!

Most upper respiratory infections (like the common cold) are caused by viruses; antibiotics cannot treat viral infections.

Taking antibiotics when they are not clinically needed can result in:

- Drug-drug interactions
- Medication side effects
- Increased health care costs

When are antibiotics not needed?

One example of antibiotic misuse is prescribing antibiotics for "asymptomatic bacteriuria" (bacteria in the urine without the presence of symptoms).

Another example is green or yellow nasal discharge. This symptom alone does not mean that a resident has a bacterial infection. A physician or nurse practitioner must assess all of the resident's symptoms to determine if he or she needs antibiotics. Green and yellow nasal discharge without other symptoms does not require antibiotics.

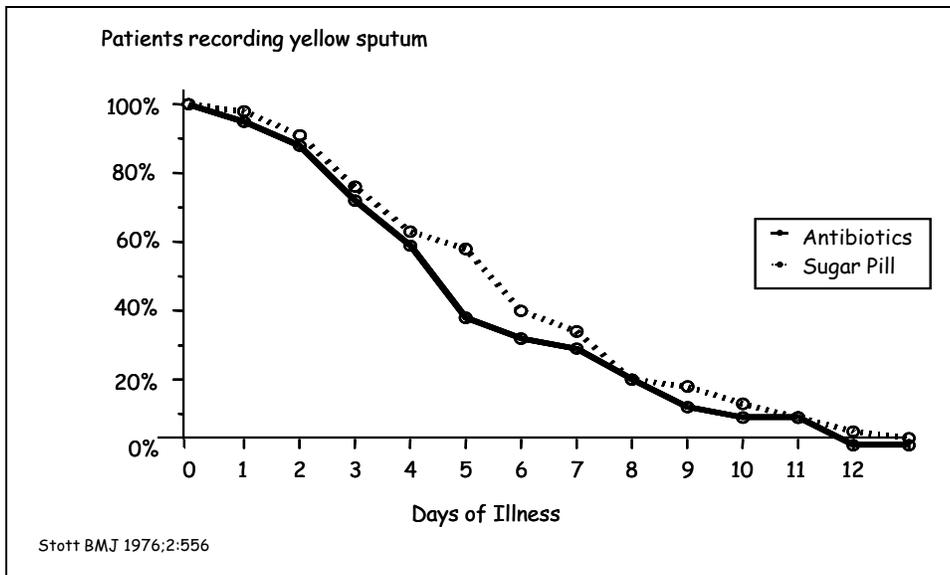


Figure 1: Effect of Antibiotics on Respiratory Symptoms⁴

The figure above is from a study that looked at patients with yellow sputum and split them into two groups. Group 1 was given antibiotics while Group 2 was given a sugar pill (without antibiotics). As you can see from the graph above, both groups of patients improved at the same rate - regardless of their treatment, which means that the antibiotics did not help people recover from symptoms any faster!

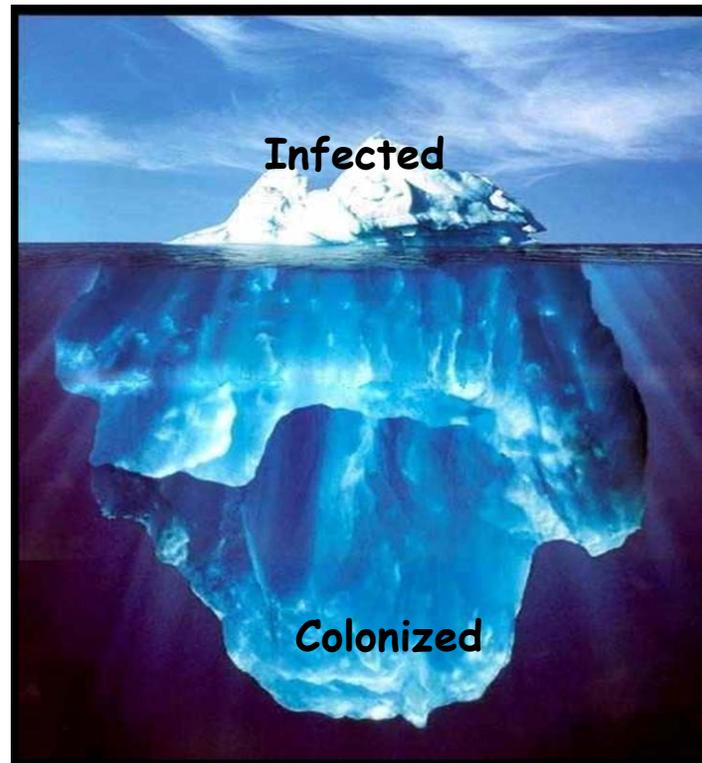
The nurse should be notified of any change in a resident's condition even if antibiotics are not needed.

Are there new antibiotics to take the place of antibiotics that no longer work because of antibiotic resistance?

The antibiotics we have to treat infections now must be preserved as much as possible through careful antibiotic use. While some drug companies are working on creating new antibiotics, this is not the answer. On average, it takes 10 years and \$800 million dollars to get a new antibiotic on the market!

Infection vs. colonization

Bacteria can be present in your body or on your skin and not cause an infection. This is called colonization. An example of colonization is a person with *Staphylococcus aureus* (*Staph*) on their skin or in their nose - without symptoms of an infection (like pus). However, if that person develops a wound, a cut, or anything else that causes an opening in their skin, they have an increased chance that the *Staph* bacteria will enter the skin opening and cause an infection.



This iceberg shows colonization versus infection as a picture. Residents that are infected with an organism are just the "tip of the iceberg" of residents that are colonized or infected with germs that can cause disease. Just because a resident is not infected or showing signs of infection (like fever, increased white blood cell count, reddened skin lesion, etc.), does not mean that they do not carry germs that could be transferred to another resident. Caring for colonized residents can result in contamination of healthcare workers' hands. Contaminated hands spread germs to other residents and the environment. Hand hygiene is critical in preventing the spread of germs!

Prevent antibiotic resistance

- Take antibiotics only for bacterial infections. Let your healthcare provider decide if antibiotics are needed to treat your infection!
- Do not demand antibiotics for yourself, your family, or LTCF residents.
- Finish the entire prescription - even if the symptoms resolve. Not completing a course of antibiotics contributes to antibiotic resistance.
- Do not share antibiotics with others - even if they have the same symptoms.

Antibiotic resistance is everyone's problem. Infections caused by antibiotic-resistant organisms can spread from person to person in healthcare settings, childcare settings, and families. We all have to do our part to prevent antibiotic resistance from occurring and spreading.

Table 1 shows how the number of antibiotic prescriptions could be decreased by over 50 million per year if antibiotics were not prescribed for five infections that are commonly caused by viruses.

Table 1: Estimated Potential Reduction in Antibiotic Prescriptions

Diagnosis	Appropriate management	Potential annual reduction	Potential annual reduction (# of prescriptions)*
Common Cold	No antibiotics needed	100%	17,922,000
Bronchitis (chest cold)	No antibiotics unless specific bacterial organism is identified or underlying lung disease	80%	13,059,200
Otitis Media (ear infection)	No antibiotics for clear fluid in the middle ear	30%	7,094,400
Pharyngitis (sore throat)	No antibiotics unless positive for Group A Strep	50%	6,555,000
Sinusitis	No antibiotics unless ill for more than 10 days or patient has severe symptoms	50%	6,480,500
Total		46.3%	51,115,600

*Estimated from National Ambulatory Medical Care Survey data, 1992

Antibiotic use in Long Term Care Facilities

Antibiotics account for about 40% of all prescriptions written in LTCF. Up to 70% of LTCF residents receive at least one systemic antibiotic every year. Up to 75% of these antibiotics are not needed because they are prescribed for non-bacterial infections or conditions. There are many reasons antibiotics are prescribed unnecessarily, including inability of LTCF residents to communicate their symptoms to care givers and the effects of aging that alter the immune response to infections in the elderly.

At the same time, infections are very common among LTCF residents. The most frequent infections among LTCF residents are:

- Urinary tract infections
- Lower respiratory tract infections such as influenza or pneumonia
- Skin and soft tissue infections
- Gastroenteritis

Elderly people, often LTCF residents, are at higher risk for infections than healthy, younger adults for several reasons including:

- Factors associated with living in a LTCF setting
- Resident factors (such as chronic illness, age, functional impairment, etc.)
- High rates of antibiotic usage

Facility factors

- Close living conditions
 - The chance of coming into contact with a variety of bacteria and viruses is increased when people live very close to one another and participate in frequent group activities.
- Low influenza vaccination rates among LTCF staff
 - One study of healthcare workers in LTCF found that when even just 61% of the healthcare workers were vaccinated, total resident deaths was reduced from 17% to 10%.
- Transfer between acute and long-term care settings
 - Many LTCF residents are admitted to the LTCF from an acute care setting, and transfer to and from these types of facilities is common among the elderly and

those requiring extended care. Residents can pick up new germs, including antibiotic-resistant bacteria, and can also leave their germs behind. Each transfer provides an opportunity for germs to spread between facilities.

- Inadequate hand hygiene
 - A study of a 255-bed facility observed staff-resident interactions and found that staff washed their hands only 27% of the time it was needed before interacting with a resident. They further determined that germs could be spread from staff to residents in 82% of the staff-resident interactions.

Resident factors

- Increased age
 - Older people have weaker immune systems and are less able to fight infections.
- Chronic disease
 - Chronic diseases like diabetes, heart disease, and kidney disease lower a person's ability to fight infections.
 - Residents with degenerative neurological diseases (like Alzheimer's, Parkinson's, and cerebrovascular diseases) often have a neurogenic bladder. Neurogenic bladder is the result of problems with nerves in the body that may control how the bladder stores or empties urine. This increases a resident's risk for a urinary tract infection.
- Functional impairment
 - Decreased mobility increases the risk for skin breakdown leading to skin infections.
- Invasive devices
 - Devices that enter the body (like catheters) provide a pathway for bacteria and viruses to enter the body.

Preventing the spread of antibiotic-resistant bacteria in Long Term Care Facilities

For the most part, the facility factors that increase residents' risk of infections such as close living quarters or transfer from acute to LTCF cannot be altered. Additionally, little can be done to change resident factors like increased age and decreased immune capacity.

Despite these risk factors, there are many steps that you can take to prevent the spread of antibiotic-resistant bacteria in your facility:

- Practice excellent hand hygiene; clean your hands every time you provide care for a resident
- Follow recommended infection prevention and control practices
- Use antibiotics wisely
- Stay home from work when you're sick
- Get a flu shot every year
- Cover your cough or sneeze with a tissue or use your sleeve (near the shoulder or elbow)

Steps you can take to reduce the risk of infection among LTCF residents:

- Limit the use of invasive devices like urinary catheters. For example, talk to the resident's nurse about removing indwelling urinary catheters within 48 hours after admission to a LTCF if it's not needed for the resident's medical condition.
- Limit the contact of healthy residents to infected residents by cohorting (grouping or rooming residents with the same illness or infection together).
- Use excellent infection control practices - especially hand hygiene.
- Always use Standard Precautions. That is, use personal protective equipment such as gowns, gloves, masks, etc. as needed according to the symptoms the resident has (coughing, incontinence) and the care you are going to give that resident (like changing an incontinence pad or performing activities of daily living (ADLs)) in order to prevent blood or body fluids from getting on bare skin, mucous membranes, or clothing.
- Use your familiarity with the resident's usual condition to accurately recognize a change in condition and notify the resident's nurse of changes as soon as possible.
- Clean your hands (soap and warm water or alcohol-based hand rubs) before and after providing resident care.

Effective diagnosis and treatment

- Be sure to collect specimens for microbiology cultures prior to giving antibiotics
 - Infection-causing bacteria might not grow in the lab if the specimen is collected after the resident has started taking antibiotics. The resident's care provider can't know if she is

treating the infection right if the bacteria doesn't grow in the lab.

- Be aware that antibiotics should not be given to residents for viral infections (like influenza, colds, acute bronchitis) or for asymptomatic bacteriuria (bacteria in the urine when the resident does not have symptoms of a urinary tract infection).

Improve antibiotic use

- Nursing assistants' role in early recognition of resident signs/symptoms is key in helping providers accurately diagnose potential infections

Antibiotic stewardship

Antibiotic stewardship is an approach that requires the participation of all healthcare workers, and includes strategies to prevent antibiotic misuse so that the benefits of antibiotics outweigh the risks.

Principles of antibiotic stewardship in long-term care include:

- Using antibiotics only when they are prescribed
- Assisting residents in managing symptoms of non-bacterial infections
- Using evidence-based guidelines to guide decisions about antibiotic therapy

Ingredients for a successful antibiotic stewardship program:

- Education for healthcare providers
- Thorough, accurate and timely observations of a resident's change in condition leads to correct symptom recognition
- Thorough, accurate, and timely communication of resident's change in condition to resident's nurse
 - Communication of resident changes in condition to appropriate staff leads to correct action being taken
- Documentation of resident changes in condition, including signs and symptoms of a possible infection
 - Documentation of resident assessment findings leads to correct follow-up
- Participation of all care providers within the LTCF
 - Your observations, reports, and documentation of a resident's change in condition are vital to residents' safety and wellbeing

Prevent the spread of bacteria

Stopping the spread of bacteria from one person to another is a very important way to control antibiotic resistance. The spread of bacteria can be prevented by using:

Hand hygiene

- Clean your hands before and after caring for all residents, specifically:
 - Before touching a resident
 - To protect the resident against harmful germs carried on your hands
 - Before performing a clean or sterile procedure
 - To protect the resident against harmful germs, including the resident's own, from entering his/her body
 - After blood or body fluid exposure risk
 - After removing gloves
 - After contact with blood, body fluids, mucous membranes, non-intact skin, wounds/dressings, etc.
 - If moving from a contaminated body site to a clean body site
 - After touching a resident
 - To avoid spreading germs from the resident to yourself or others
 - After touching resident surroundings
 - To avoid spreading germs from the resident's surroundings to yourself or others

Standard Precautions

- Use Standard Precautions in the care of all residents - all the time
- Standard Precautions are enough for most LTCF residents with antibiotic-resistant germs
- Standard Precautions include:
 - Hand hygiene
 - Gloves when you expect to have contact with blood, body fluids, secretions, excretions and contaminated items
 - Gown to protect your clothing when you expect contact with resident's blood, body fluids, secretions, excretions, or contaminated items.
 - Mask and eye protection (goggles or face shield) when you expect resident's blood, body fluids, secretions, or excretions to spray or splash when providing care to the resident

The type of personal protective equipment that you need is determined by the type of care you are going to give the resident. Standard Precautions should be used when caring for all residents, regardless of whether they are known to be colonized or infected with antibiotic-resistant bacteria.

Contact Precautions

- Contact Precautions should be implemented for any resident that:
 - Has a wound or skin lesion that cannot be covered fully by dressings or has drainage that cannot be completely contained by dressings;
 - Is incontinent and has urine and/or stool that cannot be contained in incontinence products, urine bags, or ostomy bags;
 - Has a tracheostomy with large amounts of secretions that cannot be contained and are contaminating the environment;
 - Has been linked to infections caused by antibiotic-resistant bacteria in other residents.
- Contact Precautions include:
 - Hand hygiene
 - Gloves upon room entry and especially when providing direct care to residents (such as performing ADLs) and when handling potentially contaminated items (such as bedside tables, bed controls, bathroom fixtures, etc.)
 - Gown upon room entry and especially when providing direct care to residents (such as performing ADLs, having contact with blood, body fluids, secretions and excretions) and when handling potentially contaminated items (such as bedside tables, bed controls, bathroom fixtures, etc.) or changing linens
 - Resident care equipment (glucose monitors, etc.) should be dedicated to a single resident

Cohorting

- If private rooms are not available, room residents known to be colonized or infected with the same organism together. During an outbreak, a wing or area of a facility may need to be identified for housing residents who are ill or infected with the same germ.

Resident, Family and Visitor Education

- Infection prevention and control recommendations for residents in LTCF differ from those for patients in an acute care setting. Hospitalized patients are at increased risk of infection because they are often 1) more sick, 2) frequently exposed to invasive devices (like urinary catheters), and 3) more vulnerable. Therefore, Contact Precautions are generally implemented for all patients known to have antibiotic-resistant bacteria while they are in the hospital.

Antibiotic resistance can affect everyone

- Antibiotic resistance threatens the use of antibiotics for common infections in people of any age. For example, one type of bacteria that causes ear infections in children used to be treated easily with a type of penicillin. However, because of antibiotic resistance, these bacteria are now often resistant to penicillin, and a stronger, more expensive antibiotic is needed to treat the infection.
- Everyone is at risk for getting an antibiotic-resistant infection - not just people with weak immune systems or those who are taking antibiotics. Antibiotic-resistant bacteria, like methicillin-resistant *Staphylococcus aureus* (MRSA), can spread through direct contact within a family, a childcare center, or a healthcare facility.
- While antibiotics are powerful medicines and are needed to treat some infections, antibiotics can also cause harmful side effects. Side effects of antibiotics often include: upset stomach, rashes, interactions with other medications, and diarrhea. Antibiotic-associated diarrhea can be caused by bacteria called *Clostridium difficile* (*C. difficile*). *C. difficile* infection (CDI) is the most common cause of infectious diarrhea acquired in healthcare settings. Symptoms range from mild to severe and include watery diarrhea, fever, discomfort, and abdominal cramping. (See *Clostridium difficile* module.)
- Antibiotic resistance is increasing healthcare costs in many ways. Patients with resistant infections often need to be hospitalized, seen by their doctor many times, and treated with more expensive antibiotics.

Summary

Antibiotic resistance is increasing, and poses a health threat to LTCF residents, healthcare workers, and communities.

- Bacteria can become resistant to antibiotics in a few different ways. These include genetic mutations (naturally occurring changes within the bacteria) or the transfer of genes between bacteria that allow the bacteria to survive against antibiotics.

Factors that can lead to antibiotic resistance include misuse of antibiotics:

- Treating non-bacterial infections with antibiotics.
 - Antibiotics are not effective against viruses - and cannot cure or ease the symptoms of viral infections.
- Not finishing a prescription.
 - This allows remaining bacteria - often those that are resistant to antibiotics - to multiply and cause another infection.
- Using a broad-spectrum antibiotic when a narrow-spectrum agent would work to treat the infection.

You can - and must - implement steps when caring for residents to help prevent the development and spread of antibiotic-resistant germs.

Specific steps you can take include:

- Recognize a resident's change in condition early and communicate clearly and accurately to the resident's nurse.
- Document observations in the resident's medical record, according to the facility's protocol.
- Provide comfort measures and further observation if recommended.
- Recognize resident risk factors (weak immune system, age, chronic conditions) for developing an infection.
- Be aware that symptoms of bacterial and viral infections are often similar and that antibiotics don't work against viral infections.
- Educate residents and family members about antibiotic resistance and infection prevention measures.
- Practice excellent hand hygiene.
- Use Standard Precautions in the care of all residents.

Post-test

1. Define the term "antibiotic resistance".
2. Describe at least one way that germs become resistant to antibiotics.
3. Define at least three factors that can lead to antibiotic resistance in LTCF residents.
4. List at least three action steps that you can take in your nursing practice to prevent antibiotic resistance and the spread of antibiotic-resistant germs in LTCF.

Glossary

Antibiotic-resistant bacteria - Bacteria that have mutated, or changed, so that they develop the ability to survive when exposed to antibiotics that are intended to kill them.

Bacteria - Bacteria are single-celled life forms. Bacteria are present in soil, water, and all living organisms. Many disease-causing organisms are bacteria; however, not all bacteria cause disease. Some bacteria are necessary for essential functions like digestion.

Broad-spectrum antibiotics - Antibiotics that target a wide range of bacteria. They often cause more harm and side effects than narrow-spectrum antibiotics. Broad-spectrum antibiotics may be prescribed to treat an infection when the disease-causing organism is not yet known; the antibiotic can be targeted to the organism once the lab results are available.

Colonization - The presence of bacteria, or other microorganism, without symptoms of disease.

Infection - The presence and multiplication of microorganisms (germs) that are causing symptoms (like fever, redness, wound drainage). Infection generally implies that the person has signs or symptoms of a disease.

Mutation - A permanent change in genetic make-up of an organism.

Narrow-spectrum antibiotics - Antibiotics that target a small, specific range of bacteria.

Normal flora bacteria - Many bacteria are found in the body and provide useful and even essential functions to aid human survival. These bacteria, which under usual circumstances are present but do not cause disease, are called normal flora bacteria.

Virus - A submicroscopic (very small) particle that can reproduce only if it is inside the cell of a living organism. Viruses cannot be killed by antibiotics.

References

1. Potter J, Stott DJ, Roberts MA, et al. Influenza vaccination of health care workers in long-term-care hospitals reduces the mortality of elderly patients. *J Infect Dis.* 1997;175:1-6.
2. Thompson BL, Dwyer DM, Ussery XT, Denman S, Vacek P, Schwartz B. Handwashing and glove use in a long-term-care facility. *Infect Control Hosp Epidemiol.* 1997;18:97-103.
3. Nicolle LE, Bentley DW, Garibaldi R, Neuhaus EG, Smith PW. Antimicrobial use in long-term-care facilities. SHEA Long-Term-Care Committee. *Infect Control Hosp Epidemiol.* 2000;21:537-545.
4. Stott NC, West RR. Randomised controlled trial of antibiotics in patients with cough and purulent sputum. *Br Med J.* 1976;2:556-559.

For more information

Minnesota Department of Health (MDH) Infection Prevention and Control
www.health.state.mn.us/divs/idepc/dtopics/infectioncontrol/guidelines.html

Minnesota Antibiotic Resistance Collaborative www.minnesotaarc.org

Centers for Disease Control and Prevention (CDC) General Information about Antibiotic Resistance
www.cdc.gov/drugresistance/

CDC Campaign to Prevent Antibiotic Resistance
www.cdc.gov/getsmart/healthcare/

Alliance for the Prudent Use of Antibiotics
www.tufts.edu/med/apua/

Guideline for the Management of Antimicrobial Resistant Microorganisms in Minnesota Long-Term Care Facilities
www.health.state.mn.us/divs/idepc/dtopics/infectioncontrol/ltcguideline.htm