



ANTIBIOTIC USE AND ANTIBIOTIC RESISTANCE

Educational Module For Nurses
In Long-term Care Facilities

Antibiotic Use and Antibiotic Resistance Pre-test

1. Define the term “antibiotic resistance.”
2. Describe at least one mechanism of the development of antibiotic resistance.
3. Define at least three factors that contribute to antibiotic resistance in long-term care facility 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 organisms in long-term care facilities.

Learning Objectives

- Define antibiotic resistance
- Describe mechanisms of the development of antibiotic resistance
- Define factors that contribute to antibiotic resistance
- List at least 3 action steps to prevent antibiotic resistance and the spread of antibiotic-resistant organisms

This presentation is adapted with permission from education created by the [Minnesota Antimicrobial Stewardship Program Resources for Long-Term Care Facilities](#)

Introduction

- Antimicrobials are a large group of medications that include:
 - Antibiotics – to treat bacterial infections
 - Antivirals – to treat viral infections
 - Antifungals – to treat fungal infections
 - Antiparasitics – to treat infections caused by parasites
- This educational module specifically deals with antibiotic use and antibiotic resistance among bacteria. Be aware that documented resistance to varying antimicrobial drugs exists among other types of microorganisms

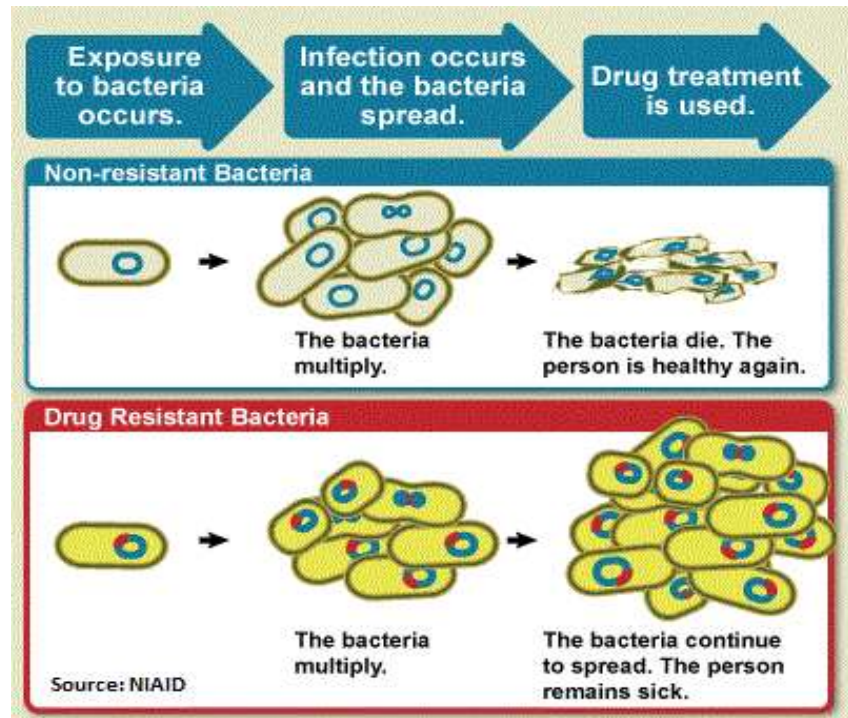
Introduction

- Antibiotic resistance is one of the most important public health threats that we face today
- Infections caused by antibiotic-resistant organisms require treatment with more toxic and expensive antibiotics
- Antibiotic use is the biggest driving factor in the development of antibiotic-resistant organisms
- Antibiotic resistance is of concern in long-term care facilities (LTCF) where antibiotic use is very common

Antibiotic Resistance

Antibiotic Resistance

- What is antibiotic resistance?
 - The ability of an organism to mutate or change to fight against antibiotics intended to kill it



Mechanisms of Antibiotic Resistance

- Antibiotic use is the biggest driver in the development of antibiotic resistance
- Biological mechanisms by which organisms become resistant vary depending on the organism
- Two ways that bacteria become resistant
 - Mutations: changes in genes
 - Gene transfer: new genes acquired from other bacteria

Consequences of Antibiotic Resistance

- Antibiotics are the most important tool we have to combat life-threatening bacterial infections
- Antibiotics may kill susceptible bacteria, but resistant bacteria continue to survive and multiply
- If antibiotic-resistant bacteria cause an infection, the infection may be more serious and difficult to treat with routine antibiotics

Diagram of How Antibiotic Misuse Can Cause Antibiotic-resistant Bacteria to Multiply

Here are the players:



Virus

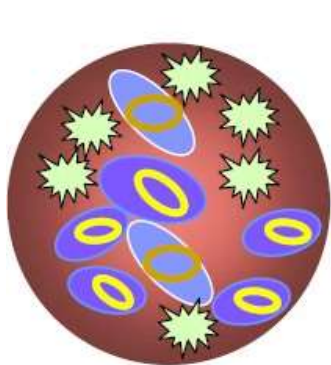


Susceptible Bacteria

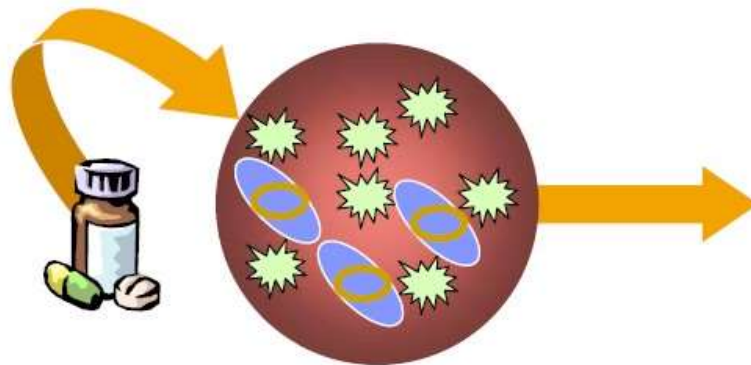


Naturally Resistant Bacteria

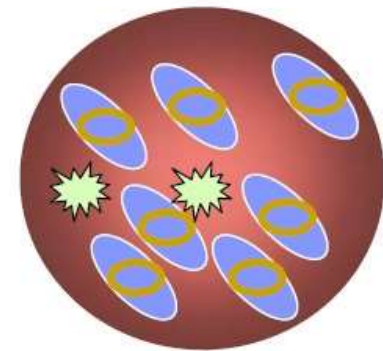
Taking antibiotics for a viral infection:



A resident takes antibiotics for a viral infection



Susceptible bacteria are killed off by the antibiotics, but the resistant bacteria and the viruses survive!



The immune system fights off the viruses while the resistant bacteria multiply - waiting for an opportunity to cause infection.

Diagram of How Antibiotic Misuse Can Cause Antibiotic-resistant Bacteria to Multiply

Here are the players:



Virus

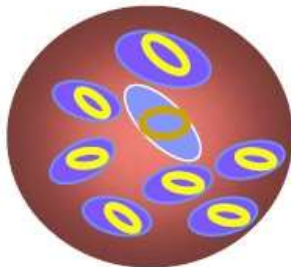


Susceptible Bacteria



Naturally Resistant Bacteria

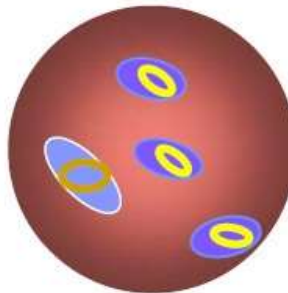
Not finishing the full course of antibiotics can also lead to antibiotic resistance:



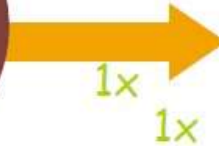
Day 1: A person is sick with a bacterial infection.



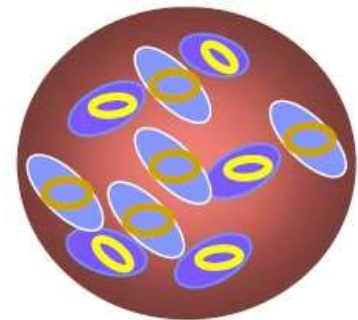
Antibiotics are prescribed. Susceptible bacteria are killed.



Day 4: Person feels better and stops taking antibiotics...



...meanwhile resistant and susceptible survivors multiply



Day 14: The infection is not cured and is harder to treat

Examples of Antibiotic Misuse

- Taking antibiotics when not indicated
 - For asymptomatic bacteriuria (bacteria in the urine without the presence of clinical symptoms)
 - For a resident with green or yellow nasal discharge – without other symptoms, this does not mean that the resident has a bacterial infection
- Not finishing an antibiotic prescription
 - Example: A person stops taking the antibiotic when he feels better instead of when his prescription is gone

Examples of Antibiotic Misuse (cont.)

- Inappropriate prescribing
 - Prescribing antibiotics for too many days
 - Example: Prescribing a 14-day course when a 7-day course is sufficient
 - Use of broad-spectrum antibiotics when a narrow-spectrum antibiotic would be effective
 - Example: Prescribing ciprofloxacin (broad-spectrum) when lab results indicate that penicillin (narrow-spectrum) can be used

Examples of Antibiotic Misuse (cont.)

- Antibiotics are not effective against viral infections!
- Antibiotics will not:
 - Cure viral infections
 - Stop the spread of viruses
 - Alleviate symptoms of viral infections



Consequences of Antibiotic Misuse

- Taking antibiotics when not clinically indicated can result in:
 - Drug-drug interactions
 - Medication side effects
 - Increased health costs
- Antibiotic misuse can lead to antibiotic-resistant bacteria
- When antibiotics are misused, they will not be able to fight infections they were meant to treat

The way we use antibiotics today or in one patient directly impacts how effective they will be tomorrow or in another patient; they are a shared resource.

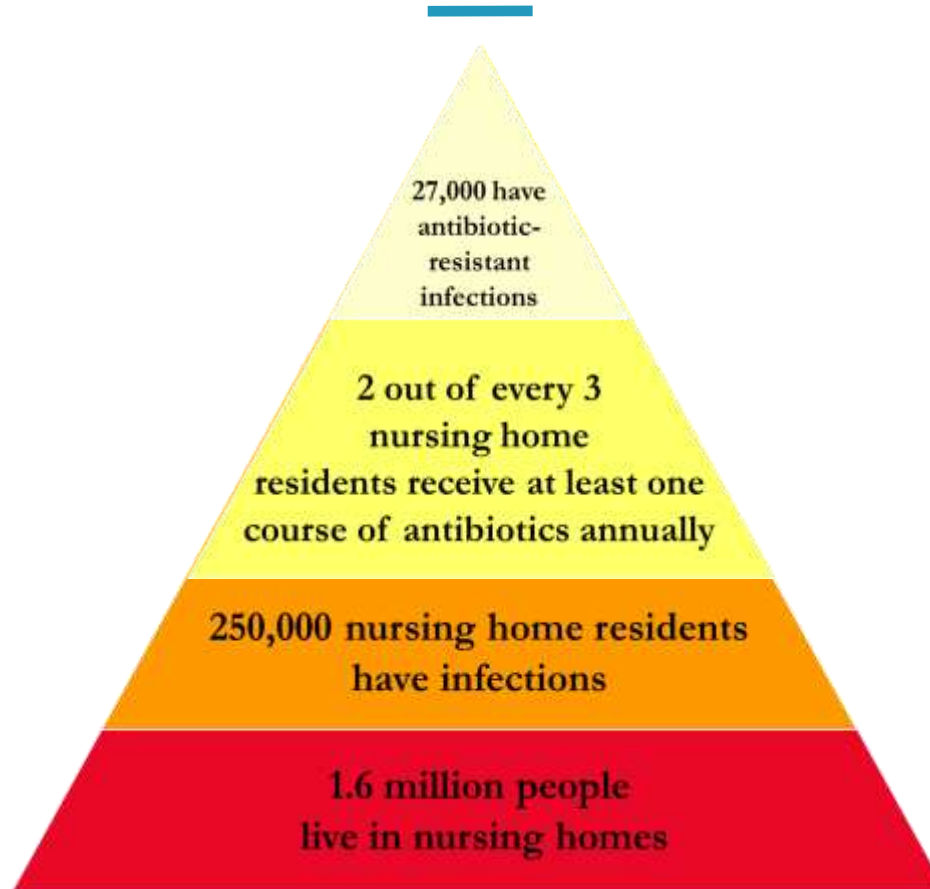


Antibiotic Use in LTCF

- 40% of all systemic drugs prescribed in LTCF are antimicrobials
- Up to 70% of LTCF residents receive at least one systemic antibiotic every year
 - 25-75% are inappropriate
- Infections are common among LTCF residents
- LTCF residents are at higher risk of infection

Infections in Long-term Care

Burden of Infections in Long-term Care

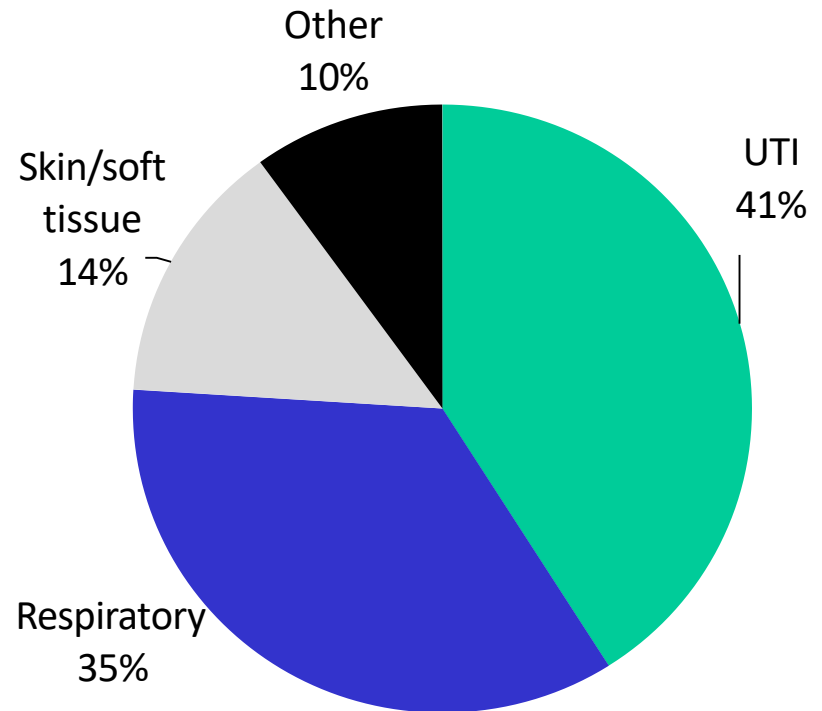


www.cdc.gov Centers for Medicare & Medicaid Services, Long Term Care MDS, Resident profile table as of 5/2/2005.

Common Infections in LTCF Residents

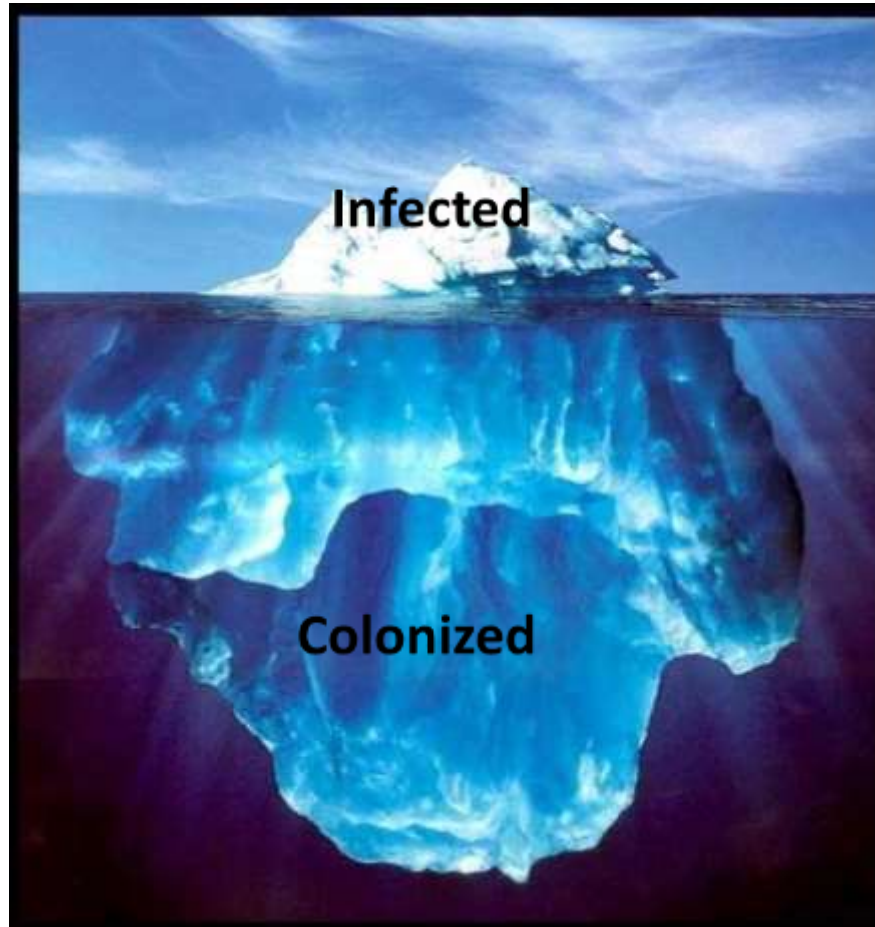
- Urinary tract infections
- Respiratory infections
- Skin and soft tissue infections
- Gastroenteritis

Indications for Antibiotic Use



Katz et al. Arch Int Med 1990

The Iceberg Effect



Colonization versus Infection

- Colonization (“carrier”)
 - Presence of bacteria (e.g., in urine or on skin) without signs or symptoms of illness
- Infection
 - Presence of pathogenic bacteria that results in symptoms of infection

Bacteria can be transmitted if the person is colonized or infected

Increased Infection Risk in LTCF Residents



Facility Factors

- Close contact with other individuals
- Transfers to and from hospitals
- Staffing issues
- Inadequate hand hygiene
- Low flu vaccination rates in staff



Resident Factors

- Older age
- Decreased immune function
- Functional impairment
- Use of invasive devices
- Chronic and degenerative diseases

Prevent Antibiotic-resistant Infections in Long-term Care

Steps to Prevent Transmission of Antibiotic-resistant Organisms in LTCF

- Practice excellent hand hygiene – clean your hands every time you provide care for a resident
- Follow recommended infection prevention and control practices
- Use antibiotics only when clinically indicated
- 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 to Reduce the Risk of Infection Among LTCF Residents

- Use nursing assessment skills to accurately evaluate resident symptoms and communicate changes in condition
- Discontinue the use of invasive devices when clinically appropriate
- Limit the exposure of healthy residents to infected residents by cohorting (grouping or rooming together residents with the same illness or infection)
- Use excellent infection control practices – especially hand hygiene
- Always use Standard Precautions – gowns, gloves, masks, etc. as indicated according to symptoms (coughing, incontinence) and the care given (e.g. change a dressing or perform tracheostomy care)

Effective Diagnosis and Treatment

- Obtain microbiology cultures whenever possible to guide appropriate antibiotic use
 - Collect specimens *prior to* initiating antibiotic therapy

Do not request antibiotics for:

- Viral infections
- Asymptomatic bacteriuria
- Change in condition not likely due to bacterial infection (e.g. falls, confusion)



Optimize Antibiotic Use

- The microbiology lab can perform an antibiotic susceptibility test on bacteria identified in a lab specimen (blood, urine, etc.)
- Antibiotic susceptibility tests are important to determine which antibiotic should be prescribed to effectively treat the infection

Optimize Antibiotic Use (cont.)

- When laboratory results are complete, notify the prescriber and facilitate an “antibiotic time-out” (re- assessment of the antibiotic prescribed)
 - If culture results are negative:
 - Recommend discontinuation of antibiotics
 - If culture results are positive:
 - Provide susceptibility report to encourage use of a narrower spectrum antibiotic, if available
 - Assess for de-escalation opportunities (e.g., from IV to P.O.)
 - Promote the 5 D’s of optimal antibiotic therapy

The 5 D's of Optimal Antibiotic Therapy

- **Diagnosis**
 - Does the condition require antibiotic therapy?
- **Drug**
 - Is the bacteria susceptible?
- **Dose**
 - What is the recommended dose?
- **Duration**
 - What is the recommended duration?
- **De-escalation**
 - Can the antibiotic be switched from IV to oral?

Antimicrobial Stewardship

- Stewardship definition: “the careful and responsible management of something entrusted to one's care” – Merriam-Webster Dictionary
- Antimicrobial stewardship: strategies for the responsible use of antimicrobials
 - In order to be effective, must include all levels of healthcare workers

Antimicrobial Stewardship, cont.

- Antimicrobial stewardship prevents misuse, enabling the benefits of antimicrobials to outweigh the risks
- Ingredients for successful stewardship include:
 - Education for nurses and providers
 - Evidence-based guidelines for clinical assessment, testing for and treating infections
 - Accurate assessment of resident changes in condition
 - Accurate, timely communication and documentation of resident signs/symptoms and laboratory results
 - Participation of all care providers within the LTCF

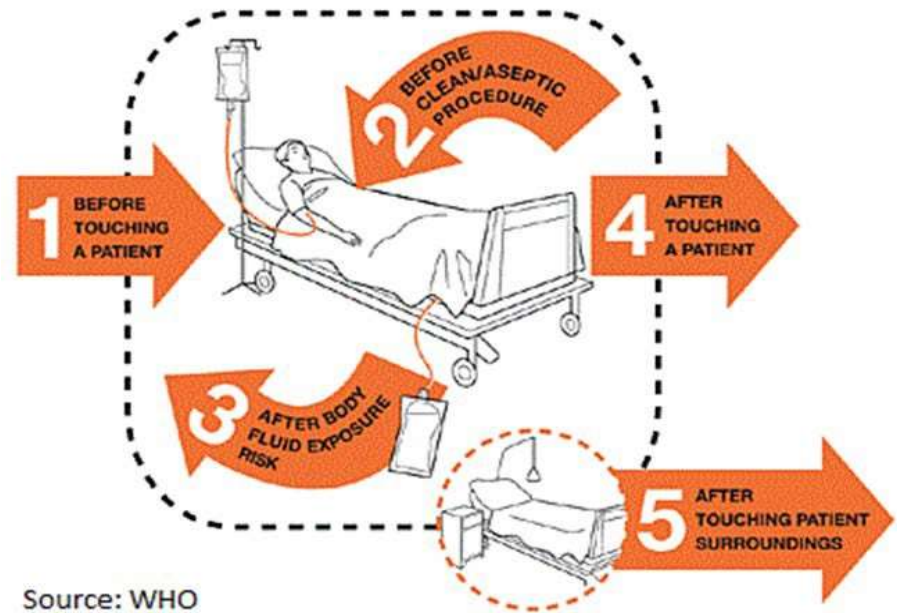
Principles of Antimicrobial Stewardship

- Use antibiotics only when clinically indicated
- Assist residents in managing symptoms of non-bacterial infections
- Use evidence-based guidelines regarding indication for treatment, antibiotic selection, and duration of antibiotic therapy

Prevent Transmission of Infections

Prevent Transmission of Infections

- Stopping the spread of organisms from one person to another is a critical way to control antibiotic resistance
- The World Health Organization (WHO) has promoted the “My 5 Moments for Hand Hygiene” approach:



Prevent Transmission of Infections (cont.)

Standard Precautions – use for all residents, all the time

- Hand hygiene
- Gloves when you expect to have contact with blood, body fluids, secretions, excretions, and contaminated items
- Gown to protect clothing against contact with resident blood, body fluids, secretions, excretions or contaminated items
- Mask and eye protection (goggles) if spraying or splashing is anticipated

Prevent Transmission of Infections (cont.)

Contact Precautions – use for any resident that:

- Has a wound or skin lesion that cannot be covered fully or has drainage that cannot be completely contained by dressings
- Is incontinent of urine and/or stool that cannot be contained by incontinence products
- Has a tracheostomy with secretions that cannot be contained
- Has been epidemiologically linked to infections caused by antibiotic-resistant organisms in other residents

Cohorting – if private rooms are not available, room together residents known to be colonized or infected with the same organism

Prevent Transmission of Infections: Contact Precautions (cont.)

- **Gloves:** clean, non-sterile; should be changed and hands cleaned after contact with material that may contain high concentrations of microorganisms
- **Gowns:** clean, non-sterile, long-sleeved; for duration of exposure to resident or resident's environment
 - When providing direct care to residents with antibiotic-resistant or other disease-causing organisms (e.g., performing ADLs) or if anticipating contact with secretions/excretions (e.g., linen changes, incontinence care)
 - When anticipating contact with items or surfaces potentially contaminated with antibiotic-resistant or other disease-causing organisms (e.g., those close to or used by the resident)
- **Resident care equipment:** dedicate to a single resident

Educate Residents, Family and Visitors

- Infection prevention and control recommendations for residents in LTCF differ from those for patients in hospitals
- Contact Precautions are generally implemented for all patients known to have antibiotic-resistant organisms while they are in the hospital because:
 - People in hospitals are sicker, more vulnerable
 - Frequent presence of invasive devices
- Assure family members that you are providing appropriate care to their loved one

Antibiotic Resistance Affects Everyone

- Antibiotic resistance threatens the use of antibiotics for people of all ages
 - Everyone is at risk for getting an antibiotic-resistant infection
- Antibiotics are essential treatment for some infections, but also can produce harmful side effects
 - Upset stomach
 - Rashes
 - Interactions with other medications
 - Diarrhea (e.g., *Clostridium difficile*)
- Antibiotic resistance increases healthcare costs (e.g., hospitalizations, doctor visits, expensive treatments)

Summary

Summary

- Antibiotic resistance is the ability of bacteria to survive the antibiotic intended to kill it
 - Mechanisms: genetic mutation, gene transfer
- Antibiotic resistance is an increasing health threat to LTCF residents, healthcare workers, and communities



Summary (cont.)

- Factors that contribute to antibiotic resistance:
 - Treating viral infections or bacterial colonization with antibiotics
 - Antibiotics are not effective against viruses – and cannot cure or ease the symptoms of viral infections
 - Not finishing the entire prescription
 - This allows remaining bacteria – often those that have acquired antibiotic resistance – to multiply and cause another infection
 - Use of a broad-spectrum drug when a narrow-spectrum agent would be effective

Summary (cont.)

You can – and must – implement steps in your nursing practice to help prevent the development and transmission of antibiotic-resistant microorganisms

- Perform thorough nursing assessments prior to contacting a provider about a change in resident status
- Document observations and assessment findings; communicate clearly and thoroughly to the provider
- Recognize resident risk factors for developing an infection (compromised immune system, age, chronic conditions)
- Implement comfort measures and further observation if recommended

Summary (cont.)

- Avoid demanding antibiotics if the provider does not determine it is indicated
- Remember that antibiotics are never effective against viral infections
- Educate residents and family about antibiotic resistance and infection prevention measures
- Practice excellent hand hygiene and use Standard Precautions in the care of all residents
- Prevent the spread of antibiotic-resistant or other disease-causing organisms by following infection prevention and control guidelines

Glossary, part 1

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

Bacteria - Bacteria (singular: bacterium) 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 are often more toxic and cause more side effects than narrow-spectrum antibiotics. Broad-spectrum antibiotics may be prescribed to treat an infection when the causative organism is not yet known; the antibiotic can be targeted to the organism once the lab results are available.

Glossary, part 2

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

Infection - The presence and multiplication of microorganisms that are causing symptoms (i.e. fever, redness, wound drainage). Infection generally implies that the person has clinical 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, such as gram-negative or gram-positive bacteria.

Glossary, part 3

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 particle that can reproduce only if it is inside the cell of a living organism. Viruses cannot be killed by antibiotics.

For more information

- [Nursing Home Resources | Washington State Department of Health](#)

References

This education is adapted with permission from the Minnesota Department of Health

- 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.
- 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.
- 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.
- Stott NC, West RR. Randomised controlled trial of antibiotics in patients with cough and purulent sputum. *Br Med J.* 1976;2:556-559.

Thank you!



420-555 | Nov 2023

To request this document in another format, call 1-800-525-0127. Deaf or hard of hearing customers, please call 711 (Washington Relay) or email civil.rights@doh.wa.gov.