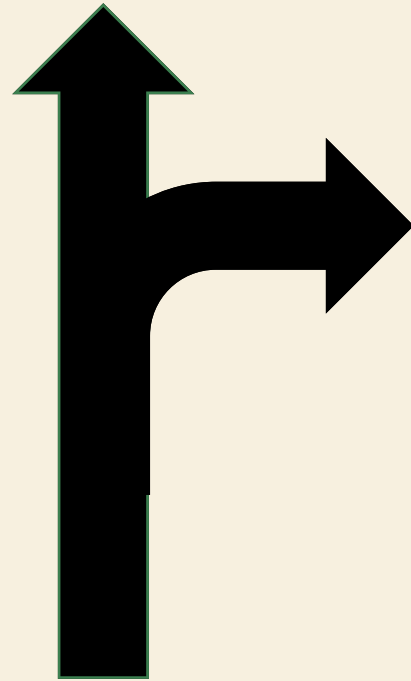


ANTIMICROBIAL STEWARDSHIP: THE ROLE OF THE CLINICIAN

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Crisis: Antibiotic Resistance



**Success
Strategy**

OBJECTIVES

- Discuss the importance of antibiotic stewardship for nursing homes
 - Current use in this setting
 - Consequences of misuse
- Describe the mechanisms of antibiotic resistance
- Discuss the goal of antibiotic stewardship in nursing homes
- Discuss the key nursing actions in decreasing antibiotic resistance and influence antibiotic management

“Microbes are educated to resist penicillin and a host of penicillin-fast organisms is bred out ...

In such cases, the thoughtless person playing with penicillin is morally responsible for the death of the man who finally succumbs to the infection with the penicillin

Resistant organism. I hope this evil can be averted.”



Alexander Fleming

DEFINITION: ANTIMICROBIAL STEWARDSHIP

- The optimal selection, dosage, and duration of antimicrobial treatment that results in the best clinical outcome for the treatment or prevention of infection, with minimal toxicity to the patient and minimal impact on subsequent resistance

★ Should also focus on appropriate diagnosis.



IMPACT OF ANTIBIOTIC RESISTANCE IN U.S.

ANTIBIOTIC RESISTANCE IN THE U.S.

According to the CDC, each year, about 2 million Americans develop antibiotic-resistant infections, and roughly 23,000 die

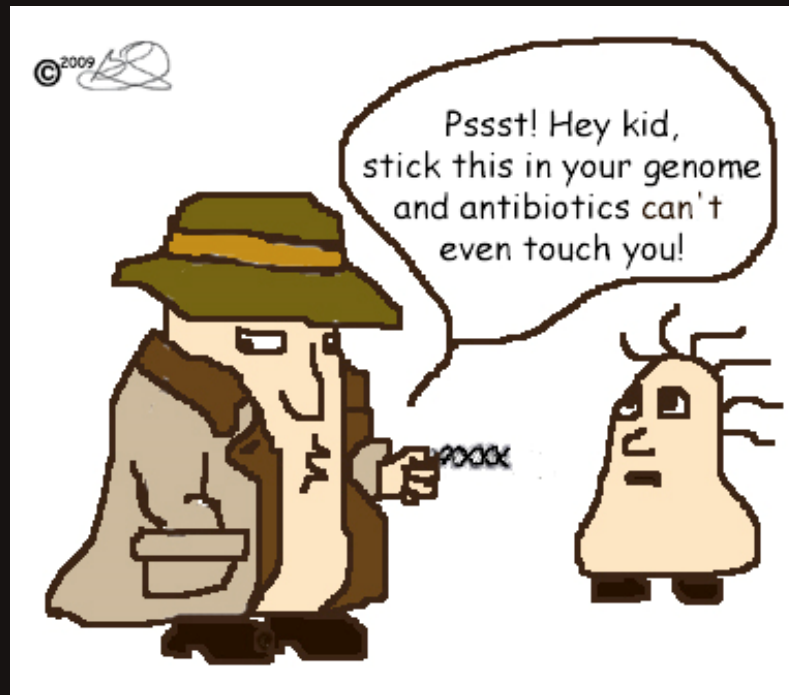
Cost the US health system over \$20 billion

An estimated 8 million extra hospital days



<http://www.cdc.gov/drugresistance/pdf/ar-threats-2013-508.pdf>
Roberts RR, et al. Clin Infect Dis. 2009 Oct 15;49(8):1175-84.

MECHANISMS OF ANTIBIOTIC RESISTANCE



ANTIBIOTIC RESISTANCE

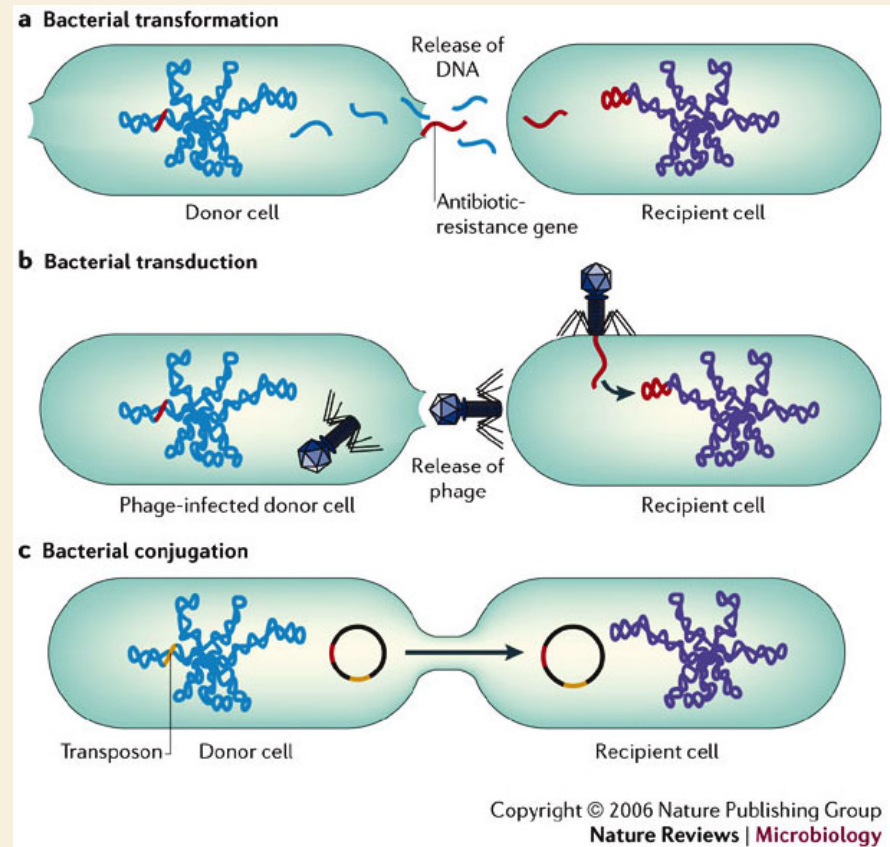
- Antibiotic resistance in bacteria may be
 - **An Inherent (natural) resistance.** Bacteria may be inherently resistant to an antibiotic. For example, an organism lacks a transport system for an antibiotic; or an organism lacks the target of the antibiotic molecule
 - **Acquired resistance.** Bacteria develop several mechanisms in order to acquire resistance to antibiotics. All require either the modification of existing genetic material (DNA) or the acquisition of new genetic material (DNA) from another source.

THREE PROCESSES OF RESISTANCE

Transformation: when parts of DNA are taken up by the bacteria from the external environment. This DNA is normally present in the external environment due to the death and lysis of another bacterium

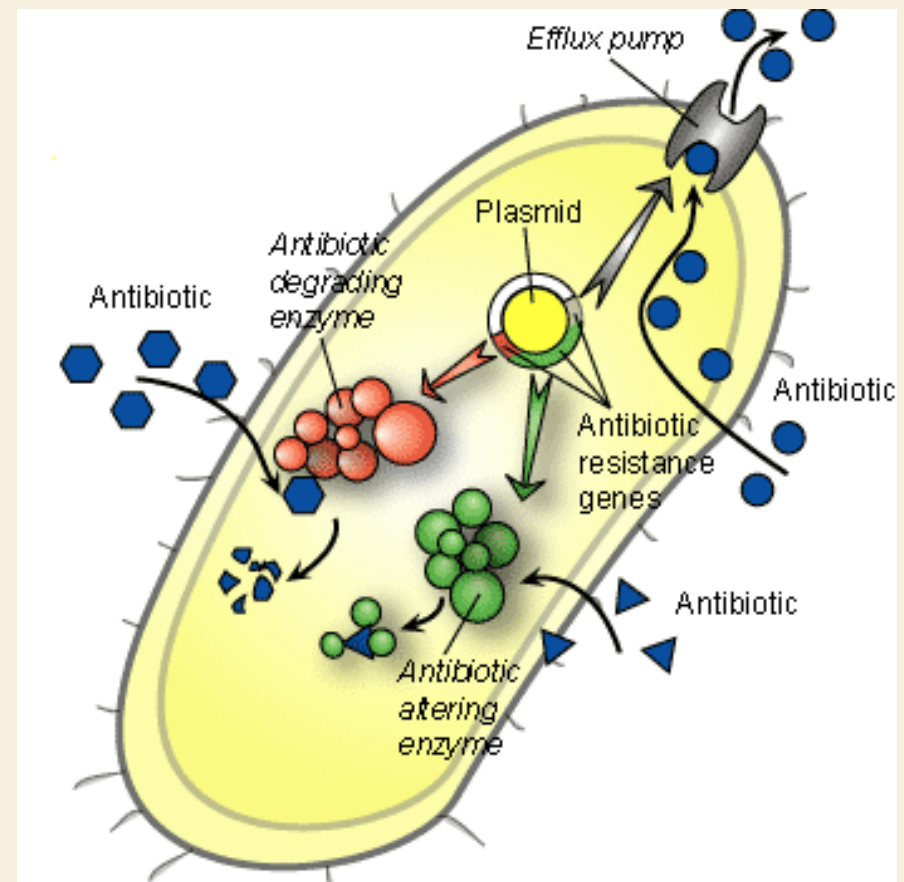
Transduction: when bacteria-specific viruses (bacteriophages) transfer DNA between two closely related bacteria.

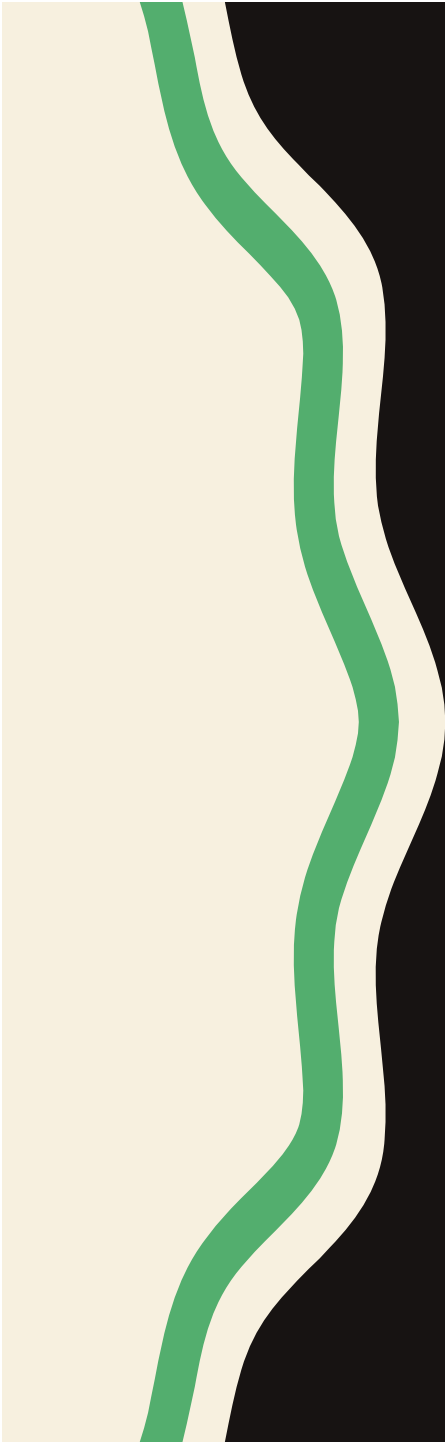
Conjugation: when there is direct cell-cell contact between two bacteria and transfer of small pieces of DNA called plasmids takes place. This is thought to be the main mechanism



MODES OF RESISTANCE

- Bacteria respond to selection pressure
 - Evolution
- Main types of resistance
 - Mutated target site
 - Destruction or alteration of drug
 - Efflux pumps that move drug out of cell
 - Reduced uptake into cell





IMPACT OF ANTIBIOTIC RESISTANCE IN NURSING HOMES

ANTIBIOTICS FREQUENTLY USED

- Antibiotics are among the most commonly prescribed medications in nursing homes.



Estimates of the cost of antibiotics in the long-term care setting range from \$38 million to \$137 million per year.



Up to 70% of long-term care facilities' residents receive an antibiotic every year

Strausbaugh LJ, et al. *Infect Control Hosp Epidemiol.* 2000;21:674-679
Daneman N, et al. *JAMA Intern Med.* 2015;175(8):1331-1339

ANTIBIOTICS FREQUENTLY USED



Up to 75% of antibiotic are prescribed incorrectly (prescribing the wrong drug, dose, duration or reason)



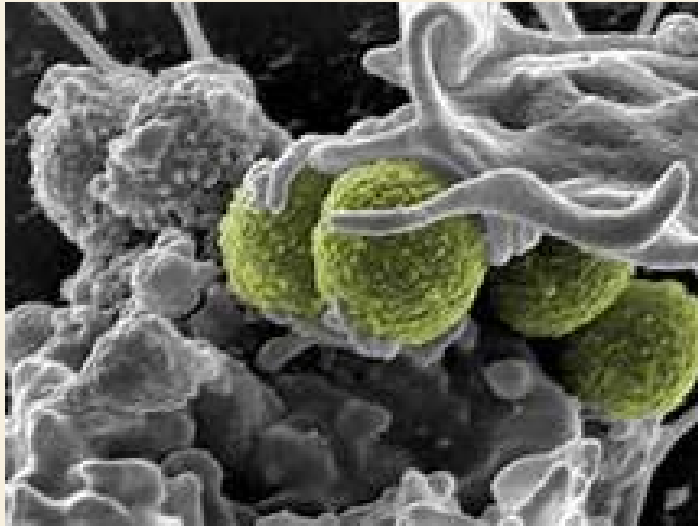
Nearly 50% of antibiotics prescribed in nursing homes may be given longer than necessary

Lim CJ, et al. Clin Interv Aging. 2014;9:165-177

Nicolle LE, et al. Infect Control Hosp Epidemiol. 2000;21:537-45

Daneman N, et al. JAMA Intern Med. 2013;173(8):673-682

RISK OF OVERUSE



Residents in nursing homes with higher antibiotic use have a 24% increased risk of antibiotic-related harm

In nursing homes with higher antibiotic use, **even residents who do not receive antibiotics are at increased risk** of indirect antibiotic-related harms due to the spread of resistant bacteria or *C. difficile* germs from other patients

TOP ANTIBIOTIC RESISTANCE THREATS IN NURSING HOMES

Organism	Est. Hospitalizations per year	Est. deaths per year	Prevalence
C. difficile	250,000	14,000	4-30%
VRE	20,000	1,300	5-18%
MRSA	80,000	11,000	30%
MDR GNR	26,000	1,700	20%

VRE = Vancomycin resistant enterococci;

MDR GNR = multidrug-resistant Gram negative rods

MRSA = Methicillin-resistant Staphylococcus

CONSEQUENCES OF ANTIBIOTIC RESISTANCE

- **Antibiotic resistance in long-term care is associated with:**
 - Increased risk of hospitalization
 - Increased cost of treatments
 - Increased risk of death

CONSEQUENCES OF INAPPROPRIATE ANTIBIOTIC USE:

Excessive Use: e.g. long duration or combination therapy

Inappropriate drug administration e.g. viral infections

Suboptimal dosing e.g. loading dose or underdosing



- Collateral Damage
 - Selection of drug resistance organisms
 - Infection with MDR pathogens
 - Super infection with fungal infection
 - Clostridium difficile infections

FOUR CORE ACTIONS TO FIGHT RESISTANCE

1. Preventing infections, preventing the spread of resistance

- Immunization
- Safe food preparation
- Handwashing
- Using antibiotics as directed and only when necessary



2. Tracking

- Data gathering (causes of infection and risk factors)

3. Improving antibiotic prescribing/stewardship

4. Developing new drugs and diagnostic tests

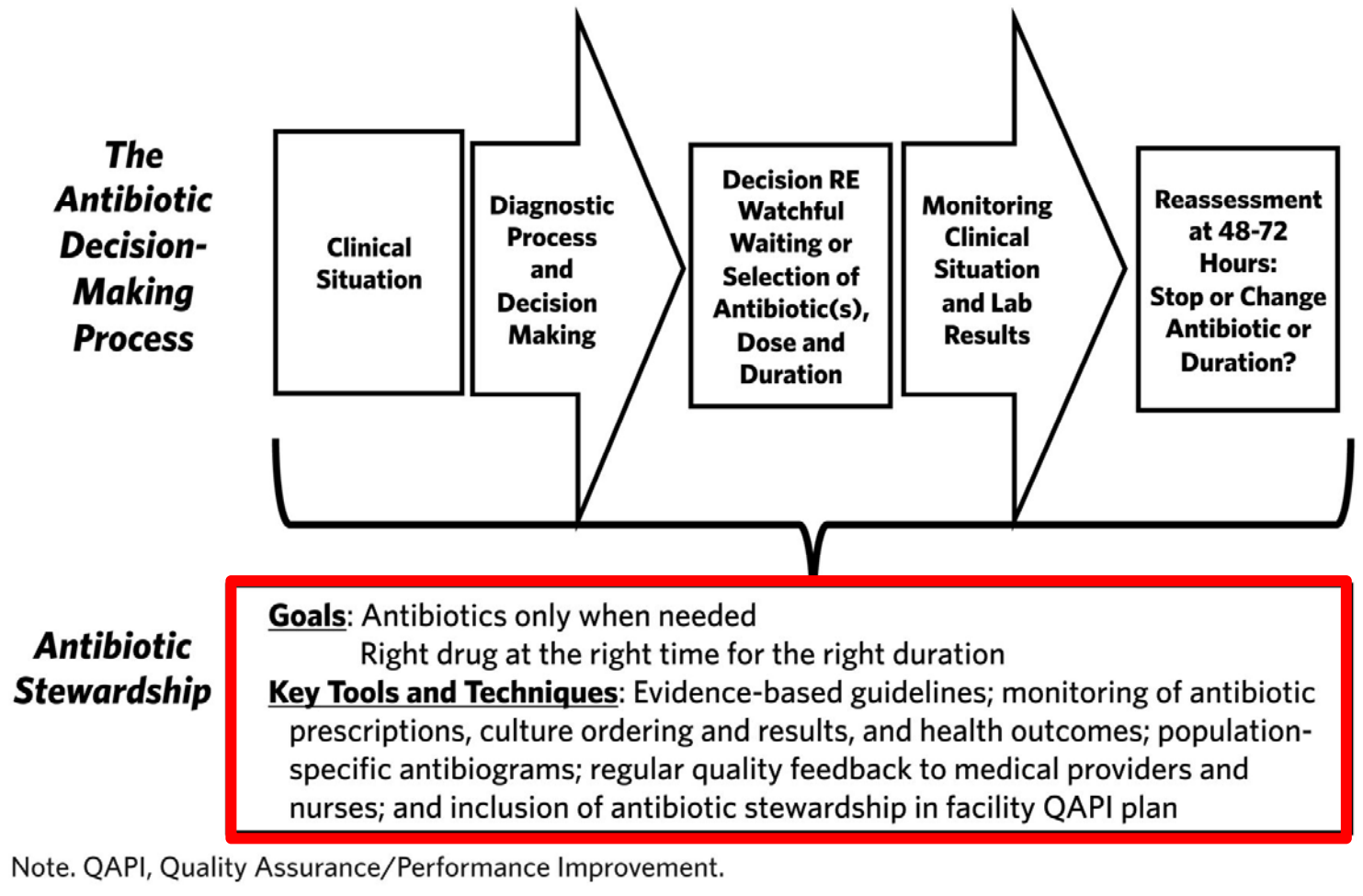


ANTIBIOTIC STEWARDSHIP

DEFINITION: ANTIMICROBIAL STEWARDSHIP

- The optimal selection, dosage, and duration of antimicrobial treatment that results in the best clinical outcome for the treatment or prevention of infection, with minimal toxicity to the patient and minimal impact on subsequent resistance
 - ★ Should also focus on appropriate diagnosis.

FIGURE 1.
Schematic Representation of the Process of Antibiotic Prescribing Decision Making and the Role of Antibiotic Stewardship



Philip D. Sloane et al. North Carolina Medical Journal 2016;77:324-329

BENEFITS: ANTIMICROBIAL STEWARDSHIP

- Benefits include:
 - Reduced mortality
 - Reduced adverse effects including clostridium difficile infections
 - Improvement of rates of antibiotic susceptibilities to targeted antibiotics
 - Optimization of resource utilization across the continuum of care

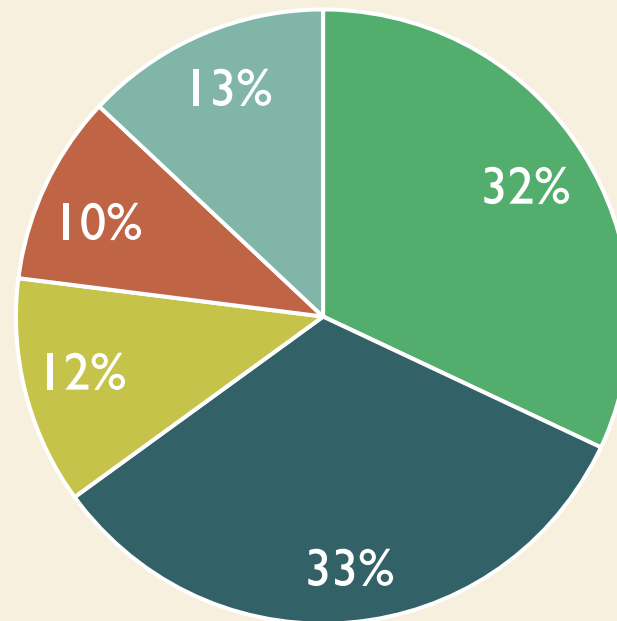
GOAL OF ANTIMICROBIAL STEWARDSHIP IN NURSING HOMES

Antibiotic stewardship refers to a set of commitments and activities designed to “optimize the treatment of infections while reducing the adverse events associated with antibiotic use.”

7 CORE ELEMENTS FOR ANTIBIOTIC STEWARDSHIP IN LTCFS

1. Leadership commitment
2. Accountability
3. Drug expertise
4. Action to improve use
5. Tracking: monitoring antibiotic prescribing, use, and resistance
6. Reporting information to staff and clinical providers
7. Education

MOST COMMON INFECTIONS TREATED WITH ANTIBIOTICS IN NURSING HOMES



- Urinary Tract Infections
- Skin and Soft Tissue Infections
- Undocumented
- Respiratory Tract Infections
- Other

12 COMMON NURSING HOME SITUATIONS IN WHICH ANTIBIOTICS ARE GENERALLY NOT INDICATED

1. Positive urine culture in an asymptomatic patient
2. Urine culture ordered solely because of change in urine appearance
3. Nonspecific symptoms or signs not referable to the urinary tract (with or without a positive culture)
4. Upper respiratory infection (common cold)
5. Bronchitis or asthma in a patient who does not have COPD

12 COMMON NURSING HOME SITUATIONS IN WHICH ANTIBIOTICS ARE GENERALLY NOT INDICATED

6. Infiltrate on chest x-ray in the absence of clinically significant symptoms

7. Suspected or proven influenza in absence of a secondary infection (do treat influenza with antivirals)

8. Respiratory symptoms in a patient with advanced dementia, on palliative care, or end of life

9. Skin wound without cellulitis, sepsis, or osteomyelitis (regardless of culture result)

12 COMMON NURSING HOME SITUATIONS IN WHICH ANTIBIOTICS ARE GENERALLY NOT INDICATED

10. Small (< 5 cm) localized abscess without significant surrounding cellulitis (note: drainage is required of all abscesses)

11. Decubitus ulcer in a patient at the end of life

12. Acute vomiting and/or diarrhea in the absence of a positive culture for shigella or salmonella, or a positive toxin assay for *C. difficile*

CLINICIAN'S RESPONSIBILITY

- Stewardship is every prescriber's responsibility
- Obtain an accurate allergy history
- Timely antibiotic initiation
- Comply with infection prevention especially hand hygiene
- Follow evidence-based guidelines;
 - Avoid unnecessary use
- Obtain appropriate cultures before starting antibiotics

CLINICIAN'S RESPONSIBILITY

- Review antibiotic use in past 48 – 72 hours
 - Determine appropriateness and need of antibiotic coverage
 - Can therapy be de-escalate
- Reduce use of antibiotics with a high risk for *C. difficile*
 - Clindamycin
 - Broad-spectrum antibiotics, especially cephalosporins
 - Fluoroquinolones

CLINICIAN'S RESPONSIBILITY

- Monitor progress, future culture reports and antibiotic adjustments and resistance
- Optimize dosing and shortest effective duration of antibiotic therapy
- Documentation of indication, dose, and duration on orders

CONCLUSION

- Antibiotic resistance in long-term care is associated with:
 - Increased risk of hospitalization
 - Increased cost of treatments
 - Increased risk of death
- The goal of an antibiotic stewardship program is to “*optimize the treatment of infections while reducing the adverse events associated with antibiotic use.*”

CONCLUSION

- Clinicians have a vital role in promoting judicious use of antibiotics and ensuring patients receive care appropriate to their need