Antibiotic Stewardship Education

1. Prevention of antibiotic resistance

Current scientific literature emphasizes the need to reduce the use of inappropriate antimicrobials in all health care settings due to antimicrobial resistance. According to the World Health Organization (WHO): "Antimicrobial resistance threatens the effective prevention and treatment of an ever-increasing range of infections caused by bacteria, parasites, viruses and fungi." The Centers for Disease Control and Prevention (CDC) identified that 20%–50% of all antibiotics prescribed in US acute care hospitals are either unnecessary or inappropriate. The CDC has also stated: "Antibiotics are among the most commonly prescribed medications in nursing homes. Up to 70% of long-term care facilities' residents receive an antibiotic every year."

The goal is to control antibiotic usage to decrease worldwide growing antibiotic resistance. MISH will be able to contribute to this goal mostly in the area of antibiotic prophylaxis used in surgery. MISH is mostly surgically based, and does not have an ER. Since opening MISH has not needed to treat an MDRO. Below is an organizational plan in developing an antibiotic stewardship program that is based on our facility needs.

While we are taking many actions to meet this endeavor which includes (please HCAI update):

1. Prevention of healthcare acquired infections such as catheter/line/surgery related.
2. Prevention of bacteria from spreading (MDRO prevention measures).
3. Promoting hand hygiene culture and isolation protocols
4. Culture specimen collection procedures, and
5. MDRO surveillance

The focus for this update will be specific to antibiotic usage. Below we are outlining our procedure for antibiotic ordering in the treatment of a suspected infection versus prophylactic use during procedures/surgery.

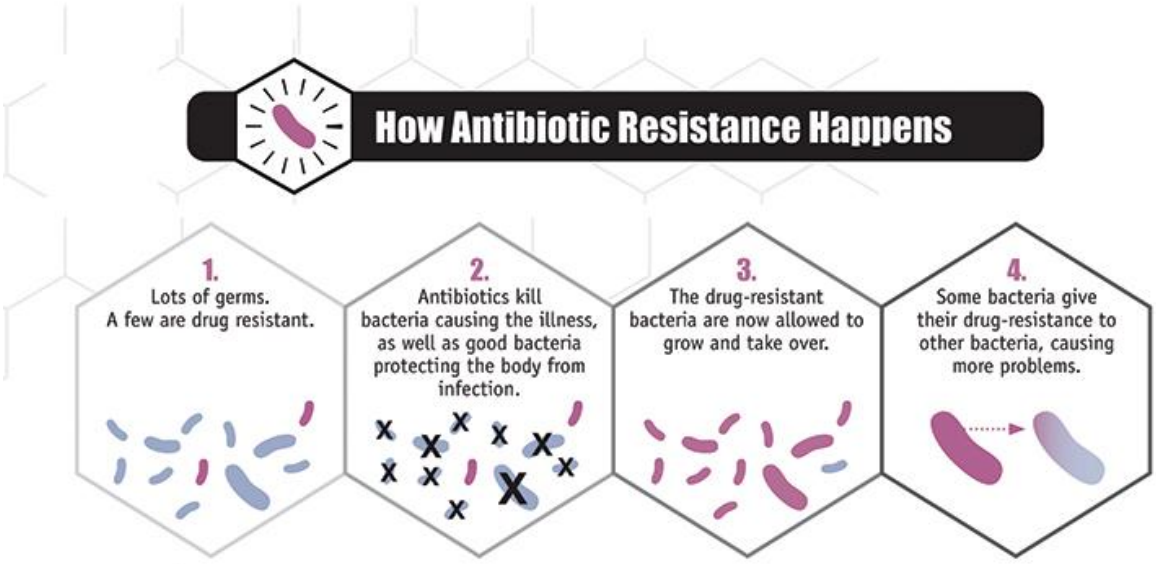
1. Starting an antibiotic for treatment:
    - An order is required. Order must state dose, frequency, **duration and indication**. Duration and indication is now required.
    - Indication is required to improve communication and allow all healthcare providers access to the WHY information.
    - Prior to start of an antibiotic for infection treatment, pertinent cultures must be drawn first.
    - The Pharmacist will place the antibiotic order in the Antibiotic log. The log monitors: patient name/DOB, antibiotic start and stop date, dose, frequency, duration, indication, ordering physician, 48hr ordering physician intervention, changes to type, dose, frequency, duration or indication of antibiotic.
    - DON and ICP are notified by the pharmacist when an antibiotic is started for treatment. The patient is entered into the Culture Log. The culture log monitors: patient name/DOB, culture type and collection date(s), culture results as they become available.
    - **The ordering physician must re-evaluate antibiotic usage within 48 hrs of start, and perform an "Antibiotic Time-Out" and document.**
    - When culture results become available they are reviewed with the ordering physician, pharmacist and ICP to review continued antibiotic management.
    - An "Antibiotic time-out" is performed when reviewing antibiotic usage, culture and MDRO logs consisting of questions such as:
        - Does this patient have an infection that will respond to antibiotics?
        - If so, is the patient on the right antibiotic(s), dose, and route of administration?
        - Can a more targeted antibiotic be used to treat the infection (de-escalate)?
        - How long should the patient receive the antibiotic(s)?

- Standardized Antibiotic usage for the treatment of many type of infections will be standardized or references will be available for your usage. Please reference those when prescribing antibiotics. Please always document indication and duration when prescribing or changing an antibiotic.
- Cultures with Drug resistant organisms are also entered into the MDRO Log. The MDRO log at minimum monitors the MDRO sensitivities, and how antibiotic is used in treatment. If an MDRO is recognized appropriate organism specific infection control measures would be initiated.
- When an MDRO is beyond MISH's capabilities be it in expertise or required environmental facilities to manage the MDRO appropriately patient will be transferred.
- Pharmacist has authority to optimize/adjust dose based on therapeutic drug monitoring, organ dysfunction, optimizing therapy for highly drug-resistant bacteria, achieving central nervous system penetration, extended-infusion administration of beta-lactams. Alert LIP's regarding duplication of treatment.
- Deviations from standardized antibiotic usage requires an indication and review with pharmacist and ICP.

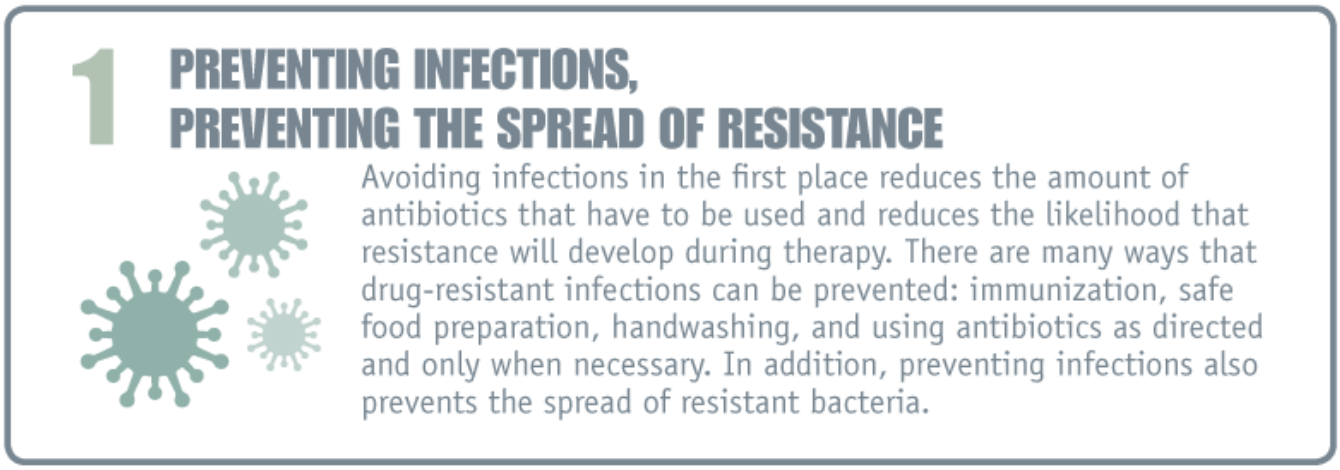
2. Prophylactic (peri-operative) antibiotic use:
    - An order is required. Order must state dose, frequency and duration
    - Only antibiotics on the approved Prophylactic Antibiotic list are used, if an alternate antibiotic is requested it will require approval.
    - The list is reviewed annually and updated as needed based on recommended current guidelines.
    - **Duration cannot be longer than 24hrs** to be considered prophylactic. Antibiotic is automatically discontinued after 24 hrs. If needs to be given then it will be treated as an antibiotic in the treatment of infection – please follow procedure outlined above.

2. Trends in Drug Resistance

- Antibiotics are among the most commonly prescribed drugs used in human medicine and can be lifesaving drugs. However, up to 50% of the time antibiotics are not optimally prescribed, often done so when not needed, incorrect dosing or duration.
- The germs that contaminate food can become resistant because of the use of antibiotics in people and in food animals. For some germs, like the bacteria *Salmonella* and *Campylobacter*, it is primarily the use of antibiotics in food animals that increases resistance. Because of the link the between antibiotic use in food-producing animals and the occurrence of antibiotic-resistant infections in humans, antibiotics that are medically important to treating infections in humans should be used in food-producing animals only under veterinary oversight and only to manage and treat infectious disease, not to promote growth.
- The other major factor in the growth of antibiotic resistance is spread of the resistant strains of bacteria from person to person, or from the non-human sources in the environment.



3. Four Core Actions to Fight Resistance

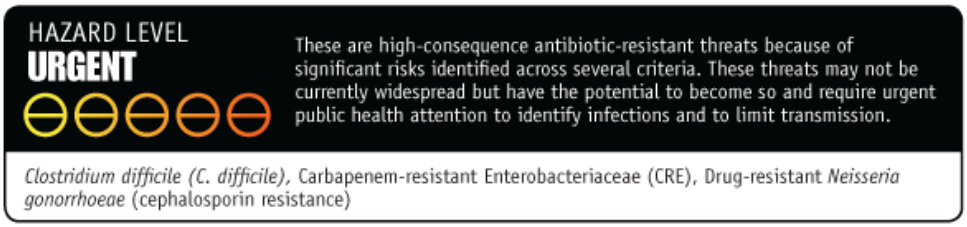


4. Biggest Threats

In 2013, CDC published a report outlining the top 18 drug-resistant threats to the United States. These threats were categorized based on level of concern: urgent, serious, and concerning.

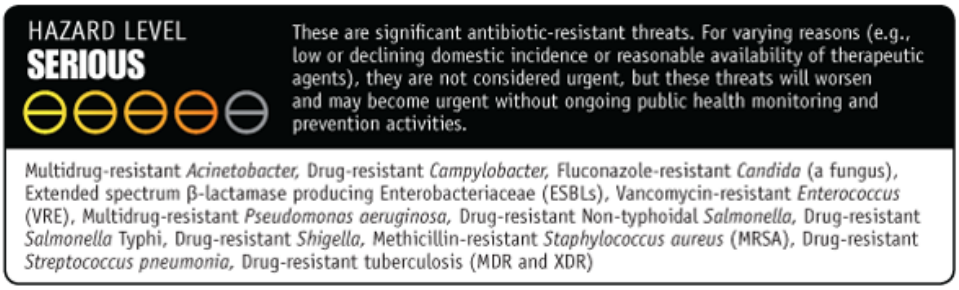
In general, threats assigned to the urgent and serious categories require more monitoring and prevention activities, whereas the threats in the concerning category require less. Regardless of category, threat-specific CDC activities are tailored to meet the epidemiology of the infectious agent and to address any gaps in the ability to detect resistance and to protect against infections

Urgent Threats



- *Clostridium difficile* (*C. difficile*) causes life-threatening diarrhea. These infections mostly occur in people who have had both recent medical care and antibiotics. Often, *C. difficile* infections occur in hospitalized or recently hospitalized patients.
- Untreatable and hard-to-treat infections from carbapenem-resistant Enterobacteriaceae (CRE) bacteria are on the rise among patients in medical facilities. CRE have become resistant to all or nearly all the antibiotics we have today. Almost half of hospital patients who get bloodstream infections from CRE bacteria die from the infection.
- Neisseria gonorrhoeae causes gonorrhea, a sexually transmitted disease that can result in discharge and inflammation at the urethra, cervix, pharynx, or rectum.

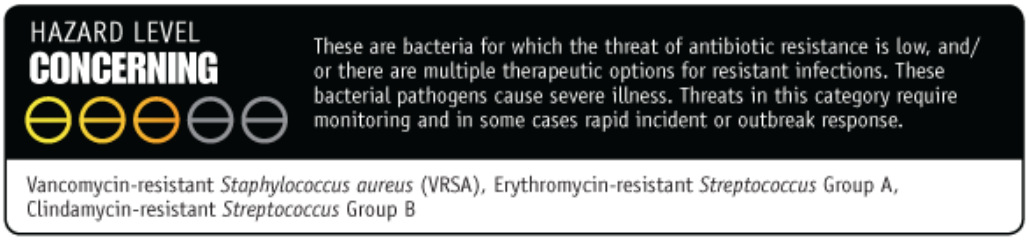
Serious Threats



- Acinetobacter is a type of gram-negative bacteria that is a cause of pneumonia or bloodstream infections among critically ill patients. Many of these bacteria have become very resistant to antibiotics.
- Campylobacter usually causes diarrhea (often bloody), fever, and abdominal cramps, and sometimes causes serious complications such as temporary paralysis.
- Candidiasis is a fungal infection caused by yeasts of the genus Candida. There are more than 20 species of Candida yeasts that can cause infection in humans, the most common of which is Candida albicans. Candida yeasts normally live on the skin and mucous membranes without causing infection. However, overgrowth of these microorganisms can cause symptoms to develop. Symptoms of candidiasis vary depending on the area of the body that is infected. Candida is the fourth most common cause of healthcare-associated bloodstream infections in the United States. In some hospitals it is the most common cause. These infections tend to occur in the sickest patients.
- Extended-spectrum β-lactamase is an enzyme that allows bacteria to become resistant to a wide variety of penicillins and cephalosporins. Bacteria that contain this enzyme are known as ESBLs or ESBL-producing bacteria. ESBL-producing Enterobacteriaceae are resistant to strong antibiotics including extended spectrum cephalosporins.
- Enterococci cause a range of illnesses, mostly among patients receiving healthcare, but includes bloodstream infections, surgical site infections, and urinary tract infections.
- Pseudomonas aeruginosa is a common cause of healthcare-associated infections including pneumonia, bloodstream infections, urinary tract infections, and surgical site infections.

- Non-typhoidal Salmonella (serotypes other than Typhi, Paratyphi A, Paratyphi B, and Paratyphi C) usually causes diarrhea (sometimes bloody), fever, and abdominal cramps. Some infections spread to the blood and can have life-threatening complications.
- Salmonella serotype Typhi causes typhoid fever, a potentially life-threatening disease. People with typhoid fever usually have a high fever, abdominal pain, and headache. Typhoid fever can lead to bowel perforation, shock, and death.
- Shigella usually causes diarrhea (sometimes bloody), fever, and abdominal pain. Sometimes it causes serious complications such as reactive arthritis. High-risk groups include young children, people with inadequate handwashing and hygiene habits, and men who have sex with men.
- Methicillin-resistant Staphylococcus aureus (MRSA) causes a range of illnesses, from skin and wound infections to pneumonia and bloodstream infections that can cause sepsis and death. Staph bacteria, including MRSA, are one of the most common causes of healthcare-associated infections.
- Streptococcus pneumoniae (S. pneumoniae, or pneumococcus) is the leading cause of bacterial pneumonia and meningitis in the United States. It also is a major cause of bloodstream infections and ear and sinus infections.
- Tuberculosis (TB) is among the most common infectious diseases and a frequent cause of death worldwide. TB is caused by the bacteria Mycbacterium tuberculosis (M. tuberculosis) and is spread mostly through the air. M. tuberculosis can affect any part of the body, but disease is found most often in the lungs. In most cases, TB is treatable and curable with the available first-line TB drugs; however, in some cases, M. tuberculosis can be resistant to one or more of the drugs used to treat it. Drug-resistant TB is more challenging to treat – it can be complex and requires more time and more expensive drugs that often have more side effects. Extensively drug-resistant TB (XDR TB) is resistant to most TB drugs; therefore the patients are left with treatment options that are much less effective. The major factors driving TB drug resistance are incomplete or wrong treatment, short drug supply, and lack of new drugs. In the United States most drug-resistant TB is found among persons born outside of the country.

Concerning Threats



- Staphylococcus aureus is a common type of bacteria that is found on the skin. During medical procedures when patients require catheters or ventilators or undergo surgical procedures, Staphylococcus aureus can enter the body and cause infections. When Staphylococcus aureus becomes resistant to vancomycin, there are few treatment options available because vancomycin-resistant S. aureus bacteria identified to date were also resistant to methicillin and other classes of antibiotics.
- Group A Streptococcus (GAS) causes many illnesses, including pharyngitis (strep throat), streptococcal toxic shock syndrome, necrotizing fasciitis ("flesh-eating" disease), scarlet fever, rheumatic fever, and skin infections such as impetigo.
- Group B Streptococcus (GBS) is a type of bacteria that can cause severe illness in people of all ages, ranging from bloodstream infections (sepsis) and pneumonia to meningitis and skin infections.

5. Protecting Patients and Stopping Outbreaks

Antibiotic resistance in healthcare settings is a significant threat to public health. Because almost all Americans will receive care in a medical setting at some point, antibiotic resistance can affect anyone. By preventing antibiotic resistance in healthcare settings, patients' lives are better protected and their health can be preserved.

Antibiotic-resistant infections can happen anywhere. Data show that most happen in the general community; however, most deaths related to antibiotic resistance happen in inpatient healthcare settings, such as hospitals and nursing homes

Inpatient Healthcare Settings

Inpatient Healthcare Providers

- Know what types of drug-resistant infections are present in your facility and patients.
- Request immediate alerts when the lab identifies drug-resistant infections in your patients.
- Alert receiving facility when you transfer a patient with a drug-resistant infection.
- Protect patients from drug-resistant infections.
- Follow relevant guidelines and precautions at every patient encounter.
- Prescribe antibiotics wisely.
- Remove temporary medical devices such as catheters and ventilators as soon as they are no longer needed.

Health Care CEOs, Medical Officers, and Other Healthcare Facility Leaders

- Require and strictly enforce CDC guidance for infection detection, prevention, tracking, and reporting.
- Make sure your lab can accurately identify infections and alert clinical and infection prevention staff when these bacteria are present.
- Know infection and resistance trends in your facility and in the facilities around you.
- When transferring a patient, require staff to notify the other facility about all infections.
- Join or start regional infection prevention efforts.
- Promote wise antibiotic use.

Outpatient Healthcare Settings

Antibiotic-resistant infections outside of the hospital setting were rare until recently.

- Prescribing antibiotics when they are not needed or prescribing the wrong antibiotic in outpatient settings such as doctors' offices is common.
- In some cases, doctors might not order laboratory tests to confirm that bacteria are causing the infection, and therefore the antibiotic might be unnecessarily prescribed.
- In other cases, patients demand treatment for conditions such as a cold when antibiotics are not needed and will not help.

There are also key stewardship actions that can be implemented by other team members in small and critical access hospitals. Indeed, experts working on stewardship in these hospitals emphasize the value of a team-based approach.

- The following items are daily activities that can also be performed by a pharmacist:
    - Review antibiotics for unnecessary duplicative antibiotic therapy, such as double anaerobic (e.g., piperacillin/tazobactam AND metronidazole) or double anti-MRSA coverage.
    - Review for opportunities for intravenous to oral conversion (e.g. patients taking other oral medications).
    - Monitor for medication safety (e.g., renal dose adjustments) though these represent general pharmacy practices and are not specific to stewardship.

In most critical access hospitals, a pharmacist, usually one who is on-site, provides the leadership and expertise for the antibiotic stewardship program. When possible, having a physician leader is helpful to support the pharmacist.

Leaders of stewardship programs can expand their knowledge and experience through a variety of educational programs and through participation in multi-hospital stewardship collaboratives. External expertise via remote or on-site consultation has also been helpful in some critical access hospitals.

6. Examples of implementation strategies:

- Appoint a pharmacist leader, ideally someone who is on-site either full- or part-time. Consider having stewardship as part of the job description or service contract of the pharmacist leader and ensure that leaders have dedicated time to spend on developing and maintaining a stewardship
- Appoint a physician leader to provide physician support to the antibiotic stewardship program, ideally someone who is on-site either full- or part-time.
  -

- Nurses play an important role in implementing stewardship actions in critical access hospitals.[13] For example, nurses can:
  - Review culture techniques to ensure that microbiology cultures are collected properly.
  - Review culture results with the treating clinician and pharmacist.
  - Monitor response to antibiotic therapy with feedback to the treating clinician and pharmacist.
  - Assess oral intake and clinical status to alert providers and pharmacist when there are opportunities to convert antibiotics from intravenous to oral therapy.
  - Educate patients about potential adverse events associated with antibiotics, especially *C. difficile* infection.
  - Nurses are also well positioned to initiate "antibiotic time-outs" with the treating clinician and pharmacist, and review antibiotic therapy after 48 hours of treatment.

The majority of all antibiotic use in hospitals is driven by just three conditions: community- acquired pneumonia (CAP), urinary tract infections (UTIs) and skin and soft tissue infections (SSTIs). Studies have demonstrated a number of interventions to improve antibiotic use for each of these and hence these are often high-yield targets for improvement. The table below summarizes some of the key areas where studies and guidelines suggest important opportunities to improve antibiotic use. Ideally, treatment decisions should be driven by local data on antibiotic resistance.

TABLE 1. KEY OPPORTUNITIES TO IMPROVE ANTIBIOTIC USE

	Diagnostic Considerations	**Guide Empiric Therapy**	**Assess Duration of Therapy Including discharge prescription**
Community-acquired pneumonia[8]	Review cases at 48 hours to confirm pneumonia diagnosis versus non-infectious etiology.	Avoid empiric use of antipseudomonal beta-lactams and/or methicillin-resistant *Staphylococcus aureus* (MRSA) agents unless	Guidelines suggest that in most cases, uncomplicated pneumonia can be treated for 5-7 days in

		clinically indicated.	the setting of a timely clinical response
Urinary tract infections[9-11]	Implement criteria for ordering urine cultures to ensure that positive cultures are more likely to represent infection, rather than bladder colonization. Examples include: -Only order a urine culture if the patient has signs and symptoms consistent with UTI such as urgency, frequency, dysuria, suprapubic pain, flank pain, pelvic discomfort and acute hematuria. -For patients with urinary catheters, avoid culturing urine based solely on cloudy appearance or foul smell in the absence of signs and symptoms of UTI. Non-specific signs and symptoms such as delirium, nausea, vomiting should be interpreted with caution as by themselves they have a low specificity for UTI.	Establish criteria to distinguish between asymptomatic and symptomatic bacteriuria. Avoid antibiotic therapy for asymptomatic bacteriuria except in certain clinical situations where treatment is indicated, such as for pregnant women and those undergoing an invasive genitourinary procedure. Fluoroquinolones are often not optimal empiric therapy.	Use the shortest duration of antibiotic therapy that is clinically appropriate.
Skin and soft tissue infections[12]	Develop diagnostic criteria to distinguish purulent and non-purulent infections and severity of illness (i.e., mild, moderate and severe) so that skin and soft tissue infections can be managed appropriately according to guidelines	Avoid empiric use of antipseudomonal beta-lactams and/or anti-anaerobic agents unless clinically indicated.	Guidelines suggest that most cases of uncomplicated bacterial cellulitis can be treated for 5 days if there is a timely clinical response.