Multi-Drug Resistant Organism (MDROs)

Infection Control & Prevention
Objectives:

- Define the term “multi-drug resistant organism (MDRO).
- Recognize risk factors for developing MDROs.
- Describe the clinical manifestations and medical treatment of MDROs.
- Discuss ways to prevent the transmission of MDROs.
What is a MDRO?

- Multi-drug resistant organisms, or MDROs, are bacteria resistant to current antibiotic therapy and therefore difficult to treat.
- MDROs can cause serious local and systemic infections that can be severely debilitating & life threatening.
- The most common MDROs include Methicillin-Resistant Staphylococcus Aureus (MRSA), Vancomycin-Resistant Enterococcus (VRE), Clostridium difficile (C-diff), Multi-Drug Resistant Acinetobacter
- Other MDRO include strains of Pseudomonas and ESBL producing organisms.
Methicillin-Resistant Staphylococcus Aureus (MRSA)

- MRSA is a type of staphylococcal organism resistant to traditional antibiotic therapy, including methicillin, oxacillin, amoxicillin, penicillin, and cephalosporins.
- In 2008, there were 89,785 reported cases and 15,249 reported deaths related to MRSA.
MRSA Risk Factors & Transmission

- MRSA infections can be spread in healthcare and community settings.
- Healthcare-associated MRSA is transmitted via personal contact with contaminated items such as dressings or other infected materials. It is also spread via healthcare providers’ hands and medical objects, such as stethoscopes.
- Community-associated MRSA is transmitted through close personal contact with infected individuals or by sharing personal items such as towels and razors.
Clinical Manifestations of MRSA

- MRSA is normally found in the nose and pharynx and may not cause illness in its host (colonization).
- If MRSA enters open cuts, incisions, or wounds, severe infection throughout the body may result.
- MRSA initially affects the skin and soft tissue, but it can quickly cause sepsis and/or pneumonia that may lead to death.
- Skin infections as a result of MRSA often include symptoms such as an area of skin that is red, swollen, painful, warm to the touch, purulent drainage, & accompanied by a fever.
MRSA Treatment

- The primary method of treatment for MRSA infection includes incising and draining infected areas.
- Treatment with empiric antibiotic therapy may also be necessary. Often, vancomycin is used in the treatment of MRSA.
Vancomycin-Resistant Enterococcus (VRE)

- Enterococci are a type of bacteria normally present in the gastrointestinal tract and genital tract of some women. Some people are colonized with VRE, meaning the organism is present, but does not result in s/s of infection.
- Enterococci can cause infections in wounds, the bloodstream, and the urinary tract.
- The two organisms that are predominately responsible for VRE include Enterococcus faecalis and Enterococcus faecium.
- Enterococci infections were predominately treated with vancomycin, leading to vancomycin-resistant strains of the organism.
VRE Risk Factors

According to the CDC, people at-risk for acquiring VRE include:

- Those who are hospitalized or have been previously treated with vancomycin or other antibiotics for long periods of time
- Those with weakened immune systems, such as patients in ICUs or cancer/transplant wards
- Those who have undergone surgical procedures such as abdominal or chest surgery
- Those with medical devices that stay in for an extended amount of time, such as urinary catheters, or central intravenous catheters
- Those who are colonized with VRE
VRE Transmission

- VRE can be found in the blood, urine and feces; therefore, it is often transmitted on the hands of healthcare providers who cared for a patient with VRE and inadvertently pass the organism on to other patients.
- VRE can also be transferred from patient to patient.
- VRE can live for several weeks on surfaces such as countertops, bedrails, and door handles and can be transmitted via contact with these surfaces.
Clinical Manifestations of VRE

- The clinical manifestations of VRE depend on the site of the infection. If the bacterium is located in the urine, symptoms of a UTI will be evident, including lower back pain, urinary urgency and frequency, and pain with urination. If the bacterium infects a wound, the area will typically exhibit swelling, redness, and other common signs of a wound infection. Patients with a VRE infection may also have fever, chills and diarrhea, as well as other symptoms of an infection.
VRE Treatment

- VRE can be treated with antibiotics, preferably Penicillin G or Ampicillin.
- Newer drugs such as Linezolid (Zyvox), Daptomycin, or Tigecycline may be needed if the VRE strain is resistant to Penicillin G or Ampicillin.
Multi-Drug Resistant Acinetobacter

- Acinetobacter is a gram-negative bacterium that is often found in soil and water and on the skin of healthy people, particularly healthcare providers.
- Multi-drug resistant Acinetobacter strains are resistant to most antibiotics.
- According to the CDC, Acinetobacter baumannii accounts for about 80% of reported infections.
Acinetobacter Risk Factors

- Acinetobacter bacterium is most often found in burn units, intensive care units, and other units that care for severely ill patients.
- Patients with weakened immune systems or chronic diseases such as diabetes mellitus are more susceptible to an Acinetobacter bacterium.
- Acinetobacter is also associated with intensive care unit acquired pneumonia.
Acinetobacter Transmission

- The Acinetobacter bacterium is transmitted from person-to-person contact, contact with contaminated surfaces or environmental exposure.
- Acinetobacter bacterium can last quite some time on the hands of healthcare providers and also in the environment on counters and other areas within healthcare settings.
- Healthcare providers who are colonized with Acinetobacter can spread the infection while not exhibiting clinical manifestations of infection.
Clinical Manifestations & Treatment of Acinetobacter

- Acinetobacter bacterium can cause a variety of infections, including blood and wound infections; therefore, the clinical manifestations will depend on the site of the infection.
- Acinetobacter bacteria can also cause pneumonia. Patients with pneumonia caused by Acinetobacter will exhibit fever, chills, and/or cough.
- MDR strains of Acinetobacter are sometimes susceptible only to polymyxins (Colistin and Polymyxin B), a class of antimicrobial drugs that has not been in widespread use for several decades and is more toxic than most currently used antimicrobial drugs.
Clostridium Difficile (C-Diff)

- Clostridium difficile is a gram-positive bacterium that causes severe diarrhea and in some cases, inflammation of the colon.
- In 2004, C-diff bacterium strains resistant to antibiotics such as fluoroquinolones were reported in several hospitals throughout the country.
- The CDC reports that increased fluoroquinolone resistance does not affect the management of infections caused by this strain as fluoroquinolones have never been recommended for the treatment of C-diff infections; however, resistance to fluoroquinolones may provide the epidemic strain with an advantage over susceptible strains to spread within healthcare facilities where these antibiotics are commonly used.
- Eighty percent of C-diff cases are found in healthcare settings and is responsible for 15-25% of all episodes of antibiotic-associated diarrhea.
C-Diff Risk Factors

- Patients at risk for the development of illness due to the C-diff bacterium predominately include the elderly but has recently been reported in traditionally healthy people.
- Other risk factors for acquiring C-diff include antibiotic exposure, gastrointestinal surgery/manipulation, long length of stay in healthcare settings, a serious underlying illness, immunocompromising conditions, and advanced age.
C-diff Transmission

- The C-diff bacterium is spread in fecal matter and can be transmitted via surfaces such as countertops, toilets, equipment and more commonly, the hands of healthcare workers.
- Because alcohol does not kill Clostridium difficile spores, use of soap and water is more efficacious than alcohol-based hands rubs. Early experimental data suggests that even using soap and water, the removal of C-diff spores is more challenging than the removal or inactivation of other common pathogens.
C-Diff Clinical Manifestations

- Patients affected by C-diff may exhibit watery diarrhea, fever, loss of appetite, nausea, and abdominal pain and tenderness.

- Clinical manifestations can range from mild diarrhea to death. Patients carrying the C-diff bacterium can be colonized with the bacterium and not exhibit any clinical manifestations; however, patients may also present with symptoms of pseudo membranous colitis, toxic mega colon, perforation of the colon, and sepsis.
Treatment of C-Diff Infections

- The usual treatment for C-diff infection includes, if possible, stopping antibiotics being given for other purposes and/or treatment with Metronidazole or Vancomycin.

- In order to reduce the likelihood of vancomycin resistance in Enterococci, current guidelines recommend the first-line use of Metronidazole over Vancomycin.

- Recent reports also suggest that new strains of C-diff may not respond as well to treatment with Metronidazole due to the increased virulence in the new strain.
MDRO Prevention

- Preventing the spread of multi-drug resistant organisms is vital to the safety and well-being of patients who are hospitalized as well as individuals who are susceptible to infection due to unsanitary or crowded living conditions or a weakened immune system.

- It is the responsibility of all healthcare providers to not only aid in preventing the development of multi-drug resistant organisms but to teach patients and the public about the prevention and transmission of multi-drug resistant organisms.

- The CDC (2007) categorized the interventions necessary to control or eradicate multi-drug resistant organisms. These categories include administrative support, education, judicious use of antimicrobial agents, MDRO surveillance, infection control precautions, environmental precautions, and decolonization.
Administrative Support

- In order to assist in controlling the transmission of multi-drug resistant organisms, administrators must be dedicated to offering the financial and human resources necessary to combat these organisms. Allocation of fiscal resources for antimicrobial agents, hand-washing sinks, personal protective equipment, alert systems, education, and infectious disease personnel are imperative.

- Administrators must also be willing to allocate personnel who can track and monitor the incidence of multi-drug resistant organisms and educate healthcare providers regarding prevention, identification, and treatment of these organisms.
Education

- Education is one of the most important components of any program designed to decrease the transmission of multi-drug resistant organisms.
- According to the CDC, educational campaigns to enhance adherence to hand-hygiene practices in conjunction with other control measures have been associated temporally with decreases in MDRO transmission in various healthcare settings. It is important for patients and healthcare providers to understand their role in the transmission of MDROs and the importance of hand hygiene.
Judicious Use of Antimicrobial Agents

- Healthcare providers must be knowledgeable regarding the administration of antimicrobial agents to control the transmission of MDROs. The CDC’s Campaign to Prevent Antimicrobial Resistance recommends focusing on the following:
  - Effective antimicrobial treatment of infections
  - Use of narrow-spectrum agents
  - Treatment of infections and not contaminants
  - Avoiding excessive duration of antimicrobial therapy
  - Restricting use of broad-spectrum antimicrobials to the treatment of serious infections when the pathogen is not known or when other effective agents are unavailable
- All healthcare providers should be knowledgeable about the efforts to use antimicrobials judiciously and educate their patients about these efforts.
One of the most essential components in the fight to control MDROs is the surveillance of MDROs. The study of epidemiological trends, emerging pathogens, and the effectiveness of interventions are all part of MDRO surveillance.

In American hospitals alone, healthcare-associated infections account for an estimated 1.7 million infections and 99,000 associated deaths each year. Of these infections:

- 32% of all healthcare-associated infection are urinary tract infections
- 22% are surgical site infections
- 15% are pneumonia (lung infections)
- 14% are bloodstream infections
Infection Control Precautions

- The implementation of Standard Precautions and Contact Precautions are necessary to aid in preventing the transmission of MDROs. Standard Precautions instruct healthcare providers to wash hands often and effectively and to use PPE (personal protective equipment) when coming into contact with blood or body fluids. Such precautions are necessary with all patients and effective in preventing transmission from potentially colonized patients.

- Precautions used when caring for patients with MDROs vary based on the organism involved. However, Contact Precautions are often used with these patients and involve wearing PPE prior to entering the patient’s room and discarding that equipment prior to leaving the patient’s room. Additionally, dedicated equipment, such as stethoscopes, blood pressure cuffs and machines, etc., should be placed and used only in the patient’s room. These patients are often assigned to private rooms or semi-private rooms with other patients who are also under special precautions.
Environmental Precautions

- Many MDROs can survive for quite some time on environmental surfaces in healthcare facilities and in patient homes. Therefore, it is imperative that healthcare providers, environmental services personnel, and patients understand the importance of both meticulous hand washing and proper cleaning methods. The CDC reports that “the lack of adherence to facility procedures for cleaning and disinfection” is a commonly cited cause for environmental contamination in healthcare facilities. Therefore, the regular testing of environmental surfaces and subsequent education of all personnel is essential to help prevent the further spread of MDROs.
Decolonization

- Decolonization involves the treatment of patients colonized with a MDRO with the goal of destroying the offending organism, usually MRSA. Decolonization has not been particularly effective and is therefore only used in the presence of a MDRO outbreak. Patients who are colonized with a MDRO and are asymptomatic are generally not candidates for decolonization.
With the constant need to protect patients from MDROs, healthcare providers must be willing and able to educate patients and their families regarding MDROs. Education for each patient should be tailored to the MDRO that caused the problem. However, there are a few general measures that healthcare providers can teach patients and their families to help prevent the transmission of MDROs.
Patient & Family Education
Continued

When at a healthcare facility:

- Employ meticulous hand washing
- Do not use alcohol-based hand sanitizer in the presence of diarrhea
- Question healthcare workers who do not wash their hands or use gloves
- Encourage at-risk patients to get the influenza/pneumococcal vaccine prior to discharge from the hospital
- Ask healthcare providers about infection control at home (including cleansing surfaces regularly and disposing of infectious items)
At home:

- Employ meticulous hand washing before eating and after toileting
- Do not use alcohol-based hand sanitizer in the presence of diarrhea
- Immediately report symptoms of infection to a healthcare provider
- Complete the full course of antibiotics even when feeling better
- Stay home when feeling ill
- Sneeze and cough into one’s elbow
- Dispose of tissues immediately; do not leave them lying on tables or counters
With the increased rate of infection caused by multi-drug resistant organisms, healthcare providers are charged with the responsibility of preventing and detecting MDROs as well as educating the public about these organisms. It is imperative that healthcare providers learn about and remain up-to-date on resistant organisms, prevention measures, and treatment options.
Facility Specific MDRO Prevention Strategies

- Effective hand washing/use of alcohol based hand rubs
- Appropriate PPE utilization by employees and visitors
- Isolation signage outside of patient’s door consistent with organism specific precautions (contact/droplet)
- Precautions identified on the front of patient’s chart to alert all departments/healthcare providers
- Equipment/environmental cleaning per policy & procedure
- Antibiotic review for effectiveness and appropriateness
- Patient & family education regarding organism specific precautions (available on e-file; addendum to care plan)
Resources

- Association for Professionals in Infection Control and Epidemiology
  http://www.apic.org
- CDC Get Smart for Healthcare Program
  http://www.cdc.gov/drugresistance/healthcare/default.htm
- Discover Nursing: Infection Control Nursing
- Infectious Diseases Society of America
  https://www.id society.org
- Institute for Health Care Improvement
  http://www.ihi.org/IHI/Topics/HealthcareAssociatedInfections
- Medline Plus: Infection Control
- World Health Organization: Infectious Diseases
  http://www.who.int/topics/infectious_diseases/en/


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