Multidrug-Resistant Organisms—Strategies to Reduce Infection

Multidrug-resistant organisms (MDROs) are defined by the Centers for Disease Control and Prevention (CDC) as “microorganisms, predominantly bacteria, that are resistant to one or more classes of antimicrobial agents.” The challenges faced by the infectious disease and infection control community are rising exponentially as antimicrobial agents lose efficacy. Prevention of the spread of these organisms within healthcare facilities is becoming more critical each day.

History of MDROs

Strains of gram-positive bacteria, including Staphylococcus aureus, account for almost 60% of the healthcare-associated infections (HAIs) noted in a report on data from SCOPE, the Surveillance and Control of Pathogens of Epidemiological Importance program. Methicillin-resistant Staphylococcus aureus (MRSA) was first noted in the United States around 1968, and infection rates have steadily increased since then. By 2003, according to National Nosocomial Infections Surveillance (NNIS) system data, 59.5% of the S. aureus isolates in intensive care units (ICUs) were identified as MRSA. Additionally, vancomycin-resistant Enterococcus accounted for approximately 28.5% of the pathogens noted in the same NNIS report. MRSA strain USA300-0114, identified within 2002, accounted for approximately 28.5% of the pathogens noted in the same NNIS report. MRSA strain USA300-0114, identified within 2002, accounted for approximately 28.5% of the pathogens noted in the same NNIS report. It is seen with increasing frequency; it is the predominant cause of community-acquired soft-tissue skin infections.

Increasing resistance among the gram-negative bacteria (e.g., Acinetobacter, Enterobacter, Klebsiella, E. coli) and the subsequent clinical manifestations represent the tip of yet another dangerous iceberg for patients and healthcare providers alike. Extended-spectrum beta-lactamases are a group of enzymes produced by a number of gram-negative bacteria, with resultant resistance to beta-lactam antibiotics such as penicillin and cephalosporins. First detected in Germany in 1983, these organisms can exhibit resistance patterns for which no antimicrobial therapies exist. They add to the alphabet of ever-increasing numbers of MDROs, and the potential to cause HAIs is daunting. Identification, isolation, and additional precautions are critical to preventing patient-to-patient spread of MDROs within facilities.

PA-PSRS Reports

A search of the PA-PSRS database yielded more than 700 reports from 2004 through 2007 that indicated inconsistencies relating to isolation precautions and identification of patients who were positive for MDROs. Examples included patients admitted with a known history of MDRO infection, for whom isolation was not promptly initiated; attending physicians not wearing proper isolation garb; and properly gowned and gloved residents who entered and left the isolation room numerous times. In addition, reports indicated that active surveillance culture specimens were collected but were sent to the lab without sufficient patient identification, which delayed the process for timely identification of an MDRO.

One report noted concern by a patient’s family members when they received conflicting instructions regarding their need to adhere to contact precautions as the patient was moved from the ICU to a medical-surgical unit. The family members indicated that the healthcare workers’ use of personal protective equipment, such as gowns and gloves, was inconsistent. The family reported that while some staff members did wear gowns and gloves, others did not—including a dialysis nurse who provided direct patient care. This report illustrates how inconsistencies and mixed messages to patients and their families can erode confidence in healthcare providers’ ability to deliver appropriate care and prevent the spread of MDROs. It also demonstrates the role patients and their families can play in enforcing isolation protocols when they understand the requirements.

Key Points of a Successful Transmission Prevention Program

Evidence-based practice incorporating risk reduction strategies is essential for acute, long-term, and ambulatory care settings to prevent, control, and ultimately eliminate MRSA and other MDROs. Successful infection control programs incorporate the following key concepts detailed in the Association for Professionals in Infection Control and Epidemiology’s “Guide to the Elimination of Methicillin-Resistant Staphylococcus Aureus (MRSA) Transmission in Hospital Settings”:

- A baseline risk assessment for MDROs as a means to determine the incidence among the patient population
- Active surveillance cultures for patient care settings as mandated by state regulation (Pennsylvania Act 52 of 2007 requires that hospitals develop procedures necessary for requiring cultures and screenings for nursing home residents admitted to a hospital, as well as procedures for identifying other high-risk patients admitted to the hospital.)
- Evaluation of colonized nursing home residents for prompt placement and initiation of facility-specific precautions
- A well-established hand hygiene program that includes readily available alcohol-based handrubs
- Prompt initiation of contact precautions for acute care patients with either a positive culture or a known history of positive cultures for MDROs
- An effective method to communicate a patient’s MDRO status across the healthcare continuum
Antimicrobial Stewardship Programs

Antimicrobial stewardship is a key component of a multifaceted approach to preventing the emergence of resistant organisms. Studies indicate that antibiotic use is unnecessary or inappropriate in as many as 50% of cases in the United States. Over the past five years, focus has increased on interventions intended to decrease bacterial resistance or reduce superinfection, including infections associated with Clostridium difficile colitis. Consistent cost savings, together with a reduction in resistance patterns, have been recognized after these interventions were instituted. It is documented that in most instances, changes in infection control procedures were implemented at the same time as the antimicrobial interventions, which would influence the success of these programs. Data from well-controlled studies relating to the effect that these programs have on resistance are somewhat limited, but documentation does exist that antibiotic stewardship reduces rates of Clostridium difficile-associated disease, resistant gram-negative bacilli, and vancomycin-resistant Enterococcus infection.1,2

The most effective means of improving antimicrobial stewardship involves a comprehensive program that incorporates multiple strategies and collaboration among various specialties within a given healthcare institution. This program should be considered an important component of patient safety in every healthcare institution and may become mandatory in the future.

Suggested Elements of a Stewardship Program

The following elements of a multifaceted program, recommended by the Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America “Guidelines for Developing an Institutional Program to Enhance Antimicrobial Stewardship,” should be considered and implemented:3

- Form a multidisciplinary antimicrobial stewardship team including
  - an infectious disease physician,
  - a clinical pharmacist,
  - a clinical microbiologist,
  - an infection preventionist, and
  - an information system specialist.
- Develop collaboration between the team and the hospital’s pharmacy and therapeutics committee.
- Demonstrate support of and collaboration with facility administration and medical staff (i.e., “buy in from the top down”).
- Promote education in collaboration with active intervention.
- Develop evidence-based practice guidelines incorporating local resistance patterns and antibiotic usage.
- Institute formulary restriction policies, including determining which drugs are placed on hospital formulary.
- Institute policies for de-escalation of empirical antimicrobial therapy on the basis of culture results.
- Institute policies for dose optimization based on a case-by-case review, causative organism, site of infection, and drug characteristics.
- Develop clinical criteria and guidelines allowing a switch from parenteral to oral agents.
- Audit antimicrobial usage, which should be conducted by an infectious disease physician or a clinical pharmacist trained in infectious disease drug management, together with feedback.

Notes


National Approach to MDRO Prevention

The CDC’s Campaign to Prevent Antimicrobial Resistance in Healthcare Settings notes the growing struggle with MDROs and includes the critical need for judicious use of antibiotics (see box article on “Antimicrobial Stewardship Programs”) as one of four main strategies. The other strategies include the diagnosis and treatment of clinical infection, infection prevention, and transmission prevention. CDC’s online campaign includes tools for clinicians in various clinical settings, such as fact sheets, posters, slide sets, and tips for patients. Additional information about the campaign is available online at http://www.cdc.gov/drugresistance/healthcare/default.htm.11

CDC’s National Healthcare Safety Network recently added an additional patient safety component: the combined MDRO and Clostridium difficile-associated disease (CDAD) module. By employing this module,
facilities may choose to document and/or monitor infections, prevalence, and prevention process measures or active surveillance testing related to either MDROs or CDADs.\textsuperscript{12}

**Pennsylvania Mandates**

The Pennsylvania Health Care-Associated Infection and Prevention Control Act of 2007, Act 52, mandates that the following be implemented in healthcare facilities:

- Procedures for requiring active surveillance cultures and screenings for all nursing home residents admitted to a hospital
- Procedures for identifying other high-risk patients admitted to the hospital, using active surveillance cultures (high-risk patients are not defined by Act 52 of 2007 and are to be determined by individual hospitals.)
- Procedures and protocols for staff who have potentially been exposed to a patient or resident known to be colonized or infected with MRSA or MDRO, including cultures and screenings, prophylaxis, and follow-up care (To date, industry standards for exposure of staff to MRSA or MDRO are nonexistent.)
- Procedures and processes for notifying a receiving healthcare facility or ambulatory surgical facility of any patient known to be colonized before transfer within or between facilities

Active surveillance cultures in combination with isolation precautions and the use of barriers are consistent with most guidelines for the control of these microbes.\textsuperscript{13}

For a description of the Pennsylvania Patient Safety Authority's role and progress and goals of Act 52, see the article in the June 2008 issue of the Pennsylvania Patient Safety Advisory at http://www.psa.state.pa.us/psa/lib/psa/advisories/v5n2june_2008/jun_2008_v5_n2_article_act52.pdf.\textsuperscript{14}

Summary points of the Act are available online from the Hospital & Healthsystem Association of Pennsylvania at http://www.haponline.org/downloads/HAP_Summary_Act_52_of_2007_07262007.pdf.\textsuperscript{15}

The call to action against MDROs is ongoing across Pennsylvania. Active government, community, and healthcare alliances are forming and working together to gain control and prevent the spread of these multidrug-resistant threats to patient safety.\textsuperscript{16} CDC’s MDRO/CDAD module will be strongly considered for integration into the mandatory reporting requirements in the future, as an additional step towards best practices.

**Summary**

The emergence of increasing bacterial resistance to antimicrobial measures, rising infection rates in facilities, and subsequent clinical manifestations represents the tip of another iceberg for patients and healthcare providers. Commitment, sufficient funding, and sufficient staffing, as well as behavioral and cultural changes and modified thought processes, are necessary in regional and national efforts to eliminate MDROs.

**Notes**


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