

Infection prevention + antimicrobial stewardship = S

Why antimicrobial stewardship?

The 20th century brought lifesaving medical advances. Antimicrobial agents, along with vaccines, clean water, sanitation, food quality, and disinfection and sterilization practices have vastly improved public health and patient safety. Common bacterial and viral diseases with high morbidity and mortality have significantly decreased through prevention and treatment in U.S. populations. Today, effective antimicrobial agents can rapidly become ineffective due to the microbes' response-triggering defensive resistance mechanisms.

Epidemiologically significant multidrug-resistant organisms (MDROs), such as methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant enterococci (VRE), extended spectrum beta-lactamase-producing Gram-negative bacilli (ESBL), carbapenemase producing Gram-negative bacilli (CRE), and *Clostridium difficile* (*C. difficile*) infections are increasing across the healthcare continuum system in acute care, long-term acute care, inpatient

rehabilitation, skilled nursing, and outpatient care programs and facilities. Antimicrobial misuse and overuse also increases the risk of unintended consequences by placing patients at greater risk for *C. difficile* infections and fungal infections – especially invasive candidiasis – due to disruption of normal bacterial flora with the use of antimicrobial agents. This is a crucial time during which new effective antimicrobial agents are few in number and not being developed fast enough.

The World Health Organization (WHO) considers misuse and overuse of antimicrobials one of the top three threats to human health and made antimicrobial resistance the focus of World Health Day in April 2011.¹ Inappropriate antimicrobial use can lead to the emergence of MDROs and rapid global spread of novel resistance. In the United States, the rapid spread of carbapenemase-resistant *Klebsiella pneumoniae* organisms spread across nearly all 50 states a mere 10 years after the first detected isolates were reported.²

synergy

Infection preventionists have a role in accelerating progress toward preventing the emergence and cross-transmission of MDROs.

BY JULIA MOODY, MS, SM(ASCP)

Highly resistant Gram-negative bacilli carrying the New Delhi metallo-beta-lactamase NDM-1 are the newest global threat. Resistance first occurred in 2010 in India, Pakistan, and Great Britain and, in the same year, NDM-1 strains were reported in the United States.³

MDROs cause a significant proportion of serious healthcare-associated infections (HAIs), as reported into the Centers for Disease Control and Prevention (CDC)'s National Healthcare Safety Network (NHSN), and are more difficult to treat because there are fewer and, in some cases, no antibiotics that will cure the infection.⁴ The CDC has long advocated for the prudent use of antimicrobial agents, as reflected through the launch of the Get

Smart: Know When Antibiotics Work campaign (www.cdc.gov/getsmart). A recent CDC *Vital Signs* report documents the sharp rise of *C. difficile* morbidity and mortality and the risk associated with inappropriate antimicrobial use.⁵

In response to the calls to action for interdisciplinary collaboration, APIC and SHEA issued a position paper on the role of infection preventionists (IPs) and healthcare epidemiologists in antimicrobial stewardship.⁶ The skills and knowledge that these highly skilled professionals bring to a facility's antimicrobial stewardship program, when combined with other disciplines, can accelerate progress toward preventing the emergence and cross-transmission of MDROs.



The IP and antimicrobial stewardship

Antimicrobial stewardship (AS) is an interdisciplinary professional effort that involves optimal, prudent antimicrobial use for patients across the continuum of care: acute, inpatient, long-term care, and outpatient settings.⁷ Overall, clinical pharmacy and AS physician champions have the primary responsibility for day-to-day AS operations and interventions with prescribers.

However, IPs and healthcare epidemiologists play a pivotal role in stewardship by assisting with prompt detection of MDROs and promoting compliance with standard and transmission-based precautions. IPs and healthcare epidemiologists can also facilitate the use of other infection prevention strategies, such as implementing care bundles aimed at preventing bloodstream, urinary, and respiratory tract infections; ensuring hand hygiene compliance; and educating staff, patients, and visitors on infection prevention topics. Effective prevention strategies minimize HAIs, decrease the use of additional antibiotics, and reduce MDROs.

Utilizing antimicrobial stewardship as one of the infection prevention

patient safety care bundle strategies to prevent the development of MDROs and *C. difficile* helps healthcare organizations effectively use limited healthcare resources and improve patient outcomes. MDROs and infection prevention strategies consume a major portion of daily work activities for healthcare givers, IPs, and healthcare epidemiologists. A walk onto U.S. healthcare units today will reveal the burden of MDROs and *C. difficile* (e.g., patients in contact precautions, personal protective supplies in boxes of gloves and gowns, and increased reliance on compulsive hand hygiene to prevent transmission). Limited critical healthcare resources are stretched even thinner when semi-private rooms are blocked for a single patient under contact precautions; this pressures healthcare providers to cohort or release patients from isolation precautions to accommodate patients waiting in overflowing emergency departments.

The infection prevention/antimicrobial stewardship partnership is bidirectional. Where there is no transmission of infection, there is no need for antimicrobial treatment, thus reducing the development of resistance.



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Resources in community-based hospitals

The IP and hospital epidemiologist have a role to play in a multidisciplinary approach to bring expertise and knowledge about AS to resource-limited community-based hospitals. Recent surveys highlight the need to expand the scope of AS programs due to resource limitations in small to medium-sized community hospitals.⁸ Community-based facilities deliver the majority of inpatient care in the United States, are located outside of metropolitan areas, and have limited or no availability of infectious disease physicians and clinical pharmacists with infectious disease-specific training. Furthermore, multidisciplinary rounding often occurs without a physician. A recent study found that although 80 percent of hospitals have an infection control committee, due to lack of funding, many do not have a trained pharmacy and provider personnel for their stewardship programs.⁸

Learn more about antimicrobial stewardship

C. difficile case study

The following case review highlights the missed opportunities in AS resulting in development of *C. difficile*:

An 85-year-old male with altered mental status and a diagnosis of a urinary tract infection (UTI) was admitted to an acute care hospital from a skilled nursing rehabilitation facility. He was taking oral amoxicillin/clavulanic acid (875 mg) twice daily for one day prior to inpatient admission. The patient's past medical history indicated that he recently had stroke and was discharged from the hospital six weeks ago and sent to a rehabilitation facility for ongoing care. The patient had a percutaneous endoscopic gastrostomy tube and Foley catheter that was placed during the initial acute inpatient stroke episode.

Upon admission, his urine culture indicated no growth, with urinalysis of 2+ Leukocyte esterase, 1+ nitrite, >20 white blood cells (WBC), 3+ bacteria and 3-5 squamous epithelial cells. One out of four blood cultures grew coagulase-negative *staphylococci* and the others were negative. He was treated with IV moxifloxacin and ceftriaxone. The patient was discharged seven days later and transferred back to the rehabilitation facility.

On his second day back in the rehabilitation facility, the patient developed multiple episodes of diarrhea. He was readmitted to the acute care hospital after he developed a low grade fever, had increased WBC counts, and tested positive for *C. difficile*. The next day, the patient became septic with toxic megacolon. He was transferred to the intensive care unit and expired four days later. The patient had no prior history of *C. difficile* infection.

How could the patient's outcome have been changed and the risk of *C. difficile* infection minimized? Answer: Antimicrobial stewardship and infection prevention. In this case:

- (1) A negative urine culture was an opportunity to evaluate the patient for discontinuation of the antibiotics or de-escalate him to a single narrow-spectrum oral antibiotic based on the facility antibiogram targeted on the most common pathogens causing UTI.
- (2) The Foley catheter had been in place for some time. Was there an opportunity to use an alternative to the catheter with less risk for infection (e.g., condom catheterization)? If alternatives were inappropriate for this patient, could the catheter have been replaced with a new device? Although evidence-based practices do not recommend a frequency for regular replacement of Foley catheters, the admission care plan could have considered replacement of the Foley catheter and retesting fresh bladder urine to eliminate contamination from microbial biofilm buildup, which may have resulted in the urinalysis results.

IPs review patient care records daily and observe the missed opportunities where evidence-based prevention interventions could have occurred. IPs have the responsibility to share findings with prescribers, clinicians, and healthcare personnel – along with rates of MDROs, including *C. difficile* infections – to drive improvements. Reporting MDROs to care providers will improve the partnership of patient safety and improved outcomes.

To learn more about antimicrobial stewardship, check out these APIC 2012 Annual Conference educational highlights, June 4-6 in San Antonio:



- Antimicrobial Stewardship: Optimizing Outcomes by Improving Antimicrobial Prescribing Practices (Session #3002)
- Improving Antimicrobial Stewardship in the Neonatal ICU with Computer Decision Support (Abstract #12-168)
- Overuse of Topical Antibiotics Among Inmates Entering Maximum-Security Correctional Facilities in New York State (Oral Abstract #100, Session #1200)
- Infections Due to Enterobacter Species: Epidemiology and Outcomes as a Function of Ceftazidime Resistance (Oral Abstract #101, Session #1200)

Additional resources:

- Get Smart about Antibiotics – The Centers for Disease Control and Prevention
www.cdc.gov/getsmart
- Antibiotic/Antimicrobial Resistance – The Centers for Disease Control and Prevention
www.cdc.gov/drugresistance/index.html
- Transatlantic Task Force on Antimicrobial Resistance: Recommendations for future collaboration between the U.S. and EU (2011) – The Centers for Disease Control and Prevention
www.cdc.gov/drugresistance/pdf/tatfar-report.pdf
- Antimicrobial stewardship: A collaborative partnership between infection preventionists and healthcare epidemiologists – *American Journal of Infection Control*, March 2012
www.apic.org/Resource_/TinyMceFileManager/Practice_Guidance/APIC_SHEA_Antimicrobial_Stewardship_Position_Statement.pdf
- Antimicrobial resistance – World Health Organization
www.who.int/drugresistance/en/

State regulatory drivers and antimicrobial stewardship

California Senate Bill 739 mandated that, by January 1, 2008, the California Department of Public Health require all general acute care hospitals in California to develop a process for evaluating the judicious use of antibiotics – the results of which shall be monitored jointly by appropriate representatives and committees involved in quality improvement activities. The legislation does not specify that hospitals must intervene to improve antimicrobial use; however, many hospitals in California have developed successful AS programs, which are varied, employing different combinations of staff, strategies, and criteria to best fit facility-specific needs and abilities.

Expanding MDRO knowledge

How do IPs remain current with new resistance mechanisms and microbiology reports that trigger alerts to flag MDRO newcomers to allow for timely infection prevention interventions? Visit the CDC website and partner with the facility microbiologist to be aware of updates to the antimicrobial susceptibility testing guidelines.⁹ APIC's Building Bridges partnership recently announced the APIC/ASM IP Col-lab-oration Project to improve patient outcomes by bridging the communication gap between infection preventionists and laboratory professionals, augmenting tools and resources currently available, and educating healthcare personnel. Visit <http://labproject.site.apic.org/> to learn more.

Key take-aways:

- Identify, monitor, and report MDRO trends; look for newly emerging Gram-negative resistance.
- Analyze and report HAIs.
- Partner with healthcare personnel to achieve highly compliant standard and transmission-based precautions practices aimed at preventing cross transmission of pathogens.
- Promote compulsive hand hygiene.
- Implement care bundle checklists to reduce the risk of developing device or surgical procedure-associated infections.
- Promote adoption of clinical treatment guidelines.
- Incorporate stewardship activities into the annual infection prevention risk assessment, based on the facility antibiogram, outbreak investigations, and antimicrobial/microbe focus reviews.
- Leverage an electronic surveillance system for timely data and reporting.¹⁰

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