

Methicillin-Resistant *Staphylococcus aureus*

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Perspective

Methicillin-resistant *Staphylococcus aureus* (MRSA) has received a great deal of media attention over the past few months following the release of a study indicating that, on an annual basis, approximately 94,000 patients develop serious MRSA infections resulting in 18,650 deaths.⁽¹⁾ These numbers are higher than previously estimated. While invasive MRSA infections occur more commonly in the hospital, 15% occurred in persons without any exposure to the health care setting. Recently, MRSA has been coined the "superbug" primarily based on its antimicrobial resistance. So does all this attention represent an "outbreak of awareness" or does this emerging resistance represent a significant patient safety issue?

Actually, it's a combination of both.

MRSA was first identified almost 50 years ago shortly after the introduction of the antibiotic methicillin.⁽²⁾ By the late 1970s, this organism had become a significant problem in the United States, with outbreaks in several tertiary care hospitals. Today, MRSA is a major pathogen worldwide and is endemic in many American and European hospitals.⁽³⁻⁹⁾ Within the hospital, the largest concentration of this bacteria is found in intensive care units. On a national level, the rate of staphylococci in intensive care units that are methicillin resistant has increased from 35% in 1995 to 59.5%.⁽¹⁰⁾ Colonized and infected patients are the primary reservoir for MRSA in health care facilities, and the predominant method of transmission occurs from person to person via the hands of health care personnel. Outside of the hospital, long-term care facilities are the major reservoir for MRSA.

Colonization of the nares either before hospitalization or following admission puts patients at increased risk for the development of MRSA infection. Between 25%–40% of the population carries *S. aureus* in their nose, and carriage is more common among people with frequent staphylococcal exposure. These include health care workers, dialysis patients, patients with diabetes, injection drug users, patients with HIV, and those with chronic skin conditions.⁽¹¹⁾ In addition, prior antibiotic exposure is an important risk factor for the development of MRSA.

While much of the focus for MRSA has been in the hospital, this organism has emerged as a significant cause of infections in the community as well. Community-associated MRSA (CA-MRSA) differs in several ways from health care-associated MRSA. Most importantly, CA-MRSA is usually susceptible to many antibiotics.(12,13) Outbreaks of CA-MRSA have occurred in various populations including children; Native Americans; prison inmates; high school, college, and professional athletes; and military trainees. Recently, a study from San Francisco identified that men who have sex with men are 13 times more likely to develop a more resistant strain of CA-MRSA.(14) Since CA-MRSA is spread by person-to-person contact, transmission is enhanced by breaks in the skin.

Antibiotic resistance has several implications with respect to clinical outcome. Patients with MRSA or other resistant bacteria generally have higher mortality rates than those with a susceptible bacterium. This may be due to initial antibiotic therapy that is not active against the infecting organism, resulting in inappropriate treatment, serious underlying illness in the patient, or a combination of both. One study indicated that the patients with MRSA in their blood had a risk of dying twice that of patients with a susceptible *S. aureus*.(15) [Connie's video](#) clearly indicates the significant morbidity associated with MRSA.

From a patient safety perspective, the single most effective method to avoid the adverse outcomes associated with MRSA as well as other antibiotic-resistant organisms is *prevention*. This requires an effective system to incorporate evidence-based guidelines into the care of all patients. These include compliance with hand hygiene, optimal management of central venous and urinary catheters, prevention of pneumonia in ventilated patients, accurate diagnosis of infections, and judicious use of antibiotics. A more detailed summary of these prevention strategies is available on the Centers for Disease Control and Prevention Web site [available [here](#)].

Like most patient safety interventions, successful control of MRSA requires a combination of interventions and strong organizational support. Infection control practices that have been demonstrated to reduce MRSA include: adherence to hand hygiene, contact precautions for patients with MRSA, active surveillance cultures, education, effective environmental cleaning, and communication between health care facilities taking care of patients with MRSA. In virtually every published study that effectively controlled resistant organisms, multiple strategies either concurrently or sequentially were required.(16,17) While not formally studied, I suspect that organizations that have a strong culture of safety are more likely to approach prevention of MRSA from a systems perspective.

The two most complex issues surrounding the control of MRSA are the role of active surveillance cultures and compliance with hand hygiene. A complete review of the controversy regarding culturing patients on admission to the hospital is beyond the scope of this perspective. However, there is considerable evidence to support the use of active surveillance cultures for identifying high-risk patients and in the setting of an outbreak.(18) There is a paucity of evidence to suggest that all patients admitted to hospitals should be cultured for MRSA. Recently, the largest prospective study of active surveillance failed to demonstrate a reduction in the rate of MRSA infections among surgical patients.(19) Despite legislative mandates in Illinois and other states, implementation of this approach is controversial and not supported by the literature. While awaiting the results of well-designed clinical trials, the best approach is to ensure compliance with well-established infection prevention practices such as hand hygiene. It is short-sighted for

a hospital to focus their efforts on the control of just one organism, since adherence to other patient safety initiatives is known to improve outcomes from all health care–associated infections. If health care organizations comply with guidelines to reduce catheter-related bloodstream infections, ventilator-associated pneumonia, and surgical site infections, the rate of MRSA will certainly drop as well.

As [Connie commented](#), we must continue to emphasize that hand washing is the simplest and most effective method to prevent the transmission of bacteria in hospitals. While there are a few examples of organizations that have improved their compliance, overall rates remain unacceptably low. Unlike bar coding for medication administration, there is no technology that will ensure that health care workers disinfect their hands, so this must be a ritual similar to the ritualistic surgical scrub prior to entering the operating room. We must involve patients (and their families) in this process so doctors and nurses expect to be challenged if they do not comply. To prevent the transmission of MRSA in our hospitals, strong support from medical and administrative leadership is critical.

Certainly, the impact on patient safety is paramount, but there are potential financial implications for hospitals to prevent MRSA and other health care–associated infections.⁽²⁰⁾ Under current payment rules, the Centers for Medicare and Medicaid Services (CMS) typically pays hospitals more for treating a patient who develops a health care–associated infection. CMS announced that, beginning October 1, 2008, it will no longer increase payment for certain selected conditions (including infections) that are not present on admission to the hospital. Therefore, many hospitals are enhancing their infection control activities to avoid a reduction in payment from CMS.

There are some potential unintended consequences of identifying a patient who is colonized with MRSA. In one study, patients isolated for MRSA were twice as likely to suffer an adverse event, more likely to file a formal complaint regarding their care, and less likely to have documented care provided to them.⁽²¹⁾ Another concern is that patients will receive unnecessary antibiotics because they are colonized with MRSA, resulting in more antibiotic resistance. If rates of MRSA become publicly reported, some hospitals may avoid caring for high-risk patients, impacting access to care. Finally, mandating an aggressive approach to MRSA might divert institutional resources away from other infection prevention or other patient safety activities. Therefore, it is essential that hospitals assess the safety of patients in isolation for MRSA before implementing a widespread program, and that states tread carefully before mandating infection control practices for MRSA.

In summary, MRSA has emerged as a significant pathogen both in the hospital and the community. Due to its virulence, patients are clearly impacted, as illustrated by Connie's multiple surgeries and prolonged course of antibiotics. To effectively ensure the safety of patients, we must adhere to evidence-based guidelines designed to prevent the transmission of this organism in the health care setting. Like most patient safety activities, this requires a comprehensive approach focusing on the system and organizational culture.

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