

Targeted MRSA Decolonization: A Cost-Effective Way for Infection Preventionists to Stem Outbreaks and Practice Good Antimicrobial Stewardship

A Diagnostics First Publication

Jeanine Thomas was young and healthy when she broke her ankle in 2000. She went to a Chicago-area hospital for surgery to repair it. While the surgery initially appeared successful, Thomas ended up back in the hospital with a new problem: a hospital-acquired methicillin-resistant *Staphylococcus aureus* (MRSA) infection that led to a life-threatening case of septic shock and organ failure. The infection recurred for several years and she had seven more surgeries on her ankle in order to save her leg from amputation.

“After MRSA, you’re affected for the rest of your life,” she says. “You’re never the same. For many, it’s a chronic disease.”

Over the years, Thomas has become an outspoken advocate for MRSA patients and something of a watchdog for the way health systems detect, prevent, and report MRSA infections. She founded the MRSA Survivors Network in early 2003 and has pushed for legislative efforts to stem the infection’s spread.

Nationwide, MRSA infection rates are slowly declining.¹ But Thomas worries that this positive trend will lead to complacency. MRSA remains a leading cause of healthcare-associated infections. The U.S. Centers for Disease Control and Prevention (CDC) still lists these bacteria as a “serious” threat that require prompt and sustained action to prevent their spread.¹ In hospitals, nursing homes, and other healthcare settings, MRSA can cause severe problems such as bloodstream, catheter-related and surgical-site infections as well as pneumonia.² If not treated quickly, MRSA infections may lead to sepsis and death.

In addition to the implementation of rigorous hand hygiene programs, there are two main approaches that hospitals and other healthcare organizations are taking to prevent MRSA infections, particularly among their most vulnerable patient populations. These populations include patients admitted to intensive care units (ICUs), those undergoing surgery, and those transferred from another healthcare facility. The approaches are:

- Targeted decolonization: perform active MRSA surveillance testing on all patients or select high-risk patient groups and place those who test positive in contact precautions and decolonize them
- Universal decolonization: treat all patients or select high-risk patient groups with a nasal antibiotic or antiseptic and bathe with the antimicrobial agent chlorhexidine (CHG), without performing surveillance and regardless of their MRSA status



Active surveillance was the primary driver of the downward trends seen in the VA because MRSA [hospital-acquired infection] rates had not changed before October 2007 when the Initiative was fully implemented, even though formal recommendations for hand hygiene and device-related infection control bundles had been in place for several years.”

Martin E. Evans, MD, an infectious disease expert in the MRSA/MDRO Prevention Office of the Veterans Health Administration

Which method is more effective at preventing MRSA outbreaks in a healthcare facility, and at what cost? Let’s take a look.

▾ Targeted decolonization

The targeted approach relies on active surveillance testing to identify and decolonize MRSA carriers. Healthcare organizations often perform nasal screening with rapid molecular diagnostic tests to identify carriers. Those who test positive for MRSA colonization typically receive topical antibiotics or antiseptics in the nares and daily CHG baths. The healthcare team takes contact precautions and uses personal protection equipment, such as gowns and gloves, to avoid transmitting MRSA.

This strategy typifies good antimicrobial stewardship. A good antimicrobial stewardship program—a health system-wide effort to ensure that antibiotics are used only when necessary and appropriate—can optimize patient outcomes, reduce unwanted side effects, and prevent further spread of antimicrobial-resistant organisms. But these efforts require clinicians to perform relevant diagnostic tests prior to treatment.³ That’s the only way to know what is growing where and who is most affected.

MRSA

by the Numbers

1 in 3 

people carry *Staphylococcus aureus* in their noses, usually without any symptoms.*

2 in 100 

carry MRSA.*

80,400+ 

invasive MRSA infections occur each year[#]

11,200+ 

MRSA deaths occur each year[#]

* CDC. General Information About MRSA in the Community. Website. Accessed February 2018. <https://www.cdc.gov/mrsa/community>
[#] CDC. Antibiotic Resistance Threats in the United States, 2013. Report. Accessed February 2018. <https://www.cdc.gov/drugresistance/threat-report-2013/pdf/ar-threats-2013-508.pdf#page=49>

Targeted MRSA decolonization is supported by a review conducted by researchers at the University of Chicago and the NorthShore University HealthSystem. Analyzing studies of more than 25,000 patients, they found that active surveillance testing followed by contact precaution for positive patients was associated with lower rates of MRSA infections, as compared to universal decolonization.

The researchers also concluded that active MRSA surveillance is cost effective. They cited a study that found that each patient who contracts a hospital-acquired MRSA infection incurs an average additional \$12,943 in cost of care after discharge. Given that, the researchers determined that spending approximately \$130 on each admitted patient for MRSA screening and prevention would result in an overall cost savings.⁴

Perhaps more than anywhere else, this targeted approach to stemming the spread of MRSA has proven effective in the Veterans Affairs (VA) Health System. In 2007, a series of infection prevention interventions deemed the “MRSA bundle,” which included universal MRSA screening, contact precautions for colonized or infected patients, and an emphasis on hand hygiene, was implemented in VA hospitals nationwide.⁵

It proved effective. Over eight years, hospital-acquired MRSA infections declined sharply. Monthly MRSA rates fell 87 percent in ICUs, 80.9 percent in spinal cord injury units, 49.4 percent in long-term care facilities, and 80.1 percent in other units.⁶

Martin E. Evans, MD, an infectious disease expert in the MRSA/MDRO Prevention Office of the Veterans Health Administration, led the study of VA MRSA rates. In the published paper, he and co-authors speculate that “active surveillance was the primary driver of the downward trends seen in the VA because MRSA [hospital-acquired infection] rates had not changed before October 2007 when the Initiative was fully implemented, even though formal recommendations for hand hygiene and device-related infection control bundles had been in place for several years.”⁶

▼ Universal decolonization

Though proven to lower infection rates, active surveillance testing is not currently reimbursable and hospitals have to cover the costs of testing. This upfront cost has led some healthcare organizations to abandon surveillance testing in favor of universal decolonization, i.e., application of a topical antibiotic or alcohol-based antiseptic in the nares and daily CHG baths, coupled with more rigorous hand-washing.

The case for universal MRSA decolonization is seemingly supported by a 2013 study published in the *New England Journal of Medicine*. A group of investigators led by Susan Huang, MD, at the University of California Irvine concluded that universal decolonization was more effective at reducing the rate of bloodstream infections than either targeted decolonization or screening and isolation was.⁷

Yet most reductions in bloodstream infection rates following universal decolonization reported were due to decreased coagulase-negative *Staphylococcus*, which are typically part of a person’s normal microbiota. Accounting for that, there were no differences in bloodstream infection rates when comparing targeted and universal decolonization.

Huang and co-authors also acknowledge that widespread use of CHG and nasal antiseptics strips patients of their own beneficial microbiota, at a time when they’re especially vulnerable to infection, and could promote resistance.⁷ The long-term effects of indiscriminate alcohol-based nasal decolonization are not yet known.



In order to reduce additional selection pressure in [hospital-acquired] pathogens it seems to make sense to restrict the valuable agent CHG to those indications with a clear patient benefit and to eliminate it from applications without any benefit or with a doubtful benefit.”

Günter Kampf of Knieler und Team GmbH in Germany, writing in a 2016 review published in the *Journal of Hospital Infection*

Indeed, microbial resistance to CHG has been documented. Researchers at Public Health England, part of the U.K. National Infection Service, have reported that the bacterium *Klebsiella pneumoniae* can adapt and become more resistant to CHG. More alarming, five of six strains that had adapted to CHG were also resistant to colistin, an antibiotic of last resort.⁸

Günter Kampf of Knieler und Team GmbH in Germany conducted a review of published data from clinical isolates with CHG minimum inhibitory concentrations and compared them to epidemiological cut-off values. While MRSA wasn't specifically addressed, the authors concluded that CHG exposure may enhance resistance in several other clinically relevant bacteria.

Kampf writes "In order to reduce additional selection pressure in [hospital-acquired] pathogens, it seems to make sense to restrict the valuable agent CHG to those indications with a clear patient benefit and to eliminate it from applications without any benefit or with a doubtful benefit."⁹

What's more, the universal MRSA decolonization approach relies heavily on healthcare workers to comply daily with the labor-intensive routine of applying nasal antiseptics, bathing with CHG, and washing hands. Compliance is notoriously low for universal procedures like hand washing. Studies have found compliance among nurses and doctors to range from 40 percent¹⁰ to 78 percent.¹¹ According to the CDC, healthcare providers should clean their hands as many as 100 times in a 12-hour shift, but in reality they do it less than half of the times they should.¹²

Even when nasal antiseptics are implemented on a relatively limited scale, compliance can be a challenge. In a perioperative case, nasal antiseptic alone requires three applications to the patient within one hour before surgery and two more applications per day for five to seven days afterward. And it's not just the patient—it is recommended that operating room staff apply nasal antiseptic once per 12-hour shift, visitors before entering the patient room and every 12 hours after, and caregivers at home twice per day. Each application requires between 8 and 16 rotations around each nostril.¹³

Final Thought

MRSA survivor and patient advocate Jeanine Thomas would like to see interventions like contact precautions and chemical decolonization reserved for patients who are known to be colonized. To her, active surveillance testing is the only way to deploy limited infection control resources responsibly, but surveillance testing also plays a vital role in ensuring we understand the true scope of the MRSA threat.



If we don't have transparency and real-time data, we don't know how big the problem is. What if we think MRSA rates are declining only because hospitals aren't even looking for it?"

Jeanine Thomas, founder of the MRSA Survivors Network

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