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On the Defensive

BY KATY HUMAN

Rising number of staph infections leads hospitals and patients to put their guard up.

Constance Roche lay in a double room after her mastectomy, a drain in her left breast to clear fluid buildup. Diagnosed with breast cancer, Roche went through surgery in December 2006 and expected to begin chemotherapy as soon as she healed. Nurses offered her a private room, but Roche didn't think she needed it. It was just one night, after all.

That evening, they wheeled another woman into the room—a patient who was fighting a serious infection following breast reconstruction surgery. Roche, herself a nurse, says she was well aware of the risk of infection.

“I tried to be extremely careful, but I was still groggy from the anesthetic,” she says. Two weeks later, Roche, now 59, was in isolation at the hospital for five days, fighting the methicillin-resistant *Staphylococcus aureus* (MRSA) that invaded her surgical site. Genetic testing linked the infection to her roommate.

MRSA (“mersa”) refers to a type of staph bacteria that has grown resistant to several first-line antibiotics—methicillin, oxacillin, penicillin, and amoxicillin. Cancer patients have a higher-than-average risk of MRSA infection for several reasons. The invasive catheters and other devices used to deliver drugs or drain surgical sites offer a point of entry for bacteria. Hospitals and other health care settings foster drug-resistant strains of staph, and cancer treatment—or the cancer itself—often leaves patients with weak immune systems that can't mount strong defenses.

“We're all seeing this in our cancer patients, and we all have started treating it pretty aggressively,” says Roy Chemaly, MD, director of infection control at M.D. Anderson Cancer Center in Houston. “We see it especially in our patients with no immune systems. They get pneumonia, bacteremia (bloodstream infections). They're just very vulnerable.”

Growing Concern

Usually, MRSA infections are fairly minor skin infections that do not require antibiotic treatment. A skin MRSA infection may look like a pimple or boil; it can be red, swollen, and painful, and may drain or seep fluid. “Invasive” MRSA occurs when drug-resistant staph bacteria find a point of entry into the body and infect

the lungs, heart, or bloodstream. Some of these infections are deadly.

View Illustration: Spreading Resistance

MRSA is probably spread most often by skin contact—from the hands of a health care worker, for example. But it can also be picked up from shared items, such as a razor, or from contaminated surfaces and medical devices.

The proportion of staph infections that are resistant to methicillin and other antibiotics has been rising steadily in health care settings for several decades. Researchers estimate about 10 percent of staph bacteria in hospitals were methicillin-resistant in the 1980s. By the 1990s, resistant strains accounted for up to 40 percent of infections, and by 2003, 64 percent of staph infections in intensive care units were resistant to methicillin.

“These days, more people in hospitals are very sick, and because of all the antibiotics used, there is intense selective pressure, which is the perfect breeding ground for resistant strains of bacteria,” says Ken Gershman, MD, an epidemiologist with the Colorado Department of Public Health and Environment.

The medical and public health world particularly began to take note when MRSA infections began popping up more often in the general community. “There appears to be more MRSA everywhere,” Dr. Gershman says.

The Centers for Disease Control and Prevention started to track MRSA more carefully, and worked with a group of state health departments and academic physicians involved in the Active Bacterial Core Surveillance (ABCs) network to identify all diagnosed cases of invasive disease in a sample population. The ABC network encompasses 10 sites around the country (nine were involved in the MRSA work), and is part of the CDC’s Emerging Infections Program. Dr. Gershman is responsible for the network’s work in the Denver area.

In October 2007, the researchers published stunning figures in the *Journal of the American Medical Association*: Extrapolating their findings from nine regions, the authors estimated MRSA causes more than 94,000 life-threatening infections every year, and nearly 19,000 deaths in the United States. For the first time, researchers had an actual number of how many people in the United States were getting MRSA. The rate of infection found was 31.8 instances per 100,000 people.

“If their projection is accurate, these deaths would exceed the total number of deaths attributable to human immunodeficiency virus/AIDS in the United States in 2005,” wrote Elizabeth Bancroft, with the Los Angeles County Department of Public Health, in an accompanying editorial.

A flurry of news articles ensued, with many calling for a national MRSA surveillance system. Advocates urged patients and families to put pressure on health care providers to wash hands and wear gloves appropriately, and to go public with cases that might have been acquired because of lack of good hygiene.

In January, MRSA was still the second top word search on the CDC website when the *Archives of Surgery* reported more infection news, this time about the risk of

surgical site infection following mastectomy. The researchers found that despite the use of preventive antibiotics before surgery, breast cancer patients receiving reconstruction with implants were twice as likely to get an infection as patients whose reconstruction used their own abdominal tissue (12.4 percent compared with 6.2 percent, respectively). The additional hospital costs per patient totaled a minimum \$4,091.

While factors such as introducing a foreign object into the body likely contribute to the increased risk, authors of the study say the next task is to determine other causes and how to prevent them.

New Drugs, New Policies

Roche, who is also a public health nurse with the Winona County Health Department in Minnesota, was aware of MRSA's rise in hospital and community settings. She had public health colleagues who dealt with MRSA patients. "I knew how serious MRSA could be," Roche says.



Constance Roche contracted MRSA while recovering in the hospital from cancer surgery. Photo by Mark Miranda.

The pain from Roche's infection lasted about two days—a vancomycin drip started clearing the infection quickly, which isn't always the case, says Dr. Chemaly. Some MRSA infections, he says, are no longer responding to vancomycin, the preferred drug for methicillin-resistant staph.

"Fortunately, we do have some other choices," Dr. Chemaly says. M.D. Anderson and other hospitals are using the synthetic antibiotic Zyvox (linezolid) for MRSA pneumonia in cancer patients, and Cubicin (daptomycin) for blood infections, he says. For persistent deep tissue infections that don't respond to vancomycin, Tygacil (tigecycline) is very effective, Dr. Chemaly says.

Many patients find MRSA infections terribly stressful, not only because of the risk of death, but also because infection treatment may delay planned treatment for cancer. "The main thing is to get rid of the infection as soon as possible," Dr. Chemaly says. "An infection can kill a patient faster than most cancers."

In January, the Food and Drug Administration approved the first rapid blood test, called the BD GeneOhm StaphSR Assay, to identify blood-borne MRSA infections—the test delivers results in two hours instead of two days—critical for quick treatment decisions. The FDA approved another test last April called Xpert MRSA, a molecular test that uses polymerase chain reaction technology to generate results from a swab in a little over an hour.

Even before the *JAMA* study came out last year, Dr. Gershman says epidemiologists and infection control practitioners knew MRSA had become an increasing problem in health care settings and more attention was needed for infection control.

At the end of 2006, for example, the Institute for Healthcare Improvement

launched its two-year 5 Million Lives Campaign to prevent five million cases of medical harm in U.S. hospitals. The campaign puts a major emphasis on preventing MRSA with basic infection control practices. At the Department of Veterans Affairs medical center in Pittsburgh, a MRSA prevention program was so successful that the VA expanded it in 2007 to all VA medical centers.

“In the past year or two, there’s been a lot of emphasis at the national level,” Dr. Gershman says. “If hospitals implement effectively some of these measures, it should be evident fairly soon in lower numbers [of MRSA].”

In February, California’s Department of Public Health announced mandatory reporting of MRSA by health care providers to identify high-risk groups and develop prevention programs. At M.D. Anderson in Texas, Dr. Chemaly says, meticulous surveillance has highlighted high-risk areas and patients, and infection specialists are responding with new policies and procedures. “Surgical services [at M.D. Anderson] was seeing higher rates than other areas, so now they’re taking a nose swipe before surgery,” Dr. Chemaly says. If a patient is colonized with MRSA bacteria, he says, they’re treated before surgery with an appropriate antibiotic.

For both inpatient and outpatient services, patients who are known to be colonized or infected with MRSA are isolated, he says, treated by providers wearing gloves and masks, and placed in rooms that are cleaned carefully before another patient enters. In intensive care, antimicrobial tubing has also helped cut down infection rates in patients who require invasive devices. “We are seeing lower rates now than the CDC reports as an average,” Dr. Chemaly says.

Hospitals in England banned long sleeves, ties, and jewelry for doctors last fall, concerned about the rise in hospital-borne infections. Dr. Chemaly says that’s not yet on the table at M.D. Anderson, and the British medical journal *Lancet* criticized the new policies there, saying they were not based on solid science. Hospitals would do better to practice the basics, such as disinfecting often-used surfaces, *Lancet’s* editors argued.

As for Roche, she’s doing very well now. Her surgery and subsequent battle with MRSA ended in December 2006, she tolerated several months of chemotherapy well, and has thrived with the support of friends and family.

She does wash her hands a little more aggressively now, she admits. “I thought I was pretty conscientious about washing my hands before,” Roche says. “Now, I scrub them even longer.”