In late 2007 and early 2008, an Arizona hospital saw an alarming increase in surgical site infections (SSI) with methicillin-resistant *Staphylococcus aureus* (MRSA).

For the first quarter in 2008, the infection rate for total hip replacements and revisions averaged 3.73%, well above the national average of 1.6%, with most involving MRSA. Some MRSA infections had also occurred after total knee procedures, cholecystectomies, and hernia repairs with mesh.

A multidisciplinary team at the hospital, Banner Baywood Medical Center in Mesa, which has 10 ORs, began a top-to-bottom review of the OR environment and practices.

By the end of October 2008, MRSA SSIs fell to zero, and none were reported through early May 2009.

MRSA can be devastating. Patients who develop an MRSA SSI have a 3.4 times higher risk of death than patients with methicillin-susceptible *Staph aureus*, and their median hospital costs are almost twice as high, according to Engemann, et al.

These are steps the hospital took to reach zero for MRSA SSIs. Two OR issues the team found needed particular attention—OR ventilation (positive pressure) and terminal cleaning.

**Team goes to work**

In May 2008, the infection preventionist, Julie Peters, RN, gathered a multidisciplinary team to begin a review and make recommendations. Included were representatives from the OR as well as infection control, sterile processing, and quality management. They used as their guide the Centers for Disease Control and Prevention Guideline for Prevention of Surgical Site Infection, 1999.

The group reviewed sterilization practices. Flash sterilization was already minimal. Among steps they took:

- All prevacuum cycles were standardized, and 1 minute was added to drying time.
- Autoclave settings were set so the staff cannot change them.
- The team changed to thicker sterilization wrap, sent letters to vendors reminding them to check and replace trays with spurs and sharp edges, and placed plastic trays under consigned orthopedic trays to reduce tearing of wrap.
- A new process was employed for cleaning all instrument containers.

Hand hygiene compliance in perioperative services averaged 75%, higher than in other units. To aid compliance with contact precautions, the hospital uses color coding to identify patients who are and who are not on contact precautions.
Informing the surgeons

Peters presented information on the outbreak to the Surgery Committee, which discussed practices such as ensuring that the antibiotic for total knee procedures was given before the tourniquet was applied and the antibiotic was administered within 1 hour of incision for all cases.

Compliance with the antibiotic measures from the Surgical Care Improvement Project (SCIP) for total joint procedures in the second half of 2008 was 94% or above. These include giving the antibiotic on time and selecting the right antibiotic. Appropriate hair removal was at 100% overall.

The surgeons discussed whether to introduce active surveillance testing for patients at high risk for MRSA, but have not gone ahead with that at present.

The effectiveness of active surveillance testing in preventing MRSA transmission is controversial, and optimal strategies for testing have not been resolved, according to a review of strategies for preventing MRSA transmission by Calfee and colleagues, part of the compendium on preventing health care-associated infections (HAI) from the Society for Healthcare Epidemiology of America (SHEA) and other organizations (sidebar).

Education reinforced

The team began reinforcing education for the staff on sterile technique.
and the SCIP measures. A review was conducted for the OR assistants and environmental services staff on decontamination and sterilization techniques. The need to control traffic in and out of the ORs was reinforced. ORs where implants are performed have signs on the doors instructing personnel to enter only through the sterile core.

**A surprise discovery**

Though reports showed all OR ventilation parameters were within guidelines, the team discovered to its surprise that 5 of the 10 ORs were actually under negative air pressure rather than positive pressure as recommended, says Chris Halowell, RN, MS-HSA, CNOR, director of perioperative services. In a positive pressure room, air flows outward to the corridor, sweeping out contaminants. Under negative pressure, air currents flow into the room.

The discovery was made on a weekend when the team came in to investigate an unrelated incident. A technician performed a “tissue test,” using a facial tissue to see the flow of air currents in the ORs and found air was actually flowing into 5 rooms.

“I didn’t believe him at first. But he showed me he was correct,” Halowell says.

The team immediately contacted the facilities department to make sure OR ventilation was brought within the correct parameters. (A table with the recommended parameters for OR heating, ventilation, and air conditioning is in the AORN 2009 Perioperative Standards and Recommended Practices, p 421.)

**Terminal cleaning gaps**

The team also learned terminal cleaning in the ORs wasn’t up to par. Environmental cleaning is important because patients infected or colonized with MRSA contaminate their environment, which can in turn contaminate health care workers’ hands, clothing, and equipment.

When Georgie Elias, RN, BS, CNOR, CPN, senior clinical manager for surgical services, and another clinical manager spent a week each with the terminal cleaners, they found lapses.

“We found they weren’t making a connection between invisible bugs and the dust they could see,” Halowell notes.

Some creative ways were used to reinforce the cleaners’ education. Elias seeded an area with a harmless powder called Go Germ, which is invisible under normal conditions but glows under a black light (www.glogerm.com).

She had the cleaners perform their routine cleaning and used the black light to check their work.

As a further check, Elias used a luminometer, a device that detects low levels of light from ATP (adenosine triphosphate) in the cells of biological material to check on the effectiveness of cleaning.

“We found they still were missing important parts of the room like the high-touch surfaces,” Elias says.

When the cleaners’ performance didn’t improve after these efforts, they were let go.

**Preoperative wash for patients**

As an additional measure, surgical patients are now given a bottle of 4% chlorhexidine gluconate, or CHG (Hibiclens), at their preoperative appoint-
ment and instructed to shower with it the day of surgery. Also, in the preoperative area, patients’ surgical areas are cleaned with 2% CHG wipes. CHG provides persistent activity against microorganisms. For the skin prep, most of the orthopedic surgeons prefer an iodophor, Halowell notes.

Preoperative bathing with CHG is considered an unresolved issue in the strategies to prevent surgical site infections by Anderson and colleagues, part of the HAI compendium. Though showering with CHG before surgery has been shown to reduce bacterial colonization of the skin, studies have not shown clear evidence of a benefit, the article notes. AORN recommends that patients having Class 1 surgical procedures below the chin have 2 preoperative showers with CHG when appropriate.

Reinforcing sterile conscience

The team also looked for ways to reinforce aseptic technique and sterile conscience.

“Everyone is trained in that. But I think as time goes on, people start getting lax,” Elias says.

An in-service on the study Silence Kills provided an eye-opening reminder. The study, released in 2005, found fewer than 10% of health care workers speak up when they see a colleague break rules, make mistakes, or appear clinically incompetent (www.silencekills.com).

Banner Baywood had already introduced Crucial Conversations, a training program that teaches skills for addressing difficult issues with colleagues (www.vitalsmarts.com).

The training is also being provided to the nonclinical staff. Halowell has found it is helpful to work with them in small groups.

“We have said, ‘It is OK to call the nurses and doctors on their practice if you think it is harming your patient,’” Halowell says. “The patient is the center of focus.”

Team Safe

A hospitalwide program called Team Safe is being introduced to develop a culture of safety and accountability.

“We are trying to create accountability so a person is not afraid to confront a coworker in the OR or anywhere,” says Peters. Personnel learn to watch for and speak up about safety lapses, such as medication that is lying around or failure to observe hand hygiene or isolation precautions.

Halowell says that as a result of the training, she observes more staff intervening when they see a lapse, and she believes most staff would now speak up about a practice breach.

Targeting zero

Halowell admits to feeling “a little complacent” prior to 2008. She says the effort to address the outbreak raised awareness at all levels of the organization.

“Now I’ve learned you don’t take a piece of paper for granted. You have to do your own testing,” she says, referring to the OR ventilation reports.

She adds that the experience and Crucial Conversations training helped get the staff involved and fueled the department’s shared leadership team.

“It’s been a team effort to fix it,” she says.

For Peters, the situation reinforced the value of the CDC SSI guideline. “Now I think targeting zero is possible,” she says. “It’s like a diet—there
is no immediate fix. It requires a change in habits that must be followed for life. You have to tighten up on the basics.”

—Pat Patterson

References


**Compendium has advice on infection**

A comprehensive review of strategies for preventing health care-associated infection is available from the Society for Healthcare Epidemiology of America. Included are strategies for:

- surgical site infection
- central line-associated bloodstream infection
- catheter-associated urinary tract infection
- ventilator-associated pneumonia
- *Clostridium difficile*
- Methicillin-resistant *Staphylococcus aureus.*

— www.shea-online.org/about/compendium.cfm