Strong evidence from a new 6-hospital study could lead many ORs to change their traditional practice for surgical skin preparation. In the first prospective, randomized study to compare the effect of 2 skin prep agents on the incidence of surgical site infections (SSIs) after clean-contaminated surgery, a chlorhexidine (CHG)-alcohol product came out ahead of a povidone-iodine scrub and paint, resulting in an infection rate 41% lower. The report is in the January 7, 2010, *New England Journal of Medicine*.

The 4-year study led by Rabih O. Darouiche, MD, involved 849 patients having clean-contaminated surgery—409 were prepped with a product containing 2% CHG and 70% isopropyl alcohol (ChloraPrep), and 440 were prepped with 10% povidone-iodine. The CHG-alcohol group had an SSI rate of 9.5% compared with 16.1% in the povidone-iodine group, showing a significant difference.

Asked why the infection rates in the study seemed high, Dr Darouiche responded that in this study, as in others, the SSI rates were assessed at 30 days postoperatively.

“Unfortunately, most reported rates of SSI underestimate the true rates,” he says, “because they assess SSIs after a relatively short time; that is, at the time of hospital discharge or at the time of the postop clinic visit.”

Dr Darouiche is professor of medicine and director of the Center of Prostheses Infection at Baylor College of Medicine in Houston.

“This is a well-done, randomized, controlled study,” an infection control expert, Richard P. Wenzel, MD, told *OR Manager*.

“I would say this is a dramatic response for something that’s fairly inexpensive and that doesn’t add time to the procedure,” says Dr Wenzel, an epidemiologist and professor of internal medicine at Virginia Commonwealth University, Richmond, who wrote an editorial accompanying the study.

Another recent study by Swenson et al from the University of Virginia Health System, Charlottesville, had a different result and a different research design. The researchers compared the effects of 3 skin preps—povidone-iodine scrub and paint with isopropyl alcohol between steps, CHG-alcohol (ChloraPrep), and iodine poviacrylex-alcohol (DuraPrep)—used in 3 different periods over 6 months. The lowest infection rate was seen in period 3 when iodine poviacrylex-alcohol was used. The study was not randomized or blinded and was conducted in a single center. The authors say the study would need to be repeated in more hospitals before one skin prep method could be recommended over another.

**Four factors of a prep agent**

Dr Darouiche told *OR Manager* that he and his colleagues considered 4
factors in comparing the CHG-alcohol and povidone-iodine skin preps:
• spectrum of activity
• rapidity of antimicrobial activity
• duration of residual activity
• potential for inactivation by bodily fluids, mainly blood.

Both products had similar broad-spectrum antimicrobial activity, but the CHG-alcohol had the upper hand for the other 3 factors:
• worked faster than povidone-iodine because of the alcohol, which is one of the most rapid agents for inactivating microorganisms
• had longer residual activity than povidone-iodine
• maintained its activity because unlike povidone-iodine, it is not inactivated by exposure to blood.

Cost considerations
Dr Darouiche noted that the cost of the povidone-iodine prep tray used in the study was about $3, and the cost of the CHG-alcohol applicator was about $6. On average, 2 applicators were used, depending on the size of the incision, for a total cost of $12 for the CHG-alcohol, a difference of $9 per patient.

Based on the study results, CHG-alcohol prevents at least 6 more cases of infection per 100 patients than povidone-iodine. The $900 in additional cost for CHG-alcohol for 100 patients is far less than the cost of treating 6 patients with SSIs.

Based on the study’s finding that about 17 patients would need to have skin prep with CHG-alcohol rather than povidone-iodine to prevent one infection, times the difference in price, the cost to the facility is still under $200, says Dr Wenzel. Duke researchers recently reported that a single case of methicillin resistant *Staphylococcus aureus* resulted in $60,000 in additional charges compared with uninfected controls.

New standard of care?

The protection given by CHG-alcohol in the study was similar to the 49% reduction in vascular catheter-related bloodstream infections in ICUs in a meta-analysis that also found CHG superior to povidone-iodine, the authors note.

Dr Wenzel says the weight of the evidence from this study suggests that CHG-alcohol should replace povidone-iodine as the standard for preoperative skin preparation.

“If we have 300,000 to 500,000 infections in 30 million operations each year, and we can reduce that by some 40%, we’re looking at potentially 120,000 fewer infections. It would be an important change that would have a big yield,” he noted.

In selecting skin antiseptics, AORN recommends assessing patients for allergies to antiseptics—CHG and povidone-iodine have both triggered allergic reactions.

AORN also notes that alcohol-based products pose fire and chemical skin burn risks. Products with alcohol must be allowed to dry thoroughly before drapes are applied to reduce the fire risk.

Dr Darouiche notes that 3 patients each in the povidone-iodine group and in the CHG-alcohol group had pruritus, erythema, or both around the incision linked to the skin prep solutions. There were no serious allergic reactions, chemical skin burns, or fires in the operating room.
The Centers for Disease Control and Prevention (CDC) “Guidelines for the prevention of intravascular catheter-related infections” recommend 2% CHG-based preparations for cleaning vascular catheter insertion sites. But the CDC does not recommend which antiseptics to use for the preop skin prep.

“Overall,” says Dr Wenzel, “the consistency with which CHG-alcohol has been shown to reduce infections is very strong, and the research supports a change of standard practice.”

Cardinal Health funded the study and provided both skin-prep products. (ChloraPrep is now sold by CareFusion.) Dr Darouiche says the companies had no access to the data.

—Judith M. Mathias, RN, MA

References


**Tips for leading a practice change**

A new study provides strong evidence that surgical skin prep with chlorhexidine gluconate (CHG)-alcohol is superior to povidone-iodine scrub in preventing surgical site infections (related article).

What if most of the surgeons in your OR use povidone-iodine? How can you introduce the new evidence to the surgeons and convince them to consider a change?

New England Baptist Hospital in Boston, which performs 10,000 procedures a year for a complex caseload, made the change in 2007.

“Implementing such a change in an orthopedic hospital is no small feat,” says Maureen Spencer, RN, MEd, CIC, the infection control manager, who notes the conversion took about 5 months. At the time, surgeons were using either povidone-iodine scrub and paint or povidone-iodine-alcohol. Spencer shared her tips about making the change.

**Start with the evidence**

Spencer started by presenting the evidence to the surgeons. A 2007 review in the *Journal of Bone and Joint Surgery* graded the evidence on infection prevention for orthopedic surgery and found the “literature strongly suggests that chlorhexidine gluconate is superior to povidone-iodine for preoperative antisepsis for patients.”

Spencer showed the surgeons the review and discussed with them the conclusions, references, and recommendations.

The discussion was part of an infection prevention effort in surgical services to move to a “chlorhexidine platform,” including the following:

- All patients would take preoperative showers with 4% CHG (Hibiclens) 2 days before and the morning of surgery.
- For skin prep in the OR, 2% CHG and 70% isopropyl alcohol (ChloraPrep) would be used.
- Antimicrobial dressings would be applied postoperatively.

“We didn’t anticipate what we were going to be up against when we introduced the change in skin preparation,” Spencer notes. “The orthopedic surgeons had always used iodine and saw no reason to use anything different.”

To become better acquainted with the orthopedic surgeons, Spencer had already begun attending their monthly staff meetings. At first, she says the surgeons were skeptical about her attendance but now regard her as a colleague and peer.

**Have infection prevention support**

Having infection prevention support in surgical services is essential, notes Spencer, adding that a perioperative department as large as New England Baptist’s could use a dedicated infection preventionist.

She has been assigned 2 perioperative staff nurses—one for the total joint service and 1 for spinal surgery—to help implement new initiatives. “It’s great because they know the surgeons and the staff. They also can get the information to me quickly if there’s a problem.”

Spencer adds, “I have been able to show the administration how important it is to integrate infection control into the OR and into surgical practice.”
The evidence plus administrative support are what win the day with new infection prevention initiatives, she notes.

**Draw on company expertise**

Spencer called on support from company representatives and clinical consultants to assist with the skin-prep product conversion. One key was to have a nurse specialist from the company with a background in critical care nursing and infection control on hand in the OR for 3 weeks. Spencer also spent more than a week in the OR herself, reassuring the staff and addressing surgeon concerns.

“You need to take at least 6 months to a year to implement a change in surgeons’ practice,” Spencer advises. “You have to keep working at it and have consistent follow-up. I have infection control issues on their staff agenda every month.”

**Address surgeon concerns**

One concern the surgeons had with making the change was that the iodophor-impregnated incise drape wouldn’t stick to the skin after ChloraPrep was applied. The iodophor products they had been using had a polymer that helped the barrier drape adhere to the skin.

The problem was addressed by allowing the ChloraPrep to dry for a minimum of 3 minutes. Then after applying the incise drape, the surgeon or nurse would rub a sterile towel on the adhesive drape to warm up the adhesive. “They were then able to get a nice adhesion, and it made the change much easier to implement,” Spencer says.

She estimates that 70% to 80% of the surgeons at New England Baptist now use the CHG-alcohol prep, and it is used for all total joint procedures. Some neurosurgeons will not switch because of a warning on the ChloraPrep label that it should not have contact with the meninges.

Some orthopedic surgeons take extra measures, Spencer notes. A couple scrub and paint with povidone-iodine and then use ChloraPrep. “We are fine with that. It is not that much more expensive, even though it is probably a waste of product,” she says.

She says the hospital has not seen a difference in its surgical site infection rates since the change to CHG-alcohol more than 2 years ago. The overall orthopedic infection rate was already low at 0.4% in 2007 before the CHG platform was introduced; it is now at 0.2%. The infection rate fell from 0.7% to 0.2% in 6 years following a variety of infection prevention initiatives.

—Judith M. Mathias, RN, MA

**References**
