

## Preventing Surgical Site Infection: Preoperative Bathing

### Why Is it so Important?

Peter D. McCann, MD

Prevention of surgical site infection (SSI) in total hip and knee arthroplasty is a top priority in healthcare management today for several reasons: increased patient morbidity, poor clinical outcomes, and excess cost. The Centers for Disease Control and Prevention (CDC) estimates that over 1 million total hip and knee replacements were performed in 2009.<sup>1</sup>

The National Healthcare Safety Network (NHSN) has reported that infection rates for total hip and knee replacements range from 0.67% to 2.4%, depending on patient risk.<sup>2,3</sup> Treatment of SSI following joint replacement requires additional surgery, prolonged use of antibiotics, results in worse clinical outcomes, and adds substantial additional hospital costs estimated to be as much as 3 times the cost of the primary procedure or \$60,000 to \$100,000 per infected joint.<sup>4-6</sup>

With the number of total joint replacements increasing each year as the Baby Boomer generation ages, the economic and compromised quality-of-life costs of SSI will increase as well. For these reasons, prevention of SSI following total joint arthroplasty has taken on paramount importance.

### Initial Steps to Prevent SSI in Hip and Knee Replacements

In an effort to minimize SSI in these high-cost, high-volume total joint procedures, a number of organizations, including the Centers for Medicare and Medicaid Services (CMS) and The Joint Commission (JC) initiated the Surgical Care Improvement Project (SCIP) in 2006, which included recommendation for best practices to improve overall surgical outcomes.

There were 5 practices specifically recommended to address minimizing SSI<sup>7</sup>:

- Appropriate antibiotics,
- Antibiotic administration 1 hour pre-incision,
- Antibiotic discontinuation within 24 hours of skin closure,
- Appropriate hair removal (ie, clipper, no razor), and
- Normothermia

Appropriate selection and timing of antibiotics for antimicrobial prophylaxis are fairly obvious requirements to achieve therapeutic tissue and joint levels of the appropriate antibiotic effective against the most common pathogens causing SSI following joint replacement. Cessation of antibiotics within 24 hours of skin closure minimizes the risk of resis-

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tant organism selection. Hair removal using clippers avoids the common abrasions associated with the use of razors that may subsequently become infected. A study by Kurz and colleagues<sup>8</sup> reported that the incidence of SSI in patients with mild perioperative

tices (ie, appropriate use of antibiotics and appropriate hair removal).

The goals of Project JOINTS were not only to educate healthcare providers about the importance of the Enhanced Surgical Bundle, but to teach hospitals and healthcare providers how to implement and monitor these practices to document improved outcomes (ie, lower SSI rates in hip and knee arthroplasty).

“Recent reports have indicated that adherence to these SCIP practices alone will not decrease SSI rates sufficiently to achieve a meaningful impact on healthcare costs.”

hypothermia was 3 times higher than in normothermia patients. Implementation of these practices is crucial to the success of the program.

However, despite these important evidence-based steps to prevent SSI, recent reports have indicated that adherence to these SCIP practices alone will not decrease SSI rates sufficiently to achieve a meaningful impact on healthcare costs.<sup>9,10</sup> Consequently, it is clear that more efforts are required to significantly impact SSI following total joint arthroplasty.

### New Initiatives to Prevent SSI: Enhanced SSI Prevention Bundle

According to its mission statement, the Institute for Healthcare Improvement (IHI) is a “... not-for-profit organization ... leading innovator and healthcare improvement worldwide. IHI helps accelerate change by cultivating promising concepts for improving patient care and turning these ideas into action.”<sup>11</sup>

In 2011, the IHI introduced the Enhanced SSI Prevention Bundle, including 3 new evidence-based practices to lower SSI in patients undergoing total hip and knee replacement surgery<sup>11</sup>:

- *Staphylococcus aureus* screening and use of intranasal mupirocin to decolonize carriers,
- Preoperative bathing with chlorhexidine gluconate (CHG) soap, and
- Use of alcohol-containing antiseptic agents for preoperative skin preparation.

With a grant supported by the federal government, the IHI then introduced a new program, Project JOINTS (Joining Organizations IN Tackling SSIs), to assist healthcare organizations implement these 3 new practices as well as 2 existing SCIP prac-

### Evidence Supporting the Enhanced Surgical Bundle

The Enhanced Surgical Bundle focuses on efforts to decolonize sites with the most prevalent pathogens causing SSI: the skin and nasal passages. *S aureus* harbored in the nasal passages increases the risk for *S aureus* wound infections following orthopedic surgery.<sup>12-14</sup> It is estimated that up to 30% of preoperative patients are *S aureus* carriers, and numerous studies have demonstrated that treating carriers with nasal mupirocin has decreased SSIs in these carriers.<sup>15-18</sup> Finally, Kim and colleagues<sup>19</sup> reported that the introduction of a prescreening program to identify and decolonize *S aureus* carriers prior to elective orthopedic surgery can lead to lower SSI rates.

The skin itself is another large reservoir for *S aureus*

### Key Points

- More than 1 million total hip and knee replacements were performed in 2009 and infection rates range from 0.67% to 2.4% depending on patient risk.
- Prevention of surgical site infection (SSI) in these patients is a priority in healthcare management today due to increased patient morbidity, poor clinical outcomes, and excess costs.
- While the initial Surgical Care Improvement Project (SCIP) measures introduced in 2006 were believed to be among the best practices to minimize SSI, they have not yielded significant decreases in SSI.
- Additional best practices have been introduced, including the Enhanced Surgical Bundle, preoperative bathing with chlorhexidine gluconate (CHG)-containing soap, preoperative skin antiseptic agents containing alcohol, screening of patients prior to surgery, and treatment of *Staphylococcus aureus* carriers.
- While it is difficult to precisely measure the effectiveness of the Enhanced Surgical Bundle in reducing SSI, the logic and association of decreasing the bacterial reservoir makes perfect sense.
- The success of the practices promoted by Project JOINTS (Joining Organizations IN Tackling SSIs) will depend entirely on how thoroughly these initiatives are implemented, the process monitored, and results reported.

carriers. Studies have shown that bathing with CHG can significantly decrease the count of skin bacteria that may cause SSI.<sup>20</sup> Additional studies have demonstrated increased effectiveness of repeated CHG bathing and that showering for 3 to 5 days prior to elective surgery enhances the antimicrobial effects of CHG.<sup>21,22</sup> Although there is no conclusive evidence that decreasing skin bacteria counts alone will lower SSI rates in total joint surgery, the IHI has, nonetheless, recommended that preoperative bathing or showering with CHG for 3 to 5 days prior to elective surgery is an important practice to prevent SSI.

Finally, the use of alcohol and CHG for preoperative skin preparation has been shown to be an extremely effective infection prevention practice, since alcohol alone has been shown to have an immediate and dramatic lethal effect on the skin flora.<sup>23</sup> Darouiche and colleagues<sup>24</sup> performed a randomized, double-blind, placebo controlled study of patients undergoing clean-contaminated surgery and compared the use of povidone-iodine versus CHG plus alcohol as preoperative skin preparations. CHG plus alcohol was associated with significantly lower superficial and deep SSI rates. Another study found that the use of iodophor plus alcohol or povidone-iodine followed by alcohol was associated with lower SSI rates than the use of CHG and alcohol.<sup>25</sup>

Clearly, the addition of alcohol to the surgical preparation should be considered an important practice to minimize SSI in total joint replacement. However, there is potential increased risk with the introduction of alcohol into the operative field. Since alcohol is combustible, ignition sources such as electrocautery and accelerants such as oxygen increase the theoretical risk of a fire hazard in the operating room. Adequate drying time for any antiseptic agent, including alcohol, is essential for safe application.

CHG has some properties that may be advantageous as an agent for preoperative skin preparation. CHG has a longer duration of effectiveness than iodine alone, and iodine may be inactivated by blood in the surgical field, rendering it potentially less effective in longer cases associated with increased blood loss. Furthermore, to be fully effective, iodine must dry on the surgical field, which may not be a consistent practice in some operating rooms. Some authors contend that there is greater effectiveness of CHG over iodine, especially when combined with alcohol.<sup>26,27</sup>

### Implementing the Enhanced SSI Surgical Bundle

One of the most important aspects of the Project JOINTS initiative is not only the identification of additional best practices that can help minimize SSI in the joint replacement patient, but the guidance and specific instructions regarding how to implement these

best practices. My own institution in New York, Beth Israel Medical Center, recently completed participation in the Project JOINTS program and found that the direct interaction among participating hospitals and IHI personnel was especially helpful in implementing the Enhanced Surgical Bundle. I would strongly recommend participation in the Project JOINTS program for any healthcare facility committed to further decreasing the rate of SSI following total joint arthroplasty and optimizing care.

### Conclusion

Prevention of SSI following total joint replacement is a major quality initiative for every healthcare organization, given the great cost and compromised clinical outcomes associated with infection. While the initial SCIP measures introduced in 2006, including the use of perioperative antibiotics, clippers for hair removal, and the maintenance of normothermia postoperatively, were believed to be some of the best practices to minimize SSI, they have failed to result in significant

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“Studies have demonstrated increased effectiveness of repeated CHG bathing and that showering for 3 to 5 days prior to elective surgery enhances the antimicrobial effect of CHG.”

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decreases in SSI following joint replacement.<sup>28</sup> For this reason, additional best practices have been introduced, the Enhanced Surgical Bundle, which includes preoperative bathing with chlorhexidine-containing soap, the use of preoperative skin antiseptic agent that contains alcohol, and the screening of patients prior to surgery to diagnose and treat *S aureus* carriers in an effort to further decrease postoperative joint infection. Recent reports indicate that the Enhanced Surgical Bundle may decrease the current SSI rate by nearly 50%.<sup>15,24,26</sup>

While it is difficult to precisely measure the effectiveness of the Enhanced Surgical Bundle in reducing SSI, the logic and decreasing the bacterial reservoir preoperatively makes perfect sense. However, the success of the practices promoted by Project JOINTS will depend entirely on how thoroughly these initiatives are implemented, the process monitored, and results reported.

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## References

- National Hospital Discharge Survey: Procedures by selected patient characteristics – Number by procedure category and age; Atlanta, GA: Centers for Disease Control and Prevention; 2009 [http://www.cdc.gov/nchs/nhds/nhds\\_tables.htm](http://www.cdc.gov/nchs/nhds/nhds_tables.htm). Accessed March 1, 2013.
- Bozic KJ, Ries MD. The impact of infection after total hip arthroplasty on hospital and surgeon utilization. *J Bone Joint Surg Am.* 2005;87(8):1746-1751.
- Edwards JR, Peterson KD, Mu Y, et al. National Healthcare Safety Network (NHSN) report: data summary for 2006 through 2008, issued December 2009. *Am J Infect Control.* 2009;37(10):783-805.
- Kurtz SM, Lau E, Schmier J, Ong KL, Zhao K, Parvizi J. Infection burden for hip and knee arthroplasty in the United States. *J Arthroplasty.* 2008;23(7):984-991.
- Kurtz SM, Ong KL, Lau E, Bozic KJ, Berry D, Parvizi J. Prosthetic joint infection risk after TKA in the medicare population. *Clin Orthop.* 2010;468(1):52-56.
- Garvin KL, Konigsberg BS. Infection following total knee arthroplasty: prevention and management. *J Bone Joint Surg Am.* 2011;93(12):1167-1175.
- Bratzler DW, Hunt DR. The surgical infection prevention and surgical care improvement projects: national initiatives to improve outcomes for patients having surgery. *Clin Infect Dis.* 2006;43(3):322-330.
- Kurz A, Sessler DI, Lenhardt R. Perioperative normothermia to reduce the incidence of surgical-wound infection and shorten hospitalization. Study of Wound Infection and Temperature Group. *N Engl J Med.* 1996;334(19):1209-1215.
- Rosenberger LH, Politano AD, Sawyer RG. The surgical care improvement project and prevention of post-operative infection, including surgical site infection. *Surg Infect (Larchmt).* 2011;12(3):163-168.
- Hawn MT, Vick CC, Richman J, et al. Surgical site infection prevention: time to move beyond the surgical care improvement program. *Ann Surg.* 2011;254(3):494-501.
- Enhanced Surgical Site Infection Prevention Bundle: Hip and Knee Arthroplasty How-to-Guide. Cambridge, MA: Institute for Healthcare Improvement; 2011.
- Babkin Y, Raveh D, Lifschitz M, et al. Incidence and risk factors for surgical infection after total knee replacement. *Scand J Infect Dis.* 2007;39(10):890-895.
- Kluytmans JA, Mouton JW, Ijzerman EP, et al. Nasal carriage of *Staphylococcus aureus* as a major risk factor for wound infections after cardiac surgery. *J Infect Dis.* 1995;171(1):216-219.
- Huang SS, Platt R. Risk of methicillin *Staphylococcus aureus* infection after previous infection or colonization. *Clin Infect Dis.* 2003;36(3):281-285.
- Bode LG, Voss A, Wertheim HF, et al. Preventing surgical-site infections in nasal carriers of *Staphylococcus aureus*. *N Engl J Med.* 2010;362(1):9-17.
- Wilcox MH, Hall J, Pike H, et al. Use of perioperative mupirocin to prevent methicillin-resistant *Staphylococcus aureus* (MRSA) orthopaedic surgical site infections. *J Hosp Infect.* 2003;54(3):196-201.
- Van Rijern MM, Bonten M, Wenzel RP, Kluytmans JA. Intranasal mupirocin for reduction of *Staphylococcus aureus* infections in surgical patients with nasal carriage: a systematic review. *J Antimicrob Chemother.* 2008;61(2):254-261.
- Kalmeijer MD, Coertjens H, van Nieuwland-Bollen PM, et al. Surgical site infections in orthopedic surgery: the effect of mupirocin nasal ointment in a double-blind, randomized, placebo-controlled study. *Clin Infect Dis.* 2002;35(4):353-358.
- Kim DH, Spencer M, Davidson SM, et al. Institutional pre-screening for detection and eradication of methicillin-resistant *Staphylococcus aureus* in patients undergoing elective orthopedic surgery. *J Bone Joint Surg Am.* 2010;92(9):1820-1826.
- Mangram AJ, Horan TC, Pearson ML, Silver LC, Jarvis WR. Guideline for Prevention of Surgical Site Infection, 1999. Centers for Disease Control and Prevention (CDC) Hospital Infection Control Practices Advisory Committee. *Am J Infect Control.* 1999;27(2):97-134.
- Paulson DS. Efficacy evaluation of a 4% chlorhexidine gluconate as a full-body shower wash. *Am J Infect Control.* 1993;21(4):205-209.
- Kaiser AB, Kernodle DS, Barg NL, Petracek MR. Influence of preoperative showers on staphylococcal skin colonization: a comparative trial of antiseptic skin cleansers. *Ann Thorac Surg.* 1998;45(1):35-38.
- Adams D, Quayum M, Worthington T, Lambert P, Elliott T. Evaluation of a 2% Chlorhexidine gluconate in 70% isopropyl alcohol skin disinfectant. *J Hosp Infect.* 2005;61(4):287-290.
- Darouiche RO, Wall MJ Jr, Itani KM, et al. Chlorhexidine-alcohol versus povidone-iodine for surgical-site antisepsis. *N Engl J Med.* 2010;362(1):18-26.
- Swenson BR, Hedrick TL, Metzger R, Bonatti H, Pruett TL, Sawyer RG. Effects of preoperative skin preparation on postoperative wound infection rates: a prospective study of 3 skin preparation protocols. *Infect Control Hosp Epidemiol.* 2009;30(10):964-971.
- Wenzel RP. Minimizing surgical-site infections. *N Engl J Med.* 2010;362(1):75-77.
- Froimson MI. Orthopedic surgical infection prevention: host and environmental factors. *Am J Orthop (Belle Mead NJ).* 2011;40(12 suppl):6-9.
- Stulberg JJ, Delaney CP, Neuhauser DV, Aron DC, Fu P, Kouroukian SM. Adherence to surgical care improvement project measures and the association with postoperative infections. *JAMA.* 2010;303(24):2479-2485.

# Preventing Surgical Site Infection: Preoperative Bathing

## Engaging Patients and Caregivers

Mark I. Froimson, MD, MBA, Kristy Olivo, PA-C, MPAS, Michelle Schill, RN, and Mary Ann Horrigan, RN

One of the primary goals in healthcare today is to find ways of reducing or eliminating postsurgical infections, specifically surgical site infections (SSI).

In orthopedic surgery, approximately 2% to 5% of patients will acquire a SSI.<sup>1-3</sup> Many hospitals have adopted prevention techniques that include a wide array of approaches. Optimizing the host and environmental factors are important, as are efforts directed at minimizing the presence of the microorganisms that cause SSIs. Host factors include maintaining excellent perioperative glucose control, smoking cessation, nutritional optimization, anemia management, intraoperative maintenance of normothermia of the patient, and intraoperative topical antiseptics.

In addition, the reduction of local flora has received increased attention, is likely to have significant merit, and play a key role in further SSI reduction. Standard factors that are already widely accepted as part of the protocol, including appropriate operative site preparation, cleaning, and antisepsis as well as the appropriate use of perioperative antibiotics, are now being supplemented by prehospital reduction in the colonization of the patient through both preoperative nasal screening for Methicillin-sensitive *Staphylococcus aureus* (MSSA) and Methicillin-resistant *S aureus* (MRSA) and appropriate use of preoperative topical antiseptic applications. Patient education and engagement are key issues in utilization of any system, which helps reduce the bio-burden on the day of surgery. Compliance with antisepsis has been among the greatest challenges to its implementation. By adding this important activity to the standard preoperative care path or checklist that the surgical team employs, the compliance with, and utility of this approach can be expected to increase.

### Current Options Available

Patients need to be educated regarding the many forms of preoperative topical antiseptic applications that are available today, particularly since some may

find application of one more accessible than another based on their individual circumstance or preference. In fact, educating patients on the wide array of products and techniques is likely to empower them and increase their acceptance of the concept as a whole. If we emphasize or attempt to build a program around a single option, patient acceptance is likely to suffer.

Products available for skin decolonization include a variety of categories and options, each having an array of advantages and disadvantages in terms of patient acceptance and efficacy in a particular situation. These products include over-the-counter antimicrobial soaps, iodine or iodophor, alcohol and alcohol-based products, and chlorhexidine gluconate (CHG)-based

### Key Points

- One of the primary goals in healthcare is to find ways of reducing or eliminating postsurgical infections.
- Many hospitals have adopted prevention techniques that include the reduction of local skin flora through appropriate use of preoperative topical antiseptic applications.
- Patients need to be educated regarding the many forms of preoperative topical antiseptic applications.
- Educating patients on the wide array of products and techniques is likely to empower them and increase their acceptance.
- When choosing a method of preoperative topical antiseptic, the physical limitations and home environment of the patient must be taken into consideration.
- The patient is given chlorhexidine gluconate with instructions to use at least 3 days prior to surgery.
- In addition to patient education, compliance with recommendations may be enhanced by communication kits, including reminders via text messages, voicemail, or email.
- Healthcare systems that intend to adopt this important component of surgical site infection reduction will be well-advised to focus on how to best integrate it into their practices and systems.

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products.<sup>4</sup> Although iodine can be very effective in reducing bacterial concentration on the skin, it can be somewhat irritating and is not widely used. Side effects, including drying and burning of the skin, have been reported, and most practices recognize that the potential for misuse or deleterious effects outweighs the benefit of this substance, given the existence of alternatives. Similarly, topical alcohol—though an effective antiseptic—is impractical and challenging to apply across large surfaces.

### Billing Codes

A4244: Alcohol or Peroxide, per pint

A4245: Alcohol Wipes, per box

A4248: Chlorhexidine Containing Antiseptic, 1 mL

The most common products currently in use to provide skin decontamination and decolonization include over-the-counter soaps and products that contain chlorhexidine. Studies that have compared CHG with over-the-counter antimicrobial soap suggest that the CHG products were more effective in reducing skin bacteria and yeast than simple soap and water.<sup>5</sup> Based on available evidence, the most commonly used substance has become CHG, in one form or another, and the real emphasis now is on ensuring and maintaining compliance with suggested regimens.

### Chlorhexidine Gluconate-Based Products

CHG has been around for over 50 years and belongs to the chemical group known as biguanides, which is a biocide that targets the bacterial cell wall.<sup>6</sup> CHG is bactericidal, veridical, and fungicidal; however, it is not effective against *Clostridium difficile* or mycobacteria because of its lack of sporicidal activity.<sup>7</sup> It comes in various forms, such as liquid soap, solution, and impregnated single-use towelettes or cloth wipes.

There is little current data available comparing CHG-based products, such as soaps and solutions, to the impregnated wipes; however, there is a theoretical advantage to using the wipes, since the CHG is not rinsed from the skin, thereby extending the potential for germicidal activity.<sup>8</sup> Additional studies have demonstrated increased effectiveness of repeated CHG-bathing and that showering 3 to 5 days prior to surgery enhances the antimicrobial effects of CHG.<sup>9,10</sup> Regardless of whether a patient uses sequential daily applications or a 1-time use application, the studies indicate that there is a reduction in bacterial load.<sup>11</sup> Perhaps the most important factor in choosing one product over another is in ensuring that the patient

understands the way in which that product is to be used and the importance of its use. In our experience, clearly describing to patients that there are several options and providing to them the literature and description on the differences in application allows them to choose the type of product that is most applicable to their situation.

The CHG liquid soap is applied while the patient showers, so its use is only applicable if the patient can effectively use a shower and can follow the instructions for use. The evening before the surgery, the patient applies the CHG liquid soap to a wet washcloth to the surgical site while in the shower; the hair should be washed with a regular shampoo and the face with a normal cleanser. The patient proceeds to wash the rest of the body from the neck down and thoroughly rinse it off with water. He or she should then take a second washcloth, rewash the surgical site only, and rinse off with water. The patient then dries the surgical site first, followed by the rest of the body without re-drying the surgical area with the same towel. The patient repeats the same process the morning of his or her surgery. The patient should also dress in clean clothes, not use any lotions, powders, or creams after each shower, or hair products or deodorant for the final shower preoperatively.

Although these instructions seem intuitive to the care providers, for the patient whose mind is on many

### Patient Instructions for Preoperative Bathing

1. Thoroughly rinse the area to be cleansed
2. Apply the minimum amount of product necessary to cover the area, and wash it gently
3. Rinse the area again thoroughly
4. Repeat this process as directed by your provider

other issues, it is not uncommon for them to forget their instructions or to not use the product appropriately. Providing them with materials that show the use clearly through images can be helpful.

The CHG solution is also applied while the patient showers, similar to the CHG liquid soap. The patient applies the CHG solution with 3 disposable sponges while showering, with each sponge to be used during a specific time (ie, 48-hours prior to surgery, the night prior to surgery, and the morning of); a new sponge with one-third solution should be used with each shower. The exact directions regarding the use can be modified to be surgeon-specific. One of the favorable features of this product is the availability of material

online to help the patient in both remembering to use the product as well as providing clear instructions on its use. These education template kits are available in several languages, both in print and online. One unique aspect of this kit is communication: the patient receives a reminder via text, voicemail, or email to use the product before the surgery.<sup>12</sup> Although further research is needed on the efficacy of such a compliance program, early anecdotal experience suggests that for a subset of patients, these vehicles for enhancing use can enhance patient engagement.

Another form of CHG is impregnated skin towelettes or cloth wipes. One example includes pre-moistened wipes that the patient applies directly to his or her body. The patient showers the evening before surgery and applies the first set of wipes to his or her entire body, not just the surgical area. Then the following morning, without showering, the patient repeats this process. These can be applied while the patient is sitting in a chair.<sup>13</sup> Some hospitals will have the patient apply the second treatment in the hospital in the preoperative holding area, under supervision of the nurse, to verify proper use, instead of at home.

### How to Choose the Right Method for Your Patient

When choosing a method of preoperative topical antiseptic, the physical limitations and home environment of the patient must be taken into consideration. Some of the physical limitations to consider when choosing a method are the patient's fall risk, body habitus, skin sensitivity, and mobility. The patient's home environment also needs to be considered, such as the type of bathing/shower design layout and if the patient has a caregiver at home to assist him or her if needed.

Elderly, arthritic patients, who are at risk for falls and have decreased mobility, may have difficulty maneuvering in a shower. Therefore, the disposable wipes that can be applied while sitting, are preferable for that population, compared with the liquid forms, that must be applied while standing in a shower.<sup>7</sup> One disadvantage of the wipe application is that elderly arthritic patients who do not have a caregiver at home will have difficulty applying the product to his or her back and extremities. For a number of elderly, there may be more acceptance of a family member or caregiver to apply wipes to the difficult-to-reach places as opposed to helping that individual with showering.

Understanding who is available to help and the nature of the relationship is paramount for the care team to provide guidance as to the method most likely to result in compliance.

The patient's body habitus is another issue to take into consideration. Those patients with obese body habitus will have increased body surface area to cover and may need more product to effectively apply the

antiseptic. In addition, they may need assistance if they cannot reach their extremity because of adipose folds.

Patients with skin sensitivities should probably avoid CHG products and may be better suited to use the over-the-counter antimicrobial soaps to prevent skin irritation. Alternatively, when skin sensitivity is a potential concern, we may ask patients to apply the CHG to an area remote from the surgical site to assess the level of sensitivity. If that concern remains, the merit of decolonization is likely to be outweighed by the risk of skin reaction, actually resulting in a less optimal skin environment. When this is the case,

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“One unique aspect of the CHG solution is communication: the patient receives a reminder via text, voicemail, or email to use the product before the surgery.”

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simple soap should be recommended.

Patient compliance of using the topical antiseptics is an issue directly related to the type of method chosen. Patients are less likely to use the antiseptic if it is tedious, time-consuming, expensive, or burdensome.

Educating patients about the importance of preparing their skin before surgery is an important step in increasing the compliance of use. The timing of the patient's education is crucial as well. If the patient is given the education material and CHG too far in advance of their day of surgery, these items are often misplaced or the patient does not remember to use them as part of their preoperative planning. Given the wide array of patient needs and ability to comprehend the importance of complying with a cleaning regimen, our approach has been to emphasize patient and family engagement during the entire process.

Patients must be made aware of the seriousness of the potential complication of SSI and of their role in reducing it. Because the data are compelling, patients can gain a sense of empowerment when given a task that can clearly result in a reduction in their personal risk of adverse outcomes. Reinforcing and reiterating the importance of such compliance throughout the presurgical phase is key to success.

In our program, the patient is educated about preoperative bathing at several different times throughout the preoperative admission process. Not only is the patient instructed using these methods during his or her education class and/or preoperative teaching visit with the surgeon's office, but it is reviewed again during the preoperative clearance appoint-

ment. At that time, the patient is given a set of CHG product, with written instructions, to use at least 3 days prior to surgery as recommended by Project JOINTS. If necessary, a second application can be completed when the patient arrives the morning of surgery in the preoperative area and witnessed by a nurse. This ensures the use of at least 1 application. Also in the preoperative area, documentation of patient compliance is recorded in the patient's chart. An audit of patient compliance allows targeting of patient populations or surgical practices that may have a rate below our goal.

Although results are inconclusive as to which method/antiseptic agent is the most effective at reducing SSIs, data have shown that having the patient use some form of preoperative antiseptic agent is effective at reducing bacterial colonization of the skin and may reduce SSIs.<sup>7</sup> Certain variables need to be considered

“Patients must be made aware of the seriousness of SSI and their role in reducing it. Reinforcing and reiterating the importance of compliance throughout the presurgical phase is key to success.”

when choosing the method/antiseptic agent, including the patient's physical and environmental limitations, compliance, and educational resources available to educate the patient about the method he or she will be using. By optimizing the rate of compliance and resources for education, patients will ultimately achieve the best outcomes.

### Conclusion

Healthcare systems that intend to adopt this important component of SSI reduction will be well advised to focus on how best to integrate it into their practices and systems. Although all will agree on the merits, it will only be an effective strategy if compliance is high and patients are engaged. As there are many components to the preoperative preparation of patients for surgery, something like skin cleaning, which can appear mundane, may not get high priority among those focused on areas of greater concern. Incorporating this discussion into multiple encounters ensures that it will occur. Further, taking this out of the hands of the surgeon and making it an important part of the system by assigning it to those charged with educating

the patient preoperatively ensures that the importance is communicated multiple times. A well-thought-out approach to this part of patient preparation will result in better outcomes, lower cost and better overall care. Engaged and educated patients will be our best tool for improving outcomes.

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### References

1. Froimson MI. Orthopedic surgical infection prevention: host and environmental factors. *Am J Orthop (Belle Mead NJ)*. 2011;40(12 suppl):6-9.
2. Kirkland KB, Briggs JP, Trivette SL, Wilkinson WE, Sexton DJ. The impact of surgical-site infections in the 1990s: attributable mortality, excess length of hospitalization, and extra costs. *Infect Control Hosp Epidemiol.* 1999;20(11):725-730.
3. Surgical site infections. Institute for Healthcare Improvement Web site. <http://www.ihl.org/IHI/Topics/PatientSafety/SurgicalSiteInfections/>. Accessed June 10, 2010.
4. Edwards P, Lipp A, Holmes A. Preoperative skin antiseptics for preventing surgical wound infections after clean surgery. *Cochrane Database Syst Rev.* 2004;(3):CD003949.
5. Vernon MO, Hayden MK, Trick WE, et al; Chicago Antimicrobial Resistance Project (CARP). Chlorhexidine gluconate to cleanse patients in a medical intensive care unit: the effectiveness of source control to reduce the bioburden of vancomycin-resistant enterococci. *Arch Intern Med.* 2000;166(3):306-312.
6. Denton GW. Chlorhexidine. In: Block SS, ed. *Disinfection, Sterilization, and Preservation*. 5th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2001:321-336.
7. Stokowski LA. Chlorhexidine in Healthcare: Your Questions Answered. Medscape Web site. <http://www.medscape.com/viewarticle/726075>. Published August 4, 2010. Accessed February 26, 2013.
8. Kamel C, McGahan L, Polisen J, Mierzwinski-Urban M, Embil JM. Preoperative skin antiseptic preparations for preventing surgical site infections, a systematic review. *Infect Control Hosp Epidemiol.* 2012;33(6):608-617.
9. Kaiser AB, Kernodle DS, Barg NL, Petracek MR. Influence of preoperative showers on staphylococcal skin colonization: a comparative trial of antiseptic skin cleansers. *Ann Thorac Surg.* 1998;45(1):35-38.
10. Adams D, Quayum M, Worthington T, Lambert P, Elliott T. Evaluation of a 2% Chlorhexidine gluconate in 70% isopropyl alcohol skin disinfectant. *J Hosp Infect.* 2005;61(4):287-290.
11. Webster J, Osborne S. Preoperative bathing or showering with skin antiseptics to prevent surgical site infection. *Cochrane Database Syst Rev.* 2007;(2):CD004985.
12. General skin cleanser. CareFusion Web site. <http://www.carefusion.com/medical-products/infection-prevention/general-skin-cleanser/> Accessed February 26, 2013.
13. Landro L. Steps for surgical patients to fight infection. Sage Products Web site. <http://www.sageproducts.com/products/preoperative-care/>. Updated March 11, 2013. Accessed February 28, 2013.