Presurgical Skin Preparation with a Novel 2% Chlorhexidine Gluconate (CHG) Cloth Leads to Decrease in Surgical Site Infection Rates in Orthopedic Surgical Patients

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INTRODUCTION

Of the possible surgical complications, postoperative surgical site infection (SSI) is the main contributor to patient injury, mortality, and healthcare costs.[1,2] SSIs are the third most common hospital-acquired infection[3] and patients who develop SSIs are more likely to spend time in an ICU, have 5 times the readmission rate, and have twice the mortality.[4] Approximately 500,000 SSIs occur annually in the US.[2]

Rates of SSIs following orthopedic surgery can be as high as 7.9% for high-risk patients undergoing spinal fusion.[5] It is estimated that up to 356,000 patients each year have SSIs following orthopedic surgery and orthopedic SSIs increase healthcare costs by more than 300%.[6] For instance, the cost of a single SSI for prosthesis removal, antibiotics, and reimplementation of prosthesis can approach $84K; a lower back fusion with infection, $100,666.[6]

SSI following hip replacement surgery

SSIs are largely preventable and are the result of damage to host barrier mechanisms induced by the trauma of a surgical incision.[7] Endogenous microorganisms implicated in SSIs come chiefly from patients' skin – *Staphylococcus aureus*, coagulase-negative staphylococci, *Enterococcus* spp., and *Escherichia coli* are the most frequently isolated pathogens.[3,8] Yet, despite advances in infection control practices, SSIs remain a substantial cause of morbidity and mortality among hospitalized patients. This may be partially due to the emergence of antimicrobial-resistant pathogens, increased numbers of surgical patients who are elderly and/or have comorbidities, and increased numbers of prosthetic implant and organ transplant surgeries.[3]

OVERVIEW

Systemic and process changes that promote compliance with established guidelines and standards can decrease infectious morbidity.[9] One of the goals of the Surgical Care Improvement Project (SCIP) partnership, led by the Institute for Healthcare Improvement, is to prevent SSIs.[10] The Centers for Disease Control (CDC) guidelines for prevention of SSIs recommend: "Require patients to shower or bathe with an antiseptic agent on at least the night before the operative day", and note that chlorhexidine gluconate (CHG) is among the most commonly used agents.[3,11,12]

Choosing an effective skin preparation product can mean the difference between an uneventful surgical recovery and a multi-drug resistant SSI for your patient.[13]

CHG is effective against gram-positive and -negative bacteria, fungi, as well as encapsulated viruses. CHG's action includes its ability to bind to the skin, a high level of antibacterial activity, and its residual effects.[7] Even in the highly contaminated skin of the feet, when compared to chloroxylenol and iodine during ankle and foot surgery, CHG is proven to be the most effective agent for eliminating bacteria.[14]

Recent studies have shown persistant antimicrobial effects and reduced rates of colonization and SSIs using newly available 2% CHG alcohol-free no-rinse cloths for pre-surgical skin preparation.[13,15,16]

METHODS

In our facility, the existing presurgical skin preparation protocol for total joint surgery patients was a betadine scrub the night before the surgery and a repeat betadine scrub in the holding area just before surgery. After high SSI rates were noted, an internal audit revealed that these preoperative scrubs were not being conducted consistently and an alternative protocol using a 2% CHG-impregnated no-rinse cloth (Sage® 2% CHG Cloth, Sage Products Inc, Cary, IL; equivalent to 500 mg chlorhexidine gluconate per cloth) was implemented.

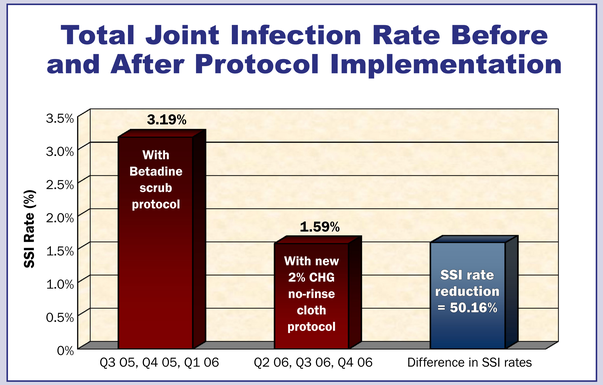
All patients undergoing orthopedic surgery for a joint procedure were included in the new protocol (736 patients). Many of these hospitalized patients were nursing home patients who were admitted to the hospital for treatment of hip fractures and were therefore at high risk for SSI.

Prior to the 2% CHG cloth intervention, patients were provided with betadine solution and a scrub brush and instructed to prepare the surgical area of their skin the night before surgery. A second betadine preparation was performed in the holding area prior to surgery.

Prepping with 2% CHG no-rinse cloth

The existing protocol was revised to use prepackaged 2% CHG no-rinse cloths instead of betadine. Patients were instructed to conduct a site-specific preparation using the 2% CHG cloths the night before the surgery, and a repeat site-specific prep with the cloths was done in the holding area prior to surgery.

SSI rates were measured as a simple percentage and compared to prior (historical) infection rates. Statistical analyses were not done and historical values were used as the control.



RESULTS

➢ 50% reduction in SSI rate

Once the CHG preoperative prepping protocol was implemented (in the 2nd quarter of FY06), there was a reduction in SSI rates.

When compared to an average SSI rate of 3.19% in the 3 quarters prior to instituting the new protocol (Qtr 3 FY05-Qtr 1 FY06), the SSI rate for 3 quarters after implementing the use of 2% CHG cloths (Qtrs 2-4 FY06) was an average of 1.59%. This represents a 50.16% difference in the rate of SSIs.

➢ Improved compliance

Under the old (betadine) protocol, it was found that patients were not prepping themselves the night before surgery and often times, unless there was a physician standing order, the preoperative preparation was not taking place. That lack of compliance could likely explain Lakeview's increasing SSI rates in the period prior to the 2% CHG cloth intervention.

CONCLUSIONS

2% no-rinse CHG cloths more effective for reducing the risk of SSI

These results indicate that the revised preoperative preparation protocol (utilizing the prepackaged 2% no-rinse CHG cloths) is more effective for reducing the risk of SSI in orthopedic surgery patients than the previous protocol (which utilized a betadine scrub).

Improvement in SSI rates after implementation of the new presurgical preparation protocol may be due to several factors including:

- the efficacy of 2% CHG cloths as a preoperative skin antiseptic,
- CHG's residual effects and broad spectrum of bacterial kill,
- exfoliation properties unique to the 2% CHG cloth, and
- improved patient compliance with the revised protocol.

2% CHG no-rinse cloths are a promising tool in the control of SSIs

This intervention project demonstrates that changing the skin antiseptic and preoperative preparation protocol has a beneficial outcome for high-risk orthopedic surgery patients and deserves further study.

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