Reducing Surgical Site Infection

2% CHG Cloth Reduces SSI Rates by >70% Difference Resulting in a $154,869 Cost Avoidance

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BACKGROUND

Postoperative surgical site infection (SSI), considered the most common healthcare-associated infection in surgical patients,[1] is a significant contributor to patient injury, mortality and healthcare costs.[2-5] It is estimated that between 500,000 and 750,000 SSIs occur annually in the United States and cost from $1.6 to $3.3 billion in excess hospital charges.[3,6,7] Patients who develop SSIs are: 60% more likely to spend time in an ICU, five times more likely to be readmitted to the hospital, and have twice the mortality.[8]

Overall, up to 5% of patients undergoing surgery develop SSIs,[9] which increase the length of hospital stay an average of 7-10 days.[4] Rates of SSIs following orthopedic surgery can be even higher.[10] Whitehouse et al estimate that up to 356,000 patients each year have SSIs following orthopedic surgery.[11] Orthopedic SSI's prolong total hospital stays by a median of 2 weeks per patient, approximately double rehospitalization rates, and increase healthcare costs by more than 300%.[11]

One of the primary goals of the Surgical Care Improvement Project (SCIP) partnership, part of the national '5 Million Lives Campaign' initiative led by the Institute for Healthcare Improvement (IHI), is to reduce the incidence of postoperative complications by preventing SSIs and thereby reduce patient morbidity, cost and length of stay.[12] Since SSIs following 'clean surgery' are nearly always caused by endogenous skin organisms introduced into the surgical wound during operation,[13,14] effective and persistent skin antisepsis is crucial in reducing the risk of SSI.

The FDA requires antiseptic skin products to demonstrate rapid reduction in transient and resident microbes. The antiseptic must also maintain its effectiveness for at least 6 hours post-application.[15] The Centers for Disease Control guidelines for prevention of SSIs note that chlorhexidine gluconate (CHG) is among the most commonly used agents.[4,16,17] CHG persists on the skin to provide prolonged antisepsis.[18] Studies have shown that its antibacterial effect is cumulative[19,20] and lasts longer than that produced by other antiseptic agents.[21-22] CHG targets the cytoplasmic membrane of Gram positive and negative bacteria and fungi. It is also effective against encapsulated viruses such as HIV, cytomegalovirus, influenza virus, and herpes simplex virus.

CHG's action includes its ability to bind to the skin, its high level of antibacterial activity, and its residual effects.[1] 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.[23-25]

Prince William Hospital (PWH) participates in the Surgical Care Improvement Project (SCIP). Although our SSI rate was below National Nosocomial Infections Surveillance System goals, we wanted to strive for the IHI goal of zero incidents of SSI. The orthopedic surgeons at PWH requested this pilot project to evaluate the effectiveness of pre-operative CHG preps in reducing the rate of SSIs.

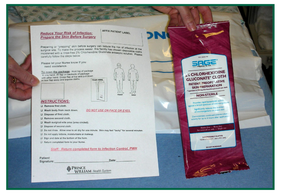
METHODS

PWH is an 170-bed acute-care facility located in Manassas, Virginia. The patient population for this study was all patients having outpatient or same day surgery.

Prior to the CHG intervention, PWH did not have a standardized pre-op body cleansing protocol.

A standardized protocol was instituted, using prepackaged 2% CHG-impregnated no-rinse cloths (Sage® 2% CHG Cloth, Sage Products Inc, Cary, IL; equivalent to 500 mg chlorhexidine gluconate per cloth) for skin antisepsis in pre-op. To maintain normothermia, the 2% CHG cloths were pre-heated in warmers. In the holding area prior to surgery, patients were instructed to perform a body cleansing/prepping from the neck down.

After applying the 2% CHG cloths, the patient signed his/her instruction sheet indicating that he/she understood and complied with the information provided and the correct use of the product. This form then validated the number of cases with the CHG cloths.



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.

This project was implemented in mid-August 2006 with concurrent monitoring.

PRINCE WILLIAM HOSPITAL

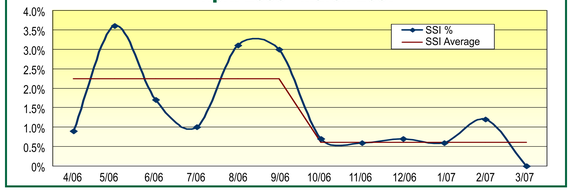
RESULTS

	Pre-Intervention	Post-Intervention	Intervention Impact	Percent Difference	
HAI-SSI Avg Cost ($15,646)[26]	$254,411	$93,876	-$160,535	-63%	$160,535
HAI SSIs	15	6	-9	-60%	
% HAI SSI/Procedures	2.2%	0.6%	-1.6%	-73%	
Readmits-HAI-SSI	12	3	-9	-75%	
Cost-Readmit Charges	$120,000	$23,125	-$96,875	-81%	
Investment-Product Cost	$0	$5,666			-$5,666
Total ROI Savings					**$154,869**

PWH realized a >70% "percent difference" in the SSI rate after one month following implementation of the new 2% CHG no-rinse cloths, which remained sustainable.

- **SSI mean rate went from 2.2% prior to use of CHG to 0.6% after CHG implementation.**
- **Return-on-Investment cost realized was $154,869 in a six-month period.**
  - o Despite higher skin antisepsis product cost, the decreased number of SSIs resulted in significant cost savings.
- **Number of patients readmitted for SSI decreased by 75%**
- **Compliance in pre-op skin antisepsis remains good.**
  - o Preparation time for nurses was not significantly increased
  - o Clear instructions, prewarming, and involvement of the patient contributed to ease of use and satisfaction of the 2% CHG cloths.

Prince William Hospital SSIs (%) per Total Procedures
April 2006 - March 2007



LESSONS LEARNED

- **SSIs are preventable and negatively impact the patient in terms of health and well-being.**
  - o The SCIP program offers evidence-based criteria to eliminate infection. The favorable literature on the 2% CHG cloth product offered an additional component to this safety issue.
- **The impact for the patient is a more clinically efficient and cost-effective recovery with lower risk of post-operative infection.**
- **The impact for the facility is the cost savings in treating an infection, decreased re-admission rate, improved postoperative outcomes and stakeholder satisfaction.**
  - o The cost of the 2% CHG product may be considered a limitation but is offset by significant potential cost savings.
- **This project is applicable across most surgery and invasive procedure settings.**
  - o Since January 2007, PWH has been using the 2% CHG cloths for pre-operative skin antisepsis hospital wide.
- **Normothermia was easily maintained and most likely contributed to the effectiveness of our new protocol.**
  - o Because surgical wound infection may be promoted by mild perioperative hypothermia due to decreased subcutaneous oxygen tension[27], maintaining pre-operative normothermia can help reduce the chance of SSIs.
  - o The ability to easily pre-warm the 2% CHG cloths contributed to patient comfort and satisfaction, increasing the likelihood of compliance.

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