Chlorhexidine gluconate preoperative skin preparation initiated a 100% reduction of incisional Cesarean section infections while other risk factors were evaluated and corrected

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Abstract

Chlorhexidine gluconate preoperative skin preparation in obstetrical cesarean section patients results in 100% prevention of surgical site infections

Objectives

To identify and implement organizational, collaborative, and process strategies to reduce surgical site infections (SSIs) after cesarean delivery.

Methods

A multidisciplinary process improvement team was implemented in the University of Minnesota Medical Center, Fairview, Minneapolis, MN to compare the preoperative skin preparation for cesarean deliveries with the use of 2% chlorhexidine gluconate (CHG) versus the current standard of 70% isopropyl alcohol (IPA) preoperative skin preparation.

Results

Between January of 2006 and August 2006, UMMC noted that our SSI rates after C-section were greater than the benchmarks set by the National Nosocomial Infections Surveillance System Index ... skin preparations, UMMC explored the use of such products as part of the initiative to reduce SSIs in C-section

Significant economic savings were realized as a result of the successful prevention of C-section-related SSIs.

Lessons Learned

Appropriate skin antisepsis is one of the care initiatives designed to reduce SSI.

The Centers for Disease Control and Prevention (CDC) recommends that patients shower or bathe with an antiseptic on the night before surgery and that an antiseptic be applied to the skin at the incision site.

Conclusions

A multidisciplinary approach to process improvement resulted in zero incisional SSIs associated with cesarean births that were present on or after the first postoperative day. A reduction in SSI rates to zero in December.

Background

The first action and the action plan included some of the following:

- Engagement and communication with physicians and nurses to identify all potential causal elements, including ongoing feedback.
- Evaluation of practice competency for surgical, circulating and anesthesia staff.
- Utilization of an antiseptic that is effective against both Gram-positive and Gram-negative bacteria, is able to bind the skin and remain active for up to 6 hours, and is not inactivated in the presence of blood and other organic material.
- The CDC notes that chlorhexidine gluconate (CHG) is a commonly used skin antiseptic with a broad-spectrum activity against both Gram-positive and Gram-negative bacteria, is able to bind the skin and remain active for up to 6 hours, and is not inactivated in the presence of blood and other organic material.

Of the estimated 4,140,419 births in the United States in 2005, 30.2% (approximately 1,250,400) were by cesarean delivery (C-section).1

C-sections are associated with a higher morbidity than are vaginal deliveries.

- Women are 5 times as likely to develop a prepartum infection after undergoing a C-section than they are after undergoing a vaginal delivery.
- These infections include surgical site infections (SSIs) and endometritis; the rate of SSIs after C-section is estimated to range from 8.2% to 11.2%.2

Although we were unable to identify formal cost studies specifically for SSIs after C-section, studies of the costs associated with SSIs after other surgical procedures suggest that the attributable cost of these infections is high.

In a review of the literature on SSIs, Stone et al5 determined a mean attributable total cost of $25,546 per SSI, which may include readmission and outpatient costs along with the inpatient stay associated with the C-section.

The University of Minnesota Medical Center, Fairview (UMMC) reported a median direct cost of $6,050 per SSI with a $125,000 increase during the last 6 months of 2005 to 36,000 incremental costs per the patient stay associated with birth – not including any readmissions or other outpatient costs. A savings of $124,000 in incremental costs for hospital stays associated with the birth was projected for 2007, following a return to infection rates that were below prior national benchmarks. Realization of such savings would increase the projected savings.

A reduction in SSIs is one of the goals of the S-Million Lives campaign of the institute for Healthcare Improvement (IHI). The S-Million Lives Campaign seeks to improve the quality of health care by protecting patients from harm, and one of the ways identified to reach this goal is to reduce the rate of SSIs.

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The use of CHG in the form of a pre-surgical scrub has been shown to reduce microbial counts on the skin,3 and the tourniquet cloth appears to be no more effective than a saline moistened preparation containing 4% CHG at reducing skin bacterial counts.4

UMMC found that assessing compliance with pre-C-section shaving and bathing with an effective antiseptic is not always feasible given the frequency of home bedrest and unscheduled/unanticipated Cesarean section cases.

Between January of 2006 and August 2006, UMMC noted that our SSI rates after C-section were greater than the benchmarks set by the National Nosocomial Infections Surveillance System Index (NNIS). Therefore, UMMC initiated a team approach to identify and address the problems that might contribute to the high rate of SSIs. Due to the benefits associated with the use of CHG-containing skin preparations, UMMC explored the use of such products as part of the initiative to reduce SSIs in C-section patients.
Objective
UMMC had a pre-intervention rate of SSIs after C-sections of between 1-2% and 8%. Between January of 2006 and August 2006, the SSI rates were greater than the NNIS benchmarks. UMMC used a team approach to develop interventions to reduce the SSI rates in C-section patients.

Methods
The UMMC infection control team first identified problems that might contribute to SSIs and then developed a core team of administrators, staff, physicians, and infection control personnel to address these problems. The team collaborated periodically to discuss methodology and outcomes. The first action and the action with the greatest positive impact was the development of a preoperative skin preparation protocol that involved the use of CHG-containing no-rinse cloths. We instituted the following interventions:

- Introduced (in August 2006) a new product - 2% CHG-containing cloths - required for use on the skin of all C-section patients before entering the operating room (scheduled cases) and on the skin of all patients at risk of having a C-section (e.g., those with prolonged labor and premature rupture of the membranes - unscheduled cases).
- Developed a quick reference sheet to educate staff on the use of the CHG-containing cloths.
- Implemented ongoing communication with direct-care staff in the form of meetings, posters/fliers including monthly graphs, and updates to the action plan.
- Educated obstetrical scrub technicians and nurse assistants on the principles of sterilization, processes, and documentation requirements; increased the availability of surgical instruments; and shifted the responsibility for sterilization of surgical instruments back to central processing.
- Developed a knowledge base assessment tool and an educational video to train staff about appropriate antiseptic practices in the operating room; topics included hand scrubbing techniques, room set up, proper attire, and surgical preparation techniques.
- Appointed a light duty nurse from the Post-Anesthesia Care Unit to assist in review of the 31 charts to help identify common risk factors for SSIs after C-section. A case-control of 144 non-infected C-section infections was also conducted.

Results
These interventions led to a reduction in the rate of SSIs after August 2006, when the use of the 2% CHG-containing no-rinse cloth was initiated. The incisional SSI rate decreased to 0% for a full year (September 2006 to September 2007). The rates dropped to zero immediately in response to initiation of the CHG-containing no-rinse cloth; allowing the team the additional time necessary to complete the action plan while continuing to deliver safe and effective care. For the remainder of 2007, there was 1 incisional SSI in October, 1 in November, and none in December.

Conclusions
Implementation of interventions led to a reduction in SSI rates in patients undergoing C-section. Of note, the incisional SSI rate decreased to 0% soon after the 2% CHG-containing no-rinse cloth for skin preparation was initiated in August 2006. UMMC also experienced a rapid reduction in rates of endometritis after August 2006. On the basis of the 36 SSIs that occurred at our institution from January to August 2006, the interventions may have prevented an estimated average of 4.5 infections per month. An additional savings of $54,000 in case-related incremental costs was projected for 2007 following the return to infection levels below historical and NNIS rates.

Lessons Learned

- Reduction of SSI rates was accomplished through the collaboration of staff and physicians and the implementation of procedural changes.
- Standardization of preoperative skin preparation techniques to include the use of CHG-containing products contributed to a reduction in SSIs.
- Education of the surgical scrub technicians and scrub nurses about operating room antisepsis, accomplished through the use of videos and hands-on training, contributed to a reduction in SSIs.
- Confirmation of an action plan to maintain the reduction in SSI rates was a necessary part of the process.

References