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Major Article

Reduction and sustainability of cesarean section surgical site infection: An evidence-based, innovative, and multidisciplinary quality improvement intervention bundle program

Chaur-Dong Hsu MD, MPH [a,b,*], Inna Cohn MD [a], Rebeca Caban MD [a]

[a] Department of Obstetrics and Gynecology, Nassau University Medical Center, East Meadow, NY
[b] Department of Obstetrics and Gynecology, Wayne State University School of Medicine, Detroit, MI

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Background: We found cesarean section (C-section) surgical site infection (SSI) at our institution was significantly higher than the national benchmark.
Methods: A retrospective cohort study was conducted under 4 phases from January 2008-December 2014. The hospital infection control (IC) policies and a presurgical checklist were bundled and implemented. The study was conducted with 3,334 cesarean deliveries: phase A (January 1, 2008-January 31,2010): 1,250 patients without intervention (baseline SSI rate), phase B (February 1, 2010-July 31, 2011): 682 patients were intervened with IC policies, phase C (August 1, 2011-December 31, 2012): 591 patients with an SSI reduction bundle, and phase D (January 1, 2013-December 31, 2014): 811 patients were monitored for C-section SSI sustainability. Patients not following strict protocols because of emergency C-section deliveries were excluded. The χ^2 test, Fisher exact test, and standard Z test were used for statistical analyses.
Results: C-section SSI rates were 6.2% (77/1,250) in phase A, 3.7% (25/682) in phase B, 1.7% (10/591) in phase C, and 0.1% (1/811) in phase D, respectively. By implementing the IC policies and bundle, the C-section SSI rate was reduced 40.3% (phase B vs phase A), 72.6% (phase C vs phase A), and 98.4% (phase D vs phase A). All statistics were significantly different.
Conclusions: We conclude that implementing a C-section SSI reduction bundle was associated with reduced C-section SSI rate down toward zero. A future prospectively randomized controlled trial is warranted.

Cesarean section (C-section) surgical site infection (SSI) is a major cause of morbidity and mortality and cause for an increase of duration in patient hospitalization and hospital costs.[1] The C-section SSI rate ranges from 3%-15%.[2] According to the Centers for Disease Control and Prevention's (CDC's) National Healthcare Safety Network (NHSN) classification, there are 3 distinct types of SSI—superficial incisional (SSI-1), deep incisional (SSI-2), and organ-space SSI (SSI-3)—occurring within 30 days after the surgical procedure.[3-5] Although a 2010 organizational and strategic performance improvement priority at our institution called for a reduction in house-wide SSIs, analysis of the baseline NHSN SSI criteria and benchmark rate (1.84%) showed a large percentage of SSIs were attributable to C-section deliveries, with a C-section SSI rate of 6.2% at our institution. We then determined to aggressively reduce C-section SSI rates and sought to use a Find, Organize, Clarify, Understand, Select–Plan, Do, Check, Act (FOCUS-PDCA)[6,7] cycle to assess current practices and to identify opportunities for improvement, conducting an innovative and evidence-based C-section SSI reduction bundle, including infection control (IC) policies and a presurgical checklist.

METHODS

This was a retrospective cohort study of 3,334 patients who had C-section deliveries between January 2008 and December 2014. The study was approved by the institutional review board. To reduce the higher C-section SSI rate, we first implemented strict IC policies and then developed a presurgical C-section reduction checklist to further reduce the C-section SSI rate. Therefore, the study was conducted through 4 phases (phases A, B, C, and D). C-section SSI was defined as any postoperative infection occurring within 30 days

* Address correspondence to Chaur-Dong Hsu, MD, MPH, Department of OB/GYN, Wayne State University School of Medicine, 3990 John R St, Box 158, Detroit, MI 48201.
E-mail address: chsu@med.wayne.edu (C.-D. Hsu).
Conflicts of Interest: None to report.
Additional Information: Publication of this quality improvement project was approved by Nassau University Medical Center Institutional Review Board.

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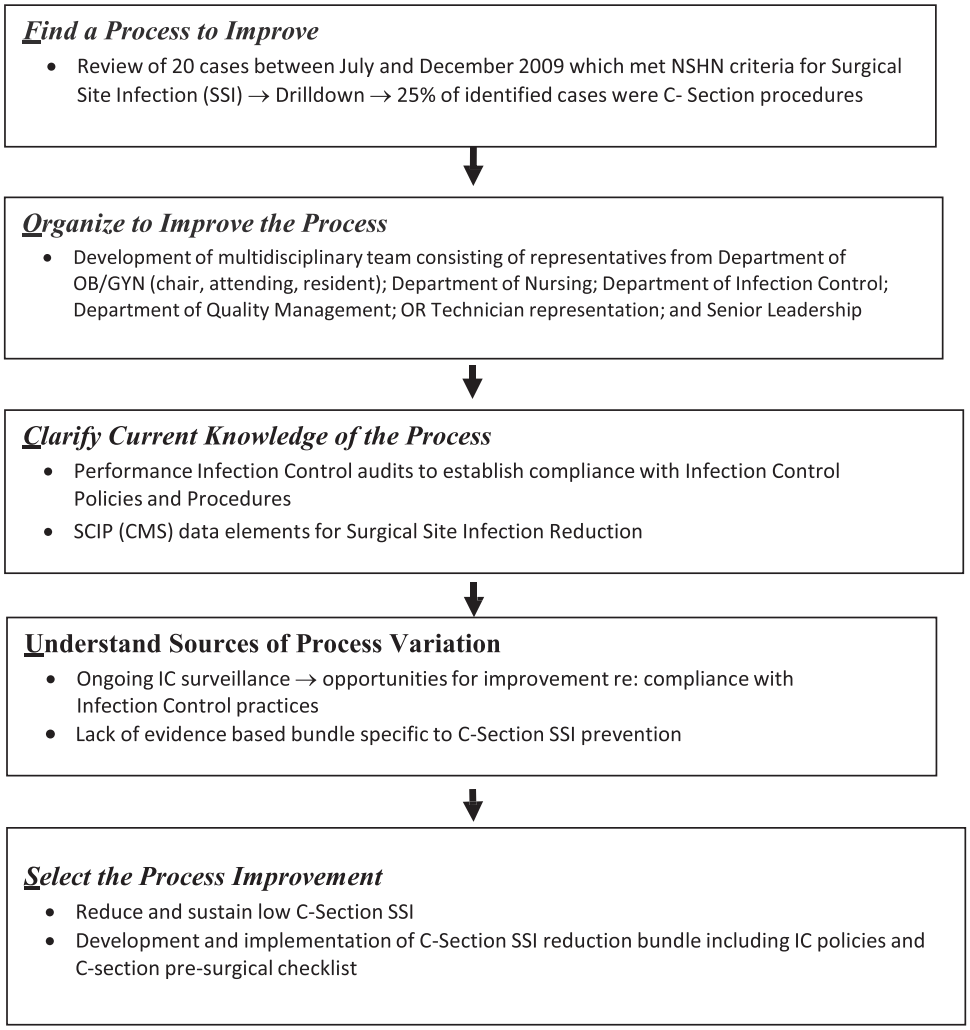

Fig 1. Find, Organize, Clarify, Understand, Select cycle used to access current practice and to identify the opportunities for improving the C-section SSI rate. *CMS*, Centers for Medicare and Medicaid Services; *C-section*, cesarean section; *IC*, infection control; *NHSN*, National Healthcare Safety Network; *OB/GYN*, obstetrics and gynecology; *SCIP*, Surgical Care Improvement Project; *SSI*, surgical site infection.

after cesarean delivery.[3-5] Driven to reduce C-section SSI, the FOCUS-PDCA[6,7] methodology (Figs 1 and 2) was used by our institution for quality performance improvement.

Phase A was to assess and determine a baseline C-section SSI rate from January 1, 2008-January 31, 2010, including 1,250 patients who underwent cesarean deliveries before strict implementation of hospital IC policies or any presurgical checklist bundle interventions. Phase B included 682 cesarean deliveries and was conducted between February 1, 2010, and July 31, 2011. Phase B focused on implementation of and compliance with hospital IC preventions and strategies. The hospital IC policies included jewelry restriction amongthe labor and delivery staff, appropriate closure of the operation room door, prohibition of long sleeves in pediatrician attire at the operation room, hand hygiene compliance, placement of alcohol dispensers in patient bathrooms, administration of antibiotics within 1 hour of surgery, use of chlorhexidine for skin preparation, and multidisciplinary team education (Table 1). The interventions were based on the following organizations and guidelines. The first was the *Perioperative Standards and Recommended Practices* of the Association of periOperative Registered Nurses,[8] which states that strict adherence to restrictions relating to surgical attire reduces the occurrence of infection. Jewelry (earrings, necklaces, etc) that could not be completely covered by surgical attire should not be worn. All personal clothing should also be completely covered, and operating-procedural room doors should be closed except during the movement of patients, personnel, and supplies. The second was The Joint Commission's *Comprehensive Accreditation Manual for Hospitals (CAMH)—National Patient Safety Goal 7 (NPSG 7): Reduce the Risk of Health Care-Associated Infections*

Table 1
Hospital infection control policies for prevention of caesarean section surgical site infection

Hospital infection control policies
1. Jewelry restriction among labor and delivery suite staff.
2. Pediatrician attire was monitored (prohibition of long sleeves).
3. Alcohol dispensers on postpartum unit bathrooms for postpartum women.
4. Surgical Care Improvement Project protocol instituted antibiotics within 1 h of surgery.
5. Operation room doors were not closed appropriately during procedures—fixed, and monitoring continued.
6. Education of team for appropriate SSI documentation and audited.
7. Chlorhexidine preparation for surgeries.
8. Hand hygiene monitoring.
9. Alcohol dispensers installed in labor and delivery patient bathroom.
10. Education and communication between patients, families, and staff.

SSI, surgical site infection.