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Brief report

Decreasing cesarean section surgical site infection: An ongoing comprehensive quality improvement program

Frank R. Witter MD^{a,*}, Patricia Lawson RN, MS, MPH, CIC^b, Janis Ferrell CT^a^a Department of Gynecology and Obstetrics, The Johns Hopkins Hospital, Baltimore, MD^b Department of Hospital Epidemiology and Infection Control, The Johns Hopkins Hospital, Baltimore, MD

Key Word:
PDSA method

This report illustrates how the “plan-do-study-act” method of continuous quality improvement can be effective in reducing surgical site infection after cesarean delivery.

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Obstetrical infections have been reported to account for more than 12% of maternal deaths.¹ The reported rate of surgical site infection after cesarean section (C/S SSI) ranges from 3% to 15%²; however, the reported rate is 30% in patients with a body mass index ≥ 50 kg/m².³

In 2004, our C/S SSI rate was 14.9%, far exceeding the National Healthcare Safety Network (NHSN) benchmark of 2.99%. We sought to improve this rate through a multidisciplinary intervention using the “plan-do-study-act” (PDSA) method⁴ beginning in 2005.

METHODS

The PDSA method is an ongoing cycle of small changes that begin with “plan,” in which an objective question is identified. The next step is “do”—collecting data concerning the question identified. Then comes “study,” in which the data are analyzed and compared with benchmarks. In the final step, “act,” the answer established for the question is incorporated into clinical practice. Through continual reassessment, repeated cycles bring additional changes.

Our “plan” has always been to improve our C/S SSI rate. An analysis of our practice revealed that we had no standardized best practices for SSI prevention, and that our rate was much higher than the NHSN benchmark. We acted by adopting the then-current Centers for Disease Control and Prevention (CDC) recommendations for SSI reduction.⁵ We chose to switch to chlorhexidine for skin preparation because it was identified as the most effective

method⁶ and otherwise modified the CDC recommendations based on the current surgical and obstetrical literature. The CDC recommendations for the use of closed suction drains was modified. Subcutaneous tissue closure with absorbable sutures has proven effective for wounds ≥ 2 cm and was recommended for most patients⁷; however, if the depth of the incision was ≥ 4 cm⁸ or if a subcutaneous flap was created,⁹ then suction drains were recommended. Other changes included the administration of prophylactic antibiotics at the time of cord clamping,¹⁰ use of transverse abdominal incisions for all classes of obesity,¹¹ and skin closure with subcuticular suture.¹⁰

We studied our rates quarterly and reviewed the chart of each patient with a reported C/S SSI. We assessed compliance with our best practices, and searched for infections that would not have been prevented by our best practices. We also reviewed the current medical literature for methods to improve the identified gaps in our best practices. We instituted new actions to improve our best practices based on the quarterly reviews.

RESULTS

Our initial best practices were introduced in calendar year 2005, and in 2006 we began providing feedback to the attending physician of each patient with a C/S SSI. As shown in Figure 1, our annual C/S SSI rates declined from the preintervention rate of 14.9% to 3.61% in calendar year 2006.

Based on safety and efficacy data from the obstetrical literature,¹² we began administering preincisional antibiotic prophylaxis in 2007. Our rate of C/S SSI increased that year. On review of failures, we observed a higher rate of infection in our heavier patients. At that time, there was no weight-based stratification of antibiotic doses for surgical prophylaxis in the literature for cesarean section; however, based on data from bariatric surgeries,¹³

* Address correspondence to Frank R. Witter, MD, Phipps 228, 600 N Wolfe Street, Baltimore, MD 21287.

E-mail address: fwitter@jhmi.edu (F.R. Witter).

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Conflict of interest: None to report.

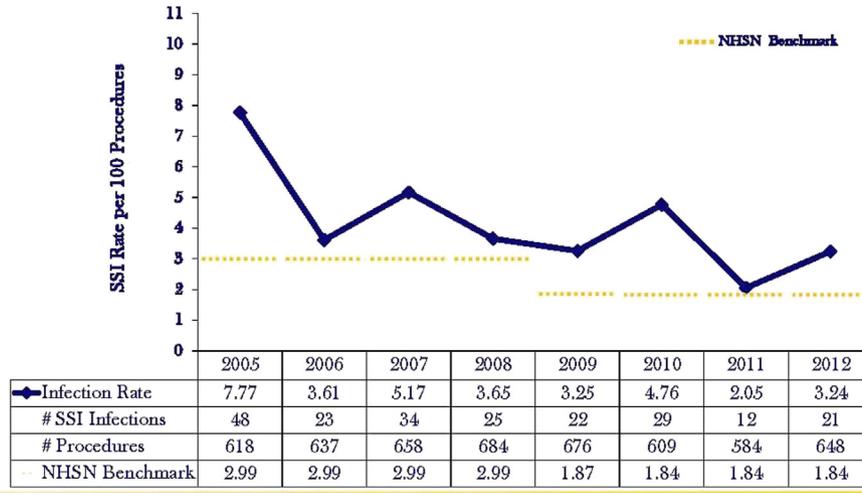


Fig 1. C/S SSI rates, 2005-2012.

Table 1

Current best practices based on CDC guidelines, obstetrical and surgical literature, and empiric observations continually revised through ongoing quality improvement by PDSA

Identify and treat all coincident remote site infections before surgery if possible.

Clip hair only if necessary at the incision site and then immediately before incision.

Administer antibiotic prophylaxis within 30 minutes before skin incision if possible. Give a repeat dose after 1500 mL of blood loss or at 3 hours of operating time (except for vancomycin). The dose is stratified by weight:

- For patients not allergic to penicillin or cephalosporin and <300 lb: cefazolin 2 g
- For patients not allergic to penicillin or cephalosporin and \geq 300 lb: cefazolin 3 g
- For patients allergic to penicillin or cephalosporin and <300 lb: clindamycin 600 mg
- For patients allergic to penicillin or cephalosporin and \geq 300 lb: clindamycin 900 mg
- For patients allergic to penicillin or cephalosporin and clindamycin, irrespective of weight: vancomycin 1 g.

Provide preoperative skin preparation with chlorhexidine:

- For scheduled cases, provide preoperative bathing with chlorhexidine-impregnated cloths the night before and the morning of surgery. Do not rinse off the last scrub.

Prepare the surgical site and surrounding area with chlorhexidine and allow it to dry before applying drapes.

Members of the surgical team should keep their hands and forearms in good condition, free of open lesions and/or weeping dermatitis, with fingernails short and healthy and no artificial nails or hand or arm jewelry.

Members of the surgical team need to perform:

- A 3- to 5-minute "scrub" of the hands and forearms with an appropriate antiseptic and cleaning under the nails at the beginning of each shift.
- The 3-pump technique with Avagard before surgery.

Protect the surgical site with a sterile dressing:

- Keep the dressing in place for 24-48 hours postsurgery.
- A dressing may be removed sooner if the wound is contaminated.
- Change dressings using sterile supplies and good hand hygiene.

Control serum blood glucose level in patients with diabetes.

Maintain a normal core body temperature (36.5°C).

Provide irrigation after closure of the uterus and closure of the fascia using a clean warm (new bottle) or sterile saline irrigation of 500 mL from graduate.

Use cautery sparingly:

- Do not enter the abdomen with cautery.
- Use cautery sparingly to coagulate bleeders.

Provide subcutaneous tissue layer management;

for wounds \geq 2 cm in depth, close with sutures.

Use closed suction draining:

- When absolute hemostasis cannot be achieved
- When serious fluid is weeping from the abdominal wall
- When the depth is \geq 4 cm
- When a subcutaneous flap has been created.

Use transverse abdominal incisions routinely in patients in all classes of obesity.

Close the skin with subcuticular sutures.

in 2008 we stratified our antibiotic dosage schedule based on weight. After this change, our rate showed a downward trend (Fig 1).

In 2009, we improved our patients' postsurgical surveillance and began collaboration with the hospital's Epidemiology and

Infection Control Department (HEIC). HEIC experts performed extensive observation in the fourth quarter of 2009 and made recommendations on surgical scrub attire, prepping, patient warming, gowning and gloving, sterile technique, room configuration, and environment.

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