Blinded Review of Surgical Compliance with a Bundle of Evidence-Based Measures Aimed at Reducing Cesarean Section-Related Surgical Site Infections

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INTRODUCTION

- Cesarean sections (c-sections) are among the most commonly performed surgical procedures; 22.9 million globally in 2012.
- **Approximately 1.3 million c-sections are performed annually in the US, representing 32% of all deliveries.**
- May be complicated by hematoma, seroma, wound dehiscence and surgical site infections (SSIs).
- National Healthcare Safety Network (NHSN) categorizes SSIs as: Superficial, Deep, or Organ/Space.
- SSIs are decreasing in incidence due to improvements in hygiene, sterile technique/surgical practices and antibiotic prophylaxis but remain a significant cause of morbidity/mortality, increased LOS and increased healthcare costs.
- Rates vary in the literature (1-23.5%); 4.8% in a large meta-analysis.
- **Risk factors:** Host factors (age, previous c-section, nulliparity, obesity, DM), Pregnancy-related factors (preeclampsia, gestational DM, PROM, epidural, invasive monitoring, chorio), Procedure-related factors (emergent, lack of antibiotics, procedure >60 min), pre-op shaving, manual placenta extraction, skin closure with staples).
- **Bundles of evidence-based best perioperative practices have been shown to significantly decrease the rate of c-section related SSI.**

	Mean	Median	Range
Age	29.6	29.5	18-45
Gravida	4.00	1	1-9
Term births	1.67	1	0-5
Preterm births	0.25	0	0-2
Abortions	1.13	1	0-3
Living children	1.88	1.5	0-5

Table 1: Patient characteristics

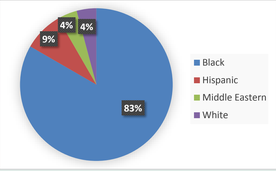


Figure 1: Patient ethnicity

- Nearly 2000 c-sections are performed annually at our large, academic-affiliated tertiary care hospital system.
- From 2/2016 to 2/2017, the 12-month mean SSI rate increased sharply from 0.57% to 2.69%
- **In response to this increase, we implemented our own evidence-based bundle of best practices designed to decrease c-section related SSIs.**

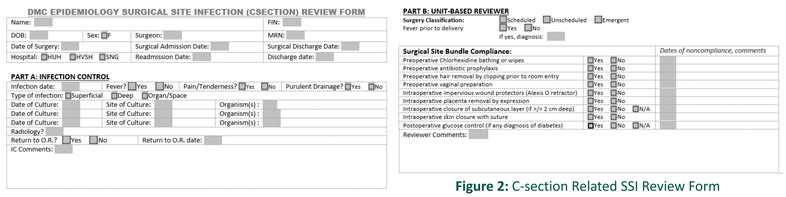
METHODS

- A bundle of 9 measures was designed (Table 2), shared with the Obstetrics department and implemented in 2/2017.
- Infection Control identified 24 patients who developed SSI through 9/2017.
- Mean age was 29.6 years and the mean number of prior pregnancies was 4 (Table 1).
- The majority (83%) of the patients were black. Figure 1 provides a further breakdown of patient ethnicity.
- For each patient, Infection Control completed Part A of a Review Form (Figure 2), describing the infection.
- OB then reviewed their compliance with each bundle component in Part B of the form.

Table 2: Bundle Components
Preoperative chlorhexidine bathing
Preoperative antibiotic prophylaxis (including azithromycin)
Preoperative hair clipping outside the OR if indicated
Preoperative vaginal preparation with iodine
Intraoperative impervious wound protector (Alexis O retractor) use
Intraoperative placenta expression (rather than manual extraction)
Intraoperative closure of the subcutaneous layer if ≥2 cm
Intraoperative skin closure with sutures (rather than staples)
Postoperative glucose control if diabetic

- A blinded reviewer (ID Fellow) not involved in the clinical care of the patients then performed the same review.
- Primary endpoint was compliance rather than effect on SSI rate.
- Compliance, as determined by the two independent reviews, was compared using a one-tailed simple test of statistical significance.
- Findings were shared with the OB department and hospital leadership monthly in order to understand/close gaps in compliance and improve documentation.

FIGURES


DMC EPIDEMIOLOGY SURGICAL SITE INFECTION (CSECTION) REVIEW FORM

Name: FIN:

DOB: Sex: F Surgeon: MRN:

Date of Surgery: Surgical Admission Date: Surgical Discharge Date:

Hospital: HUH HVSH SNG Readmission Date: Discharge date:

PART A: INFECTION CONTROL

Infection date: Fever? Yes No Pain/Tenderness? Yes No Purulent Drainage? Yes No

Type of Infection: Superficial Deep Organ/Space

Date of Culture: Site of Culture: Organism(s) :

Date of Culture: Site of Culture: Organism(s) :

Date of Culture: Site of Culture: Organism(s) :

Radiology?

Return to O.R.? Yes No Return to O.R. date:

IC Comments:

PART B: UNIT-BASED REVIEWER

Surgery Classification: Scheduled Unscheduled Emergent

Fever prior to delivery Yes No

If yes, diagnosis:

Surgical Site Bundle Compliance:		Dates of noncompliance, comments
Preoperative Chlorhexidine bathing or wipes	Yes No	
Preoperative antibiotic prophylaxis	Yes No	
Preoperative hair removal by clipping prior to room entry	Yes No	
Preoperative vaginal preparation	Yes No	
Intraoperative impervious wound protectors (Alexis O retractor)	Yes No	
Intraoperative placenta removal by expression	Yes No	
Intraoperative closure of subcutaneous layer (if >/= 2 cm deep)	Yes No N/A	
Intraoperative skin closure with suture	Yes No	
Postoperative glucose control (if any diagnosis of diabetes)	Yes No N/A	
Reviewer Comments:		

Figure 2: C-section Related SSI Review Form

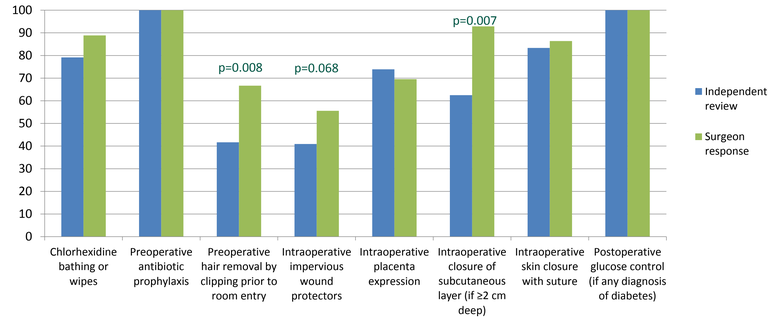


Figure 3: C-Section Bundle Compliance (Independent vs Surgical Review)

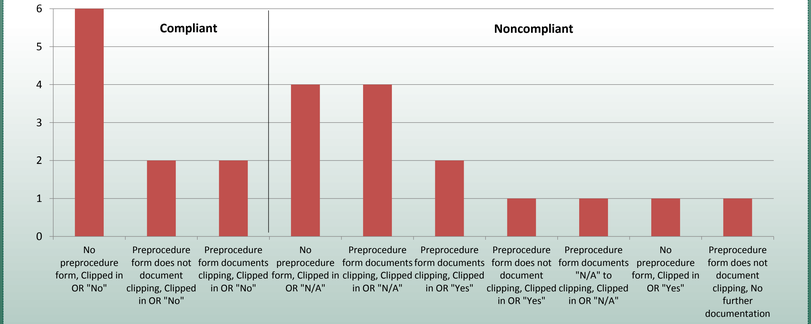


Figure 4: Compliance vs Noncompliance with Preoperative Hair Clipping Outside the OR by Documentation Type

RESULTS

- **Most c-section related SSIs were superficial (Figure 5).**
- 21% of procedures were scheduled. 54% were unscheduled and 25% were emergent.
- All patients received antibiotic prophylaxis but only 2/3 received extended spectrum prophylaxis with azithromycin.
- **Compliance with hair removal and subcutaneous layer closure was significantly lower by independent review (Figure 3).**
- Four patients were excluded from analysis of Alexis O retractor use due to adhesions.
- Compliance with vaginal preparation was not analyzed since implementation was limited to 5/24 patients.
- **For hair removal, documentation did not support the level of compliance reported by OB (Figure 4).**
- These differences remained statistically significant when the six emergent procedures were excluded.
- Compliance rates by independent vs OB review were similar for each of the other bundle components.

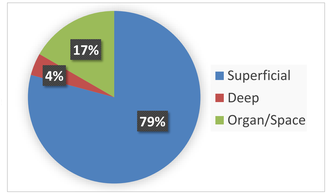


Figure 5: C-section SSIs by NHSN classification

- **C-section SSI rate decreased to 0.71% by 10/2017, with a corresponding 12-month mean rate of 1.93% (Figure 6).**

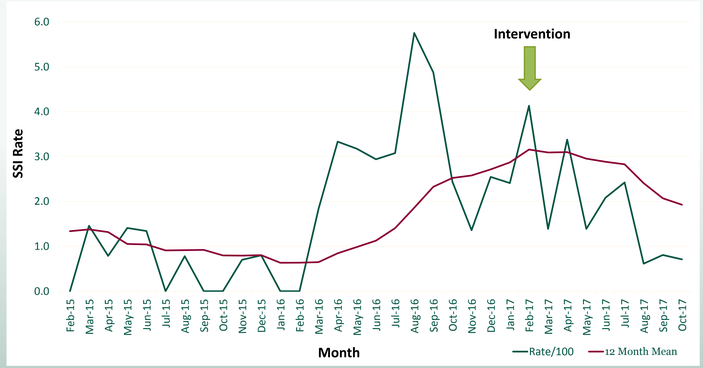


Figure 6: Cesarean Section-related SSI Rate by Month

CONCLUSION

- Cesarean section-related SSIs are a common, preventable cause of morbidity/mortality as well as increased hospital length of stay and overall healthcare costs.
- Bundles of evidence-based best perioperative practices are proven to decrease c-section related SSI rate.
- **Understanding gaps in bundle compliance and communicating these deficiencies to the surgical team has the potential to further reduce SSI rate while improving documentation.**
- **Engaging the surgical team in the best practice initiative is critical to achieve better compliance.**