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A Bundle Approach to Decreasing Cesarean Surgical Site Infections: A Four-Year Journey

By: Becky Boedeker DNP, RNC-MNN, IBCLC, C-ONQS

Surgical site infection (SSI) is one of the most common complications of Cesarean Section (C/S) deliveries. The most recent data from the CDC (2023) reports the average C/S rate for all live births in Missouri as 30.2%, and for Illinois, 31% (CDC, 2025). Experiencing an SSI after a C/S adds a substantial burden to the health care system, as well as a significant personal burden to new families, calling for effective prevention strategies (Hirani et al.,2022; Ziogou & Kokolakis, 2023).

An urban, Obstetrical high-risk tertiary center was challenged in 2021 with a sharp increase in C/S SSIs, 16 in one year. This led to a 4-year effort to identify risk factors, and implement SSI prevention care bundles, driven by an interdisciplinary team including representation from the Departments of Nursing, Maternal Fetal Medicine, Infection Prevention, and the campus executive team. Through constant surveillance, trends were identified and interventions were refined over time.

Staff/Supplies/Products

Nursing staff reinitiated a 3-minute surgical scrub at the start of each shift and reinforced the practice of changing to a new surgical mask when entering the OR. Consistent, standardized postoperative wound assessment checkpoints were identified to prevent unnecessary removal and reapplication of the dressing. Surgical dressings were evaluated and updated, adding silver-impregnated and negative pressure dressings. The C/S surgical drape was evaluated and changed to a fenestrated drape with better adhesion.

Patient Hygiene Bundle

A "bundle" of interventions was implemented daily, typically between 9:00 and 10:00 am, for all patients in Labor and Delivery. It included changing linens and monitor belts/bands, cleaning monitor parts, and washing the abdomen with soap and water. This was administered to all patients, recognizing that any patient could experience an emergency requiring a C/S. Over time, additional elements were added: Cleaning of the abdomen with Chlorhexidine gluconate (CHG) wipes on admission, as an emergency could develop before the usual daily hygiene bundle occurred; routine iodine vaginal pre-op prep for all C/S when time allowed; and the use of Betadine (povidone-iodine) surgical prep for emergent C/S due to a shorter necessary drying time than the usual 3 minute Chloraprep requirement (Cowles & Chang, 2014, Drugs.com, n.d.).

Dressing Decision Algorithm

A risk-based, post-C/S dressing algorithm was developed, which initially had two categories. The low-risk group received the Allevyn foam dressing, which was removed at discharge. The high-risk group received the Acticoat Silver (antimicrobial) foam dressing, with instructions to remain in place for 7 days. Over subsequent years, this algorithm was updated twice, resulting in three risk categories, with those in the highest risk category receiving a negative pressure dressing, to remain in place until removed by the provider at a postpartum visit (Illustration 1).

A Bundle Approach to Decreasing Cesarean Surgical Site Infections (cont.)

Postpartum and Discharge Care

The Unit had previously implemented the Early Recovery After Surgery (ERAS) protocol. In addition to this, 24-hour post C/S showers with CHG soap were initiated. Clear care instructions were developed for each type of dressing and added to the patient's after-visit summary. A postpartum C/S discharge bundle was created which included a basin, extra squirt bottle for cleansing the incisional area, CHG soap, hand sanitizer, a roll of InterDry for any individual who had a pannus, and a general post-surgical care guideline handout was produced with the help of the Infection Prevention department.

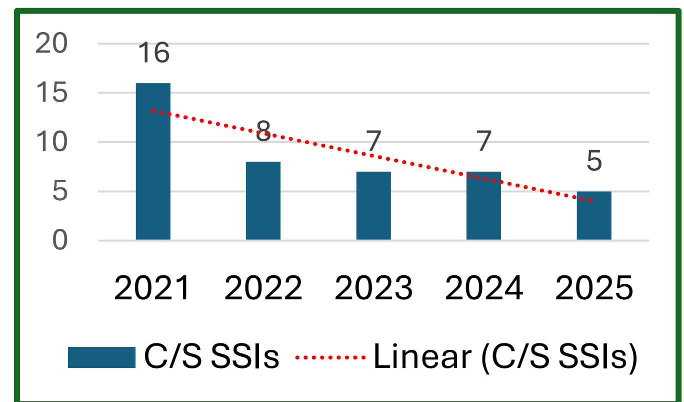
Focus on BMI

A trend emerged at the end of 2023. All patients experiencing a C/S SSI that year had a BMI >40, and more than half had a BMI of >60 at the time of delivery. Opportunities were identified to implement more in-depth care planning for this population, which included optimizing the availability of bariatric supplies and enhanced communication with planning huddles and an admission checklist (Illustration 2). A new antibiotic regimen was trialed for patients with a BMI >40, which included additional treatment with Flagyl and Keflex for 48 hours postoperatively.

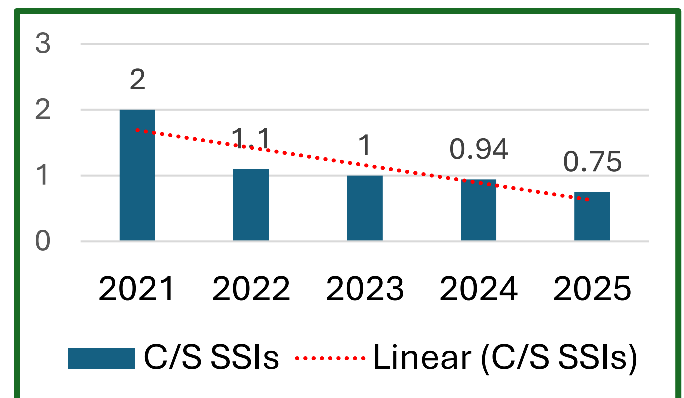
Current State

These interventions resulted in a continuous decrease in the percentage of C/S SSIs year over year. Multidisciplinary collaboration, constant attention on outcomes and trends, a focus on education and adherence to bundle elements, and the willingness to adapt to new findings were essential in making this process successful and effective. Recognizing the consequences and developing strategies to prevent SSI are critical in reducing post-cesarean morbidity and mortality (Hirani et al.,2022; Ziogou & Kokolakis, 2023). This examination and analysis of infections and the implementation of best practice guidelines using a bundled approach resulted in a significant and sustained reduction in C/S infections.

Total SSIs:



Percentage of Patients with C/S SSIs:



Author Biography

Becky Boedeker, DNP, RNC-MNN, C-ONQS has been an RN for over 40 years, the last 25 at SSM Health St. Mary's Hospital – St. Louis, currently as the Advanced Clinical Nurse for their Perinatal Units. In this role, she promotes the implementation of evidence-based practice across perinatal units in a multidisciplinary environment, analyzes patient data and healthcare processes to identify areas for improvement, and works to implement changes and monitor outcomes to enhance patient care quality. Her responsibilities include routine review and updating of Regional and System-level Perinatal Policies, Guidelines, Order Sets, and Protocols to ensure patient care aligns with current evidence and complies with regulatory imperatives.

Illustration 1

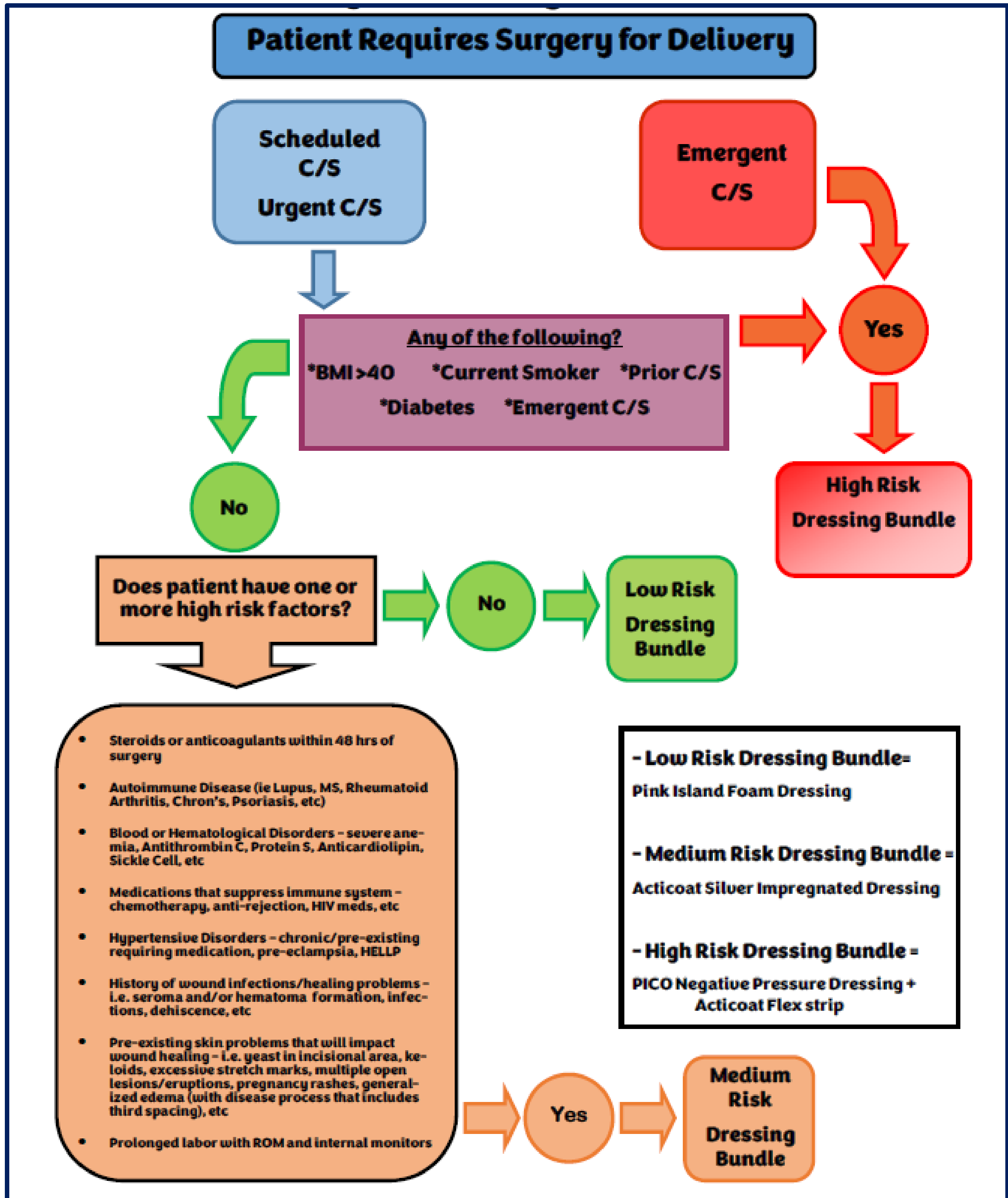


Illustration 2

Admission checklist for bariatric patients

BMI ≥50	Resources to utilize or have readily available (place pt in room 514 if possible)		Huddle for plan on admission
	Transfer Device/Turn and position system		Epidural timing
	Airpal		Fetal Monitoring
	Bariatric Bed		Incision plan for emergency/scheduled surgery based on physical assessment
	Bariatric wheelchair		Assessment of ability to fit on OR table with extenders
	Bariatric leg Slings for ceiling lift (514 only)		Antibiotic bundle/prophylaxis
	Bariatric monitor belts		VTE prohylaxis
	Bariatric gown		Daily hygiene bundle with chlorhexidine
	Bariatric OR table extenders		Nutrition consult (ensure Juven in orders)
	Bariatric Instruments		
	PRS (Pannus Retention System)		
	Alexis retractors		
	Fish (for surgery)		
	Inter Dry (Moisture Control)		
	Consider wound consult		
	Negative Pressure Dressing WITH silver flex strip		
	Novii fetal monitor		
	Footie SCD's		
	OR Sled		
	High OR stools x2 in OR for reach		

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Antibiotic Prophylaxis for Cesarean Delivery in Obese Pregnant Patients

By: Laurie Niewoehner, Pharm D.

Obesity (Class III – BMI >40 kg/m²) significantly increases the risk of cesarean delivery, and these risks escalate at higher BMI levels. Postpartum patients with obesity face an elevated risk of surgical site infections (SSIs), including wound complications and endometritis, following cesarean delivery. Even with standard preoperative antibiotic prophylaxis, poor adipose tissue vascularity and the formation of seromas and hematomas contribute to increased infection risk. Obesity doubles the risk of post–cesarean infection due to increased volume of distribution, which may dilute antibiotic concentrations and reduce their effectiveness. (ACOG, 2021).

Key Principles of Infection Prevention

- Strict aseptic technique
- Minimize operative time
- Optimize blood glucose control
- Use **weight-based antibiotic dosing**, as standard cephalosporin doses often produce subtherapeutic levels in obese patients

Microbiology of Cesarean-Related Infections

Endometritis typically involves organisms present in the amniotic cavity at the time of delivery, such as *Ureaplasma*, *Mycoplasma hominis*, *Gardnerella vaginalis*, and anaerobic bacteria including *Bacteroides* and *Prevotella*.

Surgical Site Infection (SSI) usually results from contamination of the incision by skin microbiota or lapses in aseptic technique. Common organisms include *Staphylococcus aureus*, coagulase-negative staphylococci, and *Streptococcus pyogenes* (Sanchez-Ramos et al., 2026).

Evidence Supporting Pre-Operative Antibiotic Prophylaxis

A single dose of cefazolin is the standard prophylactic agent due to its broad-spectrum activity against common Gram-positive and Gram-negative pathogens. Cefazolin inhibits bacterial cell wall synthesis by binding to penicillin-binding proteins, weakening the cell wall and causing bacterial lysis.

The addition of azithromycin to cefazolin is beneficial for patients at high risk of post-cesarean infection, such as those undergoing cesarean delivery after more than 4 hours of ruptured membranes or non-elective procedures. Azithromycin provides excellent coverage against *Ureaplasma* (poorly covered by cefazolin) by blocking bacterial protein synthesis. Its long half-life and high tissue concentrations—especially in the genital tract—make it a valuable adjunct.

If a patient is receiving penicillin for Group B Streptococcus prophylaxis, they should still receive standard surgical prophylaxis with cefazolin; azithromycin should also be added for non-elective cases. Patients being treated for suspected chorioamnionitis are considered treated rather than prophylaxed and do not require additional cefazolin. (Sanchez-Ramos et al., 2026).

Recommended Perioperative Antibiotic Protocol

Preoperative (No Allergy to Penicillin or Cephalosporins) (Bratzler et al., 2013)

- **Azithromycin 500 mg IV x1** (for laboring patients or ruptured membranes)
- **Cefazolin:**
  - 2 g IV if weight <120 kg
  - 3 g IV if weight ≥120 kg
  - Re-dose if estimated blood loss ≥1.5 L or operative time ≥4 hours

Preoperative (Severe Penicillin or Cephalosporin Allergy) (Bratzler et al., 2013)

- **Azithromycin 500 mg IV x1** (for laboring patients or ruptured membranes)
- **Gentamicin 5 mg/kg IV x1** (using adjusted body weight)
- **Clindamycin 900 mg IV x1**

Timing and Allergy Considerations

Antibiotics should be administered within 60 minutes prior to skin incision. Earlier administration (versus after cord clamping) reduces rates of wound infection and endometritis. An additional intraoperative dose is recommended if the procedure exceeds two drug half-lives (>4 hours for cefazolin) or if blood loss exceeds 1500 mL (Hayasaka et al., 2026).

Antibiotic Prophylaxis (cont.)

For patients who self-report penicillin or beta-lactam allergy, cefazolin can typically still be used. The rate of true dual allergy is low (0.7%), and unnecessary avoidance increases infection risk. Patients with a history of angioedema or anaphylaxis should receive clindamycin plus gentamicin. Infection risk is higher in patients receiving gentamicin plus clindamycin compared with cefazolin, underscoring the importance of accurate allergy assessment (Hayasaka et al., 2026).

Proposed Postoperative Prophylaxis (48 Hours) for BMI ≥40 kg/m²

If No Cephalosporin Allergy

- **Cephalexin 500 mg PO every 6 hours for 8 doses**
- **Metronidazole 500 mg PO every 8 hours for 6 doses**

If Allergic to Cephalexin

- **Cefdinir 300 mg PO twice daily for 4 doses**
- **Metronidazole 500 mg PO every 8 hours for 6 doses**

A randomized clinical trial demonstrated that 48-hour postoperative cephalexin plus metronidazole significantly reduced SSI rates in obese patients (6% vs. 15% with placebo). Metronidazole enhances anaerobic coverage and has anti-inflammatory properties that complement cephalexin's broad-spectrum activity. A post-hoc analysis showed particular benefit in patients with ruptured membranes who did not receive pre-operative azithromycin (Sanchez-Ramos et al., 2026).

Quality-improvement data from St. Mary's Health Center in St. Louis show reduced infection rates and fewer wound-related follow-up visits after implementation of this regimen in patients with BMI ≥40. Cephalexin dosing was increased from three times daily to four times daily to ensure efficacy.

Patients who develop intrapartum fever or have prolonged rupture of membranes should receive full therapeutic treatment for suspected infection rather than extended prophylaxis.

Author Biography

Laurie Niewoehner, Pharm. D is a Clinical Pharmacist, specializing in high-risk obstetrics and neonates at SSM Health St. Mary's Hospital – St Louis for 22 years. She obtained a PharmD from the University of Minnesota and completed a pediatric pharmacy residency at Children's Mercy Hospital in Kansas City, Missouri. Laurie currently serves as a preceptor at the University of Health Sciences and Pharmacy in St. Louis.

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The SSM Health Perinatal Outreach Program

The Perinatal Outreach Program is designed to improve outcomes for mothers and babies through educational programs and quality improvement activities for regional perinatal care providers in Eastern Missouri and Southern Illinois.

SSM Health Cardinal Glennon Children's Hospital and SSM Health St. Mary's Hospital – St. Louis are designated by the Illinois Department of Public Health as the Administrative Perinatal Center for Southern Illinois.

Continuing Education Opportunities

Many continuing education opportunities are available for perinatal professionals in eastern Missouri and Southern Illinois. For course calendars or more specific information on programs, please visit ssmhealth.com/perinatal outreach, call the Perinatal Outreach Program at 314-577-5317, or send an email to: SSM-PerinatalOutreach@ssmhealth.com