Reducing Surgical Site Infections in the Bariatric C-Section Patient

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Abstract

**Background:** Background evidence of surgical site infections (SSI) among bariatric c-section patients identified four themes, including risk factors, assessment, interventions, and education. Each theme guided the project intervention and recommendations for practice improvement.

**Purpose:** The original purpose of the project included four aims: educate nursing staff on the obstetrics unit about post-operative surgical site incision care through a 30-minute education session during annual training, administer a knowledge survey pre-education session, post-education session, and toward the end of project implementation to assess post-operative surgical incision care knowledge, establish ability to recognize risk and initiate prevention strategies for surgical site infection, and initiate focus group and anonymous feedback methods to gather information regarding barriers to practice change, feasibility, and for continuous quality improvement. The original purpose was adapted and instead focused on creating a practice protocol and education based on multiple Plan, Do, Study, Act (PDSA) cycles to determine organizational need and gaps in practice.

**Method and Results:** The project used the Model for Improvement framework to design multiple PDSA cycles. The PDSA cycles established gaps between unit practice and best practice literature. The results of the project included development of a practice protocol.

**Recommendations:** The project included five recommendations related to returning to the original interrupted, repeated measures design to determine baseline knowledge, the efficacy of an education curriculum, knowledge retention, contribution of knowledge to adherence, and reductions of surgical site infection in bariatric patients.

**Keywords:** bariatric, c-section, obese, obstetric and, surgical incision care
Reducing Surgical Site Infections in the Bariatric C-Section Patient

Surgical site infection (SSI) accounts for a large portion of annual nosocomial infection rates in hospitals. In obstetrics, the most common nosocomial infections are SSIs. Surgical site infections make up approximately 38% of annual nosocomial infections (Amenu, Belachew, Araya, 2011). Due to the increased risk of SSI associated with bariatric patients, bariatric c-section patients require specialized care. Bariatric and obesity are terms used interchangeably. The Center for Disease Control and Prevention (CDC) obesity guidelines define obesity as a body mass index (BMI) of 30 or greater (CDC, n.d.a).

The practice site for this DNP project is one of the first hospitals within the Twin Cities with special equipment for providing care to bariatric patients, such as rooms equipped with ceiling lifts and more appropriately sized beds (Bryant, R., Personal Communication, June 18, 2019). Due to the organization’s reputation for bariatric services, many patients choose this site for their care. In 2018 the institution became an unofficial referral site for bariatric care because of its reputation, knowledge, and resources (Bryant, R., Personal Communication, June 18, 2019). In 2019, the bariatric referral designation became official (Bryant, R., Personal Communication, November 11, 2019).

Because of the organization’s reputation for bariatric care, the overall number of bariatric patients increased, including bariatric obstetric patients. Correspondingly, the obstetric department saw an increase in surgical site infections (SSI), with the vast majority of cases occurring among bariatric c-section patients. While bariatric patients are at greater risk for SSIs, this practice problem impacts all obstetrical surgical patients, regardless of BMI. Unit leaders found a lack of standardization in care practices and interventions based on preference rather
than scientific evidence. This project aims to address current obstetric surgical site care gaps and SSI issues in the bariatric population.

**Practice Gap**

The DNP student conducted a gap analysis at the practice site and noted several issues. For example, although bariatric patients are generally at greater risk for surgical site infections, incision care for c-section patients remains inconsistent, and care does not always follow current evidence-based practice guidelines. Dressings are chosen based on practitioner preference, available options, and cost containment considerations rather than dressing effectiveness. There is no consensus regarding removing staples before patient discharge, and inconsistencies in care place patients at higher risk for complications (Ban et al., 2016; Berrios-Torres et al., 2017). Therefore, a practice gap existed, demonstrating a need for standardized surgical incision care and education for staff addressing their knowledge gap about the care of surgical incisions.

**Background Evidence of the Problem**

The practice problem inspiring for this DNP project was bariatric patients experiencing SSIs at a higher rate than other c-section patients. An important consideration when framing this problem was understanding background evidence. Surgical site infections are complex and underlying causes are multifaceted. For example, SSIs can result from a lack of standardized incision care, inconsistent implementation of best practice care for incisions, bariatric risk related to incisions, and a gap in the literature addressing the specific problem. Additionally, obese patients often have significant comorbidities, more extensive wounds, longer surgery times, and underlying infections (e.g., chorioamnionitis). The gap analysis identified four overarching issues: surgical site dressing removal, removal of sutures/staples, negative pressure wound therapy (NPWT), and education. Each theme shaped the development of the practice design and
subsequent interventions. The following discussion highlights specific practice observations that provide background evidence, however, later in this paper, a critical review of the literature, based on the clinical question for this DNP project, will present current research in greater detail.

**Practice Problem Related to Dressing Removal**

Dressing removal is an important consideration when caring for surgical incisions. There was considerable variability between providers regarding dressing removal and disagreement about how long the original surgical dressing should remain in place (Ban et al., 2016). The DNP student determined the absence of standardized practice at the DNP practice site for how long original surgical dressings should remain in place through gap analysis. Often, the staff removed dressings before or after the first shower/bath after surgery and replaced the dressing. Another issue included staff removing dressings prematurely to visualize incisions despite no signs of infection.

**Practice Problem Related to Suture/Staple Removal**

Just as with premature removal of the dressing, premature removal of sutures and staples creates significant risk for incision complications (Whitney, 2012). During the pre-project needs assessment, the DNP student noted a standardized suture removal process did not exist. Some practitioners removed sutures and staples before discharge, so patients did not need to return to the clinic soon after discharge. In 2019, the average length of stay for a c-section patient with no complications was 2.8 days (The Mother Baby Center, n.d.). Therefore, some patients had sutures or staples removed two to three days after placement.

**Practice Problem Related to Negative Pressure Wound Therapy**

Obese patients often have significant comorbidities, more extensive wounds, longer surgery times, and underlying infections. Abboud et al. (2014), in a literature review, found that
NPWT is effective in reducing SSIs in obese patients. On the obstetrics unit, the use of NPWT was rare, and many practitioners justified this practice citing cost concerns, an unfounded perception. Nherera, Trueman, and Karlakki (2017), in a randomized control trial, found that the mean cost of patients receiving NPWT is lower than the mean cost of patients with similar circumstances receiving standardized incision care. A decrease in SSIs, dressing changes, and length of patient stay are the primary reasons for reducing care cost (Nherera et al., 2017). Negative Pressure Wound Therapy was nearly 50% more effective in reducing SSIs in bariatric patients than standard care (Nherera et al., 2017). Staff beliefs about NPWT was one example of staff needs for education surrounding surgical site care in the bariatric patient.

**Practice Problem Related to Staff Education**

Staff education is an essential intervention that minimizes SSIs. Obstetric care providers, in general, lack knowledge about unique bariatric needs, especially related to their incisional care needs and risk for infection (Nobbs & Crozier, 2011; Sorensen et al., 2005). At the unit meeting before project implementation, staff indicated that they followed outdated incision care procedures. Based on this feedback, it was evident that staff needed updated information regarding best practice incision care and management of chronically ill patients (Nobbs & Crozier, 2011). Although a bariatric obstetric patient may not be chronically ill, they often present with comorbid conditions. Because the typical obstetric patient is generally healthy, nurses may not know much about incision care for patients with comorbid illnesses. With a growing high-risk population, including bariatric patients, the organization needed to address gaps in nursing knowledge for incision care (Nobbs & Crozier, 2011).
Project Aims and Clinical Question

As a result of a needs assessment and gap analysis, the purpose of this DNP project included four aims. Aims for this practice initiative included addressing nursing knowledge gaps for surgical incision care by focusing on bariatric patient concerns; measuring nursing knowledge acquisition post-education through the use of the modified knowledge survey; establishing whether nursing knowledge was a significant contributing factor to protocol adherence; and identifying other barriers and potential threats to project implementation through anonymous feedback and focus group participation open to nursing staff and unit leaders. Therefore, the practice question was: For nurses caring for bariatric c-section patients, what is the effect of implementing an education session and incision care protocol addressing nursing knowledge gaps for incision care on protocol adherence? The following section is a review of the evidence as it pertains to the practice problem of this DNP project.

Critical Review

The following is a critical review of the literature based on the clinical question for this DNP project. This DNP project's search process focused on the following three databases: Cumulated Index to Nursing and Allied Health Literature (CINHAL), PubMed, and Medline. The search terms included bariatric, obese, obstetric, c-section, and surgical incision care. The initial search using all terms yielded no results. Searching terms in smaller groups (e.g., bariatric, c-section, obese, obstetric and bariatric, obese, surgical incision care) yielded 139 articles. Exclusion criteria included articles not written or translated into English, articles greater than ten years old (except for one foundational article), and articles that did not include women in the sample. The application of the exclusion criteria resulted in 42 articles. Using the Johns
Hopkins appraisal process led to selecting 20 articles with appropriate level and quality rating that helped answer the clinical question.

In the following review, specific themes related to answering the clinical question presented in the literature. For purposes of this DNP project, the CDC defines surgical site infections using the superficial and deep incisional infection classification (CDC, n.d.b.). When examining SSI literature, four topics emerged consistently: risk factors for SSI, assessment and incision therapy, dressing types, and education.

**Risk Factors**

Understanding the risk factors for SSIs are important in the prevention of SSIs. To accurately assess patients and use appropriate interventions to mitigate risk, care providers need to understand risk factors and how they contribute to SSIs. Once care providers understand patient risk factors, care providers can create patient appropriate care plans to avoid SSIs.

Risk factors defined in the literature include patient characteristics and situational factors (Abboud et al., 2014; Ban et al., 2016; Nobbs & Crozier, 2011; Sorensen et al., 2005; Walming et al., 2017; Whitney, 2012). The literature concerning surgical incisions identified the following as complication risks: smoking, comorbid illness, blood loss, type of surgery (Abboud et al., 2014; Ban et al., 2016; Nobbs & Crozier, 2011; Sorensen et al., 2005; Walming et al., 2017; Whitney, 2012). Four additional sources included obesity or BMI as a significant factor contributing to SSI and incision healing (Abboud et al., 2014; Nobbs & Crozier, 2011; Walming et al., 2017; Whitney, 2012).

While obesity is a major risk factor for SSIs, the definitions for obesity in pregnancy are not clearly defined. The CDC definitions for obesity do not include guidelines for pregnancy (CDC, n.d.a). The practice site uses pre-pregnancy BMI to determine obesity (Hoffman, S.,
Personal Communication, November 12, 2019). However, the hospital does not always have access to pre-pregnancy BMI for patients (Hoffman, S., Personal Communication, November 12, 2019). Because pre-pregnancy data is inconsistent, the operational definition for obesity is the strict application of the CDC definition even in pregnancy.

Patient risk factors for SSIs fall into two categories: modifiable or unmodifiable. Modifiable risk factors are risk factors that can be changed, avoided, or mitigated through intervention (Sorensen et al., 2005; Walming et al., 2017). Unmodifiable risk factors cannot be changed and require interventions to reduce risk (Sorensen et al., 2005; Walming et al., 2017). Even though some comorbidities and obesity are modifiable, they are not typically modified during pregnancy and considered unmodifiable risk factors (Ban et al., 2016; Whitney, 2012). Therefore, the interventions of the DNP project focused on mitigating modifiable risk factors and proper management and care for unmodifiable risk factors for SSIs. Because SSIs are often multifactorial, patients with more risk factors are at a higher risk of developing complications (Ban et al., 2016; Rouse, Nascu, Dawson, & Morris, 2019: Noorit, Siribumrunwong, & Thakkinstian, 2018). For purposes of this project, the protocol and education included risk factors and how they relate to SSIs (See appendix 1 for the practice protocol).

**Incision Assessment and Therapy**

A common concern amongst practitioners in the facility visualizing the incision before patient discharge. However, the literature is clear that the original surgical dressing should remain in place without interruption (National Collaborating Centre for Women's and Children's Health, 2008; Whitney, 2012). The length of time that dressings should remain in place post-surgery is a point of contention in the literature. One article indicated that the original dressing should remain in place for 48 to 72 hours (National Collaborating Centre for Women's and
Children's Health, 2008). Other sources, including the facility infection control department, determined that three to five days is optimal for reducing SSIs (Fergeson, J., Personal Communication, July 16, 2019; Whitney, 2012).

It is unclear why the organization’s infection control department elected three to five days. The dressing manufacturers supported literature claiming that five to seven days is best (Molnlycke Health Care, Personal Communication, June 30, 2019). Ban et al. (2016), in an integrative systematic review, indicated that there is not enough evidence to show that dressing removal before 48 hours causes increased SSI risk. There is conflicting data within best practice literature about the length of time post-surgical dressings should remain in place. The evidence does not report conclusive findings to support the length of time a dressing should remain in place. Despite the unclear evidence to support the length of time, the evidence is clear that limiting dressing interruptions decreases the potential introduction of pathogens into the incision site (Ban et al., 2016; Whitney, 2012). The primary reason surgical dressings were interrupted at the practice site is for incision visualization and assessment.

Desiring incision visualization is to identify signs of infection or other problems early in the incision healing process. However, the practice site used dressings designed for visualization of the area surrounding the incision. The purpose of the dressing design is to limit the need to interrupt the original surgical dressings without signs of infection. The literature is clear that practitioners should rely on other signs of infection (Ban et al., 2016; National Collaborating Centre for Women's and Children's Health, 2008; Whitney, 2012). Other signs of infection include increased exudate, vital sign changes, pain and discomfort, and odor (National Collaborating Centre for Women's and Children's Health, 2008; Whitney, 2012). For purposes of this project, the language in the protocol included leaving the dressing in place for at least 48
hours post-surgery because the practitioners were uncomfortable discharging patients without visualizing the incision at least once (Hoffman, S., Personal Communication, November 12, 2019). Being able to leave dressings in place requires an appropriate dressing selection.

**Dressing Types**

The protocol also addressed dressing types and best practice recommendations. The DNP project focused on using standard dressings (Island and silver-impregnated dressings) and NPWT dressings. Island and silver-impregnated dressings are the standard dressings currently used in the facility. Negative pressure wound therapy dressings served as the intervention to reduce SSIs in post-op patients with moderate to high-risk incision issues, such as bariatric c-section patients.

**Silver Dressings.** Both guidelines suggest that use of silver-impregnated dressing is indicated in routine surgical incision care (Ban et al., 2016; National Collaborating Centre for Women's and Children's Health, 2008). However, the literature regarding the use of silver dressing is conflicting. Two studies indicate no difference in rates of SSI for patients with silver-impregnated dressings versus those with island dressings (Abboud et al., 2014; Cabrales et al., 2014). Both articles indicate the need for more research on the use of silver dressings. The same two articles also indicate that silver dressings cause no harm or discomfort to patients. Cabrales et al. (2014) did not include the effect of silver dressings on contaminated incisions. The Abboud et al. (2014) study indicates that silver concentration in the dressing may be an important factor for reducing infection rates. However, because silver-impregnated dressings are in the guidelines, and there is no literature contraindicating its use, this type of dressing will remain a standard dressing type in the DNP project protocol for surgical site care.
**Negative Pressure Wound Therapy (NPWT).** Studies indicate that NPWT is effective, especially in high-risk surgical patient cases (Abboud et al., 2014; Bonds, Novick, Dietert, Araghizadeh, & Olson, 2013; Nherera et al., 2017). High-risk surgical patients are patients with one or more of the previously listed risk factors (See Appendix 1 for risk factors in the protocol). Two studies indicate that NPWT is best for bariatric patients, patients with contaminated surgical sites, and patients with incisions that have excessive drainage and exudate (Abboud et al., 2014; Bonds et al., 2013). Therefore, the protocol includes NPWT for patients with moderate or high-risk for SSI as defined in the protocol. To understand changes in practice, nurses will need education on using the protocol and its interventions appropriately.

**Protocol Elements, Education, and Assessment**

A routine nursing assessment should incorporate a thorough incision assessment. However, the research indicates that nursing knowledge of incision assessment and care of the chronically ill is limited in obstetric units (Lin et al., 2019; Nobbs & Crozier, 2011; Skoufalos et al., 2012). The literature contends that nursing knowledge will increase with proper education (Lin et al., 2019; Skoufalos et al., 2012). Upon creating a surgical site care protocol, nurses will need education related to the use of the protocol, tools, and interventions. Lin et al. (2019), in an ethnographic study, indicated that facility procedures need to reflect current evidence-based practice and be readily accessible to reduce adherence barriers for staff. Skoufalos et al. (2012), in a program review, found that a multistakeholder approach increased adherence through collective creations of the tools and processes.

In summary, the literature identifies smoking, comorbid illness, blood loss, type of surgery (Abboud et al., 2014; Ban et al., 2016; Nobbs & Crozier, 2011; Sorensen et al., 2005; Walming et al., 2017; Whitney, 2012) and BMI as risk factors contributing to SSI and incision
healing (Abboud et al., 2014; Nobbs & Crozier, 2011; Walming et al., 2017; Whitney, 2012). The number of risk factors present in a patient should determine the dressing used for postsurgical incision care. In most cases, standard dressings are appropriate. However, NPWT is effective in preventing SSIs in some high-risk patients (Abboud et al., 2014; Bonds et al., 2013).

Based on a review of the literature, the development of a protocol integrating best practice recommendations was the focus of this DNP project for purposes of providing nurses with tools necessary to mitigate patient risk. To implement the protocol effectively, nurses required education to address their knowledge gaps and protocol implementation. The following discussion describes each component of the evidence-based practice question, including the target population, intervention, comparison or alternative, and outcome measures.

**Target Population**

The target population for this project plan included nurses caring for bariatric patients undergoing c-section procedures. Unfortunately, the DNP student was unable to collect demographic data about unit staff. The second component of the target population alluded to bariatric c-section patients and the following discussion addresses obesity in pregnancy.

The practice site did not have data specific to their obstetrics unit regarding the number of bariatric patients undergoing c-sections annually. However, in 2019, the organization recorded nearly 11,000 births between its three hospitals (The Mother Baby Center, n.d.). It was also unclear how many bariatric patients the specific practice site cared for annually. However, according to the CDC (n.d.), bariatric patients represented approximately 24.8% of the total annual obstetrics population in 2014. To establish measurable data for bariatric pregnant patients, obesity in pregnancy needed a concrete definition. For purposes of this project, the operational definition of obesity is the strict CDC definition regardless of pregnancy. To be
considered a bariatric patient, the patient must have a BMI greater than or equal to 30 (CDC, n.d.a).

The operational definition of obesity selected for this DNP project defines the target population based on BMI. However, this definition is problematic because obesity in pregnancy is not defined. Inconsistencies in identifying the obese pregnant patient population contribute to the practice problem. The organization used pre-pregnancy BMI to determine the patient’s obese classification. Pre-pregnancy data is often missing, and overlooks obesity developed during pregnancy. Also, using a target BMI greater than or equal to 30 does not address the benefits of enhanced surgical incision care to candidates presenting with lower BMIs. For example, according to Abboud et al. (2014), patients with a BMI greater than or equal to 25 may be candidates for NPWT based on comorbid illness and incision characteristics. Debating how to define the target population should not obscure the practice problem, meaning the importance of caring for overweight and bariatric obstetric patients at higher risk of developing an SSI.

**Intervention**

After selecting a target population, the next step in this project focused on identifying an intervention that address the practice problem. Practice gaps identified through a needs assessment and review of literature highlighting best practice surgical site care, including research specific to the bariatric patient population, determined the project intervention. The initial project plan focused on developing a practice protocol and care algorithm, but ultimately the Obstetrics Unit Educator created a care algorithm independently, with input from unit staff.

The project intervention was revised and limited to developing a practice protocol and staff education curriculum. The following section describes these interventions. The first subsection includes a description of a practice protocol that applies to all obstetric surgical
patients. The second subsection includes a curriculum outline for staff education that addresses knowledge gaps in incision care and implementation of the practice protocol.

**Intervention 1: Practice protocol**

A surgical site care protocol was developed after reviewing best practice information about patient risk factors for SSI, patient assessment processes, incision care, dressing types, and suture/staple removal. The following evidence was incorporated into this protocol, starting with foundational understandings. Because the practice site follows CDC surveillance standards, the site adopted the CDC’s SSI definitions. For purposes of this project, a superficial incisional SSI is defined as an infection occurring within 30 days of surgery involving only the skin and subcutaneous tissue and at least one of the following elements: purulent drainage, presence of organisms identified through culture or diagnosis of an SSI from a physician (CDC, n.d.b). The CDC defines a deep incisional SSI as an infection occurring within 30 days of surgery involving deep, soft tissue and at least one of the following elements: purulent drainage, spontaneous dehiscence, or intentional wound opening that had the presence of organisms identified through culture with at least one of the signs and symptoms of infection in the patient (fever, pain, tenderness), or an abscess or other evidence of infection involving the deep incision (CDC, n.d.b). The following discussion outlines key elements of the practice protocol. See appendix 1 for the practice protocol.

**Risk Factors.** The practice protocol includes patient risk factors for SSI. Understanding patient risk factors is important because the risk factors determine the patient’s risk category. No risk indicates that a patient has no additional risk factors; low risk indicates a patient has one of the identified risk factors; moderate risk indicates that a patient has two of the identified risk factors (Noorit, Siribumrungwong, & Thakkinstian, 2018). High risk indicates that a patient has
more than two of the identified risk factors (Noorit, Siribumrunwong, & Thakkinstian, 2018). A patient’s risk category helps care givers mitigate the effect of risk factors through intervention.

**Assessment.** Risk categorization occurs through thorough patient assessment. The patient assessment process outlined in the protocol requires nurses to consider other patient characteristics to identify potential issues. Other patient characteristics to assess include site location, dressing size, surface qualities, grade and appearance, exudate type and volume, state of surrounding skin, and level of incision pain, smell, and vital signs (Ban et al., 2016; NCCWCH, 2019; Whitney, 2012). Assessment should occur at least once per shift unless there are changes (Ban et al., 2016; NCCWCH, 2019; Whitney, 2012). Reassessment should occur with reported or observed changes from baseline (Ban et al., 2016; NCCWCH, 2019; Whitney, 2012). See appendix 1 for practice protocol.

Nurses intervene based on assessment findings and the patient’s level of risk. While this DNP project focused on a specific patient population, interventions apply to the care of all surgical incisions. For example, staff must monitor blood glucose, temperature, and blood loss post-surgery. Glucose levels greater than 180 mg/dL (Kwon et al., 2013), hypo and hyperthermia, and excessive blood loss are all linked to complex wound healing and SSI (Lin et al., 2019; Nobbs & Crozier, 2011; Noorit, Siribumrunwong, & Thakkinstian, 2018; Rouse et al., 2019). See appendix 1 for practice protocol. The assessment process offers essential patient information necessary for determining further interventions, such as dressing selection.

**Dressing selection.** Another component of the surgical site care protocol focused on dressing selection. At the practice site, it was noted that staff used standardized dressings, including typical island and silver-impregnated dressings, with low or no risk patients. According to the literature, this is appropriate, however with some moderate risk patients,
depending on risk factors or wound severity, NPWT may be a better option (Rouse et al., 2019). High-risk patients (patients with more than two risk factors) are candidates for NPWT unless otherwise contraindicated (Abboud et al., 2014). See appendix 1 for the practice protocol. Regardless of the dressing selected for the incision, the patient will require education on dressing use and care of the incision site.

**Patient education.** The final component of this DNP project intervention, namely a surgical site care protocol, focused on patients and their educational needs. Patient education is an important aspect of post-operative c-section care for several reasons, and staff must assess patient knowledge post-surgery and before discharge (Ahsan, 2015). There are many educational topics that all patients must understand. For example, patients need to understand normal occurrences post-surgery and signs and symptoms to report immediately for early intervention (Ahsan, 2015; Skoufalos et al., 2012). Early intervention is important to reduce the potential for deep tissue incisional infection and wound dehiscence (CDC, n.d.b.; Noorit, Siribumrungwong & Thakkinstian, 2018).

Patients need education on how to resume activities of daily living, such as bathing. The Ban et al. (2016) guideline indicates there is no evidence to show that bathing increases SSI risk. However, patients should not submerge most dressings left in place in water for an extended period (Molnlycke Health Care, Personal Communication, June 30, 2019). Therefore, showers and protective coverings for the dressing may be most appropriate in patients with dressings left in place. Over-saturated dressings will require more frequent dressing changes, which may increase SSI risk (Molnlycke Health Care, Personal Communication, June 30, 2019). See appendix 1 for practice protocol.
It is up to staff to assess and evaluate a patient’s informational needs (Ahsan, 2015). If an individual patient’s knowledge is insufficient, or health literacy inhibits understanding, patients may require other learning strategies. To have proper patient education, implement project interventions, and increase the likelihood of intervention sustainability, staff required education on the need for change, intervention measures, and expectations (Lin et al., 2019). The following section describes the project’s second intervention, namely developing a curriculum designed to increase unit staff’s knowledge about wound management techniques.

**Intervention 2: Staff education**

Thorough staff education is essential to any successful change process (See Appendix 5 for education outline), and according to Lin et al. (2019), is one way to reduce barriers to care. Barriers to care include topics, such as the need for or importance of change, use of equipment (e.g., dressings), how to access and use facility tools (e.g., protocol and algorithm), and understanding unit expectations (Lin et al., 2019). Therefore, to increase the likelihood of successful intervention of the practice protocol and algorithm (Intervention 1), staff needed education. By designing a curriculum that supported the implementation and use of the practice protocol and algorithm (Intervention 1), this intervention was considered an essential part of the DNP project (See Appendix 5).

This DNP project's initial plan included using a knowledge survey to determine the education's effect. Labeau et al. (2010) developed a nine-item survey to assess nurse knowledge about reducing SSIs. With the permission of Labeau et al. (2010) (Appendix 2), the project team modified the nine-item survey to include more questions regarding newer best practice standards for incision care. The purpose of the revised nine-item survey was to assess nursing knowledge
pre- and post-education to determine whether an educational intervention made a difference in understanding abdominal incision care and wound management.

Unfortunately, the unit staff decided to implement education sessions before the Institutional Review Board (IRB) study approval, and consequently, it was not possible to gather meaningful outcome data. Additionally, because of COVID-19, hospitals placed all student projects on hold, which created significant constraints on project progression. Despite multiple challenges, this project was able to address a significant practice problem, and as part of a larger initiative, offered an opportunity for continued efforts going forward. An evidence-based practice question always includes a comparison or alternative to the proposed intervention. The following discussion describes this comparison.

**Comparison**

Standard practice was the comparison selected for this DNP project; namely how bariatric c-section patients were cared for at this practice site before project implementation. A comparison serves as a control and allows evaluation of a particular intervention or treatment. Earlier in this paper, background evidence was presented and established the comparison component.

**Outcome**

The outcome is the final aspect of an evidence-based practice question and determines one’s evaluation measures. The project team determined several outcome measures at the onset of this DNP project, including measuring protocol adherence, resolving differences in staff knowledge because of the education intervention, changes in practice, and identifying barriers limiting best practice.
DNP Student Role

This DNP project was part of a larger initiative focused on obstetrical care within this organization. The DNP project centered on developing a practice protocol (Appendix 1), staff education about protocol use (Appendix 5), and modification of the nursing education survey (Appendix 3). Second, the DNP student conducted a literature review for the entire project, including a more extensive organizational study literature review. Initially, the DNP student's responsibility included collecting data from the chart reviews about adherence to the practice protocol and data analysis related to the items outlined in the DNP project proposal (e.g., the occurrence of SSIs, protocol adherence, and education). However, due to COVID-19, the student encountered site access restrictions.

Project Implementation/Findings

With the implementation of a surgical site care protocol and education on its use, there was an expectation that instances of SSI would decrease for the bariatric C-section population. The SSI rate was at the national average, one percent (Hospital Care Data, 2019). However, being at the national average is an increase for the practice site. In previous years, the practice site performed better than the national average. However, the hospital care data indicated that the national averages decreased, while the practice site's averages increased slightly or remained the same (Hospital Care Data, 2019). In 2018, the obstetrics unit had 17 total incisions that developed SSIs (See Table 1 for SSI Data). Of the 17 incisions with SSIs, 14 were bariatric patients, and one patient overweight patient based on the CDC definition with a BMI of 25 (See Table 1 for SSI Data). Bariatric patients make up roughly 82% of the SSIs for 2018, but only 24.8% of the annual unit population (See Table 2). Applying the protocol risk categories, the
2018 data showed nine moderate risk patients, seven high-risk patients, one low risk patient, and no patients from the no risk category (See table 3).

**Table 1: SSI Data (2018)**

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<th>Patient #</th>
<th># of Comorbid Illnesses</th>
<th>Infection Type</th>
<th>Pregnancy Related Illness (I.E. Preeclampsia)</th>
<th>Surgery &gt; 56 min</th>
<th>BMI</th>
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<td>No</td>
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<td>3</td>
<td>EMET</td>
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<td>EMET</td>
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<tr>
<td>17</td>
<td>1</td>
<td>Deep</td>
<td>Yes</td>
<td>No</td>
<td>23</td>
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</table>
Table 2: Bariatric SSI Rate

<table>
<thead>
<tr>
<th># BMI ≥ 30</th>
<th>% of Infections</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>82.4</td>
</tr>
</tbody>
</table>

Table 3: Patient Risk Category Based on 2018 SSI Data

Surgical Site Infection

As stated previously, the SSI rates before the project for the practice site are no different from the national average (one percent) for hospital performance (Hospital Care Data, 2019). Despite being comparable to the national average, staff and leaders on the obstetrics unit experienced an increase in the number of SSIs in their bariatric c-section patient population due to growing numbers of bariatric patients the unit receives. The project's goal was that the
intervention would decrease SSI rates in the bariatric c-section patient population to either meet or decrease compared to the hospital and national averages. The following critical review includes best practice information that supports the organizational goal of reducing SSIs and supporting the interventions previously discussed.

**Framework**

The Model for Improvement (MFI) is a quality improvement framework that the Associates in Process Improvement created and the Institute for Healthcare Improvement (IHI) endorsed (IHI, n.d.). The MFI is a commonly used quality improvement framework in healthcare settings (IHI, n.d.). The model includes three essential questions for beginning a quality improvement endeavor: what are we trying to accomplish, how will we know that a change is an improvement, and what change can we make that will result in improvement (IHI, n.d.). The purpose of asking the three essential questions in the quality improvement process is to set aims for a project, establish measures for a project, and identify the changes that occur after project implementation. After answering the three essential questions, the model calls for several cycles of the Plan, Do, Study, Act (PDSA) framework to implement, test, and spread change (IHI, n.d.). See Appendix 6 for model visual.

The MFI framework is ideal for the project because implementing the project’s interventions requires continual monitoring, assessment, and interruption to increase the likelihood of success. During the preplanning phased of the project, the learner, with the input of the site mentor, unit leaders, and staff, answered the three essential questions to develop the aims for the project, identify the outcomes measures, and the desired changes for the institution, the larger project, and the unit. The multiple cycles of the PDSA framework allow for the planned implementation interruptions explained in the Methods section for the project. The purpose of
interruption is to address barriers to implementation during the project to promote the intervention implementation's sustained success.

**Methods**

The proposed method for the original DNP project was a quantitative, quality improvement design. The initial plan included repeated measures to determine the staff’s baseline knowledge, the knowledge acquisition from the education session, and knowledge retention. The reason for the use of repeated measures was the small size of the nursing population. The repeated measures design would allow for statistical inference with fewer subjects by reducing the variance of treatment estimates (Laerd Statistics, n.d.). The use of the repeated measure allows for determining the effect of the intervention on staff over time. However, due to the COVID-19 pandemic, the use of repeated measures was not possible.

During the beginning stages of the COVID-19 pandemic, the intent was that the project would continue after the organization’s initial lockdown phases that prevented students from entering the facility to control for infection. Unfortunately, the lockdown continued for the duration of the project's implementation, data collection, and evaluation phases. The practice site halted the work on projects and research in late March. The invitation for students to return to the practice site did not occur until August of 2020 after the project implementation period concluded. Additionally, the initial education session occurred in February of 2020. The interruption between the initial stages of the intervention period and when the site invited students back was too long to do anything more on the project. Staffing changed, the workload increased, and some previous project participants stopped communicating or became unwilling to participate due to time constraints.
Because of the COVID-19 pandemic, the design of the initial project had to change based on the available data. Following the MFI framework for this project, the new project design involved multiple PDSA cycles. The implementation of the PDSA cycles began with determining the organizational need and ended with staff education sessions. The following section will include details of the initial project design and intent because the initial project design outlines the need for further investigation.

**Implementation**

Implementation of this DNP projects’ interventions initially involved two phases. The first part of implementation included a 30-minute education session during the unit’s annual education event for all staff in February and March of 2020. The expectation was that all staff involved in surgical incision care use the practice protocol and algorithm (Intervention 1) (See Appendix 1). The initial plan included monitoring education and protocol adherence biweekly over six months. During monitoring for adherence, the initial project design included additional coaching for nurses at the bedside as needed (interruption). Additionally, the intent was for project members to track barriers to adherence to make the necessary change to improve adherence measures throughout the project implementation phase (interruption) (Skoufalos et al., 2012).

Because of COVID-19 and its effect on organizational projects, the project design and implementation changes. As a result of the design change, the implementation phase began with the first PDSA cycle. The first PDSA cycle included the initial needs assessment.

**Determination of Organizational Need (Needs Analysis/Assessment)**

Even though the practice site has a designation as a bariatric care center, this label does not reflect the organization’s overall goals, specifically to become a premier referral site for
high-risk pregnancies in the Minneapolis-St. Paul area (Bryant, R., Personal Communication, November 11, 2019). Therefore, to reach the organization's goal, project leaders must determine the gap between current practice and goal achievement.

**Plan, Do, Study, Act Cycle One.** One step toward meeting the obstetric unit's goal was to address issues related to high-risk pregnancies associated with bariatric patients. During the first meeting with the organizational leaders overseeing this DNP project, the obstetrics department CNS identified that the department experienced an increase in SSIs in their bariatric c-section population. As stated earlier, the institution uses the Center for Disease Control and Prevention (CDC) definition of obesity, and describes a bariatric patient as someone who has a body mass index (BMI) at 30 or greater (CDC, n.d.a).

Even though the organization uses the CDC definition for its general bariatric patient population (Hoffman, S., Personal Communication, November 11, 2019), the CDC does not define obesity in pregnancy. (CDC, n.d.a.). Therefore, the unit initiated bariatric interventions when a patient has a pre-pregnancy BMI greater than 30 or is over 300 pounds (Hoffman, S., Personal Communication, November 11, 2019). Admittedly, the practice site does not always have access to pre-pregnancy BMI data (Hoffman, S., Personal Communication, November 11, 2019), so it is unclear how one would initiate bariatric interventions without pre-pregnancy weight. The practice sites’ previous practice for initiating bariatric care was a slight departure from the CDC definition, including patients with a BMI equal to 30 (CDC, n.d.a.). Additionally, the obstetrics unit initiated special interventions for patients with a pregnancy BMI greater than 40 (Hoffman, S., Personal Communication, November 11, 2019).

Based on the information from the initial site meeting, it was clear that there were too many unclear variables related to the definition of obesity in pregnancy. Unfortunately, there is
no clear definition in the literature. However, because pre-pregnancy data remains inconsistent, a change had to be made in the definition of obesity for the unit. Therefore, this DNP project's first action was to adopt the operational definition of obesity, which is the strict application of the CDC guideline.

**Plan, Do, Study, Act Cycle Two.** The next step in the project implementation included analysis of existing data regarding bariatric c-section patients and SSIs. The organizational data required recoding based on the new operational definition of obesity for the DNP project. Based on the new definition, the data indicated that in 2014, the bariatric population made up approximately 24.8% of the total population of women delivering babies annually (CDC, n.d.b).

The percentage of bariatric obstetric patients undergoing c-section is unknown for the organization. However, based on the operational definition of obesity, the site identified that of the 17 c-section incisions that resulted in SSIs during 2018 in their obstetric unit, 14 of the patients’ pregnancy BMI classified them as obese or morbidly obese. Of the remaining patients with SSIs, one patient met the CDC definition for overweight, and two patients were from the CDC’s normal weight category. Based on the findings, approximately 82 percent of the obstetric unit’s SSIs were bariatric patients. Therefore, bariatric patients are experiencing SSIs at a rate disproportionate to their overall patient population.

The rate of SSIs bariatric patients experienced illustrates the importance of post-op c-section incision care to improve the bariatric pregnant patient's overall care. Additionally, addressing the gap in care to bariatric pregnant patients helps the organization achieve its goal to become a premier bariatric referral site. Because of the findings from the existing organizational
data, project leaders discovered the gaps in care provided to bariatric pregnant patients. The next step was clear; to identify gaps in incision care for patients undergoing c-section procedures.

**Plan, Do, Study, Act Cycle Three.** After attending a staff meeting for the obstetrics unit, a clear gap in knowledge emerged regarding the current best-practice care for surgical incisions in general, especially for patients presenting with additional risk factors for SSIs. Even though the surgical dressings allow practitioners to view skin surrounding the incisions, practitioners verbalized a desire to see incisions before patient discharge when literature indicates that dressings should remain in place (Whitney, 2012). Additionally, incision care methods differed based on surgeon preference rather than patient characteristics, which demonstrates the need for a standardized care process on the unit that reflects best practice incision care. Following the meeting, a review of site standards uncovered a policy for wound care and a policy for preventing SSIs. Neither of the existing policies included information specific for pregnancy or bariatrics. Thus, the third PDSA cycle's focus was to identify the most current best practice guidelines for incision care, develop a practice protocol, and staff education.

**Plan, Do, Study, Act Cycle Four.** After reviewing the literature specific to surgical site care, and risk factors for SSIs, a significant amount of research was greater than five years old. In addition to there being older literature, literature addressing the care of bariatric surgical patients is primarily limited to weight loss surgery. However, even though literature addressing this topic includes articles greater than five years old or other bariatric surgeries, surgical site care recommendations remain pertinent. The protocol and algorithm from the Intervention 1 section, developed based on the findings of the literature review (See Appendix 1 for protocol). The project aims to develop a protocol and algorithm that addressed the standardization of care issue identified in the third PDSA cycle. However, because the staff wants to visualize the
incision during the assessment, some staff disagreed with the new protocol and algorithm's content.

**Plan, Do, Study, Act Cycle Five.** The staff had attitudes and beliefs about surgical site care that were inconsistent with the new protocol and algorithm. Because the newly developed protocol and algorithm differed from previous practice, the staff required education to address potential knowledge gaps in caring for surgical incisions. The most current best practice literature drove the education development based on the identified staff knowledge gaps identified in the third PDSA cycle. The literature included collecting the most current best practice literature for surgical site care and care of the incision in a bariatric patient. The education helped staff identify the reason for needing practice change, key differences in staff expectations, information about using the new dressing tools, and assessing the new material (see Appendix 5). The fifth PDSA cycle identified important elements needed to achieve the organization’s goals. However, it is important to understand the original evaluation plan for the DNP project to outline the modified project’s limitations.

**Evaluation**

The initial DNP project evaluation plan included continuous data collection throughout the six months, starting with at least three 15-item knowledge survey administrations. The survey intervals included a pre-education assessment to establish baseline knowledge, an immediate post-education survey to determine knowledge acquisition, and at least one additional post-education survey to measure knowledge decline. Unfortunately, project leaders were unable to administer the initial knowledge survey at the education event, and the effects of COVID-19 interrupted the other opportunities to administer the survey.
However, implementation of PDSA cycles and the initial education experience highlighted this DNP project's limitations. The project method and design had to change mid-implementation and evaluation phase. The abrupt change in the project plan created gaps in all aspects of the original DNP project. Based on the data obtained from the needs assessment, clear themes about practice occurred. First, many staff on the unit continue to use outdated practices regarding surgical site care, even post-education. Some outdated practices, such as premature suture removal and frequent dressing changes, may cause greater risks for all c-section patients, especially those classified as obese (bariatric). Second, a discrepancy between the research department and obstetrics unit about the best way to address issues, such as education session content, method, design, and timeliness of content delivery was apparent. The previously mentioned discrepancies caused significant disparities between the project proposal and actual implementation. Finally, because project leaders could not assess staff knowledge, it is unclear what the staff baseline knowledge was and if knowledge improved from baseline based on the education. Therefore, staff knowledge may not be a contributor to the lack of adherence to the new protocol. The practitioners, such as midwives and physicians, were often the driving forces behind practice gaps. For example, the physicians choose when to remove the sutures and remained steadfast on visualizing wounds.

Discussion

The COVID-19 pandemic greatly affected the DNP project. The pandemic caused an abrupt change to the project method and design, which left the DNP Project’s initial aims unaddressed. Additionally, events during the DNP project illustrated the difficulty DNP student’s positions completing a project in an organization where they are not employed.
Because there are no baseline measurements for staff knowledge regarding SSIs, there is no data on the efficacy of staff education. There is no way of knowing if the staff retained that knowledge. Therefore, staff may or may not have knowledge gaps related to SSIs. The practitioner initiates many of the critical interventions for decreasing greater SSI risk, especially in bariatric patients. Without the education data, one cannot determine how knowledge contributes to the barriers to implementing the protocol and for patient advocacy.

Another important limitation of the DNP project is the implementation of the protocol. The protocol's implementation process lacked clarity because the research departments (research and infection control) and the unit educator had differing perspectives regarding the education content and methods. The interested parties made compromises for delivery of the educational component to meet the DNP student’s needs. However, the unit educator delivered the education before IRB approval. Therefore, project leaders could not include the survey. Additionally, the delivery of educational content was unclear. It is unclear if content remained unchanged, if the unit used the protocol, and if there was an assessment to determine implementation success.

The disagreements between organizational staff involved in the project left the DNP student to navigate competing needs. The project must continue to meet the needs of the organization and fulfill the project requirements for educational purposes. As a student, it was important to complete the project while pleasing the organization. Negotiation is difficult for students when priorities no longer align. The DNP project illustrated the difficult of balancing the needs of the school, organization, and unit. Despite the efforts not to offend site personnel, there was a point in the DNP project where unit staff disengaged due to disagreements.
Recommendations

Even though the completion of the DNP project was different from the original plan, substantial information can still come from the data collected. Because this project is part of a larger research study within the organization, the information of this project provides details related to gaps in practice and limitations of the organization and the existing literature.

The first recommendation is to address the discrepancies in the definition of obesity in pregnancy. The organization is defining obesity in pregnancy in a variable way. Based on the organization definition, a patient’s classification as obese is determined by pre-pregnancy data that may not exist for all patients. When data is lacking, staff are guessing as to the bariatric status of a patient. It is unclear who is determining bariatric status, and it is unclear what data is being used for the bariatric determination.

The second recommendation is to revisit interventions protocol implementation, education, and the knowledge survey of this DNP project. It is important to identify the knowledge gap and how it contributes to implementation barriers. Additionally, it is important to validate that there is a protocol in place for standardizing practice. Once the protocol is in place, it is easier to conduct chart audits to determine if staff are using the interventions outlined in the protocol.

The third recommendation is to revisit the project interventions using the original interrupted, repeated measures design. In the original design, the knowledge survey administration occurs through a Qualtrics link that does not include the collection of any identifiable participant data. The survey does not require participants to include any identifying information on their surveys. The survey should be administered before the education, immediately post-education, and at least once, a few weeks after initial education. The purpose
of the staggered survey administrations is to establish baseline staff knowledge, knowledge
acquisition based on education, and knowledge retention.

Using the initial project design requires both retrospective and prospective data. The
retrospective data includes all patients undergoing a c-section procedure admitted to the unit
during the year before the beginning phases of the project. The prospective data should include
all patients undergoing a c-section procedure admitted to the unit post-project implementation,
knowledge data, and barriers/threats to adherence.

The staff survey is housed in Qualtrics and is available for future use by the organization.
The survey design in Qualtrics does not track any personal data from participants, including
name, birth date, or email. The questions on the survey do not include solicitation of any
personal or identifiable participant data. No patient data is ever recorded. The initial plan for
data analysis included several outcome measures. The retrospective and prospective data
analysis will identify if there is a change in the overall reduction in SSIs. When adherence data
is collected, the findings will determine threats to the success of the implementation. Finally,
there are two purposes for collecting education data. The first purpose of collecting education
data is to demonstrate a decrease in the knowledge gap of staff. The second purpose determines
if knowledge contributes to adherence to the protocol.

**Incision Infection.** Data about incision infection is nominal is recorded as infection yes
and infection no. The infection control specialist determines if an infection is present using the
Center for Disease Control and Prevention (CDC) guideline for SSIs (Berrios-Torres et al.,
2017). The analysis would require a two-by-two chi-squared statistical analysis or a Fisher exact
test depending on the sample size.
Adherence. The Institute for Healthcare Improvement (IHI) defines adherence as the degree to which one follows instructions given on a procedure or intervention (Federicko & Oyekan, 2012). The original project plan included the collection of adherence data, which is a review of patient charts. The data collected in the chart review would indicate adherence through charted documentation for dressing removal, incision assessment, and patient education according to the new protocol. Each chart will have a rate of adherence. Statistical analysis would include an average.

Education. The tool to measure knowledge levels of nurses regarding best practice methods for incision care is a modification of the Labeau (2010) nine-item survey. The author approved modifications (see Appendix 2), which included removing one non-applicable item and the addition of seven items that cover nutrition, assessment, risk factors, and signs of infection (see Appendix 3). Each item has four response choices with one correct answer and three distractors (Labeau et al., 2010). The score for the survey is the total number correct out of 15 total points. Labeau et al. (2010) used an expert panel to develop a content validity index score of .05 for the original nine items. Subsequent studies site the nine-item survey indicating reliability using test-retest (Ding, Lin & Gillespie, 2016; Qasem, & Hweidi, 2017).

The test scores for the 15-item survey produces interval level data. The survey data requires testing for normality in distribution and outliers. The distribution of data would determine the statistical test used. If the data is normally distributed, a repeated measures ANOVA test would be used to detect if differences between mean scores exist. If the data is not normally distributed, transformation of the data may lead to normal distribution. However, if the transformation is ineffective in creating a normal distribution of the data, a non-parametric test (Friedman) should be used.
The fourth recommendation is to create risk categories based on data. The risk categories used in this DNP project came from a surgical study use pre-op and inter-op. It is unclear if those categories apply post-op. Future researchers could create classifications of risk based on more specific data that might be better to determine a patient’s actual risk for SSI development.

Finally, the fifth recommendation is to address the knowledge gaps regarding research and education. This DNP project illustrated that the key reasons for disagreement between the research departments and the obstetrics units were knowledge of the research process and education pedagogy. Ideally, those involved in future studies will be opened to different ideas and processes. Still, in the event of pivotal disagreements, it helps to have the ability to address issues in a way that does not jeopardize the entire study.

**Results**

The aim of the quality improvement project was to establish how the use of education, protocols, and algorithms could affect nursing knowledge related to best care practice for incision management. The overarching goal was to improve patient care outcomes for all patients undergoing c-section procedures by targeting patient care outcomes disproportionately affecting the bariatric patient (SSI). Because of COVID-19, the data collection and analysis did not occur. This DNP project's results are the development of the protocol for surgical site care in obstetrics and an educational counterpart. Creating a continuous quality improvement process and determining the next steps for the organization related to SSIs can aid the organization in its goal to become a premier referral site for high-risk pregnancies. This project's results demonstrated the need for additional research regarding obstetric incision care and management of the bariatric pregnant patient.
References


Appendix 1: Protocol and Algorithm

Clinical Practice Protocol for Post-Operative Care of C-Section Incisions

RATIONALE: The purpose of this protocol is to promote optimal incision healing, increase patient comfort, and implement cost effective incision care in line with best practices for c-section patients. The aim of this protocol is to reduce surgical site infections for all patients undergoing a c-section procedure at Abbott Northwestern Hospital.

TARGET GROUP: The protocol is meant to be used by all health care providers caring for patients post c-section surgery.

TRAINING: All staff in the obstetric surgical unit and the postpartum care unit are responsible for completing initial education regarding the use of the protocol and any additional coaching required based on performance. Additional refresher training will be in accordance with hospital annual training guidelines.

RISK ASSESSMENT FOR SURGICAL SITE COMPLICATION: All c-section patients must undergo a risk assessment for surgical site complication. Risks for surgical site complications include BMI equal to or greater than 30, history of smoking, history of SSI or dehiscence, presence of diabetes, hypertension, use of medications that impair incision healing (i.e. steroid use) fecal contamination, incision length, chromioamnionitis, and length of operation. Patient risk will be identified based on the following four categories:

- No risk factors: no risk
  - No risk does not mean one will not have surgical site complications. It means there is no additional risk based on patient and surgical factors.
- One risk factor: low risk
- Two risk factors: moderate risk
- More than two risk factors: high risk

Because BMI and comorbid illnesses are significant risk factors for surgical site complications, patients with such conditions may meet standards for high risk surgical site complication interventions.

INCISION ASSESSMENT: The original surgical site dressing should remain in place and uninterrupted. The target goal is to keep the original surgical dressing in place at least 48 hours and can remain in place 3-5 days post-op. Assessment should be complete without premature removal or “pulling back” of the original surgical site dressing. Surgical site dressings should only be removed if there is a sign of infection or surgical site complication. Surgical dressings will allow for visualization of the skin surrounding the incision.

- Complete initial incision assessment and record baseline observations. Incision assessment includes site location, size of dressing to cover the incision, surface, grade and appearance, exudate type and volume, state of surrounding skin and level of incision pain, odor, and vital signs (Including temperature and blood glucose).
Incision assessment does not require visualization of the incision. During assessment, note if the original dressing is intact, presence or absence of erythema, swelling, odor, drainage, pain, discomfort, and other physical signs of incision complication. Monitor systemic indicators for incision complications such as elevated temperature, white blood count and blood glucose.

- Incisions should be assessed at least once per shift for oncoming nursing staff.
- Reassessment of the incision should take place with any reported or observed changes from baseline observations and any time the dressing requires changing.

**INTERVENTIONS:** Intervention choices should be made based on patient risk level for surgical site complication and initial and subsequent incision assessment. The following are evidence-based interventions to reduce the instance of surgical site complications.

- Monitor blood glucose immediately post-surgery. Glucose levels greater than 180 mg/dL are associated with higher instances of surgical site complications.
  - Treat glucose levels greater than 180 mg/dL based on physician or standing orders.
  - Glucose levels lower than 110 mg/dL may cause risk for surgical site complications
- Monitor temperature. High temperatures are associated with infection. However, hypothermia conditions are linked to increased rates of surgical site complications.
  - Warming and cooling efforts should be based on patient assessment and sound clinical judgment.
- Monitor blood loss. Blood loss and blood transfusion candidates are at increased risk for surgical site complication. Monitor and document the blood saturation level of vaginal pads and surgical dressings. Patients with significant blood loss may require additional antimicrobial/bacterial prophylactic measures to decrease surgical site complication risk.
- Dressing selection.
  - For no and low risk patients, the use of standard dressings or silver-impregnated dressings are sufficient.
  - Moderate risk patients may be candidates for negative pressure incision therapy (NPWT) if there is increased exudate/drainage, if the patient has a contaminated incision, patients with chorioamnionitis, or patients with high BMI (BMI greater than 40). If the patient is not a candidate for NPWT, silver-impregnated dressings are indicated.
  - High Risk patients are candidates for NPWT. Unless there are indicators that NPWT is not needed or is contraindicated, patients deemed high risk should have single-use NPWT dressings.
- Follow normal post-operative routines for nutrition, hydration, and ambulation, unless otherwise indicated. Diets high in protein are known to promote wound healing. Patient’s should be prompted to select food choices high in protein unless otherwise indicated.
EXUDATE: Exudate exists in both acute and chronic incisions as part of the normal healing process. Exudate is an important part of the healing process but may become problematic if it is excessive or malodorous.

INFECTION OR DEHISCENCE: If infection or dehiscence is suspected, fill out the appropriate documentation and swab incisions for cultures. Other interventions will be on a case-by-case basis.

SUTURE AND STAPLE REMOVAL: Premature removal of sutures or staples is linked to increased rates of surgical site complication. Staples should remain in place for 3 to 10 days post-op and sutures should remain in place for four to five days.

PATIENT EDUCATION: Patients should receive education about c-section and surgical site complications pre-surgery (if time allows) and prior to patient discharge. Patient education should include information about signs and symptoms to report immediately, normal incision healing, dressings and dressing removal, bathing, obstetrics follow-up care, and suture/staple removal.

- Patients need education to understand the importance of reporting changes in pain, feeling ill, bleeding, etc.
- Patient education must include information regarding whether it is alright to shower or take baths. If the incision or dressing type indicates that the patient may not fully submerge in water, they will need bathing instructions.
- Patients will need education about when they may remove the original surgical dressing (See patient education protocol and teaching guide).
  - Must include instructions for cleaning and redressing the site
  - Must include instructions to return for suture/staple removal if leaving the hospital prior to the third post-op day.
  - Must include instructions for signs and symptoms to report or that require return to the hospital or clinic.
References


OB Surgical Dressing Algorithm

- Cesarean Delivery
  - Scheduled
  - Urgent
  - STAT

- BMI > 50?
  - Yes: Advanced Dressing or Vacuum Dressing
  - No

- BMI > 40?
  - Yes: Advanced Dressing
  - No

- Does this patient have any of the following infection risk factors?
  - Diabetes (Type 1, 2, GDM)
  - Anemia (pre-eclampsia) 10
  - Chronic hypertension or preeclampsia with severe features
  - Tobacco, alcohol or substance use during pregnancy
  - Chorioamnionitis (confirmed or suspected)
    - PPROM or MRSA
    - Need for blood transfusion
    - Surgery duration > 90 minutes
  - STAT Cesarean

- Standard Dressing
Appendix 2: Author Permission for Adaptation of 9-Item Survey

Sonia Labeau <sonia.labeau@kogent.be>

Dear Shelley,

Thank you so much for your interest in our research. It is my pleasure to grant you permission to use the questionnaire and to adapt it according to your needs on the sole condition that it is properly referenced.

As the questionnaire has been developed quite some time ago and has not been updated since, please consider that it might be necessary to revise and bring it up to date according to the most recent guidelines.

I wish you lots of success with your project. Please do not hesitate to get back to me with any questions that might come up.

Kind regards, thank you
Sonia
Appendix 3: Sample of Nursing Knowledge 15-Item Survey

Research Consent Form
Survey Introduction

Key Information about this Study
Ruth A. Bryant PhD, MS, RN, CWOCN, Director of Nursing Research at Abbott Northwestern Hospital, part of Allina Health in collaboration with Shelley Rayborn MSN PHN RN, DNP Student at St. Catherine University invites you to take part in a quality improvement project about reducing surgical site complications in bariatric cesarean section (c-section) patients. The purpose of the project is to implement best practice incision care interventions for bariatric patients through development of a care protocol. We are asking you to participate because you are an employee that is involved in the post-operative care of bariatric c-section patients.

If you decide to participate in the quality improvement project, you will be asked to fill out a survey at three different points during the project about your knowledge of post-operative incision care. This questionnaire will take about three to five minutes to finish. There are no right or wrong answers to these questions. You may skip any question you do not want to answer. Risk is minimal. There will be no identifying data on the survey that can identify participants.

As stated previously, the survey does not ask you to include any identifiable data. You will not be asked for your name, employee ID, birthdate, or phone number. You will be asked to create a unique, four-digit code to place on all your survey submissions so pre and post data can be linked. Researchers will not be able to connect your answers in the questionnaire to you. The only people allowed to see your information will be the people who work on the study and people who make sure we run our study the right way. We plan to publish the results of this study but will not include your personal information.

Participation in the project is voluntary. Even if you decide to participate in the project now, you may stop at any time. If you have any questions about the study or feel that you have been injured in any way by being in this study, please contact: Shelley Rayborn by email at smrayborn@stkate.edu or by phone at 917-963-0226.

The Allina Health Institutional Review Board (IRB) has reviewed this project. If you have any concerns about your rights in this study, please contact the Allina Health IRB at 612-262-4920 or IRB@allina.com.
## Questionnaire for Post-Operative Incision Care

### Prevention of surgical site infection

1. It is recommended to protect a closed incision ...

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>during the first 12 hours following surgery;</td>
</tr>
<tr>
<td>B</td>
<td><strong>during the first 24-48 hours following surgery</strong>;</td>
</tr>
<tr>
<td>C</td>
<td>during the first 5 day after surgery;</td>
</tr>
<tr>
<td>D</td>
<td>I do not know.</td>
</tr>
</tbody>
</table>

2. The appropriate time to shower or bathe with an uncovered incision is ...

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>A</td>
<td>≥ 48 hours following surgery;</td>
</tr>
<tr>
<td>B</td>
<td>≥ 96 hours following surgery;</td>
</tr>
<tr>
<td>C</td>
<td><strong>unresolved by lack of evidence</strong>;</td>
</tr>
<tr>
<td>D</td>
<td>I do not know.</td>
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3. Surveillance succeeds in reducing the incidence of SSI.

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<thead>
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<tbody>
<tr>
<td>A</td>
<td><strong>Yes it does</strong></td>
</tr>
<tr>
<td>B</td>
<td>Yes it does, but only when accompanied by supplementary preventive measures.</td>
</tr>
<tr>
<td>C</td>
<td>No it does not, surveillance only helps to gain insight into the prevalence of infection, but has no influence on incidence rates.</td>
</tr>
<tr>
<td>D</td>
<td>I do not know.</td>
</tr>
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</table>

4. SSIs are classified as ...

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<tbody>
<tr>
<td>A</td>
<td><strong>superficial incisional SSI, deep incisional SSI, and organ/space SSI</strong>;</td>
</tr>
<tr>
<td>B</td>
<td>superficial incisional SSI, SSI in subcutaneous to fascial layers, and subfascial SSI;</td>
</tr>
<tr>
<td>C</td>
<td>superficial incisional SSI, deep incisional SSI, and necrotising SSI;</td>
</tr>
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Appendix 4: Educational Handout

Reducing Surgical Site Complications for C-Section Patients

Interprofessional Evidence-based Practice

One Minute Updates

Surgical Site Care

Purpose
The purpose of this one minute update sheet is to promote optimal incision healing, increase patient comfort, and implement cost effective incision care in line with best practices for c-section patients. The aim of this education is to reduce surgical site complications for all patients undergoing a c-section procedure at Abbott Northwestern Hospital. Surgical site complications include surgical site infection and acute incision failure (deliriousness).

Risk Assessment
- All c-section patients must undergo a risk assessment for surgical site infection (SSI).
- Risk assessment includes review of patient relevant past medical history, comorbidities, surgical data (including time, incision length, complications, etc.) and assessment of the incision site.
- Incision assessment includes site location, size, dressing type, surface grade, appearance, surrounding skin characteristics, presence of drainage/exudate, characteristics of any present drainage/exudate, volume of drainage/exudate, pain, skin temperature, odor, and patient vital signs.
- Assessment occurs upon patient arrival, at least once per shift, and with any observed or assessed changes from baseline.
- Risk level based on number of risk factors present: No risk, low, moderate, and high

Risk Factors to determine risk category
Risk categories are based on additional patient categories that contribute to risk for surgical site infection. No risk does not mean that there is no patient risk. It means the patient does not possess additional risk factors.
- BMI equal to or greater than 30
- History of smoking/alcohol/substance use
- History of SSI or deliriousness
- Presence of comorbid illnesses such as diabetes and hypertension
- Use of medications that impair incision healing (i.e. steroid use)
- Fecal contamination
- Incision length

Interventions

Assessment
Dressings—Island, Silver, and Negative Pressure Wound Therapy (NPWT) (PREVENA)
Dressings remain in place, uninterrupted for at least 48 hours post surgery
Monitoring vital and systemic signs of infection
Nutrition—diets high in protein promote healing

Surgical Site Complication Patient Risk Factors

- BMI ≥ 30
- Smoking History
- History of SSI/deliriousness
- Length of incision
- Medications
- Comorbidities
- Fecal Contamination
- Chronicomniotis
- Length of operation

Assessment Principles
- Conduct initial/baseline assessment
- Reassess with observed or reported changes from baseline
- Complete skin assessment of the surgical site and surrounding skin
- Continuous monitoring of the patient vital signs and systemic signs of infection.

Dressings
- Leave in place, uninterrupted for at least 48 hours.
- Standard dressings include both standard island and silver impregnated dressings.
- Negative pressure wound therapy dressings may be indicated in some patient populations.
- Dressing selection should be based on patient risk and need.
Appendix 5: Objective from Education Session

Objectives

A. To incorporate strategies to promote optimal incision healing in both the healthy and chronically ill pregnant patient

B. To address the unique risk factors that affect c-section patients, including those from high-risk care populations, such as bariatric patients

C. To clarify and explain the expectations of the new surgical incision care protocol/algorithm

D. To explain the use of Negative Pressure Wound Therapy (Prevena)
Appendix 6: MFI Framework