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# Surgical Site Infection Reduction Through Nasal Decolonization Prior to Surgery

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Surgical Site Infection Reduction Through Nasal Decolonization Prior to Surgery

Melissa S. Schmidt

University of San Francisco

### **Surgical Site Infection Reduction Through Nasal Decolonization Prior to Surgery**

The Centers for Disease Control and Prevention define surgical site infection (SSI) as an infection within 30 days after surgery without an implant and 90 days for patients with an implant, and classify the infection as superficial, deep, or involving the surrounding area or organ (Mockford and O'Grady, 2017). Surgical site infections occur in 2-5% of patients who undergo surgery, and are currently the most common and expensive healthcare-acquired infection in the United States (D. J. Anderson et al., 2014). Currently The Joint Commission (2016) lists reducing and eliminating SSIs as a national patient safety goal. To meet this goal hospitals employ many interventions. One of the recommended interventions to reduce SSIs is to provide nasal decolonization for *Staphylococcus aureus* (*S. aureus*). In the summer of 2016, the Clinical Nurse specialist from the Infection Control Department identified rising methicillin-resistant *Staphylococcus aureus* (MRSA) surgical site infections as an opportunity to adopt new interventions to improve rates in the medical center. The project goal was to reduce surgical site infections at the hospital by implementing a nasal decolonization intervention of *Staphylococcus aureus* before surgery.

Nursing care can directly affect long-term outcomes for patients. At a large Veteran's hospital on the West Coast, I undertook the opportunity as a clinical nursing leader (CNL) student to create and implement an improvement project to reduce surgical site infection through nasal decolonization of high-risk patients. The role of the CNL has evolved since its introduction in 2007. As a microsystem expert, one of the strengths of the CNL is developing quality improvement strategies which improve outcomes for patients without increasing the burden on frontline staff. This improvement project incorporated expert knowledge of the microsystem, patient preparation, and current evidence-based recommendations to create an

intervention reduce SSIs through nasal decolonization for *Staphylococcus aureus* (*S. aureus*) prior to surgery.

### **Clinical Leadership Theme**

The Clinical Nurse Leader role embraces nine core competencies; advocate, member of a profession, team manager, information manager, life-long learner, systems analyst/risk anticipator, clinician, outcomes manager, and educator (American Association of Colleges of Nursing, 2013). The theme for improvement was the reduction of surgical site infections (SSIs). This quality improvement process incorporated advocate, team manager, outcomes manager and educator competencies.

As an advocate, an opportunity to improve patient outcomes while reducing cost was identified. Reducing surgical site infections supports a high quality of life and successful surgical outcomes. As outcome manager, I designed and implemented a process to treat all patients with a surgical incision to prevent deep tissue MRSA infections.

As outcome manager, I collaborated with a Clinical Nurse Specialist who is an SSI reduction expert. It was critical that all disciplines understood and executed their roles in the process. In accordance with CNL Competency 2.2, “Assume a leadership role of an interprofessional healthcare team with a focus on the delivery of patient-centered care and the evaluation of quality and cost-effectiveness across the healthcare continuum” (American Association of Colleges of Nursing, 2013, p. 10), the new process was developed and implemented with support. As a CNL student I coordinated with the commodities committee to obtain the product needed for implementation, and with Information Technology (IT) to create documentation to reflect the intervention performed.

As an outcome manager, I used baseline data to select opportunities for improvement in

the microsystem. I monitored charts to evaluate completion of the intervention and documentation. I followed the SSI rates and assessed the efficacy of the intervention to determine the next steps, if needed, to improve MRSA SSI rates. This aligns with CNL Competency 3.1, “Use performance measures to assess and improve the delivery of evidence-based practices and promote outcomes that demonstrate delivery of higher-value care” (American Association of Colleges of Nursing, 2013, p. 12).

For the implementation of the quality improvement project, I embodied the CNL educator role in many ways. Before implementation I developed teaching aides for implementation to aid in the proper use of the chlorhexidine wipes and povidone-iodine nasal swabs (see Appendices A and B). I prepared and presented a 15-minute seminar on surgical site infections, present hospital SSI rates, existing interventions, and proposed changes. For the first week of implementation I was present and available for staff to answer questions and problem-solve when necessary.

The decontamination process began with testing patients for MRSA in the pre-op clinic. The process ended 30 days after surgery for patients without an implant and 90 days after surgery for patients with an implant. The process identified patients with nasal methicillin-resistant *Staphylococcus aureus* (MRSA) colonization, assured appropriate antibiotics were selected for a surgical procedure, and standardized intervention prior to surgery to ensure all patients receive the same standard of care.

### **Statement of the Problem**

Prior to the implementation of the project the practice for cardiac and orthopedic preoperative patients at the medical center was routine screening for MRSA colonization via nasal swab one to four weeks prior to surgery. Patients who were MRSA-positive were treated

with mupirocin ointment to nares and chlorhexidine showers for five (5) days prior to surgery. Despite interventions to reduce SSIs, SSI rates had increased in these populations.

At the medical center compliance with the protocol had been challenging at every step; patients were not always seen more than seven (7) days prior to surgery, positive screens did not consistently result in provider action, the medication did not always arrive in time, and patients did not reliably follow instructions. When a patient arrived on the day of surgery and had not received treatment the decision was left to the attending surgeon to cancel or move ahead without decolonization.

### **Project Overview**

The goal of the project was to identify and implement a practical decolonization protocol for high-risk veteran populations undergoing surgery. The Operative Care Division (OCD) and the Infection Control Clinical Nurse Specialist (CNS) partnered to identify a practical decolonization protocol for high-risk veteran populations. I implemented the rollout of the new protocol. Moving forward, the CNS will monitor and report quarterly on SSI rates for both populations.

The process involved nurses in three distinct practice areas: pre-op clinic, pre-op holding, and the operating room, as well as surgeons and the operating room pharmacist. The initiation of povidone-iodine (PI) treatment commenced May 15, 2017. Screening for nasal colonization of MRSA began June 27, 2017.

The initial plan was initiated as an evidence-based best practice recommendation to reduce SSIs by treating each preoperative patient with chlorhexidine washcloths, oral chlorhexidine rinse, and intranasal PI solution the evening before surgery and on the day of

surgery (Bebko, Green, & Awad, 2015). Due budget constraints for supply purchases and staff ability to provide bedside baths on the day of surgery the intervention needed to be scaled back.

The first intervention initiated was to test all “patients except eye surgery and endoscopy patients” attending the preoperative readiness clinic for MRSA by nasal swab. If patients tested positive, they received Vancomycin, as opposed standard cephalosporin such as Cefazolin (Rao et al., 2011). This intervention was driven by the operating room pharmacist, who partnered to help reduce surgical site infections.

Initiation of the MRSA testing required education of the preoperative readiness clinic to identify patients and enter orders for each patient. On the day of surgery the admitting nurse verified that the patient had bathed with chlorhexidine. If the patient had not, the patient received a chlorhexidine bath at the bedside. All indicated patients received the intranasal PI within two hours of surgery. The staff documented the intervention in the pre-op holding note. The exceptions to treatment are: patients who are allergic to povidone-iodine, patients having surgery at the site of application, or those who refuse treatment. Patients who bypass the pre-op holding area are treated with intranasal PI in the operating room by the circulating RN.

To meet the primary goal several objectives were created, each one opening a door for successful project development and implementation. In the pre-op clinic, the objectives included identification of patients requiring MRSA swab for the pre-operative clinic visit and ensuring patients understood the importance of and process for pre-operative showers (see Appendix A). In the pre-op holding area the objectives included obtaining the needed PI swabs, creating educational posters to support staff training (see Appendix B), training staff to provide the PI intranasal intervention, and identifying patients requiring PI swab the day of surgery.

There is also a cohort of patients that bypasses the pre-op holding area. These patients

include emergent operations, after-hour cases, and patients originating in the Intensive Care Unit. It was necessary to make certain that these patients also received PI treatment to address all patients undergoing surgery and ensure successful implementation. The strategies to accomplish this included training staff to provide the PI intranasal intervention, providing the PI swab in a convenient storage area, and providing an efficient process to chart the intervention.

The final goal was the creation of a Standard Operating Procedure (SOP) regarding pre-operative interventions to reduce SSIs and to promote the adoption of the intervention over time.

### **Rationale**

Reducing surgical site infections is currently a Joint Commission patient safety goal on which hospitals report (The Joint Commission, 2016). At the medical center the Infection Control Department collects data on all SSIs at the hospital and reports the rates quarterly; the data can be accessed on the hospital's intranet. Despite current interventions, SSI rates continue to increase. Critically evaluating current interventions including contributing causes (see Appendix C) can assist in identifying weaknesses within the microsystem and macrosystem and opportunities to create improvement interventions.

SSIs are extremely costly; the cost of treating a single surgical site infection is reported to range from \$26,000 to \$250,000, with direct hospital costs averaging \$117,411 per infection (Courville et al., 2012). However, the most compelling reason to implement this improvement project is that outcomes after SSI with joint surgery are often not equal to the successful functional outcome of an uncomplicated surgery (Courville et al.).

Cost-benefit analysis can demonstrate cost savings associated with a proposed process improvement project (Penner, 2017). In the case of this demonstration project, the hospital allocated \$5,000 for labor and \$70,000 for materials for the first year. The labor costs covered



100 hours of CNL time at the cost of \$50 per hour. The materials needed were a sufficient supply of PI swabs to treat a projected 5,000 patients. The on-going cost to maintain the protocol is projected to be \$70,000 per year for subsequent years. After initiation of the process the application of the PI is expected to become standard practice while preparing a patient for surgery and to require no additional staff support.

In fiscal year 2016 the hospital reported 13 MRSA SSIs. If this improvement project meets its goal of reducing MRSA SSIs by 10%, this will avoid an average of 1.3 infections per year, with an associated cost savings of \$117,411 per infection. This cost savings alone fully justifies the expense associated with the change in protocols.

Additionally, a reduction in SSIs yields an improvement in patient quality of life. Quality of life is significantly and negatively affected when a patient experiences an SSI, especially for patients with implanted hardware. Patients who experience deep SSIs report lower quality of life and pain. (Andersson, Bergh, Karlsson, & Nilsson, 2010). Patients experienced decreased work productivity, lower functional capabilities, and require months of antibiotic therapy and rehabilitation services (Courville et al). While these costs are primarily borne by the patient, their reduction should be considered to be of benefit to the medical center as well.

### **Methodology**

Lippett's change theory was chosen as the theoretical framework for this project aimed at reducing surgical site infections (SSIs).

As described by Mitchell (2013), Lippett's change theory (1958) has seven phases:

- phase 1, identify the problem;
- phase 2, assessment of motivation and capacity for change;
- phase 3, assess if the change agent has the resources and impetus to make the

change;

- phase 4, select an objective, develop an action plan;
- phase 5, determine the role of the change agent with clearly defined expectations;
- phase 6, sustain the change;
- phase 7, the change agent should remove themselves over time, and the sustained change will become part of the established norms;

Kritsonis (2005) describes Lippett's change theory as an extension of Lewin's three phases of change (1951); freezing, changing, and unfreezing, taking the basis of purposeful intervention for change and emphasizing the accountability of the change agent. As Mitchell (2013) described, Lippett's change theory aligns with nursing process; assessing the problem, making a plan to improve the problem, implement interventions, and evaluating efficacy. This makes it an especially appropriate framework to use in this project as it builds upon an already familiar and relatable process. Therefore an action plan for implementation of the change strategy was identified. (See Appendix B for a visual roadmap).

Phase 1 began in July 2016, when the workgroup identified the need to revise the nasal decolonization protocol prior to surgery. During phase 2, a higher-than-desired SSI rate motivated the workgroup to research and develop improved protocols, with the goal of providing better care for veterans by reducing SSI rates and thereby improving surgical outcomes. In phase 3 I determined professional resources available. A mentor and hospital leadership supported the project, and a clinical need drove the change in protocol. During phase 4 I developed the AIM to reduce *S. aureus* SSI rates by 10% for FY17, and the action plan to meet the AIM. (See Appendix D for the specific action plan.) In phase 5 the workgroup determined that I would be leading the project, with the overwhelming support of all the other team members.

I was tasked with determining how the existing protocol needed to be changed, creating the new protocol, procurement of all necessary supplies, updating all relevant documentation, educating staff and overseeing the final rollout. For phase 6, which began in May 2017, sustained change was supported by active monitoring of supply levels to ensure adequate stock of all needed materials, regular check-ins with frontline staff to verify compliance with the new protocol, and on-going communication with the surgeons to maintain awareness of the change and to remind them of the benefits both to their patients and to themselves.

Upon successful implementation of the new protocol (phase 7), the workgroup will meet in November 2017 for a final debriefing session, after which the new protocol is expected to be self-sustaining. Regular monitoring of SSI rates will confirm the value and efficacy of the new protocol, reinforcing both its desirability and staff compliance. The Infection Control Department tracks and reports all MRSA surgical site infections that occur at the medical center. In future years MRSA SSI rates will be compared quarterly to evaluate the intervention efficacy.

### **Data Source/ Literature Review**

The focus of this project was a specific intervention to reduce SSIs. In a multidimensional problem such as this, interventions were required at multiple points along the care continuum. The focus of this project was to implement a practical decolonization protocol for high-risk veteran populations undergoing surgery, and to do so using evidenced-based practice recommendations to decrease the occurrence of SSIs.

The PICO used was: P: Surgical patients at risk for *S. aureus* surgical site infection, I: Standard decolonization treatment of five days nasal mupirocin and five days of chlorhexidine body wipes, C: Decolonization with nasal PI day of surgery, O: Reduced *S. aureus* surgical site infection rates. A search of the PubMed database conducted using a PICO search strategy

of *povidone-iodine*, *prevention of surgical site infections*, and *nasal* yielded 12 articles with dates from 2012-2017. Six quantitative studies were selected for review.

A search of the CINAHL database conducted using a PICO search strategy of *povidone-iodine*, *prevention of surgical site infections*, and *nasal* yielded 15 articles with dates from 2012-2017. Five quantitative studies were selected for review. The selected articles described treatments to reduce *S. aureus* SSIs.

Search strategies that did not yield desired articles included *morbidity*, *morality*, and *surgical site infection*, *best practice surgical site infection*.

The literature supports a multifaceted approach to successfully preventing surgical site infections. The authors reported that there are four types of wound classification when surgery is performed; clean, such as a joint replacement, clean-contaminated, such as uncomplicated appendectomy, contaminated such as a ruptured appendectomy, and dirty, such as an incision and drainage of an abscess. Risk factors for infection included virulence, wound environment, and patient risk factors including an infective load that could be modified with pre-operative antibiotics and MRSA decolonization.

Measures to decrease the incidence of SSI included preoperative, surgical, and postoperative measures. Preoperatively, preoperative antibiotics, bowel preparation (if indicated), preoperative showers, preoperative hair removal conducted in a manner not to shave the skin, nasal decolonization for MRSA carriers, and operative staff adhering to dress code and hand decontamination protocols were recommended. During surgery, preoperative antibiotics were given prior to incision, prepping the skin with chlorhexidine, and the use of antimicrobial sutures was recommended. Postoperatively, proper nutrition, effective glycemic control, aseptic wound care, and proper oxygenation were shown to decreased rates of surgical site infections.

The literature presently supports two techniques for nasal decolonization. Anderson, M.J. et al. (2015) demonstrated PI is successful in treating mupirocin-resistant strains of *S. aureus*. Four experiments were performed to evaluate the efficacy of nasal mupirocin and nasal PI on MRSA colonization of tissue. In the two ex-vivo experiments healthy tissue was exposed to MRSA and treated with betadine or mupirocin ointment. The third experiment was performed on healthy human subjects. This experiment involved a baseline MRSA swab test followed by control solution or povidone preparation, after which swabs of the normal flora of the anterior nares were attained at 1, 6, and 12 hours. The final experiment was performed on MRSA infected explants receiving treatment with PI, mupirocin, or no treatment. All revealed significant finding of treatment versus control group. Clinical implications of the study concluded that the best preventative treatment of potential *S. aureus* SSIs in surgical populations is PI nasal treatment.

Also, Phillips et al. (2014) demonstrated that a single treatment of nasal PI yields superior results to 7-10 mupirocin treatments over five days. Patients undergoing spinal or orthopedic joint surgery (N=1874) were randomized into mupirocin or PI treatment groups. Findings suggested a significant reduction in *S. aureus* in the mupirocin group versus iodine alone (P=03). The author advocated the use of PI as a superior choice based on cost and patient outcome.

Surgical site infections have physical, emotional and financial implications. Andersson, A. E., et al. (2010) reported on a qualitative research study in which 14 patients with deep surgical site infections were interviewed. This study investigated the patient's quality of life after experiencing a deep tissue SSI. The patients reported on three themes; the emergence of the problem, a period of pain and fear of the potential outcomes of the infection, and the impact on their lives and the need to adapt to their disability. Patients reported that their deep SSI had

affected physical, emotional, social, and economic aspects of their life. Pain from the SSI site was reported as a finding in most patient reports. Patients reported that the most significant outcomes they were seeking after SSI occurrence were pain relief, improved function, and improved quality of life.

Dohmen, P. M.(2013) also explored the economic impact of surgical site infection after cardiac surgery. The direct costs of prolonged hospital stays, additional surgery, needed treatment for infection, and medications were estimated to be \$1,084,63 for a single deep-tissue SSI. Indirect costs including loss of income by patient or family, loss of quality of life, and cost incurred traveling to seek care. The indirect costs of an SSI were estimated to be 800% of the direct costs.

There are many approaches to preoperative reduction of surgical site infections. Bebko, et al. (2015) describes an evidence-based approach to reduce surgical site infections in patients undergoing elective orthopedic surgery with hardware implantation. The prospective study included 709 patients, 344 in the control group and 365 who received decolonization. The decolonization group interventions included a chlorhexidine washcloth bath and oral chlorhexidine rinse the evening before surgery, a repeated bath and oral rinse the morning of surgery, and an application of intranasal PI on the day of surgery. The control group surgical site infection rate was 3.8%, compared to the decolonization group rate of 1.1%. The reported results represent a more than 50% reduction in surgical site infections in the experimental group.

Other concerns when selecting an intervention is patient tolerance of the intervention. Maslow, Hutzler, Cuff, Rosenberg, Phillips, and Bosco (2014) explored patient experience of preoperative nasal decolonization. Patients were randomized prior to surgery to self-administer five days or nasal mupirocin or receive nasal PI administered by staff within two hours of

surgery. Of the patients (N=1903) 88.1% were interviewed prior to discharge. Adverse reactions reported from both groups were; a headache, rhinorrhea, lung or throat congestion, pruritus, and sore throat. Participants who received PI reported lower rates of adverse reactions ( $P<.05$ ) except pruritus ( $P=.193$ ). Of the patients who received mupirocin, 38.8% reported having an unpleasant or very unpleasant experience, compared to 3.4% of patients receiving PI ( $P<.0001$ ). Clinical implications of this study conclude that nasal PI can be considered better tolerated than nasal mupirocin for preoperative nasal decolonization.

When selecting an intervention another concern is cost. Torres, Lindmar-Snell, Langan, and Burnikel (2016) compared the cost of nasal mupirocin and nasal PI for preoperative nasal decolonization. Two consecutive cohorts were used. The first cohort was screened for MRSA, and if positive, patients received five days of nasal mupirocin and five days of chlorhexidine showers. In the second cohort, no MRSA screen was performed, and all patients received five days of chlorhexidine showers and a single treatment of nasal PI. Two findings suggested no difference in infection rates ( $P=1$ ). The cost per patient for nasal mupirocin was \$116.19 while the cost per patient for nasal PI was \$16.42. Clinical indications from this study conclude nasal PI treatment is less expensive than nasal mupirocin, with comparable SSI outcomes.

In conclusion, this research indicates that a single step treatment of nasal PI has equivalent or better results than mupirocin ointment to nares for five days prior to surgery. Furthermore, benefits included less likelihood of the development of antibiotic resistance, greater patient compliance with the treatment, decreased cost, and lower incidence of SSI development.

### **Timeline**

Creating a timeline can be helpful to maintain momentum and provide a guide to completion. A successful timeline captures the essential steps in chronological order and also tracks

the journey over time. The timeline also serves as a reminder to re-center if the process gets off track. See Appendix J for a visual timeline to implement nasal decolonization prior to surgery to decrease surgical site infections.

### **Expected Results**

The expected results are a decrease in the incidence of MRSA surgical site infections at the medical center. Although the originally proposed intervention included all of Bebko et al.'s (2015) recommendations to add oral chlorhexidine and a chlorhexidine wipes rinse the evening before surgery, along with a repeated bath, oral rinse, and an application of intranasal PI at the bedside on the day of surgery due to cost and staff availability full initiation of the described protocol was not feasible. If the results do not meet the AIM, the SSI improvement workgroup will recommend adding more Certified Nursing Assistants (CNAs) to allow for additional interventions to improve SSI rates.

### **Nursing Relevance**

This nurse-driven process improvement project is intended to identify a cost-effective and practical decolonization protocol that will improve patient outcomes and avoid hundreds of thousands of dollars in medical expenses. This improvement project is an example of evidence-based practice (EBP) change guided by Lippett's change theory. EBP changes support the translation of new knowledge from idea to implementation to provide improved care with better-quality outcomes (Lockwood & Hopp, 2016). Frontline nursing staff are the eyes and ears process improvement. They have valuable insight into how processes can be improved, and the ability to influence their practice. Nurses using horizontal leadership strategies to support small changes at the bedside can create big-picture changes.

Developing nurse-driven procedures that meet national patient safety goals, improve



patient care, and patient outcomes demonstrate the importance of the transformation of nursing practice. We nurses are the face of nursing to our patients. Setting the expectation that frontline staff are experts in their care and are continually improving care is the gold standard for excellent care in healthcare today. The relevance of this project is two-fold; to decrease the incidence patient experiences of life-changing medical sequelae, and to demonstrate the effectiveness of nurse-driven change to improve care. Future change agents can use this process improvement strategy as a framework for their projects.

### **Summary**

The objective of this nurse-driven process improvement project was to implement a cost-effective and practical decolonization protocol to improve outcomes for high-risk veteran populations undergoing surgery at a large veteran's hospital in the Pacific Northwest. The AIM was to reduce *S. aureus* SSI rates by 10% for FY17. During the process of the project the AIM was further refined to MRSA SSIs based on current data collection processes. The population is all surgical patients except eye surgery patients, endoscopy patients, and patients having surgery at the location of the intranasal treatment.

The original AIM was to reduce all SSIs, and the intent will be to minimize infections for all surgeries. Data for SSIs are collected by the Infection Control Department. Data are collected for all MRSA infections, coronary artery bypass, implanted hardware orthopedic surgery, implanted hardware craniotomy neurosurgery, and colon surgeries. Constraints in existing data collection and difficulty in capturing SSI information not being currently collected caused me to choose to adjust the AIM to ensure accurate data collection and reporting.

Implementation of the project had three distinct phases. Baseline data (see appendix K) provided evidence that a new intervention is needed to address rising rates of MRSA SSIs. The

first phase, involved planning for all three phases, determining who to test, what interventions to implement, and how to disseminate information about the chosen interventions to hospital staff.

I found the first phase to be the most challenging, in particular defining roles for participants and obtaining successful buy-in in the project. Testing for MRSA in the pre-op clinic for all surgical patients added two tasks for the LPN's of the clinic. The LPN would have to add the order to the electronic medical record and then perform the test. The staff was very comfortable with performing the lab test, but adding orders proved more challenging.

This element of the project required additional steps, including requesting the staff access to order the test in the electronic medical record and teaching the staff how to enter the order correctly. Although not difficult, staff expressed anxiety with this task and required written and multiple in-person education to successfully complete this step.

The next step was to create a sense of urgency among the staff involved. I developed a presentation which included the current SSI results and EBP recommendation, along with the proposed changes at the medical center. The infection control CNS attended each presentation to support the project and answered specific questions about hospital data. I gave presentations pre-op clinic staff, Operative Care leadership, surgeons, the pre-op day of surgery staff, and the operating room staff.

The second phase involved implementing the intervention. Requesting the PI swab through commodities involved completing a request form, explaining the need for the product. Approval of the request required gaining approvals from the Division Director, the Commodities Committee, and the Service Chief overseeing the Commodities Committee. The approval process took a total of two months. I was told that was impressively quick compared to previous requests.

The next task was to work with logistics to locate a good place to store the swabs which was accessible to the staff. I also created the educational reference (see Appendix B). I chose to use a well-respected staff member for the demonstration photograph to encourage staff buy-in. This proved to be a successful strategy; I received many positive comments about his participation. In healthcare, if it isn't documented it isn't done. The final, crucial step was creating a simple way to document the intervention without creating additional work for the staff (see Appendix L). The documentation is two additional clicks in the existing note the nurses already utilize.

I was not scheduled into the staff mix on the first implementation day to ensure a successful rollout, this allowed me to be present to support the staff but not take a patient load. I recruited the PI company representative to be present for the first week of implementation to offer support with the application, if necessary. After implementation I recruited staff members to participate in chart review of documentation and patient compliance. After 12 weeks of implementation, preliminary chart review and MRSA SSI results were presented to the group and a competency form was distributed and completed by staff (see Appendix M). Staff was given an opportunity to ask questions about the process and to provide feedback. I am pleased to report that feedback from staff was positive.

In the second phase, we identified patients who did not go through the pre-op holding area. Those patients include ICU patients, urgent patients, and patients treated outside of normal working hours. Including these patients in the process became phase three of the project. This phase entailed educating the OR staff, partnering with the Assistant Nurse Manager of the OR to include identical charting in the OR nurses charting standard charting review of chart compliance with the new intervention by the OR nurses. Chart review of 10 weeks of

documentation revealed compliance rate of 52% (see Appendix N). The next step will be targeted re-education to increase compliance.

After review of the first 16 weeks of charting since implementation, compliance with the intervention was found to be 90% (see Appendix O). I had expected a reduction, as stated in the AIM, a 10% reduction, which would be one or two fewer infections. The results are better than expected as no MRSA SSIs have been reported since the implementation of the intervention. This represents a 62% decrease from FY17 (see appendix K). It has been seven months since initial implementation, with Lippett's change theory the final step is that the sustained change will become part of the established norms after the change agent removes themselves. On any given day, you can walk into the pre-op holding area, and hear the staff, explaining and performing the intervention. I feel very accomplished that chart review reveals high compliance, and the intervention has been adopted by the staff as has been "normal practice".

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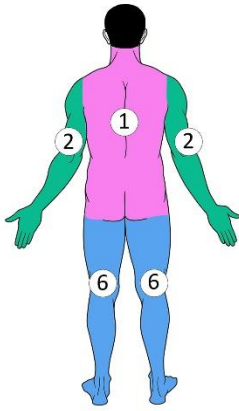
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Appendix A

Pre-operative Bathing Instructional Handout

Preparing Your Skin Before Surgery - CHG Cloths



**Areas of body to wipe:**

**First Cloth:** (Try to get help with this cloth) Wipe your back, starting at the base of your neck and ending at the bottom of your buttocks. Cover entire pink area.

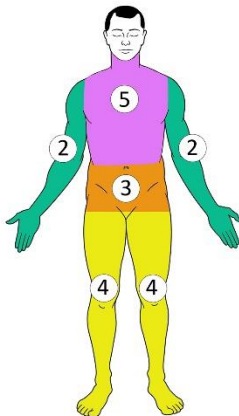
**Second Cloth:** Wipe the entire surface of both arms starting at your shoulders and ending at your fingertips. Be sure to spend extra time wiping your underarms. Cover entire green area.

**Third Cloth:** Wipe your right and left hips, followed by your groin area. Be sure to wipe folds in your belly and groin areas. Cover the entire orange area.

**Fourth Cloth:** Wipe the front of your legs, starting at the top of your thighs and ending with your toes. Cover entire yellow area.

**Fifth Cloth:** Wipe your neck and chest. Cover entire purple area.

**Sixth Cloth:** Wipe the back of both your legs, from the bottom of your buttocks down to and including the soles of your feet. Cover entire blue area.



**DO NOT** allow this product to come in contact with eyes, ears, mouth, and mucous membranes.

**DO NOT** shave anywhere on the body 24 hours before using the cloths.

**DO NOT** flush cloths down the toilet.

**DO NOT** rinse, shower, or apply any lotions, moisturizers, or makeup after using the cloths.



## Appendix B

## Povidone-Iodine Internasal Application Instructions

## Nasal Application Instructions

- 1 Use a tissue to clean the inside of both nostrils. Discard.
- 2 Dip one swab into solution and stir vigorously for 10 seconds. Withdraw the swab slowly to avoid wiping solution off.



- 3 Insert swab comfortably into right nostril and rotate for 15 seconds, covering all surfaces. Then focus on the inside tip of nostril and rotate for an additional 15 seconds. (swab 1)

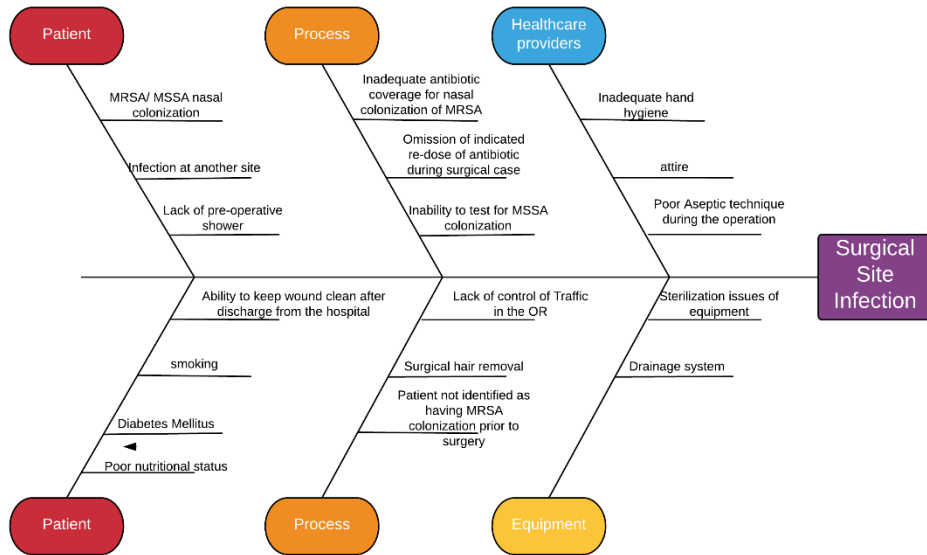


- 4 Using a new swab, repeat step 3 on left nostril. (swab 2)
- 5 Repeat steps 2, 3, and 4 using a fresh swab each time. (swabs 3 & 4)
- 6 Do not blow nose. If solution drips out of nose, it can be lightly dabbed with a tissue.

Appendix C

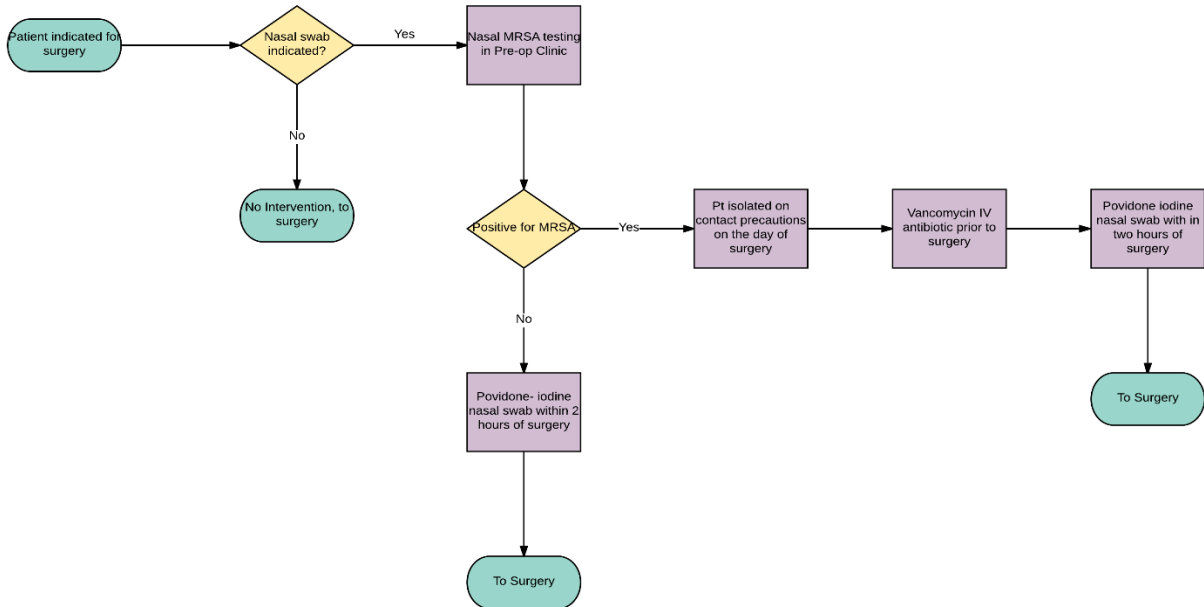
Fishbone Diagram

Surgical Site Infection Root Cause Analysis

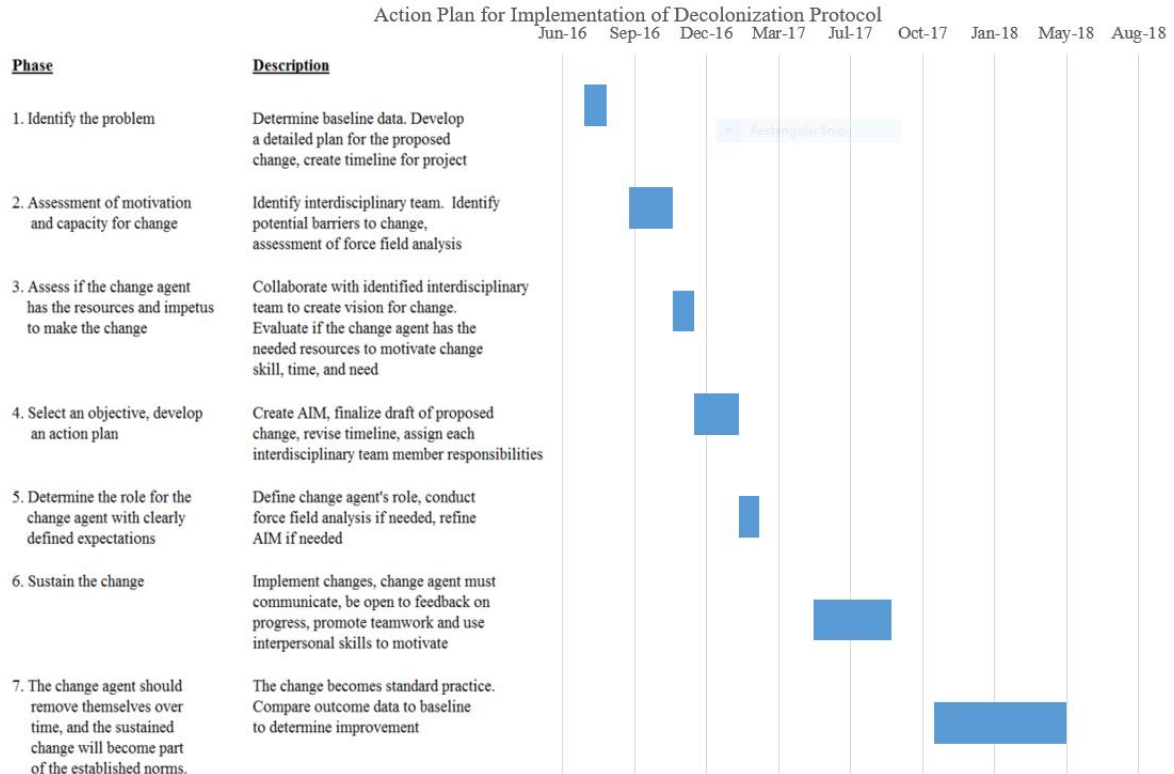


Appendix D

Surgical Site Infection Process Map



Appendix E



Adapted from Mitchell, G. (2013). Selecting the best theory to implement planned change. *Nursing Management - UK*, 20(1), 32–37

Appendix F

SWOT ANALYSIS

<p><b>S Strengths</b></p> <ul style="list-style-type: none"><li>•Low risk intervention</li><li>•Inexpensive intervention</li><li>•Nurse driven</li><li>•Staff committed to continuous improvement</li><li>•Established successful communication between project leader and front line staff</li><li>•CNS mentor committed to success of project</li></ul>	<p><b>W Weaknesses</b></p> <ul style="list-style-type: none"><li>•Intervention is time consuming, 2 full minutes</li><li>•Difficult to communicate to all surgeons</li><li>•Unable to fully implement EBP recommendation due staffing and available resources</li><li>•Mentor is experienced at mesosystem level, not microsystem level implementation</li></ul>
<p><b>O Opportunities</b></p> <ul style="list-style-type: none"><li>•Innovation the unit level</li><li>•Novice nurse leaders looking to contribute to a present improvement project</li><li>•Present SSI rates concerning to Neurosurgery team, team motivated to participate</li></ul>	<p><b>T Threats</b></p> <ul style="list-style-type: none"><li>•Resistance by staff to "do one more thing"</li><li>•Long process to acquire new products at the medical center</li><li>•Several months of tight staffing, staff is tired, presently resistant to change</li><li>•Patient refusal</li></ul>

Appendix G

**Stakeholder Analysis Matrix**

<b>Stakeholder</b>	<b>Impact</b>	<b>Influence</b>	<b>What is important to the stakeholder</b>	<b>How could the stakeholder contribute to the project?</b>	<b>How could the stakeholder block the project</b>	<b>Strategy for engaging the stakeholder</b>
Pre-op Clinic LPN's	High	Medium	Understanding responsibility, communication, being included in decision making	Identify patients in pre-op clinic who require MRSA testing.	Failure to test MRSA in pre-op clinic	Educating staff on need for project, engage staff in creating a process, update staff to outcome data
Infection control Clinical Nurse Specialist	High	High	Surgical Site Infection rates reflect her effectiveness	Mentor CNL student leading project	If leader is unable, she will step in and lead	Frequent updates
Surgeons	Low	high	Low surgical site infection	Vocally support	Refuse the intervention	Present EBP findings at

			rates	intervention	for patients	multiple surgeon meetings
Pharmacist	High	Low	Appropriate antibiotics administered on the day of surgery	Follows up on antibiotic orders for patients with MRSA with physicians if orders are not sufficient	Choose not to participate	Include pharmacist when planning project implementatio n
Preoperative Staff Nurses	High	High	Being included in planning Understanding the reason for the intervention.	Provide the intervention to the patient	Not provide the intervention to the patient	Educate Nurses on the importance of intervention. Update with outcome data
OR Nurses	High	High	Decreasing Surgical Site Infection	Provide the intervention to the	Provide the intervention to the patient	Educate Nurses on the importance of

			Rates	patient		intervention. Update with outcome data
Patient	High	High	Receiving good care, may or may not think about Surgical Site Infections	Accept the intervention	Refuse the intervention	Educate patient on the importance of intervention.



Appendix H

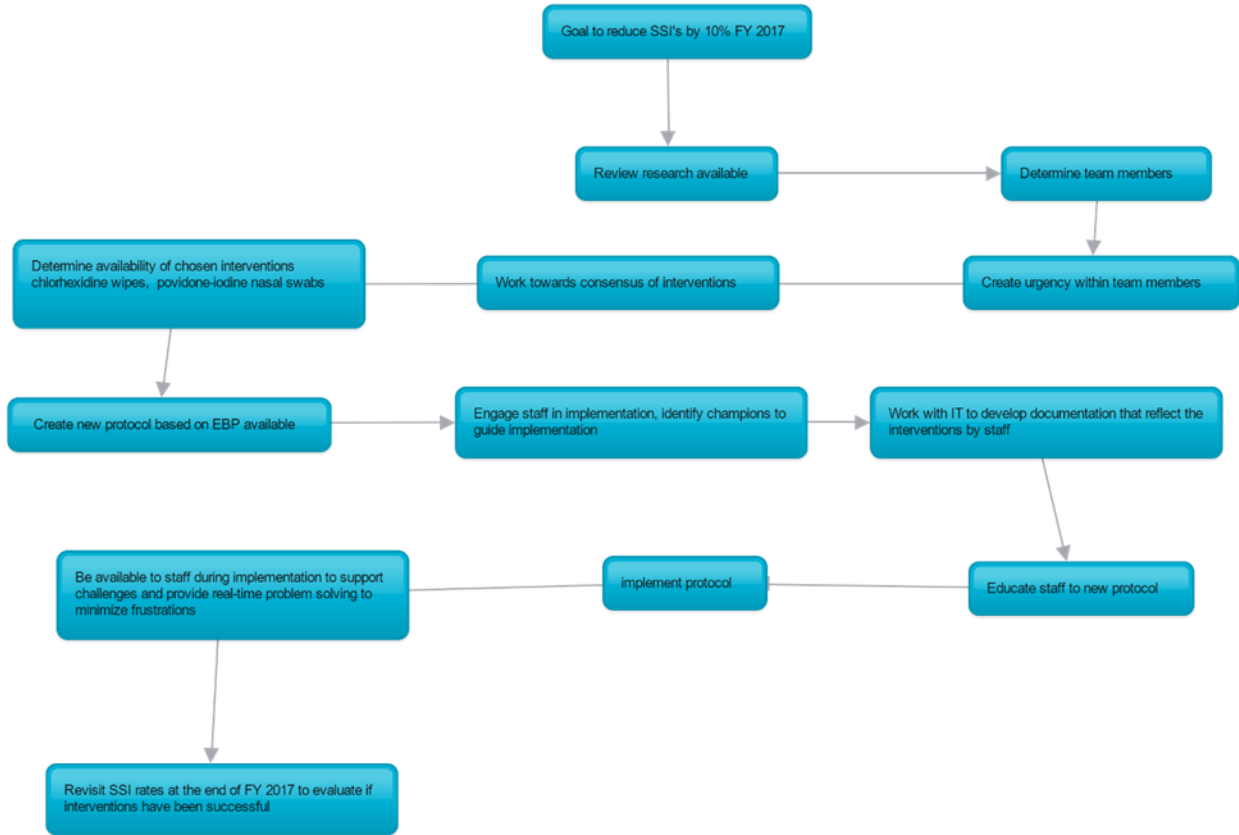
Cost Benefit Analysis



Costs	Year 1	Year 2	Total
<b>Cost-Benefit Analysis</b>			
Portland VA Healthcare System			
Nasal decolonization prior to surgery			
<b>Non-Recurring Costs</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Total</b>
CHL time allocated to the project	100 hr X \$50		\$5,000.00
<b>Total Non-Recurring Costs</b>	<b>\$5,000.00</b>	<b>\$0.00</b>	<b>\$5,000.00</b>
<b>Recurring Costs</b>			
Povidine-Iodine Nasal swabs \$14 a pt X 5,000 patients	70000	70000	\$140,000.00
<b>Total Recurring Costs</b>	<b>\$70,000.00</b>	<b>\$70,000.00</b>	<b>\$140,000.00</b>
<b>Total Costs</b>	<b>\$75,000.00</b>	<b>\$70,000.00</b>	<b>\$145,000.00</b>
<b>Cost Avoidance</b>			
\$117, 441 per infection	\$117, 441	\$117, 441	
<b>Total Cost Avoidance</b>	<b>\$42,441.00</b>	<b>\$42,441.00</b>	
<b>Net Benefits</b>			

Appendix I

Process Map



## Appendix J

**Detailed Timeline for Implementation**

<b>Date started</b>	<b>Task</b>	<b>Persons responsible</b>	<b>Steps to complete</b>	<b>Date completed</b>
<b>July 2016</b>	<b>Identify the problem</b>	<b>CNL student, CNS mentor CNL preceptor</b>	<ul style="list-style-type: none"> <li>• <b>Determine baseline data</b></li> <li>• <b>Develop a detailed plan for prosed plan</b></li> <li>• <b>Create timeline for project</b></li> </ul>	<b>August 2016</b>
<b>September 2016</b>	<b>Create interdisciplinary team (SSI reduction workgroup)</b>	<b>CNL student, CNS mentor</b>	<ul style="list-style-type: none"> <li>• <b>Brainstorm stakeholders</b></li> <li>• <b>Invite members to join team</b></li> <li>• <b>Meet to determine goal of workgroup</b></li> </ul>	<b>September 2016</b>
<b>October 2016</b>	<b>Create AIM and PDSA to guide project</b>	<b>SSI reduction workgroup</b> <ul style="list-style-type: none"> <li>• <b>CNL student</b></li> <li>• <b>CNS mentor</b></li> <li>• <b>CNL preceptor</b></li> <li>• <b>PACU manager</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Determine goal</b></li> <li>• <b>Collaborate with workgroup</b></li> </ul>	<b>October 2016</b>

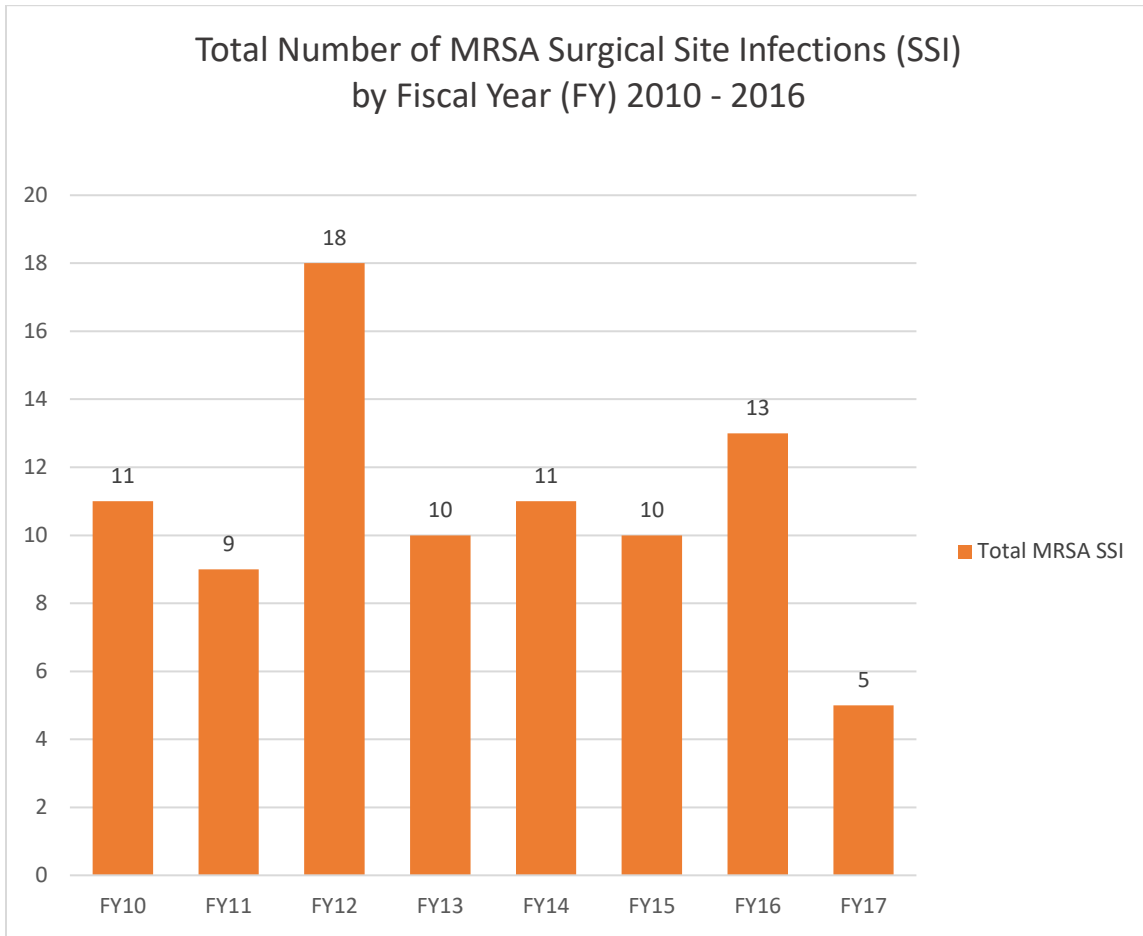
		<ul style="list-style-type: none"> <li>• <b>OR pharmacist</b></li> </ul>		
<p><b>October 2016</b></p>	<p><b>Request Povidone-Iodine nasal swabs</b></p>	<ul style="list-style-type: none"> <li>• <b>CNL Student</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Complete request form</b></li> <li>• <b>Provide evidence to why product is needed</b></li> <li>• <b>Present proposal to leadership for approval</b></li> </ul>	<p><b>January 2017</b></p>
<p><b>October 2016</b></p>	<p><b>Create educational seminar for staff regarding intervention</b></p>	<p><b>CNL student, CNS mentor CNL preceptor</b></p>	<ul style="list-style-type: none"> <li>• <b>Create educational handouts</b></li> <li>• <b>Create educational presentation</b></li> </ul>	<p><b>April 2017</b></p>
<p><b>April 2017</b></p>	<p><b>Prepare for implementation</b></p>	<p><b>CNL student, CNS mentor CNL preceptor</b></p>	<ul style="list-style-type: none"> <li>• <b>Present educational seminars to Pre-op Clinic, Pre-op staff, and surgeons</b></li> <li>• <b>Work IT to develop correct documentation</b></li> <li>• <b>Work with Supply department to determine location of item in pre-op and par level of stocking</b></li> </ul>	<p><b>June 2017</b></p>

<p><b>May 2017</b></p>	<p><b>Implement changes</b></p>	<p><b>CNL Student</b></p>	<ul style="list-style-type: none"> <li>• <b>Implement MRSA nasal testing pilot patients</b></li> <li>• <b>Implement Povidone-Iodine intranasal in pre-op</b></li> <li>• <b>Implement MRSA nasal testing of all patients</b></li> <li>• <b>Implement Povidone-Iodine intranasal treatment for patients who bypass the pre-op area</b></li> </ul>	<p><b>May 2017</b></p> <p><b>May 2017</b></p> <p><b>July 2017</b></p> <p><b>July 2017</b></p>
<p><b>May 2017</b></p>	<p><b>Evaluate the effectiveness of implementation</b></p>	<p><b>Workgroup member</b></p>	<ul style="list-style-type: none"> <li>• <b>Review charts for documentation</b></li> <li>• <b>Provide feedback to staff with difficulty completing documentation</b></li> </ul>	<p><b>August 2017</b></p>
<p><b>October 2017</b></p>	<p><b>Evaluate outcome of Intervention</b></p>	<p><b>CNL Student</b></p>	<ul style="list-style-type: none"> <li>• <b>Compare FY 16 quarter 3 and 4 to FY 17 FY quarter 3 and 4 MRSA SSI rates to gauge</b></li> </ul>	

			<p><b>effectiveness of intervention</b></p> <ul style="list-style-type: none"> <li>• <b>Report findings to staff and leadership</b></li> </ul>	
<b>May 2018</b>	<b>Evaluate outcome of Intervention</b>	<b>CNL</b>	<ul style="list-style-type: none"> <li>• <b>Compare one year of results to year before for effectiveness of intervention</b></li> <li>• <b>Report findings to staff and leadership</b></li> </ul>	

Appendix K

**Reported MRSA Surgical Site Infections 2010-2017**



Appendix L

**Documentation of Povidone Iodine Intranasal swab in Electronic Medical Record**

Template: SURGERY HOLDING NOTE

- SKIN INTEGRITY
- SHOWER STATUS
- STOP SSI PROTOCOL
  - Patient completed Povidone Iodine nasal swab to both nares.
  - Not completed patient has documented Povidone Iodine allergy.
  - Povidone Iodine nasal swab was not completed patient refused.
  - Patient completed Chlorhexidine bed bath in pre-op holding.
- VOID STATUS
- BOWEL STATUS
- ASSESSMENT----- ...
- RECOMMENDATIONS

All   None   \* Indicates a Required Field   Preview   OK   Cancel



Appendix M

Competency Form

**Skin and Nasal Antiseptic**

Position title: RN / LPN / HT / NA / Other \_\_\_\_\_

Name: \_\_\_\_\_ Unit/Department: \_\_\_\_\_

Instructor/Designee: \_\_\_\_\_

<b>Knowledge:</b> <input type="checkbox"/> A. Test-Passing <input type="checkbox"/> B. Simulation or Scenario/TMS <input type="checkbox"/> C. Verbalization of Understanding			
<b>Skills &amp; Behaviors:</b> <input type="checkbox"/> D. Direct Observation <input type="checkbox"/> E. Medical Record Audit <input type="checkbox"/> F. Return Demonstration			
Key Points of Competency	Check List		
	S=Satisfactory	U=Unsatisfactory	NP=Not Performed
<b>Nasal Antiseptic Precautions:</b> DO NOT use if patient has a known sensitivity to iodine or any other ingredient in this product. Do not use in eyes. Stop use and ask a surgeon if significant irritation, sensitization, or other allergic reaction occur. For external use only and do not reuse.	<input type="checkbox"/> S	<input type="checkbox"/> U	<input type="checkbox"/> NP
a) Verify correct patient	<input type="checkbox"/> S	<input type="checkbox"/> U	<input type="checkbox"/> NP
b) Verify the need for pre-procedure nasal antiseptic	<input type="checkbox"/> S	<input type="checkbox"/> U	<input type="checkbox"/> NP
c) Ensure nasal antiseptic within 2 hours prior to procedure; Document in holding note	<input type="checkbox"/> S	<input type="checkbox"/> U	<input type="checkbox"/> NP
<b>Usage of Nasal Antiseptic:</b>			
a) Perform hand hygiene and don protective gloves	<input type="checkbox"/> S	<input type="checkbox"/> U	<input type="checkbox"/> NP
b) Have patient use a tissue to clean the inside of both nostrils including the inside tip of the nostril. Discard tissue.	<input type="checkbox"/> S	<input type="checkbox"/> U	<input type="checkbox"/> NP
c) Tilting the bottle slightly, dip one swab into solution and stir vigorously for 10 seconds. Withdraw the swab slowly to avoid wiping solution off during removal.	<input type="checkbox"/> S	<input type="checkbox"/> U	<input type="checkbox"/> NP
d) Insert swab comfortably into one nostril and rotate for 15 seconds covering all surfaces. The focus on the inside tip of nostril and rotate for an additional 15 seconds.(Swab 1)	<input type="checkbox"/> S	<input type="checkbox"/> U	<input type="checkbox"/> NP
e) Using a new swab: repeat steps 2 and 3 with the other nostril.(swab2)	<input type="checkbox"/> S	<input type="checkbox"/> U	<input type="checkbox"/> NP
f) Repeat the application in both nostrils using a fresh swab each time. Swabs 3 & 4)	<input type="checkbox"/> S	<input type="checkbox"/> U	<input type="checkbox"/> NP
g) Inform patient not to blow nose. If solution drips out of nose, it can be lightly dabbed with a tissue.	<input type="checkbox"/> S	<input type="checkbox"/> U	<input type="checkbox"/> NP

I affirm that I have been trained to the competency and the verification of this competency is valid and accurate:

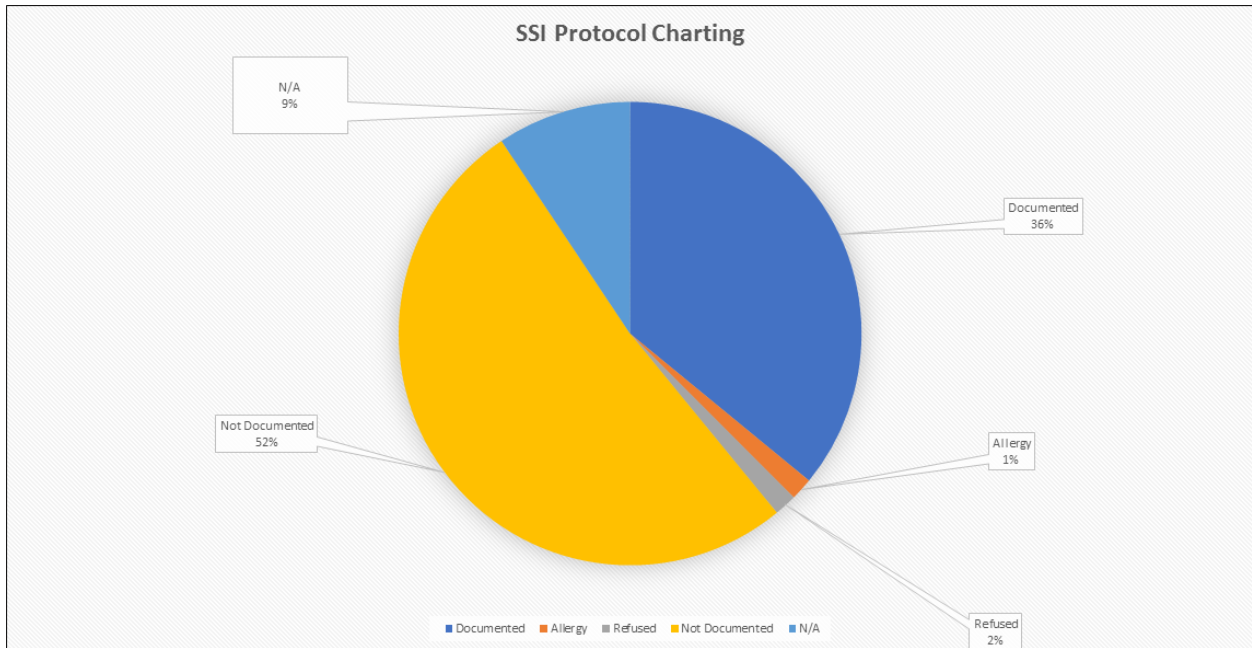
Employee Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Instructor/Designee Signature: \_\_\_\_\_ Date: \_\_\_\_\_

<b>Action Plans for Unmet Elements:</b>

Appendix N

Operating Room RN Compliance of Intervention August 1<sup>st</sup>- October 15<sup>th</sup>



Appendix O

Documentation and Patient Compliance in Pre-op Holding

