Standardizing Orders for Preoperative Mupirocin Ointment on Spinal Surgery Patients

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DNP Scholarly Project Proposal
Standardizing Orders for Preoperative Mupirocin Ointment on Spinal Surgery Patients

Methicillin-Resistant *Staphylococcus aureus* (MRSA) is the leading cause of surgical site infections (SSI), has incidence rates of 2-5% in surgical patients in the United States (U.S), and is associated with longer hospital stays, increased morbidity and mortality, and increased healthcare costs (Awad et al., 2009; Bode et al., 2010; Pofahl, Ramsey, Nobles, Cochran, & Goettler, 2011). Most SSIs associated with elective surgery are preventable with strict adherence to prevention practices (Awad et al., 2009). The Institute of Healthcare Improvement (IHI, 2012) has recommended guidelines for various prevention practices, including the preoperative use of intranasal mupirocin ointment. Mupirocin 2% ointment applied to the nares for three to five days preoperatively has been shown to temporarily decolonize the MRSA bacteria and reduce the risk of postoperative MRSA infection (Sasi et al., 2015).

The setting for preoperative assessments of surgical outpatients at risk for SSIs was a targeted hospital’s Patient Readiness and Evaluation Program (PREP) Center in a tertiary, academic medical center. In this setting, the preoperative screening process included a thorough patient history and physical examination. However, providers varied regarding their practices about prescribing mupirocin for surgical patients considered to be at greater risk. These included those preparing to have elective spinal surgery, which were performed either by orthopedic surgeons or neurosurgeons, depending on patient choice, presence of neurological injury, and/or primary provider referral. The orthopedic surgeons requested preoperative mupirocin use for all patients on whom they would be performing spinal surgery. In contrast, the neurosurgeons did not request mupirocin for their spinal surgery patients. This inconsistency among providers regarding preoperative mupirocin use resulted in different standards of care for spinal surgery patients at this PREP Center and may possibly affect SSI rates. There was no specific data
available for SSIs related to neurosurgical spine surgeries at this medical center. The orthopedic spinal surgery data included a SSI rate of 2.1 for the fiscal year 2012 and a SSI rate of 1.4 in the fiscal year 2015.

Research shows that MRSA colonization in cases of elective spine surgery exists and can have major negative effects on patient outcomes (Chen, Chivukula, Jacobs, Tetreault & Lee, 2012). Patients colonized with MRSA are 2-11 times more likely to develop a postoperative SSI, which can be life-threatening and debilitating (Awad et al., 2009; Sasi et al., 2015). From the patients’ perspective, any rate of infection is excessive (IHI, 2015), and efforts to prevent these complications should be optimized. With a significant incidence of MRSA SSIs in hospital settings and the number of MRSA carriers in communities rising (Awad et al., 2009; Levy, Ollivier, Drancourt, Raoult & Argenson, 2013), it was imperative that this PREP Center standardize care for all preoperative patients to decrease their risk of developing a SSI. This was done by developing and implementing a clinical practice protocol for using preoperative mupirocin 2% ointment on all spinal surgery patients at the hospital.

The purpose of this evidence translation project was to standardize preoperative mupirocin empiric treatment of MRSA colonization in all elective spinal surgery cases at the PREP center. To implement this practice for spinal neurosurgeries, the project used an existing set of instructions on mupirocin use in orthopedic surgery patients. The result eliminated the disparity between treatment of orthopedic and neurosurgical spinal surgery and standardized care for all patients undergoing elective spinal surgery. The short-term outcome of this quality improvement project was that all providers used consistent, standardized orders and instructions regarding mupirocin prescriptions for all spinal surgery patients. The long-term results
anticipated from this change in practice are a reduced rate of MRSA SSIs, which would ultimately reduce healthcare costs, and improve patient outcomes.

**Theoretical Framework**

Using a theoretical framework provided a structured process with which to facilitate evidenced-based practice (EBP). This project used the *Knowledge to Action Cycle (KTA)* framework developed by Graham et al. (2006) as the theoretical model for its knowledge translation, implementation plan, and evaluation. The *KTA Cycle* has an inner core of knowledge creation and an outer action circle of seven iterative phases (Straus, Tetroe & Graham, 2013). These bidirectional phases illustrate potential flow in either direction and include 1) identifying the problem then reviewing/selecting knowledge; 2) adapting knowledge to the setting; 3) assessing barriers/facilitators; 4) choosing, tailoring, implementing interventions; 5) monitoring knowledge use; 6) evaluating outcomes; and 7) sustaining knowledge use (Straus et al., 2013). This Doctorate of Nursing Practice (DNP) project used as a guide a detailed translation plan that used some of the above concepts.

For this project, identifying the problem was translated as a known, non-standardized practice based on surgeon’s preference and recommendation. Documenting the problem was captured by an anonymous online SurveyMonkey survey taken by the nurse practitioners (NPs) at the PREP Center, which assessed their current prescribing practices of mupirocin in spinal surgeries (see Appendix A). The survey results showed 100% of NPs prescribe mupirocin to orthopedic spine patients, while only 20% of NPs prescribed mupirocin to neurosurgery spine patients. This identified problem of disparity facilitated a review and selection of knowledge. The initial knowledge creation was linked to a thorough review of supportive literature regarding preoperative mupirocin use in surgical patients. The modified spinal neurosurgery instructions
became a knowledge tool from the pre-existing orthopedic MRSA colonization instructions (see Appendix B). Support by neurosurgeons was required for the success of the project, and any lack of support on their part would have been a significant barrier. The facilitators for the project included support of the nursing leadership staff and the infectious disease (ID) team at the hospital. Part of the quality improvement project’s action cycle was developing a multidisciplinary team, which was led by the project leader. This team interfaced with the neurosurgeons and advocated consistent practice decisions related to care and management at the PREP Center. The implementation plan involved the project leader and nursing leadership promoting a standardized, EBP change to be used by providers in the PREP Center. This practice change was summarized in clinical decision tools/instructions posted at the site to ensure easy access by all providers in the practice setting.

**Literature Review**

The importance of standardized anti-MRSA care for patients undergoing elective surgery is evidenced by many studies conducted over the past decade (Chen, Wessel, & Rao, 2013; Epstein, 2011; Goyal, Miller, Tripathi, & Parvizi, 2013). A key infection-prevention strategy is the use of preoperative intranasal mupirocin, which has been introduced as a standard of care for at-risk patients. Adherence to this practice can potentially reduce SSIs (Center for Disease Control and Prevention, 2014; Epstein, 2011; IHI, 2012). This literature review along with an evidence table (see Appendix C) incorporates mupirocin use as an important, infection-prevention practice among various surgical procedures, including those for general, orthopedic, and neurosurgical. The flow of evidence begins with standardizing care among patients to improve outcomes and then proceeds to using mupirocin ointment on many surgical patients, including those preparing for spinal surgery.
Standardizing patient care, particularly when it is enforced by well-positioned physicians, improves outcomes and value in the healthcare setting (Koenig & Bozic, 2015). Value is defined as patient-centered outcomes of care and the healthcare costs to achieve these outcomes (Koenig & Bozic, 2015). The process of standardization has been well-studied and shown to be effective in adding value to a complex healthcare system (Rotter et al., 2008). Barbieri et al. (2009) performed a meta-analysis of 22 studies related to joint replacement surgery. Their analysis showed significantly fewer postoperative complications, including superficial and deep infections, in groups using a standardized clinical pathway as compared to the usual care ($p = 0.01; p = 0.04$). The authors concluded that standardizing surgical care can significantly improve its quality; however, the cost-effectiveness of such standardization was unclear due to lack of appropriate cost analyses in the included studies. In 2010, a large study using the Premier Perspective database analyzed 182,146 consecutive patients undergoing hip or knee replacements to assess surgeon and hospital volume and standardization of care on postoperative outcomes, quality, and efficiency (Bozic et al., 2010). Interestingly, the authors found that using standardized process measures had a more significant effect on improving patient outcomes than did hospital and surgeon volume. The study demonstrated that neglecting 1 or 2 process measures, respectively, increased negative outcomes 1-1.2% and 1.8-2.0% (Bozic et al., 2010). Using EBP to implement standardization of care and reduce unwanted disparities not only improves quality of care and value, but it also avoids complications and decrease costs (Koenig & Bozic, 2015).

Mupirocin use has been introduced as a standard of care among many at-risk surgical patients (Savage & Anderson, 2013). This topical antibiotic is applied intranasally to inhibit the growth of *S. aureus*, and its effectiveness against MRSA makes it the best method for eradicating
it (Savage & Anderson, 2013). Approximately 33% of the U.S. population test positive for MRSA in their nasal cavities (CDC, 2014). Because the bacterial organism *S. aureus* is a major cause of postoperative infection, it is advantageous to treat patients who are nasal carriers of MRSA with mupirocin preoperatively (Goyal et al., 2013, Levy et al., 2013).

Many studies support preoperative screening for MRSA colonization and its treatment with intranasal mupirocin 2% ointment applied twice daily for 5 days before surgery to reduce the risk of SSIs (Chen et al., 2013; Kallen, Wilson, & Larson, 2005; van Rijen, Bonten, Wenzel & Kluytmans, 2008). In 2008, van Rijen et al. conducted a comprehensive, systematic review of four prospective, randomized controlled trials (RCTs) involving the relationships of many types of surgeries, including general, gynecologic, orthopedic, cardiothoracic, cardiac, and neurologic, to the incidence of *S. aureus* SSIs. Each of the four studies had evaluated a group treated with mupirocin 2% (see Appendix C) and a group that had received a placebo, each had used standard culture techniques to identify MRSA carriers, and each has used CDC criteria to identify infections. These studies represent standardizing care with their results showing a 3.6% rate of *S. aureus* infections in the mupirocin group and a 6.7% rate in the placebo group (*p* = 0.02). The reviewers concluded that intranasal mupirocin treatment of nasal carriers of MRSA reduced the incidence of SSIs. However, they concluded that not all surgical patients should be treated prophylactically, because doing so would have no effect on noncarriers (Epstein, 2011; van Rijen et al., 2008) and there would be cause for increased concern of antimicrobial resistance. Lee et al. (2011) demonstrated a low grade mupirocin resistance but patients treated perioperatively for short periods have not had a significant problem with resistance (van Rijen et al., 2008).

The effectiveness of mupirocin ointment in the positive nasal carrier states is supported. Other research studies concluded that SSI rates were significantly reduced by MRSA screening
using polymerase-chain-reaction (PCR) and then intranasal mupirocin 2% treatment of patients positive for MRSA (Bode et al., 2010; Pofahl et al., 2009). In one study, the rate of MRSA SSIs was 3.4% in the treatment group and 7.7% in the placebo group (Bode et al., 2010), and in another, MRSA SSI rates decreased from 0.23% to 0.09% (Pofahl et al., 2009). In addition, Pofahl et al. (2011) performed follow-up quasi-experimental research on their 2009 study results and found that those patients who developed a MRSA SSI were the same patients who had not been treated preoperatively for their positive status as MRSA carriers. MRSA nasal carriers are at increased risk for SSI, so prevention measures by healthcare providers can play an important role in decreasing the burden of MRSA SSIs (Levy et al., 2013).

Studies related specifically to elective, spinal neurosurgery cases were much more limited but included two recent retrospective comparative studies (RCSs). First, in 2012, a study by Chen et al. showed that the prevalence of MRSA colonization in patients who had undergone elective spinal surgery (2.8%) was comparable to that in patients who had had arthroplasty. The data trend showed decreased MRSA SSIs in patients who had been screened and treated for MRSA colonization. In the second study, Thakkar et al. (2014) concluded that preoperative MRSA colonization was associated with postoperative spinal MRSA SSI. This correlational study showed MRSA SSIs in 8% of the patients who had tested positive for MRSA, as opposed to only 0.6% of patients who had tested negative MRSA. These studies demonstrated the risk factor for MRSA carriers. The authors of both studies recommended future prospective RCTs with larger samples of spinal surgery patients to strengthen the evidence regarding these preventive measures.

The overall consensus of the evidence supports preoperative MRSA screening and decolonization with intranasal mupirocin ointment to decrease the incidence of MRSA SSI.
Most researchers used intranasal mupirocin ointment twice daily for five days to effectively eradicate MRSA (Chen et al., 2013; Kallen et al., 2005; van Rijen et al., 2008). Currently, the SSI rate in the U.S appears to be low and declining further according to the CDC (2014), but the cost of SSIs is substantial, and patients may die from MRSA SSIs in particular and their associated complications (Goyal et al, 2013). In addition, the hospital costs for one SSI have been estimated to be $120,000 (Goyal et al., 2013). Mupirocin treatment is safe and effective (Pofahl et al., 2011; van Rijen et al., 2008) and its use is economical (Chen et al., 2013). At this project’s target setting, the population needing spinal surgery is increasing, and MRSA continues to be prevalent. Nasal carriers of MRSA can be effectively treated with mupirocin preoperatively to reduce their risk of developing a costly and potentially life-threatening SSI.

**Methodology**

Standardizing care by using preoperative mupirocin ointment to eradicate MRSA in nasal carriers undergoing spinal surgery has been shown to optimize patient outcomes (Awad et al., 2009). Furthermore, researchers have demonstrated that intranasal mupirocin ointment is safe and effective (Pofahl et al., 2011) and that implementing its use can successfully be achieved with the collaborative efforts of a multidisciplinary team. Design, setting and sample, procedures, and data collection and analysis will be addressed.

**Design**

The purpose of this evidence translation project was to implement preoperative intranasal mupirocin treatment for neurosurgical spine patients presenting to the PREP Center. This quality improvement initiative involved a practice change intervention that standardized care for all spinal surgery patients. The *KTA Cycle* (Straus et al., 2013) was used as a framework for the
knowledge translation and implementation plan. The project was conducted over a five-week period (Appendix D).

Setting and sample

The PREP Center located in a tertiary, academic medical center has the responsibility to preoperatively assess every surgical patient at the hospital, with the exception of inpatients and emergent admissions. This medical record documentation was performed less than 30 days before the surgical procedure and included a patient history and a complete physical examination, necessary preoperative tests, preoperative teaching, and information on infection prevention measures. The preoperative surgical patient encounters used a multidisciplinary team that included anesthesiologists and residents, nurse practitioners (NPs), nurses, clinical technicians, and clerical staff.

From the multidisciplinary team, the NPs were the providers performing physical assessments, implementing the practice change, and prescribing the mupirocin preoperatively to the neurosurgical spine patients. They were the targeted sample population for this project with a projected number of eight NPs.

Human Subjects

The project proposal was be submitted to University of Maryland Baltimore (UMB) for approval of the Institutional Review Board (IRB) under the expedited review. Providers were volunteers and there were no identifiers collected to protect anonymity. The Health Insurance Portability and Accountability Act (HIPAA) rules and regulations for patient privacy and confidentiality was followed. Additionally, password protected devices was used at all times.
Procedures

After the approval of the IRB, the expert panel consisting of the ID director of nursing and the hospital epidemiologist were recruited through a scheduled meeting with a specific agenda. The agenda included five components: introducing the problem and discussing the project’s purpose, presenting the evidence from a literature review, exploring the current SSI rate in neurosurgical spine cases, modifying pre-existing orthopedic spinal instructions, and stratifying for neurosurgeon support (see Appendix E). The project leader recorded minutes of the meeting, scheduled further meeting dates, and created and distributed specific agendas for the meetings.

The support by the neurosurgeons was crucial to the success of the practice change in this project. To gain their support, the project leader arranged a meeting with the Vice President of Perioperative Services (the site person) to create a key communication tool (policy brief) regarding the recommendation of mupirocin use, and then delivered the tool to the neurosurgeons (see Appendix F). They also received an introduction speech from the Vice President (VP) of Perioperative Services (the site person) to initiate communication about the intention of the project. After the introduction and policy brief, the project leader arranged a meeting to interface with the neurosurgeons for their support and collaboration. The project leader presented the findings of the literature review, which support standardizing care for patients and using intranasal mupirocin 2% ointment, to the neurosurgeons and the VP of Perioperative Services. Evidence-based recommendations were discussed and the modified instructions for standardizing orders for mupirocin ointment in spine surgery patients were distributed. Feedback from the neurosurgeons and any revisions were addressed, then their
approval sought to initiate the practice change. Throughout the meeting and planning periods, the project leader sent follow-up emails to the nursing leadership staff.

Through the direction of the project leader, the nurse manager contacted the NPs via email and arranged a time to participate in the project. During the NPs monthly staff meeting, the NPs at the PREP Center actively participated in a live educational session with the project leader about using the new instructions for the neurosurgical spine patients. The project leader made handouts for the staff including the revised spine instructions. Also, the project leader devised a check box within the EHR to incorporate the mupirocin practice change. This check box provided an available reminder for the NPs to prescribe mupirocin and provided sufficient documentation of the practice change by the NPs. The educational content is outlined in detail (see Appendix G).

Implementation of the practice change began after the live-educational session, and email feedback was used throughout the implementation to assess the need for improvement in facilitating the practice change. The project leader changed the EHR template to prompt NPs to prescribe appropriately, posted the PREP Staff Instructions for Spinal Surgery/PREP Tips (see Appendix B) in an easily accessible and designated area, and reviewed patient charts weekly to verify provider compliance with the prescription. In addition, the project leader ensured response times of 12 hours or less to email communications and a monthly meeting with prescribing NPs to discuss facilitators of and barriers to the practice change.

**Data Collection**

The project leader reviewed 98 electronic charts to determine the pre-implementation, implementation, and post-implementation data as described below. Data was collected concomitantly during the five-week (June) implementation period to track compliance and assess
for improvements. Data was collected retrospectively from a two-month period (April and May) pre-implementation, and for the two-months (July and August) post-implementation. Data included the date of the presurgical assessment, the NP provider, the NP provider’s documentation of preoperative mupirocin on spine patients, and the service performing the spinal surgery (see Appendix H).

**Data Analysis**

After the practice-change implementation, data analysis involved the number of mupirocin treatments written by the providers to elective spine patients pre and post-implementation. Data analysis and evaluation occurred during the month of September. Descriptive statistics were used to show how many treatments for mupirocin were written during the pre and post-implementation period of this project. The number of NP’s (also stated as a percentage) who prescribed the mupirocin for the neurospine patients after implementation of this project were compared to the number of NP's (also stated as a percentage) who prescribed the mupirocin for the neurospine patients before implementation of the project. These findings were used to evaluate whether there has been an increase in the standardization of care. If there was, then the next step would be to evaluate whether there has been a reduction in the SSI rate at the PREP Center, which was beyond the scope of this project.

**Findings**

The empiric mupirocin treatments for MRSA colonization in all elective spinal cases at the PREP Center was increased from 28% to 97%. Pre-implementation data included 36 elective spinal cases, which 28 cases had no mupirocin treatment and 8 cases were prescribed mupirocin treatment. Post-implementation data included 38 elective spinal cases, which 37 cases were
prescribed mupirocin and 1 case was not prescribed mupirocin ointment. There was 1 out of 8 NPs that failed to prescribe mupirocin post-implementation for one case, therefore the number of NPs prescribing mupirocin for elective spinal cases increased from 25% to 88%.

**Conclusions**

The implementation of this quality improvement project has increased the standardization of care regarding the prescription of empiric mupirocin treatments for all elective spinal cases at the PREP Center. The support of the neurosurgeons and collaboration of the NP providers were crucial to the success of this project. This standardized anti-MRSA care for patients undergoing elective spinal surgery has eliminated the disparity between the orthopedic surgical patients and the neurosurgical patients. With continuing effort to optimize standardized care, the future step recommended would be to evaluate whether there has been or will be a reduction in the SSI rate at the PREP Center, which was beyond the scope of this project.
References


carriage after decolonization: A case-control study. *Clinical Infectious Disease, 52*(12), 1422-1430.


Question 1:
In your current practice, select the response that best describes your prescribing patterns of mupirocin ointment to patients undergoing spinal surgery performed by orthopedic surgeons?
A. Night before and morning of surgery
B. 5 days BID prior to surgery
C. No prescription
D. Comments

Question 2:
In your current practice, select the response that best describes your prescribing patterns of mupirocin ointment to patients undergoing spinal surgery performed by neurosurgeons?
A. Night before and morning of surgery
B. 5 days BID prior to surgery
C. No prescription
D. Comments
Appendix B

Staff Instructions for Spinal Surgery

* *S. aureus* is one of the leading causes of infections after many surgeries. About 1 in 4-5 people harbor this organism in the mucous membranes of their nose.

* Studies have shown that people whose nares are colonized with *S. aureus* are more than twice as likely to have wound infections after surgery. Patients will be made aware of the risk and offered topical antibiotic (mupirocin) to eradicate the organism during the surgical preoperative/postoperative period.

**Instructions**

**Prior to surgery**

- Provide an explanation to the patient regarding intranasal mupirocin use.
  - The patient should understand that this prescription may reduce the risk of wound infection following surgery.
  - Ask the patient to make sure their contact information is up to date.

**Prep Center responsibilities**

- NP performing the patient’s preoperative history and physical will provide the patient a prescription of topical Mupirocin 2% ointment and instruct patient to fill the prescription.
  - Instruct on use:
    * Ointment will be applied to the anterior nares night before and morning of surgery.

This prescription will be handled like any other. It will be billed to patient and/or insurance.

*Modified instructions from pre-existing Staff Instruction Packet*
## Appendix C

### Evidence Rating Table

<table>
<thead>
<tr>
<th>Source (Authors, year)</th>
<th>Objective/ Study intervention</th>
<th>Design</th>
<th>Sample (how selected and measured)</th>
<th>Outcomes studied (how measured)</th>
<th>Results</th>
<th>Level of Evidence and quality rating</th>
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<tbody>
<tr>
<td>Bode et al., 2010</td>
<td>The purpose of this study was to assess the impact of <em>S. aureus</em> carriers treated with intranasal mupirocin ointment compared to those who were not for prevention of hospital-associated infections with <em>S. aureus</em>. Intervention- Mupirocin 2% applied twice daily for 5 days.</td>
<td>Randomized, double-blind, placebo-controlled</td>
<td>From Oct 2005-June 2007 screened 6771 patients on admission and 1251 were positive for <em>S. aureus</em>. Intention-to-treat participating patients 917 which 808 of them were surgical. Randomly assigned to active treatment or placebo ointment. Inclusion criteria- pt to remain hospitalized for at least 4 days. Exclusion criteria- less than 18yo.</td>
<td>Health care-associated <em>S. aureus</em> infections- cumulative incidence and source of infection along with localization of infection.</td>
<td><em>S. aureus</em> was significantly lower in the mupirocin-chlorhexidine group than the placebo group.</td>
<td>1, A</td>
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<td>Chen A., Chivukula et al., 2012</td>
<td>The purposes of this study was to determine the prevalence of MRSA colonization in elective surgical</td>
<td>Retrospective comparative study</td>
<td>Data collection from 1002 patients undergoing elective spine surgery in 2010. 12 patients lost to follow up. 990 total patients. 503 were</td>
<td>Early wound complications- wound drainage or the presence of an abscess. Frequency from MRSA or MSSA in two different</td>
<td>MRSA colonization in elective spine surgical patients are comparable to arthroplasty patients. Clinical</td>
<td>3, B</td>
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<tr>
<td>Study</td>
<td>Purpose</td>
<td>Intervention</td>
<td>Methodology</td>
<td>Outcome Measures</td>
<td>Findings</td>
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<td>Chen, A., Wessel et al., 2013</td>
<td>Two purposes: does <em>S. aureus</em> screening and decolonization reduce SSIs in orthopedic patients and is this type of protocol cost-effective. Intervention- Mupirocin 2% twice daily for 5 days.</td>
<td>Systematic review- prospective RCTs, retrospectives, systematic review, Cochrane review of RCTs, Model, RCT</td>
<td>19 studies examining decolonization protocol to reduce SSIs. 10 studies entailed cost-effectiveness of screening and decolonization. Exclusion criteria- studies before 1968. 25 studies total.</td>
<td>SSIs- definition of infection, location of infection, infection reduction. Economic impact- PCR vs culture, USD dollars per quality-adjusted life year, cost of preventing one MRSA infection, comparing hospital cost of pre with postintervention pts, different measures used in cost effectiveness studies.</td>
<td>Preoperative screening and decolonization of <em>S. aureus</em> in orthopedic pts is cost-effective to reduce SSIs. 1-4, A-B</td>
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<td>Levy et al., 2013</td>
<td>Assess the relationship between <em>S. aureus</em> nasal carriers and SSIs in orthopedic surgery. Treatment of Mupirocin 2%</td>
<td>Systematic literature review and meta-analysis</td>
<td>5 studies included. Relevant studies=860 then 835 exclusion criteria. 25 further evaluations then 20 excluded from analysis criteria.</td>
<td>Percentage MSSA or MSRA SSIs- Centers for Disease Control and Prevention criteria. Effect of nasal <em>S. aureus</em> carriage on SSIs- point forest</td>
<td><em>S. aureus</em> is a major risk factor for SSIs. Eradication efficacy not demonstrated because of small ortho sample</td>
<td>1-2, B-C</td>
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<tr>
<td>Study Authors and Year</td>
<td>Study Design</td>
<td>Inclusion Criteria</td>
<td>Details</td>
<td>Results</td>
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<td>Pofahl, W., Goettler et al., 2009</td>
<td>Quasi-experimental</td>
<td>5094 patients underwent Surgical Infection Prevention Project (SCIP) procedures. Cardiac, ortho, colorectal, gynecologic. Then excluded vascular and colorectal because inaccurate data.</td>
<td>SSI rates per 100 procedures using the National Nosocomial Infection Surveillance definitions. MRSA SSI rates were compared before and after the MRSA tx intervention.</td>
<td>Decreased SSIs from MRSA after a universal screening and eradication with mupirocin was instituted.</td>
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<tr>
<td>Pofahl, W., Ramsey et al., 2010</td>
<td>Quasi-experimental</td>
<td>Inclusion criteria-patients who developed MRSA SSI following institution of the screening and eradication protocol. Patients under SCIP (n=8980).</td>
<td>SSI- standard definition by the National Nosocomial Infection Survey (CDC) and the National Health and Safety Network. MRSA SSI rates as percentages.</td>
<td>Ongoing MRSA SSI reduction 2 years after beginning universal screening and tx of carriers.</td>
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<td>Thakkar et al., 2014</td>
<td>Retrospective electronic chart review</td>
<td>519 patients total. Year 2011- June 2013. Inclusion criteria-patients undergoing spinal surgery who were Nasal MRSA screen- MRSA positive group, MSSA positive group, and MRSA/MSSA negative group.</td>
<td>SSI results- S. aureus most common organism isolated from infected wound culture.</td>
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<tr>
<td>Study</td>
<td>Intervention</td>
<td>Exclusion criteria</td>
<td>Inclusion criteria</td>
<td>Primary outcome</td>
<td>Secondary outcome</td>
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<td>van Rijen et al., 2008</td>
<td>To assess whether preoperative intranasal mupirocin tx of nasal <em>S. aureus</em> carriers results in decreased postop <em>S. aureus</em> infections. Intervention-Mupirocin 2% day before and day of surgery for 1 study, Mupirocin 2% twice daily for 5 days for 2 studies, Mupirocin 2% twice daily for 7 days for 1 study.</td>
<td>Pt who had spinal surgery for initial diagnosis of infection, intrathecal baclofen pumps, or spinal cord stimulators.</td>
<td>Any gender and age.</td>
<td>Preoperative intranasal mupirocin ointment decreased the rate of postoperative <em>S. aureus</em> infections among surgical patients who were nasal carriers.</td>
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## Appendix D

### Timeline for Scholarly Project

<table>
<thead>
<tr>
<th>Goal</th>
<th>2016</th>
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<tbody>
<tr>
<td></td>
<td>April</td>
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<tr>
<td>Finalize project proposal</td>
<td>X</td>
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<tr>
<td>Present proposal and secure committee approval</td>
<td>X</td>
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<tr>
<td>Submit to the IRB committee</td>
<td>X</td>
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<tr>
<td>Conduct project</td>
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<tr>
<td>Analyze, synthesize, and evaluate findings</td>
<td>X</td>
</tr>
<tr>
<td>Prepare final scholarly project manuscript</td>
<td>X</td>
</tr>
<tr>
<td>Present final scholarly project</td>
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</table>
Appendix E

Agenda for Meeting with the Expert Panel

I. Introduction
   A. All members present will introduce themselves (DNP student, DNP chair, Infectious Disease Nursing Director, Hospital Epidemiologist)
   B. Identify the clinical practice problem of disparity of preoperative mupirocin use in elective spine cases in orthopedic versus neurosurgical services at the PREP Center and validate findings with the results of SurveyMonkey taken by the nurse practitioners in December 2015

II. Project’s purpose
   A. Quality improvement project to standardize preoperative mupirocin treatment of MRSA colonization in all elective spinal surgery cases at the PREP center. To implement this practice for spinal neurosurgeries, the project will use as a template an existing set of instructions on mupirocin use in orthopedic surgery patients.
   B. Currently, no MRSA screening on any spine patients. However, this practice is being addressed in another DNP project for the PREP Center.

III. Literature Review
   A. PowerPoint
   B. Handout

III. Exploring the current SSI rate for the hospital
   A. Assess and document pre-change SSI in neurosurgical patients
   B. Comparison assessed to all elective spine cases coming through the PREP Center

IV. Modifying pre-existing orthopedic spinal instructions
A. Draft presented to the expert panel

B. Revisions if necessary and approval by expert panel to submit to neurosurgeons

V. Stratifying for neurosurgeon support

A. “Buy in” strategies

1. Present evidence based recommendation
2. Discuss disparity between orthopedic and neurosurgical spine cases
3. Nursing leadership support
4. ID team advocacy
5. Current SSI data at the hospital
6. National attention and CMS payment reduction for preventable complications therefore adhere to prevention practices (Center for Disease Control and Prevention, 2012; Institute of Healthcare Improvement, 2012)

B. Desired Outcome to standardize care and prevent SSIs

1. Feedback, revisions if necessary, and support from neurosurgeons
2. Timeline discussion of pilot implementation trial (3months) and evaluation of the project with EHR chart reviews
To: Dr. Sansur and Dr. Aarabi

From: Heather Moore, CRNA, DNP student

Re: Preoperative Mupirocin Use in Neurosurgical Spine Patients

ISSUE SUMMARY: There is disparate care of preoperative mupirocin use among orthopedic spine surgery and neurosurgical spine surgery at the PREP Center. The standardization of care with similar surgeries using EBP will eliminate this disparity.

Background
* Standardization of patient care will improve outcomes and value in the healthcare setting (Koenig & Bozic, 2015). Value is patient-centered outcomes of care and the healthcare costs to achieve these outcomes (Koenig & Bozic, 2015).
* Mupirocin use has been introduced as a standard of care among many at risk surgical patients (Savage & Anderson, 2013). Approximately 33% of the population test positive for MRSA in their nasal cavities (CDC, 2014). Knowing a major cause of developing a postoperative infection is from the bacterial organism, *S. aureus*, it is advantageous to treat these MRSA nasal carriers with preoperative mupirocin (Goyal et al., 2013, Levy et al., 2013).
* Many studies support preoperative MRSA colonization screening and treatment with intranasal mupirocin 2% ointment applied twice daily for 5 days before surgery to reduce the risk of SSIs (Chen et al., 2013; van Rijen, Bonten, Wenzel & Kluytmans, 2008).
* In 2012, Chen et al.’s research showed that the prevalence of MRSA colonization in elective spine cases (2.8%) was comparable to arthroplasty cases.

Alternatives
1. Preoperative Mupirocin Use in Neurosurgical Spine Surgery
   **Advantages:** Standardization of care avoids surgical complications and reduces healthcare costs. EBP allows for optimal, patient outcomes. The elimination of the disparity between ortho and neuro spine surgeries with mupirocin use will avoid preop provider confusion and promote standardized compliance. Treatment of MRSA carriers will potentially reduce MRSA SSIs. Mupirocin treatment is safe and effective (Pofahl et al., 2011; van Rijen et al., 2008) and its use is economical (Chen et al., 2013).
   **Disadvantages:** Change is resistant, chaotic, and time-consuming. Mupirocin may be a financial burden to some patients.
   **Advantages:** Neurosurgeons maintaining their current prevention infection practices.
   **Disadvantage:** A disparity remains among similar surgeries and the standardization of care is not being met. Failure to provide EBP could lead to less than optimal patient outcomes.

Proposal: To implement EBP of preop intranasal mupirocin use among neurosurgical spine surgeries at the PREP Center. A 3-month period for implementation followed by a 3-month period of evaluation will be the projected timeline. A reduced rate in MRSA SSIs leading to healthcare cost savings and improved patient outcomes are anticipated after this practice change is implemented.

References


### Instructional Lesson Plan

**PREP Center Preoperative Practice Change for Neurosurgical Spine Surgery**

<table>
<thead>
<tr>
<th>Topic:</th>
<th>Date: June 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standardization of care among the surgical spine population at the PREP Center to optimize patient outcomes. Preoperative intranasal mupirocin 2% ointment for MRSA nasal carriers to reduce the risk of developing a postoperative MRSA SSI.</td>
<td></td>
</tr>
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</table>

**Instructor: Heather Moore, CRNA**

**Goal:** Neurosurgeons will support evidence based recommendations and prescribe preoperative mupirocin for their spine surgeries, which will eliminate a disparity at the PREP Center and provide a standardization of care to improve quality outcomes. The prevention practice of mupirocin use in surgical spine patients will potentially reduce the incidence of MRSA SSIs.

**Context (learner characteristics, style, developmental level, learning theory):** Experienced advanced nurse practitioners. Interactive learning approach will be utilized.
<table>
<thead>
<tr>
<th>Objectives</th>
<th>Content</th>
<th>Method of Instruction</th>
<th>Time</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>To identify the disparity among spinal cases and the need for standardizing care.</td>
<td>The NP SurveyMonkey results on mupirocin use in the spinal surgeries will be discussed.</td>
<td>Lecture/Interactive</td>
<td>3-5 minutes</td>
<td>NPs will verbalize understanding.</td>
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<tr>
<td>To understand the importance of standardizing care and the use of mupirocin preoperatively to reduce SSIs.</td>
<td>Presentation of the evidence supporting standardizing care and preoperative mupirocin use.</td>
<td>Lecture/interactive</td>
<td>8-10 minutes</td>
<td>NPs feedback and questions answered.</td>
</tr>
<tr>
<td>To implement the practice change of mupirocin use in neurospine patients</td>
<td>Instructions on implementation of the practice change and the EHR component of a “drop down” box. This box will be checked to prescribe mupirocin in neurospine patients.</td>
<td>Lecture/interactive – a modified version of the existing orthopedic spine instructions approved and prescribed by the neurosurgeons. Each provider accessing the EHR to practice with “drop down” box.</td>
<td>10-12 minutes</td>
<td>Questions will be asked to clarify the process of the practice change.</td>
</tr>
</tbody>
</table>
Appendix H

Data Collection for Standardizing Preoperative Mupirocin Use in Spinal Surgery Patients

<table>
<thead>
<tr>
<th>Patients #1 thru #98</th>
<th>NP provider Labeled 1 thru 8</th>
<th>Date of the presurgical assessment</th>
<th>Neurosurgery or Orthopedic Service 1=Neuro 2=Ortho</th>
<th>Mupirocin Prescribed 1=Yes 2=No</th>
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