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Reduction in Postoperative Infections using Surgical Care Improvement Project (SCIP) Guidelines: A Quality Improvement Project

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Reduction in Postoperative Infections using Surgical Care Improvement Project (SCIP) Guidelines: A Quality Improvement Project

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Abstract

**Background:** Optimal methods for measuring and reporting quality surgical care have predominantly been based on process measures, rather than outcome measures. Efforts to reduce adverse outcomes and increase quality perioperative care, were instituted with the introduction of the Surgical Care Improvement Project (SCIP). These measures were created to reduce postsurgical complications as they have been associated with substantial increase in costs, length of stay and most importantly, patient quality of life and mortality.

**Methods:** This quality improvement project focused on four SCIP measures and their effectiveness in reducing post operative infections in lower extremity total joint surgery. Educational sessions regarding infection/complication rates and evidenced based data showing the importance of SCIP measure compliance were held. Pre and post intervention results were analyzed and presented to the surgical and physician office staff.

**Results:** A total of 63 primary lower extremity joint surgeries were performed during the intervention period with a 5% decrease in reported SSI from previous 30-day period (10.0% vs. 5.88%). These reported SSI’s were based on the revision surgeries performed within 30 days of the initial surgery. A 100% compliance of SCIP measures was reported during the intervention period.

**Conclusion:** SCIP measure compliance has shown to reduce risk of postoperative infections. However, compliance alone does not equate to a surgical experience without infection or adverse events. Factors such as compliance to discharge instructions and co-morbidities have an overall effect to the patient experience.

**Keywords:** SCIP, surgical care improvement project, postoperative infections, postsurgical infections, orthopedics, orthopedic surgery, total joint
Reduction of Post Operative Infections Using SCIP Guidelines

**Introduction**

Despite many changes and advancements in surgical practice and technology, postoperative infections still occur and continue to be a challenging problem. Surgical infections are a leading cause of patient morbidity and mortality and have emerged as the most common and costly cause of healthcare associated infections (Anderson, 2014). Surgical site infections account for over 20% of all healthcare related infections (Fan, 2014). These infections also frequently complicate operations, with an estimated annual incidence of 780,000 cases per year (Shepard, Ward, & Milstone, 2013). Post surgical infections can cause pain, delayed healing, need for unnecessary treatment, longer hospital stay and increased cost. They can also cause severe and, debilitating problems, including failure of implanted hardware, organ failure, sepsis or even death.

**Background**

Surgical site infections are a major cause of morbidity and patient mortality. Surveillance of SSI rates has traditionally been focused on inpatients and usually the monitoring ends when patients are discharged. The current trend toward shortening hospital stays increases the probability that SSI’s may develop after discharge and remain undetected or lost to follow up.

Postoperative infection is defined as any discharge with a diagnosis of infection due to surgery (Davis, Kuo & Ahmed, 2011). The four infection control related SCIP measures used in this project are (1) administration of appropriate prophylactic antibiotics within one hour before surgical incision (two hours for vancomycin); (2) glycemic control; (3) appropriate surgical-site hair removal; and (4) immediate postoperative normothermia after surgery.
Surgical site infections in orthopedic cases are disastrous as it is difficult to rid the joint and bone of infection. Orthopedic surgeries are associated with one of the highest rates of SSI among elective surgical procedures, with incidences of SSI’s ranging from 2% to almost 20% not accounting for those unreported occurring 30 days after discharge (de Lissovoy, Fraeman, Hutchins, Murphy, Song & Vaughn, 2010). Orthopedic surgeries are also associated with a high mortality rate and high hospital costs.

The Surgical Care Improvement Project (SCIP) program was first introduced in 2002 by the Centers for Medicare & Medicaid Services (CMS) in partnership with national organizations, including the American Hospital Association, Centers for Disease Control and Prevention (CDC), the Institute for Healthcare Improvement, and The Joint Commission. It is a set of process compliance measures that aims to reduce SSIs. Its goal is to reduce the rates of postoperative surgical infections by promoting the adoption of publicly reported individual SCIP measures selected by a technical expert panel (The Joint Commission, 2010). Currently, there are a total of twenty-two core measures in the SCIP program. Of these measures, nine are publicly reported, and six of the nine core measures are focused on the prevention of postoperative infections.

Although participation in SCIP is not mandated, CMS reduces reimbursements by 2% to hospitals that do not report SCIP measure performance (Barlan & Kasper, 2012). While adherence to SCIP measures has controversial effects on patient outcomes, there is a growing incentive for compliance through pay-for-performance and pay-for-value initiatives (Stulberg, Delaney, Neuhauser, Aron & Koroukian, 2010).

Over three hundred thousand surgical site infections are reported each year with annual direct and indirect costs estimated to be in excess of $1 billion and $10 billion, respectively.
(Gaston & Kuremksy, 2010). Many of the complications are life threatening, but most are preventable. Traditionally, surgical complications are thought to be an inevitable hazard of having a surgical operation. However recent evidence suggest that a systematic approach for providing consistent care has decreased the amount of post-surgical complications, specifically postoperative infections (Cataife, Weinberg, Wong & Kahn, 2014).

A systematic set of process compliance measures such as the SCIP program has been found to reduce the incidence of SSIs, even at the beginning stages of the program’s implementation (Davis, Kuo & Ahmed, 2011). Adherence to SCIP measures resulted in a decrease in postoperative infections, i.e. 6.8 and 14.2 postoperative infections per 1000 discharges with and without adherence (Barlam & Kasper, 2014).

Although the primary purpose of this project is to achieve an overall reduction in postoperative infections, healthcare organizations can also benefit from this incentive financially since an increased rate of postoperative infections lead to unnecessary readmissions that cost a lot of financial burden to both the patient and the hospital organization. Patients diagnosed with an SSI after discharge incurred $3,696 in additional outpatient costs (Shepard, Ward & Milstone, 2013). In addition, the daily total charges, mean length of stay and 30-day readmission rate for patients with an SSI compared with patients without an SSI were $7,493 vs. $7,924 ($P = .99$); 10.56 days vs. 5.64 days ($P < .001$); and 51.94 vs. 8.19 readmissions per 100 procedures ($P < .001$) according to a large scale study performed at the John Hopkins Health System acute care hospitals in Maryland (Shepard, et al 2013).

Lastly, as part of Medicare’s 2012 value-based purchasing program, SCIP measures performance affects a part of the hospital cost reimbursement which is based on care quality, not just services provided. Therefore, any and all reported incidence of readmission due to
postsurgical infections can result to a decrease or a nonreimbursed hospital care and stay, resulting in a loss of potential and actual revenue.

**Problem Statement**

One of the most challenging aspects of quality improvement has been the identification of best practice. The literature demonstrating direct cause and effect on relationships for a specific intervention is scarce. To minimize the incidence of postoperative infections, it is important to focus on modifying perioperative risk factors and managing ways to reduce them using a uniform guideline. There are numerous intrinsic factors such as medications and prior infections that can be minimized prior to any surgery that can reduce the risk for surgical infections. There are also many patient related factors that can increase their risk for developing postoperative complications, such as co-morbidities of diabetes and uncontrolled hypertension.

An approach to explore and evaluate the factors that contribute to postoperative infections may reduce the risk and incidence in the already overburdened healthcare system. Establishing a uniform criteria and guideline that allows for a maximum compliance to such guideline may be able to help address the rate and incidence of postoperative infections. The purpose of this project was to utilize the SCIP measures related to surgical infections, in order to maintain compliance and adherence to such measures and promote them to become part of the culture of safety within the facility. However, due to time constraints, the project focused on the effectiveness of utilizing four SCIP measures in reducing postoperative infections in patients undergoing elective lower extremity joint surgery.

**Organizational “Gap” Analysis of Project Site**

The project was implemented at a 425-bed level two trauma hospital with twelve dedicated surgical suites, open heart/cardiac suite and a hybrid suite shared with the Cathlab.
This facility operates on a 24-hour basis, and performs an average of 25 surgical procedures daily, ranging from general procedures to high acuity open heart surgeries.

This facility has reported 381 knee prosthesis and 320 hip prosthesis surgeries performed between April 2016 and March 2017 (Centers for Medicare and Medicaid Services, 2017). When benchmarked to national rating, this facility scores the same as the national average rate for the same surgical procedure category (Centers for Medicare and Medicaid Services, 2017). A general overall improvement in the current infection rates will not only improve the hospitals overall safety score, but also in direct patient outcomes.

**Review of the Literature**

A comprehensive search of the literature for evidence addressing the use of SCIP measures for postoperative complications were included in the search. This literature review is done through a large database search for inclusion keywords *SCIP, surgical care improvement project, postoperative infections, postsurgical infections, orthopedic surgery, total knee, total hip* using MedLine, EBSCOhost, PubMed, CINAHL and Ovid databases. Inclusion criteria were full text articles published in English.

The search resulted in over 275 inquiries, which were narrowed down even further to research articles published between 2012 to 2018. A total of 21 relevant articles were found, 11 of which came from CINAHL, 6 from Ovid, 4 from EBSCOhost and 7 from MedLine. Duplicated articles were eliminated.

The resulting articles were evaluated for strength, level of evidence and quality based on the John Hopkins Nursing Evidence-Based Appraisal (JHNEBP). Any articles that were determined to be at Level IV and V were omitted as these types of articles may provide insufficient and conflicting evidence (Newhouse, Dearholt, Poe, Pugh & White, 2005). The
articles used for this review include retrospective studies, prospective cohort studies, meta-analysis and randomized control trials.

**Staff Knowledge, Beliefs and Attitudes**

Staff knowledge, beliefs and attitudes affect patient outcomes as adherence to protocols and guidelines can be mismanaged when there is insufficient knowledge of rationale behind certain nursing related tasks. Certifications have been developed to measure the cognitive knowledge of a nurse with the assumption that the knowledge will then be translated into improved skills at the point of patient care. Improved perceptions of surgical team communication and intervention for hypothermia resulted in a thirty percent decrease in the number of patients with hypothermia upon arrival to the postoperative care unit (Scott & Stonemetz, 2015). These findings did not result in overall improved SSI rates; however, a significant reduction in SSI was seen in other subspecialty group.

Surgical care improvement measures that were found as reminders in the electronic health record (EHR) were shown to be effective in reminding staff, particularly circulating nurses, the important aspects of care and checkboxes to remind them to perform such tasks (Andersson, Bergh, Karlsson, Eriksson & Nilsson, 2012). This retrospective study further discusses the increased rate of adherence and therefore, it subsequent reduction in postoperative complications, when such measures are placed in multiple parts of the EHR, no matter the complaints of redundancy.

Consequently, in another quasi-experimental study (Thirukumaran et al, 2013), EHR’s were found to be counterproductive in the implementation and adherence to SCIP measures as staff spent more time charting than performing the actual measures. Statistically significant short term declines in scores were observed for the composite, postoperative removal of urinary
catheters and post-cardiac surgery glucose control measures. However, a statistically insignificant improvement in scores for these measures was noted three months after EHR deployment. The authors also acknowledge that differences in services, culture and organization between the hospitals in the study may differently influence their response to EHR deployment.

This lack of initiative from a surgical team member can compromise the patient’s outcome and therefore increasing their risk for postsurgical infections (Al-Mulhim, Baragbah, Sadat-Ali, Alomran & Azam, 2014). Several strategies are mentioned in the same study to be feasible in increasing adherence and reducing the prolongation of surgical antibiotic prophylaxis, such as written standards according to evidence-based guidelines, education, training, simplification of the guidelines, and implementation of checklists, which cover the entire surgical pathway.

Use of Prophylactic Antibiotics

Several correlations and studies have shown patient outcome improvement with compliance to the four public reported, infection related process measures (i.e., antibiotic administration within 1 hour before incision [SCIP-1]; appropriate antibiotic prophylaxis [SCIP-2]; antibiotic discontinuation within 24 hours after surgery [SCIP-3]; and appropriate hair removal [SCIP 6]). Three studies (Caitfe, Weinberg & Kang, 2014; Friedman, Styles & Low, 2013; Smith, Fox, Fakhro, & LaChant, 2012) have provided evidence for the effectiveness of the prophylactic use of antibiotics. A brief course of antimicrobial prophylaxis, when initiated shortly before the first incision, has also been shown to be as effective in reducing infections as longer courses in reducing postoperative infections (Caitfe, Weinberg & Kang, 2014).

Hospital groups with higher compliance rates had significantly lower SSI rates for 2 SCIP measures: antibiotic timing and appropriate antibiotic selection (Bratzler, Houck &
Richards, 2015). Appropriate choice, timing and duration of surgical antibiotic prophylaxis were also found to have a significant impact. In a case controlled study of 223 patients, none of the patients who received intravenous infusion of antibiotics 30 minutes before surgery developed wound infection immediately or at minimum of 12 months follow-up after surgery (Dhammi, Ul Haq & Kumar, 2015). This may be due in part of the 30 minute half life of the commonly used antibiotics such as cloxacillin and cephalosporin. Prophylactic administration was found to be least effective when antibiotic is given after the application of a tourniquet as the extremity remains unprotected for a large duration from antibiotic prophylaxis (LaBove, Davison & Jackson, 2016).

Furthermore, compliance and complete adherence to the four SCIP antibiotic guidelines in emergent or traumatic events, independently decreased the risk of SSI (odds ratio, 0.43; 95% CI. 020-0.94, p = 0.035). Patients adhering to these guidelines less often developed SSI (17% vs. 33%, p=0.001) and had a shorter overall hospital duration of antibiotics (4[6] vs. 9 [11] days, p<0.001), although no difference in mortality was noted (Smith, Fox et al 2012).

**Normothermia**

Compliance with body temperature management as defined in the SCIP measures is found to be associated with a reduced incidence of morbidity and mortality, including postoperative infections (Scott & Stonemetz, 2015). Inadvertent intraoperative hypothermia (core temperature, 34°C –35.9°C; approximately 2°C below normal) has been associated with a variety of adverse patient reactions, including prolonged recovery, extended hospital stay, increased need for blood products, and development of SSIs (Beltramini, Salata & Ray, 2015; Kurtz et al, 2016; Matika, Ibrahim & Patwardhan, 2017). Both meta-analysis and randomized control trials show that a 2°C drop in core temperature resulted in a 100% increase in bleeding
time (Matika, et al, 2017). Compliance to SCIP guidelines was associated with improved outcomes in both nonadjusted and risk-adjusted analyses. Core body temperature on admission to PACU was higher in the SCIP-compliant group (36.6° ± 0.5°C; n = 44,064) compared with the SCIP-noncompliant group (35.5° ± 0.5°C; n = 1,240, p < 0.0001). SCIP compliance was associated with a reduced incidence of hospital-acquired infection (3,312 [7.5%] vs.160 [12.9%]) events (Kurtz et al, 2016).

Hypothermia averaging only 1.5º C less than normal, resulted in cumulative adverse outcomes adding between $2,500 and $7,000 per surgical patient to hospitalization costs across a variety of surgical procedures (Scott, Stonemetz, Wasey, et al, 2015). The cost of preventing adverse outcomes that affect patients experiencing intraoperative hypothermia is much less than the cost of treating the adverse outcomes that affect patients experiencing intraoperative hypothermia. A link between active warming devices and the continuous maintenance of normothermia was also seen in a twelve-month project where the infection rate fell from 15% (95% CI 10.4-20.2) before the project to 7% (95%CI 3.4-12.6) 12 months after the project (Bull, Wilson & Worth, 2017).

**Glycemic Control**

Glycemic control, as part of the SCIP measures, is an important part of improving patient outcomes and reducing postoperative infection. There is a strong correlation between hyperglycemia and an increased risk of SSI (Butler, Btaiche & Alaniz, 2015). Whether diabetes plays a role in increasing a patient's risk for an SSI is unclear; however, studies have shown that there is a correlation between increased levels of glycosylated hemoglobin and SSI rates (Butler, Btaiche & Alaniz, 2015).
A chronic state of impaired glucose metabolism affects multiple components of the immune system, possibly leading to an increased incidence of postoperative infection risk (Blankush, Leitman & Suleman, 2016). In the same retrospective study of 1100 patients, it was shown that elevated HbA1C (>6.5%) has a predictive capacity when applied to specific patient subgroups. This result is also supported by documented evidence as part of the CMS surgical care improvement project (2012).

**Surgical Hair Removal**

The removal of hair in a surgical site has traditionally been part of the routine preoperative preparation process. Practical reasons such as skin marking, access and adequate exposure of the surgical site and dressing application may be complicated with the presence of hair. A potential for increased surgical site infection has been cited due to the lack of cleanliness in areas with dense hair (Tanner, Norrie & Mellen, 2011). This Cochrane review (2011), however, concluded that there was no statistically significant effect on SSI rates. However, a significant amount of harm was found when hair was removed using clippers vs. razors due to the microscopic skin trauma caused by a razor's blade drawn directly over the skin, while clippers are found to cut hair close to the skin without actually touching it.

As demonstrated in the literature review, SCIP measures are designed to improve patient outcomes and standardize the care received intraoperatively. These measures have been set up as a multiagency collaboration to ensure that patients receive optimum care. A multi-institutional study shows that patients who received all 4 perioperative care measures attained a very low, risk-adjusted SSI rate of 2.0% (Waits, Fritze, Banerjee, 2015). These results suggest the promise of an SSI reduction intervention for quality improvement.
The chosen SCIP measures used for this specific project have been shown to be an effective tool in reducing risk for postoperative infections. The measures are also brief, do not require any patient input and are directed solely to the staff that perform or are directly involved with the surgical procedure. Educating staff about the importance of following the guidelines and measures is an important part in helping achieve patient goals and favorable outcomes.

**Theoretical Framework/Evidence Based Practice Model**

The theoretical framework selected for this project is the knowledge to action (K2A) model (Appendix A). It was developed in Canada in 2006 by Graham, Straus and Tetroe intended to help in knowledge translation and delivering sustainable, evidence-based interventions (CDC, 2014). Healthcare, implementation and translation of evidence-based practices is highly complex and riddled with many barriers. The K2A framework is based on the commonalities of over 30 planned-action theories (action cycle). It assumes a systems perspective and situates knowledge producers and users within a system of knowledge that is responsive, adaptive, and unpredictable. As such, the process of moving evidence to action is iterative, dynamic, and complex (Graham & Tetroe, 2010).

It is composed of two distinct, but related components: Knowledge Creation, and the Action Cycle. As the process of K2A is iterative, not only can knowledge creation inform the action cycle, but components of the action cycle also feed back to inform knowledge creation. It is dynamic, easily influencing the results of the other. The first component funnels, refines and summarizes the evidence-based knowledge specific for its end users. The second component then implements the knowledge through various steps to cause change in behavior, attitude and outcomes (CDC, 2014).
Action phases may be carried out sequentially or simultaneously; knowledge phases may impact on the action phases. The action cycle outlines a process, representing the activities needed for knowledge to be applied in practice; knowledge is adapted to the local context, and barriers and facilitators to its use are explicitly assessed. Involvement of stakeholders, and tailoring knowledge to the needs of people who are going to use it is crucial.

There is an almost endless amount of information regarding postoperative infections and evidence-based practices shown to decrease the rate and incidence of SSIs (Gaston & Kuremsky, 2010, Hawn, Vick, & Richman, 2011). This wide base of knowledge is refined to specifically fit the project goal of consistent use of SCIP measures in reducing postoperative infections. The SCIP measures are further synthesized to only include sections that are applicable to intraoperative infection-related care (Kaplan, 2017). After such knowledge base is funneled and refined (knowledge creation), the information is then used to present evidence-based practices to a more use-friendly format that is translatable and easily used in the surgical setting. This is not necessarily linear and sequential process, rather one can start at any phase of the cycle and can also move between different sections of each phase, depending on the part of the process which tailors the need and end goal. As the project progressed, an integrated approach was taken to assess each step of the implementation process (action cycle), tailored to meet the needs and goals of the project.

The objective of this project was to assess the incidence of postsurgical infections using established SCIP guidelines. It analyzed the current organizations practice, as well as postoperative infections. Based on the data collected, quality improvement measures were assessed and discussed with the hospital facility and the physician’s office. Data collected during post intervention evaluation were also discussed and will possibly be utilized as an educational
tool for future use. Utilizing the K2A framework allowed this project a smooth iterative transition between interventions and results and maximized the potential to reduce postoperative infections.

The primary goal achieved at the end this project was the reduction of postoperative infections in lower extremity joint surgeries by at least 5% using specific four SCIP measures. These measures include the use of prophylactic antibiotics within sixty minutes of incision, glycemic control, surgical hair removal and maintenance of normothermia. The objective was to evaluate the effectiveness of the four SCIP measures for patients undergoing defined elective orthopedic surgeries, with the goal of reducing the overall SSI rates. Increased compliance to the SCIP measures, as an expected outcome, would lead to an improved care, treatment and patient outcome post surgery.

**Project Design/Methods/Implementation**

A multi phase approach utilizing program evaluation and practice intervention was utilized in implementing this project. It included a (i) pre-intervention preparation of data collection of the current rates of infection, postsurgical complications of the facility, internal and national benchmark statistics, (ii) educational session to the surgical and physician office staff of the current facility infection/complication rates and evidence based data showing the importance of SCIP measure compliance (iii) implementation of proposed changes to the current practice guidelines (iv) surveillance of adherence to proposed guideline and, (v) postoperative data analysis and presentation. The delivery and development of the entire project was covered solely by the project facilitator. A detailed budget breakdown is available in Appendix E.

The project consisted of multiple phases designed to collect information and be modified intermittently using the K2A framework:
**First Phase:** Initial pre intervention survey and analysis of surgical case load, established infection guidelines, compliance to such guidelines, reported postsurgical infections, internal and national benchmarks was performed. Surveillance and monitoring of compliance to already established protocols and guidelines were performed. An educational meeting and in-service was conducted during the initial meeting among the surgical staff and anesthesia providers regarding their knowledge, beliefs and attitudes on postoperative infections and SCIP measures. The education process PowerPoint presentation included surgical site infections and the importance of prevention of SSI, discussion of current policies and procedures aimed at reducing the risk of SSI (Appendix B, C).

**Second Phase:** A specific criteria for implementation was established within the unit, as were used as the basis of the project’s design and implementation. Infection SCIP measures included as appropriate were: (1) prophylactic antibiotic administration within one hour of surgical incision, (2) surgery patients with appropriate hair removal techniques, (3) perioperative temperature management and (4) glycemic control. These measures were typed in a brightly colored single page checklist (Appendix D) placed in all the surgical suites to be used in all primary lower extremities total joint surgeries as previously described. This checklist was collected at the end of the each applicable surgical case and was placed in a locked mailbox located at the nurses’ station charge nurse desk.

**Third phase:** Analysis of the postoperative infection rates of the surgeries performed between November 15th and December 15th was performed. A follow up telephone survey of randomly selected patients was also performed to assess the patient experience before, during and after surgery.
**Fourth phase**: Project results, including compliance to SCIP measures, and patient feedback were reviewed and discussed with the surgical staff and physician office staff (Appendix E). Recommendations to practice and its potential for further future utilization were also discussed.

The project focused on the compliance and utilization of the four SCIP measures: prophylactic antibiotic use, glycemic control, normothermia and surgical hair removal. In order to measure the outcomes of the project, a one-page checklist was used intraoperatively in all primary lower extremity total joint procedures utilizing the four SCIP measures and the confirmation of the use of CHG bath prior to admission. Postoperatively, follow up and progress of randomly selected patients were performed through telephone survey. Any readmission due to postoperative infections, as well as reported postoperative infections to the surgeon’s office were assessed.

An educational PowerPoint presentation (Appendices B and C) during initial pre-intervention phase was done to show current statistical data, facility standing, SCIP measures and other evidence-based practice recommendations. A re-education of the surgical and physician office staff was also performed showing the results of the project.

Data collected for this project were based on scheduled primary lower extremity joint surgeries between November 15\textsuperscript{th} and December 15\textsuperscript{th}, 2018. Surgeries scheduled during this time period were assessed concurrently with the compliance to SCIP measures as applicable to the surgeries performed. Compliance to the SCIP measures was assessed through checklists given to surgical nurses. Assessment of rate and number of post operative infections were measured during the time period, extending to January 15\textsuperscript{th}, thirty days after the last day of the intervention period. The type of revision surgeries, such as the use of antibiotic knee spacers, debridement and total replacement of previously implanted prosthesis, were also documented. To
measure the impact of the project, descriptive statistics and Excel software were utilized. Data gathered were also compared to internal and national benchmarks to evaluate its effectiveness and warrant for change.

**Project Site and Population**

The project was implemented at a large level two trauma hospital that actively participates in SCIP and National Surgical Quality Improvement Program (NSQIP) databases and quality performance reporting for at least three years. It is one of two trauma centers that serves a large portion of the northwest area of Los Angeles county, serving a total population of 1,840,994, with a median age of 37.1 (US Census Bureau, 2016). According to the same 2016 census data, the population is composed of over 51% female, with 43% Hispanics, 40% Whites, 11% Asians, 4% Blacks.

**Inclusion/Exclusion Criteria**

All primary hip and knee joint surgeries performed between November 15th and December 15th 2018 were included in this project. Revisions within this time period were excluded, as well as other surgeries performed by the orthopedic surgeon. Revision surgeries for knees and hips, however, were reviewed between November 15th 2018 and January 15th 2019 to assess whether these procedures were performed patients who had primary lower extremity joint surgery included in the project. A total of 48 total knee surgeries, 3 partial knee surgeries and 12 total hip were used as the sample project population.

**Ethical Considerations/Protection of Human Subjects**

The University of Massachusetts, Amherst (UMass) Internal Review Board (IRB) approval was obtained prior to initiation of the project. The project was determined as “not humans subject research”. In compliance with the Health Insurance Portability and
Accountability Act (HIPAA), all information collected for this project were stored in a locked storage area within the surgical unit, only accessible by the unit manager and DNP student. All electronic files were password protected to prevent unnecessary and unwanted access by unauthorized users. Throughout the project, no specific identifiable patient information were collected. No names or any other identifiable information were included and collected. Additionally, no pictures or recording of any kind were made during the course of the project.

**Results**

The following tables illustrate the rates of infection and post surgical revisions occurring within thirty days after the initial surgical procedure. A total of 48 total knee surgeries, 3 partial knee surgeries and 12 total hip surgeries were performed during the study period. Three staged knee revision surgeries were performed within thirty days from the initial primary joint surgery. When compared to infections reported one month prior to the initiation of the project, the infection rate was considerably higher. Following the completion of the project, there were no reported knee revision cases for primary knee surgeries performed between December 15\textsuperscript{th} to January 15\textsuperscript{th}. See Table 1.

**Table 1**  
*Monthly Comparison of Knee Surgeries and Reported Revisions*

<table>
<thead>
<tr>
<th>Rate of Reported Infections</th>
<th># of Revision Knee</th>
<th># of Knee Sx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sept to Oct</td>
<td>6.90%</td>
<td>29</td>
</tr>
<tr>
<td>Oct to Nov</td>
<td>10.00%</td>
<td>30</td>
</tr>
<tr>
<td>Nov to Dec</td>
<td>5.88%</td>
<td>51</td>
</tr>
<tr>
<td>Dec to Jan</td>
<td>0.00%</td>
<td>24</td>
</tr>
</tbody>
</table>

- **Rate of Reported Infections**
  - Sept to Oct: 6.90%
  - Oct to Nov: 10.00%
  - Nov to Dec: 5.88%
  - Dec to Jan: 0.00%

- **# of Revision Knee**
  - Sept to Oct: 2
  - Oct to Nov: 3
  - Nov to Dec: 3
  - Dec to Jan: 0

- **# of Knee Sx**
  - Sept to Oct: 29
  - Oct to Nov: 30
  - Nov to Dec: 51
  - Dec to Jan: 24
Similar results are seen in primary hip replacement surgeries performed prior to the initiation of the project, and in the 30-day period immediately following the project intervention period. See Table 2.

**Table 2**

*Monthly Comparison of Hip Surgeries and Reported Revisions*

<table>
<thead>
<tr>
<th>Month</th>
<th>Rate of Reported Infection</th>
<th># of Revision Hip</th>
<th># of Hip Sx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sept to Oct</td>
<td>5.56%</td>
<td>1</td>
<td>18</td>
</tr>
<tr>
<td>Oct to Nov</td>
<td>13.33%</td>
<td>2</td>
<td>15</td>
</tr>
<tr>
<td>Nov to Dec</td>
<td>8.33%</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Dec to Jan</td>
<td>0.00%</td>
<td>0</td>
<td>5</td>
</tr>
</tbody>
</table>

There was 100% compliance from the surgical staff with SCIP measures utilized, in both primary knee and hip joint surgeries, was reported. This result were verified by the total number of surgical checklists submitted by the staff.

In the general population, post surgical infections accounted for approximately 20.4% of all total knee revision arthroplasities (Delanois, Mistry, et al, 2017). In contrast, dislocation (17.3%) was found to be the main indication for total hip revision, followed by mechanical
loosening (Gwan, Mistry, et al, 2017). These data are consistent to the same surgical day hip prosthesis dislocation reported in the DNP project.

To gain more understanding of the patient’s perspective of the patient experience, a group of seven randomly selected post operative patients were interviewed by the surgeon’s office staff using a set of ten questions (Appendix G). The patients were asked several questions regarding their surgical experience from pre op to discharge. Overall, patient’s were satisfied with the care they received (strongly agree 42.8%, agree 57.14%). However, patients have commented on the vagueness of the discharge instructions they received. Forty two percent of the patients surveyed reported dissatisfaction with the discharge instructions they received. Confusion on the details was reported, with two patients reporting “the instructions were too long.”

Evaluation of the pre and post discharge instructions at the surgeons office showed some vagueness in patient interpretation which caused some misinterpretations. The surgeons’ medical office is shared between members of the orthopedic group. Due to the busyness of the group as an orthopedic practice, a generalized instruction sheet is shared among all orthopedic surgeons, with some sections not applicable to all patients. Patients also received discharge instructions from the hospital that was several pages long. Patients reported loss of interest in reading long and generalized discharge instructions. Noncompliance to discharge instructions due to noncomprehension is associated with early hospital readmissions, surgical complications and ultimately, poor surgical health outcomes (Albrecht, Gruber-Baldini, et al 2014). See Table 3.
Table 3

Patient Responses to Telephone Survey

<table>
<thead>
<tr>
<th>Before your surgery, the instructions you received were easy to understand, helpful and adequate</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>When I received my preanesthesia/preadmission phone call, my questions were answered satisfactorily</td>
<td>4</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>On the day of surgery, the surgical staff were knowledgeable and courteous, spent adequate time answering my questions</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>After my surgery, the clinical staff was concerned about my progress and comfort</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>I was given discharge instructions that were easy to understand, helpful and adequate</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>I am satisfied with the treatment I received</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Following the post intervention educational session, the surgical and physician office staff were polled for how well the project went and they reported overwhelming support for the use and compliance of the SCIP measures. Feedback from the physician’s office staff showed an increase in the understanding, knowledge, comfort and usefulness of the SCIP measures as well as the importance of pre and post discharge instructions. Three of the five office staff members (60%) showed increased interest in learning about the surgical process and in educating patients on the importance of compliance to such instructions.

**Discussion and Interpretation**

The results of the intervention and compliance to the four SCIP measures showed a decrease in the reported surgical infections. The interventions used in this DNP project proved to be effective in improving the consistent use of the SCIP measures. Staff participants reported
increased awareness of the use, importance and practice of the SCIP measures. Additionally, the office staff reported that they were more likely to discuss the importance of the pre and post discharge instructions with diligence and attention, after the post implementation presentation. The office staff reported a better understanding of the discharge instructions when rationale was given. They also were more confident in answering patient questions, reducing the load for the surgeon and in-office physician assistant to answer basic questions.

The patient experience survey also revealed important details to the compliance and adherence of patients to instructions given. Discharge instructions communicate important medical care information to patients when they are home. Understanding of such information is critical in the success of the transition of their care from acute care setting to home. Restructuring and re-evaluation of current discharge instructions is necessary to provide relevant, clear and concise information to the patients.

The project was well received by the unit manager, orthopedic surgeon, surgical and office staff and enthusiasm was expressed by the administrative staff as potential financial incentives from insurance reimbursements were possible with the success of the project. The project was implemented between November 15th to December 15th, 2018 with the anticipation of an increased volume of surgical patients, due to end of year covered deductibles and insurance plan resetting. An anticipated potential barrier to the project was lack of interest and receptiveness of the surgical and office staff. However, this was not the case, as both surgical and physician office staff were receptive and fully supportive of the project for the goal of patient care improvement and possible reduction of surgical site infections. Time constraints, however, limited the extent to which the project can fully be utilized.
Limitations

While the goal of the project is to reduce post operative infections in lower extremity total joint surgeries for hips and knees through consistent use of SCIP measures, the reported repeated surgeries prove that certain elements and factors not included in this project contribute to the incidence of post operative infections. The extent of a full revision of a primary total joint surgery was not also measured as staged surgeries, typically beyond the thirty days allocated for this DNP project. Length of time was a limiting factor for this study. The limited time for post surgical data collection may have misreported actual number of post surgical infection related revision arthroplasties. Additionally, the lack of a universal clinical information system shared between the surgeon’s office and hospital organization may have also unreported the actual number of post operative infections. Although a survey at the surgeon’s office reported similar number of cases.

Actual, billed ICD codes used for the resulting revision surgeries were also not evaluated by the study. A generalized accounting of all lower extremity joint surgeries by the performing orthopedic surgeon was made instead. Additionally, this project did not collect other specific patient data such as co-morbidities and other external, patient specific factors that may contribute to their increased risk for surgical site infections.

Recommendations

As the number of total joint arthroplasties increase in both acute care and ambulatory settings, it is important to realize the importance of a standardized infection reduction program. Increased resources and further investigation should be focused on the prevention, early diagnosis and treatment of prosthetic joint infections.
Continuous and consistent use of SCIP measures are necessary in reducing patient risks for post surgical infections. Utilization of a surgery specific pre and post discharge instructions can be beneficial to patients in reducing confusion and increasing compliance. Approximately 19% of patients experience post discharge adverse events (Waniga, Gerke, Shoemaker, Bourgoine & Eamranond, 2016). Enhancing and standardizing patient-provider communications through clear and specific discharge instructions can improve the patient experience and outcomes.

Patients can also benefit from healthcare data sharing. Responsible sharing of clinical trial data serves this public interest by strengthening the science that is the foundation of safe and effective clinical care (Lo, 2015). Open data sharing facilitates free exchange of pertinent medical information, providing for an efficient, patient specific care. Follow up of patients are also more consistent and accurate as patient demands are met accordingly.

Conclusion

Healthcare organizations and hospitals have a mandate to improve patient care and safety, which requires infrastructure that can support interventions focused on decreasing adverse events such as postoperative infections. These infections not only affect the patient’s recovery and overall health, but it can also be a source of readmissions and a driver of hospital performance. The financial burden of readmissions related to postoperative infections can become very costly to the healthcare organization and to the patient’s themselves.

Despite advances in infection control practices, SSIs remain a substantial cause of morbidity and mortality among surgical patients. A systemic and process change that promote compliance with established guidelines and standards may decrease infectious morbidity. The use of SCIP guidelines represents a national initiative to improve surgical patient outcomes
through standardized perioperative treatment. Patients will benefit from this project as it will allow them to gain more insight regarding the care they receive intraoperatively. They will be able to gain an understanding on the importance of SCIP measures as applied to their surgical procedures and in the educated decisions they make as patients. These guidelines are also a work in progress. Continuous research and implementation of new practices is necessary so improvements can be made.
References


http://doi.org/10.1186/1754-9493-6-11


Centers for Disease Control and Prevention.


http://doi.org/10.1038/srep06783


Scott, A.V., Stonemetz, MD (2015). Compliance with Surgical Care Improvement Project for body temperature management (SCIP Inf-10) is associated with improved clinical outcomes. *Anesthesiology*, 123, 116-125, doi:10.1097/ALN.0000000000000681


Appendix A

Theoretical Framework

Knowledge to Action Framework (K2A)

Figure 1. Knowledge to Action Framework. Retrieved from: http://www.who.int/reproductivehealth/topics/best_practices/greatproject_KTAframework/en/
Appendix B

Pre Intervention PowerPoint Presentation

5/1/18

**What Is SCIP?**
- Surgical Care Improvement Project
- TJC, CMS peri-operative guidelines
- National partnership committed to improve surgical care safety
- Reduce post operative complications
- Introduced in 2002,
  - Healthy People 2010 goal: Post op infection reduction by 25%
- 20 Core Measures, 9 are publicly reported, and 6 of the 9 core measures are focused on the prevention of postoperative infections

**Surgical Infections**
- 780,000 cases per year
- Over 20% of all healthcare related infections
- Annual related costs: excess of $1 billion to $10 billion
- Patients incurred $3,696 in additional outpatient costs
- Longer length of stay (10.66 days vs 5.64 days)
- Readmission rates (5.14 vs 8.19 readmissions per 100 procedures)

**SCIP MEASURES**
(Applicable to peri-op)
- SCIF-1: Prophylactic antibiotic received at least one hour before surgical incision
- SCIF-2: Prophylactic antibiotic continued for surgical patients
- SCIF-3: Prophylactic antibiotic discontinued within 24 hours after surgery and less 16 hours for cardiac patients
- SCIF-4: Calcium/Lipid patients with controlled LDL
- SCIF-5: Surgical patients with appropriate bed removal
- SCIF-6: Urinary catheter removed on postoperative day 1 or 2
- SCIF-10: Surgical patients with perioperative comparison management
- SCIF-12: Surgical patients on beta-blocker before surgical procedure
- SCIF-16: Surgical patients with recommended surgical technology and prophylactic agents

**WHERE WE STAND?**

<table>
<thead>
<tr>
<th>Procedure Type</th>
<th>Rating</th>
<th>Overall Rating</th>
<th>Number of SCIP Measures Achieved</th>
<th>Compliance</th>
<th>Target</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Surgery</td>
<td>0.0</td>
<td>0.0</td>
<td>1</td>
<td>100%</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Gynecological</td>
<td>0.0</td>
<td>0.0</td>
<td>1</td>
<td>100%</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Orthopedic</td>
<td>0.0</td>
<td>0.0</td>
<td>1</td>
<td>100%</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Cardiac</td>
<td>0.0</td>
<td>0.0</td>
<td>1</td>
<td>100%</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Otolaryngological</td>
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<td>0.0</td>
<td>1</td>
<td>100%</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Neurological</td>
<td>0.0</td>
<td>0.0</td>
<td>1</td>
<td>100%</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Thoracic</td>
<td>0.0</td>
<td>0.0</td>
<td>1</td>
<td>100%</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Vascular</td>
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<td>0.0</td>
<td>1</td>
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<td>1</td>
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<td>1</td>
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<tr>
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<td>1</td>
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<tr>
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<td>100%</td>
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<td>1</td>
</tr>
<tr>
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<tr>
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<td>1</td>
<td>100%</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Thoracic</td>
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<td>0.0</td>
<td>1</td>
<td>100%</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Vascular</td>
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<td>0.0</td>
<td>1</td>
<td>100%</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Urological</td>
<td>0.0</td>
<td>0.0</td>
<td>1</td>
<td>100%</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**Overall Rating**

- Excellent: 5.0
- Good: 4.0
- Fair: 3.0
- Poor: 2.0
- Unacceptable: 1.0
**Proposed Project Monitoring Focus**

- INF-1: Prophylactic Antibiotic Received within ONE hour prior to surgery
- INF-2: Prophylactic Antibiotic Selection for Surgical Patients
- INF-3: Prophylactic Antibiotics Discontinued 24H AFTER surgery
- INF-4: Surgery Patients with Appropriate Hair Removal
- INF-5: Surgery Patients with Peri-Op Temperature Management
- INF-6: Surgery Patients with Appropriate Blood Glucose

**What we will measure?**

- Appropriate antibiotic selection
- Antibiotic given within 1 hour (2H for vancomycin) of incision
- Temperature maintained at 96.8°F intra op and PACU reading
- Abx discontinued
- Clipping vs shaving (NO RAZOR!)

**When will we measure?**

- Patients are scored by circulating RN
- One month
- All colorectal and abdominal cases

**Why are we measuring?**

- Prevent surgical infections
- Use the SCIP measures

**SCIP INF-1, INF-2, INF-3 Prophylactic Antibiotics**

- Pertains to TIMING, TYPE and DISCONTINUATION of ABX
- Added to monitoring measures
- Abx selected should provide coverage for pathogens most likely encountered during sx
- Checking the earliest documented start time for the ordered antibiotic and comparing it to the Surgical incision date and time for the procedure.
- Time cannot exceed 60 minutes

**Prophylactic Antibiotic Regimen Selection for Colorectal Surgery**

<table>
<thead>
<tr>
<th>Procedure category</th>
<th>Approved antibiotics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colon</td>
<td>Ceftriaxone, Cefotetan, Ampicillin/Sulbactam, or Ertapenem. A single dose of ertapenem (6.0 mg/kg) is recommended for colon procedures. OR Cefazolin or Ceftazeidine - Metronidazole.</td>
</tr>
</tbody>
</table>
## Prophylactic Antibiotic Regimen Selection for Surgical Procedure

**Procedure Category**: Hysterectomy  
**Approved Antibiotics**: Cefotetan, Cefazolin, Cefoxitin, Cefuroxime, OR Ampicillin/Sulbactam  
**If β-lactam allergy**: Clindamycin + Aminoglycoside OR Clindamycin + Quinolone or Clindamycin + Aminoglycoside OR Metronidazole + Aminoglycoside or Metronidazole + Quinolone OR Vancomycin + Aminoglycoside or Vancomycin + Aminoglycoside or Vancomycin + Quinolone

---

## SCIP INF 4  
**Glycemic Control**

- **Euglycemia**
- Specific measure for cardiac surgery only; BUT has been shown to also reduce SSI in colorectal surgeries  
- Glucose monitoring intraoperatively (≤180 mg/dL blood glucose)  
- Post op glucose <200 mg/dL vs >200 mg/dL infection 29.7% vs 14.3%

---

## SCIP INF 6  
**Hair Removal**

- No longer required by CMS but remains a Joint Commission measure driven.  
- USE of Clippers only  
- Shaving or use of blade inappropriate intraoperatively

---

## SCIP INF 10  
**Normothermia**

- Use if active warming devices  
- Bair Hugger, warming blankets  
- Active warming reduces SSI in colorectal surgical procedures  
- Increased risk for impaired wound healing, adverse cardiac events as well as altered drug metabolism and coagulation responses  
- Maintain the patient’s body temperature at >99.5°F / 37°C during surgery.

---

## Information Collected  
**Intervention Checklist**

- Date of Surgery  
- Performing Surgeon  
- Actual Procedure  
- Pre-op Diagnosis  
- Patient Data  
  - Age  
  - Height, Weight (BMI)  
  - Co-morbidities  
    - [ ] Diabetes, pre op glucose__________  
    - [ ] Hypertension  
    - [ ] Other__________  
- Wound Classification  
  - Clean  
  - Clean-Contaminated  
  - Contaminated  
  - Dirty/Infected
**YES/NO Questions**

- Was the patient given an antibiotic 0-60 mins before surgical cut?
- Was a warming device used during the procedure?
- Were all layers of the skin closed?
- Is this an non-emergent, scheduled procedure?
- Was the patient’s glucose checked during the procedure?
  - What was the intra op value?

**Questions???

Any antibiotic is acceptable to be used for surgical prophylaxis.

- A. True
- B. False

Hypothermia during surgery can lead to an increased risk for

- A. Impaired wound healing
- B. Adverse cardiac events
- C. Seizures
- D. A & B

The 24 hour clock for discontinuing prophylactic antibiotics starts with the__________ end time.

- A. Incision
- B. Anesthesia
- C. Room charge

**References:**

- Stulberg, J., Delaney, CP, Neuhauser, DV, Aron, DC., Konstine, SM (2010). Adherence to surgical improvement project measures and the association of postoperative infections, JAMA, 303(24), 2479-2485
Appendix C

Facility Report
<table>
<thead>
<tr>
<th>Procedure Type</th>
<th>Reported SSI</th>
<th>Predicted SSI</th>
<th>Number of Procedures</th>
<th>SIR</th>
<th>Compared with 2015 National Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal aortic aneurysm repair</td>
<td>0</td>
<td>0.0</td>
<td>2</td>
<td></td>
<td>Not enough procedures to calculate SIR</td>
</tr>
<tr>
<td>Appendix surgery</td>
<td>1</td>
<td>0.6</td>
<td>120</td>
<td>1.55</td>
<td>Same</td>
</tr>
<tr>
<td>Bile duct, liver or pancreatic surgery</td>
<td>0</td>
<td>0.6</td>
<td>23</td>
<td>0.00</td>
<td>Same</td>
</tr>
<tr>
<td>Cardiac surgery</td>
<td>0</td>
<td>0.1</td>
<td>34</td>
<td></td>
<td>Not enough procedures to calculate SIR</td>
</tr>
<tr>
<td>Cesarean section</td>
<td>0</td>
<td>0.4</td>
<td>366</td>
<td></td>
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</tr>
<tr>
<td>Colon surgery</td>
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<td>1.5</td>
<td>59</td>
<td>0.65</td>
<td>Same</td>
</tr>
<tr>
<td>Coronary bypass, chest and donor in..</td>
<td>0</td>
<td>0.5</td>
<td>72</td>
<td>0.00</td>
<td>Same</td>
</tr>
<tr>
<td>Coronary bypass, chest incision only</td>
<td>0</td>
<td>0.1</td>
<td>12</td>
<td></td>
<td>Not enough procedures to calculate SIR</td>
</tr>
<tr>
<td>Exploratory abdominal surgery (lapar..</td>
<td>1</td>
<td>0.9</td>
<td>127</td>
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<tr>
<td>Gallbladder surgery</td>
<td>0</td>
<td>0.6</td>
<td>203</td>
<td>0.00</td>
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</tr>
<tr>
<td>Gastric surgery</td>
<td>0</td>
<td>0.3</td>
<td>21</td>
<td>0.00</td>
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</tr>
<tr>
<td>Hip prosthesis</td>
<td>2</td>
<td>2.3</td>
<td>320</td>
<td>0.87</td>
<td>Same</td>
</tr>
<tr>
<td>Hysterectomy, abdominal</td>
<td>1</td>
<td>0.5</td>
<td>72</td>
<td>1.97</td>
<td>Same</td>
</tr>
<tr>
<td>Hysterectomy, vaginal</td>
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<td>0.1</td>
<td>31</td>
<td></td>
<td>Not enough procedures to calculate SIR</td>
</tr>
<tr>
<td>Kidney surgery</td>
<td>0</td>
<td>0.0</td>
<td>11</td>
<td></td>
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</tr>
<tr>
<td>Knee prosthesis</td>
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<td>1.4</td>
<td>381</td>
<td>0.70</td>
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<tr>
<td>Laminectomy</td>
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<td>0.4</td>
<td>85</td>
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</tr>
<tr>
<td>Open reduction of fracture</td>
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<td>212</td>
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</tr>
<tr>
<td>Ovarian surgery</td>
<td>0</td>
<td>0.1</td>
<td>123</td>
<td></td>
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</tr>
<tr>
<td>Pacemaker surgery</td>
<td>0</td>
<td>0.1</td>
<td>72</td>
<td></td>
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</tr>
<tr>
<td>Rectal surgery</td>
<td>0</td>
<td>0.2</td>
<td>8</td>
<td></td>
<td>Not enough procedures to calculate SIR</td>
</tr>
<tr>
<td>Small bowel surgery</td>
<td>2</td>
<td>0.6</td>
<td>34</td>
<td>3.14</td>
<td>Same</td>
</tr>
<tr>
<td>Spinal fusion</td>
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<td>1.0</td>
<td>92</td>
<td>0.00</td>
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</tr>
<tr>
<td>Spleen surgery</td>
<td>0</td>
<td>0.1</td>
<td>8</td>
<td></td>
<td>Not enough procedures to calculate SIR</td>
</tr>
<tr>
<td>Thoracic surgery</td>
<td>1</td>
<td>0.1</td>
<td>33</td>
<td></td>
<td>Not enough procedures to calculate SIR</td>
</tr>
</tbody>
</table>

Appendix D

SSI Prevention Checklist

Date of Surgery: _______________________________________________________

Surgical procedure performed: ___________________________________________

Patient Age: _______________  [ ] Male  [ ] Female

Please indicate measures used during the procedure

[ ] Use of provided CHG bath prior to admission

[ ] Glucose check

  [ ] Pre op  result: ___________________

  [ ] Intra op  result: ___________________

  [ ] Post op  result: ___________________

[ ] Normothermia measures (i.e. use of hair hugger and warming devices)

  [ ] Immediate post op temperature ___________________

[ ] Use of antibiotics 60 minutes within incision time

[ ] Surgical site hair removal procedure using clippers  [ ] NA

Comments:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Thank you for your participation. Your feedback is greatly appreciated

Please place this form in the locked box at the front desk
Appendix E

Post Intervention Presentation

**Surgical Infections**
- 299,000 cases per year
- Over 15% of all healthcare related infections
- Annual related cost excess of $1 billion to $10 billion
- Patients incurred $3,646 in additional outpatient costs
- Length of stay (10.66 days vs 6.64 days)
- Readmission rate (0.84% vs 0.13 readmissions per 100 procedures)

**SCIP Measures Used**
- Antibiotic Prophylaxis within 60 minutes of incision
- Glycemic Control
- Hemothermia
- Appropriate Hair Removal (use of clippers)

**SCIP INF-1, INF-2, INF-3 Prophylactic Antibiotics**
- Pertain to TIMING, TYPE and DISCONTINUATION of ABX
- Added to monitoring measures
- Also selected should provide coverage for pathogens most likely encountered during surgery
- Checking the surgeon documented start time for the ordered antibiotic and comparing it to the surgical incision date and time for the procedure
- Time cannot exceed 60 minutes

**SCIP INF 4 Glycemic Control**
- Hypoglycemia
- Specific measure for cardiac surgery only; SSI has been shown to also reduce SSI in colorectal surgeries
- Glucose monitoring intra-operatively (100-150 mg/dL) blood glucose
- Post op glucose <200mg/dL vs >200mg/dL: Infection 39.7% vs 14.3%

**SCIP INF 6 Hair Removal**
- No longer required by CMS but remains a Joint Commission measure driven.
- USE of Clippers only
- Shaving or use of blades inappropriate intra-operatively
SCIP INF 10
Normothermia
- Use of active warming devices
- Bair Hugger, warming blankets
- Active warming reduces SSI in colorectal surgical procedures
- Decreased risk for impaired wound healing, adverse cardiac events as well as altered drug metabolism and coagulation parameters
- Maintain the patient's body temperature at >91.5 F / 33o C during surgery.

Information Collected
- Intervention Checklist
  - Date of Surgery
  - Performing Surgeon
  - Actual Procedure
  - Pre-op Diagnosis
  - Patient Data
    - Age
    - Height, Weight (BMI)

What we will measure?
- Appropriate antibiotic selection
- Antibiotic given within 1 hour (2H for vancomycin) of incision
- Temperature maintained at 96.8F intra-op and PACU reading
- IV discontinued
- Clipping vs shaving (NO RAZOR)

When will we measure?
- Patients are scored by circulating RN
- 30-day period (November 15th to December 15th)
- All lower extremity total joint cases

Why are we measuring?
- Prevent surgical infections
- Use the SCIP measures

RESULTS
- Total number of surgeries performed:
  - 49 total knee surgeries
  - 13 partial knee surgeries
- Total number of revision surgeries performed:
  - 3 revision knee surgeries
  - 1 revision hip surgery
- 100% compliance to SCIP measures reported

Questions????
Appendix F

Cost/Benefit Analysis

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Materials</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Bright Colored Paper</td>
<td>$20</td>
<td>$20</td>
</tr>
<tr>
<td>• Printer ink for copying and printing</td>
<td>Free of use with permission of facility</td>
<td></td>
</tr>
<tr>
<td><strong>Facility use</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Free of charge, utilized monthly meeting scheduled education room</td>
<td></td>
</tr>
<tr>
<td><strong>Food/Drinks</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Breakfast set up for 2 meetings</td>
<td>$50 x 2</td>
<td>$100</td>
</tr>
<tr>
<td><strong>Total Estimated Cost</strong></td>
<td></td>
<td><strong>$120</strong></td>
</tr>
</tbody>
</table>
Appendix G

Patient Experience Telephone Survey

Procedure: [ ] Total Hip [ ] Total Knee [ ] Partial Knee
[ ] Revision Hip [ ] Revision Knee

Date of surgery: _____________________  Date of Survey:___________________

Before your surgery, the instructions you received were easy to understand, helpful and adequate

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

When I received my preanesthesia/preadmission phone call, my questions were answered satisfactorily

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

On the day of surgery, the surgical staff were knowledgeable and courteous, spent adequate time answering my questions

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

After my surgery, the clinical staff was concerned about my progress and comfort

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

I was given discharge instructions that were easy to understand, helpful and adequate

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

I am satisfied with the treatment I received

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

My overall general health BEFORE surgery is

<table>
<thead>
<tr>
<th>Excellent</th>
<th>Very Good</th>
<th>Fair</th>
<th>Good</th>
<th>Poor</th>
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<tbody>
<tr>
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<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

My overall general health AFTER surgery is

<table>
<thead>
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<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

What did you like least about your experience?

_____________________________________________________________________________________

What could we have done to make your experience better?

_____________________________________________________________________________________