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Decreasing Surgical Site Infections in Vascular Surgery Patients

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
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Walden University
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Abstract

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MSN, Walden University 2011

BSN, Queen College 1988

Project Study Submitted in Partial Fulfillment

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Abstract

Postoperative surgical site infections are common complications in the operating room. Such infections, often prolong hospital stays, heighten costs, and increase morbidity and mortality rates. The purpose of this evidence-based quality improvement project was to develop policy, program, and practice guidelines to prevent surgical site infections in vascular surgery patients. Rosswurm and Larrabee's change model was used to develop materials using the best evidence for the recommended practice changes. The Plan, Do, Check, Act model was selected to guide quality improvement. The project goal was to the decrease the surgical site infection rate to below the national average. Products of the project include policy, protocol, and practice guidelines developed based on the recommended practice of the Association of periOperative Nurses and current peer-reviewed literature. An interdisciplinary project team of institutional stakeholders was used to insure context-relevant operationalization of the evidence in practice. The team was assembled, led in a review of relevant literature, and convened regularly until project products were finished. Three scholars with expertise in the content area were then identified by the project team and asked to validate the content of developed products. Products were revised according to expert feedback. Implementation and evaluation plans were developed by the project team to provide the institution with all necessary process details to carry out the practice change. The evaluation plan advises using a retrospective chart review to compare rates of infection between patients receiving chlorhexidine skin preparation with showers and preoperative chlorhexidine cloths alone. A positive outcome could contribute to positive social change by decreasing preventable infections.

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Dedication

To my mother the late Grace R. Knight the love of my life, my best friend.

Acknowledgments

To my husband, Kerry and grandchildren who were patient as I went through the process of obtaining this degree. To my sister Mary, who talked me into beginning this journey with her; to Bishop Deryl Bowick, who prayed for me and encouraged me; to my co-worker Varnell McDonald-Fletcher, EdD, PA-C who help me keep my sanity as I went through this process. Lastly, all the vascular surgeons I have had the pleasure of working with.

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Section 1: Foundation of the Study and Literature Review

Introduction

In the1990s, of the71 million patients who were hospitalized and had undergone surgery in the United States, approximately1.4 million of those patients acquired an infection (Pear, 2007). The infections in hospitalized patient were originally known as nosocomial infections, but they are now known as hospital-acquired infections. These hospital-acquired infections have led to increased morbidity and mortality rates in the United States. According to Quinn, Hill, and Humphreys (2009), surgical site infections cause 14.5% of hospital-acquired infections. In the past, surgical site infections were primarily associated with bowel surgery, such as colorectal surgeries.

Some surgery specialties are adversely affected clinically and financially by surgical site infections. Surgeries involving general prosthesis removal make the postoperative management of wound infections difficult, and there is an increased risk for bloodstream infections (Quinn et al., 2009). Surgical site infections prolong hospital stays, increase readmissions, and increase costs to the hospital and the individual/family. Direct costs include lengthening of hospital stay, additional surgeries, readmission, and emergency room visits (Urban, 2006). Indirect costs include temporary or permanent loss of patient mobility, as a patient may decline in mental capacity and no longer have the ability to care for his or herself (Urban, 2006).

According to Urban (2006), the estimated costs for superficial surgical site infection are less than $400 per procedure. Serious infections such as a space infection (e.g., in total joint surgery) could amount to more than $30,000 per total joint surgery

(Urban, 2006). The estimated cost in 2006 for deep wound infections increased. Because of the no-pay policies approved by the Centers for Medicare and Medicaid Services in 2008, organizations are experiencing a loss of revenue (O'Reilly, 2012). Paddock (2007) stated that as of 2009, surgical site infection was no longer covered by insurance companies such as Medicare and Medicaid. The rule came into effect as the result of the Center for Disease Control and Prevention (CDC) reporting that hospital-acquired infections take the life of over 100,000 individuals in the United States yearly. Patients suffer as an unnecessary result of hospitals not preventing hospital-acquired infections and medical errors (Paddock, 2007). The new insurance reimbursement rules encourage health care organizations to provide improved and safer patient care (Paddock, 2007).

Problem Statement

Health care organizations must reduce the instances of postoperative surgical site infections in vascular patients. The CDC propose that 70% of known bacterial strains found in many hospitalized patients are resistant to most commonly used drugs to treat hospital-acquired infections such as a surgical site infection (Mundy & Doherty, 2010). Surgical site infections in vascular patients continue to rise. The rate at the project site is currently well above the national average and is an outlier for the facility of study. The number of vascular surgery infections at the project site is significantly higher than the percentage identified by the CDC's National Nosocomial Infections Surveillance system. To address the high number of surgical site infections, in 2003, the Surgical Care Improvement Project was developed is group of national organizations that created several measures to decrease surgical site infections (Cataife, Weinberg, Wong, &

Kahan, 2014). The Surgical Care Improvement Project recommended the use of antibiotics 1 hour prior to incision, with the continuation of the antibiotic for 24 hours after surgery.

Purpose Statement

Surgical site infections are continuously on the rise in the United States partially due to antibiotic-resistant bacteria. According to Giles et al. (2010), surgical site infections increase hospital stays, increase the cost of hospitalization, and decrease the quality of life. Surgical site infections not only decrease successful patient outcomes, but also increase patient's mortality and morbidity. The purpose of this project was to develop quality improvement practice guidelines and a policy to reduce surgical site infections in vascular surgical patients.

Goal

The normal skin flora contains bacteria and is a contributing factor to surgical site infections. To alleviate the number of bacteria on the skin, the Association of periOperative Nurses recommended showering with chlorhexidine (Emuna & Kisner, 2011). The practice of using chlorhexidine solution can be costly to an organization. Yet, the accumulative effect of chlorhexidine on skin has been shown to decrease surgical site infections. Kaiser, Kernodle, Barg, and Petracek (1988) concluded multiple applications of chlorhexidine were necessary to achieve maximum antimicrobial benefits. The project goal was to reduce surgical site infections in vascular surgical patients in the postoperative phase to below the nationally reported level.

Expected Outcomes

The anticipated positive outcome of this quality improvement project was decreased surgical site infection rates in vascular patients. The statistical outcomes will provide further research in this area and decrease the gap that remains in the literature regarding the reduction surgical site infections. The number of readmissions was used to measure the outcome after the development of policy and practice guidelines and the eventual implementation of the quality improvement initiative.

Approach

The problem statement has a role in the decision of the design of any evidenced-based intervention (Tymkow, 2011). According to Tymkow (2011), the study design is determined by the problem statement. The study design provides background information that includes a rationale for moving forward with an intervention and evidence of previous research (Tymkow, 2011). The process can generate quantitative data that include patient outcomes, clinical judgments, and study outcomes (Tymkow, 2011). Quality improvement and patient-centered care require continual improvement in practice.

A quantitative design was the selected approach and the best choice for the project. According to Burns and Grove (2009), the quantitative approach can be used to describe and examine relationships and to establish cause and effect. The focus of quantitative studies is on patterns and trends that are used to describe, clarify, and predict phenomena (Burns & Grove, 2009, p. 23).

Definitions

Definitions of the terms in this study were as follows:

Hospital-acquired infections: Any infections not present on admission (Stone, 2009).

Surgical site infections: Deep wound infections present 30 days after surgery (Schimmel, Horsting, Kleuver, Wonders & Limbeek, 2010). Surgical site infections are hospital-acquired infections currently reported to be increasing in the United States (Garrett, 2012). Nearly 30 million surgeries are performed yearly in the United States, and 2% to 5% of those procedures develop surgical site infections (Garrett, 2012). The responsibility of providing quality safe patient care belongs to the surgical team.

Surgical Care Improvement Project: Measures used to decrease surgical site infections (Cataife et al., 2014).

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Assumptions

The Association of periOperative Nurses encourages the use of chlorhexidine as the skin cleanser of choice to decrease surgical site infections. Therefore, it is assumed that the skin cleanser is given to the patients several days before the surgical procedure with instructions on its usage. It is assumed that the patient will follow directions and apply skin cleanser as instructed. Another factor is patient compliance in using the chlorhexidine solution as instructed. The organization's surgical site infections have been significantly higher. In past months, a large number of the vascular patients have been

readmitted for surgical site infections. Patients had positive cultures for methicillin-resistant staphylococcus aureus (MRSA).

This quality improvement project does not focus on a specific organism However, MRSA carriers are not identified and perhaps could cause some hospital-acquired infections and surgical site infections observed. MRSA is an organism that lives on normal skin flora; many organizations test for MRSA on admission, but the test results are not available for individuals having same-day surgery. In most cases, a surgical patient has been assessed medically prior to the surgical procedure; however, the necessary results are not available that could alert the surgical team to the possibility of infection.

Limitations

The increase in surgical site infections at the project site in vascular patients has caused this service to become an outlier according to the national benchmark. The lack of supplies and patient compliance are factors in the implementation and outcome of this DNP project. The perioperative area has been asked to obtain and maintain the supply of chlorhexidine to ensure that all surgical patients, including vascular patients, receive the solution for the preoperative showers. The preoperative assessment nurses, as well as inpatient nurses, were not always compliant with giving patients the cleansing solution. Even when patients were given the solution, there was no guarantee that patients were compliant if they obtained the cleansing solution. In observations and discussions with perioperative assessment nurses, I found that the standard of care recommended by Association of periOperative Nurses was not being followed.

Significance of Nursing Practice

The role of the nurse is to care for patients during their perioperative experience. The perioperative nurse should ensure that no harm comes to the patient. The project will standardize the current practice so that it will meet the standards of the Association of periOperative Nurses. In meeting the recommended standards, the facility will provide quality, safe, patient-centered care to meet the standard of the National Healthcare Safety Network. The facility will meet the national benchmark for hospital-acquired infection with the implementation and valid outcomes of the project. The facility will discover the benefits of a quality improvement program to decrease surgical site infections, which will decrease the facility's financial burden caused by readmissions through longer hospital stays.

Summary

Webster and Osborne (2006) found that, on average, it costs $3,000 or more to provide care for patients with a surgical site infection. The quality improvement project implementation will be in conjunction with the Surgical Care Improvement Project currently used in the facility. The Surgical Care Improvement Project incorporates the use of an antibiotic protocol, discontinuation of antibiotic, and identifies the preferred method for hair removal at the operative site, which is clipping.

Surgical site infections do not only cause financial burdens, but also can shorten the lifespan of an individual. The Association for Professionals in Infection Control and Epidemiology (APIC) infection prevention concept was used and was monitored and evaluated by the PDCA model. The method of data collection was quantitative using

chart reviews and hospital readmissions. Scholars have supported the use of 2% chlorhexidine as a solution to decrease surgical site infections. The use of a 2% chlorhexidine solution has the potential to decrease surgical site infections. In Section 2, I will outline the literature reviewed for the project will be outlined.

Section 2: Research Design and Data Collection

Introduction

Surgical site infections can lead to longer hospital stays, which causes financial burdens for patients and the hospital. Surgical site infections increase mortality and morbidity in surgical patients. In some cases, patients have increased anxiety and pain and may endure the removal of an extremity due to postoperative infection. Surgical site infections have been a problem nationally for many years, and some scholars have recommended the use of chlorhexidine to minimize surgical site infections as well as hospital-acquired infections. In this review, several articles describing the use of chlorhexidine prior to a surgical procedure are presented.

Literature Research Strategy

The reviewed articles were found using a Google search engine and the Walden Library, which led to several databases. The major databases used where CINAHL-Pro Quest, CINAHL-ScienceDirect, CINAHL, Medline, and the Cochrane Database of Systematic Reviews. The articles were found in these databases using key search terms such as *perioperative surgical site infections, chlorhexidine, chlorhexidine shower decreases surgical site infections,* and *surgical site infections*. The literature review includes sources written from 2006-2011. The review includes a randomized comparison study, a randomized controlled trial, a randomized controlled trial and treatment study, a historical randomized controlled trial, randomized controlled group studies, a systematic review, and a consensus viewpoint.

Change Theory

The model for change to evidence-based practices included the use of synthesized, evidence-based practice (Rosswurm & Larrabee, 1999). The model for change steps begin with assessing the problem and continue with linking the problem to interventions and outcomes (Rosswurm & Larrabee, 1999). There was an increase in surgical site infections in vascular patients at the project site that caused the facility to be lower than the national benchmark. The comparison of the internal data and external data was used to illustrate a need for a change in practice. The problem was identified, and individuals were informed to research a solution to the problem (Step 2). In Step 3, the best evidence was synthesized after the interventions and outcomes were pooled with clinical judgments (Rosswurm & Larrabee, 1999). According to the model, the design developed should incorporate the best evidence for practice changes and should include feedback from stakeholders, the environment, and resources (Rosswurm & Larrabee, 1999). The remaining steps (4 through7) in the model for change are implementing, evaluating, integrating, and maintaining the change, which includes close monitoring of the process and continuous communication with stakeholders (Rosswurm & Larrabee, 1999). According to Rosswurm and Larrabee (1999), throughout the six stages of the model, it is important to include the stakeholders, as they are essential to the acceptance of the practice change.

It will be important to focus on, act on, and review all factors rather than only one factor to ensure the necessary strategies are deployed to provide an active solution (Kelly,

2011). The model for change to evidence-based practice is essential in providing quality patient care and ensuring patient satisfaction.

Conceptual Model

The APIC conceptual model is a circular design centered on patient safety in which the goals extend outward (Murphy et al., 2012). There are four domains identified by APIC for current and future competency development: leadership, infection prevention and control, technology and performance improvement/implementation science. The four domains are not mutually exclusive, but are connected to the core competence as well as to each other (Murphy et al., 2012). The model allows a novice individual to become competent in the core competency, infection prevention, which has been designed by APIC.

The first domain discussed is leadership, in which there are five categories. Rather than authority, leadership in infection prevention relies on influences that involve collaboration, followership, program management, critical thinking skills, and communication (Murphy et al., 2012). Collaboration is important as an individual begins to build an effective team. The individual must have the ability to network effectively within the organization and have verbal, as well as written, communication skills. During the project, the number of people involved continued to expand. Therefore, integration of the project required effective verbal and written communication skills to ensure that every department was knowledgeable of the prevention of surgical site infections through the use of the chlorhexidine wipes. The use of the chlorhexidine wipes led to the second domain that is infection prevention and control.

According to Murphy et al. (2012), infection prevention and control require the identification of various risk factors and other commonalities for infection. It is a process of breaking the chain of infection (Murphy et al., 2012). There should be observed risk reduction and infection prevention in various areas. However, previously, the preoperative unit did not supply or discuss appropriate skin care prior to surgery. In addition, the operating room nurse should apply the surgical preparation, instead of the residents or intern, to enhance patient safety. As new methods and procedures are applied, the reduction of infection will be evaluated. The evaluation of the implementation of chlorhexidine wipes will be monitored to ensure compliance is correlated with the decrease in surgical site infections. Compliance with the use of the product will come through the education of both nurses and residents. Surveillance is two domains: observation and technology.

Surveillance was essential to the collection tool to be used, which led to the third domain of technology. It was important to review the current benchmark and data set and to establish a baseline and set an infection reduction target. The interdisciplinary team had access to and reviewed the previous patient medical information. The project required an information technology professional to assist with data collection, communication of data, access to reports, and validation of report accuracy. The systematic data collection, collation, and analysis of the information were presented. The analyzed information moved the project forward to the fourth domain, performance improvement and implementation science (Murphy et al., 2012).

The performance improvement combined all systems related to the project such as team activities, as well as the organizational implementations, to achieve the goal of preventing/decreasing surgical site infections (Murphy et al., 2012). The implementation science was the scientific study method of unifying clinical research findings and evidence-based practices to improve health care (Murphy et al., 2012). For improvement in performance to occur, the individual had to communicate and coordinate with the infection control individual regarding the planning and implementation of the process of improvement protocol directed at decreasing surgical site infections. Once the improvement performance individual identified the need for the implementation of the protocol, a team was assembled. An experienced team applied the tool of choice: plan, do, check, act (PDCA) model.

Plan, Do, Check, Act Model

The PDCA model is a continual cycle that evaluates the project, showing a need for improvement, planning the improvement, implementing the improvement, checking on the implementation, and evaluating the improvement. The plan was to incorporate chlorhexidine as a preventive measure against surgical site infections, which included one to two showers, the application of the chlorhexidine cloth wipes, and the application of the Chloroprep stick. The hospital executives have given their approval; it has also been given the approval by the Nurses Clinical Practice committee.

Concept of Asepsis

According to Burns and Grove (2009), a concept is a phrase that abstractly describes and names an object, a phenomenon, or thought. As a result, it has a separate

identity or meaning (Burns & Grove, 2009). Concepts can be concrete or abstract, variable or invariable, as well as an object or thing (Wills & McEwen, 2011). The concept of asepsis is the process or method of bringing about a condition in which no disease causing microorganisms are present.

I observed patients returning to the surgical suite with surgical site infections. I often believed that surgical site infections were the results of a patient not scrubbing the operative site prior to surgery. I automatically began to incorporate a prescrub to all peripheral vascular patients that, in a few months, led to a decrease in surgical site infections. The concept of asepsis related to reducing surgical site infections is important because it affects patient morbidity.

Literature Review of the Evidence

Researchers have produced mixed reviews about the use of chlorhexidine decreasing surgical site infections. Eiselt (2009) found that incorporating of 2% chlorhexidine cloths with the surgical shower decreased surgical site infection. The process was a shower the evening before, applying two chlorhexidine cloths for 3 minutes each, and applying 2% chlorhexidine cloths prior to surgery for 3 minutes each time (Eiselt, 2009). The chlorhexidine was allowed to air dry after the last application of 3 minutes in both the evening and morning. According to Eiselt, the 2% chlorhexidine cloths may help accomplish the goal of decreasing surgical site infections.

Johnson, Daley, Zywiel, Delanois, and Mont (2010) found problems with chlorhexidine adhering to washcloths, resulting in an insufficient amount of chlorhexidine on the skin and recommended the use of 2% chlorhexidine cloths. Johnson

et al. concluded that the use of chlorhexidine cloths may be a simple and easy solution to decrease surgical site infection, but also acknowledged the need for large prospective studies. Johnson et al. also recommended that the protocol be considered in addition to other surgical site infection preventive methods.

Edminston et al. (2008) conducted a study as the result of a Cochrane Collaboration review that questioned the continuance of the preoperative shower stating the evidence-based data does not validate the practice. Appropriate skin asepsis involves the effective concentration of chlorhexidine, but also requires a timed exposure to the chlorhexidine (Edminston et al., 2008). According to Edminston et al., a timed preoperative shower is a beneficial strategy for surgical procedures at risk for postoperative infections such as with the implantation of prosthetic devices. A standardized timed preoperative shower achieved high levels of chlorhexidine on the skin (Edminston et al., 2008). However, there remains a gap in the literature on preoperative skin asepsis and evidence-based outcomes (Edminston et al., 2008).

Edmiston et al. (2010) stated that surgical site infections rank third as the most commonly reported hospital-acquired infection. Edmiston et al. found that chlorhexidine is not affected by blood or serum protein and shows evidence of antimicrobial action remaining on the skin surface. Chlorhexidine inhibits the microbial growth for hours after use (Edmiston et al., 2010). The use of chlorhexidine is an effective and safe agent for skin antisepsis, which can decrease surgical site infections. Edminston et al. found flaws in previous studies performed between 1983 and 2009, which included problematic issues with the study design, implementation, and the analysis. The previous researchers

indicated that perioperative preparation with chlorhexidine showers or cleaning does not significantly decrease surgical site infections (Edmiston et al., 2010).

According to Edminston et al. (2010), a study was performed with orthopedic patients for 3 months using 2% chlorhexidine cloths. The results showed a 50% decrease in total joint infections. There is some inconsistency regarding the accumulation of chlorhexidine on the skin, but evidence-based clinical studies document that it is a risk reduction approach (Edminston et al., 2010). The use of 2% cloths or a 4% solution in a timed process used prior to admission is a preventive strategy for reducing the risk of surgical site infection (Edminston et al., 2010). According to Edminston et al., the Surgical Care Improvement Project has not been instrumental in decreasing surgical site infection and that other reduction strategies are needed.

Lipke and Hoytt (2010) discussed surgical site infection as serious health acquired infections that occur in up to 4.5% of patients who have had surgery. According to Lipke and Hoyott, the mortality rate is three times higher in a surgical patient due to staphylococcus aureus and is known to be five times higher in older surgical patients. The mortality rate is even higher for surgical site infection caused by MRSA (Lipke & Hoytt, 2010). The project did not focus on one particular organism, but the goal was to use chlorhexidine effectively, along with the Surgical Care Improvement Project, to decrease surgical site infection. Lipke and Hoytt stated that an increase in MRSA infections led to a quality improvement initiative that included the use of 2% chlorhexidine cloths and identifying individuals infected with MRSA.

Other factors can cause surgical site infection. Cheadle (2006) claimed that the following can cause site infection: prolonged surgical procedures, shock, blood transfusions, hypoxia, hyperglycemia, and hypothermia. I implemented the project in all vascular patients. However, the factors that can increase the risk of surgical site infection were identified in the data collection.

Grelle et al. (2008) emphasized that other factors increase the risk for surgical site infections such as excessive personnel in the operating room, presence of prosthesis or foreign body, and tissue trauma. Grelle et al. listed independent variables such as smoking, alcohol intake, steroid use, and the anesthesiologist classification. Grelle et al. found that a precleansing in the surgical suite appeared to decrease surgical site infection, even though there were no data to support this supposition. The surgical site infection rate in that organization had not reported an increase since the implementation of the precleansing technique (Grelle et al., 2008).

McHugh, Hill, and Humphreys (2011) discussed the number of people in the operating room and surgical attire as factors leading to surgical site infections. McHugh et al. (2011) stated that earlier studies associated airborne bacteria to surgical site infection in total joint cases. Many surgical suites have laminar airflow to decrease surgical site infection. According to McHugh et al., laminar flow has not been found to reduce surgical site infection. Restriction of the number of individuals moving in the operating room is important, but it is difficult to reinforce this policy in a teaching institution as medical students, interns, and residents can be numerous. Many factors can increase the risk of surgical site infection. The goal of the project was to decrease surgical

site infection in vascular patients and colorectal patients by eliminating as many external factors as possible while ensuring the concepts of asepsis.

Background

In 2006, project site revised their mission and vision statement. The facility has world-class academic and health care systems, that strive to transform medicine and health locally and globally through innovative scientific research, the rapid translation of breakthrough discoveries, and educating future clinical and scientific leaders who will benefit society. The facility continues to advocate and to practice evidence-based medicine to improve community health and to eliminate health inequalities.

The CDC's Guidelines for Prevention of Surgical Site Infections (1999) established methods of preoperative patient preparation and identified practices to decrease the risk of surgical site infection. McBride and Beamer (2007) required hospital policies based on Center for Disease Control and Prevention and Operating Room Nurses Association of Canada standards. The surgical staff consisted of the surgeon and nurses, and they formed the policies (McBride & Beamer, 2007). The policies included patient education, hair clipping, and prescrubbing based on a patient's body mass index to prevent surgical site infections (McBride & Beamer, 2007). According to McBride and Beamer, "Ongoing literature reviews have identified that these policies continue to be relevant and up to date with recommended practice as evidenced by the pre-operative wash and hair removal recommendations of the Safer Healthcare Now! Campaign" (p. 30). The perioperative nurse should review current literature, revising policies as needed, and follow recommended practices for the prevention of surgical site infections.

I am a perioperative nurse who, as mentioned previously, observed the use of 4% chlorhexidine on vascular patients. The majority of these patients were undergoing femoral artery bypass surgery. The surgeon would prescrub the groin area and entire leg with 4% chlorhexidine and dry, then apply Dura-prep, which consists of betadine and alcohol mixture. When applied, the prescrub appeared to prevent surgical site infection in those vascular patients who had prosthetic implants. The project was originally developed for the orthopedic patients undergoing total joint surgery in another facility, as many were returning with infections that led to amputations and disarticulations. I became concerned and wanted to attempt to alleviate the problems.

The problem was alleviated when I created and implemented a protocol in my place of employment. The decrease in surgical site infections is currently well below the national benchmark. I discussed the protocol with a vascular surgeon when I was in need of a mentor and a place to begin my practicum. The vascular surgeon agreed to be a mentor for me and we began the planning process at a nearby university hospital. A project team was formed to discuss the current problem, and a plan was formed using a protocol.

Conclusion and Summary

There are numerous studies regarding the use of chlorhexidine as the antiseptic choice over the use of a povidone-iodine solution. The implementation of this project will ensure that patients had 2% chlorhexidine wipes, and the solution was applied to the operative site prior to surgery. On the evening before, the patient will receive verbal instructions as well as a demonstration; the morning of the shower with chlorhexidine,

the instructions will be reiterated. The application of the 2% chlorhexidine cloth wipes and the use of the Chloroprep stick(s) will be a key practice change. The 2% chlorhexidine cloth incorporated into the practices has been reported to decrease surgical site infection more effectively than 4% chlorhexidine, which is the solution given for the shower regimen. The Chloroprep stick will be applied prior to the incision to provide an accumulative effect of chlorhexidine, which has been shown to reduce surgical site infection. The project will be the standard of care for vascular patients in the facility.

In improving the standard of care according to the recommended practice and the current preparation of surgical policy, fewer surgical site infections will be documented. It will important to have a clear, concise, reliable, and validated study of this project to change the preparation practices in other facilities associated with the university hospital and other local organizations. The implementation of this program will improve the standard of care and the quality of care and will provide safe patient care in the facility. The findings of this project will be published to share more insight into the effects of the accumulative use of chlorhexidine as the surgical preparation antiseptic of choice. In Section 3, the approach for the project is presented.

Section 3: Approach

Introduction

The purpose of this project was to develop quality improvement practice guidelines and a policy to reduce surgical site infections in vascular surgical patients. The project included an evidence-based protocol to support the continual use of chlorhexidine during the perioperative experience. According to O'Malley (2008), surgical site infections are the third most common hospital-acquired infection. Hospital-acquired infections increase cost and readmissions leading to increased morbidity and mortality (O'Malley, 2008). Surgical site infections in vascular patients in the facility are above the national benchmark, which calls for an immediate action plan. The approach presented in this section includes

1. Assemble an interdisciplinary team
2. Lead project team in a review of relevant evidence and literature
3. Develop practice guidelines and project protocol
4. Validate developed products with scholars in the field
5. Develop an implementation plan
6. Develop an evaluation plan

Interdisciplinary Team

I began the project by asking a vascular surgeon about surgical site infection issues in the organization where she was chief of vascular surgery. The chief of vascular surgery was interested in pursuing the practice change in the project facility where surgical site infections were outliers according to the national benchmark. The chief of

vascular surgery became my mentor and facilitated my ability to work within the organization. The selection of the project team was conducted by my mentor and I and consisted of

- Vascular fellow: aided in implementation and monitor documentation
- Quality/performance improvement coordinator: provided resources if necessary for the project
- Vascular physician's assistant: documented readmissions for surgical site infection
- Clinical research coordinator vascular surgery: ensured patient rights and present project to organizations Internal Review Board
- Clinical director of perioperative services: assisted in setting up educational in-services for stakeholders
- Perioperative nurse manager: nurse manager of proposed project unit.

The selection of the team members was based on their knowledge, expertise, and willingness to support the project. The individuals selected had an understanding of the organizational structure and the ability to influence others through their interpersonal relationships. Involvement of the other key members was not planned, but the executive staff had the authority to support or eliminate the process. The executive members of this team included the president of the organization, an association professor of medicine, a National Surgical Quality Improvement Program (NSQIP) surgical champion, and the associate chief of perioperative surgery. The six team members were contacted and given a brief overview of the issue along with one question.

The question to the team at the onset of the first meeting was a pattern level question. According to Kelly (2011), pattern level questions can move from an individual to a group with the focus on what the organization needs to do differently. The question started the conversation to brainstorm different strategies to diminish surgical site infection. Therefore, a shared action from a team was required to develop the policy, protocol, and guidelines. Figure 1 is the developmental plan of the project. Currently, I am working closely with the sales representative and the hospital commodity member to stock the appropriate amount of chlorhexidine wipes in the facility. I am also working with the designated project champion to prevent wasting of chlorhexidine wipes when stocked.

ACTIVITY	PLAN START	PLAN DURATION	ACTUAL START	ACTUAL DURATION	PERCENT COMPLETE
Meeting mentor	oct	5	1	7	0%
Selection of team	nov	7	2	2	0%
Meeting team	dec	4	2	9	0%
Sales representative meeting	dec	8	4	6	0%
Budget discussion	jan	2	5	6	0%
Develop plan	jan-feb	3	5	6	0%
Develop protocol	feb-mar	4	6	4	0%
Develop policy	feb-mar	2	6	5	0%
CPC conusel	mar-apr	2	7	4	0%
facility IRB	apr	5	7	3	0%
Develop evaluation plan	apr	1	7	4	0%
walden IRB	apr	3	10	3	0%

Figure 1. Development plans for project

Relevant Evidence and Literature

I shared the results of the implemented protocol from another facility with the chief of vascular surgery. The chief of vascular surgery showed the results to the executive board to obtain permission to proceed with a plan. The results showed a decrease in surgical site infection in total joint cases and cardiac surgery patients. The results were shared with the six team members along with literature by Edmiston et al. (2010) and Emuan and Kisner (2011). The project team reviewed the numerous articles and the results of the protocol at a nearby facility.

The project team discussed the use of chlorhexidine wipes prior to surgery and the current policies in place to decrease surgical site infection. Several discussions arose during the development of the protocol and policy for the organization. The team members provided input on the policy and guidelines in their area of expertise. I provided a copy of the Association of Perioperative Nurses guide for surgical preparation.

Develop Practice Policy, Guidelines, and Protocol

Project Policy/Standard Operating Procedure

The policy for the protocol was developed based on a recommended practice published by the Association of periOperative Nurses (Association of periOperative Nurses, 2015). The policy includes the recommended practice for surgical skin preparation. The policy/standard operating procedure includes the purpose, policy, and procedure for using an antiseptic agent for vascular surgical patients. The project team discussed the use of chlorhexidine for the vascular surgical patients. The discussion resulted in a guideline for skin preparation of the surgical site and, if possible, how to

ensure surgical patients receive appropriate skin preparation to reduce the risk of postoperative surgical site infection.

The perioperative standards and recommended practices by Association of periOperative Nurses (2015) indicted that the patient should receive a shower/bath the evening prior and the morning of the surgical procedure. The team had to first decide if the 2% chlorhexidine was the antiseptic solution preferred after the review of the literature and other evidence. As agreed upon by the team, the policy and protocol were based on 2% chlorhexidine usage. The team discussed the practice of showers performed by patients. A team member obtained information regarding the perioperative teaching vascular patients receive prior to surgery. The team acknowledged the standard precautions for allergies to medications and solutions. However, the team decided upon a substitute solution. In surgical procedures, it is imperative that the surgical site is marked. The team members discussed where the site verification and marking would take place prior to the application of the antiseptic solution.

The surgical site marking should remain visible after the application of the antiseptic solution. The team investigated the use of an alcohol-based surgical site marker over water-based skin markers that washes off during the skin preparation and have been found to transmit MRSA (Association of periOperative Nurses, 2011). The team ensured that the solution is FDA approved as recommended by Association of periOperative Nurses and approved by the health care organization's infection control personnel. The team submitted the policy, along with the protocol, to the Clinical Practice Council committee to gain approval prior to implementation.

Project Protocol

I developed the project protocol based on past observation of the use of chlorhexidine. The plan included developing a protocol using chlorhexidine wipes for operative site cleaning. The original team members came together to discuss the former protocol and to remove or add additional sequences or steps. The team members met once per week to discuss the protocol and guidelines.

The protocol was based on the current practices in place to decrease surgical site infection, such as the Surgical Care Improvement Project initiative and patient's showers as recommended by the Association of Perioperative Nurses. The project team requested the presence of the sales representative with the goal of obtaining information regarding the product, cost, and proposed application of the product. As the team leader, I obtained information concerning all of the necessary equipment for the product and worked with the sales representative to acquire the product and equipment. The executive team received notice of the cost of supplies and equipment. The team decided on the method for the application of the product, the number of wipes per procedure, the amount of time solution is required to dry, and the education of stakeholders regarding the practice change.

It was important to ensure that the project was fair, respectable, just, and caused no harm (Hodges & Videto, 2011). Approval for the developmental project without implementation was approved by the Walden University IRB (approval #01-12-0070067), a presentation in the quality improvement policy committee at the hospital provided information about the purpose and procedures of the program along with the

potential risks and benefits related to collection of data (Hodges & Videto, 2011). After the approval of the program development by Walden IRB and the implementation by the quality improvement policy committee at the hospital, the project moved forward with an implementation model.

Validation of Developed Product with Scholars in the Field

Some experts in the field recommend the use of chlorhexidine as the product to reduce surgical site infections. Three affiliated surgeons at the University Hospital in Durham, North Carolina (with expertise in vascular, general, and orthopedic surgery) were consulted during the initial stages of the protocol. The scholars received a copy of the policy, written protocol, and the project paper in its current form. The response from the scholars was positive with the suggestion of using the NSQIP instead of both NSQIP and readmissions.

Implementation Plan

The long-term goal of the project is for the pilot to be extended from 6 months to 12 months, allowing the project to be in place for an entire year. The pilot will include the implementation of the protocol with the education of the stakeholders. The pilot period will solve all unforeseen problems and concerns. The pilot will ensure that all necessary supplies are available and used effectively. The pilot period is expected to show a decrease in readmissions in vascular surgical patients. A discussion of the long-term goal will occur at the end of the year with NSQIP report results.

Evaluation Plan

The established goal is to provide the direction of the project (Kettner, et al., 2008). According to Kettner et al. (2008), the objectives and activities of the project will provide a framework for performance measurements and evaluation. The evaluation of the project will be continual throughout the year at which time the facility will review and compare NSQIP reports from the last 2 years to verify a decrease in surgical site infections. During the coming year, stakeholders will be observed for the effectiveness of the newly acquired knowledge and educating new employees on the protocol using the chlorhexidine wipes. The readmission list will be reviewed quarterly with expectations of a decrease in vascular surgery readmission for surgical site infections.

Summary

The purpose of the project was to develop quality improvement practice guidelines and a policy to reduce surgical site infection in vascular surgical patients. Many organizations provide instructions to the surgical patient to perform a preoperative bath or shower that may be adhered to by the patient. The age-old ritual of the shower/bath was effective prior to same-day surgery. The implementation of the chlorhexidine wipes prior to surgery would alleviate the uncertainty of the preoperative bath/shower. The organization's approval and collaboration by the chief of vascular surgery and other executives were imperative to the implementation of the project.

The project team was a multidisciplinary team who came together and strategized, developed, and planned the policy, guidelines, protocol, and the implementation of the project. The team members selected had roles in the implementation and evaluation

process. Members worked in different areas to complete the common goal of decreasing surgical site infection. The project protocol was shared with the sales representative to include her or him in the team effort.

The protocol was designed to clean not only the operative site but also the surrounding area. The team determined the number of packages to use for the surgical procedure. The population for the project will consist of vascular surgery patients and some pediatric patients. The time and resources required are minimal; the current goal is the implementation process to begin in the next 6 months.

The project team discussed the use of chlorhexidine wipes prior to surgery and the current policies in place to decrease surgical site infection. The team members provided input on the policy and guidelines in their area of expertise. The implementation and evaluation plans for the project will occur in 2016. The organization (after receiving the developed plans, protocol, and guidelines) will begin the implementation and evaluation process. The project is expected to be continually monitored and evaluated to ensure that the protocol is effective. The continual monitoring and evaluation will aid in the removal of obstructions and different learning curves of the stakeholders. The evaluation process at the end of 2016 will open a discussion regarding the findings of the project. In Section 4, I present the discussion of the project including application to professional practice and implications for social change.

Section 4: Discussion and Implications

Introduction

Hospital-acquired infections are on the rise nationally and in the project site and are a concern in the health care field. Surgical site infection has become a problem because insurance companies no longer pay hospitals for readmissions due to hospital-acquired infections. The purpose of this project was to develop quality improvement practice guidelines and a policy to reduce surgical site infection in vascular surgical patients through the application of 2% chlorhexidine wipes.

Discussion

The planning process for the quality improvement project continues as the implementation phase discussion begins. The implementation process (which will begin post DNP graduation) has a tentative start in the month of July 2016 with the education of perioperative nurses and sales representative concerning the chlorhexidine wipes. The sales representative will provide product information. I will discuss the technique and method for application of the product. The plan is to present the information to the perioperative staff during two staff meetings. In August 2016 the product (Appendix B) and the figure (Appendix A) will be posted in a designated area. The product will be in an area that is accessible to staff members.

Product

The product used to decrease or alleviate infections in vascular patients is chlorhexidine wipes. Chlorhexidine is an antiseptic solution that has been used in many operative areas for some years. Typically, a 4% chlorhexidine solution is used, generally

followed by the application of alcohol to the operative area. However, Edminston et al. (2010) showed 2% chlorhexidine to be more effective to decrease surgical site infections. The chlorhexidine wipe was developed by Sage and can be used the evening before and the morning of surgery and has been successful in decreasing surgical site infections. Normal skin flora has been found to harbor numerous forms of bacteria (Appendix C). The application of the chlorhexidine wipes prior to surgery allows the operative site and surrounding area to be free of normal skin flora bacteria for several hours. The application of multiple wipes is necessary to ensure the operative site and surrounding area are cleaned and bacteria free.

Application of Product

When applied, the 2% chlorhexidine cloth wipes have a life span of up to 6 hours on the operative site and surrounding tissue. It will be important to clean the operative site first before cleansing the surrounding area. The chlorhexidine wipes are in a company-supplied warmer for patient use. The wipes must be used within a 24-hour period or be discarded. After the skin is clipped, the chlorhexidine is applied. The nurse and patient will apply the wipes to the operative site and surrounding areas. The protocol (Appendix C) will guide the application of the chlorhexidine wipes to the correct part of the patient's body according to the surgical procedure. The elements of the protocol written into the standard procedure of the operating room is a policy known as "Preoperative Patient Skin Preparation" (Appendix A).

Policy

The policy follows the guidelines and standards of the Association of periOperative Nurses 2014. The project committee was in agreement with the development of the policy (See Appendix A). The policy states the usage of chlorhexidine wipes for all vascular patients as well as other services. The Clinical Practice Committee will review the policy for approval. During the review of the policy, the perioperative staff will continue the application of the chlorhexidine wipes. Nurse compliance to the protocol will be reviewed by a vascular fellow and me during the review of the policy. The review of staff compliance will lead to the PDCA model mentioned in Section 1.

Compliance with Protocol

Staff compliance can be identified by checking previous vascular surgery patients chart for application of chlorhexidine wipes. A learning curve should be expected. Nurses might have difficulty adding the protocol to their current workload (Appendix E). The patient will need to be clipped when necessary prior to the application of chlorhexidine. The other potential issue may be anesthesia refusing to allow the staff to apply wipes prior to the start of a procedure, such as spinal and regional anesthesia. These are a few of the issues that may arise as the perioperative staff begins the project. The charge nurses are expected to have a role in ensuring the supply of chlorhexidine is placed in the warmer as well as alerting staff members of the vascular patient who will need the chlorhexidine applied.

Along with a selected champion, the charge nurse will aid staff members in recognizing vascular patients and documentation of the use of wipes (Appendix E). The champion will be instrumental in providing a list of the vascular surgeons to ensure that all vascular patients receive the protocol. The chart will be reviewed quarterly to ensure that documentation of the project is occurring; this documentation will be used to examine comparison information (Appendix G).

Implementation

The implementation process will begin with creating a team and selecting a facilitator who will handle contacting the sales representative and obtaining samples of the product in bulk and warmers for the wipes. The selected person will work with a sales representative and in-services staff members (Appendix D). The facilitator and the sales representative will discuss cost with the purchasing agent within 6 months of product usage. At that time, the product is to be purchased and stocked in the perioperative area.

Evaluation

The evaluation process will be in two parts that include compliance with the project (Appendix D) and the review of readmission records and the NSQIP. The evaluation process has been designed to accomplish the goal, and the expected outcome is to decrease surgical site infection in vascular patients. The evaluation has several steps in which different members of the project team will document the information. The evaluation process will be ongoing and continual beginning several days post-surgery and will continue for a few years (Appendix F). The evaluation process will also include age, sex, and morbidities that will determine factors that may lead to surgical site infection

(Appendix G). The evaluation of the project will be through collected data via retrospective chart review. A descriptive summarization of the data will be performed to represent the etiology, interventions, and outcomes for the population. The measured intervention will include patients receiving chlorhexidine skin preparation with showers versus preoperative chlorhexidine cloths. The endpoint measures will include, but are not limited to, an incidence of surgical site infection, compliance with skin preparation protocol, readmissions, and 30-day mortality. The analysis will be completed by a surgical fellow and/or selected staff member with the assistance of an individual experienced in analyzing research findings at the university hospital.

Analysis of Self

I found that my role as a practitioner was not as difficult as I had expected. I was comfortable in this particular role, as it was most familiar. As a scholar, I found that I was knowledgeable regarding the product information and continued to stay current with literature about the product and reported results. I also realized that effective communication is an important tool, one that I had not used well prior to this experience. According to Sullivan (2004), it is important for a DNP student to accomplish the art of written and verbal communication as well as nonverbal communication using facial expressions, body language, and silence.

I found that a project manager required patience and collaboration with a variety of disciplines. The collaboration with several different disciplines allowed me to acquire knowledge that will aid me as I become more involved quality management in my present state. My long-term goal is to become in certified in quality management. The

project has encouraged me to continue to pursue changes that will improve patient care and provide safe, quality patient care for all surgical patients. I have learned the importance of evidence-based practice, which, when investigated completely and presented effectively, can create a positive change for individuals, communities, and organizations.

I realized that creating positive change is necessary, but is not always welcomed by all. It was important to understand that there will be some individuals who will not accept change. However, as a project manager, it is important to communicate effectively and, if possible, incorporate those individuals into the plan. I found that obtaining others' ideas and thoughts as the process continued was often beneficial. Last, it was a useful learning experience and allowed me to realize that a person can always learn if he or she is willing to adopt new and different concepts.

Summary

The project is expected to prevent surgical site infection in the vascular patient. The use of chlorhexidine has been shown to have a longer lifespan on the skin than any other product used for surgical preparation. The project is expected to improve the infection rate in this facility; therefore, allowing the community to experience less anxiety with the knowledge of a low infection rate for the facility. At the completion of the project, it should be shown that the protocol and the product used have effectively prevented hospital-acquired infections. Surgical site infections are a concern in many hospitals in the community. This protocol may be the first step in reducing hospital-acquired infections caused by surgical site infections.

Section 5: The Scholarly Product

Introduction

The manuscript is a quality improvement project to prevent surgical site infections with the use of Chlorhexidine wipes. The peer-reviewed journal the manuscript was written for is the Association of periOperative Nurses. The journal is an essential resource recognized for scholarly, evidence-based, peer-reviewed articles that convey standards of excellence for perioperative nursing. The mission of the journal is to provide perioperative registered nurses with evidence based practice information that will meet the needs of diverse patient population. The journal supports clinical, research/quality improvement, education, and management strategies related to the nurses role in caring for patients before, during, or after an operative procedure.

Abstract

Postoperative surgical site infections are common complications in the operating room. Such infections, often prolong hospital stays, heighten costs, and increase morbidity and mortality rates. The purpose of this evidence-based quality improvement project was to develop policy, program, and practice guidelines to prevent surgical site infections in vascular surgery patients. Rosswurm and Larrabee's change model was used to develop materials using the best evidence for the recommended practice changes. The Plan, Do, Check, Act model was selected to guide quality improvement. The project goal was to the decrease the surgical site infection rate to below the national average. Products of the project include policy, protocol, and practice guidelines developed based on the

recommended practice of the Association of periOperative Nurses and current peer-reviewed literature. An interdisciplinary project team of institutional stakeholders was used to insure context-relevant operationalization of the evidence in practice. The team was assembled, led in a review of relevant literature, and convened regularly until project products were finished. Three scholars with expertise in the content area were then identified by the project team and asked to validate the content of developed products. Products were revised according to expert feedback. Implementation and evaluation plans were developed by the project team to provide the institution with all necessary process details to carry out the practice change. The evaluation plan advises using a retrospective chart review to compare rates of infection between patients receiving chlorhexidine skin preparation with showers and preoperative chlorhexidine cloths alone. A positive outcome could contribute to positive social change by decreasing preventable infections.

Decreasing Surgical Site Infections in Vascular Patients

In the1990s, of the 71 million patients who were hospitalized and had undergone surgery in the United States, approximately1.4 million of those patients acquired an infection (Pear, 2007). The infections in hospitalized patient were originally known as nosocomial infections, but they are now known are known as hospital-acquired infections. These hospital-acquired infections have led to increased morbidity and mortality rates in the United States. According to Quinn, Hill, and Humphreys (2009), surgical site infections cause 14.5% of hospital-acquired infections. In the past, surgical site infections were primarily associated with bowel surgery, such as colorectal surgeries.

Some surgery specialties are adversely affected clinically and financially by surgical site infections. Surgeries involving general prosthesis removal make the postoperative management of wound infections difficult, and there is an increased risk for bloodstream infections (Quinn et al., 2009). Surgical site infections prolong hospital stays, increase readmissions, and increase costs to the hospital and the individual/family. Direct costs include lengthening of hospital stay, additional surgeries, readmission, and emergency room visits (Urban, 2006). Indirect costs include temporary or permanent loss of patient mobility, as a patient may decline in mental capacity and no longer have the ability to care for his or herself (Urban, 2006).

According to Urban (2006), the estimated costs for superficial surgical site infection are less than $400 per procedure. Serious infections such as a space infection (e.g., in total joint surgery) could amount to more than $30,000 per total joint surgery (Urban, 2006). The estimated cost in 2006 for deep wound infections increased. Because of the no-pay policies approved by the Centers for Medicare and Medicaid Services in 2008, organizations are experiencing a loss of revenue (O'Reilly, 2012). Paddock (2007) stated that as of 2009, surgical site infection was no longer covered by insurance companies such as Medicare and Medicaid. The rule came into effect as the result of the Center for Disease Control and Prevention (CDC) reporting that hospital-acquired infections take the life of over 100,000 individuals in the United States yearly. Patients suffer as an unnecessary result of hospitals not preventing hospital-acquired infections and medical errors (Paddock, 2007). The new insurance reimbursement rules encourage health care organizations to provide improved and safer patient care (Paddock, 2007).

Problem Statement

Health care organizations must reduce the instances of postoperative surgical site infections in vascular patients. The CDC propose that 70% of known bacterial strains found in many hospitalized patients are resistant to most commonly used drugs to treat hospital-acquired infections such as a surgical site infection (Mundy & Doherty, 2010). Surgical site infections in vascular patients continue to rise. The rate is at the project site currently well above the national average and is an outlier for the facility of study. The number of vascular surgery infections at the project site is significantly higher than the percentage identified by the CDC's National Nosocomial Infections Surveillance system. To address the high number of surgical site infections, in 2003, the Surgical Care Improvement Project is a group of national organizations that created several measures to decrease surgical site infections (Cataife, Weinburg, Wong, & Kahan, 2014). The Surgical Care Improvement Project recommended the use of antibiotics 1 hour prior to incision, with the continuation of the antibiotic for 24 hours after surgery.

Purpose Statement

Surgical site infections are continuously on the rise in the United States partially due to antibiotic-resistant bacteria. According to Giles et al. (2010), surgical site infections increase hospital stays, increase the cost of hospitalization, and decrease the quality of life. Surgical site infections not only decrease successful patient outcomes, but also increase patient's mortality and morbidity. The purpose of this project was to develop quality improvement practice guidelines and a policy to reduce surgical site infections in vascular surgical patients.

Goal

The normal skin flora contains some bacteria and is a contributing factor to surgical site infections. To alleviate the number of bacteria on the skin, the Association of periOperative Nurses recommended showering with chlorhexidine (Emuna & Kisner, 2011). The practice of using chlorhexidine solution can be costly to an organization. Yet, the accumulative effect of chlorhexidine on skin has proven to decrease surgical site infections. Kaiser, Kernodle, Barg, & Petracek (1988) concluded that multiple applications of chlorhexidine were necessary to achieve maximum antimicrobial benefits. The project goal was to reduce surgical site infections in vascular surgical patients in the postoperative phase to below the nationally reported level.

Expected Outcomes

The anticipated positive outcome of this quality improvement was to decreased surgical site infection rates in vascular patients. The statistical outcomes will provide further research in this area and decrease the gap that remains in the literature regarding the reduction surgical site infections. The number of readmissions was used to measure the outcomes after the development of policy and practice guidelines and the eventual implementation of the quality improvement initiative.

Approach

The problem statement has a role in the decision of the design of any evidenced-based intervention (Tymkow, 2011). According to Tymkow (2011), the study design is determined by the problem statement. The study design provides background information that includes a rationale for moving forward with an intervention and evidence of

previous research (Tymkow, 2011). The process can generate quantitative data that include patient outcomes, clinical judgments, and study outcomes (Tymkow, 2011). Quality improvement and patient-centered care require continual improvement in practice.

A quantitative design was the selected approach and the best choice for the project. According to Burns and Grove (2009), the quantitative approach can be used to describe and examine relationships and to establish cause and effect. The focus of quantitative studies is on patterns and trends that are used to describe, clarify, and predict phenomena (Burns & Grove, 2009, p. 23). The group was statistically similar, but did not undergo the newly implemented practice (Kettner, Moroney, & Martin, 2008). According to Hodges and Videto (2011), quantitative data can be easily achieved in large numbers that are objective, precise, and easy to analyze (p. 64).

Definitions

Definitions of the terms in this study were as follows:

Hospital-acquired infections: Any infections not present on admission (Stone, 2009).

Surgical site infections: Deep wound infections present 30 days after surgery (Schimmel, Horsting, Kleuver, Wonders, & Limbeek, 2010). Surgical site infections are hospital-acquired infections currently reported to be increasing in the United States (Garrett, 2012). Nearly 30 million surgeries are performed yearly in the United States, and 2% to 5% of those procedures develop surgical site infections (Garrett, 2012). The responsibility of providing quality safe patient care belongs to the surgical team.

Surgical Care Improvement Project: Measures used to decrease surgical site infections (Cataife et al., 2014).

Assumptions

The Association of periOperative Nurses encourages the use of chlorhexidine as the skin cleanser of choice to decrease surgical site infections. Therefore, it is assumed that the skin cleanser is given to patients several days before the surgical procedure with instructions on its usage. It is assumed that the patient will follow directions and apply skin cleanser as instructed. Another factor is patient compliance in using the chlorhexidine solution as instructed. The organization's surgical site infections have been significantly higher. In past months, a large number of the vascular patients have been readmitted for surgical site infections. Patients had positive cultures for methicillin-resistant staphylococcus aureus (MRSA).

Limitations

The increase in surgical site infections at the project site in vascular patients has caused this service to become an outlier according to the national benchmark. The lack of supplies and patient compliance are factors in the implementation and outcome of this DNP project. The peroperative assessment nurses, as well as the inpatient nurses, were not always compliant with giving patients the cleansing solution. Even when patients were given the solution, there was no guarantee that patients were complaint if they obtained the cleansing solution. I found that the standard of care recommended by Association of periOperative Nurses was not being followed.

Significance of Nursing Practice

The role of the nurse is to care for patients during their perioperative experience. The perioperative nurse should ensure that no harm comes to the patient. The project will standardize the current practice so that it will meet the standards of the Association of periOperative Nurses. In meeting the recommended standards, the facility will provide quality, safe, patient-centered care to meet the standard of the National Healthcare Safety Network. The facility will meet the national benchmark for hospital-acquired infection with the implementation and valid outcomes of the project. The facility will discover the benefits of a quality improvement program to decrease surgical site infections, which will decrease the facility's financial burden caused by readmissions through longer hospital stays.

Literature Research Strategy

The reviewed articles were located with the use of the Google search engine and the Walden Library, which led to several databases. The major databases used where CINAHL-Pro Quest, CINAHL-ScienceDirect, CINAHL, Medline, and thebCochrane Database of Systematic Reviews. The articles were found in these databases using such key search terms as *perioperative surgical site infections, chlorhexidine, chlorhexidine shower decreases surgical site infections,* and *surgical site infections.* I obtained articles written from 2006-2011. The review includes a randomized comparison study, a randomized controlled trial, a randomized controlled trial and treatment study, a historical randomized controlled trial, randomized controlled group studies, a systematic review, and a consensus viewpoint.

Change Theory

The model for change to evidence-based practices included the use of synthesized, evidence-based practice (Rosswurm & Larrabee, 1999). The model for change steps begin with assessing the problem and continue with linking the problem to interventions and outcomes (Rosswurm & Larrabee, 1999). There was an increase in surgical site infections in vascular patients at the project site that caused the facility to be lower than the national benchmark. The comparison of the internal data and external data was used to illustrate a need for a change in practice. The problem was identified, and individuals were informed to research a solution to the problem (Step 2). In Step 3, the best evidence is synthesized after the interventions and outcomes were pooled together with clinical judgments (Rosswurm & Larrabee, 1999). According to the model, the design to be developed should incorporate the best evidence for practice changes and should include feedback from stakeholders, the environment, and resources (Rosswurm & Larrabee, 1999). The remaining steps (4 through7) in the model for change are implementing, evaluating, integrating, and maintaining the change, which includes close monitoring of the process and continuous communication with stakeholders (Rosswurm & Larrabee, 1999). According to Rosswurm and Larrabee (1999), throughout the six stages of the model, it is important to include the stakeholders, as they are essential to the acceptance of the practice change.

It will be important to focus on, act on, and review all factors rather than only one factor to ensure the necessary strategies are deployed to provide an active solution (Kelly,

2011). The model for change to evidence-based practice is essential in providing quality patient care and ensuring patient satisfaction.

Conceptual Model

The APIC conceptual model is a circular design centered on patient safety in which the goals extend outward (Murphy et al., 2012). There are four domains identified by APIC for current and future competency development: leadership, infection prevention and control, technology, and performance improvement/implementation science. The four domains are not mutually exclusive but are connected to the core competence as well as to each other (Murphy et al., 2012). The model allows a novice individual to become competent in the core competency, infection prevention, which has been designed by APIC.

Plan, Do, Check, Act Model

The PDCA model is a continual cycle that evaluates the project, showing a need for improvement, planning the improvement, implementing the improvement, checking on the implementation, and evaluating the improvement. The plan was to incorporate chlorhexidine as a preventive measure against surgical site infections, which included one to two showers, the application of the chlorhexidine cloth wipes, and the application of the Chloroprep stick. The hospital executives have given their approval; it has also been given the approval by the Nurses Clinical Practice committee.

Concept of Asepsis

According to Burns and Grove (2009), a concept is a phrase that abstractly describes and names an object, a phenomenon, or thought. As a result, it has a separate

identity or meaning (Burns & Grove, 2009). Concepts can be concrete or abstract, variable or invariable, as well as an object or thing (Wills & McEwen, 2011). The concept of asepsis is the process or method of bringing about a condition in which no disease causing microorganisms are present.

Literature Review of the Evidence

Researchers have produced mixed reviews about the use of chlorhexidine decreasing surgical site infections. Eiselt (2009) found that incorporating of 2% chlorhexidine cloths with the surgical shower decreased surgical site infection. The process was a shower the evening before, applying two chlorhexidine cloths for 3 minutes each, and applying 2% chlorhexidine cloths prior to surgery for 3 minutes each time (Eiselt, 2009). The chlorhexidine was allowed to air dry after the last application of 3 minutes in both the evening and morning. According to Eiselt, the 2% chlorhexidine cloths may help accomplish the goal of decreasing surgical site infections.

Johnson, Daley, Zywiel, Delanois, and Mont (2010) found problems with chlorhexidine adhering to washcloths, resulting in an insufficient amount of chlorhexidine on the skin and recommended the use of 2% chlorhexidine cloths. Johnson et al. concluded that the use of chlorhexidine cloths may be a simple and easy solution to decrease surgical site infection, but also acknowledged the need for large prospective studies. Johnson et al. also recommended that the protocol be considered in addition to other surgical site infection preventive methods.

Edminston et al. (2008) conducted a study as the result of a Cochrane Collaboration review that questioned the continuance of the preoperative shower stating

the evidence-based data does not validate the practice. Appropriate skin asepsis involves the effective concentration of chlorhexidine, but also requires a timed exposure to the chlorhexidine (Edminston et al., 2008). According to Edminston et al., a timed preoperative shower is a beneficial strategy for surgical procedures at risk for postoperative infections such as with the implantation of prosthetic devices. A standardized timed preoperative shower achieved high levels of chlorhexidine on the skin (Edminston et al., 2008). However, there remains a gap in the literature on preoperative skin asepsis and evidence-based outcomes (Edminston et al., 2008).

Edmiston et al. (2010) stated that surgical site infections rank third as the most commonly reported hospital-acquired infection. Edmiston et al. found that chlorhexidine is not affected by blood or serum protein and shows evidence of antimicrobial action remaining on the skin surface. Chlorhexidine inhibits the microbial growth for hours after use (Edmiston et al., 2010). The use of chlorhexidine is an effective and safe agent for skin antisepsis, which can decrease surgical site infections. Edminston et al. found flaws in previous studies performed between 1983 and 2009, which included problematic issues with the study design, implementation, and the analysis. The previous researchers indicated that perioperative preparation with chlorhexidine showers or cleaning does not significantly decrease surgical site infections (Edmiston et al., 2010).

According to Edminston et al. (2010), a study was performed with orthopedic patients for 3 months using 2% chlorhexidine cloths. The results showed a 50% decrease in total joint infections. There is some inconsistency regarding the accumulation of chlorhexidine on the skin, but evidence-based clinical studies document that it is a risk

reduction approach (Edminston et al., 2010). The use of 2% cloths or a 4% solution in a timed process used prior to admission is a preventive strategy for reducing the risk of surgical site infection (Edminston et al., 2010). According to Edminston et al., the Surgical Care Improvement Project has not been instrumental in decreasing surgical site infection and that other reduction strategies are needed.

Lipke and Hoytt (2010) discussed surgical site infection as serious health acquired infections that occur in up to 4.5% of patients who have had surgery. According to Lipke and Hoyott, the mortality rate is three times higher in a surgical patient due to staphylococcus aureus and is known to be five times higher in older surgical patients. The mortality rate is even higher for surgical site infection caused by MRSA (Lipke & Hoytt, 2010). The project did not focus on one particular organism, but the goal was to use chlorhexidine effectively, along with the Surgical Care Improvement Project, to decrease surgical site infection. Lipke and Hoytt stated that an increase in MRSA infections led to a quality improvement initiative that included the use of 2% chlorhexidine cloths and identifying individuals infected with MRSA.

Other factors can cause surgical site infection. Cheadle (2006) claimed that the following can cause site infection: prolonged surgical procedures, shock, blood transfusions, hypoxia, hyperglycemia, and hypothermia. I implemented the project in all vascular patients. However, the factors that can increase the risk of surgical site infection were identified in the data collection.

Grelle et al. (2008) emphasized that other factors increase the risk for surgical site infections such as excessive personnel in the operating room, presence of prosthesis or

foreign body, and tissue trauma. Grelle et al. listed independent variables such as smoking, alcohol intake, steroid use, and the anesthesiologist classification. Grelle et al. found that a precleansing in the surgical suite appeared to decrease surgical site infection, even though there were no data to support this supposition. The surgical site infection rate in that organization had not reported an increase since the implementation of the precleansing technique (Grelle et al., 2008).

Background

In 2006, the project site revised their mission and vision statement. The facility has world-class academic and health care systems, that strive to transform medicine and health locally and globally through innovative scientific research, the rapid translation of breakthrough discoveries, and educating future clinical and scientific leaders who will benefit society. The facility continues to advocate and to practice evidence-based medicine to improve community health and to eliminate health inequalities.

The CDC's Guidelines for Prevention of Surgical Site Infections (1999) established methods of preoperative patient preparation and identified practices to decrease the risk of surgical site infection. McBride and Beamer (2007) required hospital policies based on Center for Disease Control and Prevention and Operating Room Nurses Association of Canada standards. The surgical staff consisted of the surgeon and nurses, and they formed the policies (McBride & Beamer, 2007). The policies included patient education, hair clipping, and prescrubbing based on a patient's body mass index to prevent surgical site infections (McBride & Beamer, 2007). According to McBride and Beamer, "Ongoing literature reviews have identified that these policies continue to be

relevant and up to date with recommended practice as evidenced by the pre-operative wash and hair removal recommendations of the Safer Healthcare Now! Campaign" (p. 30). The perioperative nurse should review current literature, revising policies as needed, and follow recommended practices for the prevention of surgical site infections.

The project included an evidence-based protocol to support the continual use of chlorhexidine during the perioperative experience. According to O'Malley (2008), surgical site infections are the third most common hospital-acquired infection. Hospital-acquired infections increase costs and readmissions leading to increased morbidity and mortality (O'Malley, 2008). Surgical site infections in vascular patients in the facility are above the national benchmark, which calls for an immediate action plan. The approach presented in section includes

1. Assemble an interdisciplinary team
2. Lead project team in the review of relevant evidence and literature
3. Develop practice guidelines and project protocol
4. Validate developed products with scholars in the field
5. Develop an implementation plan
6. Develop an evaluation plan

Interdisciplinary Team

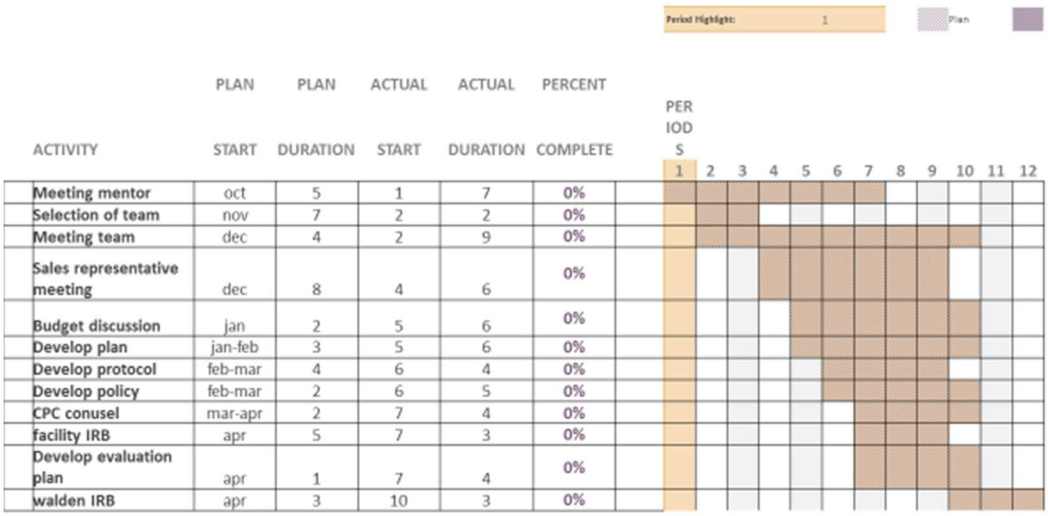
I began the project by asking a vascular surgeon about surgical site infection issues in the organization where she was chief of vascular surgery. The chief of vascular surgery was interested in pursuing the practice change in the project facility where surgical site infections were outliers according to the national benchmark. The chief of

vascular surgery became my mentor and facilitated my ability to work within the organization. The selection of the project team was conducted by my mentor and I consisted of

- Vascular fellow: aided in implementation and monitored documentation
- Quality/performance improvement coordinator: provided resources if necessary for the project
- Vascular physician's assistant: documented readmissions for surgical site infection
- Clinical research coordinator vascular surgery: ensured patient rights and present project to organization's Internal Review Board (IRB)
- Clinical director of perioperative services: assisted in setting up educational in-services for stakeholders
- Perioperative nurse manager: nurse manager of proposed project unit.

The selection of the team members was based on their knowledge, expertise, and willingness to support the project. The individuals selected had an understanding of the organizational structure and the ability to influence others through their interpersonal relationships. Involvement of the other key members was not planned, but the executive staff had the authority to support or eliminate the process. The executive members of this team included the president of the organization, an association professor of medicine, a National Surgical Quality Improvement Program (NSQIP) surgical champion, and the associate chief of perioperative surgery. The six team members were contacted and given a brief overview of the issue along with one question.

The question to the team at the onset of the first meeting was a pattern level question. According to Kelly (2011), pattern level questions can move from an individual to a group with the focus on what the organization needs to do differently. The question started the conversation to brainstorm different strategies to diminish surgical site infection. Therefore, a shared action from a team was required to develop the policy, protocol, and guidelines. Figure 1 is the developmental plan of the project. Currently, I am working closely with the sales representative and the hospital commodity member to stock the appropriate amount of chlorhexidine wipes in the facility. I am also working with the designated project champion to prevent wasting of chlorhexidine wipes when stocked.



ACTIVITY	PLAN START	PLAN DURATION	ACTUAL START	ACTUAL DURATION	PERCENT COMPLETE
Meeting mentor	oct	5	1	7	0%
Selection of team	nov	7	2	2	0%
Meeting team	dec	4	2	9	0%
Sales representative meeting	dec	8	4	6	0%
Budget discussion	jan	2	5	6	0%
Develop plan	jan-feb	3	5	6	0%
Develop protocol	feb-mar	4	6	4	0%
Develop policy	feb-mar	2	6	5	0%
CPC conusel	mar-apr	2	7	4	0%
facility IRB	apr	5	7	3	0%
Develop evaluation plan	apr	1	7	4	0%
walden IRB	apr	3	10	3	0%

Figure 1. Development plans for project

Develop Practice Policy, Guidelines, and Protocol

Project Policy/Standard Operating Procedure

The policy for the protocol was developed based on a protocol published by the Association of periOperative Nurses (Association of periOperative Nurses, 2015). The policy included the recommended practice for the surgical skin preparation. The policy/standard operating procedure includes the purpose, policy, and the procedure for using an antiseptic agent for vascular surgical patients. The project team discussed the use of chlorhexidine for the vascular surgical patients. The discussion resulted in guidelines for skin preparation of the surgical site and, if possible, how to ensure that surgical patients receive appropriate skin preparation to reduce the risk of postoperative surgical site infection.

Project Protocol

The plan was developed for a protocol using chlorhexidine wipes for operative site cleaning. The original team members discussed the former protocol and whether they should remove or add additional sequences or steps. The team members met once a week to discuss the protocol and guidelines. The protocol was based on the current practices in place to decrease surgical site infections, such as the Surgical Care Improvement Project initiative and patient showers as recommended by the Association of periOperative Nurses. The project team requested the presence of the sales representative with the goal of obtaining information regarding the product, the cost, and the proposed application of the product.

I obtained information on all of the necessary equipment for the product and worked with the sales representative to acquire the product and equipment. The executive team received notice of the cost of supplies and equipment. The team decided on the method for the application of the product, the number of wipes per procedure, the amount of time solution is required to dry, and the education of stakeholders regarding the practice change.

It was important to that ensure the project was fair, respectable, just, and caused no harm (Hodges & Videto, 2011). Approval for the developmental project without implementation was approved by the Walden University IRB (approval #01-12-0070067)), a presentation in the quality improvement policy committee at the hospital provided information about the purpose and procedures of the program along with the potential risks and benefits related to collection of data (Hodges & Videto, 2011). After the approval of the program development by Walden IRB and the implementation by the quality improvement policy committee at the hospital, the project moved forward with an implementation model.

Validation of Developed Product with Scholars in the Field

Some experts in the field have recommended the use of chlorhexidine as the product to reduce surgical site infections. Three affiliated surgeons at the University Hospital in Durham, North Carolina (individuals with expertise in vascular, general, and orthopedic surgery) were consulted during the initial stages of the protocol. The scholars received a copy of the policy, the written protocol, and the project paper in its current

form. The response from the scholars was positive with the suggestion of using the NSQIP instead of both NSQIP and readmissions.

Implementation Plan

The long-term goal of the project is for the pilot to be extended from 6 months to 12 months, allowing the project to be in place for an entire year. The pilot will include the implementation of the protocol with the education of the stakeholders. The pilot period is expected to solve all unforeseen problems and concerns. The pilot will ensure that all necessary supplies are available and used effectively. The pilot period is expected to show a decrease in readmissions in vascular surgical patients. A discussion of the long-term goal will occur at the end of the year with NSQIP report results.

Evaluation Plan

The established goal will provide the direction of the project (Kettner et al, 2008). According to Kettner et al. (2008), the objectives and activities of the project will provide a framework for performance measurements and evaluation. The evaluation of the project will be continual throughout the year at which time the facility will review and compare NSQIP reports from the last 2 years to verify a decrease in surgical site infections. During the coming year, stakeholders will be observed for the effectiveness of the newly acquired knowledge and educating new employees on the protocol using the chlorhexidine wipes. The readmission list will be reviewed quarterly with expectations of a decrease in vascular surgery readmission for surgical site infections.

Discussion

The planning process for the quality improvement project continues as the implementation phase discussion begins. The implementation process (which will begin post DNP graduation) has a tentative start in the month of July 2016 with the education of perioperative nurses by the sales representative concerning the chlorhexidine wipes. The sales representative will provide product information. I will discuss the technique and method for application of the product. The sales representative will provide product information. The plan is to present the information to the perioperative staff during two different staff meetings. In August 2016 the product (Appendix B) and the figure (Appendix A) will be posted in a designated area. The product will be in an area that is accessible to staff members.

Product

The product used to decrease or alleviate infections in vascular patients is chlorhexidine wipes. Chlorhexidine is an antiseptic solution that has been used in many operative areas for some years. Typically, a 4% chlorhexidine solution is used, generally followed by the application of alcohol to the operative area. However, Edminston et al. (2010) showed 2% chlorhexidine to be more effective to decrease surgical site infections. The chlorhexidine wipe was developed Sage and can be used the evening before and the morning of surgery and has been successful in decreasing surgical site infections. Normal skin flora has been found to harbor numerous bacteria. The application of the chlorhexidine wipes prior to surgery allows the operative site and surrounding area to be

free of normal skin flora bacteria for several hours. The application of multiple wipes is necessary to ensure the operative site and surrounding area are cleaned and bacteria free.

Application of Product

When applied, the 2% chlorhexidine cloth wipes product has a lifespan of up to 6 hours on the operative site and surrounding tissue. It will be important to clean the operative site first before cleansing the surrounding area. The chlorhexidine wipes are in a company-supplied warmer for patient use. The wipes will be used within a 24-hour period or be discarded. After the skin is clipped, the chlorhexidine is applied. The nurse and patient will apply the wipes to the operative site and surrounding areas. The protocol (Appendix C) will guide the application of the chlorhexidine wipes to the correct part of the patient's body according to the surgical procedure. The elements of the protocol written into the standard procedure of the operating room is a policy known as "Preoperative Patient Skin Preparation" (Appendix A).

Policy

The policy follows the guidelines and standards of the Association of periOperative Nurses 2014. The project committee was in agreement with developing the policy (Appendix A). The policy states the usage of chlorhexidine wipes for all vascular patients as well as other services. The Clinical Practice Committee will review the policy for approval. During the review of the policy, the perioperative staff will continue the application of the chlorhexidine wipes. Nurse compliance to the protocol will be reviewed by a vascular fellow and me during the review of the policy. The review of staff compliance will lead to the PDCA model mentioned in Section 1.

Compliance with Protocol

Staff compliance can be identified by checking previous vascular surgery patients chart for application of chlorhexidine wipes. A learning curve should be expected. Nurses might have difficulty adding the protocol to their current workload (Appendix E). The patient will need to be clipped when necessary prior to the application of chlorhexidine. The other potential issue may be anesthesia refusing to allow the staff to apply wipes prior to the start of a procedure, such as spinal and regional anesthesia. These are a few of the issues that may arise as the perioperative staff begins the project.

Implementation

The implementation process will begin with creating a team and selecting a facilitator who will handle contacting the sales representative and obtaining samples of the product in bulk and warmers for the wipes. The selected person will work with a sales representative and in-services staff members (Appendix D). The facilitator and the sales representative will discuss cost with the purchasing agent within 6 months of product usage. At that time, the product will be purchased and stocked in the perioperative area.

Evaluation

The evaluation process will be in two parts that include compliance with the project and review of readmission records and the NSQIP. The evaluation process has been designed to accomplish the goal and the expected outcome, which is to decrease surgical site infections in vascular patients. The evaluation has several steps in which different members of the project team will document the information. The evaluation process will be ongoing and continual beginning several days post-surgery and will

continue for a few years (Appendix F). The evaluation process will also include age, sex, and morbidities that will determine factors that may lead to surgical site infection (Appendix G).

Summary

The project is expected to prevent surgical site infection in a vascular patient; the use of chlorhexidine has been shown to have a longer lifespan on the skin than any other product used for surgical preparation. The project is expected to lead to decreased infection rate at this facility, thereby allowing the community to experience less anxiety with the knowledge of a low infection rate for the facility. At the completion of the project, it should be shown that the protocol and the product used have effectively prevented hospital-acquired infections. Surgical site infections are a concern in many hospitals in the community. This protocol may be the first step in reducing hospital-acquired infections caused by surgical site infections.

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Appendix A: Surgical Site Infection Prevention Policy

Institutions Name

Date Issued
Date of Revision

STANDARD PROCEDURE
Operating Room Service
Preoperative Patient Skin Preparation

The policy for the protocol was derived from the Association of periOperative Nurses and an article from the literature review namely Eiselt (2009). The recommended practice for the surgical skin preparation is included in the policy. The policy/standard operating procedure is a follows:

PURPOSE: to provide a guideline for skin preparation of the surgical site. The importance of preoperative preparation of the patients' skin is to reduce the risk of postoperative surgical site infection by removing soil and transient microorganisms from the skin, decreasing an individual's microbial count to lower levels of disease-causing bacteria.

POLICY: To ensure surgical patients receive appropriate skin preparation solution prior to surgical procedure. Patients will be given a chlorhexidine solutions to shower/bathe the evening prior to surgery and the morning of surgery. Chlorhexidine 2%wipes will be utilized in the perioperative holding area prior to surgery.

PROCEDURE:
As recommended by Association of periOperative Nurses and the Center for Disease Control and Prevention the patient should receive a shower/bath prior to the surgical procedure the evening prior to and/or the morning of surgery. All patients undergoing open Class I surgical procedures below the chin should have two preoperative showers/baths with chlorhexidine gluconate.
A. If chlorhexidine gluconate is to be used, the following instructions should be provided to the patient:
• following each preoperative shower, the skin should be thoroughly rinsed; dried with a fresh, clean, dry towel; and the patient should don clean clothing.
Unless contraindicated, patients should be instructed to perform two preoperative baths/ showers with chlorhexidine prior to surgery to reduce the number of microorganisms on the skin and reduce the risk of later contamination of the surgical wound.
The intraoperative skin antiseptic agents that have been FDA-approved and/or approved by the health care organization's infection control personnel should be used for all preoperative skin preparation as recommended by Association of periOperative Nurses.
A. The intraoperative skin antiseptic agent should:

a. significantly reduce microorganisms on intact skin,
b. contain a nonirritating antimicrobial preparation,
c. be broad spectrum,
d. be fast acting, and
e. has a persistent effect.

1. Assess the patient for allergy or sensitivity to skin preparation agents.
2. Povidone-iodine can cause contact dermatitis or irritant reactions and does not indicate an allergy to iodine. Anaphylaxis to povidone-iodine is extremely rare and has not been shown to be from the iodine. There is no correlation between reactions to povidone-iodine and allergies to seafood or contrast media (Association of periOperative Nurses, 2012).
3. Chlorhexidine gluconate has triggered allergic reactions in sensitized individuals ranging from mild local symptoms to severe anaphylaxis. Mild symptoms may precede severe attacks.
4. Assess the patient for contraindications to specific skin preparation agents.
   A. Chlorhexidine gluconate is neurotoxic and can cause permanent injury, if the inner ear is exposed to chlorhexidine through a non-intact tympanic membrane. Chlorhexidine gluconate can cause corneal irritation if allowed to contact the eye. (Note: Avoid chlorhexidine gluconate on all eye and ear cases).
   B. Avoid application of any skin preparation agent if the patient has a known sensitivity.
5. The manufacturer's written instructions should be reviewed for additional information about their product's use.

The surgical site should be identified and marked prior to arriving in perioperative holding or in the perioperative holding area before anesthesia blocks and skin preparation. The verification minimizes the risk of prepping the wrong area, which could contribute to wrong-site surgery. Use 2% chlorhexidine wipes on the specified area of all colorectal and vascular surgery cases and allowed to dry prior to admission to the surgical suite.

- The marker used to make the surgical site mark should not facilitate microbial growth.
- Provide a mark that remains visible after the surgical preparation.
- The surgical site should be confirmed before marking the site.

Association of periOperative Nurses recommends the use of an alcohol-based surgical site marker over water-based skin markers that wash off during the skin preparation and have been found to transmit MRSA.

_____ _____

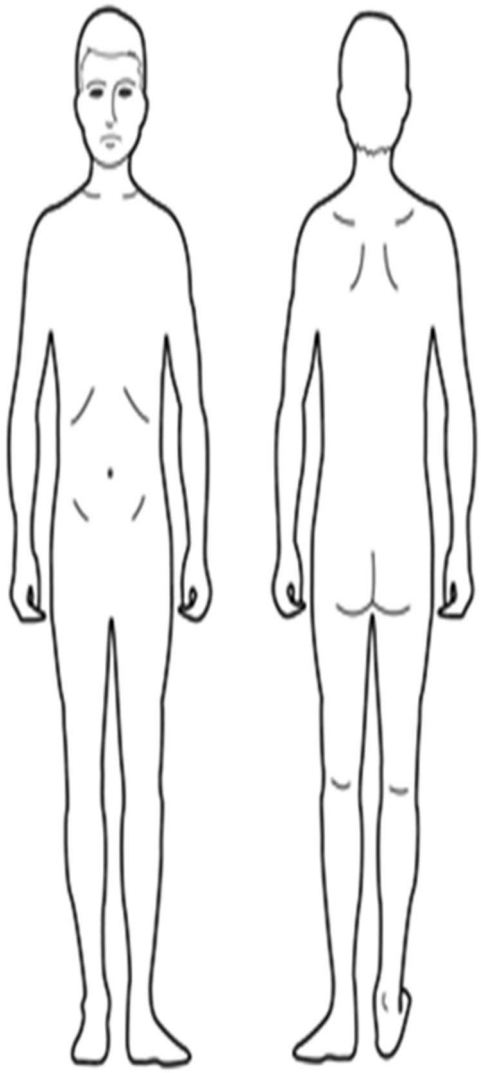
Nurse Manger Signature Infection Control Nurse

_____
Associate Chief of Surgery

Appendix B: Surgical Site Infection Prevention Protocol

The protocol for the new implementation is a follows:
The preoperative nurse will provide patients a with chlorhexidine solution and give instruction about how to shower with the solution the evening before or morning of surgery. The solution will be applied to the entire body and once again focusing on the operative site.

Once in the perioperative area, the site will be marked, and chlorhexidine cloth wipes will be applied four to five minutes to the operative site and allowed to dry. The patients undergoing vascular surgery will have chlorhexidine wipes applied to the abdomen, groin, and the entire operative leg including the foot if indicted. The protocol will include all vascular implant surgeries as well as other specified procedures, which may include re-implant of patient veins. The procedure, area to be cleansed, and numbers of wipes to utilize are provided. See visual aid that will be provided to stakeholders for application of chlorhexidine wipes:



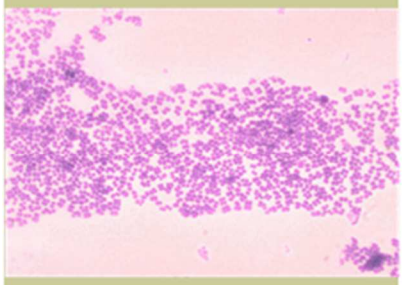
Surgery_ minimum area to be prepped
Triple A _ 1st cloth - clavicle to mid-thigh
2nd cloth_ groin
Auxiliary bi-fem (full body prep)
1st cloth_ neck, chest and abdomen
2nd cloth _right arm, axilla last
3rd cloth_ left arm, axilla last
4th cloth_ left leg, groin
5th cloth-_right leg, groin
femoral to femoral and/or to popliteal
1st cloth_ umbilicus down
2nd cloth_ circumference leg including groin (apply last)
Multiple vascular grafts_ (full body prep)
1st cloth_ neck, chest and abdomen

2nd cloth_ right arm, axilla last
3rd cloth_ left arm, axilla last
4th cloth _left leg, groin
5th cloth _right leg, groin

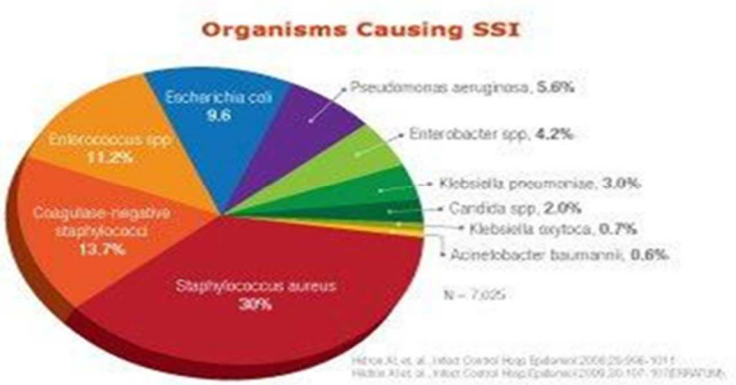
Appendix C: Surgical Site Infection Prevention Product

Reduce Surgical Site Infections (SSI) with 2% Chlorhexidine Gluconate Cloths

THE ENEMY: NORMAL SKIN FLORA



Surgical site infections occur in 5% of patients who undergo clean operations, and in up to 20% of patients who undergo intra-abdominal or clean-contaminated surgery.



Instructions

Dry surgical sites (such as abdomen or arm): use one cloth to cleanse each 5 x 5 inches of skin to be prepared. Vigorously scrub skin back and forth for 3 minutes. Allow area to air dry for 1 minute. Do not rinse.

Moist surgical sites (such as inguinal fold): use one cloth to cleanse each 2 x 5 inches of skin to be prepared. Vigorously rub skin back and forth for 3 minutes. Allow to air dry for one (1) minute. Do not rinse. **Use as many cloths as necessary to cover operative area. For lower extremity cases prep groin and entire operative leg/legs. For upper extremity, use a separate cloth for the axilla.

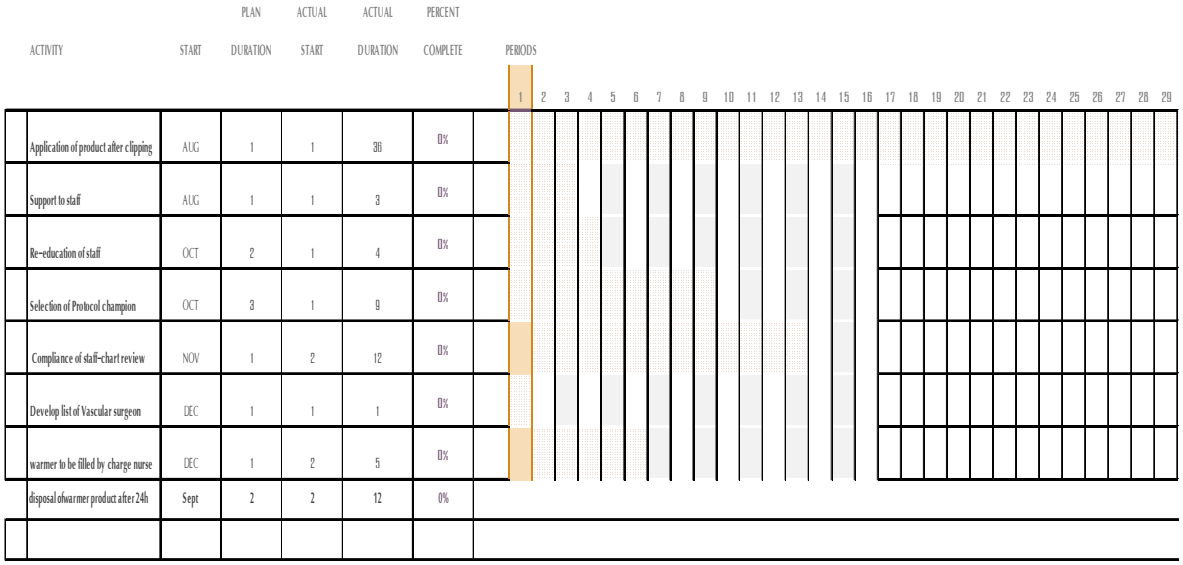
Appendix D: Surgical Site Infection Prevention Implementation Plan

ACTIVITY	implementat START	PLAN DURATION	ACTUAL START	ACTUAL DURATION	PERCENT COMPLETE	PERIODS 1 2 3 4 5 6 7 8 9 10 11 12 13 14
Implementation	July	1	1	2	0%	
Introduction of pr	Aug	2	1	3	0%	
Sales representat	Aug	2	1	1	0%	
Product placed in	Aug	12	1	12	0%	
Support to staff	Aug	12	1	6	0%	
Application of prc	Aug	12	1	12	0%	
List of all Vascular	Aug	12	2	12	0%	
Documentation o	Aug	12	1	12	0%	

The implementation process will begin with receiving the product along with the product warmers. It will be important to discuss the number of wipes arranged in the warmer. It may be necessary to work with the charge nurse of the area to ensure the product will always be in the warmer and tat chlorhexidine wipes in the warmer every 24 hours or longer are discarded. The sales representative should be notified and work closely with the purchasing agent to ensure availability of the product. The staff will have an in-service regarding the product and its use. It will be important to educate staff and be available for several weeks to answer questions and any unforeseen problems. In a larger facility, preoperative nurses may not know all of the surgeons. A list of surgeons will be necessary and available. Instructions will be given to the nurses on the documentation of both the preoperative shower and the chlorhexidine wipes. The documentation of the usage of chlorhexidine wipes will be monitored by chart review to assess for compliance

with the new protocol. The chart review will be completed quarterly or every three months to verify compliance. Re-education of staff may be necessary.

Appendix E: Compliance to Protocol



ACTIVITY	START	PLAN DURATION	ACTUAL START	ACTUAL DURATION	PERCENT COMPLETE
Application of product after clipping	AUG	1	1	36	0%
Support to staff	AUG	1	1	3	0%
Re-education of staff	OCT	2	1	4	0%
Selection of Protocol champion	OCT	3	1	9	0%
Compliance of staff-chart review	NOV	1	2	12	0%
Develop list of Vascular surgeon	DEC	1	1	1	0%
warmer to be filled by charge nurse	DEC	1	2	5	0%
disposal ofwarmer product after 24h	Sept	2	2	12	0%

The perioperative nurse will be instructed on the application of chlorhexidine wipes after clipping is completed. The perioperative nurse will obtain instructions on cleanings dirty areas last such as armpits and groin areas. It will be important to strategize a clipping process that will allow the nurse to apply chlorhexidine wipes immediately. This practice will aid in the flow of patient care. The perioperative nurse and anesthesia will work together ensure the application chlorhexidine wipes prior to leaving the perioperative area. It will be important to support staff during this process, Re-education of staff may be required to ensure wipes are applied, and documentation is complete. A few weeks into the project, it will be important to select a champion for the project, a staff member/members who has repeatedly and completed the protocol.

Appendix F: Surgical Site Infection Prevention Evaluation Plan

Evaluation Plan

Activity Evaluation Plan	Start Days	Duration Months	Plan Start	Actual Duration	Actual Complete	Percent Years 1	2	3	4	5	6	7
Postoperative surgery readmission	10 days	1	Aug	2	0%							
Date of surgery/Date of readmission	21 days	2	Aug	3	0%							
Review surgeon specific data	7 days	2	Nov	1	0%							
Review of NSQIP report prior to implementation	3 days	1	Sept	2	0%							
NSQIP report	365	120	16-Dec	5								

The evaluation plan will include the documentation of readmission for surgical site infection at 10 days and 21 days. The NSQIP report will be documented by a member of the project team yearly.

Appendix G: Surgical Site Infection Prevention 5-Year Comparison Data

Chart Review Evaluation

PATIENT ID											
Age	15-80										
Sex											
Race											
Procedure/Date											
Diabetic											
MRSA/VRE											
Antibiotic											
Preop Shower											
Outpatient											
Inpatient											
surgical site infection Readmission											
		2012	2013	2014	2015	2016	2017				

The data collection for the project will consist of a method used with a quantitative quasi-experimental design method, which is archived information or chart review (Terry, 2012). The group will be statistically similar but will not have undergone the newly implemented practice (Kettner, Moroney, & Martin, 2008). The measurements collected will also include information on age, gender, comorbid conditions, infection history, site of infection, and compliance with chlorhexidine wipe protocol, type of

operation, hospital length of stay, readmissions, and 30-day mortality. An estimation of the total evaluable sample size will be approximately 500 individuals. The data in existence as of June 30, 2015, will be collected. The estimated timeframe for the completion of this research is 18-24 months. The project population will be identified using the NSQIP reporting system. According to Tymkow (2011), the population for a project is determined by the method and the accessibility of the population. The selection will be all adult patients 18 years old or older who underwent a vascular operation at the university hospital and developed a surgical site infection from January 2016 through December 2021.