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Standardizing the Superior Preoperative Skin Antiseptic

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Standardizing the Superior Preoperative Skin Antiseptic

A Benchmark Study

A Paper Submitted in Partial Fulfillment of the Requirements

For NURS 5382: Capstone

In the School of Nursing

The University of Texas at Tyler

by

Marissa Eckeberger

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Contents

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Executive Summary

A surgical site infection (SSI) is the most common hospital acquired infection and causes prolonged hospital stays and even death (CDC 2021). SSIs are costly as they are the leading cause of hospital readmission following surgery and are a significant cause of morbidity and mortality (Patient Safety Network, 2019). These are negative outcomes for all parties involved. However, there is an opportunity to decrease the risks for SSIs through a simple change that could be implemented. Currently, the preoperative skin preparation agent used is chosen based on the surgeon's preference, given there are no contraindications present. There are several options, but Chlorhexidine Gluconate and Povidone Iodine are the most used agents (Abdullah Al Maqbali, 2013). Though the Centers for Disease Control has yet to recommend one agent over the other, there has been thorough research executed and evidence provided that shows the superiority of chlorhexidine in preventing SSIs. Therefor the question is raised: why is the superior skin antiseptic agent not standardized to be used on all patients? Surgeons must be continually educated as new evidence is presented and held accountable to provide the highest quality care. With continually evolving research and evidence, remaining stagnant is unacceptable: standardization is necessary. It is imperative that healthcare professionals continue to advance toward excellence in patient care and outcomes, and a standardized preoperative skin preparation would aid in those advancements.

Standardizing the Superior Preoperative Skin Antiseptic

Preoperative skin antisepsis is a critical component in the prevention of surgical site infections. Evidence has shown Chlorhexidine to be more effective than Povidone Iodine as well as any other agent, therefor it should be a standard of care for

surgical patients. Patients expect to receive exceptional care and have good quality outcomes. Surgery is a means to resolve patient problems, not to develop new ones. Not having a standardized process in place means that patients are subject to receiving substandard care based on which surgeon they have and the surgeon's preferences. Surgical nurses may be a part of two surgeries with two different surgeons in the same day and use different agents on each patient. How is the nurse to know which patient received the best care? With no policy in place, surgical nurses have no support in their own duty of evidence-based practice while trying to advocate for a surgeon to choose the superior agent. It is the responsibility of all healthcare professionals to deliver the best treatment possible and standardization that results in implementation of policies will eliminate potential debate.

Rationale for the Project

Surgical site infections are a significant problem in the healthcare field. They account for 20% of all health care-associated infections (Privitera et al., 2017). They can increase a hospital stay from three days to thirty-two days, double the chance of death or an intensive care stay, and increase the likelihood of readmission after discharge by 5 times (Privitera et al., 2017). Prevention of these infections involves a bundle of measures, but preoperative skin antisepsis is crucial. Skin is the first line of defense against microorganisms, and surgical skin preparation to reduce these microorganisms is critical to help prevent infection (Bernard,2009). Standardization of the most effective skin preparation agent will help to reduce the risks of SSIs.

Literature Synthesis

A collection of twelve peer-reviewed articles provide evidence that chlorhexidine is more effective than iodine in reducing SSIs when used as a skin preparation agent before surgery. Articles by Dumville et. al (2015), Ayoub et. al (2015), Chen et. al (2020), Privitera et. al (2017), and Noorani et al. (2010) were quantitative meta-analyses of moderate and high levels of certainty that showed CHG as more effective in reducing SSIs in comparison to iodine. Randomized control trials by Darouiche et al. (2010), Ritter et al. (2020), Yasuda et al. (2017), Luwang et al. (2021), and Yeung et al. (2013) all showed Chlorhexidine superior to Iodine in various ways including reducing risks of SSIs, reducing skin flora at surgical site, and fewer positive skin cultures. A quantitative cohort by Qintar et. al (2014) and a quantitative experimental RCT by Park et. al (2016), of moderate levels of certainty, showed no significant differences between the two agents. However, SSI rates were higher for the povidone iodine group in the evidence by Park et. al (2016). Articles graded with high levels of certainty revealed statistically significant findings that CHG is superior to povidone iodine in reducing the risk of SSIs. These articles include Ayoub et. al (2015), Chen et. al (2020), Darouiche et al., (2010), Ritter et al. (2020), and Noorani et al. (2010).

Project Stakeholders

In the surgical practice setting, patients and stakeholders both want the same thing: a successful surgery free of a surgical site infection. According to Fineout-Overholt et al. (2019), clinicians are expected to be competent and deliver high quality care, which means care supported by evidence. Stakeholders for this project, including surgeons, infection control, patients, nurses, and hospital administration, all want to ensure that an infection is prevented because they are costly to the both the patient and the hospital.

From an administrative and quality department standpoint, preventing SSIs is crucial because hospital reimbursement is greatly reduced when it comes to hospital acquired infections and patient readmissions. The Centers for Medicare and Medicaid Services (CMS) monitor these sentinel events closely. Every year, an evaluation is performed on each hospital based on their Healthcare Acquired Condition (HAC) scores. Funding gets cut for those poor performing hospitals, which could result in a hospital closure. These stakeholders want the hospital to excel in its reputation, quality of care provided, and its business.

Surgeons and nurses also share that viewpoint, as a hospital closure would mean hundreds of jobs lost, including their own. Surgeons and nurses are obligated to uphold certain ethical principles as they possess the knowledge and the responsibility to provide exceptional care for all patients. As healthcare professionals, they took an oath which included the ethical principle of nonmaleficence, which means “do no harm”. Providing substandard care in using an inferior skin preparation agent when a better one is available could be considered a breach of this principal.

Patients and their families want to trust that they are being taken care of appropriately. When patients are undergoing surgery, they are at their most vulnerable state. They cannot advocate for themselves, nor are they aware of what kind of care they are being given. Surgery is also a stressful event for family members who wait helplessly for the procedure to be complete. These circumstances demand the patient and family member put their full trust in the healthcare team. It is the duty of the team to see that all the correct steps are taken. Surgical site infection prevention through standardization of Chlorhexidine for preoperative skin antisepsis is a solution to the needs and desires of all stakeholders involved.

Implementation Plan

. Implementing a change, especially in the healthcare field where patient outcomes are at stake, can be challenging. Standardizing Chlorhexidine is a change that will affect several parties, with the main party being surgeons who are not currently using this practice. Knowledge, attitude, and awareness are significantly different amongst surgeons when it comes to best practice and infection prevention (Sartelli et al., 2018). This is a key motivator in this project. According to Hockenberry et al. (2015), obtaining clinical support at the beginning of an EBP project is imperative, and including experts and mentors early on can help gain this support. Talking to the surgeons who would be affected, explaining how important the change is, and asking them to be a part of this change before implementing it, is a resolution to the issue of potential pushback. Identifying change champions, whether they are already using the agent or will be newly affected by the implementation of this change, is essential to the success of this project. The site where the change will take place is a level one trauma hospital in East Texas. Current incidence rates of SSIs at this facility will be needed to demonstrate why changing to a standardized skin preparation agent is warranted. This change would directly affect surgeons, circulating nurses, and materials management. This change would require surgeons who are currently using povidone iodine to be willing to use chlorhexidine gluconate instead. It would be an asset to have the chief of surgery and the chief medical officer in agreement of this change as they function as leadership of the surgeons. Quality and infection control administrators would also be assets as they can provide specific data to help prove the change is needed, encourage the change, and provide evidence. Persistence, patience, and perseverance are key elements in transforming into an evidence-based practice culture (Rodgers et al., 2019).

Resources needed would consist of an educational demonstration provided by the representatives of the chlorhexidine company to help surgeons who have not been actively using this product get acquainted with it. Having this representative on site to help educate and answer questions could help obtain trust and compliance of the surgeons. The implementation and collection of data will take 12 weeks. The following are step by step instructions on what is needed for this project to be successful.

- Step 1: Meet with infection control and quality departments to gather SSI incidence rates at the facility over the past year and investigate what agent was used during each procedure that resulted in an SSI. Meet with the OR manager and gather data about how many surgeons are using povidone iodine versus CHG. Schedule a meeting for early next week with administration and medical staff.
- Step 2: Present proposed change to administration and to those surgeons who are being asked to change their practice. Include research to validate proposed change as well as the data from the past year for SSIs. Have a representative of the company that manufactures the chlorhexidine agent on site to help educate and answer questions. Identify champions of change and allies. Educate OR staff members of upcoming practice changes. Work with supply chain to make sure there is an abundance of the chlorhexidine agent available and agree on a place to keep iodine in case its use is necessary.
- Step 3: Change of practice begins: ensure Chlorhexidine is available and plentiful, and that the Iodine products are off the shelves. The Iodine product must be available in necessary situations such as patients who have allergies to chlorhexidine or the nature of the procedure/area to be prepped is contraindicated for use of chlorhexidine.

- Step 4: Monitor that the change is being implemented; damage control for any issues that arise. Obtain feedback from surgeons on the change. Have the medical sales representative on site to function as a resource.
- Step 5: Evaluate the change, communicate with infection control to get an update on any readmissions for SSIs from patients during weeks 3-6 (SSIs are within 30 days of surgery) or any change in incidence rates. Gather data and create a post-change summary to present to administration and policy makers. Schedule meeting for this presentation.
- Step 6: Present evaluation and data to administrators and policy makers to help motivate a policy be written for standardization of the superior skin prep agent.

Timetable/Flowchart

The major steps of implementing this evidence-based change include gathering data, presenting proposed change to those affected and stakeholders, setting a date for the change of practice, monitoring the practice change, and evaluating it. The following provides a detailed, week by week account of the plan.

Weeks	Tasks				
	Monday	Tuesday	Wednesday	Thursday	Friday
1	Confirm meetings, contact Chlorhexidine representative	Schedule meeting with admin and medical staff, OR manager meeting	Infection control and quality meeting	Analyze information from meetings, prepare proposal	Work on proposal
2	Finalize proposal	Meet with admin and medical staff to propose change	Work with supply chain to ensure product is plentiful, pull inferior product	Reach out to change champions, educate OR staff on upcoming change	Communicate a reminder about the change initiative, verify supply
3	Change of practice begins	Monitor change and complicance, be available for support/resource	Monitor change and complicance, be available for support/resource	Monitor change and complicance, be available for support/resource	Meet with supply chain to ensure continuity of available resources
Weeks 4-8	Meet with change champions for updates/opinions	Monitor change and complicance, be available for support/resource	Monitor change and complicance, be available for support/resource	Monitor change and complicance, be available for support/resource	Meet with supply chain to ensure continuity of available resources
9	Meet with infection control to evaluate patient outcomes from weeks 3 & 4	Analyze data	Work on presentation	Work on presentation	Meet with supply chain to ensure continuity of available resources
10	Meet with OR manager to discuss any concerns	Meet with infection control to evaluate patient outcomes from week 5	Analyze data	Work on presentation	Work on presentation
11	Schedule meeting with admin for next week	Meet with infection control to evaluate patient outcomes from week 6	Analyze data	Work on presentation	Finalize data and presentation
12	Complete presentation	Meet with hospital and OR admin to present outcomes	Meet with change champions to share results of admin meeting and project	Work with policy makers to help initiate the process of standardization	

Data Collection Methods

The plan is to standardize the superior skin preparation agent, Chlorhexidine, to help prevent surgical site infections in all cases with the wound classification of “clean”. Data needed to reflect a successful change would be compliance evaluation, surgeon opinions, and incidence rates of SSIs.

To evaluate the process of change, a few measures can be taken. The first measure is random audits of these “clean” cases to confirm that the agent is being used and being applied correctly. To do this, recruitment of two surgical nurses to perform audits is needed. These nurses would each perform at least 10 audits a week, record and report back. This would allow for verification of compliance. The next measure includes surveys given to the surgeons for feedback. These surveys would include a scale to rate their satisfaction with the change, with allowance of free text to report any concerns or offer any opinions.

According to Shah et al., 2017, SSI readmissions are a target for quality improvement and are defined as an unplanned return to the hospital that occurs within 30 days of the initial procedure. Data on readmission rates for SSIs would provide statistics on the change process effectiveness.

Cost/Benefit Discussion

Currently, the facility pays a price of $5.24 for the Chlorhexidine applicators and $3.60 for the Iodine applicators. This is a cost difference of $1.64. Initially, it seems as though this is not cost-effective. However, the small price increase is irrelevant in comparison to the cost of an SSI. Due to prolonged hospitalization, additional procedures, intensive care stays, and medical resources, the expense of an SSI is extensive. According to Iskander et al. (2019), the average cost of an SSI in 2019 was $20,785 per patient. There are also indirect costs not associated with the previously stated price. Patients who get readmitted for an SSI are having to deal with unplanned absences from work and loss of income. Ultimately, purchasing the more expensive product will result in cost savings for the hospital. Because SSIs can cause death, this expense will also help to save lives.

Discussion of Results

This is a benchmark project. The COVID pandemic has been debilitating to the operations of surgical services. With only certain procedures allowed to be performed due to bed and nursing shortages, the data would be too skewed at this time to produce evidence of a successful change. Unfortunately, with the increased census in the hospitals and scarcity of inpatient beds as well as ventilators, most surgeries have come to a halt at this institution unless urgent or emergent. Most of the surgical staff have been getting floated out to other departments in the hospital to help for weeks with no estimated date of things returning to normal. Because of this, the plan is to implement this project in the spring, given that surgical volumes return. A successful project would include staff compliance, surgeon satisfaction, and a trend of decreasing SSI rates.

Conclusions/Recommendations

In the healthcare field, changes of best practice are constant as new data is found. Healthcare professionals, as well as organizations, have an ethical duty to provide the best care. This means being willing to adapt to new practices as research provides data that initiates change. Changes that promote quality outcomes and are backed by evidence should be embraced and implemented as facilities strive for excellence. Therefor, it is recommend that this project be implemented as soon as surgical volumes return. While awaiting these volumes to return, more research with evidence should be evaluated and incorporated into the proposal. Starting conversations with surgeons now about the potential for this future project could also help gain trust and willingness to change. The lack of standardization leaves too much room for error, error that can result in loss of human life. It is highly recommended that

standardization of Chlorhexidine for preoperative skin antisepsis in “clean” procedures be implemented and policies created to support this.

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Appendix A

Synthesis Table

PICOT: In patients having a clean surgery performed (P), how does using the skin preparation agent chlorhexidine gluconate (I) compared to povidone-iodine (C) affect incidence of surgical site infections (O) within a 30-day post-operative period (T)?

Studies	Design	Sample	Intervention	Outcome
A	Systematic review and meta-analysis	N=13	-IA vs AA -PVP vs SA -PI vs PI (variety) -PI vs CH	-IA vs AA= no statistically significant difference in SSI reduction -PVP vs SA= no statistically significant difference in SSI reduction -PI vs PI (variety)= no statistically significant difference in SSI reduction -PI vs CH= no statistically significant difference in SSI reduction
B	Cohort study	N=2792	-CH vs PI	Inconclusive: the antiseptic used was not associated with increased risk for infection
C	Systematic review and meta-analysis	N=2484	-CH vs PI	-CH more effective than PI in preventing SSI in CL and CC surgery
D	Systematic review and meta-analysis	N=29,006	-CH vs PI	-CH superior to PI in preventing SSIs, but no significant difference in adverse skin effects
E	Randomized control trial	N=534	-CH vs PI	-CH vs PI= no statistically significant difference in SSI reduction
F	Randomized control trial	N=849	-CH vs PI	-CH superior to PI in preventing SSIs
G	Randomized control trial	N=279	-CH vs PI	-CH superior to PI in reducing complications of wound healing

H	Randomized control trial	N=796	-0.5% CH vs PI -1.0% CH vs PI	Both 0.5% and 1.0% CHG are superior to PI in preventing catheter colonization
I	Systematic review and meta-analysis	N=19 studies	-CH vs PI	CH is associated with fewer positive skin cultures versus PI
J	Systematic review and meta-analysis	N=5031	-CH vs PI	CH preferred over PI in reducing risk of SSI in CC surgery
K	Randomized control trial	N=311	-CH vs PI	CH lowered risk of infection vs PI, but no statistical significance reached
L	Randomized control trial	N=100	-CH vs PI	CH superior to PI in eradicating skin flora at surgical site

Legend: A = Dumville et al., B = Qintar et al., C = Ayoub et al., D = Chen et al., E = Park et al., F = Darouiche et al., G= Ritter et al., H= Yasuda et al., I= Privitera et al., J= Noorani et al., K= Luwang et al., L= Yeung et al., IA= Iodine with alcohol, AA=Alcohol alone, PVP=Povidone iodine paint, SA=Soap and alcohol, PI=Povidone iodine, CH=Chlorhexidine, SSI=Surgical site infection, CL=Clean, CC=Clean-contaminated

Outcomes Table: Effect of Reduced Risk for SSI

	A	B	C♦	D♦	E	F♦	G♦	H	I	J♦	K	L
SSI Risk	NSS	INC	↓ *	↓ *	NSS	↓ *	↓ *	NE	NE	↓ *	↓,NSS	
Microbes on skin	NSS	INC	NE	NSS	NE	NE	NE	↓ *	↓	NE	↓	↓

Legend: A = Dumville et al., B = Qintar et al., C = Ayoub et al., D = Chen et al., E = Park et al., F = Darouiche et al., G= Ritter et al., H= Yasuda et al., I= Privitera et al., J= Noorani et al., K= Luwang et al., L= Yeung et al., NSS=No statistical significance, NE=Not evaluated, INC=Inconclusive

* = statistically significant findings

♦ = higher level evidence

Recommendations:

Chlorhexidine has show in several studies to be superior in reducing the risk of surgical site infections over povidone iodine. In studies where surgery was not present, it showed decreased microbes on the skin evidence by skin cultures. Although some of the studies

showed no statistically significant difference between the two agents, it should be noted that none of the studies showed evidence that povidone iodine is superior to chlorhexidine. Aside from an allergy to this agent, chlorhexidine should be standardized as the superior agent used to help prevent surgical site infections.

Appendix B

Compliance Audit

Date: _____

1. **What procedure is being performed?**

2. **What surgeon is performing the procedure?**

3. **What is the surgeon's preference for skin anstisepsis?**

4. **What agent was actually used for this procedure?**
   If the agent differs from the surgeon's preference, explain why?

5. **Were there any factors that would contribute to an infection?**
   (Antibiotics not given within 30 mins of incision, any contamination of the sterile field, etc…)

Appendix C

Surgeon Satifaction Survey

Name: _____ Specialty:_____ Date: _____

1. **What is your primary preference for a surgical skin antiseptic agent?**

2. **How do you feel about using Chlorhexidine as the primary skin antiseptic for your surgical patients?**

Disagree **Unsure** **Agree**

Please explain further:

_____

_____

_____

_____

_____

_____