Effect of chlorhexidine bathing on ssis and hais

A Limited Integrated Literature Review

Abstract

Patient safety and infection control are two aspects in healthcare that are compromised when a surgical site infection or a hospital acquired infection occurs in healthcare. This literature review compares the impact of chlorhexidine gluconate bathing versus soap and water bathing on surgical site infections or hospital acquired infections in surgical patients. SSIs and HAIs are preventable occurrences. These adverse events are a prevalent problem in healthcare. The results from this review revealed that chlorhexidine offers a significant benefit in decreasing the occurrence of SSIs or HAIs in surgical patients. However, due to the limitations of the evidence more research is needed to make this a standard of care in healthcare.

Keywords: chlorhexidine gluconate, surgical site infections, healthcare associated infections, surgical patients,

Effect of Chlorhexidine Bathing on SSIs and HAIs

Surgical site infections (SSIs) and hospital acquired infections (HAIs) are a significant adverse event in healthcare. SSIs and HAIs are a patient safety concern for all healthcare professionals. Surgical site infections account for a third of all hospital acquired infections and can be very costly to healthcare organizations (Centers for Disease Control and Prevention, 2018). SSIs and HAIs are never events which can be prevented. In 2007 the Centers for Medicare and Medicaid Services put into place a policy that Medicare will no longer pay hospitals for costs of care associated with never events (Agency

for Healthcare Research and Quality, 2018). The cost of a surgical site infection or a hospital acquired infection can be from 28 to 45 billion to the hospital (Stone, 2009). Statistics have shown that surgical site infections occur in 2. 6% – 5% of surgeries that take place (Stokowski, 2011). In addition to SSIs and HAIs being costly to hospitals, these incidents are negative patient outcomes that may cause death, increased length of stay, increase risk of rehospitalization, and more (Whitehouse, Friedman, Kirkland, Richardson, & Sexton, 2002). It is estimated that four percent of hospitalized patients has a healthcare acquired infection (Magill, 2014). A Healthy People 2020 goal is aimed at preventing, decreasing, or eliminating these events from occurring (Office of Disease Prevention and Health Promotion, 2018).

A few current practices to prevent these events include having the patient take a chlorhexidine bath or soap and water bath prior to surgery. What is the benefit of using chlorhexidine bathing versus soap and water bathing in preventing a SSI or HAI? It is important to further explore these two interventions to promote patient safety as well as save the hospital money that may be reallocated into another project. SSIs and HAIs are a negative patient outcome; healthcare delivery is aimed at promoting positive patient outcomes. Infection control is also a priority when providing care to patients. The purpose of this review is to determine in surgical patients how a chlorhexidine bath, as compared to a soap and water bath, influences whether the patient acquires a surgical site infection or a hospital acquired infection?

Methods

A systematic literature review search was executed using highly developed search strategies to obtain pertinent results. Multiple electronic databases were cross-examined and specifically selected to provide comprehensive data related to the PICO question. The electronic databases that were searched included MEDLINE, CINAHL, and Cochrane. The following primary key search terms helped in identifying the impact of chlorhexidine bathing in decreasing SSIs or HAIs, which include *surgical patients, chlorhexidine bath, surgical site infections, and hospital acquired infections* . The primary key terms were searched independently and then searched again with the use of MeSH terms and synonyms. Expanding the literature search by means of Medical Subject Headings (MeSH terms), synonyms, and the Boolean operator " or" was intended to maximize the retrieval of applicable results (Melnyk & Fineout-Overholt, 2015). MeSH terms and synonyms that were examined included:

- surgical patients or operative patients
- chlorhexidine bath or chlorhexidine bathing or chlorhexidine gluconate or chlorhexidine gluconate bathing or chlorhexidine wipes or soap and water bath
- surgical site infection or surgical wound infection or SSI or hospital acquired infection or healthcare associated infections or nosocomial infections

To limit the search results to articles related to the PICO question the Boolean operator " and" was utilized to connect each of the subject headings. For each separate database search the same key words and Boolean operators were used. A search tactic was used to include articles

only if published between 2010 and 2018, limiting the results to the most recently published literature. Articles were included if the publication type was a clinical trial, comparative study, controlled clinical trial, evaluation study, meta-analysis, multicenter trial, randomized controlled trial, or a validation study. Only articles in the English language were included. Articles were excluded if they did not address the population, the intervention and at least one of the outcomes. Article quality and level of evidence was determined by utilizing criteria published in *Evidence-Based Practice in Nursing & Healthcare: A Guide to Best Practice* (Melnyk & Fineout-Overholt, 2015).

Results

Search Results

The initial search resulted in 22, 751 from the key search terms. Upon using Boolean operators, exclusion criteria and inclusion criteria the search results were decreased to 49. Articles were only used or reviewed if published between 2010 and 2018. The titles were then read to scan for the essential elements of the PICO question. A total of 43 articles were excluded. One reason articles were excluded is for the reason that the articles did not address the surgical patient population. Another reason articles were excluded is that they focused on interventions other than CHG bathing and soap/water bathing such as iodine. Articles that were excluded that included iodine in the title amounted to 10 articles. Finally, articles were excluded if the article did not address surgical infections or hospital acquired infections.

Five quantitative research articles were kept to evaluate this PICO question. The final five articles that were pertinent to the PICO question were reviewed for validity, reliability, and applicability. The articles were critically appraised for their level of evidence. Of the five articles that were retrieved three were randomized trials or studies. Randomized controlled trials are considered level 2 evidence in the hierarchy of evidence published in *Evidence-Based Practice in Nursing & Healthcare: A Guide to Best Practice* (Melnyk & Fineout-Overholt, 2015). The other two articles were cohort studies. Cohort studies are considered level 3 evidence (Melnyk & Fineout-Overholt, 2015).

The articles included sample sizes ranging from 100 participants to 1134 participants. Four of the articles reported surgical site infection or hospital acquired infection incidences when comparing presurgical bathing techniques such as chlorhexidine bathing vs standard bathing methods (Graling et al., 2013; Johnson et al., 2010; Kapadia et al., 2016; Swan et al., 2016). One of the articles although it did not report SSI or HAI incidences, it did report a decrease in bacterial flora when CHG bathing was implemented vs standard of care (Murray et al., 2011). Of the articles three out of five were focused on the outcome of some type of orthopedic surgical site infection (Johnson et al., 2010; Kapadia et al., 2016; Murray et al., 2011).

Chlorhexidine Bathing Products

Chlorhexidine is an antimicrobial agent that reduces bacterial flora on the patients’ skin when applied. Most CHG products have alcohol in them, which make them very effective in killing viruses and bacteria (Stokowski, 2011). Chlorhexidine comes in many different forms and is used for many different

antimicrobial purposes. Chlorhexidine comes as impregnated wipes, liquid CHG soap, oral solution, CHG impregnated dressings, CHG impregnated catheters, and more (Chlorhexidine, 2018). This literature review brings up the question, which is more effective in preventing SSIs and HAIs the impregnated CHG cloths or the CHG soap? Minor skin irritation or contact dermatitis is a risk in utilizing CHG topical wipes or soap (Cheng & Kroshinsky, 2011). However, this adverse event does not occur in all patients and the patient must consider the risk versus the benefit of preventing an infection.

Surgical Site Infections

Surgical site infections are events that can be prevented with best evidence-based practices. Every patient has their own skin flora and surgical site infections can occur because of this (Milstone, Passaretti, & Perl, 2008). Surgical site infections are a quality outcome measure for acute care hospitals (Biscione, 2009). Hospitals are not paid by Medicare for SSIs since the policy change made by the Centers for Medicare and Medicaid Services in 2007 (Agency for Healthcare Research and Quality, 2018). It is recommended and accepted into practice that patients wash with an antimicrobial agent 24 hours prior to surgery to prevent surgical site infections; this recommendation is a classified as a category IB recommendation which is supported by low-quality evidence suggesting net clinical benefits (Berrios et al., 2017).

Resistance Concerns

CHG is a commonly accepted antimicrobial used for surgical infection prophylaxis, but this raises the concern of bacteria developing resistance to this product. Already in healthcare there are three common antibiotic resistant bacteria which include MRSA, VRE, and C-Diff; each year 23, 00 patients die from some type of antibiotic resistant infection (CDC, 2018). What is the risk of CHG products in becoming resistant to different types of bacteria? There is evidence that CHG is resistant in the presence of gram-negative *Bacilli* and MRSA isolates with prolonged use of CHG products for regular bathing (Kassakian, Mermel, Jefferson, Parenteau, & Machan, 2011; Wang et al., 2008).

Limitations of Evidence

Some limitations of the evidence include small sample sizes, unevenly divided intervention groups, compliance issues and following up with patients. Different types of biases compromise the validity of a study (Melnyk & Fineout-Overholt, 2015). Multiple types of bias exist within this review, which comprise of a loss to follow up bias, information bias, an external bias and more (Graling & Vasaly, 2013; Johnson et al., 2010; Kapadia, Elmallah, & Mont, 2016; Murray et al., 2011; Swan et al., 2016). The results reported significant p values in the effect of CHG preoperative bathing in reducing SSIs or HAIs. This review will help me when caring for my patients in preventing SSIs and HAIs. More evidence is needed to provide a stronger evidence base recommendation in preventing SSIs and HAIs.

Discussion

To answer the question “ In surgical patients how a chlorhexidine bath, as compared to a soap and water bath, influences whether the patient acquires a surgical site infection, or a hospital acquired infection?”, significant evidence has been provided in literature as to how well CHG bathing is at preventing SSIs or HAIs versus a standard bath. This review comprises of multiple cohort studies and a few randomized trials; however, the evidence base is limited due to multiple biases in all the studies. Stronger evidence types are needed to provide a higher certainty of benefit. CHG bathing is an accepted standard of practice to prevent SSIs and HAIs (CDC, 2018). To fully interpret the significance of CHG bathing on SSIs and HAIs more RCTs are needed. Randomized controlled trials (RCTs) are a high level of evidence if planned correctly with specific guidelines for interventions, correct implementation, good measurement techniques, and more (Melnyk & Fineout-Overholt, 2015).

Recommendations

Based on the evidence in this review I would recommend the use of CHG bathing prior to surgery to prevent surgical site infections and hospital acquired infections. The evidence although limited does present significant p values in most of the studies (Graling & Vasaly, 2013; Kapadia, Elmallah, & Mont, 2016; Murray et al., 2011; Swan et al., 2016). Disseminating this information or research is crucial for more healthcare organizations in adopting this standard of infection control and patient safety. Nurse leaders can have a strong influence on healthcare policies. Nurses are important stakeholders in healthcare because we have a vested interest to promote

positive patient outcomes as well as being at the bedside implementing these policies.

Another recommendation is that research studies need to evaluate the impact of CHG routine bathing on developing resistances to multidrug-resistant organisms. The limitations in the research evidence base solidifies the need for further research studies in this area to present stronger evidence in making CHG bathing a standard of care.

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Appendix

Table 1

Citation	Evidence Level	Sample	Variables	Interventions	Measurement	Results	Ap
Graling, et al., (2013)	Cohort Level 4	619 adult surgical patients CHG (n= 335) No CHG (n= 284)	Independent Variables: • 2% CHG pre-operative cloth bath. • No bath Dependent Variables: • Incidences of overall surgical site infections within 30 days after surgery • Incidences of postoperative organ	Historical controls were utilized for the no bath cohort. Patients in the CHG cohort received a 2% CHG preoperative cloth bath prior to surgery when admitted for a four-month period.	t-tests or Wilcoxon signed rank tests to analyze continuous data and chi-square or Fisher exact tests for categorical data.	SSI CHG = 2. 1% No CHG = 6. 3% p= 0. 01	In Pr Su in pr H pr sh ev pr pr ev oc Ke

			space infections				
Johnson, et al., (2010)	Prospective Cohort Level 4	1134 hip replacement patients Home CHG (n= 157) Usual Care (n= 897)	Independent Variables: • At home CHG cloth skin preparation • No at home presurgical skin preparation Dependent Variables: • Surgical site infection rates • Incidences of periprosth	Patients were randomized to either home CHG group or a usual care group.	A statistical analysis was conducted using a χ^2 test to provide P values and to evaluate differences between the study groups.	SSI Home CHG = 0% Usual Care = 1. 6% p= 0. 231	In Pr Su in pr in pr H pr sh ev pr pr ev oc Ke

			etic infections				
Kapadia, et al., (2016)	Randomized controlled trial; Level 2	554 lower extremity total joint arthroplasty patients CHG (n= 275) Soap & Water (n= 279)	Independent Variables: • 2% CHG preoperative cloth bath • standard soap & water bath Dependent Variables: • Incidences of periprosthetic infection/SSI post-surgery	Patients were enrolled between March 1, 2012 and November 30, 2012 who were preparing to undergo a joint arthroplasty. Patients were randomly put into two cohorts; the patients received an	Fisher's exact tests and independent samples' t-tests were used to compare baseline and outcome variables between patients in the cohorts.	SSI CHG = 0. 4% Soap & Water= 2. 9% p= 0. 049	In Pr Su in pr in pr H pr sh ev pr pr ev oc Ke

			advance preadmissio n CHG bath or standard-of-care bath (soap bathing). Specific instructions were given to each cohort. The aim of this study was to evaluate periprostheti c infection risk at 1-year follow-up between the 2 cohorts.				
Murray , et al., (2011)	Randomiz ed controlled trial;	100 shoulder surgical	Independent variables: • 2% chlorhexidi	Patients divided into 2 cohorts. The study	Quantitative bacterial cultures	Positive Cultures CHG =	In Pr Su in

Level 2	patients CHG (n= 50) Soap & Water (n= 50).	ne gluconate impregnated cloth bath. • Soap/ water shower Dependent Variables: • Incidence of SSIs • Bacterial load	compared the incidences of SSIs and bacterial load at the surgical site after standard soap and water bath vs CHG bath preoperatively Participants were monitored for possible development of infection for a 2-month period after their operation.	bacterial growth were analyzed for the bacterial load. Clinical characteristics were compared between groups using the Wilcoxon rank sum test for age; the Fisher exact test for other dichotomous variables. Posterior and axilla qualitative measures	66% Soap/ Water= 94% p = 0.0008	pr H pr sh ev pr pr ev oc Ke

					were each compared between the CHG cohort and the standard soap-and-water cohort using the Fisher exact test.		
Swan, et al., (2016)	Randomized controlled trial; Level 2	325 surgical ICU patients CHG (n= 161) Soap & water (n= 164)	Independent Variables: • 2% CHG bath • standard soap & water bath Dependent Variables: • Incidences of hospital acquired	• 2% CHG bath • Standard soap & water bath	Cox regression analysis, chi-square tests, t-tests, Poisson regression	The results indicated a statistically significant overall reduction of risk for a	In Pr H ac (H pr H pr sh ev pr pr ev

oc

Ke

HAI.

infections CI 0.

(HAI) post- 309-0.

surgery. 997

P=. 049

CHG; chlorhexidine

NSQIP; National Surgical Quality Improvement Program