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Assessing the Impact of Daily Chlorhexidine Baths in Prevention of Central Line Associated Bloodstream Infections: An Evidence Based Project

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An Evidence Based Project

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Contents

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Executive Summary

Central venous catheters are frequently used in critical care and are often necessary to provide life-saving interventions and monitoring of patients. Although necessary, central venous catheters leave patients extremely vulnerable to a wide spread of viruses, fungus, and bacteria. Patients are at risk from the moment of insertion and throughout the length of time catheters are left in place. Patients requiring central lines are often already immunocompromised due to being in a critical state of health which puts them at an even higher risk of developing complications from infection.

Once an infection takes place, the patient is susceptible to many complications including sepsis, organ failure, and even death. Mortality becomes significantly more likely in the critically ill patient if a central line associated bloodstream infection (CLABSI) takes place. Not only is this detrimental to patients and their loved ones, but also leads to significantly increased cost for healthcare due to longer hospital stay and additional treatment required to treat infection.

There are many protocols in place for the maintenance of central lines in intensive care units to aide in the prevention of infection. Although these protocols are in place, we continue to see a high infection rate nation-wide. After a systematic search of evidence, I propose that nurses implement the use of daily chlorhexidine baths into their mandatory care for patients. The data supports that this small intervention can decrease the rate of CLABSIs tremendously. This is a cost-effective intervention being that chlorhexidine is kept in stock in the hospital setting and will in turn decrease the length of stay and costs of additional treatment due to CLABSIs.

Assessing the Impact of Daily Chlorhexidine Baths in Prevention of Central Line Associated Bloodstream Infections: An Evidence Based Project

Central lines are often necessary to provide lifesaving medications and offer a way to hemodynamically monitor intensive care unit patients (Shah, et al., 2016). However, with prolonged use, the likelihood of exposure to central line associated bloodstream infections and therefore sepsis increases substantially (Shah, et al., 2016). Across all 12 studies included in this evidence-based project, each supported that the implementation of daily chlorhexidine bathing on all patients with central venous access decreases the rates of central line associated bloodstream infections.

Rationale for the Project

Central lines are a crucial part of intensive care, which makes it necessary to make an evidence-based change to reduce complications including central line associated bloodstream infections (CLABSI). A CLABSI is defined as a bloodstream infection confirmed by a laboratory that develops within 48 hours following central line placement (Haddadin et al., 2022). Approximately 250,000 bloodstream infections are documented yearly with majority of them being related to intravascular accesses (Haddadin et al., 2022). Once an infection is present, many devastating complications follow. CLABSIs often deteriorate patients' outcomes and overall mortality (Baier et al., 2020). They also lead to longer hospital stays and increased healthcare costs (Haddadin et al., 2022). It is estimated that the cost associated with treatment of CLABSIs is approximately $46,000 per case (Haddadin et al., 2022). Severe infections can lead to sepsis, organ failure, blood clotting, and eventually death (Pennsylvania Department of Health, 2016).

Although there are many protocols in place for the management of central lines, daily chlorhexidine baths are not always considered a standard or mandatory practice in the maintenance of them. Chlorhexidine gluconate has a broad-spectrum antimicrobial property, and its use has proven to be effective in decreasing and even eradicating several pathogens found in hospital settings (Jusino-Leon et al., 2019). If this change is not implemented, we will likely continue to see increasing rates of CLABSIs and therefore, continue to see the negative outcomes that follow.

Literature Synthesis.

A significant number of studies support that performing daily Chlorhexidine baths on patients with central access significantly reduces rates of CLABSIs. Although majority of facilities have several protocols in place regarding maintenance of central lines with the purpose being to prevent infection, we continue to see high CLABSI rates. The 12 studies referenced in this section show undeniable evidence supporting that implementing daily chlorhexidine baths on patients with central venous access significantly decreases rates of CLABSIs.

Incorporating chlorhexidine bathing into our daily mandatory interventions can play a significant role in reducing not only central line associated bloodstream infections, but all hospital-acquired infections. In the randomized control trail, Daily bathing with 4% chlorhexidine gluconate in intensive care settings, 449 individuals participated in the study (Pallotto et al., 2019). Of the 449 individuals that participated, 226 were in the treatment arm and 223 in the control arm (Pallotto et al., 2019). A total of 34 individuals from the treatment arm were diagnosed with a hospital acquired infection, while 57 were diagnosed from the control arm (Pallotto et al., 2019). This supports a significant decrease in the treatment arm. In the systematic review and meta-analysis Chlorhexidine Bathing and health care-associated infections among

adult intensive care patients, 17 trials were included in the study aim (Frost et al, 2016). Summary estimates were calculated as incidence rate ratios and 95% confidence intervals (Frost et al, 2016). Of the 17 trials included, chlorhexidine bathing was estimated to reduce the rates of CLABSI by 56% (Frost, et al., 2016). In meta-analysis, The effects of chlorhexidine gluconate bathing on health care–associated infection in intensive care units, 18 studies were reviewed for analysis (Kim, et al., 2015). Conclusion of results calculated using risk ratios and the ratio of the log risk ratios were estimated with 95% confidence intervals, supported significant reduction of acquiring CLABSI, MRSA, and VRE (Kim et al, 2015). In the systematic review and meta-analysis, Bathing With 2% Chlorhexidine Gluconate Evidence and Costs Associated with Central Line–Associated Bloodstream Infections 6 studies were included in review (Shah et al, 2016). Of the 6 studies reviewed, at total of 33,794 central catheter-days were pooled (Shah et al, 2016). Using the chlorhexidine bath intervention, 124 CLABSIs developed over 17,229 days compared with 223 developed CLABSIs over 16,565 central venous catheter days in the control group (Shah et al, 2016). In the article, Implementation of daily chlorhexidine bathing in intensive care units for reduction of central line- associated bloodstream infections, a before-and-after study was conducted implementing daily chlorhexidine baths on patients in the Intensive Care Unit who had central venous catheters (Scheier, 2021). The study included a 19-month baseline period and a 9-month intervention period (Scheier, 2021). Of the 5,008 patients included in the study, 94 CLABSIs were found during the baseline period and 14 CLABSIs were found during the implementation period (Scheier, 2021). In the article, Results of the Chlorhexidine Gluconate Bathing implementation intervention to improve evidence-based nursing practices for prevention of central line associated bloodstream infections study, a randomized control trial was completed to evaluate the effect of using a implementation strategy program on nursing staff

compliance with daily chlorhexidine bathing and proper documentation of the task on critically ill patients with central venous access on 14 different units (Reynolds, et al., 2021). Results concluded that compliance of daily chlorhexidine bathing process and nurses' knowledge of chlorhexidine bathing significantly improved after the implementation period (Reynolds, et al., 2021). Which also resulted in a significant reduction of CLABI rates during the trial (Reynolds, et al., 2021). In the article, Chlorhexidine Gluconate Baths Supporting daily use to reduce central line–associated bloodstream infections affecting immunocompromised patients, a study was conducted over 2 months on a 24-bed unit (Jusino-Leon, et al., 2019). Nurses and patient care technicians used chlorhexidine gluconate impregnated wipes to bathe patients with central venous access daily (Jusino-Leon, et al., 2019). Results for the project study period were three nonpreventable bloodstream infections and zero preventable bloodstream infections (Jusino, et al., 2019). In the article, Efficacy of chlorhexidine bathing for reducing healthcare associated bloodstream infections, the authors performed a meta-analysis of randomized control trials to determine if daily bathing with chlorhexidine decreased hospital-acquired bloodstream infections in critical patients (Choi, et al., 2015). The overall rates of bloodstream infections reduced significantly calculated using risk ratio and confidence intervals (Choi, et al., 2015). In the article, Central Line Associated Blood Stream Infection Reduction at an Academic Community Hospital During the COVID-19 Pandemic to Achieve Patient Safety, a study was conducted by the hospital's infection prevention team and administration to reduce CLABSIs (Hill, et al., 2023). Multiple interventions were being implemented including the removal of unneeded central lines, using best insertion practices, and providing daily chlorhexidine baths resulting in a significant decrease in CLABSI rates (Hill, et al., 2023). In the systematic review with meta-analysis, Chlorhexidine Bathing Effects on Health-Care-Associated-Infections, 23 articles were

included in review with significant evidence to support incorporating daily chlorhexidine baths on all patients with central venous access (Denny & Munro, 2017). In the study, Chlorhexidine Bathing to Reduce Central Venous Catheter associated Bloodstream Infection: Impact and Sustainability, the authors conducted a trial in 12 different hospital units comparing bathing patients with regular soap and water versus bathing patients with chlorhexidine (Montecalvo, et al., 2012). Results calculated using risk ratio and confidence interval supports decrease in CLABSI rates with the implementation of daily chlorhexidine baths (Montecalvo, et al., 2012).

Bathing our intensive care patients is something that we are required to do daily. Changing from regular soap and water to chlorhexidine gluconate is a simple change that does not require and extra steps. Implementing this into our required daily tasks and sustaining change will help to ensure our patient's best outcome.

Project Stakeholders

Stakeholders in the proposed project would include hospital administrative staff including Chief Nursing Officer and Department Director to provide awareness, necessity of the change, and answer any questions or concerns of staff members. Nursing manager to oversee implementation process and add additional support to staff as needed. Unit nursing staff and patient care technicians as they will be directly carrying out the implementation process. Finally, and most importantly the patients and their family members as they are the most affected individuals. The main objective of this project for our patients, and their family members is recovery, prevention of further illness, and complications.

Implementation Plan

This change would begin at Paris Regional Medical Center in the Intensive Care Unit. Data needed to justify that the change is warranted would include the hospital's current CLABSI

rates and associated costs resulting from CLABSI treatment and extended hospital stays. The gatekeepers would be the project leader and unit director. Nurse managers could be involved in the process by giving support such as friendly reminders to conduct baths during the shift and follow up with nurses on their thoughts or issues with the new intervention. Permission would need to be granted by the Intensive Care Unit Department Director for the project to be begin. The Chief Nursing Officer, House Supervisor, and other administrative staff could help oversee the project and offer support as well.

Barriers to this project would mainly be related to time and scheduling of baths for the nursing staff. It often takes more than one nurse to bathe a patient especially if they are sedated and therefore immobile. Nurses would have to have careful time management to allow for daily bathing of all patients with central lines. Things such as helpful reminders by administrative staff, added charting in the electronic medical record to state that the intervention had been completed, and positive teamwork among nurses will help to eliminate these barriers.

Resources needed would include a consistent supply of chlorhexidine soap and adequate staffing to implement daily baths. Considering that Paris Regional Medical Center keeps chlorhexidine soap in an adequate supply, there should not be a significant increase of cost. The only major cost increase would be the cost of having adequate amount of staff members to ensure that the baths could be implemented each shift. Over the course of a year, cost should decrease dramatically due to less incidences of CLABSIs, associated treatment, and extended stays. The Intensive Care Unit Department Director would assist in carrying out the change.

The first step of the project implementation would be to gather necessary documents of CLABSI rates over the past year and costs associated. Conduct a detailed review analysis of the data. Plan to have a meeting with administrative staff during the first week to provide the

evidence and make the case for why a change needs to take place. Once approved, a department meeting would need to take place to educate all staff on the significance for change and answer any questions or concerns regarding newly implemented protocol. This should be completed during the second week. During the third week, a meeting would take place with hospital Information Technology (IT) team to get the new intervention added to the electronic medical record (EMR) to record data and compliance. After all staff has been educated on the plan, the implementation process can begin. Nurses and patient care technicians will continue to provide daily baths to patients but use chlorhexidine solution in place of soap and water. Once bath is completed, nurses will document that the task has been completed in the EMR. Documents will be collected of all patients with central lines receiving daily chlorhexidine baths and corresponding infection rates. Data will be recorded for the next eight weeks. After eight weeks of implementation, charts can then be evaluated over the next two weeks to adequately analyze the results. This entire process should take twelve weeks to complete.

An additional department meeting would need to be held with nursing staff to evaluate the process of change. The staff would have the opportunity to express their opinions and thoughts of the new change, what barriers they came across, and what facilitators were identified in the process. If problems occurred that kept the project from occurring or being successful, a discussion would need to take place to identify ways to eliminate these issues.

Timetable/Flowchart

This project began in previous semesters and has expended over the course of the program. Although it was originally intended to be implemented into practice, this project has been completed as a benchmark study due to circumstance changes at current facility. It is hoped to continue to be implemented at Paris Regional Health Intensive Care Unit at a later time.

The goal is for this project to be completed over the course of eight weeks. With the first week spent gathering necessary documents of CLABSI rates, costs associated, and have a meeting with administrative staff. Once this is completed, the second week a department meeting would need to take place to educate all staff on the significance for change and answer any questions or concerns regarding newly implemented protocol. The third week will be to update the EMR to provide proper documentation of completed task. The implementation process will begin at this time over the next 8 weeks. Finally, week 12 will be to collect and analyze data to determine success of change.

Data Collection Methods

Electronic charts will need to be reviewed and audited of all patients with central line access who received daily chlorhexidine baths over the past eight weeks with infection rates documented. An additional department meeting would need to be held with nursing staff to evaluate the process of change. The staff would have the opportunity to express their opinions and thoughts of the new change, what barriers they came across, and what facilitators were identified in the process. If problems occurred that kept the project from occurring or being successful, a discussion would need to take place to identify ways to eliminate these issues.

Cost/Benefit Discussion

The result of CLABSIs causes many detrimental concerns for the patient and the healthcare facility including life-threatening complications, increased length of hospital stays, and additional costs required to treat infection. It is estimated that the cost associated with treatment of CLABSIs is approximately $46,000 per case (Haddadin et al., 2022). Two of the more commonly used brands of chlorhexidine gluconate include the 4% chlorhexidine foam soap (Hibiclens) and the 2% chlorhexidine-impregnated wash cloths (Musuuza & Safdar, 2016). The

impregnated wipes cost approximately $5.52 per patient bath and are 74% more expensive than using the chlorhexidine soap which is around $3.18 per patient bath (Musuuza & Safdar, 2016). The cost associated with one CLABSI is 10 times more expensive than the cost of using 2% CHG-impregnated cloths (Shah, et al., 2016). Therefore, the facility will benefit significantly due to tremendous reduction of cost associated with CLABSIs.

Discussion of Results

This study is a bench-mark study that is hoped to be carried out through Paris Regional Health Intensive Care Unit soon. At the time the evidence-based project began, the pandemic had taken over the healthcare system. Although work has remained in the emergency department throughout this entire process, many intensive-care unit patients were being held and treated in the emergency department due to full intensive-care unit bed capacity and extreme difficulty transferring patients during this time. Since this is no longer the case and intensive-care unit patients are not continued to be treated long term in the emergency department, a bench-mark study was performed.

Conclusions/Recommendations

Based on research evidence, it is best practice to incorporate chlorhexidine gluconate baths into daily interventions for patients with central venous lines. It is already put into practice that intensive care patients be bathed daily, this would only change the process by using chlorhexidine solution in place of soap and water for nurses. This is a small intervention to incorporate that would make a significant difference in patient outcomes regarding secondary infection prevention. Patient outcomes remain top priority in practice, which means they deserve to have every preventive measure possible to avoid life-threatening complications from a

secondary infection. Therefore, it is recommended that all patients with central venous access be bathed with chlorhexidine solution daily.

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Appendix A

Synthesis Table

	1	2	3	4	5	6
Level I: Systematic review or meta-analysis	X				X	X
Level II: Randomized controlled trial		X				
Level III: Controlled trial without randomization				X		
Level IV: Case-control or cohort study						
Level V: Systematic review of qualitative or descriptive studies						
Level VI: Qualitative or descriptive study (includes evidence implementation projects)			X			
Level VII: Expert opinion or consensus						

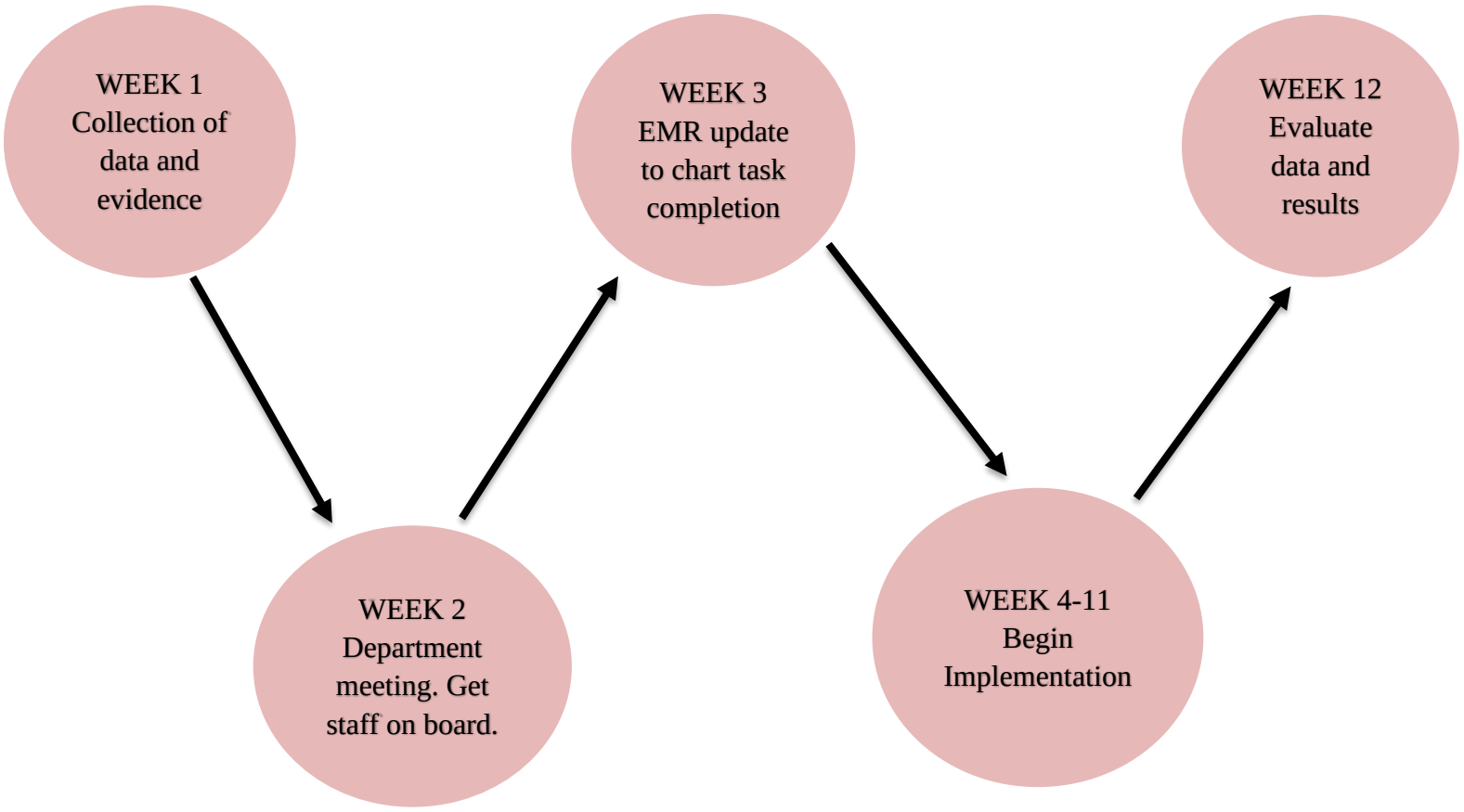
1= Shah, H., et al. 2= Pallotto C, et al. 3= Musuuza, J., et al. 4= Scheier T., et al. 5= Frost SA., et al. 6= Kim HY., et al.

	7	8	9	10	11	12
Level I: Systematic review or meta-analysis	X		X		X	
Level II: Randomized controlled trial						
Level III: Controlled trial without randomization						
Level IV: Case-control or cohort study				X		X
Level V: Systematic review of qualitative or descriptive studies						
Level VI: Qualitative or descriptive study (includes evidence implementation projects)		X				
Level VII: Expert opinion or consensus						

7= Reynolds S., et al. 8= Jusino L., et al. 9= Choi E., et al. 10= Hill J., et al. 11= Denny J., et al. 12= Montecalvo M., et al.

Appendix B

Flowchart



Appendix C

Instrument

The Effect of Daily CHG Bathing in ICU Patients with Central Lines

	1	2	3	4	5	6
CLABSI Rates Increase						
CLABSI Rates Decrease	X	X	X	X	X	X
No Effect on CLABSI Rates						

1= Shah, H., et al. 2= Pallotto C, et al. 3= Musuuza, J., et al. 4= Scheier T., et al. 5= Frost SA., et al. 6= Kim HY., et al.
CHG= Chlorhexidine Gluconate CLABSI= Central Line Associated Bloodstream Infection ICU= Intensive Care Unit

	7	8	9	10	11	12
CLABSI Rates Increase						
CLABSI Rates Decrease	X	X	X	X	X	X
No Effect on CLABSI Rates						

7= Reynolds S., et al. 8= Jusino L., et al. 9= Choi E., et al. 10= Hill J., et al. 11= Denny J., et al. 12= Montecalvo M., et al.
CHG= Chlorhexidine Gluconate CLABSI= Central Line Associated Bloodstream Infection ICU= Intensive Care Unit