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**Role of Hand Hygiene in the Prevention of Central Line-Associated Bloodstream
Infection in Intensive Care Unit Patients: A Benchmark Project**

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A Paper Submitted in Partial Fulfillment of the Requirements for

NURS 5382: Capstone

In The University of Texas at Tyler, School of Nursing

To

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Role of Hand Hygiene in the Prevention of Central Line-Associated Bloodstream Infection in Intensive Care Unit Patients: A Benchmark Project

Executive Summary

Central lines are widely used in intensive care units. Critically ill patients need a central line to monitor their health, receive multiple medications at the same time, and obtain blood samples for stat laboratory studies, among other indications. However, a central line increases the risk of patients catching central line-associated bloodstream infection (CLABSI) by many folds. CLABSI is one of the most common hospital-acquired infections (HAI) in intensive care units (ICU) and constitutes a burden for both the hospital and the patient. CLABSIs lead to prolong hospital stays and increase healthcare costs and mortality. According to the Centers for Disease Control and Prevention (2021), CLABSIs result in thousands of deaths every year and billions of dollars are added to the costs of the United States healthcare system. CLABSI decreases patient outcomes considerably; it questions healthcare providers' skills and performance.

Evidence-based practice has demonstrated that zero CLABSI is achievable. This is feasible through continuous education and compliance with care bundles and guidelines. Healthcare providers need to remain consistent with the interventions that decrease CLABSI in ICUs because it is not one person's responsibility. Although a bundle of care is often used to reduce infection due to central lines in hospitals, proper hand hygiene is the most vital component. The importance of hand hygiene in fighting CLABSI is undebatable. Hand hygiene is a simple yet effective way to stop CLABSI. However, Lambe et al. (2019) noted that hand hygiene compliance is considerably lower than desirable targets in healthcare. Hendler (2022)

suggested that CLABSI has been on the rise with the Coronavirus pandemic. Therefore, healthcare providers, now more than ever, need to step up and fight the good fight.

Rationale and Purposes

The ultimate goal of healthcare is to deliver excellent quality care and to obtain continuous satisfactory patient outcomes. Every patient deserves the right to be free of HAIs such as CLABSI, regardless of their level of care. The amount of money spent yearly to treat CLABSI could be used to eliminate it instead and serve other purposes that are beneficial to both the patient and the healthcare organization. In the Christus Health ICUs, more than 75% of the patients have at least an invasive central line, whether it is a peripherally inserted central catheter (PICC) line, a dialysis catheter, or an arterial line. Despite the protocol in place, consisting of removing those invasive lines as soon as they are no longer needed and changing line-dressing every week and as needed, CLABSI incidence has been fluctuating. Collections of data showed the incidence of CLABSI, from January 2022 to June 2022, being respectively: 30%, 38%, 20%, 25%, 12%, and 20%. This period marks the time when the need for changes was made visible, therefore the debut of this project.

Driven by an interest to review the literature and seek methods to alleviate this problem, this benchmark project starts with the following PICOT question: In ICU patients with peripherally inserted central catheter (PICC) lines (P), how does including proper hand hygiene as part of the line assessment and dressing change protocol (I) compared to not including handwashing (C) affect CLABSI rates (O) between dressing changes over three months (T)? This benchmark project aims to evaluate and reinforce the importance of mindful handwashing in decreasing CLABSI incidence in ICU patients, therefore decreasing the related expenses and increasing overall patient outcomes and satisfaction.

Literature Synthesis

Hand hygiene reduces cross-contamination and, thus, the incidence of HAIs. For this project, a total of twelve articles were reviewed and they all concur that the role of hand hygiene in the fight against CLABSI is indisputable. Myatra (2019) stated that hand hygiene is a universal strategy to prevent all nosocomial infections, it prevents the transmission of pathogens. Perin et al. (2016) suggested that hand hygiene is the primary element in all the CLABSI care bundles. Other studies concluded that failure to comply with even one of the care bundle variables: hand hygiene, skin asepsis, proper and timely dressing change, or daily evaluation of the central line, is regarded as incompliance” (Atilla et al., 2016). A couple of years later, Alazani et al. (2021) agreed with both Perin et al. (2016) and Atilla et al. (2016), by supporting that effective compliance with the central line care bundle which includes proper hand hygiene decreases CLABSI in the intensive care units.

Another group of authors, Mitchell et al. (2020), explained that hand hygiene remains the first and most important step during the insertion and maintenance of the central line, should CLABSI need to be prevented. There is no disagreement among Perin et al. (2016), Ista et al. (2016), and Mitchell et al. (2020) that proper handwashing prevails over all other strategies or interventions in the prevention of CLABSI. To paraphrase Ista et al. (2016): “The effect of hand hygiene practices on the results can only be speculated, but good hand hygiene has been noted to contribute to CLABSI reduction in the ICU population”. Currie et al. (2018) stated that even patients and their families understand that hand hygiene is the best way to stop the transmission of HAIs. Lee et al. (2018) provided direct evidence that compliance with hand hygiene is essential to prevent CLABSI. The authors suggested that not only nurses, but all healthcare providers including nurse assistants and physicians, must abide by proper hand hygiene.

Customized education is needed. Each facility should evaluate its practice and find its weakness in providing education for its staff according to their needs. Aloosh (2018) showed that hospitals with higher compliance with hand hygiene and other CLABSI care bundles have a lower rate of CLABSI and CLABSI-related mortality. The international study conducted by Valencia et al. (2016) showed that there is a tangible interest and awareness in the ICU community for CLABSI prevention, but implementation and adherence to existing guidelines including proper hand-washing need to be reinforced. The quantitative study led by Mahieu et al., 2022, showed how a lack of adherence to guidelines and a lack of compliance with individual items of the CLABSI care bundles promote the rise of CLABSI in the ICU.

Stakeholders of the Project

The stakeholders of this project are those with a vested interest in this clinical decision and those who can influence and promote the advancement of the project. The main stakeholders include the patients, the nurses, the physicians, the clinical director, the chief nursing officer, and even the policymakers of the institution. Being the main caregivers and the users of practices that have been done routinely for decades, nurses are the target population for evidence-based practice implementation. The clinical director plays an important role in allowing the project to be conducted on their unit as they oversee clinical operations and regulatory compliance. The clinical director reports to the chief nursing officer who will confirm approval of the project. Policymakers can review and rewrite guidelines regarding proper hand hygiene.

Clinical nurse educators are role models of effective patient-centered care, they share their expertise and offer support, and enable new nurses to become competent practitioners. The most experienced nurses can have their voices heard more efficiently, therefore influencing the staff, because it is very likely that everyone will turn to them for advice. The newest graduate is

open to changes and teaching; wanting to be a better nurse day after day, they are willing to try new ideas. The patients play their part by challenging providers and by actively participating in decision-making to ensure they receive the treatment they feel meets their needs best.

Plan for Implementation

While change is a good thing, many people are uncomfortable with and even fear it. Because change can be very challenging, it is paramount to pick the right strategies when implementing change within a clinical setting. After reviewing the literature, the first step for implementation would be to share the research findings on this evidence-based project with the Unit-Based Council (UBC) on the floor. During their meeting with the staff, the UBC would discuss the research findings and the need to implement mindful hand hygiene when caring for patients with PICC lines. The next step would be to expose the project and its goals to the clinical director and to obtain approval before implementation can start within the clinical setting. After obtaining approval, discussions would be made with the nurses to elaborate on the project's how, why, and when. The nurses would be surveyed and their strengths and weaknesses in mindful hand hygiene would be assessed, before sharing handouts and flyers containing pertinent information such as the key moments and the steps of hand hygiene. Regular meetings with staff are important and should not exceed twenty (20) minutes.

Maintaining effective and trustworthy communication keeps participants engaged therefore increases sustainability, and so does maintaining transparency. It is important to show support and encouragement to the team and to keep them involved. Bringing food, candies, and beverages to the meeting shows the staff that their time is appreciated. The availability of quality hand hygiene products can increase compliance with hand hygiene. Some nurses may skip hand

hygiene due to products being harsh on their hands and causing contact dermatitis. Mindful hand hygiene before accessing the central line should be consistent for at least four weeks within the duration of the project. Education would be reinforced on proper hand hygiene highlighting each step and each key moment of hand hygiene. Weekly evaluation would help determine what needs to be kept, eliminated, or reinforced. Certificates and pins would be given to the three most compliant nurses at the end of the project

Timetable/Flowchart

Once all the research findings are reviewed and appraised, the leader will launch the project for a duration of twelve weeks. Below is the weekly plan for the change project. The flowchart will be found in Appendix A.

- Week 1: Meet with UBC and share the research findings. The UBC would arrange a meeting with staff by the end of this week to discuss the research findings and the need for the project on this unit. The UBC would report feedback to the project leader.
- Week 2: Meet with UBC and the clinical educator to align the findings with the need of the unit. The nurse educator would assess the steps, the key moments, and the barriers to proper hand hygiene on the unit.
- Week 3: Work with the UBC and the clinical educator to establish a plan that fits the unit's needs regarding CLABSI and hand hygiene and schedule a time to meet with the clinical director and the staff within the next week.
- Week 4: Meet with the clinical director to elaborate on the needs of the project for this unit and the goal of the project. The clinical director would follow up with the

chief nursing officer to obtain approval. The clinical educator would arrange a hand hygiene session to determine the weakness of the staff in proper hand hygiene. Pre-implementation survey is to be completed.

- Week 5: Prepare and print handouts/ flyers with pertinent information about hand hygiene and CLABSI. The handouts would be distributed to the staff and the flyers would be posted in the staff lounge room, the nursing stations, and the staff bathrooms.
- Week 6: Meet with the staff including the clinical director, nurse educator, and staff nurses to gather more input about the change project. Equipment such as soaps, hand sanitizers, and tissue would be made available in each patient room. Highlight any potential obstacles that the project might face and discuss strategies to overcome them. The launch of the project will be officially set for next week.
- Week 7: Initiation of practicing mindful hand hygiene every time central lines are being accessed. A checklist to mark hand hygiene before accessing the central line would be set at the bedside of each patient with a PICC line. (See Appendix C). This checklist would be collected at the end of each shift and replaced at the beginning of each shift.
- Week 8: Staff continues to practice mindful hand hygiene when accessing central lines. Meet with staff to evaluate the previous week. What was done well or not would be discussed and considered for change. The need for equipment renewal or change would be checked. Collect checklist for weekly review.
- Week 9: Staff continues to practice mindful hand hygiene. Meet with the staff to review the previous week. Challenges met by the nurses while implementing the

project would be noted. The need for equipment renewal or changes would be considered. Collect checklist for weekly review.

- Week 10: Another meeting with staff to evaluate the new implementation while they continue practicing mindful handwashing before accessing central lines. Suggestions, comments, and criticism are all welcomed. Collect checklist for weekly review.
- Week 11: Meet with UBC and the clinical director to review the weekly data and results while staff continues to practice mindful hand hygiene. Collect checklist for weekly review.
- Week 12: Overall review of data with the staff and finalize the change project. Acknowledgments to all the participants and certificates to the three most compliant nurses based on the checklists.

Data Collection Methods and Planned Evaluation

Data such as how many patients on the unit have an existing PICC line; how many newly inserted PICC lines would be collected weekly. Other information such as vital signs, lab results (infection indicators), PICC line site assessment, dressing changes, line access frequency, and any symptoms or risk factors of CLABSI would be recorded and reviewed every week for every patient with a central line. Two anonymous surveys would be done with the nurses: A pre-and post-evaluation assessment to help determine the changes throughout the project. (See appendix B). A checklist (See appendix C) to mark compliance with handwashing would be set at the bedside of each patient with a PICC line. This checklist would be collected at the end of each shift and replaced at the beginning of each shift. Every week, those checklists would be reviewed for mindful hand hygiene compliance.

The number of new cases of CLABSI in the ICU is the most plausible data to evaluate whether this project is a success or a failure. Every week, proper hand hygiene compliance is expected to increase by at least 50%. Weekly expectations are more nurses practicing mindful hand hygiene, more nurses remembering and respecting the key moments of hand hygiene, and fewer to no patients presenting signs of CLABSI.

By the end of the project, an increase in compliance with hand hygiene by 50 to 60 % each week regardless of the shift, therefore a monthly decrease of CLABSI incidence by 50% is expected. At the end of the project, nurses will continue to practice mindful hand hygiene prior to accessing a central line. Continuing education is necessary as the ultimate goal is to achieve zero CLABSI. Weekly data could be recorded and reviewed thirty days post-implementation to measure the outcomes of the project.

Cost/ Benefits Discussion

The costs of the project would cover human resources, supplies, and food. A nurse educator would be needed to reinforce education on hand hygiene. Since the floor already has a hired nurse educator, an incentive of \$250 would be given weekly ($\$250 \times 12 \text{ weeks} = \3000). Office supplies such as pens, paper, and folders, for the face-to-face education session plus certificates, and pins would be estimated at \$250. Printed handouts and flyers are estimated at \$100. Food during the meetings would be estimated at \$500. Buying quality soaps and hand sanitizers that do not cause skin problems would be about \$200 per week ($200 \times 12 \text{ weeks} = \2400). \$250 would be put aside for unforeseen expenses. So, startup and ongoing costs are estimated at \$6,500, should the project last three months. However, developing partnerships with donors and free volunteers can help reduce the costs. For instance, we can receive free hand hygiene products; flyers can be printed for free and little incentives can be freely given weekly to

the most compliant nurses. Free volunteers can help palliate the needs of human resources in collecting checklists and replacing equipment as needed.

This project would save the hospital thousands of dollars that should have been spent every day caring for patients with CLABSI as those patients stay longer in the hospital and require more resources. Eradication of CLABSI in the ICU would decrease the length of stay for patients in the hospital. Hundreds of patients would be able to go back to their families and their normal lives sooner, therefore there would be an increase in patient satisfaction. A hospital with a low rate or zero CLABSI would attract more patients and more healthcare professionals would want to stay, therefore a lower rate of turnover, and less money spent to orient new hires and new graduates. A decrease in CLABSI would eliminate the prolonged use of antibiotics in patients, therefore reducing potential resistance to antibiotics.

Overall Discussion

Reviewing the literature shows that zero CLABSI is achievable with effective education and compliance with guidelines and care bundles including hand hygiene. Fighting CLABSI entitles all healthcare providers but mainly the nurses. Since this is a benchmark project, discussing its success is difficult. However, inputs from peers and faculty members highlight the importance and necessity of such a project in the ICUs. Sharing the research findings with some colleagues reveals how valuable it would be. Should the project be implemented, many ICU patients would benefit from a central line without catching CLABSI. Nurses would increase their compliance with hand hygiene, therefore decreasing cross-contamination in the hospital.

Conclusion/Recommendation

In summary, CLABSI is a burden that ICU patients do not need to add to their list of problems. Because of its high morbidity and cost-prohibition, it is paramount to cast it out of clinical settings. Along with proper hand hygiene, evidence-based practice (EBP) such as the central line care bundle from insertion to maintenance and early removal is proven to reduce CLABSI. However, implementing those EBP in clinical practice can be challenging but attainable. An effective leader, together with the appropriate team, along with the collaboration of the patients and their families can reach zero CLABSI.

It is recommended that a collective and conscientious effort be made to maintain optimal hand hygiene and eliminate CLABSI. All healthcare professionals including registered nurses, licensed vocational nurses, nurse aids, and physicians have to play their part. A more patient-centered approach would help the team to focus on patient satisfaction rather than provider/hospital satisfaction. Patients need to be more involved and challenge healthcare providers to deliver quality care. Continuous research is necessary to increase the implementation of evidence-based practices in healthcare. Faculty staff and nurse instructors are not to let their guard down when training future nurses. Student nurses must receive the best quality of education to deliver safe quality care to their patients. Nurses and advanced practice nurses need to continuously educate themselves and stay updated until the end of their professional careers. Nursing is a wonderful science that has made a remarkable name for itself throughout the decades. Its future is very promising for the advancement of healthcare; therefore, nurses need to step up to the game and keep pushing the profession forward.

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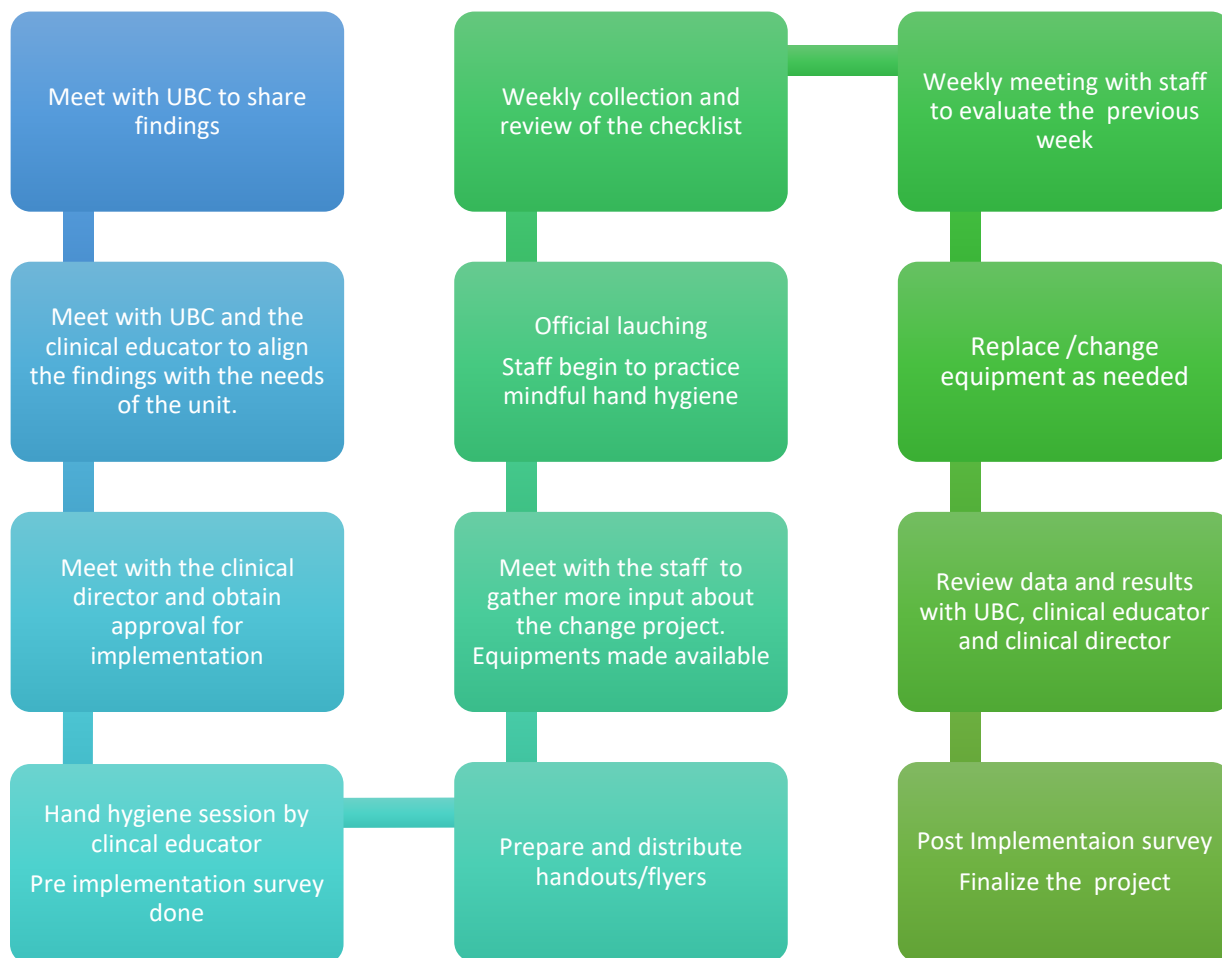
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Appendix

Appendix A: Flowchart



Appendix B: Pre- and post-implementation questionnaire

1. How likely are you to practice hand hygiene overall?
 - Not at all
 - Sometimes
 - Most of the time
 - Always

2. How likely are you to practice hand hygiene prior to accessing a central line?
 - Not at all
 - Sometimes
 - Most of the time
 - Always

3. How confident are you about the key moments of hand hygiene?
 - Not at all
 - Somehow
 - Mostly confident
 - Very confident

4. Do you think this project is beneficial to your ICU floor?
 - Not at all
 - Somehow
 - Very much

Appendix C: Checklist to keep at the bedside every shift

Check the working shift: AM -----PM-----		Date-----			
Handwashing moments during the shift	Circle the correct one				
Upon entering the room	Every time	75% of the time	50% of the time	25% of the time	Less than 25 % of the time
Before touching the patient	Every time	75% of the time	50% of the time	25% of the time	Less than 25 % of the time
After touching the patient	Every time	75% of the time	50% of the time	25% of the time	Less than 25 % of the time
Right before accessing the CL	Every time	75% of the time	50% of the time	25% of the time	Less than 25 % of the time
After touching the patient's surroundings	Every time	75% of the time	50% of the time	25% of the time	Less than 25 % of the time
Before leaving the room	Every time	75% of the time	50% of the time	25% of the time	Less than 25 % of the time