Capstone Paper Part 1: Central Line-associated blood stream infection (CLABSI)

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Capstone Paper Part 1

Central venous catheters (CVCs) include some of the medical devices that are mostly used in the management of patients with severe illnesses. Complications however arise with the use of these devises despite the many steps that are undertaken to manage them (Malek et al., 2018). Central line-associated bloodstream infection (CLABSI) is one of the most common complications that arise with the use of CVCs. CLABSI is defined as primary laboratory-confirmed blood stream infection that arises among patients with a central line and the infection is not caused by a cultured organism is not from another site. The prevention of CLABSI is based on the adoption of evidence-based measures. The study by Guenezan et al. (2018, p. 1) has shown that the implementation of bundle care measure that includes hand hygiene before inserting a catheter and/or during maintenance, full-barrier precautions at the time of inserting the catheter, using 2% alcoholic chlorhexidine in the process of preparing skin and removing CVCs that are no longer in on time can help reduce incidence of CLABSIs by over 50%. This assignment offers a summary of the findings from at least five evidence-based sources that support the selected practice problem.

**Summary of the Findings**

CLABSIs remains one of the most occurring complications associated with the use of CVCs. Its incidence rate is estimated to be 4.1 for every 1000 central line days (Chi et al., 2020). While the incidence of CLABSIs have reduced in most of the developed nations, this issue remains a challenge for some countries. This is supported by the study by Geldenhuys et al., (2017) which explained that surveillance of the CLABSIs incidence has seen a reduction in its incidence among developed nations to zero incidence rate. This is however different among the developing nations that lacks surveillance programs in their facilities. According to this study, the incidence of CLABSIs cases continue to double and triple among the developing nations because of the lack of effective surveillance systems. The findings from the study indicated that that while avoiding the use of central lines could be a sure way of avoiding the incidence of CLABSIs, central lines cannot be avoided in neonatal intensive care units (NICUs) given that they ae used to deliver blood, antibiotics and other intravenous fluids.

Incidence of CLABSIs have adverse effects both on the patients and the healthcare system. CLABSIs leads to increased rate of deaths, morbidity and increases the cost of care. The study by Chi et al. (2020) shows that patients diagnosed with CLABSIs have a 2.75 higher risk of dying in a hospital compared to those without CLABSIs. This has been supported by the study carried out by Karagiannidou et al. (2019) which explained that CLABSIs results in a higher rate of morbidity and mortality. The authors explained that CLABSIs remains one of the most reported case of hospital-acquired infections [HAIs] in pediatric unit. Their study was focused on determining the effects of CLABSIs on the long of stay (LOS) in hospitals and its impact on the cost of care. The results from this study indicated that CLABSIs increases the LOS in hospitals by approximately 21 days while increases the cost of care from €17,788 to €31,302.

The use of CVCs is a common practice in the process of caring for patients with severe illnesses. The study by Malek et al. (2018) explained that over 3million CVCs are used annually in the US. This high use of CVCs increases the likelihood of CLABSIs occurring. The findings from this study supports the need for an evidence-based intervention to be adopted to manage the incidence of CLABSIs. The authors explained that CLABSIs have adverse effects on the patient given that it increases the cost of medical care, increases morbidity and mortality. The concept that CLABSIs increases the cost of care has been echoed by the study by Venturini et al. (2016). According to this study, CLABSIs increases the cost of medical care by approximately $45,000.

Based on these adverse effects of CLABSIs, it is essential for the nursing professionals to adopt an evidence-based approach that would help mitigate on this issue. Installing a surveillance system has been shown to be an effective way of understanding the extent of this nursing problem. Developed nations like the US have exemplified the importance of adopting a surveillance system to manage the incidence of CLABSIs. According to Geldenhuys et al. (2017), surveillance system allows the healthcare system to evaluate the extent of this nursing issue and discover the exact units in the healthcare facilities where CLABSIs occur. Another intervention is the adoption of the central-line care bundle. A central line care bundle is a strategy that involves the implementation of several evidence-based best practices during the insertion and maintenance of a catheter (Geldenhuys et al., 2017). Some of these practices include maintaining hand hygiene, use of chlorhexidine skin antisepsis during skin preparation, daily assessment of the line necessity, sterilizing the line access and using closed needless intravascular catheter.

A capstone project is an important process in the nursing education given that it allows students to integrate the knowledge that they have gained in class and their clinical experiences by applying them in a larger context that would be beneficial to the community. While undertaking a capstone project, nursing students can identify the existing nursing problems that exist in the community. This allows them to focus on a specific populace, develop a deeper understanding of the issues affecting the group and design a solution to the address the challenges (Mitchell, 2019). The nursing unit is everchanging and to address the existing challenges, nursing professions are required to develop evidence-based interventions. There are several nursing problems that still affect the healthcare system today. Some of these problems include falls, medical errors, nursing staff shortage and surgical errors (Zerwekh & Garneau, 2017). The purpose of this capstone paper is to identify a quality improvement practice problem, review and synthesize evidence-based practice evidence, and propose an evidence-based quality improvement plan that will be used to address the practice problem.

**The practice problem**

There are numerous issues facing the healthcare unit. Central line-associated bloodstream infections [CLABSI] is one of the nursing problems that has greatly affected the provision of quality care in healthcare facilities. CLABSI is a form of hospital-acquired blood infection that arises when a virus, bacteria or any other germs enters the bloodstream of a patient via the central line (Malek et al., 2018). For a person to be diagnosed with CLABSI, there has to be a pathogen in the bloodstream that is not associated with an infection from a different part and the patient present with symptom that include high fever, chill, contamination of the skin based on over two blood cultures that has been drawn on separate occasions (Hakko et al., 2015). While these infections can pose serious effects on the patients, they can easily be treated successfully.

The management of patients specifically those diagnosed with severe conditions requires the use of Central Venous Catheters (CVCs) (Conley, 2016). The use of CVCs in emergency unit and the intensive care units (ICUs) increases the likelihood of acquiring CLABSIs. It is estimated that there are between 250,000 and 500,000 cases of CLABSIs in the US annually resulting in between 10-30% mortality (Malek et al., 2018). According to the Centers for Disease Control and Prevention (CDC) (2016), over 41,000 of these cases can be easily prevented. Oncology patients are among the highest number of patients with a central line and as such are more susceptible to CLABSIs.

CLABSIs are not only harmful in terms of health but also has adverse financial implications on the patients and the healthcare system. A study by Hakko et al. (2015). showed that the management of CLABSIs costs up to $45000 per infection. The study further explained that for patients who have developed CLABSIs, the length of hospital stays is increased by about 7 days with each of the patients treated with a form of antibiotics. It also increases the length of stay in the ICU by approximately 2days (Hakko et al, 2015). The increased stays in hospitals results in increased cost of care and reduced satisfaction with care provided. Given the adverse effects associated with this nursing problem, it is important to develop an evidence-based intervention that would address this issue.

**Analysis of Evidence**

To have a deeper understanding of this nursing problem, I carried out a systematic review of literature of the topic on databases that include CINAHL, Cochrane, Embase, and PubMed. Some of the key words that I utilized to search for the topic include blood stream infection (BSI), CLABSIs, Central Venous Catheters and a quality improvement to manage CLABSIs.

I identified a total of 83 research studies on the topic. 72 of these articles were however published over ten years ago. Out of the remaining 11articles, 6 did not meet the research criterion given it utilized a mixed research method. I therefore utilized five articles to answer the research problem. The objective of this capstone project is to propose an evidence-based intervention that would reduce the incidence of CLABSIs as part of the continuous quality improvement [QI] plans.The studies that I located explained that managing the occurrence of CLABSIs can be achieved through an implementation of a quality improvement [QI] initiative. The proposed QI intervention for this capstone project is the adoption of the central line care bundles.

The first article that I located explained that CLABSIs is the most reported cases of hospital-acquired infections [HAIs] in pediatric unit. The authors further explained that CLABSIs is associated with high rate of morbidity and increased cost of healthcare (Karagiannidou et al., 2019). The authors carried out a study to determine the length of stay [LOS] attributed to CLABSIs and how it affects the cost of healthcare among pediatric patients in Greece. A retrospective matched-cohort study was utilized in the study where a total of 188 participants were involved. Of the 188 participants, 94 had CLABSIs while the other 94 did not. The results from the study indicated that the mean LOS of participants with CLABSIs is 57.7 days while that of participants without CLABSIs is 36.6days, an increase of about 21days. The cost of treating participants with CLABSIs was found to be approximately €31,302 while that of treating patients without CLABSIs was found to be €17,788 (Karagiannidou et al., 2019). Based on the outcomes of this study, it is essential to adopt evidence-based intervention that would help in addressing the nursing problem.

 The second by Geldenhuys et al. (2017) article discusses the extent of CLABSIs incidence in neonatal intensive care units (NICUs) in South Africa. The authors explained the surveillance of HAIs specifically on the low-income nations is still low or not available. The lack of surveillance has seen doubling and tripling of HAI incidence as compared to developed nations that have a surveillance system for the disease. The authors further explained that CLABSIs are the most reported forms of HAIs in the ICU units. They explained that the use of central lines cannot be avoided in the NICUs as they are used to administer antibiotics, blood products and intravenous fluids (Geldenhuys et al., 2017). The article explained that the declined cases of CLABSIs among the developed nations is because of the adoption of central-line care bundles.

 The third study that I located for this nursing problem discusses the incidence and risk factors for the occurrence of CLABSIs. The article explains that the use of CVCs is a common process in hospitals with over 3 million CVCs used in the US each year (Malek et al., 2018). The high usage of these instruments increases the likelihood of CLABSIs occurrence. This is because more microorganisms cover the external surfaces of the CVCs or the pathway of the fluids when the devices have been inserted. The authors further report that the most frequent cause of the HAIs are the CVCs (Malek et al., 2018). The study also explained that these HAIs increases the rate of morbidity and mortality and increases the cost of care.

The concept of increased cost of care associated with CLABSIs has been supported by the fourth article which explained that CLABSIs causes an additional hospital cost of $45,000 to manage a case of HAI. In the fourth article, a total of 388 participants were included to study the occurrence of CLABSIs among children in an Italian tertiary care facility. The outcome of the study showed that a total of 29 CLABSI episodes were recorded among 26 patients. This translates to about 2 participants experience between 2 and 3 episodes of CLABSIs over a period of 7783 observation days (Venturini et al., 2016). The study also focused on the risk factors for the incidence of CLABSIs. Some of the factors that were discovered in the study include gender where females were found to be at a higher risk of developing CLABSIs. It was shown that children with underlying conditions like renal or cardiac diseases, respiratory, or neurological diseases are at a higher risk of developing CLABSIs.

The last article that I located for this capstone project researched on the risk factors related to mortality from CLABSIs among patients who are admitted to the ICU. The authors explained that central lines are primarily used among patients with severe conditions. Given the widespread use of central lines, CLABSIs continue to be the leading cause of HAIs that can be prevented (Lin et al., 2015). The article further discusses the adverse effects associated with CLABSIs. These include longer stays in healthcare facilities, increased cost of cate and increased mortality. the authors explained that the management of CLABSIs can be achieved through effective surveillance of the infections and adoption of quality improvement initiatives (Lin et al., 2015). The article explains that the adoption of preventive measures that can result in zero rate of CLABSIs incidences.

**Quality Improvement Process**

Given the adverse effects associated with CLABSIs, a quality improvement [QI] initiative should be adopted. The proposed QI for this nursing problem is the implementation of a CLABSI care bundle. This is a care strategy that outlines the evidence-based practices that should be considered during insertion and maintenance of a central line (Salama et al., 2016). Some of these practices that should be observed include maintaining hand hygiene, review of the line necessity on daily basis, optimal catheter-site choice, using closed needleless intravascular catheter systems and making sure the line dressing is intact and clean (Payne et al., 2018). The study by Geldenhuys et al. (2017) has shown that using this QI model helps to greatly eliminate the incidences of CLABSIs.

**Conclusion**

There are numerous issues facing the healthcare unit. Central line-associated bloodstream infections [CLABSI] is one of the nursing problems that has greatly affected the provision of quality care in healthcare facilities. CLABSI is a form of hospital-acquired blood infection that arises when a virus, bacteria or any other germs enters the bloodstream of a patient via the central line (Malek et al., 2018). It is estimated that there are between 250,000 and 500,000 cases of CLABSIs in the US annually resulting in between 10-30% mortality. CLABSIs are not only harmful in terms of health but also has adverse financial implications on the patients and the healthcare system. the management of CLABSIs costs up to $45000 per infection (Hakko et al., 2015). The study further explained that for patients who have developed CLABSIs, the length of hospital stays is increased by about 7 days with each of the patients treated with a form of antibiotics.

**Quality Improvement Process**

A quality improvement (QI) is an essential aspect in the nursing practice. A QI refers to a structured model that allows the user to analyze the performance of its processes and systems. The outcome of a QI process would then be used to determine the improvements that needs to be undertaken both with regard to operational and functional sections. Based on the studies conducted on the adverse effects of Central line-associated bloodstream infection (CLABSI), an intervention to address this challenge needs to be developed.

The proposed QI model to manage the incidence of CLABSIs is the implementation of a CLABSI care bundle. This care bundle entails a care strategy that explains the evidence-based practices that must be observed during insertion and maintenance of a central line (Salama et al., 2016). Some of these practices that should be observed include maintaining hand hygiene, review of the line necessity on daily basis, optimal catheter-site choice, using closed needleless intravascular catheter systems and making sure the line dressing is intact and clean (Payne et al., 2018). The study by Geldenhuys et al. (2017) has shown that using this QI model helps to greatly eliminate the incidences of CLABSIs.

The first adverse effect associated with CLABSIs is increased stays in the hospital. Patients who have been diagnosed with an CLABSIs tend to spend a longer time in the healthcare facility. Data on the length of hospital stay would be useful in assessing the effectiveness of the care bundle. An assessment of the project would be assessed in four phases. During the first quarter, it is expected that length of stay in the hospital would have reduced by over 50%. While there are other conditions that could impact on the length of stay, the focus would be on the length of stay arising due to CLABSIs.

References

Centers for Disease Control and Prevention (CDC) (2016, January). Blood stream infection events. Central line associated bloodstream infection and non-centrally line associated blood stream infection. *Device Associated Module BSI,* 4-1- 4-32. Retrieved from www.cdc. com

Chi, X., Guo, J., Niu, X., He, R., Wu, L., & Xu, H. (2020). Prevention of central line-associated bloodstream infections: A survey of ICU nurses’ knowledge and practice in China. *Antimicrobial Resistance & Infection Control*, *9*(1). https://doi.org/10.1186/s13756-020-00833-3

Conley S. B. (2016). Central Line-Associated Bloodstream Infection Prevention: Standardizing Practice Focused on Evidence-Based Guidelines. *Clinical journal of oncology nursing*, *20*(1), 23–26. https://doi.org/10.1188/16.CJON.23-26

Geldenhuys, C., Dramowski, A., Jenkins, A., & Bekker, A. (2017). Central-line-associated bloodstream infections in a resource-limited South African neonatal intensive care unit. *South African Medical Journal*, *107*(9), 758. https://doi.org/10.7196/samj.2017.v107i9.12124

Guenezan, J., Drugeon, B., Marjanovic, N., & Mimoz, O. (2018). Treatment of central line-associated bloodstream infections. *Critical Care*, *22*(1). https://doi.org/10.1186/s13054-018-2249-9

Hakko, E., Guvenc, S., Karaman, I., Cakmak, A., Erdem, T., & Cakmakci, M. (2015). Long-term sustainability of zero central-line associated bloodstream infections is possible with high compliance with care bundle elements. *Eastern Mediterranean health journal = La revue de sante de la Mediterranee orientale = al-Majallah al-sihhiyah li-sharq al-mutawassit*, *21*(4), 293–298. https://doi.org/10.26719/2015.21.4.293

Karagiannidou, S., Zaoutis, T., Maniadakis, N., Papaevangelou, V., & Kourlaba, G. (2019). Attributable length of stay and cost for pediatric and neonatal central line-associated bloodstream infections in Greece. *Journal of infection and public health*, *12*(3), 372–379. https://doi.org/10.1016/j.jiph.2018.12.004

Lin, K., Cheng, A., Chang, Y., Hung, M., Wang, J., Sheng, W., Hseuh, P., Chen, Y., & Chang, S. (2015). Central line-associated bloodstream infections among critically ill patients in the era of bundle care. Journal of Microbiology, Immunology and Infection, 50(3), 339-348. https://doi.org/10.1016/j.jmii.2015.07.001

Malek, A. M., Abouseif, H. A., Abd Elaziz, K. M., Allam, M. F., & Fahim, H. I. (2018). Incidence of central line-associated bloodstream infections in intensive care units in a private hospital (Cairo, Egypt). *The Open Public Health Journal*, *11*(1), 562-571. https://doi.org/10.2174/1874944501811010562

Mitchell, M. (2019). Undergraduate Nursing Student Engagement in Blended Learning: A Quality Improvement Capstone Project.

Payne, V., Hall, M., Prieto, J., & Johnson, M. (2018). Care bundles to reduce central line-associated bloodstream infections in the neonatal unit: a systematic review and meta-analysis. *Archives of disease in childhood. Fetal and neonatal edition*, *103*(5), F422–F429. https://doi.org/10.1136/archdischild-2017-313362

Salama, M. F., Jamal, W., Al Mousa, H., & Rotimi, V. (2016). Implementation of central venous catheter bundle in an intensive care unit in Kuwait: Effect on central line-associated bloodstream infections. *Journal of infection and public health*, *9*(1), 34–41. https://doi.org/10.1016/j.jiph.2015.05.001

Venturini, E., Montagnani, C., Benni, A., Becciani, S., Biermann, K. P., De Masi, S., Chiappini, E., De Martino, M., & Galli, L. (2016). Central-line associated bloodstream infections in a tertiary care children’s University hospital: A prospective study. *BMC Infectious Diseases*, *16*(1). https://doi.org/10.1186/s12879-016-2061-6

Zerwekh, J., & Garneau, A. (2017). *Nursing Today-E-Book: Transition and Trends*. Elsevier Health Sciences.