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Nursing Education for Central Line-Associated Bloodstream Infections in Intensive Care Units

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Walden University

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Walden University

College of Nursing

This is to certify that the doctoral study by

Carren Mullings

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

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Walden University

2022

Abstract

Nursing Education for Central Line-Associated Bloodstream Infections in

Intensive Care Units

by

Carren Sandra Mullings

MS, Chamberlain College of Nursing, 2016

BS, Nova Southeastern University, 2007

Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

Walden University

August 2022

Abstract

Central line associated blood stream infections (CLABSIs) are the most acquired hospital infection in the United States. CLABSI is caused by bacteria that enter the bloodstream through a central line. In the United States, CLABSI has a mortality rate of 18%, and every year 250,000 people are infected. Of these, 30,000 patients die due to CLABSI infections, hospital stays are prolonged, and hospital costs are increased. Patients in an intensive care unit (ICU) are more exposed to CLABSI because of procedures that break tissues and skin, such as the insertion of a central line. A gap in practice was identified in a Southeastern U.S. state where staff were not following standard protocol for the prevention of CLABSI, including hand hygiene. The focus of this project, therefore, was on the development of an educational program on CLABSI to increase nursing staff knowledge regarding preventive measures and to determine whether these measures were effective in reducing CLABSI rates two months following the program. The analysis, design, development, implementation, and evaluation model were used as guiding frameworks for this study. A stakeholder group of six experienced ICU nurses assisted in the planning, implementation, and evaluation. Seventy-nine of 90 eligible staff nurses participated in the project (88%). Using a pretest/post-test design, results indicated an increase in knowledge from the pretest ($M=9.59$) to the post-test ($M=13.63$) on a 15-item test. In addition to improved scores, there was a decrease in the rates of CLABSI after the education session. The approximate percentage rate decrease post education was 11.38% in a 54 bed ICU that spanned four units, thus promoting positive social change.

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Dedication

I dedicate the DNP project to my husband, Yohann Stephens, for his unwavering support throughout my doctoral journey. To my family, immediate and extended who provided encouragement and fortification especially in times of frustration during this work.

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I would like to acknowledge the dedicated nursing professionals who have worked with me through my project period, devoted their time, expertise and to Dr. Cheryl Holly and Dr. Susan B. Fowler from Walden University. Your stewardship has been priceless.

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Section 1: Nature of the Project

Introduction

Central line associated blood stream infections (CLABSI) is a familiar and widespread infection acquired in hospitals. The disease is associated fever, sepsis, and septicemia. CLABSI significantly adds to in-hospital mortality and morbidity rates and is related to augmented costs and intensive care unit (ICU) length of stay (Yokoe et al., 2014). The CLABSI prevalence in ICUs results from confounding factors such as immunosuppression, sepsis, old age and disease, fluids, drug management, repeated and lengthy laboratory testing, and catheter placement emergencies.

Problem Statement

The most common and lethal hospital-acquired infections are central line-associated bloodstream infections (CLABSIs; Miller et al., 2016). CLABSI is an infection caused by bacteria or viruses that enter the bloodstream through a central line. The central line (CL) is a catheter or tubing placed in large veins to collect blood and administer medication or fluids. Healthcare workers need to ensure the CL is kept sterile to prevent CLABSI. Approximately 250,000 CLABSI occur each year in the United States, with a mortality rate of 18% (Balla et al., 2018). CLABSI can cause symptoms of pain, redness, and swelling around the central line site and fever, chills, odor, purulent drainage, sepsis, and death (Haddadin et al., 2020). CLABSI is detrimental to patients and is a burden to the health care system, with an associated cost of approximately \$45,000 for each occurrence (Balla et al., 2018). Treatment involves removing the CL, intravenous antibiotics, administration of intravenous fluid, oxygen therapy, and other

supportive care. Patients need aggressive management; however, despite treatment, CLABSI causes 30,000 patient deaths each year (Miller et al., 2016). Miller et al. (2016) reported that CLABSI burden in developed and developing countries, resulting in high hospital costs, increased length of stay, and increased mortality and morbidity rates. A recent meta-analysis conducted by the World Health Organization (WHO) in adult intensive care units in the United States revealed that CLABSIs are the primary reason for hospital-acquired infections (Bell & O'Grady, 2017). Therefore, it is critical to address the high rates of CLABSI in patients in intensive care units (Marschall et al., 2014). The best treatment for CLABSI is prevention, as it is estimated that 41,000 CLABSI are preventable.

The effort to prevent CLABSI is two-sided, from the healthcare providers and the patients. Healthcare providers must follow the recommended procedures for inserting the central line, such as performing hand hygiene, applying appropriate skin antiseptic, wearing sterilized gear, and removing the mainline once it is not in use. At the same time, the patient needs to avoid touching or allowing others to touch the tubing. This involvement of the patient and healthcare personnel is part of the Comprehensive Unit-Based Safety Program (CUSP), which has been instrumental in reducing CLABSIs (Weaver et al., 2014). The CUSP is an intensive quality improvement program that can play a significant role in preventing and controlling the high rates of CLABSI by involving both the patients and health personnel (Pitts et al., 2017). Increasing education on the CUSP model among ICU nursing staff is necessary to raise its awareness and

potentially reduce CLABSI rates. The program helps healthcare teams improve their care by combining best clinical practices, teamwork, and safety that revolves around science.

ICU patients are particularly at risk for a CLABSI due to factors such as an immunocompromised state, breaks in skin and tissues, required invasive devices and procedures, unconsciousness, and the possibility of immobility (Latif et al., 2015). The CLABSI rate in intensive care units (ICU) is 0.8 per 1000 CL days. International Nosocomial Infection Control Consortium (INICC) surveillance data from January 2010 through December 2015 (703 intensive care units in 50 countries) reported a CLABSI rate of 4.1 per 1000 central line days (Zeigler et al., 2015). Therefore, strategies to reduce CLABSI are needed.

In this project, I focused on CUSP education for nurses focusing on CL. I sought to educate ICU nursing staff about CUSP and its application in reducing CLABSI rates. Nurses knowledgeable about CUSP may close the gap between CLABSI and nurses' preventive measures described in this CLABSI prevention program, thus promoting social change.

Purpose Statement

The gap in practice that I focused on in this project was the lack of knowledge among nurses about the causes and prevention techniques for CLABSI. My focus was educating ICU nursing staff about CUSP and its application in reducing CLABSI rates. Despite a preponderance of literature on preventive strategies for CLABSI, the infection continues to burden patients and hospital systems. Notwithstanding, noncompliance with the available methods used to reduce the rates of CLABSI among the nurses working in

the ICU is the primary obstacle to eliminating CLABSI. I believe that providing nursing staff with evidence-based guidelines will decrease the rates of CLABSI. Reducing the rates of CLABSI is possible within the ICU settings if the nursing staff comply with evidence-based guidelines. Continuous training and compliance with the evidence-based guidelines provided to the nursing staff can reduce CLABSI rates within the ICU settings (Bizzarro et al., 2010, Yaseen et al., 2016). Nurses' compliance with the safety measures has a significant impact on the rates of CLABSI. Nurses knowledgeable about CUSP, which includes patient teaching about infection control practices with CL, may close the gap between CLABSI and nurses' preventive measures described in this CLABSI prevention program. Developing a CUSP integrated with local infection control practices will result in the standardization of the practice skills of registered nurses for CUSP at the project site.

This may improve the nurses' practice skills and knowledge to prevent and decrease the prevalence of CLABSIs, thereby contributing to a positive social change. The guiding project question was: What is the impact of an education program for ICU staff nurses on applying CUSP methodology to the prevention of CLABSI on rates of CLABSI? A CL is an essential part of ICU patient treatment as it delivers drugs and fluid therapy to critically-ill patients. Still, two key factors contribute to infections with a central line: single-use devices and lack of hand hygiene (O'Grady et al., 2011). I addressed both issues in the CUSP educational session for ICU nursing staff.

Nursing education and the translation of research knowledge into practice is a crucial way to reduce the cases of CLABSI through training nursing staff on safety

measures. CLABSIs can be eliminated within 4 years if these procedures are implemented, including reducing hand hygiene with a single piece of sterile equipment and keeping patients aware of the necessity not to touch the tubing (Mezoff et al., 2021). However, the crucial aspect to preventing CLABSI, in addition to washing hands and patient avoidance of touching the tubing, may be the use of single-use equipment as although the use of multi-lumen catheters is convenient for patients requiring multiple infusions or blood draws for laboratory testing, it also results in additional potential pathways for infection (Bell & O'Grady, 2017). Guidelines recommend using a catheter with limited ports to reduce the further potential for disease (O'Grady et al., 2011). Nurses have much influence over patients, and they have a significant impact on the patients' lives. Through education, nurses can implement the best practices to reduce the cases of CLABSI.

Nature of the Doctoral Project

I used the Walden University *Staff Education Manual* (2019) and social change mission during this project. I focused on the project question. Therefore, this doctoral project may be used to reduce the high rates of CLABSI by educating staff on the CUSP program and championing compliance with various policies, processes, and procedures in the ICU founded on a culture of patient safety, which aligns with Walden's mission of social change. Equipping nursing staff with knowledge of CUSP and its application to infection prevention can positively influence the financial and physical toll imposed by CLABSI (Miller et al., 2016). Ultimately, education on CUSP may foster a care-healing

environment that will encourage nursing staff to take necessary safety measures to prevent CLABSIs.

The evidence that I used in this project included a literature search and pre- and post-educational session data to determine any knowledge increase. I conducted a literature search to look for evidence supporting the development of the CLABSI staff educational program based on the CUSP and reviewed currently published clinical guidelines for CLABSI prevention to support the development of the program. I used the pre- and post-educational session data to determine program success in increasing knowledge. Educating nursing staff on the use of the policies and procedures in CUSP has the potential to close the practice gap.

Significance

ICU patients are particularly at risk for a CLABSI due to factors such as an immunocompromised state, breaks in skin and tissues, required invasive devices and procedures, unconsciousness, and the possibility of immobility. I created a nursing education based on CUSP to focus on a CL that will reduce the cases of CLABSI. I provided education for nurses based on CUSP and its application to reduce CLABSI. Nurses' knowledge about CUSP will decrease the gap between CLABSI and nurses' understanding of preventative measures, promoting social change.

Patients in the ICU will benefit most from reduced death cases, decreased in-hospital stay, other complications, and reduced treatment costs due to CLABSI. My focus in this project was on the safety measures to prevent patients from CLABSI and enhance patient healthcare outcomes.

Summary

In Section 1, I highlighted CLASBI as one of the significant causes of death among patients in the United States, and a problem for diverse nursing practitioners in the ICUs. I showed that CUSP can manage CLASBI by both nurses and patients.

Understanding CUSP management procedures for CLASBI will significantly improve and empower the nurses. In the next section I will present the background and context for the project.

Section 2: Background and Context

Introduction

CLABSI infections are surging in the United States and worldwide, given the increased numbers of patients in the ICUs. I was the project coordinator and engaged with the library and other health experts to identify the reliable evidence relating to CLABSI infections and the corresponding preventative measures.

Concepts, Models, and Theories

I used the ADDIE model as the basis for this study. I used the model as the basis for the analysis, design, development, implementation, and evaluation of all activities carried out during the project period. An expert panel will be formed to assist in a program for educating nursing staff on reducing the rates of CLABSI.

Using the ADDIE model, an analysis was done about the practice gap. The current situation was analyzed based on the available training and knowledge gap. The primary goal of the intervention is to educate nursing staff on how to reduce the rates of CLABSI, which can lead to reduced CLABSI rates. In this analysis stage, the aim and outcomes of the educational program were developed based on this information. The design step focused on developing the learning objectives, content, subject matter analysis, lesson planning, and assessment instruments.

In the development step, the group created the program for nursing staff in the ICU. The training was offered to the nursing staff on safety measures to reduce rates of CLABSI at the project site. With the course content decided in the previous phase, I

refined to remain relevant to the nurses by including graphics about the current ICU CLABSI data, and the pre- and posttests were developed.

I then implemented and evaluated it to determine how effectively it increased the nursing staff's knowledge about preventive measures using CUSP procedures. I provided staff with a pre-test before the program and the same test as a post-test. I compared these to determine any knowledge gained and also asked to evaluate the program. The feedback I obtained from the implementation phase is critical and I will use it to check on the progress of the project.

ADDIE's primary aim is to offer a structural approach for creating training programs, and it is also essential in providing the future way forward in any iterations formed.

Relevance to Nursing Practice

Continued nursing education remains relevant to the nursing practice. Long-life training keeps nurses updated on current issues and how they can face such issues. Patients' acuity levels have increased, challenging staff to remain current through regular training.

Local Background and Context

An urban hospital in the Midwest was the location for this project. Patients with sepsis, multiorgan failure, heart failure, and respiratory failure are cared for by 90 nurses in four ICUs with a combined total of 54 beds. Patients in the ICU always have a CL for drug administration, blood collection, and fluid administration. According to the Center for Disease Control (CDC nd), the prevalence of CLABSI is 12.06 percent for every 669

cases that occur each year. The ICU management team acknowledged the need to reduce CLABSI rates in the ICU.

Role of DNP Student

As a DNP student, my focus in nursing was on conducting and evaluating the educational program for nursing staff at the project site. This is vital because it will help reduce CLABSI rates, save lives, cost of treatment, and reduce periods taken in the hospitals. Patient safety remains one of the most critical aspects of the healthcare system that should be addressed.

My role in the project was extensive, and one of my roles is to identify the problem to be addressed through the project. I assessed the current situation at the healthcare facility, recruit participants, make sure participants are protected, and ensure that the project considers all the ethical considerations. I will conduct and evaluate the program. My motivation for the doctoral project is to reduce complications resulting from CLABSI, such as death. The statistics about the impact of CLABSI, including the number of deaths and those affected reported annually, are dramatic. This program can reduce those numbers at the practice site through staff education.

Role of DNP Project Team

A stakeholder group included ICU nurses was established after the project's approval. The project stakeholders were responsible for assisting in the planning, implementation, and evaluation of the project using the ADDIE model. The DNP project team focused on the development and assessment of the educational session for nursing staff. CLABSI rates were collected months after the academic session and compared with

presession rates to determine any reduction. Due COVID-19 policies, face-to-face meetings with the team members was not possible. Online sessions were conducted via ZOOM, Blackboard Collab Ultra, or Microsoft Teams, where all the aggregate data were outlined, discussed, and distributed through email.

Summary

Discussed in this section was the location of the, how the project was developed and evaluated, and its relevance to nursing practice. The results from the project are vital for the reduction of treatment costs, CLABSI prevention, and healthcare personnel empowerment. Following is a description of the collection and analysis of evidence.

Section 3: Collection and Analysis of Evidence

Introduction

The positive effects of the several care approaches to prevention and decrease of CLABSI infections were shown through numerous studies. However, most authors emphasized hand hygiene, primarily due to its cost-effectiveness (Weeks et al., 2014). Often, microorganisms are carried by both patients and health personnel and are spread to others repeatedly. Compliance with hand hygiene has significantly increased due to COVID-19 prevention protocols. However, it is bound to lessen after the pandemic (Mezoff et al., 2021). Researchers articulated catheter care, which is entirely abandoned in the routine processes. Therefore, this informs continued research and education teaching to all ICU health practitioners about CLABSI and its associated control measures (Marschall, 2014). Providing such information to the nursing staff at the project site is critical in reducing CLABSI as reduction protects the health of healthcare workers and reduces care costs for the patients.

Practice Focused Question

The project practice question was: What is the impact of an education program for ICU staff nurses on applying CUSP methodology to the prevention of CLABSI on rates of CLABSI? The poor hand hygiene coupled with solitary-use devices highly increases the risk of practitioners in ICUs, which makes the need for a well-structured and intensively evidenced-based education program essential for reducing CLABSI cases in ICUs.

Sources of Evidence

To create the educational program, I conducted a literature search to identify evidence to support the development of the CLABSI staff educational program based on the CUSP. See Appendix A for the Table of Evidence. This evidence was derived from 2015–2021 peer-reviewed articles from Medline/PubMed, CINAHL, Google Scholar/MedNar, and the Cochrane Library. I sought currently published clinical guidelines for CLABSI prevention to support the program's development further. The pre-and post-educational session CLABSI data and pre-post-test results will determine program success. CLABSI data was obtained from the QI Department.

Protections

This minimal risk project followed Walden University's and the project site's policy on social distancing. I obtained approval from the Walden University IRB and the project site. No personal information from participants was collected. All the classes were done online to avoid exposing the participants to COVID-19. No patient data were collected. No identifying information was collected from nurse participants to maintain confidentiality. All project-related data were kept in a locked drawer in my office to which only I had access. Data will be kept for 5 years as required by Walden University IRB. Participants were informed that they were free to withdraw from the project for any reason.

Analysis and Synthesis

I collected data before and after the educational session to determine an increase in the nursing staff's knowledge regarding preventive measures for decreasing CLABSI

rates. I used descriptive statistics and graphs to display findings as appropriate. I used an Excel spreadsheet to record, track, organize, and analyze the pretest and posttest. To protect the anonymity of the staff, the pre-test and post-test did not require the participants' names or any identifiable information. This provided a means to assess the knowledge gained.

Data were provided by the project site QI department on CLABSI rates 3 months before the project and 2 months following the project to determine if the educational program on preventive measures for CLABSI made a difference in rates. I used descriptive statistics and graphs to display the findings.

Summary

The sources used in data analysis are fundamental to understanding if an educational program can help reduce CLABSI rates. I used project site QI data and evidence gathered from a comprehensive literature search to inform program development.

Section 4: Findings and Recommendations

Introduction

According to the American Nurses Association, one of the practice standards for nursing is to seek the opportunity to participate in education and training programs for the nurses to remain updated on the current issues facing patients and the healthcare sector. Nurses' participation in educational and training programs is effective because they are responsible for delivering safe healthcare services to patients. CLABSI is a healthcare problem affecting both patients and the healthcare sector, and it increases harm and mortality risk. It has remained a threat to the patients in the intensive care unit because it involves immunosuppression, sepsis, old age and disease, fluids, drug management, repeated and lengthy laboratory testing, and catheter placement emergencies. It is the responsibility of nurses working in the intensive care unit to be more knowledgeable on the prevention of CLABSI because they have direct contact with the patients in the ICU settings. When they have such knowledge, they foster the outcomes of the patients and deliver patient-centered services.

To reduce the rates of CLABSI among ICU patients, a Comprehensive Unit-Based Safety Program (CUSP) for the nurses working in ICU is necessary. Nurses are the primary stakeholders to realize a reduction in CLABSI rates if they are educated on the safety measures based on evidence-based practices. Healthcare experts and the patients benefit from decreased CLABSI. Healthcare experts need to adhere to the suggested processes for implanting the central line, such as execution of hand cleanliness, applying suitable skin antibacterial, using sterilized gear, and eliminating the mainline when not in

use. At the same time, the patient should evade touching or letting others have contact with the tubes. Increasing education on the CUSP model among ICU nursing staff is necessary to raise awareness and potentially reduce CLABSI rates.

One important aspect considered was the areas the education program will address to create and establish staff education and training programs for the nursing staff. The nursing leadership assessed the areas with higher risks of infection. Different methods were used such as video, PowerPoint, lecture, and demonstrations to meet varying learning styles.

The program consisted of three modules based on different teaching strategies to enhance the nurses' understanding of the evidence-based CL practices. Modules contained objectives, background information on CLABSI, techniques on how to reduce the risk of infection, and the practices on how to control the CL infection. Current ICU CLABSI rates were also reviewed. The program included a pretest and after completing the program, the participants completed a posttest to evaluate what they had learned.

Different forms of teaching were used to address the diverse learning styles of the nurses working in the ICU settings, including visual, auditory, and tactile methods (Yokoe, et al, 2014). See Appendix B and C for teaching plan and PowerPoint presentation.

Findings and Implications

To inform the educational program, I conducted a literature search to identify evidence to support the development of the CLABSI staff educational program based on the CUSP. Evidence used was derived from 2015–2021 peer-reviewed articles from

Medline/PubMed, CINAHL, Google Scholar/MedNar, and the Cochrane Library. I searched currently published clinical guidelines for CLABSI prevention to support the program's development further.

From all the literature reviewed for CL maintenance and CLABSI prevention based on CUSP no outlined standards to care for CLABSI was found. The practices not based on the present evidence could contribute to the lack of standardization of care methods. Authors reported that nurses were now requesting the standardized practices to help them prevent the CLABSI rates in the ICU settings. I reviewed all the available literature to identify some of the offered practices to control central line infection.

CLABSI is the most lethal and common infection acquired in the hospital. It is contamination initiated by bacteria or viruses that come into the bloodstream over a central line (Miller et al., 2016). CLABSI is harmful to patients and is a load to the healthcare sector, with a linked budget of about \$45,000 for every incidence (Balla et al., 2018). Management includes removing the CL, venous antibiotics, administration of venous liquid, oxygen treatment, and other helpful precautions. Authors further reported that CLABSIs burden both established and unindustrialized nations, consequential in tall hospital expenses, enlarged stay, and increased death and illness tolls. A current meta-analysis led by the World Health Organization (WHO) in mature severe care facilities in the United States exposed that CLABSIs are the primary cause of healthcare facility acquired contaminations.

The CUSP is a focused quality improvement program. Increasing education on the CUSP model among ICU nursing staff was a necessary first step in raising awareness

and potentially reducing CLABSI rates. Understanding the program will assist healthcare teams improve their care by combining best clinical practices, teamwork, and safety that revolves around science.

Another key finding was that the ICU patients are predominantly at danger for a CLABSI because of issues such as an immunocompromised state, breakdowns of skin muscles, essential aggressive procedures, oblivion, and the likelihood of stillness (Latif et al., 2015).

Findings

Stakeholders

Six ICU nurses with experience in this area ranging from 20 to 25 years formed the expert panel. These nurses assisted in development and evaluation of the project.

Nursing staff

Seventy-nine of 90 nurses currently working in the ICUs at the project site participated in the project (88%). Nurses in these units work 12-hour shifts and both day and night shift staff participated. Figure 1 presents demographic information on the nurse participants.

Figure 1*Demographics of Participating Nurses*

Demographic of Participating Nurses			
Characteristics	(n=90)	%	
Age in Years			
20 < 25	13	14.4	
25 < 30	28	31.1	
30 < 35	32	35.6	
35 and above	17	18.9	
Education Level			
Bachelor's Degree in nursing	43	47.8	
Master's in nursing	35	38.9	
DNP, PhD, etc.	12	13.3	
Years of Experience			
< 5	20	22.2	
5 < 10	12	13.3	
10 < 15	15	16.7	
15 < 20	24	26.7	
20 & more	19	21.1	
Department			
CC ICU	8	8.9	
NICU	18	20.0	
INP UNIT	7	7.8	
SCT ICU	15	16.7	
CV ICU	16	17.8	
MICU	8	8.9	
SICU	18	20.0	
<i>n = the number of nurses in the combined ICUs</i>			
Attendance percentage for Staff Education program = 87.7% i.e. 79 nurses			

Pre- and Posttest

The pre-test and post-test consisted of 15 questions as indicated in Figure 2. The full pre-test/posttest can be found in Appendix A. These are based on general central-line

infection questions requiring the participant to select the correct answers from what is listed. Pre- and post-test values are the number of correct answers from the 79 participants of the education program. Although the participants were predominantly experienced nurses, nursing supervisors, and managers, deficits were prevalent. There was marked improvement on the post-test scoring weighed against the pre-test (Pre-test Mean: 9.59; Post-test Mean: 13.63)

Figure 2*Pre- and Posttest Results*

Question #	Question	Pre-test results	Post-test results
Question 1	Central line-associated bloodstream infections (CLABSI) are not manageable	60	75
Question 2	CLABSI pathogenesis -	45	67
Question 3	CLABSI are detected by:	43	70
Question 4	What is one feature of the valve catheter?	50	71
Question 5	Non-tunnel catheters -	38	62
Question 6	Features of tunnel catheters:	36	63
Question 7	Compressive Unit-Based Safety Program (CUSP) focuses on:	47	69
Question 8	CUSP is based on the following	50	70
Question 9	Which of the following is the role of a nurse manager in CUSP?	35	66
Question 10	How often should a CL be changed?	55	77
Question 11	What should the nurse do when the CL dressing is loose?	58	76
Question 12	When is sterile strategy needed in CL dressing change?	49	78
Question 13	How often should the insertion setting be cleaned?	59	75
Question 14	Proper hand hygiene prevents infection in the ICU settings	70	79
Question 15	Wash your hands with water and soap, at least for?	63	79

Note. Pre-test Mean: 9.59; Post-test Mean: 13.63

Calculation Formula: $n=79$ i.e., the number of nurses participating in education pre- and post-test. ($\#$ of correct answers x $\#$ of questions) divided by n = Per Question Mean (Sum of Per Question Mean) divided by $\#$ of questions = Pre- and Post-test Mean

CLABSI data

Initial assessment indicated high rates of CLABSI within the healthcare facility 3 months before the project. These data were obtained from the healthcare facility and categorized on the new cases of infection weekly. The considered cases were from the last 3 months before the start of the project. The data presented in Tables 1 and 2 Figures

3 and 4 and were derived from actual cases per week against number of patients admitted in the ICUs.

Table 1

CLABSI Rates 3 Months Before the Project

Weeks	2	1	3	4	5	6	7	8	9	10	11	12
CLABSI rates In %	45	45	55	35	29	35	25	33	47	43	32	44

Figure 3

CLABSI Rates Before the Project



After Educational Session (Posttest)

In addition to improved scores on the posttest, there was a decrease in the rates of CLABSI after the education session. The approximate percentage rate decrease post education was: 27.62% (avg % pre-education [39%] minus avg % post-education [11.38%])

Table 2

CLABSI Rates 2 Months After the Project

Weeks	1	2	3	4	5	6	7	8
CLABSI rates In %	20	15	12	12	6	10	5	11

Figure 4

CLABSI Rates After the Project



Recommendations

The major recommendation based on the outcomes of this project is to offer this program yearly across all ICU settings at the project site. Additionally, peer audits to review the central line practices and deliver immediate feedback to nurses on their use of CUSP concepts to decrease rates of CLABSI is also recommended. Another recommendation is to review monthly rates of CLABSI with nursing staff at staff meetings. The final recommendation is evaluating the CUSP to identify the necessary changes based on the available evidence. The project stakeholders suggested the proposed recommendations that were part of the project plan and presented them to all team members.

Publishing the CLABSI rates from the ICU and positive patient outcomes every month would encourage nurses to continue using the evidence-based central line practices. The publication of the rates would enhance consistency in the control practices hence reducing the CLABSI rates. Every year, the review of the literature and evidence-based practices would enhance the most appropriate content to be included in the program. The content needs to be updated based on the current trends in the healthcare sector to address the current problems based on current practices and literature.

Contributions of the Doctoral Project Team

A stakeholder group that included ICU nurses, and the project stakeholders are responsible for the planning, implementation, and evaluation of the project using the ADDIE model. The focus of the DNP project team was on the development and assessment of the educational session for nursing staff. CLABSI rates were collected two

months after the academic session and compared with pre-session rates to determine any reduction. The project stakeholder was very active and provided or responded to the questions, suggestions, and recommendations. The team members worked together to implement the recommended evidence-based practices.

Strengths and Limitations of the Project

Strengths

The project received the needed backing from the group members and the healthcare facility. The project depended on the quality of literature related to the problem being addressed. The project did not only depend on the available abundant literature from the peer-reviewed journals, but it also relied on the national guidelines and professional organizations that offered critical information on the strategies to reduce CLABSI rates.

Limitations

The project's primary focus was the CLABSI rates within the ICU settings at one site limiting generalizability. Most of the literature I found focused on the CLABSI within the ICU settings. Central line infection is not only common in ICU settings; the project does not address central line infection outside ICU settings. Not all the literature used in the project was within the last five years, some of the articles used were published in 2010, and the current strategies used to reduce the rates of CLASI have been used for the last ten years with very little change observed. Most of the studies cited works published in the last ten years, which resulted in limitations to the project.

There is no standardization in the prevention and management of the problem. The peer-reviewed journals, national guidelines, and organizations consider CUSP one of the best approaches to maintaining central line infection. More research is needed to conclude a standardized approach to addressing central line infections in the healthcare sector. A comprehensive Unit-Based Safety Program (CUSP) is recommended as one of the best strategies to reduce the rates of CLABSI within healthcare facilities.

Section 5: Dissemination Plan

Introduction

Lack of knowledge by nurses concerning the causes and prevention of CLABSI results in high rates of CLABSI in healthcare facilities. Educating ICU nursing staff about CUSP and its application in reducing CLABSI rates was the project's focus in reducing the rates of CLABSI. I developed the program in collaboration with different stakeholders, including the nurses practising in the ICU settings, and reviewed the final results with the ICU department's nurse leaders prior to implementation.

Analysis of Self

I have always been interested in improving nursing practice throughout the healthcare sector. I have been focused on changes within my practice area, and I do everything it takes to remain updated on the current trends in the healthcare system. I spend most of my time in a clinical environment, mentor students learning from different healthcare facilities, read published journals concerning the trending issues, and attend educational programs and conferences linked to oncology. I have been an active member of different nursing organizations where I have been able to gain skills and experiences in addressing the healthcare issues; through such healthcare organizations, I have been able to network with different colleagues across the country and learned about some new practices that would help me address healthcare problems.

Long-life learning is a priority for healthcare providers, and I decided to continue with my education to have the necessary knowledge to practice. I have gained leadership skills and understand health policy and evidence-based practices. Walden University

accepted my request to study a Doctorate Nursing Practice program, which motivated me to develop more interest in healthcare occupation and mentor other students who would like to study nursing as their career. While studying my nursing career at Walden University, I got the opportunity to improve in research, writing, communication, leadership, and understanding of my role as a nurse in the policy-making process.

My ability to use evidence-based practices grounded on nursing theories, research, and experiments has improved. My research on the solutions to the healthcare sector's problems is based on evidence-based practices. Evidence-based practices promote healthcare within the community. I learned management skills, and in most cases, I acted like a nurse leader because I understood the manager's tasks. My values and professional excellence are motivated by ethical conduct and political commitment. My effectiveness has improved from the practicum experiences.

I possess leadership skills that consist of knowledge and ability handle different situations within and outside the professional field. I can now develop and build effective relationships that enhance my personal and professional networks. I can use my experiences and the findings from my research to promote a wide possible reach to my networks and strengthen the meaning of my research.

Addressing issues facing the healthcare sector requires a scholar-practitioner who can understand the origin of the problem and suggest evidence-based practices to solve the problem. My research and understanding of problems facing the healthcare sector improved. As a nurse working in ICU at a cancer center care, it has been routine to conduct deep research on some of the problems I witness at the department and offer the

solutions to address the issue. One of the projects currently underway is how nursing staff education effectively reduces the CLABSI rates within the hospitals.

I have learned skills that have promoted my development as a scholar-practitioner and a nurse leader. The skills assisted me with a diverse understanding of problems within and outside the workplace. The management skills I have learned have enhanced my ability to manage team members and guide them. I use the skills to ensure that all the team members are included and accommodated. Management skills should be displayed so that everybody feels they are treated equally, and justice is served to the members regardless of their cultural background at the workplace. All the employees need to be motivated to deliver in their areas of specialization, resulting in good performance within the department.

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that all the team members are included and accommodated. Management skills should be displayed so that everybody feels they are treated equally, and justice is served to the members regardless of their cultural background at the workplace. All the employees need to be motivated to deliver in their areas of specialization, resulting in good performance within the department.

Summary

Patient safety is a top priority in the healthcare sector. Because CLABSI can be prevented, healthcare providers should research to have a standardized approach for preventing and controlling CLABSI.

The CUSP program enhances safety measures for the nurses and patients within the ICU settings to reduce CLABSI rates within the ICU settings. The educational program contained the significance of hand hygiene, types of CL, dressing changes, flushing strategies, and scrubbing of the hub.

I administered pre- and posttests to the participants. The evaluation was done to help the nurses who were still having challenges with the project to achieve the objectives. The program reinforced evidence-based practices for the nurses' ICU settings. Educating the nurses about safety measures while conducting central line practices remains the best and most standardized option for reducing CLABSI in the ICU settings.

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Appendix A: Table of Evidence

Citations	Design /method	Sample/ setting	Measure ment	Data analysis	Findings	Appraisal worth to practice of evidence
Balla, K. C. (2018). Decreasing central line-associated bloodstream infections through quality improvement initiative. <i>Indian Pediatrics</i> , 55(9), 753-756.	Systematic Review and Meta-Analysis of Quality Improvement Interventions Assess impacts of quality improvement through the use of care bundle approach on CLABSI Infection rates QI team created For the infection Control in NICU	Doctors From Neonatology and microbiology departments NICU nurses Administration Members A 30 bed Unit catering 338 infants Control 1227 infants Intervention group	Chi-square or Fisher's exact test to compare the variables	Microsoft excel word to compare incidence rates of infection	Decline in health-related infections through the use of QI principles	Limitations The study only focus on the infection rates and not nurse knowledge Strength Significant reduction rates through the use of QI principles
Bell, T., & O'Grady, N. (2017). Prevention of central line-associated bloodstream infections. <i>Infectious Disease Clinic of North America</i> , 31(3), 551-559.	Literature review and EBP implementation Assess evidence-based guidelines and other technology used to reduce CVC	Data Compiled from other studies	Comparison of different strategies (evidence-based and technology)	Not available	Prevention of CLABSI need multiple techniques education and training and technological approaches	Strength Focus is on Evidence-based and technological approaches to reduce CVC related infection Limitations The study does not show how ICU nurses are included in the research
Bizarro, M. J., Sabo, B., Noonan, M., Bonfiglio, M. P., Northrup, V., Diefenbach, K., & Central Venous Catheter Initiative Committee (2010). A quality improvement initiative to reduce central line-associated bloodstream infections in a neonatal intensive care unit. <i>Infection</i>	Quasi-experimental study design assess educational interference designed to enhance quality of nurse practice in NICU settings	NICU patients who are having CVC	Review of data collected for 2 years and published data to establish guidelines for CVC management	Pre Intervention and post intervention comparison data and from the NHSN	CLABSI rates can be reduced through compliance to the evidence-based practice guidelines	Strengths The study focused on evidence-based practices and obtain data from recognized organizations such as NHSN. Limitations The research does not involve patients

control and hospital epidemiology, 31(3), 241–248. https://doi.org/10.1086/650448						
Haddadin, Y., Annamaraju, P., & Regunath, H. (2020). <i>Central line-associated bloodstream infections (CLABSI)</i> . StatPearls.	Descriptive research design The research provides evidence-based practices organizations can use to reduce CLABSI Data collection through surveillance	Healthcare facilities	Not available	Ration Comparison based on data from different organizations	Healthcare organization using CLABSI bundles on their patients witness decline in the rate infection	Strengths The research includes both patients and family members in the education program Limitations nurses' not included in the training program
Richter JP, Scherk A. S. (2018). Targeted implementation of the Comprehensive Unit-Based Safety Program through an assessment of safety culture to minimize central line-associated bloodstream infections. <i>Health Care Management Review</i> , 43(1), 42-49.	Descriptive research design the research is to identify critical factors of safety culture before execution of CUSP linked to the reduction of CLABSI Staff survey response and the rates provided by hospital units	649 Hospital units	Binomial regression and logistics to assess hospital Units	Binomial regression	Hospital units slow down CLABSI rates drastically Promoting CUSP in hospitals is based on hospitals focusing on safety measures before executions stage	Strengths Interventions are generated within the hospitals Limitations The intervention does not have immediate impact
Latif, A. (2015). Implementing a multifaceted intervention to decrease central line-associated bloodstream infections in SEHA (Abu Dhabi Health Services Company) intensive care units: The Abu Dhabi experience. <i>Infection Control</i>	Prospective cohort collaborative study design to assess in case execution of multifaceted intervention effectively reduce CLABSI	ICU in Abu Dhabi Healthcare Services Organization Facilities located in Emirates of Abu Dhabi Healthcare Providers	CLABSI rates	Interrupted time-series studies revealed significant results	Steady reduction of the world's morbidity and mortality to CLABSI is possible in ICU settings using multifaceted interventions	Limitations The study is only focused on ICU settings Strengths Intervention is based on behavior change

<i>and Hospital Epidemiology</i> , 36(7), 816-822.						
Marshall, J. (2014). Strategies to prevent central line-associated bloodstream infections in acute care hospitals: 2014 update. <i>Infection Control and Hospital Epidemiology</i> , 35(7), 753-771.	Literature review on several strategies to CLABSI in acute care facilities	Nurses and patients	Not available	Not available	Hand hygiene one of the strategies to manage CLABSI	Strengths The research provides options that can be used Limitations The research does not explain deeper how the strategies can be applied.
Mezoff, E. A., Roberts, E., Ernst, D., Gniadek, M., Beauseau, W., Balint, J., & Dienhart, M. (2021, May 22). Elimination of hospital-acquired central line-associated bloodstream infection on a mixed-service pediatric unit. <i>Journal of Parenteral and Enteral Nutrition</i> . https://doi.org/10.1002/jpen.2195	Descriptive research design Demonstrate impacts of multidisciplinary prevention of CLABSI	Kids with IF A 24-bed medical surgical unit	CLABSI rates through comparison of different events	CLABSI rate per 1000 CVC days	The intervention linked with culture reduced the rates of CLABSI	Strengths Intervention and support and empowerment contributed to the elimination of CLABSI Limitations The study did not focus on healthcare providers
Miller, K. (2016). Using the comprehensive unit-based safety program model for sustained reduction in hospital infections. <i>American Journal of Infection Control</i> , 44(9), 969-976.	Retrospective pre-test/post-test design Assess impacts of CUSP in reducing CLABSI and report on the CAUTIs and VAP in ICU Settings	2 ICU Settings putting into practice CUSP and other local safety measures	CLABSI rates	Mendeley	CUSP did not led to the decrease CLABSI but also CAUTI and VAP CUSP model enhanced application of evidence-based practices	Strengths The study also focused on other infection like VAP and CAUTI Limitations The study does not outline the role of nurses
O'2 O'Grady, N. P., Alexander, M., Burns, L. A., Dellinger, E. P., Garland, J., Heard, S. O., Lipsett, P.	Literature Review and Guideline Review of nursing practice in	Intravascular catheters related diseases in healthcare facilities	Education and training intervention	Complying with the guidelines CLABSI rates	Elimination of CRBSI is a challenge but with consistent	Strengths The study provides options to be used to eliminate

<p>A., Masur, H., Mermel, L. A., Pearson, M. L., Raad, I. I., Randolph, A. G., Rupp, M. E., Saint, S., & Healthcare Infection Control Practices Advisory Committee (HICPAC) (2011). Guidelines for the prevention of intravascular catheter-related infections. <i>Clinical Infectious Diseases: An Official Publication of the Infectious Diseases Society of America</i>, 52(9), e162–e193. https://doi.org/10.1093/cid/cir257. IIII</p>	<p>preventing central line infections</p>	<p>Healthcare personnel</p>			<p>efforts it is possible</p>	<p>CRBSI Limitations Analysis of data not included</p>
<p>Pitts, S. I., Maruthur, N. M., Luu, N. P., Curreri, K., Grimes, R., Nigrin, C., & Peairs, K. S. (2017). Implementing the Comprehensive Unit-Based Safety Program (CUSP) to improve academic primary care practice patient safety. <i>The Joint Commission Journal on Quality and Patient Safety</i>, 43(11), 591-597.</p>	<p>Retrospective review over 6 months Pretest-Posttest design. successful impacts of CUSP in enhancing safety among the inpatient settings</p>	<p>Academic primary care nursing staff clinician</p>	<p>Safety Attitude Survey</p>	<p>Mendeley</p>	<p>CUPS is the appropriate tool to address safety issues in ambulatory settings</p>	<p>Strengths The study included both staff and clinicians Limitations the assessment only measure safety issues</p>
<p>Weaver, S. J., Weeks, K., Pham, J. C., & Pronovost, P. J. (2014). On the CUSP: Stop BSI: Evaluating the relationship between central line-associated bloodstream</p>	<p>Correlation research design evaluate the relationship between CLABSI rates and patient security climate</p>	<p>237 adults CUSP Stop BSI project</p>	<p>CLABSI rates</p>	<p>Regression</p>	<p>Fewer CLABSI rates are linked to safety climate outline</p>	<p>Strengths The research Include general safety of the patient based of CUSP model Limitations It is not clear</p>

infection rate and patient safety climate profile. <i>American journal of infection control</i> , 42(10), S203–S208. https://doi.org/10.1016/j.ajic.2014.05.020 .	outline.					how CUSP model was applied in the study
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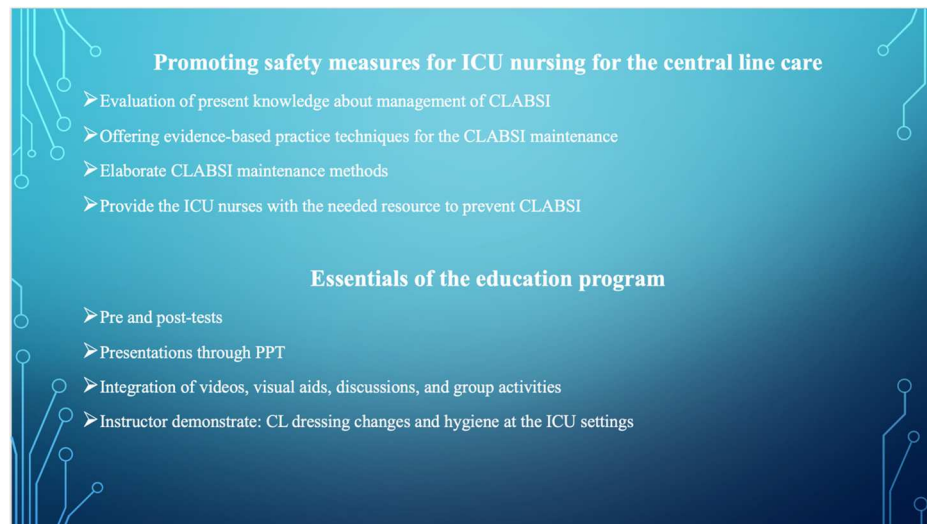
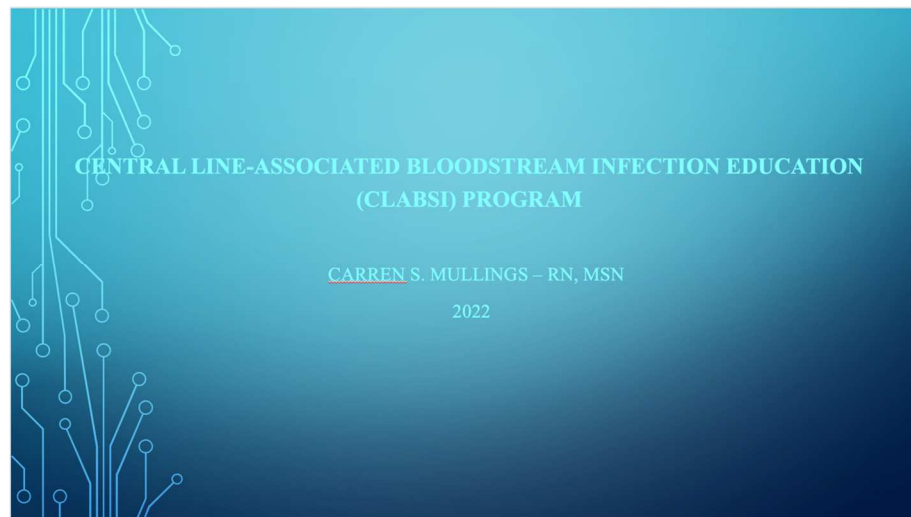
Appendix B: Nursing Education Plan

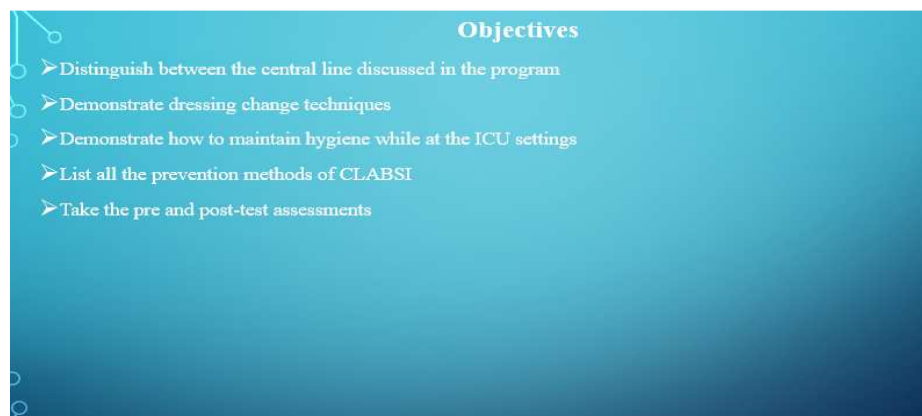
Time	Objectives	Content	Methods and Materials	Evaluation Methods
0900-0930 30 minutes	Introduction and discussion on the CUSP program for the whole day and the 15 assessment multiple-choice questions			
Module 1 CLABSI 0930-1030 One hour	In the end the participants should be able to do the following: 1. Define what is CLABSI 2. Explain how CLABSI is detected 3. Explain Pathogenesis of CLABSI 4. Explain the impacts of CLABSI	The instructor will explain the following: 1. Background information of CLABSI 2. Explain was CLABSI is 3. How CLABSI is Detected 4. Pathogenesis of CLABSI 5. Impacts of CLABSI	Lecture through PowerPoint and visual aid	Questions: 1,2,3 with multiple choices
Module 2 A. Different types of Central Line	At the end of the session participants should be able to: 1. Specify	The instructor will Explain: 1. Explain the types	Lecturing through PPT Discussion within	Questions: 4,5,6 with multiple

1030-1130 One hour	differently forms of central line	of central line within the ICU	the participants on types of CL (30 minutes) Participants engage in group activities to Identify types of CL (30 minutes)	choices
Module 2 B. CLABSI prevention through CUSP 1130-1230	At the end of the session participants should be able to: 1. Define CUSP 2. How to use the CUSPS methods 3. Components of toolkit for preventing CLABSI 4. The toolkit for preventing CLABSI 5. Explain the importance patients being involved in safety measures and the signs of CLABSI infections	The instructor will: 1. Define CLABSI 2. Explain how to use the CUSP methods and the core CUSP toolkit Explain how to assess, implement and to overcome the challenges 3. Explain to patients involvements in safety measures and signs of the infections	Lecture through PPT, videos, and group activities and discussion on how to apply CUSP methods	Questions: 7,8,9 with multiple choices
1230-0100 (30 minutes break)				
Module 3 A. Central Line Dressing changes 0100-0200 One hour	Participants will be Expected to: 1. Explain types of central line dressings applied in ICU 2. Explain when the CL dressings need to be changed in ICU and provide reasons it should be changed among the ICU	The instructor will explain: 1, All central line addressing that can be applied in ICU patients 2. Explain the dressing changes and pressure among the ICU patients 3. why change central line dressings	Lecture through PPT	Questions: 10, 11, 12 with multiple questions

	patients			
Module 3 B, Hygiene within ICU settings 0200-0300	The participants are expected to 1, Explain importance of hygiene in ICU settings 2. How to promote hand hygiene in ICU settings 3. Significances of Appropriate hand hygiene practices in ICU settings.	The facilitator is expected to discuss: 1, Explain Significances of hygiene in ICU settings and importance of proper hand hygiene 2. Elaborate on how to promote hygiene in the ICU settings	Lecture through PowerPoint	Questions: 13, 14, 15
C. Central line dressing change and proper hygiene within the ICU settings demonstrations 0330-0400 One hour	The participants are expected to: 1, Appropriately Display a central line addressing change and hygiene in ICU settings	Instructor is expected to address: How to promote hygiene and CL addressing changes	Group discussions and skill development	Will not be graded but immediate feedback will be given
0400-0430 (30 minutes break)				
Question and answer session before the protest 0430-0500				
End of education program Evaluation 0530-0545 (15 minutes) to take the posttest questions with multiple choices	Participants are expected to take 15 multiple choices questions	Facilitator to give out the 15 questions	Multiple choices for the protest	Administering the protest questions


Appendix C: CLABSI Education Program





Objectives

- Distinguish between the central line discussed in the program
- Demonstrate dressing change techniques
- Demonstrate how to maintain hygiene while at the ICU settings
- List all the prevention methods of CLABSI
- Take the pre and post-test assessments



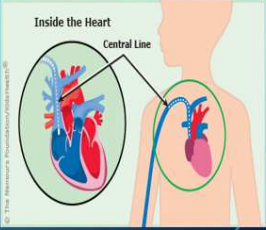
Module 1

Overview

- Introduction
- Pre-test
- Terminologies
- CLABSI
- CLABSI pathogenesis

Terminologies

- **Healthcare associated infection (HAI):** Infections that patients get as they receive healthcare services like medical and surgical services
- **Central line (CL):** An intravenous (IV) line that moves to a vein next the heart or within the heart
- **Central line associated bloodstream infections (CLABSI):** An infection caused by bacteria that enters the body through CL then to the bloodstream.
- **Comprehensive unit-based safety program (CUSP):** Strategies that assist healthcare provider to offer safe care based on teamwork, evidence-based practices, and science of safety



The diagram illustrates a central line (CL) inserted into a vein. A callout box titled 'Inside the Heart' shows a detailed view of the heart and the central line's connection to the bloodstream.

Impacts of CLABSI

AHRQ

- Lethal and common infection within the healthcare facilities
- 1 out of 25 patients are affected
- Over one million patients affected every year
- Cause the economy a burden of 30 billion every year
- It is a threat to the safety of the patients

Why use evidence-based practices for central line care

- To enhance patient outcomes through patient safety and quality services
- To minimize the exposure of infection through satisfying the patients expectations and using standardized care

How to determine CLABSI

- Detected through a confirmed laboratory bloodstream infection that happen in the last 48 hours of the catheter insertion

Pathogenesis of CLABSI

Before the answers are displayed, please write down what you think are the route causes of the infection

- Contaminated medication equipment or fluids
- From the dirty hands of the healthcare provider due to the manipulation of the lines
- Catheter location
- Connections settings
- From the patient own skin flora
- From the vein from an infected area to uninfected areas

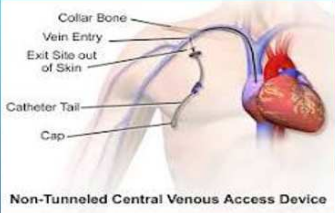
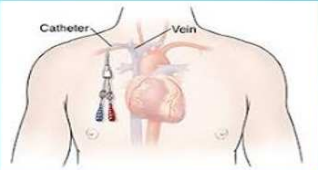
Module 2

Overview

- Types of CL
- Valve and non-valve
- Tunnel and non-tunnel
- Images of the CL

<p>Valve</p> <ul style="list-style-type: none"> ➤ Anti-reflux valve ➤ Control the back flow of blood ➤ Stops the air from the venous circulation ➤ Heparin flush not needed ➤ Lacks clamps 	<p>Non-Valve</p> <ul style="list-style-type: none"> ➤ lack anti-flux valve ➤ constant flushing required ➤ unclamp before and after use ➤ consist of clamps
<p>Tunnel</p> <ul style="list-style-type: none"> ➤ Operating insertion is needed ➤ Last long time (1,2,3 lumen) ➤ Apply post placement confirmation ➤ Exposer for CLABSI and thrombosis ➤ Used for IV infusions 	<p>Non-Tunnel</p> <ul style="list-style-type: none"> ➤ Placed at the bedside ➤ last for short time (1,2,3 lumen) ➤ apply post placement conformation ➤ exposer for infection compared to tunnel ➤ used for pressure checking and monitoring

Images of CL

Non-Tunneled Central Venous Access Device

Module 2: Part B

Overview

CLABSI management

- Insertion setting valuation
- Catheter valuation
- Symptoms of CLABSI
- CUSP elements
- Proper hygiene
- Maintaining sterility
- Involvement of patients in safety measures

CLABSI prevention

Insertion settings valuation

- Visual daily valuation of the insertion setting
- Before any access to the insertion settings it should be assessed
- Check for the signs and symptoms of infection

Catheter valuation

- Check for cracks, linkages and any mechanical problems
- In case of any complication please notify the clinician responsible

Symptoms and signs of CLABSI

Tenderness, fever, pain, redness, bleeding, and warmth around the insertion area

CUSP toolkit

- Strategies that assist healthcare provider to offer safe care based on teamwork, evidence-based practices, and science of safety
- The toolkit consist of assessment, implementation and solution for the problem
- They are standardized interventions, but based on the on the ICU settings

Some of the strategies needed to reduce CLABSI

- Proper hand hygiene
- Change of dressing immediately when loosen or contaminated with soil
- Documentation and assessment should be done everyday
- Clear semipermeable dressing need to be new after every 5-7 days
- Apply positive pressure valve
- Brush the hub for 15 seconds



How to maintain sterility

- Sterile field should be on a clean surface
- Avoid touching the sterile field
- Items should be away from the sterile field

Patients' involvement in safety practices

- Infection prevention strategies are good for both patients and their family members
- It helps patients to practice proper hand hygiene
- Patients learn to detect early signs and symptoms of infections
- Patients report to the healthcare providers in case their central line loose, wet or contaminated with soil.

Module 3: Part A

CL dressing change

Overview

- Types of CL dressing change
- Appropriate time to change CL dressing
- Why it is important to change the CL dressing

Types of CL dressing



- The CL dressings should be changed after every seven days according to the policy
- The change should be made when the dressing is wet, loose, or when contaminated with soil
- While changing the CL dressing the clinician needs to wear a mask, sterile gloves, wash his/her hands, apply a microbial while dressing

Module 3: Part B Proper hand hygiene

Overview

- Importance of general and hand hygiene in ICU settings
- Promoting hand hygiene

Importance of proper hand hygiene

- Proper hand hygiene reduces the exposure to CLABSI
- General hygiene ensures that all the items used in the ICU settings are always clean to reduce the risk of exposure

Promoting hygiene in the ICU settings

- Provide hand sanitizers in each department within the healthcare facility
- Pay close attention to hand washing at shift because most clinicians do not wash their hands as they start their duties
- Train nurses on the importance of hand washing and general hygiene.

Module 3: Part C

- Central line dressing change and proper hygiene within the ICU settings demonstrations
- Questions and answer session before the post-test

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Appendix D: Nursing Education Pretest

Circle the most appropriate answer for you

1. Central line-associated bloodstream infections (CLABSI) are manageable
 - A. Correct
 - B. Wrong
2. CLABSI pathogenesis
 - A. Happen from contamination during insertion line
 - B. Happens from the client's membrane
 - C. None of the above
 - D. Can occur everywhere alongside the IV scheme because of the influence of the line
3. CLABSI are detected by:
 - A. A contagion
 - B. Fever
 - C. An infection confirmed in 48 hours of a supplement of CL
 - D. A contagion confirmed within 24 hours of insertion of CL
4. What is one feature of the valve catheter
 - A. It lacks an anti-reflux valve
 - B. It has an anti-reflux valve
 - C. It needs to be unclamped before use
 - D. When not used, it should be clamped always
5. Non-tunnel catheters
 - A. Used for short-term
 - B. Lack of the subcutaneous cuff to control bacteria movement
 - C. Rate of infection is higher than in tunnel catheters
 - D. None of the above
6. Features of tunnel catheters

- A. Surgery procedure necessary for insertion
 - B. Control movement of bacteria because of Dacron cuff
 - C. Can last for a long time
 - D. All are correct
7. Compressive Unit-Based Safety Program (CUSP) focuses on
- A. Safety measures through evidence-based practices
 - B. Training nurses on safety measures
 - C. Patient safety
 - D. All the above
8. CUSP is based on the following expect
- A. Assessment
 - B. Implementation
 - C. Solution
 - D. Evaluation
9. Which of the following is the role of a nurse manager in CUSP
- A. Obtain feedback from the staff
 - B. Implement the program alone
 - C. Assess care offered in their unit
 - D. None of the above
10. How often should a CL be changed?
- A. In case wet, stained, or when unfastened
 - B. Every Sundays
 - C. A and B
 - D. None of the above
11. What should the nurse do when the CL dressing is loose?
- A. Change the CL dressing

- B. Record the incident and immediately reinforce the CL dressing
 - C. Record and continue with other responsibilities
 - D. Reinforce the CL dressing
12. When is sterile strategy needed in CL dressing change
- A. When cleaning the insertion setting
 - B. To change the caps
 - C. When using a new dressing
 - D. All are correct
13. How often should the insertion setting be cleaned
- A. before and after the insertion procedure
 - B. Only after the insertion procedure
 - C. only before the insertion procedure
 - D. None of the above
14. Proper hand hygiene prevents infection in the ICU settings
- A. False
 - B. True
15. Wash your hands with water and soap, at least for?
- A. 2 minutes
 - B. 1 minute
 - C. 15 seconds
 - D. 45 seconds

Appendix E: Nursing Education Post-test

Circle the most appropriate answer for you

1. Central line-associated bloodstream infections (CLABSI) are not manageable
 - A. Correct
 - B. Wrong
2. CLABSI pathogenesis
 - A. Occur from contamination during insertion line
 - B. Happens from the patient's skin flora
 - C. None of the above
 - D. Can occur anywhere within the IV system because of the influence of the line
3. CLABSI are detected by:
 - A. A contagion
 - B. Fever
 - C. An infection confirmed within 48 hours of a supplement of CL
 - D. A contagion confirmed within 24 hours of insertion of CL
4. What is one feature of the valve catheter
 - A. It lacks an anti-reflux valve
 - B. It has an anti-reflux valve
 - C. It needs to be unclamped before use
 - D. At what time not used, it should be clamped always
5. Non-tunnel catheters
 - A. Used for short-term
 - B. Lack of the subcutaneous cuff to control bacteria movement
 - C. Rate of infection is higher than in tunnel catheters
 - D. None of the above
6. Features of tunnel catheters

- A. Surgery procedure necessary for insertion
 - B. Control movement of bacteria because of Dacron cuff
 - C. Can last for a long time
 - D. All are correct
7. Compressive Unit-Based Safety Program (CUSP) focuses on
- A. Safety measures through evidence-based practices
 - B. Training nurses on safety measures
 - C. Patient safety
 - D. All the above
8. CUSP is based on the following expect
- A. Assessment
 - B. Implementation
 - C. Solution
 - D. Evaluation
9. Which of the following is the role of a nurse manager in CUSP
- A. Obtain feedback from the staff
 - B. Implement the program alone
 - C. Assess care offered in their unit
 - D. None of the above
10. How long should a central line last?
- A. In case wet, soiled, or when unfastened
 - B. Every Sundays
 - C. A and B
 - D. None of the above
11. What is the role of a nurse when CL dressing is loose?
- A. Change the CL dressing

- B. Record the incident and immediately reinforce the CL dressing
 - C. Record and continue with other responsibilities
 - D. Reinforce the CL dressing
12. When is sterile strategy needed in CL dressing change
- A. When cleaning the insertion setting
 - B. To change the caps
 - C. When using a new dressing
 - D. All are correct
13. After how long should the insertion setting be cleaned?
- A. before and after the insertion procedure
 - B. Only after the insertion procedure
 - C. only before the insertion procedure
 - D. None of the above
14. Proper hand hygiene does not prevent infection in the ICU settings
- A. False
 - B. True
15. Wash your hands with water and soap, at least for?
- A. 2 minutes
 - B. 1 minute
 - C. 15 seconds
 - D. 45 seconds