

Fall 2020

Developing an Interdisciplinary Team Checklist to Assess Readiness for Appropriate Medical Removal of Central Venous Catheter (CVC)

Miranda Harper

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DEVELOPING AN INTERDISCIPLINARY TEAM CHECKLIST TO ASSESS
READINESS FOR APPROPRIATE MEDICAL REMOVAL OF
CENTRAL VENOUS CATHETER (CVC)

by

Miranda Rawls Harper

A Doctoral Project
Submitted to the Graduate School,
the College of Nursing and Health Professions
and the School of Leadership and Advanced Nursing Practice
at The University of Southern Mississippi
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Nursing Practice

Approved by:

Dr. Cathy Hughes, Committee Chair
Dr. Marti Jordan, Committee Member
Dr. Steven Stogner, Committee Member

December 2020

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Published by the Graduate School



ABSTRACT

Healthcare-associated infections are not a new concept in health care. Many different health-care-associated infections have been established over the years including but not limited to healthcare-associated pneumonia, catheter-associated urinary tract infection, and central line-associated bacterial infection. While these infections are common in healthcare facilities, the rates of these infections are still prevalent in hospitals across the United States. This DNP project focused on central line-associated bacterial infections.

An interdisciplinary team checklist to assess readiness for appropriate medical removal of central venous catheter (CVC) was developed to assess intensive care unit patients for early appropriate medical CVC removal. The interdisciplinary team consisted of the project director, Critical Care Medical Director, and ICU Nurse Manager. The checklist was utilized for four weeks in the adult intensive care unit. At the end of the four weeks, the results indicated that the checklist helped identify patients eligible for early CVC removal through medical indications to continue or discontinue the CVC and the interdisciplinary team members were assessed for their satisfaction with the checklist.

The project was completed for a total of 20 days. During the four weeks, 874 total patients were encountered on daily rounding. Of those 874 total patients, only 289 had a CVC line placed. The total number of CVCs with indications to keep the line was 231 and the total number of CVCs without indications to keep the line was 58. The interdisciplinary team survey revealed that 100% of the team members were satisfied with the checklist, ease of use of the checklist, ability to identify patients for early removal and would implement the checklist into the unit's day to day procedures.

ACKNOWLEDGMENTS

I would like to thank the professors at The University of Southern Mississippi, including Dr. Cathy Hughes and Dr. Marti Jordan who collaborated with me in order to make this project possible. Without guidance and direction, my goals would not have been achieved. I would also like to acknowledge two of my peers, Amber Ryals and Diane Van, for their unending support throughout my educational journey.

DEDICATION

I cannot put into words the gratitude I have for my husband, James Harper III, and parents, Russell and Wanda Rawls, for their constant love, support, and perseverance throughout my educational adventure. These individuals have been the motivation in my life by always encouraging me to strive to reach my goals no matter how big or small they may be. They have taught me to keep God first, and with faith in Him, everything will fall into place.

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LIST OF ABBREVIATIONS

<i>AACN</i>	American Association of Colleges of Nursing
<i>CLABSI</i>	Central Line Associated Bacterial Infection
<i>CMS</i>	Centers for Medicare and Medicaid Services
<i>CRBSI</i>	Catheter Related Bloodstream Infection
<i>CVC</i>	Central Venous Catheter
<i>DNP</i>	Doctor of Nursing Practice
<i>EMR</i>	Electronic Medical Record
<i>HIPAA</i>	Health Insurance Portability and Accountability Act
<i>ICU</i>	Intensive Care Unit
<i>IDT</i>	Interdisciplinary Team
<i>IRB</i>	Institutional Review Board
<i>TPN</i>	Total Parenteral Nutrition

CHAPTER I - INTRODUCTION

Introduction

Central line-associated bloodstream infections (CLABSI) are major healthcare-associated infections related to central venous catheter use (CVC). Bell and O’Grady (2017) state “There are two major definitions used to describe bloodstream infections related to CVCs: catheter-related bloodstream infections (CRBSI) and central line-associated bloodstream infection” (para. 3). These two definitions are differentiated by CRBSI based on clinical criteria related to a specific patient in which the diagnosis is being considered and requires specialized microbiological techniques to specifically identify the catheter as the source of bacteremia, versus CLABSI being a simplified definition based on surveillance criteria that identify bloodstream infections in patients with CVCs in which there is no other obvious secondary source for bacteremia (Bell & O’Grady, 2010). Central venous catheters are used in many critically ill patients to provide access for total parenteral nutrition, harsh irritating drugs, intravenous access for patients with conditions that make it difficult to obtain a peripheral intravenous catheter, fluid volume resuscitation, hemodynamic monitoring, and as an introducer for a Swan Ganz catheter or hemodialysis catheter. There are many different risk factors for developing CLABSIs deriving from the patient, provider, and device characteristics. This project focused on patient characteristics that predispose individuals to develop a CLABSI and observation of the timing of the removal of the CVC. Characteristics that predispose patients to CLABSI include lengthy hospital stay before device placement, stark skin burns, malnutrition from lack of proteins or calories, and immunocompromised or neutropenic hosts (Chopra et al., n.d.).

Problem Statement

CLABSIs are major healthcare-associated infections with detrimental effects. CLABSIs lead to thousands of patient deaths per year and billions of dollars in further costs to the United States, nevertheless, these infections are preventable (Centers for Disease Control and Prevention [CDC], 2011). These infections can be prevented if all team members involved in the insertion and maintenance of CVCs implement the appropriate precautions necessary. The proper care in the fundamentals of insertion, maintenance, and early removal must all be adhered to make an impact on decreasing CLABSI rates. Currently, the facility has no universal standards for the timing or enforcement of removing CVC devices.

This Doctor of Nursing Practice (DNP) project focused on the early removal aspect of CLABSI prevention. To improve the CLABSI rates at the chosen facility, this project evaluated the outcomes of implementing an interdisciplinary team-driven CVC removal checklist when the CVC is no longer medically necessary. A checklist was utilized to determine if the patient meets the requirements for CVC removal, and the decision was made to remove or leave the CVC in place until the following interdisciplinary team rounding.

Background and Significance

CLABSIs are challenging healthcare-associated infections for patients and hospitals equally. Nearly all patients in the Intensive Care Unit (ICU) setting obtain a CVC at some point in their ICU stay due to the critical and labile conditions these patients experience. Patients with CLABSIs undergo the effects of systemic infections which could lead to death. The effects of CLABSIs on hospitals include decreased

reimbursement from The Centers for Medicare and Medicaid Services (CMS) and increased financial burden. According to the Centers for Medicare and Medicaid Services (2020), “ We reduce the payments of subsection (d) hospitals with a Total HAC Score greater than the 75th of all Total HAC Scores [that is, the worst-performing quartile] by 1 percent” (para. 7). The United States has a range from 250,000 to 500,000 CLABSIs occurrences estimated per year resulting in a 10% to 30% mortality rate (Perin et al., 2016). These infections are the initial source of nosocomial bloodstream infections in the intensive care unit (ICU) with 80,0000 cases yearly costing \$300 million to \$2.3 billion; added cost could be as profound as \$30,000 per survivor, including one-week extended ICU stay and two to three extended weeks in the hospital (Frasca et al., 2010).

PICOT

Problem Description

Central line-associated bacterial infections are prevalent among many hospitals across the United States. These infections lead to increased patient morbidity and mortality. CLABSIs also lead to the increased financial burden of hospitals. The cost for single bloodstream infections in the U.S. is estimated to be \$16,500 and the mortality of patients with CLABSIs is 2-4-fold above those without CLABSIs (Wichmann et al., 2018).

In patients who have a central venous catheter (P) inserted in the intensive care unit (S), does an interdisciplinary team-driven checklist to assess appropriate medical readiness for central venous catheter removal (I) versus no checklist (C) accurately assess factors and increase awareness for early identification of patients eligible for central venous catheter removal (O)?

Needs Assessment

The need for this project is increased in this population of interest. Patients that require central venous catheters for treatment are among the sickest and vulnerable to healthcare-acquired infections (McCraw et al., 2018). ICU patients are at a higher risk for CLABSIs due to the urgent situations under which CVCs are placed, how frequently they are accessed, and an extended number of catheter days (McCraw et al., 2018).

The facility where the project will be completed is composed of a 48-bed intensive care unit. This facility scored a 1.222 for infections in the blood; the worst hospital scored a 2.952 (Leapfrog Group, 2019). The score represents a comparison of CLABSIs that occurred at this hospital to the number of infections projected for this hospital, considering the number of central lines used and other factors such as the facility type and size (Leapfrog Group, 2019). This facility's score was barely under half of the worst scoring hospital; therefore, this illustrates how important the priority is to reduce CLABSI rates at this facility. The unit has 8 cardiovascular recovery beds, 8 cardiac care beds, and 32 medical intensive care unit beds. The patients range from cardiac, trauma, neurological, medical, and surgical intensive care unit patients.

The facility's ICU supervisors have consulted the representatives of the company where they purchase central venous line dressings to perform educational training with the bedside nurses on proper dressing application. Management of the facility's ICU is utilizing the education department to conduct training with nurses on the maintenance of the central venous catheters as well. The management staff of the facility's ICU is also requesting that physicians and practitioners write orders to remove central venous lines as

soon as medically able to and assess the daily needs of central venous catheters in patients during the daily care rounds.

Synthesis of Evidence

Literature and evidence support evidence-based knowledge on measures to prevent central line-associated bacterial infections. Through the database search, there are many articles and studies on different interventions on how to prevent this type of infection. However, the research is lacking in the adult population on the relationship between central venous catheter removal and central line-associated bacterial infections.

Key Word Search

The keyword search using four different databases include CINAHL, Cochrane Library, Google Scholar, and Medline. Each keyword search started with *central line-associated bloodstream infection* or *CLABSI*. The following keywords included *prevention*, *central venous catheter* or *CVC*, and *intensive care unit* or *ICU*, respectively. This search was built on each word, rather than searching for each word exclusively.

When using the CINAHL database, the final articles considered totaled to 119. Searching for *central line-associated bacterial infections* or *CLABSI* revealed a total of 783 articles. The search was then narrowed to *prevention* which gave 535 articles, followed by *central venous catheter* or *CVC* totaling 225 articles, and lastly *intensive care unit* or *ICU* narrowed the search down to a final 119 articles.

The Cochrane Library database narrowed the final count of articles down to 18. Searching for *central line-associated bacterial infections* or *CLABSI* exposed a total of 126 articles. The search was then narrowed to *prevention* which gave 66 articles,

followed by *central venous catheter* or *CVC* totaling 40 articles, and lastly *intensive care unit* or *ICU* narrowed the search down to a final 18 articles.

Google Scholar database leads to the most articles to decipher through. The final count for this database resulted in 8,550 total articles. Searching for *central line-associated bacterial infections* or *CLABSI* uncovered a total of 19,900 articles. The search was then narrowed to *prevention* which gave 17,600 articles, followed by *central venous catheter* or *CVC* totaling 12,400 articles, and lastly *intensive care unit* or *ICU* narrowed the search down to a final 8,550 articles.

The final database, Medline, was narrowed down to a total of 95 articles. Searching for *central line-associated bacterial infections* or *CLABSI* discovered a total of 1,054 articles. The search was then narrowed to *prevention* which gave 680 articles, followed by *central venous catheter* or *CVC* totaling 202 articles, and lastly *intensive care unit* or *ICU* narrowed the search down to a final 95 articles.

Indications for CVC Placement and Indications for CVC Removal

Central venous catheters are frequently placed in critically ill patients and are commonly done under emergency circumstances. Emergency circumstances can cause a break in aseptic technique such as being placed during cardiac arrest. Often when a provider is placing a central venous catheter line during an emergency, the femoral vein is the only access point due to less than ideal circumstances. According to Leib et al. (2020), “indications include patients with multiple, incompatible intravenous medications with limited peripheral access, or who are being treated with vasoactive or phlebosclerotic agents which may not be suitably cared for with a peripheral intravenous catheter alone” (para. 1). Other indications for central venous catheter placement include

temporary or permanent hemodialysis access, to introduce a Swan Ganz catheter to measure internal hemodynamics of the heart, or to introduce temporary venous pacemaker leads in the critically ill patient who has severe bradycardia or high-degree heart block (Lieb et al., 2020). Contrary, there are indications for immediate CVC Removal. These indications include proven and unresolved infection, end of treatment, device has exceeded recommended dwell time, unamendable/faulty/fractured device, proven thrombosis, unresolved occlusion, and unresolvable phlebitis/thrombophlebitis (Joint Commission, 2013).

Catheter Care Bundles

CLABSIs have been researched for many years. The evidence for CLABSI prevention is astounding. Most of the literature used focuses on catheter care bundles or protocols. Frasca et al. (2010), Gilmartin and Sousa (2016), Perin et al. (2016), and Wichmann et al. (2018) all concur that implementing and utilizing catheter care bundles supports a decrease in CLABSI rates in each of their studies and reviews. Each article utilizes the same care bundle which includes hand hygiene by using soap and water, cleaning the catheter insertion site with chlorhexidine rather than povidone-iodine, avoiding the femoral site when possible, and removal of the CVC as soon as it is not indicated.

However, a study by Wichmann et al. (2018) implements the catheter care protocol as a checklist while inserting CVC lines. This checklist includes setting, preparation of the person inserting the line, clothing and hand hygiene, and preparation of the patient. The study also included meta-data such as the date, start and stop time, physician, and assisting person. The results were very revealing, the control group

consisted of 2,898 CVC and the checklist group consisted of 1,518 CVC. Out of those CVCs, the CLABSI rate was 5.9 out of 1,000 catheter days for the control group and 3.8 out of 1,000 catheter days for the checklist group.

Early CVC Removal

When comparing the evidence-based knowledge of early CVC removal and catheter care bundles, the evidence for early CVC removal is not as abundant. CVC removal as soon as the catheter is not indicated makes a tremendous impact on the reduction of CLABSIs. Aufricht et al. (2019), Burnham et al. (2018), McCraw et al. (2018), and Tejedor et al. (2009), agree that early removal of CVC lines as soon as they are not indicated is a proven intervention in the reduction of CLABSIs. The study implemented by Tejedor et al. (2009), used two groups, pre-and post-intervention groups. The pre-intervention group included 531 CVC days and the post-intervention group included 312 CVC days. By implementing the early CVC removal among other interventions, the CVC days per patient on the ward were reduced from 14.8 to 10 days. The mean number of CVC days for an unnecessary catheter was reduced from 5.1 to 3.6 days. This intervention reduces catheter dwell time, and in return also reduces CLABSI rates.

Rationale

The evidence supports that reducing catheter dwell times and removing unnecessary catheters as soon as they are not indicated leads to decreased CLABSI rates. These patients are at risk for mortality, financial burden, and 30-day re-admissions as well. In a study conducted by Stevens et al. (2014), the results support that patients with

CLABSIs are twice as likely to die than patients without CLABSI and that CLABSIs are associated with higher total variable cost.

The research strictly for reducing CVC dwell time is lacking. There is a gap in the literature for decreasing CVC dwell time and the effects on CLABSI rates. Decreasing catheter dwell times have been included in many research articles about catheter care bundles, but the evidence is lacking for support of a reduction of dwell time independently.

In addition to the financial cost on the patient, the institution is also putting a strain on themselves and increasing the inpatient cost expenditure. This unit requires new evidence and unit-wide change to reduce their CLABSI rates. This study provided insight into the reduction of catheter days, the use of unnecessary CVCs, and a decrease in CLABSI rates by implementing an interdisciplinary team CVC removal checklist.

Theoretical Framework

This DNP project focuses on two frameworks. The theoretical framework is titled The Change Theory and the quality improvement process titled The Juran Trilogy. The following paragraphs include how the frameworks are useful for this project.

The Change Theory

The theoretical framework used to guide this project is The Change Theory by Kurt Lewin. The Change Theory is composed of three stages. These stages include the unfreeze stage, the change stage, and the freeze stage. The following discussion outlines how this theory was used in this DNP project.

The unfreeze stage requires individuals to neglect their prior methods and become aware of other ways to achieve their outcome. According to Morrison (2014), the

unfreezing stage requires individuals to "... unlearn their bad habits, and open up to new ways of reaching their objectives" (para. 5). During this stage, the interdisciplinary team focused on providing an alternative method for assessing the medical necessity of the CVC. The charge person of the checklist, whether it is the patient care coordinator or medical director, was taught how to answer the questions included on the checklist, and any follow-up teaching was discussed.

Morrison (2014) states that the change process "... if it is to be effective, it will probably take some time and involve a transition period" (para. 6). The change stage involves implementing the intervention of the interdisciplinary checklist to assess the medical necessity of the CVC. This stage was conducted for 30 days to determine the effectiveness of the CVC medical necessity checklist to guide the interdisciplinary team to decide for removal of the CVC. During the change stage, patients were assessed daily for CVC removal on multidisciplinary team rounds to ensure each patient is assessed consistently and the checklist is answered correctly.

The freeze stage focuses on making the implemented change long-lasting. For the change to be permanent, every effort must be made to make sure the new organization becomes standard (Morrison, 2014). The facility was provided with the results of the project, but ultimately it is up to the facility to ensure the changes have become part of standard measures of the unit.

The Juran Trilogy

The quality improvement process used in this project is The Juran Trilogy. The Juran Trilogy is composed of three important concepts. These concepts include quality planning, quality control, and quality improvement. According to Goetsch and Davis

(2016), “Quality planning involves developing the products, systems, and processes needed to meet or exceed customer expectations” (p. 11). The population of interest was evaluated to identify which steps and materials need to be included in the process to meet the highest expectations for this DNP project. This quality planning allowed for the best evidence-based approach to develop a proper interdisciplinary team CVC removal checklist. Goetsch and Davis (2016) state “Quality control involves the following processes: assess actual quality performance, compare performance with goals, and act on differences between performance and goals” (p. 11). To measure the outcomes, the checklist will be utilized to identify patients with and without indications to continue the CVC and the interdisciplinary team satisfaction survey will assess the team member’s satisfaction with the checklist. Lastly, quality improvement is stated by Goetsch and Davis (2016) as “The improvement of quality should be ongoing and continual” (p.11).

Specific Aims

The purpose of this DNP project is to develop an interdisciplinary checklist, identify patients eligible for early CVC removal, and assess the interdisciplinary team’s satisfaction and support to implement the checklist in the ICU. A long-term goal includes decreasing CLABSI rates and increasing nursing awareness/knowledge on the association between early central venous catheter removal and reduction of central line-associated bacterial infections. An assumption made is if the CVC catheter is removed when no longer medically necessary, the infection rate associated with CLABSI will decrease.

DNP Essentials

The DNP Essentials that follow closely along with this project include essential I, III, and VII. Essential I is Scientific Underpinnings for Practice. According to the

American Association Colleges of Nursing [AACN] (2017), this DNP essential underscores the importance of using science-based concepts to evaluate and enhance healthcare delivery and improve patient outcomes. This essential aligns closely with any DNP project based on the fact that each project is using science-based concepts and evidence-based research as a guide to develop policies to enhance health care and patient outcomes. This project was used to further enhance the patient's outcome, decrease CLABSI rates, and improve the facility's finances associated with infection rates. Essential III is defined as Clinical Scholarship and Analytical Methods for Evidence-Based Practice. Advanced education in systems leadership ensures that Doctors of Nursing practice possess the skills to facilitate meaningful organization-wide changes in healthcare delivery (AACN, 2017). Developing checklists and enhancing patient outcomes and satisfaction are essential components of a leader that the DNP graduate embodies. The ambition of this project is to ultimately develop meaningful organization-wide changes in the facility where the project will take place by implementing the interdisciplinary team CVC removal checklist. Finally, Essential VII is Clinical Prevention and Population Health for Improving the Nation's Health. The project focuses is characterized by the prevention of infection in a specific population, which associates closely with this DNP essential.

Summary

In summary, many researchers have executed studies on different interventions to reduce CLABSI rates. The research is copious on catheter care bundles, but further research on the relationship between the reduction of catheter days and CLABSI rates are lacking. The purpose of this DNP project is to determine if developing an

interdisciplinary team checklist to remove CVC when no longer medically necessary
reduces CLABSI rates.

CHAPTER II – METHODS

Introduction

The following chapter outlines this DNP Project so that the intervention could be duplicated by another researcher. The methods, intervention, and analysis of data are all given so that it can be easily followed and duplicated. The different ethical considerations have also been discussed so that no issues should arise.

Intervention

The interdisciplinary CVC removal checklist was the intervention used with the goals of creating the checklist, identifying patients eligible for early appropriate medical removal of CVC, and assessing the interdisciplinary team member's satisfaction with the checklist. The Interdisciplinary Team Checklist to Assess for Readiness for Appropriate Medical Removal of Central Venous Catheter (CVC) is provided in Appendix A. The project leader (DNP student) discussed the checklist with designated individuals (Critical Care Medical Director and ICU Nurse Manager) and answered any questions the individuals had.

This interdisciplinary CVC removal checklist was utilized daily during multidisciplinary team rounding for 30 days, with the exception of weekends. The checklist was completed by the project leader Monday through Friday for four weeks. The results from the daily checklist were kept in the project leader's possession for the entirety of the project.

The interdisciplinary team completed a satisfaction survey for the checklist. The Interdisciplinary Team Member Satisfaction Survey was completed at the end of the four

weeks. This survey was given to interdisciplinary team members on paper the final week of the four weeks and the project leader collected surveys once completed.

Population and Setting

The project took place in a 48-bed intensive care unit at a level 2 trauma center 500-bed healthcare facility in the southeast region. This unit provides an array of services ranging from many different specialties. The services this unit provides varies from acute exacerbations of chronic illness, trauma services for patients recovering from a motor vehicle accidents or gunshot wounds, cardiac services including myocardial infarctions or coronary artery bypass graft patients, neurological services including strokes or brain bleeds, and vascular surgery patients including carotid artery stents.

The population consisted of critically ill adults in which a central venous catheter was inserted. The inclusion criteria consist of adults over the age of 18 with central venous catheter access. The exclusion criteria consisted of pediatric and neonatal patients and a lack of central venous access.

The second population is the interdisciplinary team (IDT) of the hospital. The interdisciplinary team consists of the project leader, the Critical Care Medical Director, and the ICU Nurse Manager. This team characterizes a multidisciplinary approach to achieve a common goal of early removal of CVCs when medically appropriate.

Stakeholders involved included the facility, patients, physicians/practitioners, nurses, quality measures team, and the intensive care unit medical director. The facility will benefit financially by reducing rates of healthcare-associated infection in turn bringing more reimbursement to the hospital. The patients will benefit from early CVC removal, shorter length of stays, decreased risk for mortality. Physicians and practitioners

will benefit from decreased infection rates on their records. The quality measures team will benefit from the project improving their overall objective of higher patient safety scores. Lastly, the medical director of the intensive care unit will benefit from decreased infection rates in their intensive care unit.

Approach to Assess the Impact of Intervention

The goal of the intervention is to develop an interdisciplinary checklist, identify patients eligible for early CVC removal, and assess the interdisciplinary team's satisfaction and support to implement the checklist in the ICU. Two long-term goals for this intervention is to decrease CLABSI rates and increase nursing awareness/knowledge on the association between early central venous catheter removal and reduction of central line-associated bacterial infections. The long-term goals' impact was not assessed because those goals were not the focus of the project. To assess the impact of the intervention, a baseline CLABSI rate was identified during the pre-intervention period. The CLABSI rate was collected for the month of August during the pre-intervention timeframe. The checklist was developed and used to identify patients for early CVC removal during patient rounding encounters for four weeks on Monday through Friday. The Interdisciplinary Satisfaction Survey was used to assess the interdisciplinary team's satisfaction and support to implement the checklist in the ICU.

Approach to Assess Observed Outcomes

This project had the potential to yield three possible observed outcomes. The CVC was either removed or stayed in place; and the CLABSI rates were either decreased, increased, or stayed the same. The overarching long-term goal of this project was for a reduction in CLABSI rates through the development of an interdisciplinary team

checklist for CVC removal when no longer medically necessary. However, since determining the effect implementing the checklist had on the ICU's CLABSI rates was not the main focus of this DNP project, this was not measured.

Measures

To measure the outcomes of this DNP project the following data points were measured: multiple incompatible intravenous (IV) medications, inadequate peripheral access: one peripheral IV site, vasoactive medications, phleboscrotic medications: potassium, magnesium, calcium, phosphorus, temporary or permanent hemodialysis access, to introduce a Swan Ganz catheter, and to introduce temporary venous pacemaker leads. The patient's age and ICU diagnosis were also collected, along with the CVC insertion date, whether the patient had a sepsis diagnosis and the date of the sepsis diagnosis. These patient characteristics are a pertinent deciding factor for indications to continue a CVC.

Analysis

The CLABSI rates were identified in the pre-intervention phase. The checklist was used to determine the medical necessity for CVC and identify indications to continue or discontinue the CVC. An analysis of whether the CVC was removed on the date the decision was made was identified. This analysis proved useful to identify the relationship between early CVC removal when no longer medically necessary and CLABSI rates.

Ethical Considerations

Approval to implement the project was sought and received from the facility administrators and The University of Southern Mississippi Institutional Review Board (IRB). The USM IRB approval was obtained before initiating the DNP Project (IRB-20-

344). Approval from the facility was also obtained through a presentation informing the Nurse Research Committee and the Nurse Practice Council of all aspects of the project, including all patient and hospital data that will need to be acquired.

The risks to patients participating in this project are no different than the risks of receiving standard critical care. The information collected was confidential, and the personnel granted access was the project coordinators. All participants were protected by the Health Insurance Portability and Accountability Act of 1996 (HIPAA) which protects the privacy of patients' health information. Information on paper was kept in the project director's possession the entire time and electronic information was password protected.

Summary

In summary, the intervention utilized was an interdisciplinary team checklist for CVC removal when no longer medically necessary with a goal of developing a checklist, identifying patients eligible for early appropriate medical removal of CVC, and assessing the interdisciplinary team's satisfaction and support to implement the checklist in the facility's ICU. The population is adult patients older than 18 years of age in which a CVC has been placed and the interdisciplinary team. The setting is a 48-bed intensive care unit with a wide array of services. All of the stakeholders benefitted from this project. The approach to observe the impact of the intervention and observed outcomes have been utilized so that the results will be associated with the intervention. The decision for CVC removal was based on a checklist and decided at the time of multidisciplinary rounding. The analysis of whether the CVC was removed on the date the decision was made was useful to identify the relationship between early CVC removal when no longer medically necessary and CLABSI rates.

CHAPTER III - RESULTS

The purpose of this DNP project was to assess appropriate medical readiness for CVC removal in adult ICU patients, expose interdisciplinary team member's satisfaction with the checklist, and assess the impact the checklist made on CLABSI rates in the unit. The patients were assessed using the Interdisciplinary CVC Removal Checklist created from research containing best practice for the reduction of CLABSIs. The checklist contained elements pertaining to patient age, CVC insertion date, diagnosis, sepsis, and detection date, and indications for CVC including multiple incompatible intravenous (IV) medications, inadequate peripheral access: one peripheral IV site, vasoactive medications, phlebosclerotic medications: potassium, magnesium, calcium, phosphorus, temporary or permanent hemodialysis access, to introduce a Swan Ganz catheter, and to introduce temporary venous pacemaker leads.

Interdisciplinary Team Checklist to Assess Readiness for

Appropriate Medical Removal of CVC

The results of the checklist were documented on a weekly basis. Week one revealed 228 total patients included during the rounding encounters, 84 (36.84%) total patients with CVC lines, 74 (88.10%) total CVCs with indications to continue the CVC lines, 10 (11.90%) total CVCs with no appropriate medical indications to continue the line, 11 CVCs were removed on the recommended date of removal, 3 CVCs were not removed on the recommended date of removal. Week two revealed 203 total patients included during the rounding encounters, 66 (32.51%) total patients with CVC lines, 49 (74.24%) total CVCs with indications to continue the CVC lines, 17 (25.76%) total

CVCs with no appropriate medical indications to continue the line, 12 CVCs were removed on the recommended date of removal, 2 CVCs were not removed on the recommended date of removal. Week three revealed 219 total patients included during the rounding encounters, 69 (31.51%) patients with CVC lines, 50 (72.46%) total CVCs with indications to keep the CVC line, 19 (27.54%) total CVCs with no appropriate medical indications to continue the line, 9 CVCs were removed on the recommended date of removal, 4 CVCs were not removed on the recommended date of removal. Week four revealed 224 total patients included during the rounding encounters, 70 (31.25%) patients with CVC lines, 58 (82.86%) total CVCs with indications to keep the CVC line, 12 (17.14%) total CVCs with no appropriate medical indications to continue the line, 5 CVCs were removed on the recommended date of removal, 5 CVCs were not removed on the recommended date of removal.

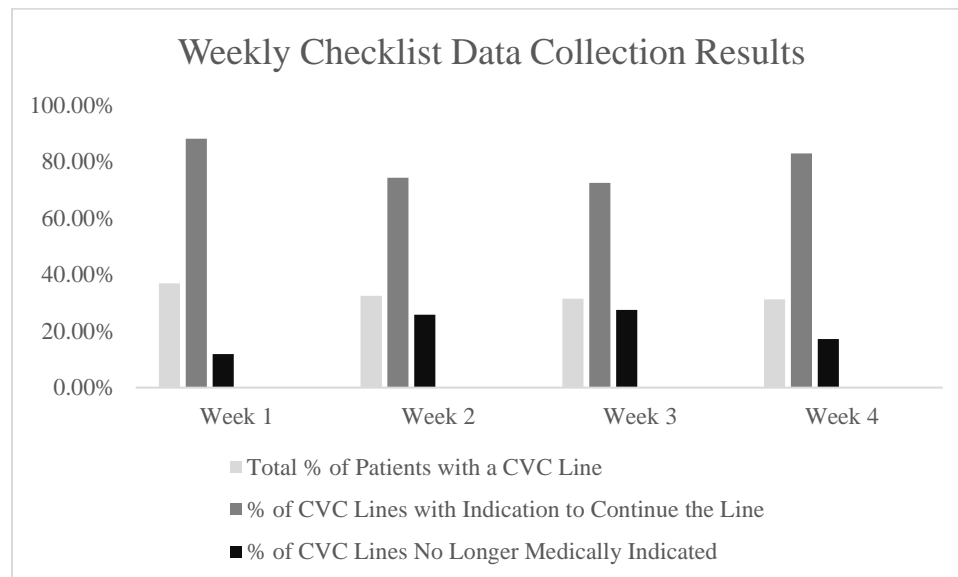


Figure 1. *Weekly Data Collection Results.*

Interdisciplinary Team Satisfaction Survey

Upon the completion of the four-week time observation period, the interdisciplinary team members were given a survey regarding their satisfaction with the Interdisciplinary CVC Removal Checklist. The survey is located in Appendix B. The survey was composed of the following elements: survey participants are over the age of 18, consent to participate in the survey is voluntary with no repercussions for refusal to participate, an acknowledgment that partially completed surveys may be turned in, and three open-ended questions pertaining to factors they would include or exclude on the checklist and any barriers that would prevent them from using the checklist. Survey questions and related data are shown below. The data is shown graphically in Figure 2.

1. I am over 18 years of age.
100% answered *Yes*
2. Are you aware that participating in the survey is voluntary and there are no repercussions for refusal to participate?
100% answered *Yes*
3. Are you aware that partially completed surveys are accepted?
100% answered *Yes*
4. Are you satisfied with the implementation of the interdisciplinary team checklist for appropriate medical readiness to remove CVC in the adult intensive care unit?
100% answered *Yes*
5. Would you continue to use this interdisciplinary team checklist for appropriate medical readiness to remove CVC?

100% answered *Yes*

6. Do you feel like this interdisciplinary team checklist for appropriate medical readiness to remove CVC helps create a better view of the assessment for the readiness of early removal of CVC?

100% answered *Agree*

7. How satisfied are you with the ease of use of the interdisciplinary team checklist for appropriate medical readiness to remove CVC?

100% answered *Satisfied*

8. Do you feel like the implementation of the interdisciplinary team checklist for appropriate medical readiness to remove CVC created extra work for you?

50% answered *Disagree* and 50% answered *Neither agree disagree*

9. Are you familiar with the risk factors with CVC use that increase CLABSIs?

100% answered *Yes*

10. This checklist is relevant to clinical practice.

100% answered *Agree*

11. Are there any factors you would recommend to be excluded from this readiness checklist?

100% answered *No*

12. Are there any factors you would recommend to be included in this readiness checklist?

100% answered *No*

13. Are there any barriers that prevent you from using this readiness checklist?

100% answered *No*

14. Would you consider adopting the *Interdisciplinary Team Checklist to Assess Readiness for Appropriate Medical Removal of Central Venous Catheter (CVC)?*

100% answered *Yes*

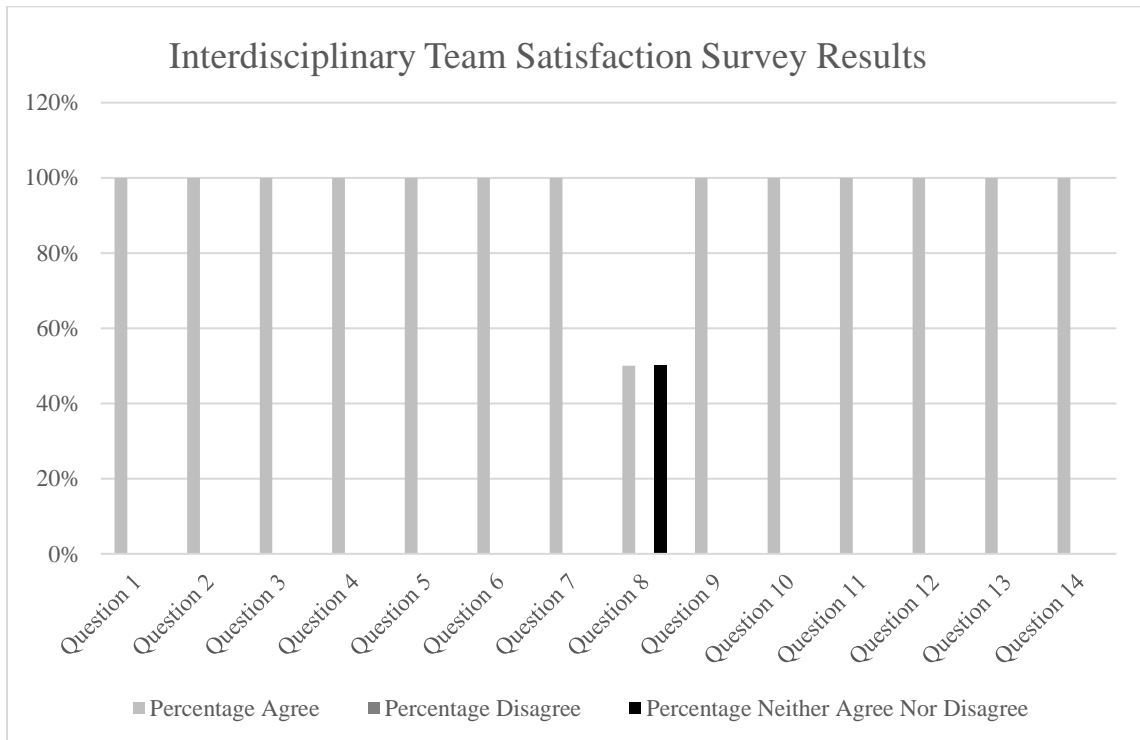


Figure 2. *Satisfaction Survey Results.*

Data for seven questions of the quantitative survey are of special interest.

Questions 5 and 14 are especially important because they relate directly to the implementation of this checklist in the ICU. Question 5 asked, “Would you continue to use this interdisciplinary team checklist for appropriate medical readiness to remove CVC?” and question 14 asked, “Would you consider adopting the *Interdisciplinary Team Checklist to Assess Readiness for Appropriate Medical Removal of Central Venous Catheter (CVC)?*” Both of these questions provided results that 100% of the

interdisciplinary team members would continue to use this checklist and would consider adopting the checklist into unit practice. Question 6 is directly related to this project and provides a positive answer to the PICOT question. This question revealed that 100% of interdisciplinary team members answered that the checklist helped create a better view of the assessment for the readiness of early removal of CVC. The results from question 7 disclosed that 100% of interdisciplinary team members were satisfied with the ease of the use of the checklist. For question 8, 100% of interdisciplinary team members answered that the checklist did not create extra work for them.

CHAPTER IV – DISCUSSION

Summary

The purpose of this DNP project was to assess readiness for appropriate medical removal of CVC catheters, reveal interdisciplinary team member's satisfaction with the checklist, and assess the impact the checklist made on CLABSI rates in the unit. The results of the data collection were determined based on daily patient rounding encounters, and the results were reported on a weekly basis. The interdisciplinary team was given a survey at the end of the four weeks to assess their satisfaction with the checklist. Lastly, CLABSI rates were reported after the intervention period to assess if the checklist made an impact on the rates in the unit.

Interpretation of Results

The results of the project are broken up into 3 sections. The first section is the results of the data collection for the *Interdisciplinary Team Checklist to Assess Readiness for Appropriate Medical Removal of CVC*. The next section of results contains the interdisciplinary team's satisfaction survey.

Interdisciplinary Team Checklist to Assess Readiness for Appropriate

Medical Removal of CVC

Week one exposed that 36.84% of patients in the intensive care unit had a CVC line, of those CVC lines, 88.10% of the CVC lines were medically indicated to continue the CVC line, and 11.90% of CVC lines were no longer medically indicated. During week one, 11 total CVCs were removed, 81.82% of CVC lines were removed on the recommended day of removal, 9.10% of CVC lines were removed one-day past

indication, and 9.10% of CVC lines were removed 2 days past indication. Week two exposed that 32.51% of patients in the intensive care unit had a CVC line, of those CVC lines, 74.24% of the CVC lines were medically indicated to continue the CVC line, and 25.76% of CVC lines were no longer medically indicated. During week two, 12 total CVCs were removed, 91.67% of CVC lines were removed on the recommended day of removal, and 8.33% % of CVC lines were removed one-day past indication. Week three exposed that 31.51% of patients in the intensive care unit had a CVC line, of those CVC lines, 72.46% of the CVC lines were medically indicated to continue the CVC line, and 27.54% of CVC lines were no longer medically indicated. During week three, 9 total CVCs were removed, 44.45% of CVC lines were removed on the recommended day of removal, 11.11% of CVC lines were removed one day past indication, 11.11% of CVC lines were removed two days past indication, 11.11% were removed three days past indication, and 11.11% of CVC lines were removed four days past indication. Week four exposed that 31.25% of patients in the intensive care unit had a CVC line, of those CVC lines, 82.86% of the CVC lines were medically indicated to continue the CVC line, and 17.14% of CVC lines were no longer medically indicated. During week four, 10 total CVCs were removed, 50% were removed on the recommended date of removal, and 50% of CVC lines were removed one-day past indication.

The results from this checklist reveal major indications for continuing the patient's CVC line in this unit. These factors include vasoactive medications, temporary or permanent hemodialysis access, and to introduce a Swan Ganz catheter. The length of catheter days is directly related to the length of time the patient is requiring vasoactive medications. Vasoactive medications will damage small peripheral veins, therefore the

patient will require a large CVC line to avoid that potential damage. Many patients in the ICU have a diagnosis of acute kidney injury which could require emergent hemodialysis. These patients received a temporary hemodialysis catheter because they do not have a dialysis graft to potentiate hemodialysis. Lastly, cardiovascular surgeons leave their introducers in the patient in case of emergencies where they require surgery. These introducers are a CVC and are left in once the patients are transferred out of the ICU.

The diagnoses used the most during the checklist intervention period include sepsis, cardiovascular shock, and motor vehicle crashes. These patients are all very unstable and are critically ill. The CVC is used to administer vasoactive medications to keep their blood pressure up, devices to help with heart failure associated with cardiogenic shock, and multiple intravenous medications such as antibiotics, maintenance intravenous fluids, vasoactive medications, and electrolyte replacement.

Interdisciplinary Team Satisfaction Survey

The results of the interdisciplinary team satisfaction survey reveal that the team members were impressed with the impact the checklist had on the unit. The results of the survey reveal that the team members were satisfied with the implementation of the checklist in the unit as well as the ease of using the checklist, would continue to use this checklist in the unit, believes that this checklist creates a better view of the assessment for the readiness of early CVC removal, did not believe the checklist created extra work for them and would consider adopting the checklist for implementation in the unit. The open-ended questions were not revealing; 100% of interdisciplinary team members did not add any factors to be excluded or included in the checklist and did not identify any barriers to

prevent the use of the checklist. Each interdisciplinary team member wrote in *No* to the open-ended questions which were questions eleven through thirteen.

Limitations

One limitation of the study is the inability to track ICU patients that transfer out of the ICU to a regular room. The project director had no way of keeping up with the CVC line once the patient is transferred outside of the ICU. Even though it is this facility's policy to remove CVC lines upon transfer out of the ICU, some patients require an exception to that policy such as post-operative coronary artery bypass graft patients.

Another limitation of this study is the inability to collect patient data during the weekend. This DNP project focused on four weeks, Monday through Friday. Therefore, patients that had their CVC line removed during the weekend were unable to be included in the data collection of this project.

Lastly, the small number of interdisciplinary team members who participated in the team and surveyed about their satisfaction with the checklist poses an impact on the project. With only two interdisciplinary team members participating in the satisfaction survey, the data collected could have been obstructed. The data collected from the satisfaction survey could have negatively impacted the survey if there were more participants on the interdisciplinary team.

Implications for Future Practice

There are many implications for future practice for the DNP project including things to do differently and the next steps this project could move towards. One implication for future practice is adding Total Parenteral Nutrition (TPN) to the checklist because TPN is an indication to keep the CVC. This particular unit utilizes TPN for

malnourished patients and patients who have had major stomach issues, therefore the indication for TPN is directly related to this project and facility.

In the future, this project could be followed for patients in the entire facility, not just the intensive care unit. Some patients are being transferred out of the unit with a CVC despite facility policy to discontinue the CVC line therefore this checklist would be beneficial to data collection. Data collection through the weekend would allow better tracking of CVC removal than just a Monday through Friday basis.

The next steps for this project can be implemented with the checklist created. The staff members such as bedside nurses could be surveyed for the satisfaction of the checklist. The checklist could be implemented as part of daily charting in the electronic medical record (EMR). If this checklist were implemented in the EMR, the questions of where the checklist should be placed, how the checklist should be executed in the EMR, and how to educate the staff on charting the checklist should be addressed. Finally, focusing on the checklist as becoming a mandatory part of patient care should be addressed for a clearer objective of reducing CLABSI rates.

The checklist could also be formed into continuing education credit for critical care nurses. The education should be focused on the critical care nurse's knowledge of indications to keep a CVC along with assessing patients daily for criteria to continue CVC lines. This education will increase nurse's awareness of patient factors to continue CVC lines and the relationship between early removal and decreased CLABSI rates.

Each CLABSI a facility has decreases hospital funding due to decreased reimbursement from The Centers for Medicare and Medicaid. A cost-analysis for assessing how well removing a CVC early in a patient's hospital stay relates to hospital

financial burden. Factors such as how CLABSIs affect hospital reimbursement is important for decreasing the financial burden for the hospital.

Lastly, this study may be repeated with the inclusion of additional factors, continuing for seven days a week, including all adult patients in the entire hospital, for a longer period of time such as three or six months, the checklist can be further assessed for appropriateness. The next step could include working with the state hospital association. This checklist could be offered to all hospitals in the state to assess for readiness for appropriate removal of CVC.

Conclusion

The results of this DNP project reveal that early identification of patients whose CVC is no longer medically necessary through the implementation of the checklist provides a quick and easy assessment tool that could greatly benefit the unit if implemented into the facility. The results from this DNP project indicate that the checklist proved beneficial for identifying patients eligible for early CVC removal. The satisfaction survey revealed that the interdisciplinary team was very satisfied with the checklist and would consider implementing it into part of daily patient care. Finally, the relationship between the checklist and the CLABSI rate cannot be directly determined. Based on these results, the PICOT question was answered for this DNP project.

APPENDIX A - Interdisciplinary CVC Removal Checklist

Data Collection Tool
Interdisciplinary Team Checklist to Assess for Readiness for Appropriate Medical Removal of CVC

Day: MON TUES WED THURS FRI Date _____

ID#		ID#		ID#		ID#	
CVC Present	Yes No	CVC Present	Yes No	CVC Present	Yes No	CVC Present	Yes No
Age:		Age:		Age:		Age:	
If no CVC Line Present, STOP HERE. If less than 18 years old, STOP HERE.							
Insertion Date:		Insertion Date:		Insertion Date:		Insertion Date:	
ICU Diagnosis:		ICU Diagnosis:		ICU Diagnosis:		ICU Diagnosis:	
Sepsis	Y/ N	Sepsis	Y/N	Sepsis	Y/ N	Sepsis	Y/ N
Sepsis Detection Date:		Sepsis Detection Date:		Sepsis Detection Date:		Sepsis Detection Date:	
Criteria for Continuing CVC:							
1. Multiple incompatible intravenous medication		1. Multiple Incompatible Intravenous medication		1. Multiple incompatible Intravenous medication		1. Multiple incompatible Intravenous medication	
2. Inadequate peripheral access: one peripheral IV site		2. Inadequate Peripheral access: one peripheral IV site		2. Inadequate Peripheral access: one peripheral IV site		2. Inadequate peripheral access: one peripheral IV site	
3. Vasoactive medicines		3. Vasoactive medicines		3. Vasoactive medicines		3. Vasoactive medicines	
4. Phelobosclerotic medications: Potassium, Magnesium, Calcium, Phosphorus		4. Phelobosclerotic medications: Potassium, Magnesium, Calcium, Phosphorus		4. Phelobosclerotic medications: Potassium, Magnesium, Calcium, Phosphorus		4. Phelobosclerotic medications: Potassium, Magnesium, Calcium, Phosphorus	
5. Temporary or permanent hemodialysis access		5. Temporary or permanent hemodialysis access		5. Temporary or permanent hemodialysis access		5. Temporary or permanent hemodialysis access	
6. To introduce a Swan Ganz catheter		6. To introduce a Swan Ganz catheter		6. To introduce a Swan Ganz catheter		6. To introduce a Swan Ganz catheter	
7. To introduce temporary venous pacemaker leads		7. To introduce temporary venous pacemaker leads		7. To introduce temporary venous pacemaker leads		7. To introduce temporary venous pacemaker leads	

APPENDIX B – Interdisciplinary Team Satisfaction Survey

Dear ID Team member,

On behalf of The University of Southern Mississippi (USM) Doctor of Nursing Practice Program, you are invited to take part in the evaluation of an Interdisciplinary Team Checklist to Assess Readiness for Appropriate Medical Removal of Central Venous Catheter (CVC).

Your participation should be no more than approximately 10 minutes. There are no known risks or discomforts associated with this study, and your participation is completely voluntary. This survey is a part of the clinical practice project titled *Developing an Interdisciplinary Team Checklist to Assess Readiness for Appropriate Medical Removal of Central Venous Catheter (CVC)*. The results from this project could indicate that the use of this checklist is appropriate to use as a part of the strategies in surveillance of CVC with an overall goal to reduce CLABSIs in this facility.

Miranda Harper, BSN, RN, a current DNP student in the BSN-FNP-DNP program at USM is conducting this project. Please email any questions or comments to Miranda.Rawls@usm.edu. This project has been reviewed and approved by the Institutional Review Board of USM. If you have questions, concerns, or want a summary of this project, feel free to contact Dr. Cathy Hughes, DNP Project Chair at 601-2666-5493, or by email at cathy.hughes@usm.edu.

To participate in this study, after the project director has completed the data collection for 30 days, a presentation will be given to the ID Team and DNP Project faculty. A survey will be offered at this time for your input on aspects of this checklist. Results from incomplete surveys will be included with reporting responses. Your

responses will be kept strictly confidential. You will submit your form to a locked box at the end of the presentation time. No identifying information will be included. All results will be reported as aggregate (group) data. You may withdraw from the survey at any time or choose not to answer all questions.

Miranda Harper, BSN, RN, DNP Candidate

By answering the following survey questions:

- (1) You are agreeing to participate in this study and
- (2) You are confirming you are 18 years of age or older.

Interdisciplinary Team Checklist Satisfaction Survey

By participating in this survey, I am giving my consent to participate in the study.

1. I am over 18 years of age.
 - Yes
 - No
2. Are you aware that participating in the survey is voluntary and there are no repercussions for refusal to participate?
 - Yes
 - No
3. Are you aware that partially completed surveys are accepted?
 - Yes
 - No
4. Are you satisfied with the implementation of the interdisciplinary team checklist for appropriate medical readiness to remove CVC in the adult intensive care unit?
 - Yes

- No
5. Would you continue to use this interdisciplinary team checklist for appropriate medical readiness to remove CVC?
- Yes
 - No
6. Do you feel like this interdisciplinary team checklist for appropriate medical readiness to remove CVC helps create a better view of the assessment for the readiness of early removal of CVC?
- Agree
 - Neither agree nor disagree
 - Disagree
7. How satisfied are you with the ease of use of the interdisciplinary team checklist for appropriate medical readiness to remove CVC?
- Satisfied
 - Neither satisfied nor dissatisfied
 - Dissatisfied
8. Do you feel like the implementation of the interdisciplinary team checklist for appropriate medical readiness to remove CVC created extra work for you?
- Agree
 - Neither agree nor disagree
 - Disagree
9. Are you familiar with the risk factors with CVC use that increase CLABSIs?
- Yes
 - No
10. This checklist is relevant to clinical practice.
- Agree

- Neither agree nor disagree
- Disagree

11. Are there any factors you would recommend to be excluded from this readiness checklist?

12. Are there any factors you would recommend to be included in this readiness checklist?

13. Are there any barriers that prevent you from using this readiness checklist?

14. Would you consider adopting the *Interdisciplinary Team Checklist to Assess Readiness for Appropriate Medical Removal of Central Venous Catheter (CVC)*?

- Yes
- No

15. If you answered “No” to question 14, please briefly explain your answer.

16. What frequency would you recommend this readiness checklist be given?

17. Please provide any additional comments and/or suggestions below.

APPENDIX C – USM IRB Approval Form

Office of
Research Integrity



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NOTICE OF INSTITUTIONAL REVIEW BOARD ACTION

The project below has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services regulations (45 CFR Part 46), and University Policy to ensure:

- The risks to subjects are minimized and reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered involving risks to subjects must be reported immediately. Problems should be reported to ORI via the Incident template on Cayuse IRB.
- The period of approval is twelve months. An application for renewal must be submitted for projects exceeding twelve months.
- Face-to-Face data collection may not commence without prior approval from the Vice President for Research's office.

PROTOCOL NUMBER: IRB-20-344

PROJECT TITLE: Developing An Interdisciplinary Team Checklist To Assess Readiness For Appropriate Medical Removal Of Central Venous Catheter (CVC)

SCHOOL/PROGRAM: School of LANP

RESEARCHER(S): Miranda Rawls, Cathy Hughes

IRB COMMITTEE ACTION: Approved

CATEGORY: Expedited

4. Collection of data through noninvasive procedures (not involving general anesthesia or sedation) routinely employed in clinical practice, excluding procedures involving x-rays or microwaves. Where medical devices are employed, they must be cleared/approved for marketing. (Studies intended to evaluate the safety and effectiveness of the medical device are not generally eligible for expedited review, including studies of cleared medical devices for new indications.)

PERIOD OF APPROVAL: August 28, 2020

Donald Sacco, Ph.D.

Institutional Review Board Chairperson

APPENDIX D – Facility IRB Approval Letter



To Whom It May Concern:
Re: Miranda Rawls Harper Research Project

Miranda Rawls Harper's project "Developing an Interdisciplinary Team Checklist To Assess Readiness For Appropriate Medical Removal Of Central Venous Catheter (CVC)" was approved at Nurse Practice Council on June 9, 2020.

Her research project/study proposal has been approved to be conducted within Patient Care Services at [redacted] Hospital. She is free to proceed with her project/study within the following guidelines:

Any modifications to this approved study must be re-routed to the Research Committee. All activity on this project must stop until you are notified by the Research Committee Chair of Committee's decision regarding proposed changes

7/24/2020
Date


Dr. [redacted], CNO



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