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Role of Midline Catheters in Patient Care

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
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Walden University
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Abstract

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MSN, Old Dominion University, 1994 & 2011

BSN, Norfolk State University, 1990

Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

Walden University

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Abstract

Central line-associated bloodstream infections (CLABSIs) are responsible for 100,000 patient deaths per year, creating a critical need for prevention of these deadly infections that occur with central venous lines (CVLs). Alternative forms of IV access such as midline catheters (MLCs) may offer lower rates of infection than those seen with CVLs. MLCs were implemented at the practice setting in 2016; however, no evaluation of their effectiveness had been conducted. The purpose of this project was to evaluate the effectiveness of MLCs using a retrospective, pre- post- comparison of CLABSI rates and device utilization rates (DUR) obtained from the practice setting before and after implementation of MLCs. Infection control and Lewin's change theories were used to provide a foundation for the project. This retrospective, pre-post comparison of CLABSI and DUR 6 months before and after introduction of MLCs sought to determine if MLC use affected either rate. Results of a Wilcoxon signed-rank test showed no statistical differences ($p > .05$) in CLABSI rates and DUR when comparing the rates from the specified 6 month periods. A secondary purpose was to identify the characteristics and conditions in which MLCs were used. Patients with cardiovascular, neuro, and infection diagnoses constituted 43% of the 262 MLC placements. No statistically significant improvement in infection rates was demonstrated by this project; however, these findings illuminate the types of patients or conditions where MLCs are a viable alternative for IV access, and this knowledge may assist providers in options for patient care. This project promotes positive social change by raising awareness of potential strategies for reducing infections in patients when they are at their most vulnerable.

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Dedication

This project is dedicated to my wonderful family. Thanks be to God for the many blessings he has bestowed upon me. My wonderful mother, Irene, has always encouraged me to reach high goals and instilled the morals needed to guide my love of life and learning. In memory and honor of my father, Hiram, whom I lost during this journey to crown my education, instilled the drive to work hard to achieve goals and always try to do better. He taught me, even in failure, there are lessons learned to do things better next time. My incredibly supportive and loving husband, John, believes in me, encourages me, and reminds me I need rest to help achieve those goals and think. He has taught me sometimes when you rest, the mind is able to see the answer or solve the problem. My wonderful children, Franklin and Robbin, challenge, encourage, and help me see how blessed I really am. My wonderful mentors, I must thank for pushing and stretching me to achieve this terminal degree. They helped me to see learning from each other is a life-long endeavor and never ends.

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Section 1: Overview of the Evidence-Based Project

Introduction

Healthcare-associated infections (HAIs), particularly central line-associated bloodstream infections (CLABSIs), constitute some of the most costly complications of hospital inpatient stays in the United States and the world. The need to prevent HAIs is recognized nationally and in the local health system as a problem that requires a coordinated effort to identify the risks and to strategize about ways to reduce the risk. Section 1 of this study will cover the following topics: introduction to the project, a problem, purpose, nature of the project, significance and implications for social change.

HAIs, particularly CLABSIs, are some of the most costly inpatient complications. The estimated cost for a CLABSI incident is high: $32,254 (Dawson & Moureau, 2013). The cost in terms of patient mortality is also high: approximately 100,000 patient deaths per year (Dick et al., 2015). Not only is the cost high, but more importantly the burden of illness takes a tremendous toll on patients and their families. Prevention of CLABSIs can save lives, decrease unnecessary morbidity, prevent loss of income to hospitals, and could save taxpayers and insurers millions of dollars (Scott et al., 2014). A number of published articles describe populations of patients, such as those with cystic fibrosis, who may benefit from use of MLCs (Adams, Little, Vinsant, & Khandelwal, 2016; Cummings, Hearse, McCutcheon, & Deuter, 2011; Giuliani et al., 2013); however, only a few articles were identified that describe patients in the general population who have had a MLC inserted (Moureau, Sigl, & Hill, 2015). Yet, deciding to use a MLC over other

forms of IV access must be an informed decision meaning benefits as well as risks should be considered in each case for each patient. Therefore, in this study I will describe the patients in one health system where MLCs were the preferred vascular access device (VAD) for intermediate length of time IV therapy, with a focus on decreasing rates of CLABSIs and device utilization rates (DUR), the measure of how long a central venous line (CVL) remains in a central blood vessel, for those patients.

Problem Statement

The high rate of preventable HAIs, specifically CLABSIs, results in high cost for prolonged hospitalizations, increased use of limited resources, and high morbidity and mortality for patients (Scott et al., 2014). The CLABSI rate in one Southeastern Level I Trauma Center teaching hospital is greater than the national average (Centers for Disease Control and Prevention [CDC], 2016). Numerous strategies were offered to reduce the rate of CLABSIs, including the use of MLCs, but in this health system little was known about how the MLCs performed in reducing CLABSI rates or which patients might benefit the most from their use. This doctoral project sought to compare CLABSI rates and DURs 6 months prior and 6 months after initiation of MLC use. The goal was to determine if there was a difference in infection rates and DUR after beginning the use of MLCs.

Purpose Statement

The purpose of this quantitative comparison project was to examine CLABSI rates and DUR and to identify the characteristics of patients who would be candidates for a MLC. The objective was to evaluate the impact of adding MLC use for eligible patients

on CLABSI rates in one Southeastern Level I Trauma Center teaching hospital by evaluating the DUR for CVLs and describing the characteristics of patients who received them. MLCs have been in place for 9 months in this facility. In this project a retrospective comparison of CLABSI rates and DURs for a 6-month period before the MLCs were available and then 6 months after they were available was conducted. Characteristics of patients receiving MLCs were described. This project is significant to practice because it can help avoid CLABSIs and thus prevent patient complications, expense, and potential loss of life. Quality care can save costs and prevent complications (Raschka, Dempster, & Bryce, 2013). This project addressed two questions: In a retrospective review of 6 months before and 6 months after implementation of MLCs did the CLABSI and DUR rates decrease? What are the characteristics of patients who received MLCs? This project can help to determine whether MLCs have been useful in decreasing CLABSI rates and DURs as well as providing a description of patients who have received MLCs.

Nature of the Problem

CLABSIs are one of the most costly HAIs and are largely preventable by adhering to evidence-based guidelines of care and protocols (Kusek, 2012). Retrospective data for this project were obtained from monthly infection control measure reports that were sent to the CDC. Statistical analysis comparing the two 6-month periods, one before MLCs and one after the MLCs was performed using SPSS software. A retrospective report with patient demographics for all patients receiving MLCs was analyzed for descriptive characteristics. Gathering characteristics of patients who have received MLCs

may help clinicians to more quickly identify patients in various settings, such as the emergency department (ED), who would benefit from use of this type of VAD (Adams et al., 2016; Dumont, Getz, & Miller, 2014). This DNP project sought to determine if the use of MLCs affected CLABSI and DUR rates. It also sought to describe the characteristics of patients who have received MLCs.

Significance of the Project

The Southeastern Level I Trauma Center and teaching hospital provides care for many patients in seven specialized intensive care units (ICUs) who require CVLs. Stakeholders in the process of insertion and care of CVLs were: patients, IV therapy team members, nurses, physicians, infection control specialists, educators, administrators, financial analysts, buyers, pharmacists, advanced practice registered nurses (APRNs), surgeons, occupational therapists, physical therapists, home health nurses and aides, and surgery personnel. These devices are often essential for the initial treatment of ICU patients. When transferred from the ICU, the CVL may be replaced with a more appropriate device that provides IV access but does not require repeated venipunctures if IV therapy is needed for more than 5 days but less than 4 weeks (Rosenthal, 2008). The evidence –based significance of the project is that MLCs provide a VAD for intermediate length intravenous (IV) therapy (Anderson, 2004). MLCs have advantages over short (1 inch) peripheral intravenous (PIV) catheters and central lines. The advantages include better hemodilution and longer in-dwelling time due to the use of the large veins of the upper arm. The blood flow in larger vessels allow medication to be diluted in a larger amount of faster flowing blood as it is infused through the MLC, thus altering the pH and

osmolality and making phlebitis less likely (Anderson, 2004, p.314). Because MLCs are placed in a larger vessel and are 7 to 8 inches long, they can remain in place for up to 28 days (Alexandrou et al., 2011, p.36). MLCs are VADs that provide a viable alternative for IV therapy between short PIVs and central lines (Moureau & Chopra, 2016). The potential contributions of this project to nursing are (a) a better understanding of MLCs in the role of prevention of CLABSI and (b) a description of the characteristics of patients who have received midlines. These descriptions and the findings from this project could be used throughout the healthcare system; they could also be presented to a wide audience via poster presentation or published article.

Implications for Social Change

The two strongest implications for social change in this project are the cost savings in preventing CLABSIs and having a device that provides for intermediate-length IV therapy. Prevention of HAIs and CLABSIs has an economic impact of "net benefits per case averted ranging from $15,780 to $24,391" (Scott et al., 2014, p. 1040). MLCs have the ability to be left in place for up to 28 days, which decreases the costs and pain for patients by avoiding multiple IV sticks for PIVs. MLCs also facilitate and expedite transfers to other healthcare facilities such as rehab units, nursing homes, or home for outpatient care (Alexandrou et al., 2011).

Limitations of this project include the fact that few outcome studies have compared the complications of MLCs with other VADs (Cummings et al., 2011). Some articles cite the characteristics of patients with specific disease processes as benefiting from MLC use, but no study has described the characteristics of a large group of patients

with MLCs (Anderson, 2004; Moureau et al., 2015). MLC infection rates and complications are not reported on a national level, but may be monitored in various ways in individual facilities.

Summary

This project aims to make clinicians aware the role of MLCs in patient care and where it can be used in the spectrum of VADs. The problem addressed in this study is the high rate of CLABSI and DUR rates in one hospital facility. CLABSI are one of the most costly hospital complications, but are preventable by using other VADs when feasible and adherence to quality care guidelines. The retrospective qualitative comparison of CLABSI and DUR rates 6 months prior and 6 months after the start of using MLCs in this hospital facility sought to determine the impact of this intermediate time limited VAD. The use of MLCs for appropriate patients and therapies may impact treatment costs by prevention of complications. The characteristics of patients who have received MLCs may contribute to population health by understanding how MLCs can be used in various situations and with various patients. Chapter 2 will provide the historical background of MLCs, the context for their use, and how information gained from this information could benefit nursing practice and the care of patients.

Section 2: Background and Context

Introduction

The high rates of HAIs, specifically CLABSIs, are a major problem that many hospitals face; studies to examine prevention strategies are needed. The purpose of this project was to examine CLABSI rates, which are a measure of central line infections and DUR, which reflect the use of MLCs. The objective was to identify ways to decrease the rate of CLABSIs in one hospital and to identify the characteristics of patients who benefited from MLCs. The practice-focused questions for the project were: In a retrospective review of 6 months before implementation of MLCs and 6 months after implementation did the CLABSI rate and DUR decrease? What are the characteristics of patients who received MLCs?

Concepts, Models, and Theories

A gap in knowledge regarding MLCs was identified by a needs assessment at the health system where the use of MLCs as an option for vascular access was implemented. Staff were reluctant to use the new MLCs and learn new techniques for care of this device compared to peripherally inserted central lines (PICCs) which had been in place for some time in the health system. Therefore, a need for a systematic process to promote change was identified. The conceptual model used in this project was Lewin's (1951) change theory which is ideal for guiding a change in practice; it includes an assessment of the forces driving and restraining the change. The change in practice occurs when a new equilibrium is achieved by balancing the opposing forces (McEwen & Willis, 2014). Lewin's (1951) model of change is composed of three phases:

unfreezing, moving, and refreezing. The driving forces were the need to decrease CLABSI rates, DUR, and the availability of MLCs, a new device, for patient care. The restraining forces were lack of knowledge about the use and care of MLCs. The unfreezing stage was PICCs were replacing CVLs and higher than desired CLABSIs and DURs were noted. MCLs were introduced to the hospital, which precipitated the moving phase during which education for the new device was completed. The refreezing stage occurred with MLCs being placed for IV access to replace CVLs and some PICCs. A quality initiative to measure continued competence with MLCs was introduced into the annual skills day to maintain the refreezing phase and ensure driving and restraining forces have reached equilibrium (White & Dudley-Brown, 2012).

The theory of infection control was introduced by Dr. Ignaz Semmelweis, when he showed how the spread of infection from a post mortem body to a patient could be prevented with good hand hygiene (Gould, 2010, p. 275). The first physicians to observe similar spread of diseases were Dr. Alexander Gordon, an obstetrician, and Dr. Oliver Wendell Holmes, both of whom had published pamphlets on the spread of puerperal infection prior to Dr. Semmelweis' theory (Gould, 2010). Over the last decade, the increase in HAIs has necessitated a resurgence in efforts to adhere to infection and prevention control (IPC) principles and protocols (Edwards et al., 2012). Changing health care providers' adherence to IPC has been successful using the social marketing behavior change framework. This framework has tenets in psychological theory, persuasion psychology, and marketing; the idea is to promote a permanent change in

hand hygiene and other steps to follow for promoting infection control and thus prevent HAIs (Edwards et al., 2012).

Relevance to Nursing Practice

MLCs have been in existence since the 1950s when they were first used for patient care. In the 1990s, MLCs raised concerns due to the material used in manufacturing causing hypersensitivity in some patients (Alexandrou et al., 2011). MLCs recently have returned to clinical practice after materials used in manufacturing changed. Now the new product may provide advantages over other types of VADs. Some of the advantages to MLCs are: they provide longer indwelling time, up to 28 days according to the IV Nurses Society (2016), and IV access for patients with difficult IV access (Griffiths, 2007; Maki, Kluger, & Crinch, 2006; Moureau & Chopra, 2016). MLCs are peripheral catheters placed in one of the larger veins in the upper arm but with the tip ending prior to axillary vein (Alexandrou et al., 2011; Rosenthal, 2008). The problem in nursing being addressed by this project is higher than desired CLABSI and DUR rates. Most CLABSIs are preventable when proper insertion techniques and protocols are followed (Hsu, 2014; Matocha, 2013).When a care bundle is used consistently by nursing staff CLABSI rates will decrease (Matocha, 2013). MLCs provide another option to CVLs when an intermediate duration of IV therapy is needed (Dawson & Moureau, 2013; Moureau & Chopra, 2016). One strategy to prevent CLABSI is to promptly remove CVLs when no longer required for therapy (Bianco et al., 2013) and to choose an appropriate catheter for continued therapy (Griffiths, 2007; O'Grady et al., 2011). The goal of the CDC is to decrease HAIs to protect and promote patient safety (CDC, 2016).

MLCs offer a reliable means for vascular access for up to four weeks and their use is consistent with CDC recommendations for strategies to prevent CLABSIs. These catheters have a decreased risk for infections and other complications found more often in CVLs and PICCs (Moureau et al., 2015, p. 180). Describing characteristics of patients who have received MLCs may enable clinicians to more quickly identify those who may benefit from use of this VAD and preserve vessel health (Moureau et al., 2015, p 180).

Local Background and Context

The Southeastern Level I Trauma Center and teaching hospital provides care for critically and acutely ill patients often requiring CVLs to administer needed fluids, medications, or nutrition. The CLABSI rate and DUR were at higher than desired rates causing prolonged lengths of stay, increasing patient care costs, increasing use of resources, and decrease in patient satisfaction. A potential increase in mortality was a concern because of increased complications. The CDC has targeted a decrease in CLABSIs since the 1960s (Scott et al., 2014). One of the goals for the hospital is to decrease CLABSI rates and DUR (O'Grady et al., 2011). The benefit of decreased CLABSIs and DUR are savings in patient care costs, increased patient safety, and increased patient satisfaction (Dick et al., 2015; Scott et al., 2014). CLABSI rates and DUR are reported to the CDC by the hospital. For every patient diagnosed with a CLABSI, the unit nursing staff and infection control director perform a chart review to determine the exact cause of the infection and to understand steps to prevent further infections. MLCs offer a part of the solution to the problem (Dawson & Moureau, 2013).

Terms

The following terms were defined as follows for the current project.

Central Venous Catheter is a tube or catheter placed in a large central venous blood vessel to deliver medications, fluids, and may remain in place for weeks to years. Some types of these catheters are contained entirely within the body and must be accessed with a needle. Other types have a portion of the ends of the catheter outside the skin.

Central Line Associated Blood Stream Infection is a bloodstream infection caused by the placement of a tube or catheter in a large central blood vessel.

Device Utilization Rate is a measure of how long a central venous catheter is in place in a central blood vessel.

Healthcare-Associated Infection is an infection a patient receives while in the hospital or healthcare facility.

Midline Catheter is a tube or catheter placed in one of the large veins in the upper arm with the end of the catheter remaining in the peripheral blood vessel not extending into the central blood vessel. This catheter is used for medications, fluids, and may remain in place for up to 28 days.

Peripherally Inserted Catheter is a tube or catheter that is placed in one of the veins of the fingers, hands, arms, feet, or legs that does not extend into a central blood vessel. This catheter is used for medications, fluids, and may remain in place for up to 96 hours.

Vascular Access Device is and tube or catheter that is placed in a vein or artery and may be in a peripheral or central blood vessel.

Role of the DNP Student

The DNP student has been affiliated with the hospital for over 25 years and has been a part of the growth and development of the hospital into a hospital system with numerous hospitals, nursing home facilities, home health agencies, and an insurance agency. The DNP student has been a direct patient care provider for critically ill patients for most of those years and has participated in many initiatives to improve patient care. CLABSIs are a safety issue to patients and can be reduced to almost zero if evidenced-based care is provided consistently (Moureau et al., 2015). MLCs have been introduced into this hospital system as a whole within the last year. Due to the acuity of the patients in this Southeastern Level I Trauma Center and teaching hospital, IV access is difficult to obtain for some patients. Prior to MLCs, the choices for vascular access were central line catheters consisting of CVLs with multiple lumens or peripherally inserted central catheters (PICCs) or peripheral IVs (PIV) that had to be changed every 3 or 4 days if they lasted that long. MLCs offer an intermediate therapy device as it can remain in place for up to 28 days and is a long PIV that can allow staff to discontinue CVLs when not needed.

The student's role in the DNP Project was to determine if MLC use has had an effect on CLABSIs and DUR. The second part of the project was to describe the patients who have had MLCs placed. The DNP student worked with the IV team to observe how MLCs are placed and how the nursing staff has adapted their practice to these new

devices. The student reviewed clinical information to understand why patients may or may not be candidates for MLC placement. The DNP student created a needs assessment and took a lead in educating the nursing staff about MLCs. Some differences were discovered in expenses and care of MLCs with other hospitals in the system. Interestingly, a number of patients that have had MLCs placed and have to be readmitted, have requested for them to be placed again.

Summary

CLABSIs are a major problem in healthcare facilities. Prevention strategies are the best way to avoid infections and the complications that accompany them. One strategy adopted by the Southeastern Level I Trauma Center teaching hospital was to replace CVLs with other types of VADs including MLCs. The staff was unfamiliar with the differences in insertion techniques and care of MLCs as compared to other VADs. Lewin's (1951) change theory and Semmelweis' theory of IPC were used to guide the evidence-based change in practice. MLCs, although available for many years, are starting to be used in practice again due to manufacturing processes using new materials for the catheters. The role of the student was to lead the initiative to improve patient care by examining the role of MLCs in patient care. MLCs offer an alternative solution to vascular access for the appropriate patient and may help to decrease CLABSIs and DUR. Section 3 describes the data collection and the evidence about use of MLCs on CLABSIs, DUR, and patient characteristics.

Section 3: Collection and Analysis of Evidence

Introduction

MLCs have been introduced into practice in the Southeastern Level I Trauma Center and teaching hospital in the last year. The DNP project sought to determine if MLCs have had an effect on CLABSI and DUR. The secondary goal was to describe patients who receive MLCs to determine if there are certain characteristics that are used in this setting and are common to patients where MLCs were used. MLCs have been available for many years but recently started to be used in practice again due to new manufacturing practices. MLCs may offer an alternative solution to vascular access for the appropriate patient and may help to decrease CLABSIs and DUR. The next section will review the approach used to determine the effect of MLCs on CLABSIs and DUR. Section three discusses the practice-focused questions, sources of evidence, and the analysis and synthesis plan.

Practice-Focused Questions

The high rate of preventable HAIs, specifically CLABSIs, results in high cost for prolonged hospitalizations, increased use of limited resources, and high morbidity and mortality for patients (Scott et al., 2014). The CLABSI rate in one Southeastern Level I Trauma Center teaching hospital was greater than the national average (CDC, 2016). Numerous strategies had been offered to reduce the rate of CLABSIs, including the use of MLCs, but in this health system little was known about how the MLCs perform in reducing CLABSI rates. This project sought to compare CLABSI rates and DURs, 6 months prior to and 6 months after initiation of MLC use, to determine if there was

a difference in infection rates and DUR after beginning the use of MLCs. The purpose of this quantitative comparison project was to examine CLABSI rates and DURs and to describe the characteristics of patients who received MLCs (Zerla et al., 2015). The objectives were to evaluate the impact of implementation of MLCs on CLABSI rates in one Southeastern Level I Trauma Center teaching hospital by evaluating the DUR for CVLs and MLC in appropriate patients. MLC use has been in place for 9 months in this facility. A retrospective comparison of CLABSI rates and DURs was conducted; the comparison included the 6-month period before the MLCs were available and 6 months after they became available. Characteristics of patients receiving MLC were described.

This project is significant to practice because it is expected to help avoid treatment patient complications, expense, and potential loss of life by avoiding CLABSIs. Quality care can save costs and prevent complications (Raschka et al., 2013).

1. In a retrospective review of 6 months before implementation of MLCs and 6 months after, did the CLABSI rate and DUR decrease?
2. What are the characteristics of patients who received MLCs?

Sources of Evidence

Evidence was gathered from two sources of reports: various nursing units and the infection control department. These were all created to report monthly CLABSI rates and DUR are forwarded to the CDC. The infection control department is responsible for the completeness and accuracy of this report for the CDC. Electronic medical records were

retrospectively queried for age, sex, admission diagnosis, pertinent history, medical or surgical treatment for the focus admission, and purpose for placement information that was collected to describe patients who received MLCs. A report was generated from the electronic medical record (EMR) for purposes of this project. Only the above mentioned information was collected according to independently numbered documents maintained by the IV therapy team. The report had no patient identifiers. Each data line was kept together (age, sex, admission diagnosis, pertinent history, medical or surgical treatment for the focus admission, and purpose for placement). The data for this report were entered into the computer for regular patient admissions to the hospital by nurses and admitting personnel. The limitations inherent to these data are there may be duplicate terms used or omitted. The data may not be complete for every individual who received a MLC.

Search engines EBSCOhost, ProQuest, CINAHL, MEDLINE, and Science Direct were used to provide evidence for comparisons and further insights into the findings of the project. Additionally, to translate the findings to practice, evidence from the literature and from professional organizational websites, such as the CDC, will be used to develop a plan for dissemination of the findings.

Protection of Participant Information

Before beginning the project, the student applied for IRB approval from the Walden IRB number 01-30-17-0598716. In addition, the hospital required an application for their site specific IRB (Eastern Virginia Medical School IRB number 17-01-NH-0019), presentation of the project proposal to the nursing research committee (NRC), and permission from the chief nursing officer (CNO). Application to the local IRB was

completed. Presentations were made to the NRC and permission was requested from the CNO. All applications and permissions were approved. The site IRB determined that due to the retrospective and de-identified nature of the data, this DNP project "did not involve human subjects" and thus was not subject to further IRB review. The hospital served as the IRB of record for the project and the Walden IRB served as the IRB for the analysis of the student's work. Protection of human rights were maintained in this project as no patient identifiers were gathered as data. All data for this project is being maintained in a password-protected file in the DNP student's home computer for 2 years or longer as required by the IRB. No one but the student will have access to the information. After the designated time frame is passed the data will be destroyed.

Analysis and Synthesis

Analysis of the data has been performed using SPSS software. The data has been collected from the demographic information such as age and gender entered into the computer system when the patient is admitted into the hospital. Data was collected including: admission diagnosis, pertinent history, medical or surgical treatment for current admission, and purpose for placement information. This report was generated from the electronic medical record. No specific patient identifiers were captured on the report. The Mann-Whitney U test was planned to be used to test the difference in the comparison of the CLABSI rate and DUR for 6 month pre and post MLC implementation (Polit, 2010). The best statistical test to compare the two related entities of CLABSI rates and DUR is the Wilcoxon signed-rank test because the scores have come from the same sources (Field, 2013). Descriptive statistics were used to identify frequency distributions

for diagnoses, history, and treatments for patients who received MLCs. The DNP student used SPSS software to perform the statistical analysis of the data. Synthesis of findings have been completed by the student using the descriptive and demographic data collected and the results of the Wilcoxon signed-rank test. The integrity of the data has been maintained by keeping each line of data points together on one spread sheet (Grove, Burns & Gray, 2013).

Summary

The practice-focused questions for this study were: In a retrospective review of 6 months before implementation and 6 months after, did the CLABSI rate and DUR decrease? What are the characteristics of patients who received MLCs? Search engines such as EBSCOhost, ProQuest, CINAHL, MEDLINE, and Science Direct were used to gather evidence for this study. The sources of evidence were gathered by a retrospective review of CLABSI rates and DUR reports from the nursing units and the infection control department for 6 months prior and 6 months post implementation of MLCs. A retrospective chart review of demographic information obtained by a de-identified report from the EMR was gathered to describe all patients who received MLCs from Jan – June, 2016. Human subjects protections were maintained by obtaining IRB approvals from Walden IRB, the hospital local IRB, and de-identified reports generated from electronic medical records. SPSS was the statistical package used to analyze the data. The Wilcoxon signed-rank test was used to analyze CLABSI rates and DUR. Descriptive statistics were used to identify frequency distributions for diagnoses, history, and treatments for patients

who received MLCs. Section 4 provides findings and recommendations from this comparison and description of patients.

Section 4: Findings and Recommendations

Introduction

The local problem is HAIs particularly CLABSIs are some of the most costly and potentially deadly complications of hospital inpatient care (Dawson & Moreau, 2013). The CLABSI rate at one Southeastern Level I Trauma Center teaching hospital was greater than the national average (CDC, 2016). The gap in practice is that little is known about how MLCs perform in decreasing CLABSI or the characteristics of patients who might benefit from their use. The two practice-focused questions were as follows: (a) In a retrospective study of 6 months before and 6 months after implementation of MLCs, did the CLABSI rate and DUR decrease? (b) What are the characteristics of patients who received MLCs?

The purpose of the doctoral project was to quantitatively examine CLABSI rates and DUR and to identify characteristics of patients who received MLCs and thus be able to determine those future candidates for MLC insertion. The sources of evidence included reports gathered from nursing units and from infection control department reports. These reports were created by the infection control department to report CLABSI rates and DUR monthly to the CDC. EMRs were queried retrospectively to generate a de-identified report including age, sex, admission diagnosis, pertinent medical history, medical or surgical treatment for the current admission, and purpose for placement of the MLC to determine characteristics of those who received MLCs.

SPSS was the software package used to calculate the Wilcoxon signed-rank test results. This test was chosen because it enables an examination of the differences in two

sets of data being compared as the data were from the same sources at different times and because it accounts for the specific magnitude of those differences (Fields, 2013). SPSS was the statistical package used to determine characteristics of patients who received MLCs.

Findings and Implications

The findings from the Wilcoxon signed-rank test are for the CLABSI group A for 6 months (January – June, 2015) prior to use of MLCs; there were no differences compared to those of CLABSI group B for 6 months (January – June, 2016) after MLCs were introduced , $z = .73$, $p = .463$, $r = 0.3$. The findings from the Wilcoxon signed-rank test are for the DUR group A for 6 months (January – June, 2015) prior to use of MLCs were no different than those of DUR group B for 6 months (January – June, 2016) after MLCs were introduced $z = -1.79$, $p = .074$, $r = -.73$. These results revealed no significant differences in the two groups. The result of the Wilcoxon signed-rank test is there is no difference in CLABSI rates and DUR when comparing 6 months before use of MLCs to 6 months after use of MLCs.

The characteristics of those who received MLCs in the selected 6 months after the initiation include 42.7% males and 57.3% female patients. Individuals receiving MLCs ranged in age from 15 – 103 years with the mean age being 53.8 years. The highest percentage of patients was in the 51 – 70 year old age group representing 37.4% of the 262 patients. The admission diagnoses including outpatient treatments for those who received MLCs are noted below in Figure 1. Cardiovascular, neuro, and infection admission diagnoses were noted in 43% of those who received MLCs. Sickle cell

diagnoses were characteristic in 12% of those who received MLCs. The “other” category included electrolyte imbalances, such as hyponatremia and hypokalemia, as well as diagnoses such as dementia, dehydration, hypertension, diabetic ketoacidosis, electroconvulsive therapy (ECTs) for depression, and fever of unknown origin. Analysis of the diagnoses revealed that, for those who received MLCs, 63.4% had predominantly medical diagnoses throughout their stay and 36.6% had surgical diagnoses. MLCs were inserted exclusively for IV access for therapy lasting more than 3 days.

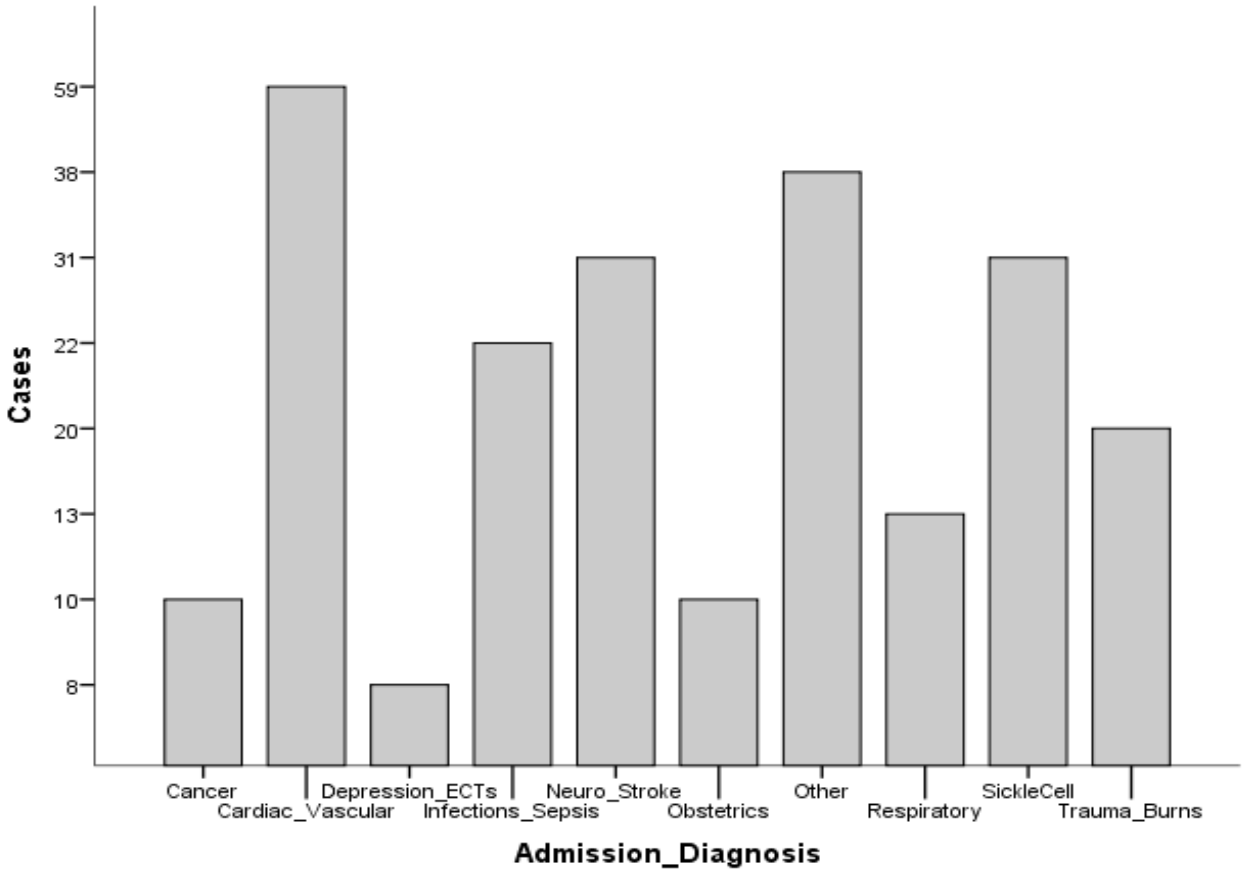

Figure 1. A graphic representation of various categorical admission diagnoses and outpatient treatment for the 262 patients who received MLCs from January – June 2016. A de-identified characteristics report and above figure were created by the student with data queried from the EMR.

Unanticipated limitations included difficulty in obtaining a list of specific diagnoses for the focused hospital stay. The EMR includes all diagnoses in the record for all admissions and may have the same diagnoses listed in synonymous terms such as high blood pressure and hypertension. The admission diagnosis was found to be the best resource for type of medical or surgical admission although there were a few exceptions such as burns which may or may not necessitate surgery. The potential impact on findings may be the percentages of medical or surgical diagnoses may be skewed.

Implications resulting from the findings include providing clinical staff, communities, institutions, and systems with information to support the use of MLCs in populations of patients who have difficult IV access and need an alternative VAD to provide IV therapy for up to 28 days (Alexandrou et al, 2011; Moureau & Chopra, 2016). The use of MLCs may be initiated not only in the ICU but in clinical settings such as the emergency department (ED) with better understanding of the characteristics of those patients that may benefit from them (Adams et al., 2016). The community may benefit by understanding MLCs may be used for home IV therapy or outpatient procedures such as ECTs for depression (Giuliani et al., 2013; Griffiths, 2007).

Recommendations

The recommendations for practice are to examine a larger sample size to determine if the comparison of 6 months prior to MLC use and 6 months after use may have made a difference when comparing CLABSI rates and DUR. The characteristics of those who have received MLCs may initiate evaluation for the use of these catheters for

similar patients sooner in their treatment there by saving those individuals from multiple IV attempts and there by preserving vessel health (Moureau et al., 2012). Characteristics of patients who have received MLCs should be described in a larger population of patients to determine if they may provide a useful alternative to other types VADs than previously known.

Strengths and Limitations of the Project

The project poses questions that have not been studied in the literature in the same way they have been in this DNP project. One strength of the project was having a single clinical provider inserting MLCs which provided control of extraneous variables in regard to careful adherence to guidelines and protocols when performing insertion. This project had limitations including a small sample size and the majority of patients were adults. The data was only gathered at one hospital rather than the whole hospital system which would have provided a larger sample size with a greater variety of patient characteristics. The time frame of 6 months for the study rather than examining a longer period of time such as one or two years of data is also a limitation. The project would have been more meaningful if the cases of those patients who had CLABSIs were able to be correlated to the characteristics of age, gender, admission diagnoses and other active diagnoses or current problems during the hospital episode. The CLABSI rates are declining across the country due to initiatives from the CDC (CDC, 2016), although, if unmonitored or with poor adherence to care bundles, such rates have a tendency to increase (Matocha, 2013).

Summary

The purpose of this study was to quantitatively compare CLABSI rates and DUR 6 months prior to and 6 months after the initiation of MLCs in one Southeastern Level I Trauma Center and teaching hospital. The Wilcoxon signed-rank test was used for the comparison and revealed no difference in CLABSI rates and DUR before and after MLCs. Characteristics of the 262 patients who received MLCs were described as follows: 42.7% males; 57.3% females; age range was 15 – 103 years with a mean age of 53.8 years; 43% had admission diagnoses of cardiovascular, neuro, and infection; 63.4% were treated for medical diagnoses; 36.6% were treated for surgical diagnoses; and 100% received these devices for IV access needed for longer than 3 days. Implications of the findings of this study include a better understanding of the purpose and use of MLCs and characteristics of patients who may benefit from them.

Recommendations for future studies include comparing longer periods of time in multiple hospitals to determine if there might be a difference observed in CLABSI rates and DUR. Strengths and limitations of this project include a better understanding of the use of MLCs in various clinical settings. Understanding patient characteristics may encourage clinicians to use MLCs earlier in the hospital stay to save patients from multiple IV attempts in difficult to access situations and to preserve vessels. A larger population of patients may reveal other patient characteristics or populations that may benefit from MLCs. Maintaining vigilance in the use of MLCs and choosing the correct VAD for the right purpose and treatment will benefit all patient populations. Section 5 will provide the plan for dissemination of the study results.

Section 5: Dissemination Plan

Dissemination

The results and recommendations learned from this project will be discussed with educators and the IV team who were influential in the MLC program and DNP Project process. A power point presentation will be created and shared by the student with stakeholders. Applications will be completed for a minimum of two organizational conferences to provide a poster presentation of the results for this project. The student intends to apply for an article to be published in the future after completion of the Walden DNP program. Nursing journals such as *Journal of Vascular Access* or *American Journal of Nursing* will be queried for interest in this topic in order to disseminate the results to a broader population of nursing professionals.

Analysis of Self

I have grown as a practitioner, scholar, project manager, and leader through this DNP Project. A project manager must have broad vision of the project understanding the overall goals, objectives, time frame for implementation, and evaluation methods needed to measure the process and outcomes. Throughout the DNP program, leadership skills have been cultivated by enhancing knowledge as a practitioner and a scholar. The DNP program has given me a broader view of patient care and the many factors that influence the ability to give evidence-based care including organizational, state, and national politics (Montalvo & Byrne, 2016). My growth in politics and leadership was enhanced by a number of mentors including a state nursing lobbyist, Director of Nursing

Education, Director of Emergency Services, and Director of Nursing Research. The experiences gained in leadership were enhanced by these mentors showing me how to query various resources to have access to the most current and accurate information. Politics and policies in the nation, state, and local areas have a tremendous impact on how patients' health care needs are met. I learned so much information about state legislation and understand the importance of the need for DNPs to be involved in leadership roles to influence access to care for all individuals and bring about social change.

A DNP must have the ability to assess problems and know where to look to find the best answers. DNPs generate internal evidence through quality improvement and Evidence-Based Practice (EBP) projects. They then translate this evidence into practice thereby enhancing health care quality and influencing health policy (Melnyk, 2013). When the best evidence is found I feel confident in my ability to translate the evidence into practice at the bedside, to improve patient care and outcomes, and to sustain the change in practice for it to become the new norm (Stoeckel & Kruschke, 2013).

This DNP project has been challenging due to the complexity of the questions being asked. The scholarly journey taken with this project has taught perseverance. The completion of this DNP project has also enhanced my leadership and mentorship. While working with the IV Team, many current issues in IV therapy have been discussed and opportunities to learn from each other have been cultivated. Tools to help the bedside staff retain skills and knowledge of protocols and MLC care management have been developed. The project has given me confidence to translate evidence into practice in a

manner that is welcomed and accepted by staff as well as empowered them with knowledge of how to use this valuable tool.

Summary

The findings from this study will be disseminated through various methods including poster and oral presentations. The DNP Project has provided the learner with an un-parallel opportunity for growth in leadership, knowledge, confidence, and the ability to become involved in health policy issues. This project was intended to examine the MLC role in patient care. The MLC is another tool that can be used to manage care effectively and efficiently for a targeted population of patients under the right circumstances. The small CLABSI rates and DUR determined there was no difference before MLC use when compared to the same measures for a similar period after implementation of these devices. Patient characteristics of those who received MLCs were described. The goal of this project was to help clinicians use MLCs for the best population of patients, for the appropriate reasons, and to provide the best evidence based care for patients as this is the role of the DNP.

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