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# IMPROVING VENOUS THROMBOEMBOLISM PROPHYLAXIS KNOWLEDGE AMONG REGISTERED NURSES ON A MEDICAL- SURGICAL INPATIENT UNIT IN THE MIDWEST

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IMPROVING VENOUS THROMBOEMBOLISM PROPHYLAXIS KNOWLEDGE  
AMONG REGISTERED NURSES ON A MEDICAL-SURGICAL INPATIENT UNIT  
IN THE MIDWEST

A Scholarly Project Submitted to the Graduate School  
in Partial Fulfillment of the Requirements  
for the Degree of  
Doctor of Nursing Practice

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Pittsburg, Kansas

May 2022

# IMPROVING VENOUS THROMBOEMBOLISM PROPHYLAXIS KNOWLEDGE AMONG REGISTERED NURSES ON A MEDICAL-SURGICAL INPATIENT UNIT IN THE MIDWEST

An Abstract of the Scholarly Project by  
Theresa Anne Umscheid

Venous thromboembolism (VTE) is the third most common vascular disease and includes approximately 900,000 cases annually in the United States. The purpose of this quality improvement project was to enhance education regarding VTE prophylaxis for registered nurses on a medical-surgical inpatient unit at a hospital in the Midwest. This study was initiated due to one nurse's perception that staff on this unit lacked confidence and expertise on the importance of VTE prophylaxis interventions. Participants completed a VTE knowledge pretest, followed by an educational intervention on VTE prophylaxis utilizing Health Stream. After the intervention, participants completed a VTE knowledge post-test. The study had a total of 19 participants and good variability of demographic information. Based on the results, the null hypothesis was rejected. There was a statistically significant difference between the pretest and posttest means ( $t = -9.795$ ,  $df = 18$ ,  $p < .001$ ), which was less than the alpha value ( $p < .05$ ). The VTE educational intervention significantly increased the nurses' knowledge about VTE prophylaxis. The nurses gained an average of 28.316% points on the posttest after completing the educational intervention. This supports the hypothesis that the educational intervention increased the nurses' knowledge of VTE prophylaxis. It is imperative that nurses and the health care team recognize the risk and significance of VTE. More staff education regarding VTE prophylaxis can lead to better patient outcomes.

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## **Chapter I**

### **Description of the Clinical Problem**

Venous thromboembolism (VTE) encompasses two common healthcare conditions, pulmonary embolism (PE) and deep vein thrombosis (DVT). A deep vein thrombosis is more commonly known as a blood clot, often formed in the lower extremities. When this blood clot breaks off and enters the bloodstream, it can get lodged in the lungs and cause a pulmonary embolism. According to Link (2018), “The Centers for Disease Control and Prevention estimates that, in the U.S. alone, the incidence of VTE could total 900,000 cases annually and cost the US health care system \$7 to \$10 billion each year.” The American Society of Hematology (ASH) states that VTE is the third most common vascular disease (Schunemann et al., 2018). Venous thromboembolism is commonly a problem in critical care and surgical patients, although healthy outpatients, such as long-distance travelers, long-term care residents, and healthy people with minor injuries are also at a high risk of experiencing VTE (Schunemann et al., 2018). Practices to prevent VTE may include medications that act as anticoagulants, as well as pneumatic compression devices (PCDs), which mechanically stimulate the tissue particularly in the lower limbs to promote blood flow and compress the veins, imitating the natural actions of the body during ambulation (Curtis, 2013).



One nurse's perception was that staff at a local community hospital in the Midwest lacked confidence and expertise on the importance of venous thromboembolism (VTE) prophylaxis interventions designed for medical/surgical inpatient admissions. If there truly was lack of expertise, this could lead to decreased patient education, application, and documentation of interventions. These patients are at increased risk for VTE, which includes both deep vein thrombosis (DVT) and pulmonary embolism (PE), due to their decreased health and admission status.

### **Significance**

Because VTE is such a common risk for medical-surgical inpatients, it is imperative that nurses and other care team members recognize the risk and significance. After recognizing how important VTE prophylaxis is, healthcare staff must feel knowledgeable and comfortable talking with their patients about these risks and the benefits of evidence-based treatment and prophylaxis options. In order for a patient to fully trust their care team, the nurses and other staff must exude confidence when teaching patients and implementing these measures. Society as a whole will benefit from this change by having a better community hospital to attend in cases of emergency and more qualified staff caring for them. This will help to encourage continuation of building a higher-quality strong nursing workforce.

### **Purpose**

The purpose of this quality improvement project was to enhance knowledge regarding venous thromboembolism (VTE) prophylaxis for Registered Nurses on a medical-surgical inpatient unit in a metropolitan area of the Midwest. This intervention will potentially result in increased patient education and improved patient health

outcomes. An educational focus should result in a better nursing workforce and improvement in the nursing staff members' confidence and capability. With an improvement in knowledge of VTE prophylaxis, this hospital will be able to provide higher quality care, decrease adverse events due to hospital admission, and improve nursing education. If successful, this type of educational intervention may be more broadly applied to the entire health system, affecting the regional metropolitan area and ultimately reaching more nurses.

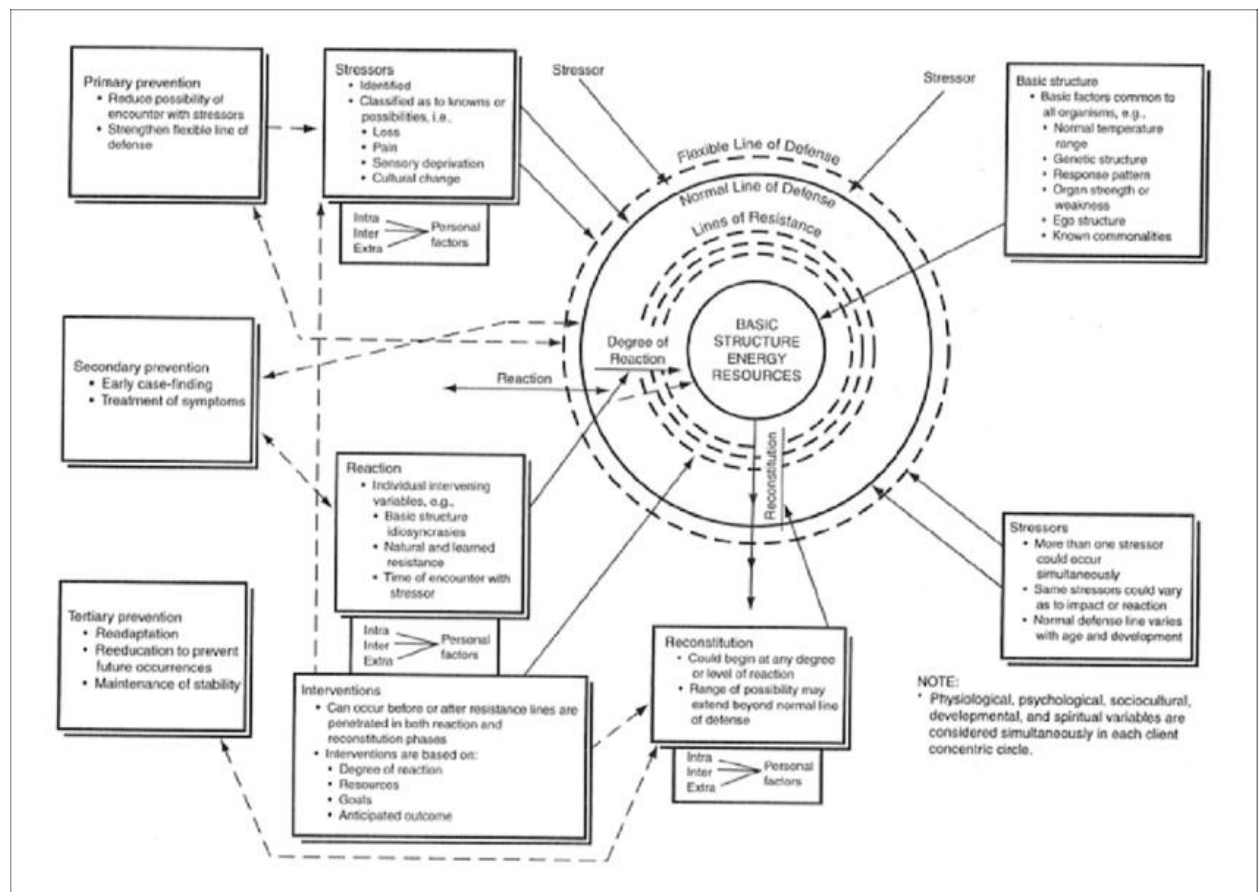
### **Theoretical Framework**

This project utilized the theoretical framework of Betty Neuman's systems model. This model discusses each level of prevention (primary, secondary, and tertiary) and takes a holistic approach to address the individual needs of each unique patient (Petepirin, 2016). Figure 1 shows the various factors affecting patient health outcomes within Betty Neuman's systems model. Major assumptions and theoretical statements include the following:

Primary prevention occurs before the patient reacts to a stressor. It includes health promotion and maintaining wellness. Secondary prevention occurs after the patient reacts to a stressor and is provided in terms of the existing system. It focuses on preventing damage to the central core by strengthening the internal lines of resistance and removing the stressor. Tertiary prevention occurs after the patient has been treated through secondary prevention strategies. It offers support to the patient and tries to add energy to the patient or reduce energy needed to facilitate reconstitution. (Petepirin, 2016)

**Figure 1**

*Betty Neuman's Systems Model*



*Note:* Stressors, reactions to stressors, lines of defense, and impact on the client system according to the Neuman model. From “Care Delivery for Filipino Americans Using the Neuman Systems Model,” by A. D. Angosta, C. D. Ceria-Ulep and A. Tse, 2014, *Nursing Science Quarterly*, 27(2), p. 143 (<https://doi.org/10.1177/0894318414522605>). Original diagram copyright 1970 by Betty Neuman.

Primary prevention such as health promotion includes the patient seeking care, keeping a heart-healthy diet, and exercising regularly to lower their risk of vascular disease and VTE. Secondary prevention would be for the patients who are symptomatic or at an

increased risk for VTE; this step would include medications such as anticoagulants or interventions such as compression devices/hosiery.

Using this step-wise model, tertiary prevention could be demonstrated by the patient who has now recovered and is ambulating independently well enough to discharge home, resume normal care, and initiate further health promotion activities. This model also discusses the challenges due to the outside environment and lines of resistance, such as poor skin, genetically dispositioned poor vascular health, or other necessary medications that increase the patient's risk for VTE.

### **Project Questions**

This nurse researcher developed a research question rather than a hypothesis because Terry (2018) states that these are more appropriate for qualitative exploratory studies, and no relationship is predicted; however, the question is still specific (p. 24). A research question is appropriate for a project such as this where there has already been adequate research behind best practices and where evidence-based practice has already been implemented by the organization, but quality improvement is still needed. The overarching research question at hand was as follows: Does the implementation of an educational intervention among registered nurses caring for medical/surgical inpatients increase staff knowledge of appropriate VTE prophylaxis measures? This goal can then be broken down into more specific research questions such as:

- What is the level of knowledge of nursing staff regarding VTE prophylaxis interventions immediately prior to an educational intervention?
- What is the level of knowledge of nursing staff regarding VTE prophylaxis interventions immediately following an educational intervention?

## Definition of Key Terms

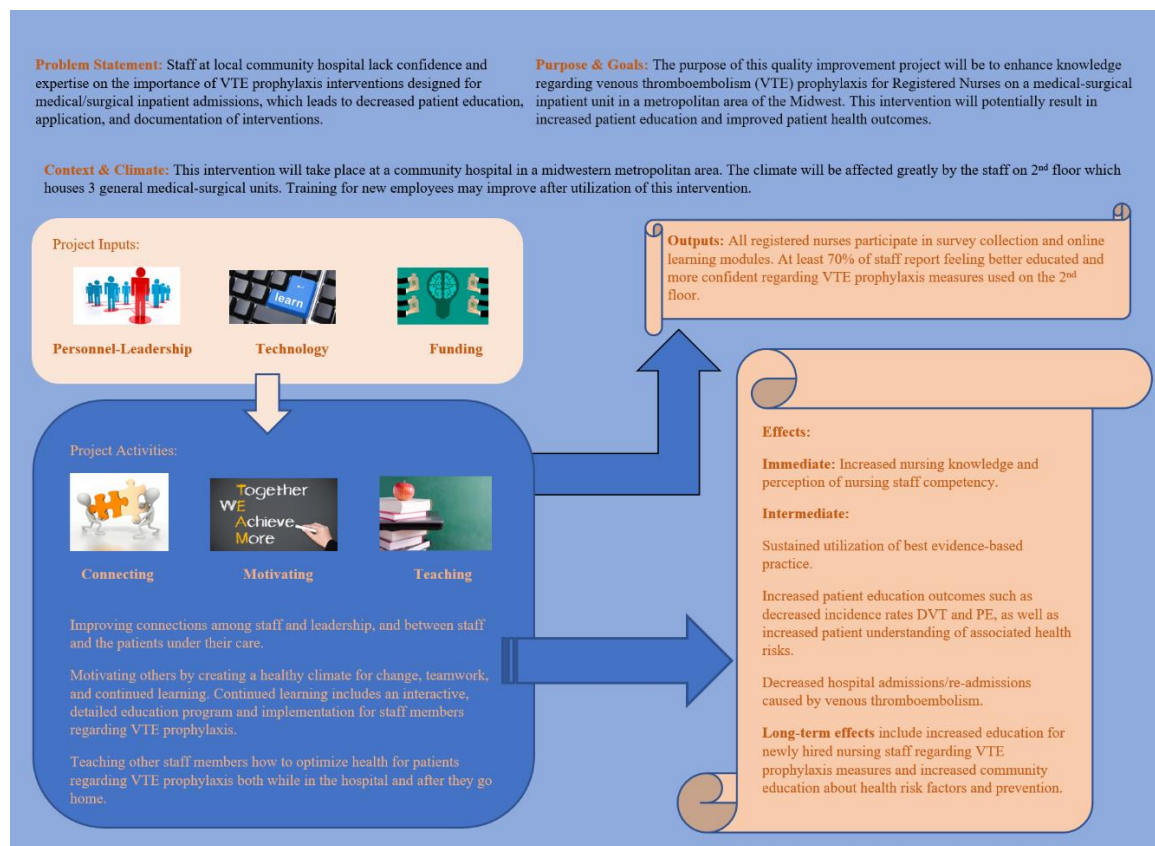
- **Anticoagulants:** “medicines that help prevent blood clots. They're given to people at a high risk of getting clots, to reduce their chances of developing serious conditions such as strokes and heart attacks” (National Health Services, 2020).  
Common anticoagulants include warfarin, heparin, dabigatran, rivaroxaban, and apixaban (National Health Services, 2020).
- **Blood clots:** “a seal created by the blood to stop bleeding from wounds. While they're useful in stopping bleeding, they can block blood vessels and stop blood flowing to organs such as the brain, heart or lungs if they form in the wrong place” (National Health Services, 2020).
- **Nursing staff:** Registered Nurses (RNs) providing direct patient care
- **Patients:** people undergoing medical treatment
- **PCDs: pneumatic compression devices: also called IPC: intermittent pneumatic compression:** “used to help prevent blood clots in the deep veins of the legs. The devices use cuffs around the legs that fill with air and squeeze your legs. This increases blood flow through the veins of your legs and helps prevent blood clots” (John Hopkins Medicine, 2020).
- **VTE: venous thromboembolism:** encompasses both incidences of pulmonary embolism (PE) and deep vein thrombosis (DVT); “a term referring to blood clots in the veins, is an underdiagnosed and serious, yet preventable medical condition that can cause disability and death” (Centers for Disease Control and Prevention, 2020).

## Logic Model

As one can see in the logic model shown in Figure 2, the purpose and mission are clearly outlined by the problem statement and goals statement for this project located at the top of the chart. The context is clearly outlined on the chart. The context was a 300-bed medical center in the Midwest and the intervention will focus on only three medical-surgical inpatient units. This will include all Registered Nurses of the 2nd floor, whether they work part-time, full-time or as needed (PRN).

**Figure 2**

### *Logic Model for the Proposed DNP Scholarly Project*



*Note:* Visual cue of purpose and context as well as all inputs, activities, and outputs.

Inputs include personnel-leadership, technology, and funding. Personnel-leadership was chosen because this project will follow a quality improvement model

primarily focused directly on improving staff education. This project will help personnel to connect better to their leadership and mentors, but will also help to create more informal leaders in patient care among the nursing staff. Technology will be utilized via HealthStream online learning modules to help disseminate the surveys and education, as well as Zoom presentations by the student. Funding could be a barrier to this project, as the researcher is unaware of the current resources available that may be needed to contribute to technologically advanced education. Funding for printed materials may also be needed in order to obtain accurate survey results and present information.

The outputs are listed clearly on the chart. A goal of at least 70% reported increase in confidence and knowledge was set to reach the majority of the staff. Some staff may feel as if they already had this knowledge, but they may benefit from re-visiting the topic of VTE prophylaxis in more detail, or will feel more confident about talking to their patients.

The effects of the intervention will vary in timing and size of impact. Listed on the chart are the immediate, intermediate, and long-term effects of this quality improvement project. These are aims and may not be reached during the timeframe of this project. Impacts reaching the patient and overall health system may take months, or even years, however the impact on the staff should be immediate after completing the educational intervention. The researcher will show improvement of knowledge via a post-educational survey completed by Registered Nurses (RNs).

### **Summary**

This chapter serves as the beginning of an in-depth analysis of how to improve Registered Nurses' knowledge of VTE prophylaxis at a midwestern community hospital

located in a metropolitan area. This quality improvement project utilized an educational intervention for nursing staff and quantitative analysis of results using a pre-test/post-test design and implementing the Plan-Do-Study-Act (PDSA) model (Taylor et al., 2014). Using this model will show the nurse researcher which areas have been improved with an educational intervention, and which areas may need further research or more development. Using Betty Neuman's systems model and a unique logic model for change, the nurse researcher created a high-quality nursing educational intervention for the staff and analyzed the results in order to better patient care. Several research questions were addressed to provide a broad overview of the research and incorporate many aspects for quality improvement. Patients may benefit from this intervention by having better-trained staff on their care team, who are empowered through knowledge to enhance their passion for patient care, proper use of VTE prophylaxis interventions, and patient education.



## **Chapter II**

### **Review of Literature**

The purpose of this quality improvement project is to enhance education regarding VTE prophylaxis for Registered Nurses on a medical-surgical inpatient unit at a hospital in a metropolitan area of the Midwest. To aid in the implementation of advanced nursing education, the researcher reviewed several pertinent resources regarding best practices for nursing education based on scientific evidence, as well as methods that have worked well for other projects in improving education among nursing staff. There is great need for this area of research as one study states “Research conducted worldwide overwhelmingly supports that nurses play an important role in thromboprophylaxis. Therefore, it is essential to recognize the necessity for education about VTE among nursing practitioners, and to explore various factors that impact clinical nursing” (Ma, et. al, 2018, p. 2). The following review of literature assisted the researcher to reach goals such as increased patient health outcomes, better workforce, decreased adverse events, increased quality of care, and increased patient compliance and satisfaction.

All sources are highly reliable as several of them are published within peer-reviewed journals and include multiple authors and review boards. The majority of these sources are quantitative and include extensive data to support their claims. The sources

vary in methodology; however, many are focused on the care of medical-surgical inpatients.

### **Risk Assessment**

Some well-known tools to assist healthcare professionals in choosing the appropriate and best VTE prophylaxis for their patients include the Padua Prediction Score (PPS) and the Caprini risk assessment model (RAM). Both of these risk assessment tools score patients as low, moderate, or high risk, based on their overall health and disease factors, as well as recent surgical procedures or reason for hospitalization. Both of these tools are to be used for general hospital or surgical patients. A quantitative study performed in China, among general hospital patients over the course of four years found that the Caprini RAM gave a better, more comprehensive review of VTE risk and risk for mortality when compared with the PPS (Zhou et al., 2018). In that study, PPS predicted fewer than 50 percent of VTE cases, while the Caprini predicted 84.3 percent of VTE cases (Zhou et al., 2018). The facility this research will take place in is already utilizing the Caprini RAM to determine VTE prophylaxis needs for medical-surgical inpatients.

According to Zhou et al. (2018), the Caprini RAM gives best practice guidelines for general medical patients that are hospitalized. This includes a combination of mechanical and chemical interventions. According to this tool, low-risk patients should use early ambulation and compression devices to prevent VTE; moderate- and high-risk patients should use medications in addition to the previously used compression devices in order to effectively prevent any type of VTE (Caprini, 2020).

Some studies focused only on DVT or PE and compared the two separately. One such study found that combined modalities are useful due to the fact that VTE has

multiple factors and refers back to Virchow's triad of hypercoagulability, venous stasis, and endothelial injury (Kakkos et al., 2016, p. 18). By treating all possible causes of VTE, DVT prevention should be improved and more effective (Kakkos et al., 2016, p. 18). This study further explains how various methods of VTE prevention are connected to the various health issues that are incorporated under Virchow's triad. Kakkos et al. (2016) supports this explanation by saying, "IPC reduces venous stasis by producing active flow enhancement, and also increases tissue factor pathway inhibitor (TFPI) plasma levels. Unfractionated and low molecular weight heparin inhibit factor X. These totally different mechanisms of action are most likely responsible for the synergy between these two modality types" (p. 18). This explanation simplifies the common confusion amongst the various ways of preventing VTE and the differing methods institutions may use. This study did not report any limitations, however it was mentioned that the quality of evidence is only considered "moderate" as there is potential for risk of bias. With this information, as well as the Caprini RAM, healthcare providers will be better suited to implement best practice for their patients requiring VTE prophylaxis. Many of these preventative treatment options have already been implemented within the facility under study.

### **Compliance and Use**

While chemoprophylaxis is studied extensively, there is research out there that helps improve compliance of non-pharmacological interventions. A study in Europe, focused on graduated compression stockings (GCS) instead of the PCDs commonly used in the United States. They researched from a more qualitative perspective and stated that poor patient compliance is a main component of ineffective GCS (Sajid, 2016, p. 89). At

the end of their study, they identified patient's barriers to GCS use and provided education as well as compromising by using GCS that are knee-high length only to allow for increased patient comfort with the benefits of still providing VTE prophylaxis (Sajid, 2016). Sajid (2016) reports no major limitations of their study, however emphasizes that a large-scale randomized controlled trial would be necessary to validate future research. Patient compliance was also focused on by other researchers in regards to chemoprophylaxis being misused or underused due to patient refusal (Kreutzer et al., 2019). In this particular study, researchers found that lack of knowledge among nurses led to missed doses, poor nurse-patient communication, and the necessity of chemoprophylaxis for these specific surgical patients; however, this study was limited by a small sample size and lack of generalizability (Kreutzer et al., 2019).

Like Kakkos et al. (2016), another study which focused specifically on critical-care patients found that preventing VTE via multiple mechanisms was most beneficial. Wan et al. (2015) states, "by combining ICP and LMWH treatments, an improved response may be achieved as each treatment functions via an independent mechanism" (p. 2335) (in this reference, ICP is abbreviating intermittent pneumatic compression and LMWH is abbreviating low-molecular weight heparin). This study incorporates more detail regarding the risk-vs-benefit assessment that must be done to rule out risk for excessive bleeding when using chemoprophylaxis, particularly among critically ill patients. A limitation of this study is that it was observational and not truly randomized.

One article supports PCD use and concludes, "There is clear evidence of the effect of IPC in reducing the risk of DVT and improving of survival over 6 months of follow-up for both ischemic and hemorrhagic stroke patients" (Zhang et al., 2018). This

article goes on to state however that IPC does not account for “quality-adjusted survival” or put more simply, a patient’s quality of life, particularly in their last years. This article reinforced that providers should assess patient’s functional status and future wishes or goals of care when helping make treatment decisions (Zhang et al., 2018, p. 189). This is the only article cited that speaks to quality of life and the significance behind these factors for patients and their families, and is limited by small number of trials and unclear methods of blinding and randomization. This quality-of-life discussion alone may help to improve patient compliance and communication between clients and their healthcare providers.

A study completed by Arabi et al., published in the *New England Journal of Medicine*, found evidence that opposes Kakkos et al. (2016) and states, among patients receiving pharmacologic prophylaxis, there was no benefit of adding IPC to prevent DVT (Arabi et al., 2019, p. 1314). This opposing discussion might be due in part to a much smaller sample size that focused on critical care patients within the first 48 hours of hospital admission. Arabi et al. (2019) chose to limit their research to critically ill patients because they knew “deep-vein thrombosis develops in 5 to 20% of critically ill patients despite pharmacologic thromboprophylaxis” (p. 1306). This patient population, more than likely, has several other risk factors when compared to general hospital and surgical clients and would likely then have a higher risk of VTE and mortality.

### **Barriers to Implementing VTE Prophylaxis**

One article by Kreutzer et al. (2019), speaks of the barriers that may exist to implementing evidence-based practices of VTE prophylaxis, and targets specifically methods in which nursing education can help break through these barriers. This study

was completed using fourteen focus group interviews to explore nurses' misconceptions and uncertainties when counseling patients regarding proper use of VTE prophylaxis measures. Another such resource (Streiff et al., 2012) discusses whether a mandatory clinical decision support tool would encourage higher levels of appropriate prophylaxis use and compliance. It was found that added education and reminders to the electronic system nurses use improved implementation of proper VTE prophylaxis by the nursing staff. This research article follows the same concept of another in which it was found that "intervention of real-time alert in eMAR and education bundle showed 43% reduction in non-administration and 47% reduction in patient refusal" (Haut, et al., 2018, p. 9).

One study found that nursing staff do not have adequate knowledge regarding VTE prophylaxis. This study assessed staff of various levels and years of experience and found that many were lacking in knowledge and scored poorly on a knowledge-based test regarding VTE. Scores were especially low in areas of pathology and anatomy, as well as risk factor assessment (Zhou, et al., 2019). This study was rather large in numbers, however it focused on only one department, limiting its breadth and generalizability. This study continues by stating, "30% of nurses reported their overall knowledge of VTE risk assessment was fair or poor and 31% reported that they seldom completed VTE risk assessment on their patients" (Zhou, et. al, 2019, p. 9). Due to staff education issues such as this, it was found that among medical and surgical inpatients, "less than 15% patients at risk of VTE received thrombosis prophylactic intervention during their hospital stay. Appropriate VTE prophylaxis was just administered to 10% patients" (Dong, et al., 2020, p. 50). The study by Dong et al., was limited by only being randomized via clusters and thus allowing for some selection bias. However, this study supports the researcher in

furthering nursing education to increase compliance among patients and encourage staff to be more diligent in advocating for best practice implementation. Because of the shocking lack of proper use of VTE prophylaxis this article found, they incorporated a clinical decision support tool/alert to help increase administration rates.

Research supports this area of necessity by identifying several studies across multiple countries' hospitals that showed VTE prophylaxis was not being properly utilized. One such study (Gibbs, et al., 2011) showed that a nurse-led active educational intervention increased appropriate VTE prophylaxis among medical and surgical inpatients in Australia by 16%. This study also found that among high-risk patients, the improvement after a multifaceted education program, appropriate VTE management increased by 42%.

Another study that supports better staff education resulted in significant improvement. Nana et al., (2020), discovered that even within a multidisciplinary approach study, the first cycle, which consisted purely of education for healthcare workers, showed the greatest amount of significant improvement. Nana et al. (2020) continues by stating, "The percentage of patients being admitted to medical wards having a risk assessment for VTE prophylaxis within the first 24 hours of their admission increased from 51% to 86% over a 12-week period following cycle 1" (p. 4). This research also utilized a reminder tool in the form of a sticker to improve compliance from the healthcare provider in assessing and administering appropriate VTE prophylaxis. It was shown that "the 'VTE sticker' assisted the clinical decision maker to balance the probable treatment benefit from VTE prophylaxis against the possible risk of increased harm and prompted dose reductions of enoxaparin where clinically indicated" (Nana et

al., 2020, p. 6). The limitation to this study is its small sample size, however cycle 2 and 3 of this study highlight the project's strength of reproducibility.

### **The Role of Nurses in VTE Prophylaxis**

Several studies have shown that currently there is a gap in nursing education and nurses' knowledge of properly utilizing VTE prophylaxis techniques. Ma et. al (2018) states that despite the critical importance of VTE prophylaxis, less than half of patients receive appropriate prevention prior to diagnosis (p. 1). It is imperative, that nurses take this responsibility upon themselves, as they have the training and interpersonal skills to improve VTE prophylaxis among inpatients. This study later reports "Direct care nurses, who have a primary obligation to patients' advocacy, can help bridge gaps between patients' specific situations and physicians' knowledge" (Ma, et. al, 2018, p. 2). A limitation of this study include nonresponse, as the information-gathering survey was not mandatory.

Another study identified that "38.9% of the medical staff were uncertain about the effect of GCS, and 27.6% doubted the efficacy of IPC" (Tang et. al, 2015, p. 6). However, this study was limited by only focusing on intensive care units in China, and results may not be generalizable to the U.S. Midwest hospital under review. This study also identified hesitations among nursing staff that included "worries regarding skin injury, difficulty removing GCS and the discomfort of mechanical thromboprophylaxis" which was "expressed by more than 50% of nurses" (Tang et. al, 2015, p. 8).

When a survey was conducted by Ma et. al (2018) regarding staff knowledge of VTE prophylaxis, the average correct response rate was inadequate, and participants who had received continuing education scored higher overall on the survey. This proves that



continuous nursing education can improve knowledge and therefore implementation of appropriate VTE prophylaxis. Ma et. al (2018) supports this claim by stating, “Without correct understanding, it is impossible to educate patients about how to actively, participate in their own physical prophylaxis treatment; therefore, improving nursing quality, and reducing unnecessary costs cannot be achieved” (p. 6). As all hospitals wish, including the facility under study by this researcher, cutting costs and improving quality of care are priority concerns for administrators.

### **Gaps in the Literature**

Gaps within the literature may be attributed to high or unclear bias (Kakkos et al., 2016). Other gaps in the literature include the vast differences among types of patients studied and various patient populations. According to the Caprini RAM, patients with active cancer are at a higher risk than say a young, healthy patient, undergoing major surgery. For example, one study focused their efforts particularly on patients with lung cancer who were undergoing a video-assisted thoracoscopic surgery (Wang et al., 2019). Within this study’s conclusion, they stated that using IPC during a procedure was effective in preventing DVT post-operatively (Wang et al., 2019, p. 2836). While this study looked at patients with higher risk than general surgical hospitalized patients, these patients, depending on their other disease states, may have in fact scored lower than the critically ill patients studied by Arabi et al. (2019). Among those mentioned above, gaps in the literature also include the fact that a single medication or group of medications has not been decided in being included as chemoprophylaxis. There are several different medications and classes of drugs that may be used throughout these studies, even when comparing chemoprophylaxis techniques to PCDs. In regards to the PCD use, some

studies use sleeves that cover the thighs and calves, while others only use calf-length sleeves (Wan, et al. 2015). There is a variance of compression amongst these devices as well, although the measurement is not explicitly stated. Another gap this researcher identified among the literature is the lack of discussion regarding quality of life. What does the patient want? Would they like to consider comfort and palliative care, more than medical-based treatment? This lack of discussion and patient consideration may contribute towards decreased patient satisfaction and compliance.

### **Summary**

The research regarding VTE prophylaxis risk assessments, compliance and proper use of prophylaxis, and barriers to adherence is widely varied and requires the researcher to view this topic through multiple perspectives. Simple interventions such as nursing and general healthcare staff education and shrewdly placed reminders can increase implementation of proper VTE prophylaxis, which will then decrease adverse effects and improve the overall health of medical-surgical inpatients. The researcher considered this vast literature review to complete the scholarly project by implementing staff education.

## **Chapter III**

### **Methodology**

This chapter describes in detail the methods utilized for data collection in regard to the Doctor of Nursing Practice (DNP) scholarly project. This focused on the sampling and specific procedures that were used by the principal investigator (PI) when attempting to improve venous thromboembolism (VTE) prophylaxis knowledge among registered nurses working on a medical-surgical inpatient unit at a Midwestern hospital. The investigator worked closely with administrative and leadership employees at the Midwestern hospital under study to complete data collection and study of outcomes.

#### **Project Design**

The DNP scholarly project in question was a quality improvement study focused on improving VTE prophylaxis knowledge among registered nurses on a medical-surgical inpatient unit in the Midwest. This study utilized purposive sampling to give the PI the best possible outcome and reliable participants. The study design was a pretest and posttest using a multiple-choice questionnaire before and after an educational intervention regarding VTE prophylaxis. A short demographics survey was also included. The pretest, educational presentation, and posttest were available to willing participants via HealthStream, an online learning management system already in place at the hospital under study.

## **Target Population**

The study took place at a 300-bed hospital within a large metropolitan area in the Midwest. All registered nurses employed on the medical-surgical inpatient unit of this hospital were invited to participate in this study. Inclusion criteria included full-time, part-time, or as needed (PRN) registered nurses of all shifts that read and comprehend the English language and work on the medical-surgical inpatient unit at the specified facility in the Midwest. Exclusion criteria included the principal investigator, as well as nurses less than 18 years of age, and those that cannot read or comprehend the English language. Recruitment of subjects took place via multiple methods such as the *Final Friday* newsletter announcements, email reminders sent from medical-surgical unit director and unit managers, as well as word of mouth. This study was also available to those registered nurses looking at the elective catalog on HealthStream. Study participants were able to access the questionnaires and educational intervention from either home or work due to the online capability and ease of access of the HealthStream system. Study participants received an appreciation gift for their time in the form of a nursing-themed small notebook, keychain, and a QuikTrip gift card in the amount of five dollars, as well as a handwritten thank-you-note.

## **Protection of Human Subjects**

This DNP scholarly project was presented to and approved by the student's project committee members, as well as the Irene Ransom Bradley School of Nursing (IRBSON) Committee for the Protection of Human Subjects, and the Pittsburg State University (PSU) institutional review board. This project was presented to and approved by the corporate compliance officers at the hospital under study. This project had already

been approved by the unit director and unit managers of the medical-surgical inpatient unit. The review processes allowed for complete approval and protection of human rights prior to the implementation of the DNP scholarly project. The principal investigator had completed an online training course regarding biomedical research via Collaborative Institutional Training Initiative (CITI) human research protection training.

Benefits and risks involved in this DNP scholarly project were openly discussed with all participants of the study, as well as the members of the aforementioned review boards. The risks of this project were minimal and were fully disclosed to all willing participants of the study. Risks included psychological stress, emotional stress, eye strain from using a computer system, and possible anxiety over test-taking. Benefits to the individuals, as well as the hospital participating in the study, included potential for improvement in nursing knowledge, potential for improvement in communication and the team nursing model, and a potential to improve VTE prophylactic interventions among registered nurses. Data obtained from this study may benefit the organization by allowing the healthcare facility to identify gaps in training, and include more individuals in other roles of the care team in future quality improvement studies.

### **Instruments**

One tool the principal investigator found while researching came from an article in which the researchers were assessing Emergency Department RN's knowledge of VTE prophylaxis, risk factors, screening, prevention and treatment. The survey tool used by these researchers (Zhou, et al., 2019) included 16 questions that were adapted and revised by the student for this DNP scholarly project in order to create the pretest and posttest and fulfill the content provided in the educational intervention. The pretest and posttest

created by the PI consisted of multiple-choice questions including content regarding symptoms of VTE, prophylaxis interventions, and risk assessments of medical-surgical inpatients. A maximum of four answer choices were available, and the participants were instructed to choose only one answer choice for each question.

As this was a pilot study, there was no proven validity or reliability of the PI's pretest and posttest; however, content validity was established through a panel of experts. Prior to submission to the education department at this local hospital, all content was reviewed by the principal investigator's project committee, including content experts who were also employed at the facility where the study will take place. The panel of experts within the project committee included a data analysis specialist, a clinical leader (unit manager) and several other nurses and healthcare providers. Data analysis was conducted via SPSS software using a quantitative statistical approach. A *t*-test was used to measure the pretest-posttest data. Descriptive statistics were analyzed for the demographic questionnaire.

### **Internal Review Board Approval**

The student's DNP scholarly project official proposal was presented to her personal committee for approval on October 13, 2021. The meeting was conducted virtually via Zoom. Upon approval of this proposal, the student then filed an application for exempt review to be submitted to the IRBSON Committee for Protection of Human Subjects. Once approved by the IRBSON Committee for Protection of Human Subjects, the project was then sent for further review by the PSU IRB committee. Written approval was also obtained through the hospital where this study took place and underwent criticism from the corporate compliance officers as well as the medical-surgical inpatient

unit director and unit managers. The student met with corporate compliance staff members, unit director, and unit managers to propose her project and obtain approval for using the organization's cohort of registered nurses to complete this pretest, educational intervention, and posttest. After project approval, the timeframe for data collection was set between November 29, 2021 and January 23, 2022.

### **Project Resources**

The resources required for completion of this project included access to HealthStream Learning Management System, which was approved for use by the PI by the hospital at no additional cost to the organization or student. Other resources included access to a computer to develop, verify, and distribute the pretest, educational intervention, and posttest. Resources such as e-mail, and *Final Friday* newsletter announcements generated by the unit director and unit managers were also used in the development and completion of this scholarly project. Fiscal resources were kept to a minimum and only included incentives, printing per preference of committee members, and gasoline for traveling costs.

### **Procedures**

Approval for this project was first be granted by the health system's Quality Review and Research Committee (QRRC), as well as the unit director and clinical leadership team (includes unit managers). Once approval had been granted to the student to carry out this DNP scholarly project, the student first worked with the education department. The education department assisted the PI with entering the demographic questionnaire as well the pretest and posttest into the HealthStream learning management

system. The student also provided a YouTube link to the educational intervention video, which was no longer than 10 minutes in length.

The medical-surgical unit director presented a list of eligible RNs to the education department for the inclusion of this study. The PI did not receive any names of eligible participants. There were approximately 50-60 RNs that could be included in this study. Eligible participants were “assigned” this HealthStream module; however, it was not be listed as mandatory. Other RNs, not on this established list were able to choose this module as an “elective training course” if they chose to participate. Once the online module had been uploaded and was able to be viewed, the student alerted the clinical leadership team. These clinical leaders utilized their role and capacity to reach out to staff RN’s communicating via word of mouth, e-mails, morning safety huddles, and *Final Friday* newsletter announcements. Halfway through the time this study was available, reminder emails and announcements were also sent via the same methods mentioned above.

Once available online, any RN could sign into their HealthStream account using their individual username (comprised of two alphabetical characters and 6 numerical characters) and password. The RNs then chose the module from their assigned list or by searching for it in the elective catalog and began the module. No informed consent form was necessary as the RN choosing to open and complete this module was taken as an assumed consent by the principal investigator; however, RNs were able to view a short, written synopsis and requirements of the module prior to beginning. The demographic questionnaire was listed first (step 1). Then, separately, the pretest (step 2) was listed as available to view after the demographic questionnaire had been completed by the RN.



The RNs completing this module then opened the audio-video presentation to view (step 3). After viewing this educational intervention, the RN was then able to access the posttest (step 4), which was identical to the pretest. Upon completion of all four steps, the RNs were able to review their scores and review any section of this module at their leisure. This learning module was available for a period of time no shorter than four weeks and no longer than eight weeks to allow RNs to participate.

The demographic questionnaire included seven questions. An eighth question was added to allow the researcher to assess which recruitment method was most popular or most effective. See appendix A for demographic questions and answer choices. Both the pretest and posttest were no more than 20 questions in length.

The results of this learning module were formatted into an Excel spreadsheet, which was automatically populated via the HealthStream system. This spreadsheet was viewable to the education department team member involved in this scholarly project. This education department member then omitted any identifying information and presented usernames only and test scores to the principal investigator. The usernames were presented exactly as they are for each user's HealthStream account; however, as this was two alphabetical characters followed by six numerical characters, the student was unable to know which RNs participated in this study. The results show if there was significant improvement in the posttest when compared to the pretest. This information was displayed via a percentage of correct questions answered on both tests. Participant A's pretest score will be kept with Participant A's posttest score, and kept separately in the data from Participant B's pretest or posttest, so on and so forth. These results were also available to view by the medical-surgical unit director and unit managers. If the

director and managers chose to view this data, all participant names and identifying information were removed from these results to protect participant anonymity.

### **Outcomes**

Outcomes of this research project included an increase in nursing knowledge regarding appropriate VTE prophylaxis. This increased knowledge allowed RNs to participate in the care team more effectively regarding these VTE prophylactic interventions. This also allowed RNs to better educate one another, as well as other members of the healthcare team who may be partially responsible for helping apply this knowledge and VTE prophylaxis interventions such as PCTs applying PCDs or compression stockings.

### **Project Sustainability**

The sustainability of this project included organizational support and continued HealthStream access or subscription service. A goal to provide continuing education in various subjects to current staff must be supported by hospital leadership in this capacity, as well as sustained assistance from the education department. A willingness to improve local healthcare practice and accessibility to evidence-based care must be acknowledged to sustain the goals of this project.

### **Summary**

Purposive sampling, along with a pretest/posttest design allowed for this data to be collected and analyzed into usable, sharable data for improvement of a local healthcare facility and its' nursing staff. The focus of this quality improvement project was improving VTE prophylaxis knowledge among RNs working on a medical-surgical

inpatient unit in the Midwest. A pretest-posttest questionnaire and an educational intervention were presented via HealthStream online learning management system.

## **Chapter IV**

### **Evaluation of Results**

The purpose of this quality improvement project was to enhance knowledge regarding venous thromboembolism (VTE) prophylaxis for registered nurses on a medical-surgical inpatient unit in a metropolitan area of the Midwest. Participants were invited to participate in a pretest, educational intervention, and posttest, after completion of a brief demographic questionnaire. In this study, 19 registered nurses participated and the intervention was available for them to complete for a total of eight weeks.

#### **Description of Sample/Population**

The majority of participants were between 25-34 years of age (n=9, 47.37%). There was good variability with some nurses being in the youngest age group which was 18-24 years of age (n=2, 10.53%). In the middle age bracket, 35-44 years of age, there were three nurses (15.79%). Four nurses from age 45-54 participated (21.05%) and there was even one in the second-eldest age group, age 55-64 (5.26%). The age distribution of participants as described can be seen in Table 1.

**Table 1***Age Distribution of Participants*

Age Groups	Frequencies	Percentage (%)
18-24	2	10.53%
25-34	9	47.37%
35-44	3	15.79%
45-54	4	21.05%
55-64	1	5.26%
65-74	0	0%

Less variability is seen in race, as most participants were caucasian (n=16, 84.21%). Two nurses identified as “other” (10.53%), but the study design did not allow them to specify further. One participant chose not to answer this demographic question (5.26%). Race distribution of all participants (N=19) can be seen in Table 2.

**Table 2***Race Distribution of Participants*

Race	Frequencies	Percentage (%)
Caucasian	16	84.21%
African-American	0	0%
Hispanic/Latino	0	0%
Native American/American Indian	0	0%
Asian/Pacific Islander	0	0%
Other	2	10.53%
Prefer not to Answer	1	5.26%

Most nurses (n=11, 57.89%) that participated in this study hold a Bachelors Degree in Nursing in preparation for their role. Some nurses (n=7, 36.84%) have an Associates Degree of Nursing. One nurse (5.26%) held another type of nursing degree; this could include a diploma or an advanced degree. Again, due to study design, this outlying result is not specified. The results regarding highest level of nursing education can be seen in Table 3 below.

**Table 3**

*Highest Level of Nursing Education*

<b>Highest Nursing Education Level</b>	<b>Frequencies</b>	<b>Percentage (%)</b>
Bachelors Degree of Nursing	11	57.89%
Associates Degree of Nursing	7	36.84%
Other	1	5.26%

The experience level among this group is widely varied. Many nurses are new to the profession, but only one RN had less than one year of experience (5.26%). The majority of participants (n=8, 42.11%) had 1-5 years of experience as a RN. The second largest group had 6-10 years of experience (n=6, 31.58%). Two nurses had 16-20 years of experience (10.53%) and another two have over 20 years of experience as a Registered Nurse (10.53%). These results are shown more clearly in Table 4.

**Table 4***Total Years of Experience as a Registered Nurse*

<b>Total Years of Experience as a Registered Nurse</b>	<b>Frequencies</b>	<b>Percentage (%)</b>
Less than one year	1	5.26%
1-5 years	8	42.11%
6-10 years	6	31.58%
11-15 years	0	0%
16-20 years	2	10.53%
Over 20 years	2	10.53%

After obtaining data on how long these nurses had worked as an RN, this researcher also obtained data on how much experience RNs had in their current role on a medical-surgical unit. Most nurses that participated in the study (n=10, 52.63%) had 1-5 years of experience in this type of role. The distribution of experience was widely spread with only two nurses (10.53%) having less than one year of experience in this role, and three (15.79%) reporting 6-10 years of experience as a medical-surgical RN. The researcher was impressed by the fact that all four nurses who previously reported 16 or more years of experience as an RN (10.53% for those with 16-20 years of experience; 10.53% for those RNs with over 20 years), had spent the entirety of their career within a medical-surgical role. Total years of experience as a RN on a medical-surgical unit can be seen below in Table 5.

**Table 5***Total Years of Experience as a RN on Medical-Surgical Unit*

<b>Total Years of Experience as a Registered Nurse on a Medical-Surgical Unit</b>	<b>Frequencies</b>	<b>Percentage (%)</b>
Less than one year	2	10.53%
1-5 years	10	52.63%
6-10 years	3	15.79%
11-15 years	0	0%
16-20 years	2	10.53%
Over 20 years	2	10.53%

Most participants (n=16, 84.21%) were employed at a full-time status with this healthcare facility. One nurse (5.26%) was employed part-time. Two others (10.53%) were employed at a PRN status. Employment status of participants is shown in Table 6.

**Table 6***Employment Status of Participants*

<b>Employment Status of Participants</b>	<b>Frequencies</b>	<b>Percentage (%)</b>
Full-time	16	84.21%
Part-time	1	5.26%
PRN	2	10.53%

There was almost even spread amongst night shift and day shift for the participating nurses. In this study, 52.63% of participating nurses work day shift (n=10) and 47.37% of participants (n=9) work night shift. Nurses that are employed at a PRN status are allowed to work either shift and can switch back and forth between day shift



and night shift at any given time. For the purposes of the study and its design, PRN nurses were instructed to choose the shift they primarily spend their time on. Results for shift variance can be seen in Table 7.

**Table 7**

*Assigned Nursing Shift of Participants*

Assigned Nursing Shift of Participants	Frequencies	Percentage (%)
Day Shift	10	52.63%
Night Shift	9	47.37%

The last question included on the demographic questionnaire was to assist the researcher in finding out which recruitment method was best. Many nurses (n=10, 52.63%) chose this course as an elective on HealthStream, the facility's learning management system. The second most effective method of recruitment seems to be the email from unit leadership in which seven nurses responded (36.84%). Two remaining nurses found out about the study via word of mouth (10.53%). No RNs reported being recruited through the morning safety huddle or the *Final Friday* newsletters. Recruitment method of participants are listed below in Table 8.

**Table 8**

*Recruitment Method of Participants*

<b>Recruitment Method of Participants</b>	<b>Frequencies</b>	<b>Percentage (%)</b>
Chosen as an elective on HealthStream	10	52.63%
E-mail from leadership	7	36.84%
Word of Mouth	2	10.53%
Morning Safety Huddle	0	0%
<i>Final Friday</i> Newsletter	0	0%

Overall, there was a good distribution of demographics with the exception of a homogenous group for the race of the study participants. It would be helpful to include an open-ended question where participants who answer “other” or “prefer not to answer” may further specify their demographics if they so choose. As previously shown, many nurses were Caucasian, working full-time on day shift, with 1-5 years of experience; Good variance was seen in all other demographic categories.

**Description of Key Terms**

This section discusses the description of key terms and variables in the study.

- **Anticoagulants:** “medicines that help prevent blood clots. They're given to people at a high risk of getting clots, to reduce their chances of developing serious conditions such as strokes and heart attacks” (National Health Services, 2020).  
Common anticoagulants include warfarin, heparin, dabigatran, rivaroxaban, and apixaban (National Health Services, 2020).
- **Blood clots:** “a seal created by the blood to stop bleeding from wounds. While they're useful in stopping bleeding, they can block blood vessels and stop blood

flowing to organs such as the brain, heart or lungs if they form in the wrong place” (National Health Services, 2020).

- **Nursing staff:** Registered Nurses (RNs) providing direct patient care
- **Patients:** people undergoing medical treatment
- **PCDs:** pneumatic compression devices: also called IPC: intermittent pneumatic compression: “used to help prevent blood clots in the deep veins of the legs. The devices use cuffs around the legs that fill with air and squeeze your legs. This increases blood flow through the veins of your legs and helps prevent blood clots” (John Hopkins Medicine, 2020).
- **VTE:** venous thromboembolism: encompasses both incidences of pulmonary embolism (PE) and deep vein thrombosis (DVT); “a term referring to blood clots in the veins, is an underdiagnosed and serious, yet preventable medical condition that can cause disability and death” (Centers for Disease Control and Prevention, 2020).

### **Analysis of Project Questions**

In the first chapter, the researcher developed two research questions to help guide the study and assess the results. This included the evaluation of participants’ knowledge before and after the educational intervention. The two research questions were:

- What is the level of knowledge of nursing staff regarding VTE prophylaxis interventions immediately prior to an educational intervention?
- What is the level of knowledge of nursing staff regarding VTE prophylaxis interventions immediately following an educational intervention?

The first research question can be answered with the pre-test scores, in which the mean was 66.53% (SD=11.452). The second research question is answered via the post-test score in which the mean was 94.84% (SD=5.640). The pretest and posttest score means can be viewed in Table 9. See also the paired samples correlations in Table 10.

**Table 9**

*Average Pretest & Posttest Scores of Participants*

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre-test Score	66.53	19	11.452	2.627
	Post-test Score	94.84	19	5.640	1.294

**Table 10**

*Paired Samples Correlations of Pretest & Posttest Scores*

Paired Samples Correlations				
		N	Correlation	Sig.
Pair 1	Pre-test Score & Post-test Score	19	.032	.895

The null hypothesis is that there will be no difference in the means of the pretest scores and the means of the posttest scores. The alternative hypothesis is that the mean knowledge score after participating in the VTE educational intervention will be significantly different from the mean knowledge score before participating in the VTE educational intervention. The critical t-value is 2.101. Based on the results, the null hypothesis is rejected. The means of the two groups are not the same as the difference between the two means is 28.316 (SD=12.601). There is a statistically significant difference between the pretest and posttest means ( $t = -9.795$ ,  $df = 18$ ,  $p < .001$ ), which is less than the alpha value ( $p < .05$ ). The educational intervention significantly increased the

nurses' knowledge about VTE prophylaxis. The nurses gained an average of 28.316% points (95% confidence interval, 22.24, 34.39) on the posttest after completing the educational intervention. This supports the overall hypothesis that this educational intervention increased the nurses' knowledge of VTE prophylaxis. The results of the paired samples *t*-test for the pretest and posttest scores are listed below in Table 11.

**Table 11:**

*Paired Samples t-test for the Pretest & Posttest Scores*

Paired Samples Test								
	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pre-test Score – Post-test Score	-28.316	12.601	2.891	-34.389	-22.242	-9.795	18	.000

### Summary

The purpose of this quality improvement project was to enhance knowledge regarding venous thromboembolism (VTE) prophylaxis for Registered Nurses on a medical-surgical inpatient unit which was achieved through a pilot study in a metropolitan area of the Midwest. The study was found to be statistically significant with an average improvement of knowledge of 28.316% shown by posttest scores of Registered Nurses. This supports the research questions as well as the overarching hypothesis. The null hypothesis was rejected. It was proven that this educational intervention did improve RNs knowledge regarding VTE prophylaxis.

## **Chapter V**

### **Discussion**

The purpose of this quality improvement project was to enhance knowledge regarding venous thromboembolism (VTE) prophylaxis for registered nurses on a medical-surgical inpatient unit in a metropolitan area of the Midwest. Both of the researcher's project questions were answered positively, as demonstrated in the fourth chapter. The null hypothesis was rejected and the researcher accepted the alternative hypothesis, proving that the educational intervention did in fact increase nurses' knowledge of VTE prophylaxis.

#### **Relationship of Outcomes to Research**

The outcomes of this study are related to research as future studies may further impact nursing practice. This research can be developed and improved so as to include future studies that will help to show a decrease in incidence of VTE within hospitals across America. The improvement shown in this study amongst nurses' knowledge will continue to improve the quality of care that is given, as well as the quality of patient education. Increased patient education may lead to improved compliance with VTE prophylaxis interventions, as well as better application and improved documentation.

### **Evaluation of Theoretical Framework**

This project utilized Betty Neuman's systems model as the theoretical framework for the study design. This incorporates primary, secondary, and tertiary levels of prevention which is evidenced in the pretest and posttest questions. Primary prevention is shown through questions regarding patient education, and as a whole of improving nursing education and training so as to prevent VTE. Secondary prevention or screening is prevalent in this research design via questions regarding symptoms for RNs to watch for, and how to identify VTE complications when caring for patients. Tertiary prevention is evidenced by questions that educate nurses on appropriate treatment options for VTE prophylaxis and when to contact the healthcare provider for more integrated care. All of these aspects of Betty Neuman's systems model support a holistic approach to patient care and nursing education.

### **Evaluation of Logic Model**

After data collection, this nurse researcher also evaluated the logic model shown in Figure 2 (Chapter I), when compared with results of the study design. The inputs were appropriately utilized and include technology, funding, and personnel, such as the employment of leadership and the education department within this project. The immediate effects were seen in observation of the data as demonstrated by an average improvement of knowledge by 28% by the RNs. The intermediate and long-term effects are not able to be analyzed at this time. The output included 70% of participants showing an improvement in knowledge. This was exceeded in the pilot study as all participants showed an improvement from the pretest score to their accompanying posttest score. The smallest improvement shown was 13%, and the largest knowledge enhancement shown

was 47% increase from the RN's pretest score. This demonstrates success within the logic model created by the PI and supports the purpose of the study as well as the alternative hypothesis.

### **Limitations**

There are several limitations to this study design. The first limitation is this was a single-site study, which did not allow for generalizability. Because of the small sample size, this cannot be applied to the general public without first conducting more research in this area of interest. Another limitation is that this population sample was a homogenous group on race, with almost all participants being caucasian. This study also focused on one specific unit within the facility and was not applied to the entire hospital or health system. Other limitations include less variability in recruitment and study design, due to the COVID-19 pandemic. It would be wise to conduct an educational intervention live in-person in the future. Funding was limited for this study as well, and with more sponsorship, perhaps a larger sample size, more resources, and more staff could be included.

### **Implications for Future Research**

Implications for future studies include encompassing a larger group of participants. This could be accomplished by including multiple sites, such as different hospitals in the Midwest and/or other regions of the US to find a more widespread demographic. Future studies should incorporate a demographic question regarding gender of participants. This study design could be applied and utilized in different types of inpatient units, such as those with specified backgrounds (i.e. cardiology, oncology, neurovascular, etc.). The researcher could present live in-person followed by a



HealthStream module. A longitudinal study design could also be considered to study how long this improved knowledge may be seen and how it is applied to practice by these RNs.

### **Implications for Practice**

The researcher should consider how to enforce this training in practice in the future. Now that an improvement in knowledge has been found, it should be illustrated how nurse managers and unit leaders can better utilize this knowledge. This may include trainings on how to keep up this higher level of knowledge 3-6 months after the educational intervention. This could be done via chart reviews looking for improved documentation of application/use of VTE prophylaxis measures. Leaders could also track the incidence of VTE on units where RNs participated in this educational intervention. It could be suggested to follow surgical patients for six months after discharge as well to ensure increased data collection. Another option would be for researchers to include healthcare providers, patient care technicians (PCTs), licensed practical nurses (LPNs), and other types of credentialed staff members for education. This could include education geared more towards the pharmaceutical interventions for the prescribing providers, or application, usage and patient education for PCTs and LPNs who may be helping the RNs with hands-on patient care. Another way to improve practice would be to better retain subjects so that they complete all steps necessary within this study design. This may include increasing the amount of recruitment methods, as well as reminders for subjects to participate or finish a HealthStream module they started. This could also include a different study design in which participants are in a more structured classroom

setting so as not to get distracted by other tasks when completing the educational intervention and testing.

### **Conclusion**

The purpose of this quality improvement project was accomplished and the study was shown to enhance knowledge regarding venous thromboembolism (VTE) prophylaxis for registered nurses on a medical-surgical inpatient unit in a metropolitan area of the Midwest. This study filled a gap in the literature, previously identified in Chapter II, regarding the lack of research in this area. When developing this project, the PI was unable to find similar studies that also tested nurses' knowledge of VTE prophylaxis. With publication of this research, future nurse researchers may be impacted, and the profession as a whole may benefit from filling this gap. This study can be improved in the future by including more participants, a larger demographic and sample, as well as being followed longitudinally. The pilot study was successful as demonstrated by the data and supports the alternative hypothesis that this educational intervention improved nurses' knowledge of VTE prophylaxis.

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## **APPENDIX**



## **Appendix A. Demographic Questionnaire**

Choose only one answer option for each question.

1. What is your current age?
  - a. 18-24 years old
  - b. 25-34 years old
  - c. 35-44 years old
  - d. 45-54 years old
  - e. 55-64 years old
  - f. 65-74 years old
2. What is your race?
  - a. Caucasian
  - b. African American
  - c. Hispanic/Latino
  - d. Native American/American Indian
  - e. Asian/Pacific islander
  - f. Other
  - g. Prefer not to answer
3. What is your highest nursing education level?
  - a. Associate Degree of Nursing
  - b. Bachelors Degree of Nursing
  - c. Other
4. How many years of experience (total) do you have working as a registered nurse?

- a. Less than 1 year
- b. 1-5 years
- c. 6-10 years
- d. 11-15 years
- e. 16-20 years
- f. Over 20 years

5. How many years of registered nursing experience do you have on a medical-surgical unit?

- a. Less than 1 year
- b. 1-5 years
- c. 6-10 years
- d. 11-15 years
- e. 16-20 years
- f. Over 20 years

6. Are you employed full-time, part-time, or PRN at this facility?

- a. Full-time
- b. Part-time
- c. PRN

7. Which shift do you primarily work?

- a. Days
- b. Nights

Additional question:

1. How did you find out about this study?

- a. *Final Friday* newsletter
- b. Word of Mouth
- c. Email from 2<sup>nd</sup> floor leadership
- d. Morning safety huddle
- e. Chosen as an elective on Healthstream

## Appendix B. VTE Prophylaxis Knowledge Pretest

1. Please rate your current confidence level regarding VTE prophylaxis on a scale of 1-5.
  - a. 1 (not confident at all)
  - b. 2
  - c. 3 (somewhat confident)
  - d. 4
  - e. 5 (very confident)
2. What is most likely encompassed in the term “venous thromboembolism?”
  - a. Deep vein thrombosis (DVT)
  - b. Heart attack and stroke
  - c. Pulmonary embolism (PE)
  - d. Both A & C
3. What are the classic signs and symptoms of DVT?
  - a. Nothing (asymptomatic)
  - b. Varicose veins and a feeling of heaviness in the legs
  - c. Swelling, pain, redness, warmth
  - d. Pale, cool skin with a blister-like lesion
4. What are the *classic* signs and symptoms of pulmonary embolism?
  - a. Cough
  - b. Chest pain and/or dizziness
  - c. Tachypnea (respiratory rate over 20 breaths/minute)
  - d. All of the above

5. What type of testing can prove or rule out DVT?
  - a. Ultrasound
  - b. D-dimer laboratory blood test
  - c. Ankle-brachial index
  - d. Both A & B
6. Which interventions are proven to help prevent VTE?
  - a. Sequential Compression Devices (SCDs) or compression hosiery/socks
  - b. Early and frequent ambulation
  - c. Maintaining a healthy body mass index (BMI)
  - d. All of the above
7. Which patient is most at risk for VTE?
  - a. Middle-aged adult with history of DVT 18 months ago
  - b. Elderly adult who does not ambulate frequently
  - c. Young adult with heart murmur
  - d. Older adult with hemophilia
8. Which drug is NOT an appropriate option for VTE prophylaxis?
  - a. Eliquis (apixaban)
  - b. Coumadin (warfarin)
  - c. Plavix (clopidogrel)
  - d. Low-molecular weight heparin
9. How long should compression (Ted Hose or SCDs) be applied to patient in order to be effective?
  - a. 8-10 hours/day

- b. 16-22 hours/day
- c. Constantly for the first 36-48 hours after surgery
- d. Compression is only effective when used in conjunction with pharmacologic therapies

10. When should any/all types of anticoagulation medications or VTE pharmacological prophylaxis be contraindicated?

- a. Patient being prepped for surgery within 24 hours
- b. Pregnant or breastfeeding
- c. Cerebrovascular attack (ischemic stroke)
- d. Atrial fibrillation

11. What medical conditions might compression devices be contraindicated that a nurse may commonly encounter working on the medical-surgical inpatient unit?

- a. Open wound with or without drainage
- b. Lymphedema
- c. Post-appendectomy
- d. Bacterial pneumonia

12. When should VTE prophylaxis interventions be expected/anticipated to be first applied for the inpatient?

- a. 72 hours after surgical procedure
- b. As soon as possible upon admission to the unit
- c. Only when the provider makes rounds
- d. After three sets of vital signs have been charted

13. What is the lowest effective pressure (mmHg) for compression devices to prevent VTE?
- a. More research is needed
  - b. 20-30 (class I)
  - c. 30-40 (class II)
  - d. 40-50 (class III)
14. Who is responsible for applying sequential compression devices or advocating for the patient to receive pharmacological intervention for VTE Prophylaxis?
- a. Pharmacist
  - b. Patient care technician (PCT/CNA)
  - c. Registered Nurse (RN)
  - d. Any member of the care team
15. Which international normalized ratio (INR) is ideal for patients that have atrial fibrillation or mechanical heart valves? (Codina, 2018).
- a. 2.0-3.0
  - b. 2.5-3.5
  - c. Less than 2.0
  - d. Over 3.5
16. Which international normalized ratio (INR) is ideal for patients without additional vascular risk factors? (Codina, 2018).
- a. 2.0-3.0
  - b. 2.5-3.5
  - c. Less than 2.0

d. Over 3.5



### Appendix C. VTE Prophylaxis Knowledge Posttest

1. Please rate your current confidence level regarding VTE prophylaxis on a scale of 1-5.
  - a. 1 (not confident at all)
  - b. 2
  - c. 3 (somewhat confident)
  - d. 4
  - e. 5 (very confident)
2. What is most likely encompassed in the term “venous thromboembolism?”
  - a. Deep vein thrombosis (DVT)
  - b. Heart attack and stroke
  - c. Pulmonary embolism (PE)
  - d. Both A & C
3. What are the classic signs and symptoms of DVT?
  - a. Nothing (asymptomatic)
  - b. Varicose veins and a feeling of heaviness in the legs
  - c. Swelling, pain, redness, warmth
  - d. Pale, cool skin with a blister-like lesion
4. What are the *classic* signs and symptoms of pulmonary embolism?
  - a. Cough
  - b. Chest pain and/or dizziness
  - c. Tachypnea (respiratory rate over 20 breaths/minute)
  - d. All of the above

5. What type of testing can prove or rule out DVT?
  - a. Ultrasound
  - b. D-dimer laboratory blood test
  - c. Ankle-brachial index
  - d. Both A & B
6. Which interventions are proven to help prevent VTE?
  - a. Sequential Compression Devices (SCDs) or compression hosiery/socks
  - b. Early and frequent ambulation
  - c. Maintaining a healthy body mass index (BMI)
  - d. All of the above
7. Which patient is most at risk for VTE?
  - a. Middle-aged adult with history of DVT 18 months ago
  - b. Elderly adult who does not ambulate frequently
  - c. Young adult with heart murmur
  - d. Older adult with hemophilia
8. Which drug is NOT an appropriate option for VTE prophylaxis?
  - a. Eliquis (apixaban)
  - b. Coumadin (warfarin)
  - c. Plavix (clopidogrel)
  - d. Low-molecular weight heparin
9. How long should compression (Ted Hose or SCDs) be applied to patient in order to be effective?
  - a. 8-10 hours/day

- b. 16-22 hours/day
- c. Constantly for the first 36-48 hours after surgery
- d. Compression is only effective when used in conjunction with pharmacologic therapies

10. When should any/all types of anticoagulation medications or VTE pharmacological prophylaxis be contraindicated?

- a. Patient being prepped for surgery within 24 hours
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- d. After three sets of vital signs have been charted

13. What is the lowest effective pressure (mmHg) for compression devices to prevent VTE?
- a. More research is needed
  - b. 20-30 (class I)
  - c. 30-40 (class II)
  - d. 40-50 (class III)
14. Who is responsible for applying sequential compression devices or advocating for the patient to receive pharmacological intervention for VTE Prophylaxis?
- a. Pharmacist
  - b. Patient care technician (PCT/CNA)
  - c. Registered Nurse (RN)
  - d. Any member of the care team
15. Which international normalized ratio (INR) is ideal for patients that have atrial fibrillation or mechanical heart valves?
- a. 2.0-3.0
  - b. 2.5-3.5
  - c. Less than 2.0
  - d. Over 3.5
16. Which international normalized ratio (INR) is ideal for patients without additional vascular risk factors?
- a. 2.0-3.0
  - b. 2.5-3.5
  - c. Less than 2.0

d. Over 3.5

## **Appendix D. Invitation to Participate**

Dear Participant,

I invite you to participate in a research project related to improving venous thromboembolism prophylaxis knowledge among Registered Nurses on a medical-surgical inpatient unit in the Midwest. I am currently enrolled in the Doctor of Nursing Practice program at Pittsburg State University in Pittsburg, KS and am completing my scholarly project. The purpose of this quality improvement project will be to enhance knowledge regarding venous thromboembolism (VTE) prophylaxis for Registered Nurses on a medical-surgical inpatient unit in a metropolitan area of the Midwest. By enhancing knowledge among Registered Nurses, there will potentially be improved patient education, patient health outcomes, and increased confidence and capability of the nurses involved. Your participation in this research project is completely voluntary. You may decline to participate or stop participating at any time. Your answers will remain confidential. Data from this research will be kept in a secure location and reported as aggregated data as it pertains to this project. Please answer the questions on the survey to the best of your ability. The surveys and presentation should take approximately 60 minutes to complete. Thank you for your time and support.

Sincerely,

Theresa A. Umscheid