Instituting Change in Blood Clot Prophylaxis Protocol for Perioperative Patients

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Abstract

Perioperative blood clots are a common, preventable occurrence in the healthcare setting. Patients undergoing surgery are at high risk for developing a deep venous thrombosis (DVT) or pulmonary embolus (PE) for a variety of reasons. Mechanical venous thromboembolism (VTE) prophylaxis using either sequential compression devices or compression stockings has been shown to be effective at preventing blood clots in this patient population. However, compliance with these devices can be hard to achieve. The purpose of this project was to implement a series of changes in mechanical VTE prophylaxis protocols, with a goal of decreasing the number of perioperative blood clots at a small, rural hospital in eastern North Carolina. Interventions were implemented over a 12-week period consisting of six Plan-Do-Study-Act (PDSA) cycle reviews. Although staff rated themselves as more knowledgeable and confident about blood clots and mechanical VTE prophylaxis after education, mechanical VTE compliance rates did not significantly increase. No blood clots were found during the implementation period. There are several implications from these findings for healthcare systems, including decreased harm to the patient population and decreased costs for healthcare organizations.

Keywords: DVT, PE, mechanical VTE prophylaxis, compliance, blood clot

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Section I: Introduction

Background

The project partner was a 135-bed, non-profit hospital founded in 1967 and located in eastern North Carolina (NC). The hospital is a member of the Mayo Clinic Care Network and provides medical services to the county's 69,473 residents and residents of surrounding counties (United States Census Bureau, n.d.). The hospital's mission is "to provide quality healthcare with exceptional compassion and respect" ([redacted], 2021a, para. 1) and "strive towards a goal of zero serious safety events of patient harm" ([redacted], 2021a, para. 1).

The project was implemented on a 32-bed unit that housed perioperative general surgery patients. Half of this unit was reserved for elective joint surgeries – hip and knee replacements and spine surgeries. It was used for general surgery overflow when there were no joint surgeries scheduled. The other half of the unit was reserved for elective and nonelective general surgery patients.

Deep Venous Thromboses (DVTs) and Pulmonary Emboli (PEs) are blood clots that can form during or after surgery and can cause serious complications or even death (Centers for Disease Control and Prevention [CDC], n.d.). These two types of blood clots together are classified as Venous Thromboembolism (VTE). PEs are one of the most frequent, avoidable causes of in-hospital deaths following surgery (Mai et al., 2021). Over half of perioperative patients have at least a moderate risk of developing a blood clot, and over half of all blood clots occur during or soon after a hospitalization or surgery (Mai et al., 2021). Risk factors for VTE include major surgery, especially abdominal, pelvis, hip, or leg surgery; limited movement or confinement to a bed, fractures, personal or family history of VTE, obesity, smoking, increasing age, and chronic medical conditions such as heart and lung disease, cancer, and inflammatory bowel disease. The chances of developing VTE increase with the presence of more than one of

these risk factors (CDC, n.d.). Ways to reduce the risk of developing VTE in perioperative patients include mechanical and pharmacological prophylaxis and early ambulation (Bartlett et al., 2020).

The Agency for Healthcare Research and Quality (AHRQ) estimates that DVTs and PEs affect between 350,000 and 600,000 patients every year, with 10-15% fatality rates in affected patients (AHRQ, 2016). The cost of healthcare for a patient who develops a VTE is 1.5 times greater than that of a patient who does not, with VTEs costing the United States health system 7-10 billion dollars a year (Link, 2018). The medical costs of a first-year survivor of VTE are estimated at 12,000 to 15,000 dollars a year (Link, 2018).

Organizational Needs Statement

The organization's mission includes striving towards zero serious safety events that cause patient harm, including DVTs and PEs. The hospital uses three leading indicators to gauge how well they are performing in this area: AHRQ Patient Safety Indicators (PSIs), Centers for Medicare and Medicaid Services (CMS) star ratings, and Leapfrog metrics. These indicators help identify how the hospital is performing in comparison to other hospitals. Poor performance can lead to decreased reimbursement from CMS and threaten the hospital's accreditation ([redacted], personal communication, March 24, 2021). Money that would be allocated to the hospital for Medicare and Medicaid patients would be redistributed to other hospitals. The data are publicly reportable, and if the hospital is performing poorly, patients may seek care elsewhere. Thus, hospital administration is motivated to decrease these events, both for safety and financial reasons.

PSI-12 is the perioperative PE or DVT rate per 1,000 patients (Mathematica, 2020). The national average as of July 2020 was 3.37 (Mathematica, 2020). The hospital's average was 5 for

the same time period ([redacted], 2021b). Their CMS star rating was 2.0 and the rating for serious complications, which includes PEs and DVTs, was 1.13 compared to the national average of 1.00 (U.S. Centers for Medicare and Medicaid Services, n.d.). The hospital's Leapfrog grade for Fall 2020 was a B (The Leapfrog Group, 2020). They were rated 5.14 in the dangerous blood clot category, with the best-performing hospital at 1.53 and the average hospital at 3.74. These numbers are for every blood clot per 1,000 perioperative patients (The Leapfrog Group, 2020). Thus, the hospital was performing below the national average in all three categories.

Decreasing the number of perioperative DVTs and PEs also aligns with the goals of the Triple Aim (Institute for Healthcare Improvement, 2021a). By avoiding harm from these preventable conditions, patients will have increased satisfaction and quality of life. The per capita cost of healthcare for patients and the healthcare system will also be decreased by the prevention or reduction of medical care and care for readmissions for DVTs and PEs (Institute for Healthcare Improvement, 2021a). A review by Fernandez et al. (2015) found that the cost of a first admission for a VTE ranged from $3,018 to $5,040, and the cost of a first admission for a PE was between $5,198 and $6,928, with costs increasing over time. Thus, the hospital has several incentives to reduce the number of harmful perioperative DVTs and PEs within the organization.

The hospital follows a Plan-Do-Study-Act (PDSA) model to strive for continual improvement in the organization (Institute for Healthcare Improvement, 2021b). They use a balanced scorecard, Transformation Plan of Care (TPOC), and dashboard to devise benchmarks for goals from year to year. The 2020 benchmark for VTE prophylaxis was a target compliance

score of ≥98% with a stretch goal of 99.9% ([redacted], 2020). The 2021 benchmark for reducing perioperative VTEs was 3 with a stretch goal of ≤ 2 ([redacted], 2021c).

Problem Statement

DVTs and PEs in perioperative patients are common, preventable occurrences that not only cause harm to the patient but are also a financial burden on the healthcare system. Despite current measures, the hospital was not meeting national benchmarks for DVTs and PEs. Compliance with mechanical VTE prophylaxis has been suggested to help prevent these occurrences but can be difficult to enforce; however, appropriate patient and staff education related to the dangers DVTs and PEs pose, as well as correct mechanical VTE use, can be a major factor in improving compliance.

Purpose Statement

The purpose of this project was to implement a series of changes in mechanical VTE prophylaxis, including staff and patient education and changes in protocols, to demonstrate improved compliance and proper use. The goal was to decrease the number of perioperative DVTs and PEs in the organization.

Section II. Evidence

Literature Review

A literature search of databases including MEDLINE via PubMed, ProQuest, Cumulative Index to Nursing and Allied Health Literature (CINAHL) Complete, and EBSCOhost via CINAHL was performed. The search strategy included MeSH terms based on (1) type of mechanical VTE prophylaxis (e.g., 'SCD,' 'elastic stockings'), (2) type of patient (e.g., 'perioperative,' 'postoperative,' 'hospital'), and (3) outcomes (e.g., 'compliance,' 'decreased DVT'). Articles were included that had a publication date within the last five years, were full text, and in the English language. Articles from developed countries (e.g., the United States, Great Britain) were included. Articles with male and female subjects aged 18 years and older were included. After inclusion criteria were applied, 470 articles were found. Articles from 3rd-world countries were excluded. No exclusions were made regarding race or nationality. No levels of evidence were excluded; levels were based on Melnyk & Fineout-Overholt's 2011 model (East Carolina University, 2021). Articles were reviewed in their entirety to determine the level of evidence and relevancy of information. Only articles directly addressing the clinical question were kept. After exclusion criteria were applied, 17 articles were retained. See Appendix A and Appendix B for the search log and literature matrix used.

Current State of Knowledge

The literature acknowledged that DVTs and PEs are a costly, harmful, and preventable complication in perioperative patients (Anderson et al., 2019; Bartlett et al., 2020; Greenall & Davis, 2020; Hamid et al., 2021; Link, 2018; Murphy et al., 2018; Nahar et al., 2018). One article suggested that the risk of a general surgery patient developing a thrombosis without any type of VTE prophylaxis is as high as six percent (Bartlett et al., 2020). However, with current

knowledge, recommendations were varied as to exact measures that should be taken to prevent these conditions. Most of the literature found discussing the subject was the opinion of experts. The overall agreement was that hospitals should have a plan in place that addresses VTE prophylaxis as part of best practice (Afshari et al., 2017; Allaway et al., 2018; Anderson et al., 2019; Bartlett et al., 2020; Carr et al., 2019; Link, 2018; Murphy et al., 2018). The consensus among the authors found in the literature search was either mechanical, pharmacological, or a mix of both kinds of VTE prophylaxis are effective at reducing DVTs in hospitalized patients and should be included in the plan. One group of authors performed an extensive literature review that found graduated compression stockings (GCS) were effective at preventing DVTs but not PEs (Sachdeva et al., 2019). Since most PEs are formed because of DVTs, it is safe to infer that prevention of DVTs would reduce incidence of PEs as well. Some experts preferred sequential compression devices (SCDs) over GCS, but most agreed that mechanical VTE prophylaxis has been shown to be effective at preventing DVTs, either alone or in combination with pharmacological prophylaxis (Afshari et al., 2017; Bartlett et al., 2020; Carr et al., 2019).

Current Approaches to Solving Population Problem(s)

None of these approaches will ultimately be successful if the patient does not comply with them. The authors in the literature agreed that compliance with mechanical VTE prophylaxis is often difficult to achieve (Hamid et al., 2021; Kim et al., 2018; Nahar et al., 2018). One study of 200 hospitalized medical and surgical patients found that even when the provider had entered appropriate mechanical VTE prophylaxis orders, 146 patients were not wearing the devices upon review, and no one followed up to make sure they were wearing them correctly (Kim et al., 2018). Two other studies found that despite education in the form of a pamphlet, flyer, and educational sessions, compliance was not increased (Hamid et al., 2021; Nahar et al.,

2018). However, one of the studies showed patients were more likely to rate themselves as more knowledgeable about the devices after education (Nahar et al., 2018).

One approach to addressing this problem focuses on patient education. Patients must first be informed of what they are expected to do. They must also be informed of why they are to do it: the benefits of compliance and the consequences of noncompliance (Hamid et al., 2021). However, as stated, patient education alone was found to be ineffective at increasing compliance with mechanical VTE prophylaxis. Several studies suggested that patient education needs to be combined with other methods to increase compliance (Allaway et al., 2018; Greenall & Davis, 2020; Hamid et al., 2021; Kim et al., 2018; Nahar et al., 2018).

Another approach focused on staff education. One study by Allaway et al. (2018) found that there was an increase in mechanical and pharmacological VTE prophylaxis administration after adopting a novel model that included staff education, chart review, and use of a dedicated provider to monitor VTE compliance. A study by Kim et al. (2018) found that staff need to be educated on the importance of compliance and follow up with patients to make sure they are wearing prophylaxis correctly. Without staff education and involvement, adherence to mechanical VTE prophylaxis cannot be expected to be achieved by patients based on the current state of knowledge. Ultimately, bedside staff are the ones responsible for providing pertinent information to patients so that they can make an informed decision.

Several studies were found which suggested that visual aids may be effective in improving compliance. A study by Clack et al. (2019) found there was a benefit to using signage to improve compliance with personal protective equipment, and a study by Egan et al. (2021) which included 4099 subjects found that infographics increased participants' compliance and confidence levels when using face masks. Another study by Kim and Lee (2019) of 2787

subjects showed an increase in hand hygiene rates among participants after implementing visual and audiovisual stimuli.

For this project, the project leader collaborated with the project partner site to determine the most appropriate approach to the problem. The literature review was shared with the project partner and a brainstorming session was held. Based on the provided research and outcomes, the decision was made to implement a multi-faceted intervention that would focus on educating both staff members and patients, as well as instituting a change in mechanical VTE prophylaxis protocol.

Evidence to Support the Intervention

During random visual inspection, patients at the site were sometimes not wearing mechanical VTE prophylaxis as ordered ([redacted], personal communication, March 24, 2021). As stated, the literature shows that patient education alone is not enough to improve compliance. It must be combined with other methods to ultimately be effective, as suggested by Hamid et al. (2021). With the lack of available literature about staff education and compliance and the need by the project partner for a method to increase patient compliance, the decision was made to implement a multi-faceted approach that focused on both staff and patient education. The hope was that staff would drive change to increase compliance through several measures, including patient education and reinforcement using an educational flyer, increased rounding to assess compliance, and auditing of charts to ensure correct documentation and appropriate order sets. A poster in each room would serve as a visual cue to both patients and staff to wear the ordered prophylaxis. As Kim et al. (2018) found, even when providers order the correct intervention for mechanical VTE prophylaxis, they cannot be expected to follow up and make sure the patient is wearing it correctly. This job is the responsibility of bedside staff, who are

with patients all shift and are responsible for educating patients on what to do during their hospital stay.

Evidence-Based Practice Framework

This project was executed using the PDSA model already implemented by the project partner (Institute for Healthcare Improvement, 2021b). The PDSA model is a continuous cycle of four steps: (1) determine a change to be made and develop a test for it, with predictions for what will happen; (2) carry out the test and document observations; (3) analyze the data and compare it to the predictions made; and (4) make changes to the test based on collected data (Institute for Healthcare Improvement, 2021b). The cycle is then repeated, starting over with the planning phase (Institute for Healthcare Improvement, 2021b). This allows for rapid cycle change to make improvements to the project model. This project addressed these steps as follows: (1) initiated project development, (2) implemented practice change, (3) held biweekly evaluations to evaluate compliance, and (4) adopted measures to increase compliance if needed.

Ethical Consideration & Protection of Human Subjects

Participants in this project were respected based on the ethical tenets of beneficence, nonmaleficence, autonomy, confidentiality, veracity, fidelity, and justice. Regarding protection of project participants, no identifying information about participants was collected, so no potential risk to patients or staff members based on protection of identity were detected. Mechanical VTE prophylaxis was already in routine use at the hospital; therefore, the patients were not exposed to a higher level of risk than they were if the project were not being implemented. The project lead attempted to use a multi-faceted intervention to improve compliance with an order that was already being implemented by the hospital. No patient protective health information or staff identities were collected as part of the data collection

process. Nursing staff were informed about the project prior to implementation and given the opportunity to voluntarily participate in the educational presentation and surveys, with the option to withdraw at any time. All eligible nursing staff on the unit were given an equal opportunity to participate, and all had an equal opportunity to win the random drawing for the participatory gift card prize. All patients on the unit received the same educational documents, and there was no risk of patients being taken advantage of due to the project. Potential benefit to patients from participating in the project outweighed any minimal associated risk. Lastly, attempts were made to treat all patients and staff members with respect and provide them with transparency and veracity throughout implementation.

Preparation for official approval of the project included completing research, ethics, and compliance training through the Collaborative Institutional Training Initiative (CITI) program (CITI Program, n.d.). This training provided a well-rounded view of the ethical concerns for consideration when implementing the project. This training provided the project lead with background to successfully prepare her for implementation in a manner that was cognizant of the welfare of the project participants.

The project site champion identified the need for a project addressing perioperative blood clots. The project site champion and project lead collaborated to create the project plan. The project was approved by the site champion and hospital administration. The project partner site did not have a formal institutional review process, so the project underwent a formal review process through the University Institutional Review Board (IRB) to evaluate the project for Quality Improvement (QI) versus human research (See Appendix C). From the review, the project was deemed as QI, no further IRB review was required.

Section III. Project Design

Project Site and Population

The project took place at a hospital in rural eastern NC. Facilitators to the project included the fact that the hospital was small, and the staff was close-knit. The project lead had been working at the site for four years and was familiar with the staff members on the unit and the project site team members. However, the site's size was also a barrier to the project. The hospital had 135 total beds, with 32 general surgery beds. Since it was a small rural hospital, the types of surgeries that could be performed were limited. Patients with major trauma or requiring heart surgery or other complicated procedures were transferred to a tertiary facility. There were five general surgeons, seven orthopedic surgeons, and three to four hospitalists covering the entire hospital with one hospitalist covering at night. The hospital did not have an intensivist.

The project participants were staff nurses and patients on a surgical unit. The nurses worked on both the surgical and medical units, with 11 nurses specially trained to work with elective joint and spine patients. The patients were ages 18 and over. Patients assigned to beds 1-12 on the unit were in the hospital for routine, elective back surgery, knee replacement, or hip replacement. These surgeries were performed Monday-Thursday. During the weekend, general surgery patients were placed in those beds if the rest of the unit was full. The most common emergent diagnoses requiring surgery included small bowel obstruction, appendicitis, cholecystitis, diabetic wounds of the lower extremities, and cancer.

The population of the county which the hospital mainly served was comprised of 90.1% Caucasian, 5.6% African American, 4.4% Hispanic or Latino, and 1.3% Asian ([redacted], 2021b). This could be seen as a disparity in that patients from a wide variety of ethnic backgrounds were not generally seen at the hospital. Fifty-one percent of the population were

female and 49% were male, with 25.7% of the population over age 65 ([redacted], 2021b). Ninety-one-point six percent of the population aged 25 and older had a high school diploma, but only 29.1% had a Bachelor's degree or higher ([redacted], 2021b).

Description of the Setting

The project site was a surgical unit in a 135-bed community hospital in eastern NC. This was the only hospital in the county, and it also served the surrounding counties. The surgical unit had 32 beds and housed perioperative patients, including scheduled general surgery patients, general emergency surgery patients, and occasionally medical overflow patients.

Description of the Population

The target population of the project included direct patient care nursing staff and perioperative patients. Inclusion criteria for staff members were: (1) must work directly with patients at the bedside on the 3rd Surgical unit, (2) be able to read and speak the English language, (3) have access to the provider's order for mechanical VTE prophylaxis, and (4) have access to, and capability to chart under, the mechanical VTE prophylaxis intervention in the Electronic Health Record (EHR). There were 39 eligible staff participants for this project: 33 full-time staff, 5 part-time staff, and 1 PRN staff member. Inclusion criteria for patients were: (1) must be admitted to the 3rd Surgical floor from August-December 2021, (2) be able to read and speak the English language, and (3) be at least 18 years old. There were up to 32 potential patient participants per day based on these criteria.

Project Team

The project team consisted of the project lead, faculty at the university, and staff members at the project site. The project lead was responsible for identifying the project idea, working with other members of the team to implement the project, revising the project as

needed, and creating the scholarly paper and project presentation, as well as presenting the project at the end of the course. The project lead's clinical faculty served as project mentor and advisor. The project site champion was the Director of Quality, Clinical Practice, and Nursing Excellence. Her role was to supervise implementation at the site, meet monthly with the project lead to discuss the project's progress and suggest changes if needed, and assist the project lead with data gathering. The project site mentor was the Director of the 3rd North Surgical and Joint and Spine units. She served as a mentor to the project lead and helped ensure staff compliance to interventions by communicating with team leaders. Outcomes data on DVTs and PEs were provided by the Director of Value-Based Reporting and Decision Support. Data on VTE orders from providers and compliance by staff for the 3rd Surgical unit was provided by the Information Systems Applications Manager.

Project Goals and Outcome Measures

The aim of the project was to use a multi-faceted approach to: (1) improve bedside nursing staff knowledge and confidence levels with using mechanical VTE prophylaxis, (2) improve patient compliance with mechanical VTE prophylaxis, and (3) reduce the incidence of DVTs and PEs in perioperative patients. This series of interventions involved both staff and patient education measures as well as measures to revise the mechanical VTE prophylaxis protocol. Education consisted of using a pre-survey, educational PowerPoint presentation, and post-survey for staff, as well as an educational handout for patients and the instillation of a poster in each room on the floor to serve as a visual reminder for patients and staff. Changes to mechanical VTE prophylaxis protocol included a comprehensive audit of staff charting, establishing changes in the mechanical VTE prophylaxis order set, and increased rounding on patients to ensure they are compliant, as well as staff reinforcement by team leaders.

The aim was to educate both bedside nursing staff as well as perioperative patients to increase knowledge and improve compliance. Bedside staff were educated on what DVTs and PEs are, who is at risk, and how to appropriately use mechanical VTE prophylaxis. Perioperative patients were educated on the same topics using an educational flyer and a poster in their room, as well as a poster on a billboard in the hallway on the 3rd Surgical unit. The intent was that staff would educate patients based on the knowledge they gained from the educational presentation, thus increasing patient understanding of and compliance with mechanical VTE prophylaxis by using these interventions. The poster served as a visual cue for both patients and staff to apply the ordered prophylaxis. Visual reminders for staff were located on each assignment sheet, in hydration stations, and on each Workstation on Wheels (WOW). The project had three proposed outcomes: (1) increase staff knowledge and confidence in target staff members, (2) increase the patient compliance rate with mechanical VTE prophylaxis, and (3) decrease the DVT and PE rate from August 2021 to December 2021.

Description of the Methods and Measurement

Potential staff participants were recruited using an email sent out through the project site's server to their work email address, alerting them to the project, with a description of the project and goals. Links to a pre- and post-survey were included in the recruitment email. Demographic information was collected in the pre-survey, such as age, race, gender, and highest level of education completed. The pre- and post-survey consisted of 10 Likert scale questions asking participants to rate their knowledge and confidence levels regarding DVTs, PEs, and mechanical VTE prophylaxis. See Appendix D for a list of pre-survey questions and Appendix E for post-survey questions. Only participants who completed all three portions of the project (pre-survey, PowerPoint presentation, and post-survey) were included in the final participant

numbers. The email also included the project lead's contact information, so participants had a chance to ask questions about the project. To increase participation, staff members who completed all three sections of the project were entered into a random drawing for a $100 gift card to a restaurant of their choice. A reminder to ensure patient compliance with mechanical VTE prophylaxis was posted in hydration stations, on each Workstation on Wheels, and printed on the assignment sheets for each shift. Team leaders also reinforced compliance with mechanical VTE prophylaxis with team members at each huddle meeting at change of shift. The project and the unit mechanical VTE prophylaxis compliance numbers were also discussed at the monthly unit meeting for all dedicated unit staff in November 2021.

Patients were provided with an educational flyer about blood clots and mechanical VTE prophylaxis upon admission to the floor (see Appendix F). The assigned nurse reviewed this information with the patient, and the document remained at the bedside for the patient to review periodically. Extra copies of the flyer were available at two nurse's stations on the floor in the event the document was misplaced or damaged. A separate flyer was made into a poster that hung above the patient's bed, as well as on a billboard in the hallway on the 3rd Surgical unit and served as a visual reminder to staff and patients to wear the ordered prophylaxis (see Appendix G).

Discussion of the Data Collection Process

A survey was available to bedside staff during implementation that measured knowledge and confidence levels regarding DVTs, PEs, and mechanical VTE prophylaxis. The pre-survey included demographic information about staff. Collected data was reviewed weekly and compiled into an Excel spreadsheet (see Appendix H). Each week, the project lead ran a report of documentation by staff on compliance by perioperative patients regarding ordered mechanical

VTE prophylaxis. Staff documented whether the patient was compliant, noncompliant, or refusing to wear the device. Compliant was defined as the patient wearing the device properly, noncompliant was defined as the patient not wearing it as directed, and refusing to wear the device meant the purpose of the device was explained to the patient, and they chose not to wear it despite this information. During implementation, a new intervention was added to the computer charting system that populated in the patient admission order set. This intervention was a reminder for staff to apply mechanical VTE prophylaxis if ordered for the patient. The intervention that staff routinely used to chart patient compliance was inserted into the admission order set so that staff could immediately document patient compliance upon arrival to the floor instead of the intervention defaulting to the next shift as the previous practice. The project lead worked with members of the project team at the site to gather data on DVT and PE rates pre- and post-implementation (see Appendix L and Appendix M). The project site reported acquired DVT and PE rates as Medicare and non-Medicare patients, but for the purposes of this project, all patients in the described population were counted regardless of insurance type.

Implementation Plan

In August 2021, eligible staff received an email that included a pre-survey, educational PowerPoint, and post-survey. At the same time, an educational flyer about DVTs, PEs, and mechanical VTE prophylaxis was included in a folder at each nurse's station on 3rd Surgical for the staff to provide to each patient upon admission to the floor. A poster of the same subject matter was posted in each patient room on the unit. Team leaders were instructed to reinforce compliance with mechanical VTE prophylaxis during huddle at the beginning of each shift. They also provided a reminder on each assignment sheet for staff. Reminders were included in hydration stations and on each WOW. A new intervention was added to the patient's admission

order set that served as a reminder for staff to apply mechanical VTE prophylaxis if ordered. An intervention to document type of prophylaxis and patient compliance status was also added to the admission order set.

During this phase, the project lead performed a retrospective audit of patient charts to determine if mechanical VTE prophylaxis was ordered for perioperative patients on the unit from August to December 2020. A retrospective audit of the number of perioperative DVTs and PEs from the same time frame was performed as well. The project lead also compared results of the pre-survey and post-survey to determine if staff members rated their confidence level and/or knowledge level as increased, decreased, or unchanged after viewing the educational PowerPoint. Compliance rates and perioperative DVT and PE rates were tracked during implementation to monitor for improvement. Data was collected weekly, and a PDSA cycle was performed every two weeks that allowed the project lead to examine the current rates of compliance and allow for rapid cycle change to make improvements to the process if needed.

After the implementation period was completed, the project lead presented a presentation on blood clots and mechanical VTE prophylaxis to the entire staff at the unit's monthly meeting. Mechanical VTE prophylaxis compliance rates for the unit were reviewed. After the implementation period was completed in December 2021, a separate audit was conducted to examine perioperative DVT and PE rates for the implementation time frame of August to December 2021. This data was compared to perioperative DVT and PE rates from the same time frame for 2020.

Timeline

Development of the project began in January 2021. It was implemented at the project site from August 2021-December 2021. Data were collected during the implementation period using six PDSA review cycles every two weeks. The data were reviewed, analyzed, and compiled from August 2021-January 2022. The project was presented to faculty and graduate students from the university, as well as the project site champion and members of the project team, in April 2022. See Appendix P for the project implementation timeline.

Section IV. Results and Findings

Results

Staff Surveys: Overall Results

Staff surveys opened August 23, 2021 and closed November 10, 2021. Out of 39 eligible staff participants, 41% (n=16) answered the pre-survey and 33% (n=13) answered the post-survey. The survey respondents had an average of 8 years of experience with direct patient care. All participants were female, and 88% were Caucasian with an age range between 23-55. Half of those surveyed had an Associate's Degree and 44% had a Bachelor's Degree. Appendix I shows responses to the pre- and post-survey.

Nursing Knowledge and Confidence Levels

Staff rated themselves as more knowledgeable and confident in all areas after watching the educational PowerPoint presentation. The area that showed the greatest improvement was knowledge of contraindications to using TED hose (question eight). In the post-survey, 69.2% (n=9) strongly agreed, 15.4% (n=2) agreed, and 15.4% (n=2) somewhat agreed compared to the pre-survey where 18.8% (n=3) of respondents strongly agreed, 31.3% (n=5) agreed, and 25% (n=4) somewhat agreed. Another area that showed improvement was knowledge of contraindications to SCDs (question six). In the post-survey, 69.2% (n=9) strongly agreed, 23.1% (n=3) agreed, and 7.7% (n=1) somewhat agreed compared to the pre-survey where 25% (n=4) strongly agreed, 37.5% (n=6) agreed and 12.5% (n=2) somewhat agreed. Improvement was also noted in participants' responses regarding knowledge of signs and symptoms of a PE (question three). In the post-survey, 76.9% (n=10) of respondents strongly agreed, and 23.1% (n=3) agreed compared to the pre-survey where 37.5% (n=6) of respondents strongly agreed, 43.8% (n=7) agreed, and 12.5% (n=2) somewhat agreed. Regarding knowledge of the signs and symptoms of

DVT (question two), 76.9% (n=10) strongly agreed and 23.1% (n=3) agreed on the post-survey compared to the pre-survey where 56.3% (n=9) strongly agreed and 43.8% (n=7) agreed.

There were two areas in which there was not an improvement in the number of responses in knowledge and confidence levels. Regarding knowledge of what a DVT and PE are and the difference between the two (question one), 76.9% (n=10) strongly agreed and 23.1% (n=3) agreed on the post-survey compared to the pre-survey where 68.8% (n=11) of staff strongly agreed and 31.3% (n=5) agreed. Regarding knowledge and comfort levels around using the SCD machine (question five), 92.3% (n=12) strongly agreed and 7.7% (n=1) agreed on the post-survey compared to the pre-survey where 87.5% (n=14) strongly agreed and 12.5% (n=2) agreed.

Nursing Survey Responses by Week

The total staff participation rate in completion of the survey steadily increased from weeks one through three, leveled off for weeks three through four, increased again for weeks four through five, and stabilized from weeks five through twelve. During week one, 28% (n=11) of eligible staff answered the pre-survey and 23% (n=9) answered the post-survey. For week two, a total of 31% (n=12) answered the pre-survey and 26% (n=10) answered the post-survey. During week three, the completion rate increased to 36% (n=14) for the pre-survey and 31% (n=12) for the post-survey. After week five the staff completion rate increased to 41% (n=16) for the pre-survey and 33% (n=13) for the post-survey with no further increases through the remainder of the implementation period. Appendix J displays staff survey responses on a week-by-week basis during project implementation.

Mechanical VTE Prophylaxis Compliance: Overall Results

Mechanical VTE prophylaxis compliance rates were tracked for two units, 3rd Surgical East and 3rd Surgical West. Data were compiled into two separate unit spreadsheets for review

and then the two units were compared. There was an overall increase in the compliance rate for 3rd Surgical West (8%) and a slight decrease in compliance (2.3%) for 3rd Surgical East compared to the same time period from 2020**.** Appendix K displays mechanical VTE prophylaxis compliance rates from PDSA Cycles 1-6 compared to rates from August-November in 2020. For 3rd Surgical East, the average mechanical VTE compliance rate during project implementation (Aug-Nov 2021) was 87.7%, compared to 90% for the same time period in 2020. During implementation, the highest compliance rate was 93% during week nine and ten, and the lowest compliance rate was 83% during weeks three, four, seven, and eight. For 3rd Surgical West, the average compliance rate during project implementation (August-November 2021) was 68.5%, compared to 60.5% for the same time period in 2020. During implementation, the highest compliance rate was 80% during week three and four, and the lowest compliance rate was 59% during week one and two.

Mechanical VTE Prophylaxis Compliance Rates by Week

As stated, compliance was tracked on two separate units. 3rd Surgical East started out at its highest compliance rate for implementation and saw slight decreases and increases on a week-by-week basis. For week one, compliance was at 91% and dropped to 83% for week two. An increase was noted during week three of 88% with a slight decrease to 81% during week four. For weeks five and six, compliance was at 89% and 88% respectively. Week seven saw the lowest compliance rate of 67%, which increased to 100% for weeks eight, nine, and eleven. Week ten had an 88% compliance rate. For the twelfth and final week, the unit had a compliance rate of 80%.

There are several possible explanations for the week-by-week differences in compliance rates on 3rd Surgical East during implementation. During week seven, elective joint replacement

surgeries were cancelled. There were only six patients on the unit for week seven, and these were overflow patients from 3rd Surgical West. Elective surgeries were rescheduled for the following weeks, utilizing nurses who were specially trained to take care of this patient population which may explain why compliance rates increased to 100% for weeks eight and nine. The first change to the mechanical VTE prophylaxis EHR charting interventions for nursing (the reminder to apply mechanical VTE prophylaxis if ordered) was not made until the middle of week ten, which had an 88% compliance rate. This rate increased to 100% for week eleven after the change was implemented. The project lead had walked around the unit at the beginning of the change and notified staff members of the change and encouraged compliance.

Compliance was tracked on 3rd Surgical West as well. Total compliance was 72% for week one, which dropped to its lowest rate of 33% for week two. Compliance increased to 81% for week three, then decreased slightly to 79% for week four. Compliance dropped further for weeks five and six to 76% and 59%, respectively. For week seven, the unit was at 74% compliance, which increased slightly to 75% for week eight. For weeks nine, ten, and eleven, the unit compliance rate decreased further to 64%, 61%, and 65%, respectively. For the final week, compliance further decreased to 59%.

There are several possible reasons for decreased compliance on 3rd Surgical West. During week 6, when compliance dropped to 59%, it was revealed that the unit director would be transitioning to a job on another unit. Thus, the director, who served as mentor to the project lead, was no longer involved in helping oversee the project and meet with team leads to help encourage staff compliance. The director of the medical floor took over as leader in the following weeks, and she was initially unaware of the project and uninvolved in assisting with it. There was a steady staff turnover rate as implementation progressed, also contributing to

decreased compliance as some staff members who voluntarily viewed the educational PowerPoint moved to other units or job opportunities outside of the organization. Additionally, new graduate nurses and travel nurses were hired for the unit and were not as familiar with mechanical VTE prophylaxis protocols as more seasoned staff members. As stated, the first change to the EHR interventions was made during week ten, which had a compliance rate of 61%, and increased to 65% during week eleven after the change took place and the staff was informed and educated by the project lead.

DVT and PE Rates by Quarter

Evaluation of the number of perioperative DVTs and PEs were broken down into quarters. For the first quarter (January-March 2021), there were two DVTs identified that occurred after admission: one affected a patient on 3rd Surgical East and the other affected a patient on 3rd Surgical West. For the second quarter (April-June 2021), there was one that affected a patient on 3rd Surgical West, and zero for the third quarter (July-September 2021). All three affected patients underwent Orthopedic surgery: one had a routine knee replacement, one had a femur revision, and one had a hip revision. For the final quarter (October-December 2021), which took place during project implementation, there were zero perioperative blood clots identified. Figure 4 in Appendix M displays the number of perioperative DVTs that occurred and were not present on admission in the organization by quarter in 2021.

Discussion of Major Findings

Staff Knowledge and Confidence Levels

All eligible staff members did not view the educational PowerPoint and take the pre- and post-surveys, since participation in the project was voluntary. However, staff who participated in the educational PowerPoint session rated themselves overall as more confident and

knowledgeable about blood clots and mechanical VTE prophylaxis in all areas than prior to viewing the materials. This is consistent with the literature which indicated individuals were more likely to rate themselves as more knowledgeable about the devices after education (Nahar et al., 2018).

Mechanical VTE Prophylaxis Compliance Rates

The authors in the literature review agreed that compliance with mechanical VTE prophylaxis is often difficult to achieve (Hamid et al., 2021; Kim et al., 2018; Nahar et al., 2018). Even with project interventions in place, compliance rates in mechanical VTE prophylaxis on 3rd Surgical East and 3rd Surgical West did not significantly increase. There was a trend toward improvement with an 8% increase in compliance for 3rd Surgical West and a 2.3% decrease in compliance for 3rd Surgical East as compared to the compliance rate for 2020. Even though 3rd Surgical East had a decline in compliance from the previous year, they continued to have the highest overall hospital unit compliance rates at 88%. In a random house-wide audit, compliance rates on other floors such as the Critical Care Unit (CCU), Progressive Care Unit (PCU), and 2nd Medical were lower than rates on 3rd Surgical East and 3rd Surgical West. As indicated in studies by Hamid et al. (2021) and Nahar et al. (2018), despite education in the form of a written documents, visual aids, and educational sessions, compliance rates did not increase significantly for the target units.

Perioperative Blood Clot Rates

Some authors suggest that the incidence of perioperative DVT ranges from 43.7 to 145 per 100,000 patients, and the incidence of PE ranges from 20.8 to 65.8 per 100,000 patients (Farias-Kovac & Reardon, 2022). Data on the incidence of perioperative blood clots were divided into four quarters by the organization. Throughout 2021, there was a gradual decline in

perioperative blood clot rates for the project site. The organization met its benchmark goal of three or less perioperative blood clots for 2021; two were identified in the first quarter and one in the second quarter. The organization did not meet its stretch goal of ≤ 2 perioperative blood clots for 2021. However, there were zero perioperative blood clots during the implementation period in the third and fourth quarters. While a direct correlation between project interventions and blood clot rates cannot be inferred, this outcome is nevertheless significant and was one of the desired outcomes of the project.

Project Site Metrics

As discussed earlier, the project site uses three main indicators to gauge how well they are performing regarding perioperative blood clots: AHRQ Patient Safety Ratings, CMS star ratings, and Leapfrog metrics. For fall 2021, the AHRQ perioperative DVT and PE national average was 3.41 overall (Agency for Healthcare Research and Quality [AHRQ], 2021). The project site's average was 3.0 for fall 2021, compared to 5.0 from July 2020. Their CMS star rating improved to 3.0 for fall 2021, compared to 2.0 for fall 2020. The rating for serious complications, which includes DVTs and PEs, improved to 1.07 for fall 2021 from 1.13 for fall 2020, compared to the national average of 1.00 (U.S. Centers for Medicare and Medicaid Services, n.d.). As of fall 2021, the Hospital's overall Leapfrog safety grade was still a B. However, their dangerous blood clot rating had improved to 3.70 for fall 2021 compared to 5.14 for fall 2020, with the best-performing hospital at a 1.65 and an average hospital score of 3.61 (The Leapfrog Group, 2021).

Section V. Interpretation and Implications

Cost-Benefit Analysis

Costs Associated with Implementation

Project implementation costs were minimal and estimated at $191 with most of the costs associated with supplies. The project lead printed 75 color flyers and 300 black and white handouts for a total cost of $86.47. The gift card participation prize for one random staff member was $100. There were no costs to create the educational PowerPoint and surveys. Staff already had access to the charting system, so there was no additional cost associated with training or use. A reminder to staff to help ensure compliance was printed on each team member's assignment sheet, and reminders were printed and placed in hydration stations and on WOWs at each nurse's station. This involved the use of slightly more printer paper and ink than usual, which was estimated to be valued at less than five dollars. See Appendix N for the project implementation budget.

Sequential Compression Device (SCD) machines, stockings, and Thromboembolic Deterrent (TED) hose were already in use on the unit, and each patient was charged for the individual garments, so there was no additional cost associated with use of these items for the purposes of this project. There was no additional cost to the organization since each patient was responsible for covering the cost of the items charged to him or her. The TED hose cost the project site approximately $4.33 a pair depending on the size ([redacted], personal communication, November 8, 2021). The SCD sleeves ranged from $8.50 to $14.08 depending on the size ([redacted], personal communication, November 8, 2021). The SCD machines were $688.75 each through the Accelerated Supply Chain Endeavor (ASCEND) program ([redacted], personal communication, November 17, 2021).

While there was no additional cost for project team member and staff participation in this project, the estimated cost of these resources must be considered. It was estimated that staff members spent five minutes educating each patient about blood clots and mechanical VTE prophylaxis. The site champion spent approximately ten hours meeting and interacting with the project lead and other members of the project team at the site. The staff nurse and site champion salaries are unknown, but it was estimated that this paid time equates to less than $500.

Benefits to Implementation

The potential financial benefits to project implementation for the organization outweigh the costs associated with this project. The team lead spent $186.47 on project supplies, and the supply cost to the organization was valued at less than five dollars. See Appendix N for an outline of the project budget. Labor costs were valued at less than $500. There was no additional cost for the organization for SCD machines, garments, or TED hose. The cost of a first admission for a VTE ranges from $3,018 to $5,040, and the cost of a first admission for a PE is between $5,198 and $6,928 (Fernandez et. al, 2015). Medical costs of a first-year survivor of VTE are estimated at $12,000-$15,000 a year (Link, 2018). Additionally, the project site receives no CMS reimbursement for hospital-acquired blood clots, which are considered a sentinel event, and these events put the hospital in jeopardy of losing its accreditation. Thus, preventing even one perioperative blood clot could potentially save the hospital and patients tens of thousands of dollars each. Preventing unnecessary readmissions and treatments for hospital-acquired blood clots also reduces the patient burden for the organization.

Resource Management

The project involved utilizing several nonfinancial resources that were vital to project implementation. The project lead educated staff members and patients who were already present,

such as the site champion, unit supervisor, team leads, and staff nurses. These team members, in turn, helped educate other team members and patients. The project lead was able to communicate primarily by email, which was a simple, quick, and efficient method of communication. The project lead had four in-person meetings with the site champion that lasted approximately an hour each. The project lead also spoke briefly at each staff huddle before night shift while at the site, and the team leads spoke with the other staff members during huddle to remind them of the project and the importance of ensuring patient compliance.

The project also involved using supplies that were already stocked on the unit. The unit had a set number of SCD machines already and did not have to purchase any additional machines during implementation. The SCD machine was placed in the patient's room upon admission, cleaned upon patient discharge, and placed back in the supply room to be reused. This policy was already in place and did not require the use of additional staff members or time. There was a dedicated hospital employee who was responsible for cleaning the machines and placing them back in the supply room; nurses and nurse aides also helped clean the machines when all of them were dirty and the dedicated employee was not available. Increasing utilization of the SCD machines may have increased the labor and time spent by these staff members on cleaning the increased numbers of dirty machines. The project allowed staff to utilize mechanical VTE supplies already stocked on the unit, such as SCD stockings and TED hose.

Changes to the EHR required involvement of members of the Information Services (IS) team. While not receiving any extra pay for this work, they spent time trying to get approval for and implementation of the two changes to the interventions charted by nursing staff. If not for this project, this time would have been spent on other matters. Therefore, the value of the time spent must be considered as a nonfinancial resource.

Implications of the Findings

One major finding is that the small percentage of nursing staff who completed the educational module rated themselves as more knowledgeable and confident about mechanical VTE prophylaxis in all areas surveyed. This is important because it suggests that all nursing staff on the unit could potentially benefit from this education. Another major finding is that no perioperative blood clots were discovered during the project implementation period. As stated, this does not imply that the project directly impacted these numbers, but it cannot be ruled out that the project might have had some effect on the absence of blood clots on the unit. While compliance did not significantly increase, there were several factors potentially affecting this that will be discussed later. Overall, the potential benefit to patients and the organization by preventing even one blood clot outweighs the minimal costs that were associated with implementing this project. This aligns with the goals of the Triple Aim of improving the health of populations, improving the patient experience of care, and reducing the per capita cost of health care (Institute for Healthcare Improvement, 2021a).

Implications for Patients

Because there were no perioperative blood clots found during the implementation period, no patient had to suffer from these conditions while on the unit. Decreasing perioperative blood clots can prevent patient injury, stress, and costs associated with treatment and hospitalization, as well as costs associated with outpatient care and potential rehospitalization due to blood-clot-associated complications. Consistent, quality patient education can allow for early identification of DVTs and prevent them from becoming PEs, preventing a potentially life-threatening event from occurring. Education ensures patients have a role in their own healthcare management, are

engaged in their own health promotion, and increases both patient and family satisfaction and quality of life.

Implications for Nursing Practice

Staff rated themselves as more knowledgeable and confident about blood clots and mechanical VTE prophylaxis after viewing the educational module during implementation. Staff education can allow for early identification of DVTs and PEs and prevent further complications or even patient death. Increased staff confidence allows for more engaged staff committed to quality measures that improve outcomes for patients. Increased staff knowledge and confidence levels can also lead to better organization and teamwork on the unit, leading to increased staff morale, efficiency, quality of labor, and improved patient outcomes. More educated, empowered nurses can serve as a resource for other members of the interprofessional team to learn about VTE prophylaxis and help promote evidence-based, quality care for patients. Nurses can serve as role models for members of other healthcare systems, helping increase patient safety and quality of care on a national level by engaging with other healthcare leaders and advocating for change in best practice.

Impact for Healthcare System(s)

Decreasing perioperative blood clots decreases costs to the healthcare system for treating these conditions. It also reduces the penalty that the hospital may receive from CMS associated with sentinel events, further increasing profits. Decreasing perioperative blood clots also improves hospital ratings and patient confidence in the facility and can improve the public's perception of the healthcare facility and quality of care, as well as help to ensure the organization keeps its accreditation status. These measures can lead to increased patient volume and improved

patient satisfaction scores, reflecting positively on all members of the organization. These changes can attract new, qualified team members, increasing access and quality of care.

Sustainability

Sustainability of the project depends on several factors which are driven by members of the organization, as well as the patients themselves. The project lead discussed the formation of a VTE committee or selection of a dedicated staff member responsible for overseeing compliance, monitoring trends, educating staff, and making changes to policy if needed. After the house-wide mechanical VTE prophylaxis audit was performed, the site champion recognized a need for a change to be made house-wide. The site champion will hold a meeting with other department heads soon to discuss a possible house-wide initiative to increase mechanical VTE compliance on all units. Changes made to the admission interventions were house-wide and will remain in the charting system indefinitely. Several staff nurses have contacted the project lead directly and stated that they have continued to educate patients about their risk of blood clots and the importance of compliance with mechanical VTE prophylaxis, utilizing the patient poster and handout as references, even after implementation was over.

One argument for sustainability of the project is the low cost associated with implementation. The total cost of supplies was less than two hundred dollars, and the total labor cost was estimated at around five hundred dollars. Selection of an organization-specific as well as a unit-specific VTE champion from a pool of current employees would not incur any additional cost for the organization. These two champions could collaborate and compare data from the unit level with the hospital level data to evaluate opportunities to improve patient safety and quality of care. Overall, the project was cost-effective for the project site.

Dissemination Plan

The project was presented to the college of nursing in April 2022. The paper was submitted to the University Scholarship Repository for public access. The findings were presented to the project site champion and unit managers at the project site in May 2022. The project will be displayed in a video poster presentation and poster display at the organization in May 2022. The paper was retained by the project lead and available upon request to interested parties. There were opportunities for the project lead to submit the paper for consideration to several established nursing journals that publish Quality Improvement projects, such as The American Journal of Nursing and the Journal of Nursing Care Quality. There were opportunities for the project poster abstract to be submitted to several conferences, such as the Vascular Research Initiatives Conference in May 2022, the Society for Vascular Surgery Annual Vascular Meeting in June 2022, and the North Carolina Nurses Association (NCNA) Nurse Practitioner Spring Symposium in March 2022. The project lead submitted an abstract to the National Nurse Practitioner Symposium in July 2022.

Section VI. Conclusion

Limitations

There were many limitations that affected the implementation of this project. One major limitation was the COVID-19 pandemic. The pandemic limited communication, meetings, and numbers of patients and elective surgeries. There was a high turnover of staff at this time, an increased number of new graduate nurses and travel nurses, and multiple changes in leadership as well as management taking over multiple roles due to losing staff. Many staff members missed work due to personal illness, family illness, or death. Staff faced complacency and fatigue due to mandatory overtime, inadequate staffing, increased patient volume and medical complexity, and stress about the pandemic. Staff members may have opted not to participate in the project due to personal obligations taking precedence or conflicting priorities.

Other limitations were related to data collection. For the survey results, the data findings were reported aggregately; the project lead was not able to match up individual pre-survey and post-survey responses. The sample size was small; only 16 (41%) out of 39 eligible nurses answered the pre-survey and 13 (33.3%) answered the post-survey. Staff members were only able to access the educational presentation on the hospital network, limiting participants who may not have had time to complete the surveys while at work. Also, if one nurse charted at any time during the patient's stay that they were noncompliant or refusing to wear the ordered mechanical VTE prophylaxis, the patient was rated as noncompliant by the computer system even if patient was compliant for the remainder of the hospital stay. The document used to generate data on compliance did not differentiate between SCDs and TED hose. The mechanical VTE prophylaxis intervention was not able to be re-timed from every shift to every 4 or 6 hours. Changes to interventions in the EHR did not take place until week ten of implementation.

Other limitations were related to staff and patient compliance. Admission packets were no longer being provided to patients at time of admission, so it was up to staff to hand out flyers to patients, a task that was not always completed. Confused, obtunded, or mentally disabled patients were not able to be educated or able to wear the ordered devices. Patients with certain conditions such as leg wounds, fragile skin, restless legs, or edema were not able to tolerate the devices. Educational materials were only provided in English and non-English-speaking patients were not able to comprehend; however, a video interpreter was always available to assist with translation if needed.

Facilitators

There were several facilitators to this project. Unit staff members were engaged with the project lead during implementation and voiced their support of the project. One staff member suggested increasing the poster size and putting it in front of the patient's bed where they could see it easier. Another team member suggested having a dedicated SCD machine in each patient room so that nursing staff would not have to spend extra time looking for it or forget to put one in the room when a patient was admitted.

The project site champion was instrumental in helping the project lead coordinate this project and stay on track with the timeline by being present for scheduled meetings and easily available by email. She contacted others in the organization to help provide the project lead with data and information. The Director of Value-Based Reporting and Decision Support provided the project lead with invaluable data about the hospital's quality measures and blood clot rates. The project mentor remained supportive of the project and the project lead, even when transferring to another unit in the middle of implementation. She was involved in contacting the team leaders and making sure they discussed the project with staff members and helped keep them involved.

The project lead was grateful to hospital administration, who approved the project and allowed the project lead to implement it.

Recommendations for Others

There are several recommendations for others regarding replication of this project. One is to implement mandatory house-wide education on blood clots and mechanical VTE prophylaxis for all new staff, including new graduate nurses and travel nurses. Continuing Education Units (CEUs) could be offered as an incentive. The education could be renewed annually or bi-annually so dedicated staff members could stay current with their knowledge and training. Certified Nursing Assistants (CNAs) could be included in the education since they frequently interact with patients and are responsible for management of mechanical VTE prophylaxis. CNAs could be offered incentives in the form of discounts for the hospital cafeteria, coffee shop, or gift shop in exchange for completing the education. Nurses and CNAs could also be given a certificate of completion that could be added to their portfolio to help them achieve an increase in pay based on the organizational merit-based pay program.

Another suggestion would be to implement a dedicated staff member responsible for overseeing compliance, monitoring trends, educating staff, and making changes to policy if needed. This staff member would be responsible for staying current on best practice for VTE prevention by conducting bi-annual literature reviews. This individual could be responsible to disseminate findings of best practices to the clinical staff by email and/or in monthly staff meetings. The staff member could also review documentation, identify nurses that documented patients as noncompliant, and meet with them to discuss potential barriers to compliance and provide real time feedback.

An appointed VTE champion could visit patients upon admission and educate them about their risk for blood clots, teach them how to use ordered mechanical VTE prophylaxis, and encourage compliance. The assigned nurses could reinforce this teaching on their rounds. An educational, organization-approved video could be included in the patient video education system for patients to view upon admission and review at their convenience.

A VTE committee or council would be another viable option. It could include members from all organization disciplines: physicians, nurses, nurse aides, pharmacists, et cetera. Each of these members could have a different perspective to offer. The VTE champion would be included in the committee. Monthly meetings could be held to discuss findings, trends, and suggestions for improvement. A different committee member could be tasked each month with finding the latest evidence-based literature which would be shared and discussed with the committee. These articles, as well as the monthly committee findings, could be disseminated to the rest of the unit by email to keep them up to date and involved.

Furthermore, a dedicated SCD machine could be provided in each patient room, as the benefit of preventing even one blood clot potentially outweighs the cost of the machine. The machines are sturdy, reusable, easy to clean, and could potentially last for years if taken care of. A machine in each room would eliminate the ability of staff to overlook it or neglect to place in the room upon admission. It would also constantly be in the patient's line of vision at the end of the bed, reminding them to wear the device while in bed. The CNA assigned to each newly admitted patient could review the chart to see if TED hose or SCDs were ordered and include the appropriate device in the patient's admission kit before arrival to the floor to make sure that it was not overlooked. This would save nursing staff the time of trying to locate the devices.

For the purposes of this project, the educational poster was placed in a plastic holder behind the head of the patient's bed. Some patients and nurses reported to the project lead that the patients could not read the poster since it was behind them. Some patients additionally reported that the font was too small to read. If this project were to be replicated, the project lead recommends recreating the flyer with a larger font, enlarging the poster size, and hanging it on the wall across from the patient's bed. This would place it in their direct line of vision and make it easier for them to read. Nursing staff could also utilize the white board to educate patients and write a reminder to the patient to wear their mechanical VTE prophylaxis.

The two documentation changes made to the EHR will remain indefinitely. These changes will benefit the organization in that they will allow for more complete and accurate documentation. For future replication of this project, a comment box could be included with the mechanical VTE compliance documentation intervention that would allow staff to record patient reasons for noncompliance to help track and trend reasons for refusal.

Recommendations for Further Study

The project lead recommends further studies be conducted to find more ways to increase compliance by patients and staff. As found in other studies, patient education needs to be combined with other methods to increase compliance (Allaway et al., 2018; Greenall & Davis, 2020; Hamid et al., 2021; Kim et al., 2018; Nahar et al., 2018). Perhaps a study could be carried out to see if a VTE committee or dedicated staff member assigned to monitor VTE compliance would be beneficial to ensure the longevity of interventions and increase staff and patient engagement. Interprofessional team collaboration is vital to ensuring the unit is cohesive about their expectations and to ensure that the highest quality of care for patients on the unit is maintained.

One area that was not measured by this project was patient knowledge about mechanical VTE prophylaxis. Nahar et al. (2018) found that patients were more likely to rate themselves as more knowledgeable about these devices after education. As stated, other studies found that patient education is a key component of ensuring compliance. Patients on 3rd Surgical East had compliance levels that were consistently over 80%. In a review of the compliance rates from 2020, these patients have traditionally been more compliant than the patients on 3rd Surgical West. Most of these patients were undergoing elective knee and hip replacement surgery or spine surgery. These patients were required to attend a class before surgery and were given a binder of information to review. They were well-educated before the surgery on what to expect and do and therefore most were compliant with the ordered mechanical VTE prophylaxis because they knew what was expected of them. Clearly, more studies are needed to measure patient perception and knowledge levels regarding the devices, including measuring patient reasoning behind compliance or noncompliance. Patient engagement is another vital component to ensuring the highest quality measures are carried out. Patients who are informed and involved in their own care can be expected to have better outcomes because they are actively engaged in preventing adverse events regarding their own health. As stated before, both staff member and patient involvement are needed to improve compliance and ensure positive outcomes.

One important point is that all hospitalized patients are at risk for developing blood clots, not just perioperative patients. Hospitalized patients are more sedentary than normal and suffer from a variety of health conditions that put them at high risk of developing a blood clot. Therefore, it is the project lead's recommendation that this project be replicated on different units throughout the hospital to gauge the effectiveness of interventions at increasing compliance

since all these patients are at risk. As stated earlier, in a random audit, patients house-wide were less compliant than patients on 3rd Surgical.

Final Thoughts

Perioperative blood clots are a detriment to patients, their families, and healthcare organizations and staff. These are, in many cases, preventable conditions, and more needs to be done to keep patients safe and avoid the physical, emotional, and financial damage these conditions can cause. All healthcare organizations should have a system in place to evaluate for patient risk and help prevent these harmful blood clots from occurring.

This project was successful in increasing surveyed staff's knowledge and confidence levels regarding blood clots and mechanical VTE prophylaxis but ensuring compliance to these measures still proved to be an ongoing issue. However, the site champion and unit managers had a plan to meet and discuss more ways to help improve compliance. Staff nurses reported that they continued to educate patients using documents provided during implementation, and perioperative blood clot rates remained at zero for the organization. This information is encouraging, and hopefully the unit will continue to work on this issue to keep patients safe and engaged in their own healthcare.

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Appendix A

Literature Search Log

			DNP Project Literature Search Log		
Student: Katherine E. Searcy			**Date of Submission: 5/25/2021**		
"Instituting Change in Blood Clot Prophylaxis Protocols for Perioperative Patients"					
Date of Search	**Database**	**Key Word Searches**	**Limits**	**# of Citations Found / Kept**	**Rationale for Inclusion / Exclusion (include rationale for excluding articles as well as for inclusion)**
2/21/2021	MEDLINE via PubMed	mechanical VTE prophylaxis AND venous thromboembolism AND postoperative	Last 5 years, English language, full text, age 19 and older, Clinical Trial, Meta-Analysis, Randomized Controlled Trial, Review, Systematic Review	21 found, 1 kept	Excluded articles about children; excluded articles about neurosurgery; excluded articles about elective joint surgeries; excluded articles not from U.S.; kept articles directly related to clinical question
2/21/2021	ProQuest	VTE prophylaxis AND postoperative AND mechanical	Last 5 years, English language, full text	185 found, 1 kept	Excluded articles not from the U.S.; excluded articles about heart surgery
2/21/2021	PubMed	compression stockings AND dvt AND hospital	Last 5 years, English language, full text, age 19 and older, Clinical Trial, Meta-Analysis, Randomized Controlled Trial, Review, Systematic Review	34 found, 1 kept	3 redundant; excluded articles not from the U.S.
2/21/2021	MEDLINE via PubMed	dvt prevention noninvasive	Last 5 years, English language, full text, age 19 and older, Clinical Trial, Meta-Analysis,	4 found, 1 kept	1 redundant; kept articles directly related to clinical question

			Randomized Controlled Trial, Review, Systematic Review		
2/26/2021	EBSCOhost via CINAHL Complete	mechanical AND vte AND prophylaxis	Last 5 years, English language, full text, USA only, academic journals	53 found , 1 kept	1 redundant; kept articles directly related to clinical question
3/4/2021	PubMed	elastic stockings dvt prevention	Last 5 years, English language, full text, age 19 and older, Clinical Trial, Meta-Analysis, Randomized Controlled Trial, Review, Systematic Review	38 found, 2 kept	excluded articles not from the U.S.; kept articles directly related to clinical question
3/28/2021	MEDLINE via PubMed	vte prophylaxis AND elastic stockings AND perioperative	Last 5 years	15 found, 2 kept	2 redundant; excluded articles from 3rd-world countries; kept articles directly related to clinical question
3/28/2021	CINAHL Complete	VTE prophylaxis AND mechanical AND perioperative	Last 5 years, English language	82 found, 1 kept	1 redundant; excluded articles not from the U.S.; kept articles directly related to the clinical question
5/24/2021	PubMed	compliance AND vte AND mechanical	Last 5 years, English language	22 found, 3 kept	2 redundant; excluded articles from 3rd-world countries; kept articles directly related to clinical question
5/25/2021	PubMed	SCD AND compliance AND decreased DVT	Last 5 years, English language	16 found, 1 kept	1 redundant; kept articles directly related to clinical question
7/21/2021	PubMed	visual AND aid AND increased AND compliance	Last 5 years, English language	71 found, 3 kept	excluded articles from 3rd-world countries

Appendix B

Literature Matrix

Authors	Year Pub	Article Title	Theory	Journal	Purpose and take home message	Design/Analysis/Level of Evidence	IV DV or Themes concepts and categories	Instr. Used	Sample Size	Sample method	Subject Charac.	Comments/critique of the article/methods GAPS
Sachdeva, A., Dalton, M., & Lees, T.	2019	Graduated compression stockings for prevention of deep vein thrombosis (Review)	Clinical nursing: A helping art	*Cochrane Database of Systematic Reviews*	To evaluate the effectiveness and safety of graduated compression stockings in preventing deep vein thrombosis in various groups of hospitalized patients.	**Level I** literature review of RCTs	**IV: deep vein thrombosis DV: graduated compression stockings**	Literature review	1681 patients; 1172 individual legs	Reviewed Cochrane Vascular Specialised Register, the Cochrane Central Register of Controlled Trials (CENTRAL), and trials registries on 21 March 2017; and the Cochrane Vascular Specialised Register, CENTRAL, MEDLINE Ovid, Embase Ovid, CINAHL Ebsco, AMED Ovid , and trials registries on 12 June 2018.	Hospitalized patients of either sex undergoing general, orthopedic, cardiac, gynecological, or neurological surgery; medical patients	The authors found that GCS are effective in reducing the risk of DVT in hospitalized general and orthopedic surgical patients, w/ or w/out other methods of background thromboprophylaxis, where clinically appropriate. They also found that there is moderate-quality evidence that GCS most likely reduce the risk of proximal DVT, and low-quality evidence that GCS may reduce the risk of PE. However, they found that there is insufficient evidence to assess the effectiveness of GCS in decreasing the risk of DVT in medical patients. **Limitations**: Limited data were available to accurately assess the incidence complications and adverse effects associated with the use of GCS; only a small number of patients were routinely screened for DVT or PE; there was a low event rate. **Usefulness**: This evidence can be used to support the fact that GCS are effective at reducing DVTs in the mentioned patient group.
Murphy, P.B., Vogt, K.N., Lau, B.D., Aboagye, J., Parry, N.G., Strieff, M.B., & Haut, E.R.	2018	Venous thromboembolism prevention in emergency general surgery: A review	Health promotion in nursing practice	*JAMA Surgery*	To apply the existing literature on VTE prophylaxis to EGS patients and offer recommendations using the best available evidence.	**Level V** literature review	**IV: VTE events DV: Best practices to prevent VTE**	Literature review	5,098 patients	MEDLINE, Embase, and the Cochrane Database of Collected Reviews were searched from January 1, 1990, through December 31, 2015 for randomized clinical trials, meta-analyses, systematic reviews,and observational studies	EGS patients of both sexes	The authors found that increased recognition of the relatively higher VTE risk in EGS patients is required to improve patient safety. **Limitations**: Because of a lack of level I evidence regarding VTE prophylaxis in EGS patients, the quality of evidence was not graded. **Usefulness**: The data suggest that more research is needed on this subject.
Gordon, N.T., & Schreiber, M.A.	2016	Pulmonary emboli and deep vein thromboses: Are they always part of the same disease spectrum?	Health promotion in nursing practice	*Military Medicine*	To identify separate risk factors for PEs and DVTs to test whether they are the same disease process	**Level V** retrospective review	**IV: PEs and DVTs DV: risk factors**	A retrospective review	521,969 patient entries	A retrospective review of the National Trauma Data Bank between 2007 and 2010 was performed. Demographics, complications, comorbidities, and injury data were reviewed for risk factors for patients diagnosed with a PE or DVT.	White (71.6%); black (15.8%); Asian (1.6%); American-Indian (0.9%); other (9.9%); males and females, over 18 years old	The authors found that while PEs and DVTs have overlapping risk factors, there are also significant independent and divergent risk factors for both conditions, suggesting that they do not always go hand-in-hand. **Limitations**: For certain studies, candidate risk factors were limited to known causes of VTE. **Usefulness**: This information can be used to better understand the multitude of risk factors for PEs and DVTs and thus help medical staff better understand how to prevent and treat them.
Bartlett, M.A., Mauck, K.F., Stephenson, C.R., Ganesh, R., & Daniels, P.R.	2020	Perioperative venous thromboembolism prophylaxis	Clinical nursing: A helping art	*Mayo Clinic*	To describe the authors' approach to prevention of postoperative VTE and provide guidance on how to formulate an optimal VTE prophylaxis plan	**Level VII** opinion of experts	**IV: postoperative VTE DV: VTE prophylaxis plan**	Risk Assessment Models (RAMs), including Caprini score and Rogers score	N/A	N/A	Hospitalized patients of either sex undergoing surgery	The authors recommend no prophylaxis in patients at very low risk of VTE, mechanical or pharmacological prophylaxis in patients with low risk of VTE, pharmacological prophylaxis alone or with mechanical prophylaxis in patients at moderate to high risk, and mechanical prophylaxis alone in patients at high risk of bleeding. **Limitations**: The authors did not diferentiate between specific characteristics of patients such as age, gender, and comorbidities. **Usefulness:** This information can be used in further research studies to test and/or confirm its accuracy. It may be used to help prevent VTE in postoperative patients.
Link, T.	2018	Guideline implementation: Prevention of venous thromboembolism	Health promotion in nursing practice	*AORN Journal*	To identify risk factors associated with venous thromboembolism (VTE), describe mechanical VTE prophylaxis interventions, and describe pharmacologic VTE prophylaxis interventions.	**Level VII** opinion of experts	**IV: VTE DV: mechanical VTE prophylaxis and pharmacologic VTE prophylaxis**	Guidelines from experts such as the CDC and other evidence-based journal articles	N/A	N/A	Hospitalized surgical patients	The author found that VTE is a serious and costly complication of surgery. Many cases of health care–associated VTE could be prevented with the use of evidenced-based interventions. **Limitations**: The author did not differentiate between specific characteristics of patient such as age, gender, and comorbidities. **Usefulness**: This information can be used to confirm the importance of a VTE prevention plan, including mechanical and/or pharmacological prophylaxis.
Perrotta, C., Chahla, J., Badariotti, G., & Ramos, J.	2020	Interventions for preventing venous thromboembolism in adults undergoing knee arthroscopy (Review)	Clinical nursing: A helping art	*Cochrane Database of Systematic Reviews*	To assess the efficacy and safety of mechanical, pharmacological, or combination interventions for thromboprophylaxis in adult patients undergoing knee arthroscopy.	**Level I** literature review of RCTs	**IV: thromboembolism DV: mechanical, pharmacological, or combination thromboprophylaxis interventions**	Literature review	3818	The Cochrane Vascular Information Specialist searched the Cochrane Vascular Specialised Register, the CENTRAL, MEDLINE, Embase and CINAHL databases, and the World Health Organization International Clinical Trials Registry Platform and ClinicalTrials.gov trials registries, on 14 August 2019.	Males and females 18 and older	There is a small risk that healthy adult patients undergoing knee arthroscopy will develop PE or DVT. There is moderate to low evidence that there is no benefit to pharmacological prophylaxis in these patients. There is not significant research to support the use of GCS in preventing PE or DVT in these patients. **Limitations**: Data relating to adverse events was limited due to low numbers of events in the studies reporting. **Usefulness**: The study suggests that more research needs to be done in this area, especially regarding GCS as a preventative measure for DVT or PE.
Carr, P., Ehredt Jr., D.J., & Dawoodian, A.	2019	Prevention of deep venous thromboembolism in foot and ankle surgery	Clinical nursing: A helping art	*Clinics in Podiatric Medicine and Surgery*	To describe risk factors for DVTs and PEs in patients undergoing foot and ankle surgery, and discuss methods to help prevent them	**Level VII** opinion of experts	**IV: DVTs and PEs DV: methods to prevent DVTs and PEs**	Information gathered from evidence-based journal articles by experts	N/A	N/A	patients undergoing foot and ankle surgery	DVTs and PEs are a concern for foot and ankle surgeons despite low incidence rates. Nonpharmacologic prophylaxis should be used routinely. If the patient has risk factors, pharmacologic prophylaxis should be used. **Limitations**: The authors did not discuss patient characteristics such as age, gender, and comorbidities. **Usefulness**: This information can be used in research trials to test its accuracy.
Anderson, D.R., Morgano, G.P., Bennett, C., Dentali, F., Francis, C.W., Garcia, D.A., Kahn, S.R., Rahman, M., Rajasekhar, A., Rogers, F.B., Smythe, M.A., Tikkinen, K.A.O., Yates, A.J., Baldeh, T., Balduzzi, S., Brozek, J.L., Etxeandia-Ikobaltzeta, I., Johal, H., Neumann, I. ... Dahm, P.	2019	American Society of Hematology 2019 guidelines for management of venous thromboembolism: prevention of venous thromboembolism in surgical hospitalized patients	Clinical nursing: A helping art	*Blood Advances*	To support decision-making about preventing VTE in patients undergoing surgery.	**Level VII** opinion of experts	**IV: VTE in surgery patients DV: VTE prevention strategies**	Information gathered from a multidisciplinary guideline panel, including systematic reviews	N/A	N/A	surgical patients	For patients undergoing general surgery, the panel made conditional recommendations for mechanical prophylaxis over no prophylaxis, for SCD's over TED hose, and against inferior vena cava filters. **Limitations**: The authors did not identify the patients based on age, gender, or comorbidities. **Usefulness**: This information can be used for research to test its accuracy.
Afshari, A., Fenger-Erikson, C., Monreal, M., & Verhamme, P.	2017	European guidelines on perioperative venous thromboembolism prophylaxis: Mechanical prophylaxis	Clinical nursing: A helping art	*European Journal of Anaesthesiology*	To recommend types of VTE prophylaxis to prevent thromboembolism in perioperative patients.	**Level VII** opinion of experts	**IV: thromboembolism DV: types of VTE prophylaxis**	Information from the research of experts	N/A	N/A	perioperative patients	The authors recommend not to use GCS alone without pharmacological thromboprophylaxis for prevention of VTE in patients at intermediate and high risk. For patients at high risk of VTE with contraindications for pharmacological thromboprophylaxis, they recommend the use of mechanical prophylaxis and suggest the use of IPC over GCS. For patients receiving pharmacological thromboprophylaxis who are without a very high risk of VTE prophylaxis, the authors recommend against the use of mechanical thromboprophylaxis either with GCS or IPC. They suggest both mechanical and pharmacological prophylaxis in patients at very high risk of VTE and suggest IPC rather than GCS in these selected patients. **Limitations**: The authors did not seperate the patients based on age, gender, or comorbidities. **Usefulness**: This information could be used in research to test its accuracy.
Nahar, D., Nizam, A., Farrow, M., Restifo, A., & Nimaroff, M.	2018	Improving patient compliance with mechanical venous thromboembolism prophylaxis	Theory of power as knowing participation in change	*Journal for Healthcare Quality*	To determine if patient education using a pamphlet would improve mechanical VTE compliance	**Level III** prospective nonrandomized controlled study	**IV: mechanical VTE compliance DV: patient education using a pamphlet**	Educational pamphlet	105	2 groups (53 in control group, 52 in education group)	Women over 18 years old who underwent gynecological surgery using a laparotomy at a hospital in NY	The authors found that patients who were educated using the pamphlet were more compliant with mechanical VTE and more likely to rate their knowledge of VTE prophylaxis is "very good." **Limitations**: The sample size was small. Patients who did not undergo laparotomy, including nongynecologic surgical patients, were excluded. **Usefulness**: This information may be used to improve mechanical VTE prophylaxis in other patients and perhaps decrease the VTE rate as well.
Kim, P.S., Probeck, K., Elitharp, D., Shang, T., Gasparis, A.P., & Labropaulos, N.	2018	The staff and patient perspectives on compliance with mechanical prophylaxis for venous thromboembolism	Theory of power as knowing participation in change	*Journal of Vascular Surgery*	To evaluate the accuracy of assessment and compliance with proper use of IPC devices before and after use of education, accountability, and oversight measures for healthcare staff	**Level IV** prospective, single-center, nonrandomized cohort study	**IV: mechanical VTE compliance DV: patient and staff education**	Various strategies to improve compliance including patient and staff education, increased access to IPC devices, and administrative support	200 patients (2 groups of 100 each)	2 groups of 100 patients each; cluster sample	Randomly selected, emergently hospitalized medical and surgical adult patients (51 men and 49 women in group 1, 52 men and 48 women in group 2)	The authors found that even with use of strategies to improve compliance and appropriate orders by providers, most patients lacked adequate mechanical prophylaxis, and providers did not follow up to make sure prophylaxis was being applied. Discomfort and lack of education were found to be major factors in noncompliance. **Usefulness**: This study suggests that more work needs to be done to improve patient compliance to mechanical VTE prophylaxis. Patients should be monitored to make sure they are wearing devices appropriately and consistently. Furthermore, staff need to be educated on the importance of compliance and follow up to make sure patients are using VTE prophylaxis appropriately.
Allaway, M.G.R., Eslick, G.D., Kwok, G.T.Y., & Cox, M.R.	2018	Improving venous thromboembolism prophylaxis administration in an acute surgical unit	Conceptual model of nursing and health policy	*Journal of Patient Safety*	To determine VTE prophylaxis administration rates before and after implementation of a novel intervention, including a dedicated provider to	**Level IV** a retrospective cohort study	**IV: VTE prophylaxis administration rates DV: ASU model**	An acute surgical unit (ASU) model	1149 patients	Before ASU (167 patients), early ASU (375 patients), and established ASU (607 patients); cluster sample	18 years or older, had an appendectomy during one of 3 time periods (before ASU, early ASU, established ASU), 598 males, 551 females	The authors found that there was a significant increase in VTE prophylaxis administration (both mechanical and pharmacological) after adoption of the ASU model. **Usefulness:** The study suggests that implementing interventions such as VTE surgical order sets, appropriate chart review, patient surveillence, and staff education can improve compliance to VTE administration. **Limitations:** Causality cannot be inferred due to the type of study; a risk of bias due to data abstractors knowing which group they were affiliated with; concurrent national and hospital-wide programs to raise awareness of importance of VTE prophylaxis compliance
Hamid, S., Gallo Marin, B., Smith, L., Agyeman-Kagya, K., George, C., Wetzler, T., Badami, A., Gendy, A., & Roudnitsky, V.	2021	Improving SCD compliance in trauma patients at Kings County Hospital Center: A quality improvement report	Theory of power as knowing participation in change	*BMJ Open Quality*	To improve SCD compliance through a patient education intervention	**Level IV** cohort study	**IV: SCD compliance DV: patient education pamphlet and educational session**	PDSA model	471 patient observations	Stratified sample	Trauma patients at the specified hospital; Male - 54%; female - 46%	The authors suggested that patient education alone was not enough to increase compliance to SCDs. **Usefulness:** The authors suggested that patient education should be combined with other methods to increase compliance. **Limitations:** The study did not measure the entire time the patient had SCDs on (18-21 hours/day is baseline for effectiveness per studies), late involvement of nursing staff
Greenall, R., & Davis, R.E.	2020	Intermittent pneumatic compression for venous thromboembolism prevention: a systematic review on factors affecting adherence	Theory of power as knowing participation in change	*BMJ Open*	To determine factors affecting compliance with IPC devices in the inpatient setting	**Level V** Literature review	**IV: compliance with IPC devices DV: factors affecting compliance**	A literature search of EMBASE, MEDLINE, and PsycINFO	20 studies	Studies were included if they included inpatients and focused on factors influencing adherence to IPC devices	Studies of inpatients; focused on factors influencing adherence to IPC devices	The authors determined that a number of factors were suggested to affect compliance with IPCs, including patient discomfort and healthcare worker knowledge and behaviors. **Limitations:** The evidence was very limited; results were based on direct observation rather than self-report; low sample size; some studies had different aims and methodologies. **Usefulness:** The review suggests that more research needs to be done on this subject to determine reasons for noncompliance with IPCs
Clack, L., Stuhlinger, M., Meier, M.-T., Wolfensberger, A., & Sax, H.	2019	User-centered participatory design of visual cues for isolation precautions	Conceptual model of nursing and health policy	*Antimicrobial Resistance and Infection Control*	To develop an isolation precaution signage system to improve proper compliance with personal protective equipment	**Level V** a cohort study	**IV: compliance with personal protective equipment DV: isolation precaution signage system**	A user-centered, participatory design approach	Not named; HCP at a 900-bed hospital	HCP were sampled and developed an isolation signage system; front-end analysis through interviews and observations; creation of user personas, design thinking workshops, and prototyping; graphical symbols developed and tested	healthcare workers in a 900-bed hospital	**Conclusion:** The authors found that visual cues using signage offers a promising opportunity to make guidelines available at the frontline of healthcare; the approach holds potential for further improvement of design in healthcare settings **Limitations:** unclear target audience, low signal-to-noise ratio, ambiguity regarding the applicable precautions
Egan, M., Acharya, A., Sounderajah, V., Xu, Y., Mottershaw, A., Phillips, R., Ashrafian, H., & Darzi, A.	2021	Evaluating the effect of infographics on public recall, sentiment and willingness to use face masks during the COVID-19 pandemic: A randomised internet-based questionnaire study	Theory of power as knowing participation in change	*BMC Public Health*	To assess the impact of infographics on the knowledge of proper face mask usage	**Level IV** A randomized controlled trial	**IV: knowledge of proper face mask usage DV: infographics**	A randomised, Internet-based questionnaire; visual aids by top world health organizations	4099	Adult participants randomly recruited on the Internet	Ages 18 and up; 86% white; 3% black; 7.0% Asian; 51.2% men; 48.8% women	**Conclusion:** Participants who looked at the infographics had significantly higher average recall scores than those who did not; it also lead to increased confidence and willingness to wear a mask. The authors found that infographics can aid the recall of correct mask techniques by highlighting salient steps and reducing cognitive burden **Limitations:** potential for selection bias; willingness to wear a mask was an outcome, as opposed to actually wearing a mask
Kim, D., & Lee, O.	2019	Effects of audio-visual stimulation on hand hygiene compliance among family and non-family visitors of pediatric wards: A quasi-experimental pre-post intervention study	Theory of power as knowing participation in change	*Journal of Pediatric Nursing*	To identify the differences in interventional effects on hand hygiene compliance among families and visitors in pediatric wards	**Level V** a cohort study	**IV: hand hygiene compliance DV: audio and audiovisual stimulation**	An audio and audiovisual stimulus	2787	Subjects were observed for 4 hours when entering one of 6 pediatric wards; two interventions of a visual stimulus and audio stimulus, respectively	family and non-family visitors to a pediatric ward	**Conclusion:** The audiovisual stimulus was more effective than the visual stimulus alone. Follow-up research is advised to look at the current state of hand hygiene compliance **Limitations:** The location, space, and layout may vary among hospitals; visitors may use a hand hygiene station at a place other than the one observed; did not include preference between water and alcohol-based sanitizer

Appendix C

Quality Improvement Evaluation

Quality Improvement/Program Evaluation Self-Certification Tool

Purpose:

Projects that do not meet the federal definition of human research pursuant to 45 CFR 46 do not require IRB review. This tool was developed to assist in the determination of when aproject falls outside of the IRB's purview.

Based on your responses, the project appears to constitute QI and/or Program Evaluation and IRB review is not required because, in accordance with federal regulations, your projectdoes not constitute research as defined under 45 CFR 46.102(d). If the project results are disseminated, they should be characterized as QI and/or Program Evaluation findings.

Finally, if the project changes in any way that might affect the intent or design, please complete this self-certification again to ensure that IRB review is still not required. Click thebutton below to view a printable version of this form to save with your files, as it serves as documentation that IRB review is not required for this project. 7/8/2021

Appendix D

Staff Recruitment and Pre-Survey

Evaluating nursing staff knowledge and confidence about mechanical VTE prophylaxis – pre-survey

Dear potential participant,

My name is Katherine Searcy, and I am a doctor of nursing practice (DNP) student at East Carolina University. I am conducting a study to evaluate nursing's knowledge and confidence about mechanical VTE prophylaxis at [redacted].

The study consists of three parts. 1. You will complete a pre-survey. 2. You will watch a voiceover PowerPoint presentation. 3. You will complete a post-survey. The whole project should not take more than 30 minutes of your time.

Your participation in the project is voluntary and you may choose to withdraw at any time. I realize that your time is valuable. For completion of all three elements of the study (pre-survey, PowerPoint presentation, and post-survey) you will be entered into a random drawing for a $100 gift card to the restaurant of your choice.

If you have any questions about the study, please don't hesitate to contact me: kesearcy@carterethealth.org. Thank you for your time and consideration of this project.

Katherine Searcy, BSN, RN, CMSRN
ECU DNP-AGPCNP candidate - May 2022

What is your current age?

What is your gender?

Male
Female

What is your race?

Caucasian
African-American
Asian
Hispanic
Pacific Islander
Other:

What is the highest level of education you have completed?

High school diploma or G.E.D. equivalent
Some college but did not graduate
Associate's degree
Bachelor's degree
Master's degree
Postmaster's or doctoral degree

What is your job title?

RN - direct patient care
RN - do not work directly with patients
Other:

How many years of experience do you have with direct patient care?

1. I know what a DVT and PE are and can tell the difference between the two.

Strongly agree
Agree
Somewhat agree
Neither agree nor disagree
Somewhat disagree
Disagree
Strongly disagree

2. I know the signs and symptoms of a DVT.

Strongly agree
Agree
Somewhat agree
Neither agree nor disagree
Somewhat disagree
Disagree
Strongly disagree

3. I know the signs and symptoms of a PE.

Strongly agree
Agree
Somewhat agree
Neither agree nor disagree
Somewhat disagree
Disagree
Strongly disagree

4. I know who is at risk for a VTE (blood clot).

Strongly agree
Agree
Somewhat agree
Neither agree nor disagree
Somewhat disagree
Disagree
Strongly disagree

5. I am knowledgeable about and comfortable using the SCD machine.

Strongly agree
Agree
Somewhat agree
Neither agree nor disagree
Somewhat disagree
Disagree
Strongly disagree

6. I know the contraindications to using SCDs.

Strongly agree
Agree
Somewhat agree
Neither agree nor disagree
Somewhat disagree
Disagree
Strongly disagree

7. I am knowledgeable about and comfortable using TED hose.

Strongly agree
Agree
Somewhat agree
Neither agree nor disagree
Somewhat disagree
Disagree
Strongly disagree

8. I know the contraindications to using TED hose.

Strongly agree
Agree
Somewhat agree
Neither agree nor disagree
Somewhat disagree
Disagree
Strongly disagree

9. I feel comfortable educating patients on the proper use of SCDs.

Strongly agree
Agree
Somewhat agree
Neither agree nor disagree
Somewhat disagree
Disagree
Strongly disagree

10. I feel comfortable educating patients on the proper use of TED hose.

Strongly agree
Agree
Somewhat agree
Neither agree nor disagree
Somewhat disagree
Disagree
Strongly disagree

Appendix E

Staff Post-Survey

Evaluating nursing staff knowledge and confidence about mechanical VTE prophylaxis - post-survey

Please answer the following questions.

1. I know what a DVT and PE are and can tell the difference between the two.

Strongly agree
Agree
Somewhat agree
Neither agree nor disagree
Somewhat disagree
Disagree
Strongly disagree

2. I know the signs and symptoms of a DVT.

Strongly agree
Agree
Somewhat agree
Neither agree nor disagree
Somewhat disagree
Disagree
Strongly disagree

3. I know the signs and symptoms of a PE.

Strongly agree
Agree
Somewhat agree
Neither agree nor disagree
Somewhat disagree
Disagree
Strongly disagree

4. I know who is at risk for a VTE (blood clot).

Strongly agree
Agree
Somewhat agree
Neither agree nor disagree
Somewhat disagree
Disagree
Strongly disagree

5. I am knowledgeable about and comfortable using the SCD machine.

Strongly agree
Agree
Somewhat agree
Neither agree nor disagree
Somewhat disagree
Disagree
Strongly disagree

6. I know the contraindications to using SCDs.

Strongly agree
Agree
Somewhat agree
Neither agree nor disagree
Somewhat disagree
Disagree
Strongly disagree

7. I am knowledgeable about and comfortable using TED hose.

Strongly agree
Agree
Somewhat agree
Neither agree nor disagree
Somewhat disagree
Disagree
Strongly disagree

8. I know the contraindications to using TED hose.

Strongly agree
Agree
Somewhat agree
Neither agree nor disagree
Somewhat disagree
Disagree
Strongly disagree

9. I feel comfortable educating patients on the proper use of SCDs.

Strongly agree
Agree
Somewhat agree
Neither agree nor disagree
Somewhat disagree
Disagree
Strongly disagree

10. I feel comfortable educating patients on the proper use of TED hose.

Strongly agree
Agree
Somewhat agree
Neither agree nor disagree
Somewhat disagree
Disagree
Strongly disagree

Appendix F

Patient Education Flyer

Blood Clots: What They Are And How to Prevent Them

What is a blood clot?

A blood clot is a clump of blood that has gone from liquid to gel-like. This clot can get stuck in your veins and block blood flow. The clot usually forms in your leg or arm but it can go to other parts of your body like your heart, lungs, or brain. This puts you at higher risk for problems like having a stroke or even dying. When a clot is in your arm or leg, it is called a DVT. If it travels to your lung, it is called a PE.

Who is at risk for blood clots?

Just being in the hospital or having surgery already puts you at higher risk for having a blood clot. Other things that increase your risk of getting a clot include being less active than you normally are, smoking, being overweight, having a blood clot in the past, having a family member who has had clots, or taking certain medicines with estrogen in them.

How can I tell if I have a blood clot?

Signs of a DVT include warm, red or hot skin; pain or tenderness in your arm or leg, or swelling in your arm or leg. Most DVTs form in your calf, thigh, or pelvis. Signs of a PE include shortness of breath or difficulty breathing, a fast or irregular heartbeat, chest pain that worsens when taking a deep breath, or coughing up blood.

How do I keep from getting a blood clot?

Ask your doctor or nurse about measures to prevent blood clots. Your doctor may order you a blood-thinning medication to help prevent clots. Your doctor should also order you a special type of device to go around your legs called TED hose or SCDs. These devices squeeze your legs and help circulate blood around your body, keeping it from clotting. You should wear this device any time you are not walking around, whether you are lying in bed or sitting in a chair. You should also get out of bed and walk around as much as you can in your room and in the hallway, at least three times a day. If you need help, please ask your nurse or nursing assistant to help you. We care about you and want to keep you safe from harm.

8/23/2021

Appendix G

Patient Education Poster

Blood Clots:

What they are and how to prevent them from happening to you

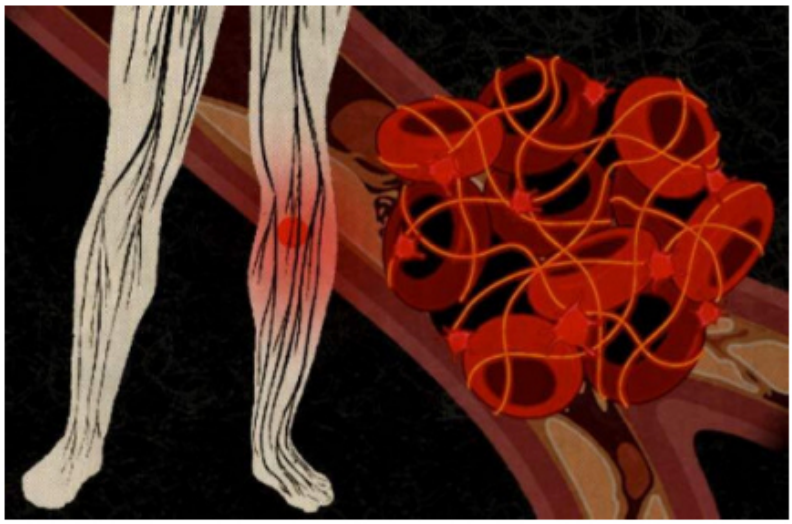


Illustration by Kimberly Carney / Fred Hutch News Service

VTE = DVT + PE

-- VTE stands for venous thromboembolism. This is a blood clot in a vein. The two types of VTE are deep venous thrombosis (DVT) and pulmonary embolism (PE).
-- A DVT is a blood clot that forms in a deep vein. They usually occur in the lower part of the body, such as the calf, thigh, or pelvis.
-- A PE occurs when part or all of a DVT breaks off and travels to the lungs, where it can block blood flow and cause serious harm or death.

Who is at risk?

-- People who have had surgery
-- People in the hospital
-- People who are immobile
-- People who are overweight
-- People who smoke
-- People with a personal or family history of blood clots
-- Pregnant women or those taking estrogen

What are the symptoms?

DVT: -- Warm, red, or hot skin
-- Pain or tenderness in the affected limb
-- Swelling in the affected limb
PE: -- Shortness of breath or difficulty breathing
-- Chest pain that worsens when taking a deep breath
-- Fast or irregular heartbeat
-- Coughing up blood

How Do You Prevent Blood Clots?

Image copyright istockphoto.com

Your doctor will order you a special type of device for you to wear to help prevent blood clots. This device is called a Sequential Compression Device (SCD) or Thrombo-Embolus Deterrent (TED) hose. This device goes around your legs. It increases circulation in your legs and helps prevent blood from pooling, which can increase your risk of a clot. Ask your nurse which type of device you should be wearing, and for how long. Ask the nurse or nursing assistant to help you apply the device if you need help or are not sure how to do it. Make sure you reapply the device after getting up to go to the bathroom, or after walking around. Make sure you get out of bed and walk as much as you can, at least three times a day. If you are lying in bed, you can pump your feet to help increase circulation as well. If your doctor has ordered you a blood thinning medication, make sure you take this as directed to also help prevent clots from forming in other parts of your body.

8/8/2021

Appendix H

VTE Prophylaxis Compliance Spreadsheet

(3rd Surgical East)		Mechanical VTE Prophylaxis Compliance August 23, 2021 through December 31, 2021													
Following treatment plan		Week 1	Week 2		Week 3	Week 4		Week 5	Week 6						
Noncompliant		8/23-8/28	8/29-9/1	PDSA Cycle 1 (8/23-9/1)	9/2-9/8	9/9-9/15	PDSA Cycle 2 (9/2-9/15)	9/16-9/22	9/23-9/29						
Refusing to wear device															
Not documented			Week 7	Week 8		Week 9	Week 10		Week 11	Week 12					
Total Compliant:		PDSA Cycle 3 (9/16-9/29)	9/30-10/6	10/7-10/13	PDSA Cycle 4 (9/30-10/13)	10/14-10/	10/21-10/27	PDSA Cycle 5 (10/14-10/27)	10/28-11/3	11/4-11/10	PDSA Cycle 6 (10/28-11/10)				
Total Noncompliant:															
Total Pts:															
(3rd Surgical West)															
Following treatment plan															
Noncompliant															
Refusing to wear device															
Not documented															
Total Compliant:															
Total Noncompliant:															
Total Pts:															
Grand Total Pts:															
Total Compliant:															
Total Noncompliant:															
Total Not Documented:															
Total Compliant East:															
Total Noncompliant East:															
Total Not Documented East:															
Total Compliant West:															
Total Noncompliant West:															
Total Not Documented West:															
Total Percentage Compliant East:															
Total Percentage Noncompliant East:															
Total Percentage Compliant West:															
Total Percentage Noncompliant West:															

Appendix I

Pre and Post Survey Responses

Figure 1

Nursing Knowledge and Confidence Levels About Mechanical VTE Prophylaxis Pre-Survey and Post-Survey Responses

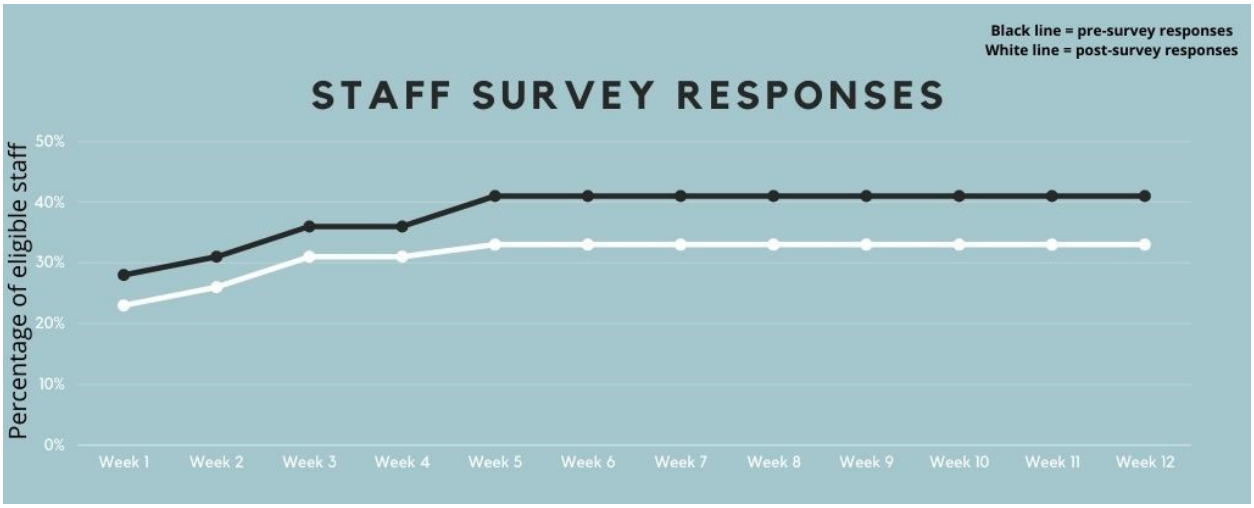
	Staff Pre-Survey Responses			(n=16)
	Strongly agree/ agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree/strongly disagree
1. Difference between DVT/PE	100%	0%	0%	0%	0%
2. Signs/symptoms of a DVT	100%	0%	0%	0%	0%
3. Signs/symptoms of a PE	81.3%	12.5%	6.3%	0%	0%
4. Who is at risk for a VTE	87.6%	0%	6.3%	0%	6.3%
5. Knowledge/comfort using SCDs	100.0%	0%	0.0%	0%	0.0%
6. Contraindications to SCDs	62.5%	12.5%	12.5%	0%	0%
7. Knowledge/comfort using TED hose	81.3%	6.30%	6.3%	6.3%	0%
8. Contraindications to TED hose	50.1%	25.0%	12.5%	6.3%	6.3%
9. Comfortable educating patients about SCDs	81.3%	18.8%	0.0%	0.0%	0.0%
10. Comfortable educating patients about TED hose	62.6%	25.0%	0%	0%	0%
	Staff Post-Survey Responses			(n=13)	
	Strongly agree/ agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree/strongly disagree
1. Difference between DVT/PE	100%	0%	0%	0%	0%
2. Signs/symptoms of a DVT	100%	0%	0%	0%	0%
3. Signs/symptoms of a PE	100%	0%	0%	0%	0%
4. Who is at risk for a VTE	100%	0%	0%	0%	0%
5. Knowledge/comfort using SCDs	100%	0%	0%	0%	0%
6. Contraindications to SCDs	92.3%	7.7%	0%	0%	0%
7. Knowledge/comfort using TED hose	92.3%	7.7%	0%	0%	0%
8. Contraindications to TED hose	84.6%	15.4%	0%	0%	0%
9. Comfortable educating patients about SCDs	100.0%	0.0%	0%	0%	0%
10. Comfortable educating patients about TED hose	84.6%	15.4%	0%	0%	0%

Appendix J

Staff Survey Responses by Week

Figure 2

Staff Survey Responses by Week for Implementation Period

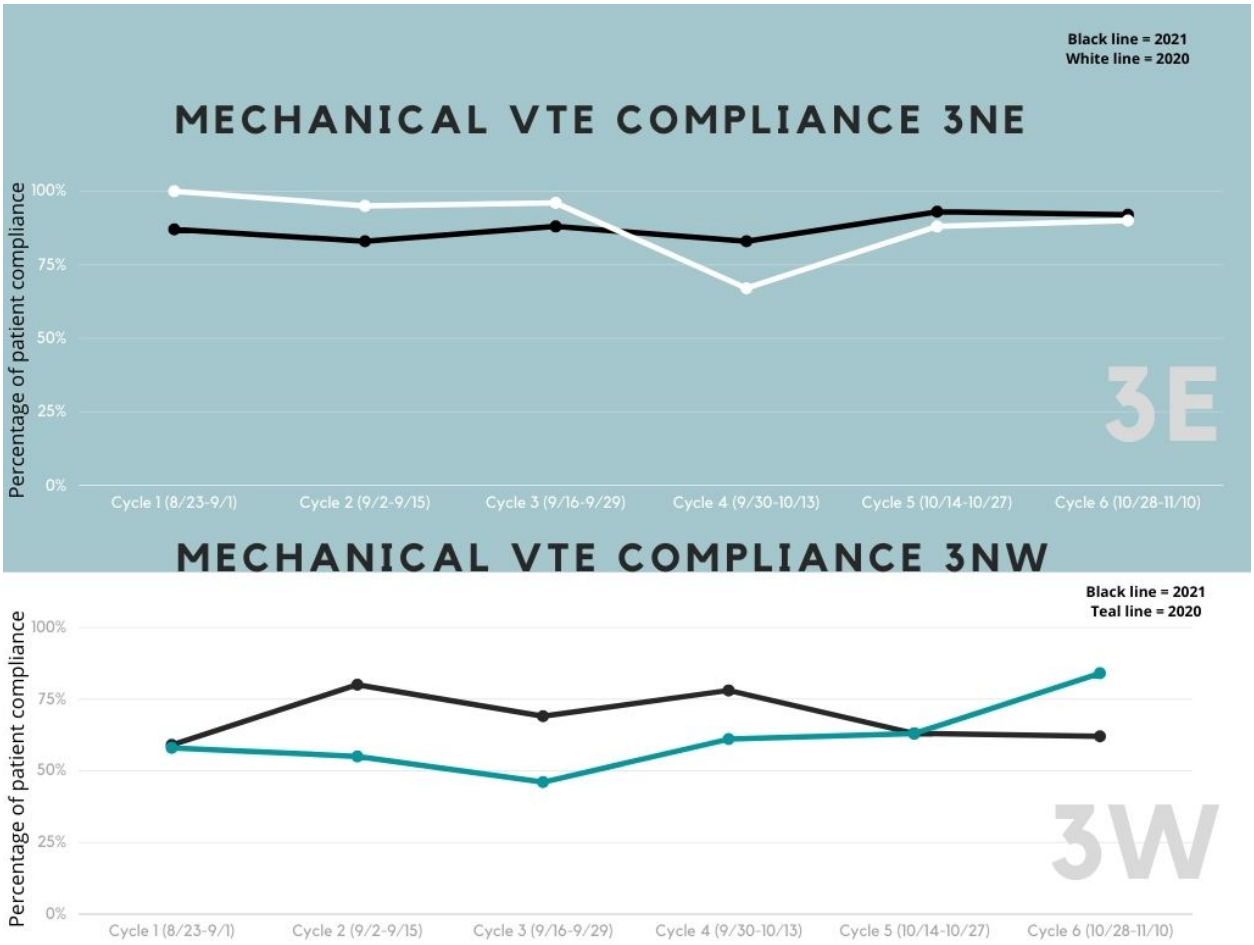


Appendix K

VTE Compliance Rate

Figure 3

Mechanical VTE Compliance Rates for 2021 and 2020



Appendix L

DVT and PE Rates by Quarter for 2021

Indicator	Jan-Mar 2021	Apr-Jun 2021	Jul-Sep 2021	Oct-Dec 2021
DVT, Any Diagnosis - Per 1000 ACA	5.947	3.205	2.242	7.536
DVT, Any Diagnosis - Per 1000 ACA (numerator)	7	4	3	10
DVT, Any Diagnosis - Per 1000 ACA (denominator)	1177	1248	1338	1327
DVT, Any Diagnosis - ALOS	4.571	2.25	1.667	3.9
DVT, Any Diagnosis - ALOS (numerator)	32	9	5	39
DVT, Any Diagnosis - ALOS (denominator)	7	4	3	10
DVT/PE, No Diagnosis - % Readmit with DVT/PE within 30 Days	0.296	0.092	0.432	0.434
DVT/PE, No Diagnosis - % Readmit with DVT/PE within 30 Days (numerator)	3	1	5	5
DVT/PE, No Diagnosis - % Readmit with DVT/PE within 30 Days (denominator)	1015	1090	1157	1152
DVT/PE, Prin Diag - % Prev Admit within 30 Days	14.286	0	0	0
DVT/PE, Prin Diag - % Prev Admit within 30 Days (numerator)	1	0	0	0
DVT/PE, Prin Diag - % Prev Admit within 30 Days (denominator)	7	4	3	10
DVT, Sec Diag - Per 1000 ACA	5.947	4.808	3.737	6.782
DVT, Sec Diag - Per 1000 ACA (numerator)	7	6	5	9
DVT, Sec Diag - Per 1000 ACA (denominator)	1177	1248	1338	1327
DVT, Not Present on Admission - Per 1000 ACA	1.699	0.801	0	0
DVT, Not Present on Admission - Per 1000 ACA (numerator)	2	1	0	0
DVT, Not Present on Admission - Per 1000 ACA (denominator)	1177	1248	1338	1327
DVT, Present on Admission - Per 1000 ACA	9.346	7.212	5.979	14.318
DVT, Present on Admission - Per 1000 ACA (numerator)	11	9	8	19
DVT, Present on Admission - Per 1000 ACA (denominator)	1177	1248	1338	1327
DVT, Present on Admission - Per 1000 ACA (numerator)	11	9	7	27
DVT, Present on Admission - Per 1000 ACA (denominator)	1177	1247	1244	3668
Phlebitis Thrombophlebitis - Per 1000 ACA	0.85	0	0	0.273

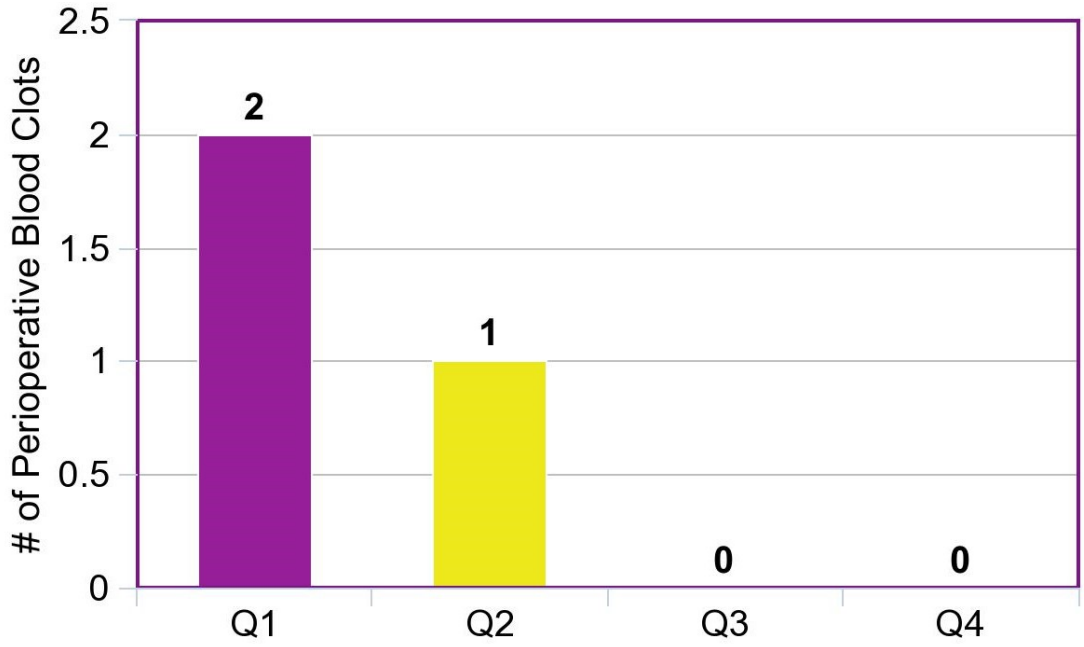
Phlebitis Thrombophlebitis - Per 1000 ACA (numerator)	1	0	0	1
Phlebitis Thrombophlebitis - Per 1000 ACA (denominator)	1177	1247	1244	3668
PSI 12 (v2020) Perioperative Pulmonary Embolism or DVT - Per 1000 Inpatients	0	3.135	0	1.131
PSI 12 (v2020) Perioperative Pulmonary Embolism or DVT - Per 1000 Inpatients (numerator)	0	1	0	1
PSI 12 (v2020) Perioperative Pulmonary Embolism or DVT - Per 1000 Inpatients (denominator)	273	319	292	884

Appendix M

Number of Perioperative Blood Clots

Figure 4

DVTs Not Present on Admission by Quarter for 2021



Appendix N

Project Budget (Organization)

	Cost
75 color flyers	$48.04
300 black and white handouts	$38.43
Printer paper and ink	$5.00
Participatory gift card prize	$100
	Total cost: $191.47

Appendix O

DNP Essentials Mapping Template

	Description	Demonstration of Knowledge
Essential I ***Scientific Underpinning for Practice***	**Competency** – Analyzes and uses information to develop practice **Competency** -Integrates knowledge from humanities and science into context of nursing **Competency** -Translates research to improve practice **Competency** -Integrates research, theory, and practice to develop new approaches toward improved practice and outcomes	• Researched previous studies concerning mechanical VTE prophylaxis • Reviewed book about DNP projects to help formulate appropriate QI project based on organizational needs
Essential II ***Organizational & Systems Leadership for Quality Improvement & Systems Thinking***	**Competency** –Develops and evaluates practice based on science and integrates policy and humanities **Competency** –Assumes and ensures accountability for quality care and patient safety **Competency** -Demonstrates critical and reflective thinking **Competency** -Advocates for improved quality, access, and cost of health care; monitors costs and budgets **Competency** -Develops and implements innovations incorporating principles of change **Competency** - Effectively communicates practice knowledge in writing and orally to improve quality **Competency** - Develops and evaluates strategies to manage ethical dilemmas in patient care and within health care delivery systems	• Formulated DNP paper and DNP poster presentation to showcase findings from QI project • Created cost-benefit analysis and project budget • Presented findings in a poster presentation to CON
Essential III ***Clinical Scholarship & Analytical Methods for Evidence-Based Practice***	**Competency** - Critically analyzes literature to determine best practices **Competency** - Implements evaluation processes to measure process and patient outcomes **Competency** - Designs and implements quality improvement strategies to promote safety, efficiency, and equitable quality care for patients **Competency** - Applies knowledge to develop practice guidelines **Competency** - Uses informatics to identify, analyze, and predict best practice and patient outcomes **Competency** - Collaborate in research and disseminate findings	• Implemented QI project over 4 months to improve compliance with mechanical VTE prophylaxis and decrease perioperative blood clots for patients • Met with faculty and organization members on a regular basis to progress project through until completion • Disseminated project findings to project site, CON, and on ECU ScholarShip portal
Essential IV ***Information Systems – Technology & Patient Care Technology for the Improvement & Transformation of Health Care***	**Competency** - Design/select and utilize software to analyze practice and consumer information systems that can improve the delivery & quality of care **Competency** - Analyze and operationalize patient care technologies **Competency** - Evaluate technology regarding ethics, efficiency and accuracy **Competency** - Evaluates systems of care using health information technologies	• Utilized Excel, organization EHR, Gmail, Google Docs, and other software to design, implement, and share QI project and associated data • Reviewed EHR, advocated for, and had implemented changes to charting system to positively impact patient care

	Description	Demonstration of Knowledge
Essential V ***Health Care Policy of Advocacy in Health Care***	**Competency**- Analyzes health policy from the perspective of patients, nursing and other stakeholders **Competency** – Provides leadership in developing and implementing health policy **Competency** –Influences policymakers, formally and informally, in local and global settings **Competency** – Educates stakeholders regarding policy **Competency** – Advocates for nursing within the policy arena **Competency**- Participates in policy agendas that assist with finance, regulation and health care delivery **Competency** – Advocates for equitable and ethical health care	• Included patients, nursing staff, and healthcare organization perspectives in formulation of QI project • Met with organization leaders to discuss gaps in care and brainstorm solutions • Made recommendations for future practice/research based on project findings
Essential VI ***Interprofessional Collaboration for Improving Patient & Population Health Outcomes***	**Competency**- Uses effective collaboration and communication to develop and implement practice, policy, standards of care, and scholarship **Competency** – Provide leadership to interprofessional care teams **Competency** – Consult intraprofessionally and interprofessionally to develop systems of care in complex settings	• Educated staff members on blood clots and mechanical VTE prophylaxis with PowerPoint presentation • Held discussions with unit director and team leaders to help promote compliance with protocols by team members • Met with team members to discuss thoughts on QI project and help improve model of delivery • Advocated for interprofessional VTE committee to monitor and help prevent blood clots
Essential VII ***Clinical Prevention & Population Health for Improving the Nation's Health***	**Competency**- Integrates epidemiology, biostatistics, and data to facilitate individual and population health care delivery **Competency** – Synthesizes information & cultural competency to develop & use health promotion/disease prevention strategies to address gaps in care **Competency** – Evaluates and implements change strategies of models of health care delivery to improve quality and address diversity	• Developed and implemented QI project that met the goals of the Triple Aim • Developed and utilized educational poster and handout to inform patients about blood clots and how to prevent
Essential VIII ***Advanced Nursing Practice***	**Competency**- Melds diversity & cultural sensitivity to conduct systematic assessment of health parameters in varied settings **Competency** – Design, implement & evaluate nursing interventions to promote quality **Competency** – Develop & maintain patient relationships **Competency** –Demonstrate advanced clinical judgment and systematic thoughts to improve patient outcomes **Competency** – Mentor and support fellow nurses **Competency**- Provide support for individuals and systems experiencing change and transitions	• Designed, implemented, and evaluated QI project to promote best practice and improve patient outcomes regarding perioperative blood clots • Served as a resource to nurses for information about blood clots and mechanical VTE prophylaxis

	Competency –Use systems analysis to evaluate practice efficiency, care delivery, fiscal responsibility, ethical responsibility, and quality outcomes measures	• Developed cost-benefit analysis and project budget

Appendix P

Project Implementation Timeline

23-Aug	26-Aug	1-Sep	6-Sep	15-Sep	22-Sep	29-Sep	6-Oct	13-Oct	20-Oct	27-Oct	3-Nov	10-Nov	17-Nov	24-Nov	1-Dec	6-Dec		
		PDSA Cycle 1		**PDSA Cycle 2**		**PDSA Cycle 3**		**PDSA Cycle 4**		**PDSA Cycle 5**		**PDSA Cycle 6**						
Data Gathering																		
Implementation begins																**Implementation ends**		
Surveys emailed to staff																		
Install posters in rooms																		
Gather Aug.-Dec. 2020 DVT/PE rates																		
Gather Aug.-Dec. 2020 VTE charting info																		
	Deliver flyers for patients																	
		Random visual inspection																
		Meet w/ site champion		Random visual inspection														
				Compile survey data		Random visual inspection												
						Compile survey data		Random visual inspection										
						Resend surveys		**Meet w/ site champion**		Random visual inspection								
						Meet w/ site champion				Compile survey data		Random visual inspection			Gather Aug.-Dec. 2021 DVT/PE rates			
												Meet w/ site champion			Gather Aug.-Dec. 2021 VTE charting info			
															Meet w/ site champion			