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Increasing Compliance with Sequential Compression Devices to Reduce Venous Thromboembolism

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This is to certify that the doctoral study by

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

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Walden University
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Abstract

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by

Randy McClain

MSN, Emory University, 1998

BSN, Brenau University, 1993

Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

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Abstract

Venous Thromboembolism (VTE) is a life-threatening complication. Approximately 900,000 people in the United States are affected by VTE with a mortality of 300,000 cases per year. Although potentially preventable, VTE remains the leading cause of hospital deaths in the U.S. The practice problem addressed in the Doctor of Nursing Practice (DNP) project was evidence of an increased incident of VTE events on a trauma surgical unit. The practice-focused question evaluated the extent to which a nurse-driven protocol for VTE prophylaxis could improve adherence to mechanical prophylaxis with sequential compression devices and compliance with nursing documentation. The purpose for the doctoral project was to retrospectively evaluate the impact of an existing quality improvement (QI) project with a 3 year analysis of the VTE prevention program. The theoretical framework that guided the project was the Institute of Healthcare Improvement's triple aim initiative to maximize healthcare performance and improve healthcare outcomes. The results of the Chi square inferential test show a statistically significant improvement when the preintervention data (N=60) were compared to the postintervention data (N=60) on both the presence of an order (likelihood ratio 4.236, 1 *df*, p=.040). Documentation also improved from preintervention to postintervention (Likelihood ratio 36.69, 1*df*, p<.0001). Thus, the interventions set forth in the QI project demonstrate successful improvement on these 2 processes measures. The impact on social change aligns with the The Triple Aim's goals to optimize healthcare performance and reduce harm. Decreasing the incidence of VTEs support social change by promoting improvement in human and social conditions.

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Dedication

This project is dedicated to my loving mother Mary Mildred Head-McClain who transitioned on February 12, 2005. My mother died from a pulmonary embolus secondary to complications of leukemia. She was a model of compassion, love, service, patience, and kindness. She loved humanity and was committed to serving others in need. She was my inspiration to pursue a career in nursing. She worked as a nursing assistant in a long term care facility where she was highly respected and loved for her gift of compassion and commitment to service. This project is also dedicated to my mom's sisters, Beatrice Head-Golden and Essie Head-DeBerry who passed away on April 1, 2020 and May 1, 2020 respectively from the novel COVID-19 virus during the coronavirus pandemic. My memories of your love, support and encouragement will forever remain in my heart. I love and miss you all dearly! In dedication to my unconditional love and greatest supporter, my wife Michelle who has been my strength and encouragement to persevere when adversity presented itself. To my children, Ashley, Cedric (Bianca), Jeremiah, Xavier, Cameron, Kyle and Kaylin for your constant love and support. To my grandsons Brylan and Asher Dru for always being the anecdotes for any stressors or challenges.

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Section 1: Nature of the Project

Introduction

Deep Vein Thrombosis (DVT) is the leading cause of preventable hospital deaths in the United States. An estimated 600,000 individuals are affected annually and one out of 20 will develop a DVT during their lifetime. DVT is defined as a single or multiple blood clots that develop in the deep veins of the extremities or pelvis with inflammation of the vessel wall (Meguid, 2011). Should the DVT break off and migrate to the lungs, it is known as a pulmonary embolus (PE). Together, a DVT and a PE are known as Venous Thromboembolism (VTE). VTE is a life-threatening complication for trauma patients. It is estimated that annually 900,000 people in the U.S. are affected by VTE and at least 300,000 cases result in deaths each year (Dasta et al., 2015). Eppsteiner, Shin, Johnson, and Van (2010) reported that surgical patients without VTE prophylaxis have an increased risk of DVT or PE by 30%. Prophylaxis for VTE may be achieved with various approaches including pharmacological, mechanical, and early mobilization in postsurgical trauma patients.

Reducing the incidence of VTE will promote a positive social change by guiding nursing practice and applying evidence-based interventions to promote human and social conditions. Prevention of DVT and PE is essential in reducing harm to patients, as VTE is an uncomfortable complication that lengthens the patient's stay in the hospital and can be life-threatening. The aim of the DNP project was to retrospectively evaluate a program put in place to eliminate the incidence of VTE at the site, as part of an existing quality improvement (QI) intiative. Reducing the incidence of this hospital-acquired condition

will improve the patient's hospitalized experience, and contribute to cost effectiveness at the DNP site, as hospital-acquired conditions are considered never events by The Centers for Medicare and Medicaid Services (CMS) and thus, hospitals are not fully reimbursed when they occur (CMS, 2020).

Problem Statement

VTE is the most common cause of potentially preventable deaths in hospitalized patients (Restrepo, Jameson & Carroll, 2015). VTE rates at a metropolitan public academic trauma center in the southeastern part of the United States, are four times higher than the benchmark of other institutions. The rate of VTE was observed to be increased by 30% during an 18 month period of time. A QI initiative was initiated to explore opportunities to decrease the rate of VTEs by identifying gaps in nursing practice with mechanical prophylaxis as an intervention. Noncompliance with mechanical prophylaxis predispose trauma surgical patients to increased risk for VTE and potential mortality if not prevented or treated.

Daily hospital costs for patients with DVT are estimated at an annual cumulative expense from $5 million to $7.5 billion dollars (Dasta et al, 2015). In the U.S., the reported cost ranges from $3000 to $9500 for initial hospitalization for patients with a DVT. The hospital cost is determined to be the primary driver of hospital expense, accounting for 50% of the total cost per patient annually (Dasta et al, 2015). Approximately 900,000 people in the U.S. are affected by VTE and nearly 300,000 will experience death associated with disease. The incidence and mortality rates are projected to increase to nearly 2 million by 2050 if not prevented or are left untreated (Dasta et al.,

2015). VTEs contribute to higher hospital costs, increased length of stays, and overall dissatisfaction in patient/family experience.

The focus of the nursing practice problem is evidenced by the VTE incidence on the pilot unit. The pilot unit had an average of 17 VTE events monthly with a range of 15 to 30 events per discharge month that were not present on admission. A QI intiative at the site was convened to reduce the VTE incidence on the pilot unit. Gaps in practice included lack of availability of sequential compression device (SCD) pumps, poor patient compliance with use of SCDs, and inadequate nursing documentation. Nursing documentation was indiscriminate, and not built into the electronic health record (EHR). The project assessment revealed lack of standardization of VTE prophylaxis and absence of any policy, procedure or nurse-driven protocol.

The outcomes associated with VTE can be life-threatening for patients. The adverse outcomes include potential mortality, prolonged hospital length of stay, increased expense, loss of reimbursement from CMS and overall compromised patient and family experience (Gidwani & Bhattacharya, 2015). VTE is a preventable condition with appropriate assessment screens and timely pharmacological and mechanical prophylaxis. Nursing clinical interventions for mechanical prophylaxis include the use of SCDs. The local relevance to address VTE is driven by the need to improve safety, quality and effective delivery of care to reduce the incidence of VTE and adverse outcomes.

The Agency for Healthcare Quality and Research (AHRQ; 2014b) reports the essential elements of safe VTE prevention measures in the hospital setting can be achieved by process redesign and standardization of practice. The impact of this

retrospective evaluation of an organization's QI initiative can be realized by comparing data and processes prior to the organization's QI project on the pilot unit. This DNP project assessed the impact on length of stay, readmission, morbidity, mortality, documentation, and income generation (AHRQ, 2014b).

Purpose

At the practice setting that is the subject of this DNP project, the gap in nursing practice included a lack of available devices and lack of standardized guidelines outlining the process from the time of physician order to daily adherence of SCD compliance by both nurses and patients. Nurses were faced with compliance issues when the physician prescribed mechanical prophylaxis with implementation of SCDs and no available equipment could be secured from central sterile department. Staff were encouraged to complete incident reports when unable to execute a physician order. In the practice setting, compliance with application and documentation of SCDs was low: a significant gap in nursing practice. Mechanical prophylaxis with use of SCDs is beneficial in decreasing the risk of VTE (Sadaghianloo & Dardik, 2016).

Staff reported additional challenges in compliance with application and documentation of SCDs. Common challenges reported by the frontline team included lack of nonlicensed personnel assistance with application of SCDs to the patient, no specific location to document in the EHR, patient refusal of treatment, physician orders not displayed in nursing treatment orders, environmental services staff disposal of equipment at discharge, and lack of consistency in central sterile's department with acquisition of equipment when needed. Development of a nurse-driven protocol to guide

nursing practice in DVT Prophylaxis could play a vital role in improving nursing documentation, increasing compliance with application of devices and hence, the incidence of DVTs. Reduced incidence of DVTs positively support the mission of Walden University in promoting positive social change by applying strategies and interventions that promote improvement of human and social conditions. The prevention of DVT and PE is critical in a high-risk patient population and prophylactic treatment may significantly reduce the risks in this population. VTE is a contributing cause of morbidity and mortality in the inpatient hospital stay. VTE Prevention remains a common cause of preventable deaths (Arnold et. al, 2017).

Thus, the purpose of the DNP project was to retrospectively evaluate the impact of the DVT prevention program on the current DVT rate, and to make recommendations at the site on next steps. The guiding practice-focused question to facilitate a reduction in the VTE rate was: To what extent did a nurse-driven protocol for DVT prophylaxis improve compliance with nursing documentation of SCDs and patient adherence to mechanical prophylaxis with SCDs?

Nature of the Project

The DNP project consisted of a retrospective program evaluation of an existing QI project with a 3 year analysis of the VTE prevention program. Data collection from a Lean Six Sigma QI project identified barriers and challenges with SCD compliance, nursing documentation, availability of SCD devices and increased incidence of DVTs. This problem is a strategic priority for the organization; the DNP project evaluated the impact of the QI initiative for mechanical VTE prophylaxis with SCDs. In addition, the

CMS along with the Joint Commission (TJC) have identified VTE as a preventable condition associated with a remarkably high medical expense and potentially high mortality rate (CMS, 2020; TJC, 2017). The CMS currently does not reimburse organizations for hospital-acquired injuries including VTE. Thus, the organization invested resources into solving this difficult problem. The goal of the VTE QI team was to eliminate any incidence of VTEs which are deemed as "never events" by CMS. Never events are conditions that are preventable in the hospital setting if best practice guidelines are utilized to eliminate harm occurrence. VTEs represent a patient safety issue that are clearly identifiably preventable and is a serious consequence should a patient develop while hospitalized. Complete elimination of VTE at the site was the goal; the purpose of the DNP project was to evaluate the impact of the interventions on the problem to determine progress towards the goal.

The setting for the DNP project was a 950-bed public academic Level I Trauma center located in Georgia. On a 35-bed surgical trauma inpatient unit, the VTE rate increased by 30% from the first quarter of 2016 through the second quarter of 2017, an 18 month period of time. Organizational QI strategies were implemented and were comprised of two components: (a) increasing availability of SCD devices and (b) implementation of a nurse-driven protocol to guide nursing compliance with SCDs including documentation in the EHR. The QI Project was piloted on a surgical trauma unit and rolled out to eight additional medical-surgical units, four intensive care units, a burn unit and a neurology unit. Nursing staff participated by serving in roles as champions specific to their assigned units.

The sources of evidence for the DNP project included retrospective and concurrent review of audits downloaded from EHR documentation data and monthly incidence of VTE events. The program evaluation included pre- and postresults related to implementation of VTE QI project. The DNP project's purpose was to evaluate a QI initiative that was implemented in response to an increase in patient harm events from VTE. The objective of the VTE program served to close the gap in practice and improve overall care of patients at risk for DVT by increasing availability of SCD pumps, standardizing documentation, estatblishing a protocol to guide practice, and ultimately decreasing the incidence of DVT and PE. By retrospectively reviewing the impact of the QI initiative on the VTE rate, the DNP project had the opportunity to expand the VTE prophylaxis project across the organization in all surgical areas and evaluated the QI initiative for next steps and recommendations.

Significance

The key stakeholders identified in the QI Project consisted of an interdisciplinary team including executive sponsor, QI specialist, QI data specialist, pharmacy, physician champion, frontline nursing staff, nursing educator, and central distribution. The stakeholders were impacted by this QI project in workflow, awareness of goal, and by their contribution to reducing variation in VTE prophylaxis. The stakeholders were critical in mapping the process to identify barriers and challenges from initial screening, order selection, acquisition of sequential compression devices and application to patients. The interprofessional collaboration was essential in improving the delivery of care to patients at significant risks for VTE. The engagement of the senior leadership team and

medical staff were beneficial in expanding the pilot from an identified surgical unit to all units in the patient care division. A structured framework for improvement was used to serve as a plan; it guided communication and helped the team to stay on task.

The contribution of this doctoral project had significant implications in changing practice that aligned with the organizational goals to reduce incidence of VTE and decrease mortality associated with VTEs. The recommendations from the American College of Chest Physicians (ACCP) support that in the presence of contraindications, the use of a low molecular weight heparin, mechanical prophylaxis is a preferred alternative. According to the American Association of Critical Care Nurse (2016), the process of prevention begins with assessment of the patient on admission for predisposing factors to VTE and initiation of VTE prophylaxis which aligns with the overall objectives of this project.

The anticipated benefits of transferability of this project included standardization of clinical interventions to improve compliance with sequential compression device and nursing documentation with mechanical prophylaxis. Interprofessional collaboration, engagement, and input into the development of a nurse-driven protocol were essential in disseminating strategies across the health system. Implementation of a nurse-driven protocol was a proactive approach to improve patient care outcomes by increasing awareness and standardization of VTE prophylaxis.

VTE is a significant health concern that afflicts approximately 900,000 patients in America yearly leading to nearly 300,000 fatalities (Dasta et al., 2015). The prevalence is expected to increase by more than 100% in the next 35 years (Dasta et al., 2015).

Critically ill patients who are administered VTE prophylaxis have a significantly reduced incidence of death and in a recent review of the absence of intervention, the prevalence of VTE in critically ill patients without prophylaxis ranges from 9 % to 32% (Adriance & Murphy, 2013).

Development of a nurse-driven protocol to guide nursing practice in VTE prophylaxis played a vital role in improving nursing documentation, increasing compliance with application of devices and hence, decreasing the incidence of DVTs. Reduced incidence of DVTs positively supports the mission of Walden University in promoting positive social change by applying strategies and interventions that promote improvement of human and social conditions. The prevention of VTE is critical in high-risk patient population and prophylactic treatment may significantly reduce the risks in this population. VTE is a significant cause of morbidity and mortality in the inpatient hospital stay. VTE prevention remains a common cause of preventable deaths (Arnold et. al, 2017).

Summary

VTE is a leading cause of preventable hospital death. Over half of VTE events developed in outpatient settings have directly linked to a recent surgery or hospital stay (Centers for Disease Control and Prevention [CDC], 2018). VTEs are conditions which are preventable with implementation of prevention strategies mechanical prophylaxis. The prevention measures in the DNP project practice site were underutilized due to lack of available equipment and lack of processes to guide nursing practice. The result of low

performance in prevention measures led to negative patient outcomes with an increase in DVT events.

A QI project was implemented to improve outcomes in the care of patients at risk for DVT and PE. Prevention strategies were implemented to include increasing supply of sequential compression devices, enhancements of EHR to improve nursing documentation, and patient education tools to increased patient compliance with SCDs. The purpose of the DNP project was to evaluate an existing QI project progress in reducing the incidence of patients developing VTE on a postsurgical trauma unit. Lack of prevention strategies with low compliance with mechanical prophylaxis increases the risk of patient harm causing VTE.

Section 2: Background and Context

Introduction

The VTE rate increased by 30% on a surgical trauma inpatient unit in a large public academic level 1 trauma center in Georgia. VTE is comprised of DVT and PE and is the leading cause of preventable hospital deaths in the United States (CDC, 2018). Utilization of preventive measures contributes to the reduction of VTE events (Grenall, 2017). The practice setting implemented an improvement project to improve VTE rates and overall delivery of safe, quality patient care. The purpose of the DNP project was to conduct a retrospective program evaluation of the effectiveness of the strategies implemented at the site and determine the impact on the VTE rate. The guiding practice-focused question addressed the lack of compliance with SCDs. The practice question was: To what extent did a nurse-driven protocol for VTE prophylaxis improve compliance with nursing documentation of SCDs and patient adherence to mechanical prophylaxis with SCDs? VTEs are potentially preventable events that have a major contribution to preventing harm, cost saving the profit margin and increase overall patient experience. This section explores research related to the QI VTE prevention program, uses conceptual frameworks and concepts used to scope the project by defining the problem and conducting root cause analysis. In this section, the relevance to nursing practice was explored at a local, system, and global level providing context to the practice setting gap in practice, specifically low compliance in VTE prophylaxis.

Concepts, Models, and Theories

The theoretical framework to guide doctoral project was the Institute for Healthcare Improvement's (IHI) triple aim initiative to maximizing healthcare performance. IHI's philosophy is based on the belief that new program designs must be created to pursue three dimensions known as the "Triple Aim." The Triple Aim represents a framework for improving healthcare delivery outcomes. The goal of IHI's framework aligns three dimensions which include: improving the patient experience of care, improving the health of populations, and reducing the per capita cost of healthcare (IHI, n.d). The Triple Aim's approach entails a systematic method to change which is based on six stages of pilot testing in more than 100 organizations around the world (IHI, n.d.). IHI recommends a process that identifies specific populations, definition of system aims and measures, creation of scope of work that is efficient to drive system results and rapid testing that is adjustable to local needs (IHI, n.d.). In the U.S., healthcare systems are among the most costly in the world and makes up approximately 17% of the total gross domestic product and are projected to reach 19.4 % by 2027 according to the National Healthcare Expenditure Projections, 2018-2027 (Sisko et., al, 2019). The concept of Triple Aim consist of a focus on individuals and families, redesign of primary care services, population health management, cost control and system integration and execution (IHI, n.d.).

AHRQ also recommends the QI team integrate a quality framework which includes a risk assessment tool and appropriate selection for pharmacological and/or mechanical prophylaxis for VTE prophylaxis (AHRQ, 2014b). Barriers to VTE

prophylaxis are also important to note because of the adverse impact in achieving reduction in VTE rates (Suh, et al., 2017). The existing QI infrastructure included the use of Plan-Do-Check-Act and Lean Six Sigma methodologies. AHRQ also suggests knowing what support is available for the project. Ongoing QI initiatives related to VTE reduction by the medical staff and pharmacy, and the active journey of pursuing a Magnet Recognition Program were instrumental in initiating this project. TJC and CMS measures were also important leverage support for the project due to both agencies evaluation of hospitals to meet performance standards on VTE reduction (TJC, 2017).

VTE Prophylaxis

The ACCP addressed issues around VTE prophylaxis. The most recent published guidelines from 2012 recommend pharmacological prophylaxis with anticoagulants. For patients who have a contraindication to a pharmacological modality, chest guidelines recommend mechanical prophylaxis such as graduated compression stockings and SCDs (Grabo et al., 2018). Graduated compression and intermittent pneumatic compression devices work by inflating and deflating to apply intermittent pressure gradient to move blood flow, prevent hemostasis, and activate the fibrinolytic pathway. A systematic review concluded that DVT prophylaxis can significantly reduce the incidence of DVT in trauma patients (Ibrahim et al., 2015).

Risk Assessment

The recommendations for VTE-prophylaxis were based on the risk factors associated with the patient. The critical need and timing of VTE prophylaxis is contingent upon a delicate balance between the patient and procedure risks for bleeding and

thrombosis (Paz Rios et al., 2018). Providers who screen and assess for risk factors and implement prophylaxis orders must also consider a balance between VTE risks and bleeding risks. If risk for bleeding is elevated, pharmacological prophylaxis is typically contraindicated due to potential complications; thus, mechanical prophylaxis should be implemented. The recommendations addressing prophylaxis should include risk factors for VTE, bleeding risks, criteria for pharmacological and mechanical prophylaxis, and appropriate contraindications (Moesker et al., 2018). VTE risk assessments identify factors that may predispose patients to increased risks of developing a DVT or PE. Risk assessments for VTE prophylaxis lead to appropriate preventative measures can significantly reduce the number of hospital-acquired VTE events (Greenall, 2017). VTE prophylaxis is essential to delivery of safe, quality care.

VTE risk assessment and prophylaxis are gold standards for care; however, they are largely underutilized worldwide (Henke & Pannucci, 2010). The risks associated with predisposition to VTE are dependant on many factors both intrinsic and extrinsic in nature. Intrinsic factors include lack of natural anticoagulant proteins, gene abnormalities, and hypercoagulable conditions. Commonly acquired risk factors include age, history of VTE, malignancies, obesity and specific types of medications. Additional risk factors include indwelling catheters, varicose veins and inflammatory bowel disease among others. Extrinsic factors that may also trigger VTE are trauma, surgery, infection and pregnancy (Henke & Pannucci, 2010).

Barriers to VTE Prophylaxis

A retrospective case-control study was conducted to determine if poor compliance with VTE prophylaxis guidelines could lead to increase in VTE events. The study showed that low adherence to the ACCP guidelines for VTE prophylaxis correlated with a concomitant increase in hospital acquired VTEs (Suh, et al., 2017). Barriers to VTE prophylaxis included low risk assessment rates, absence or incorrect contraindications to pharmacological prophylaxis and poor documentation of mechanical prophylaxis.

Lloyd et al. (2012) conducted a study using paper and electronic mail surveys to clinicians about their perceptions on the importance of DVT prophylaxis, barriers to guideline implementation, and interventions to optimize prophylaxis. Despite recommendations and guidelines that support prophylaxis, a gap in translating this knowledge into practice continues to lead to underutilized prophylaxis in patients at risk for DVTs. Results of the study showed top barriers were lack of clear indications and contraindications for prophylaxis and concerns about bleeding with pharmacological prophylaxis (Lloyd et al., 2012).

Lean Six Sigma

The Define-Measure-Analyze-Improve-Control (DMAIC) model of Lean Six Sigma was used to help understand the problems associated with the increased VTE events. The acronym DMAIC represents the five stages of Lean Six methodology. The five stages of DMAIC are similar to the stages used in Deming's Plan-Do-Check-ACT Cycle (Improta, et al., 2017). The five stages of process improvement in the DMAIC approach are: (a) the *Define* phase, where the goals of increasing utilization and

compliance with SCDs were defined and the project charter was made; (b) the *Measure* phase, where the team shadowed a nurse at the bedside on the practice setting unit to map out the current process for acquisition and application of SCDs to patients when ordered, (c) the *Analyze* phase, which used the fishbone diagram (cause and effect) which showed there was a lack of SCD equipment in the hospital leading to lack of compliance; (d) the *Improve* phase, the phase of change, where all possible improvements were made to improve compliance with application of SCDs on patients at risk for DVT; and (e) the *Control* phase, where improvement measures were hardwired and sustained (Henshall, 2017). Six Sigma, compared with other QI methods, highlights the use of statistics in an active way to perform data analysis (Improta et al., 2017) and seeks to reduce process output variation or error in a process outcome over time not to exceed 3.4 defect parts per million (PPM) opportunities or 3.4 defects per million opportunities ("Statistical Six Sigma Definition", n.d).

The control phase of the DMAIC cycle was used in the retrospective program evaluation of the DVT prophylaxis QI initiative at the site. A range of 17 to 30 VTE events per month was unacceptably high to the leadership at the acute care site, indicating a significant opportunity for improvement. Since the organization was seeking to continuously improve and eliminate completely patient harm related to the hospitalization stay, the DNP project sought to discern the progress towards zero VTE events on the pilot unit as a result of the QI initiative at the site.

Relevance to Nursing Practice

Mechanical prophylaxis for VTE with SCDs remain the primary clinical intervention by nurses to prevent DVT and PE (Restrepo et al., 2015). Low compliance rates are very common by both nurses and patients. Nursing noncompliance with SCD therapy has been associated with lack of education about correct use of this therapy and about VTE pathophysiology. Brockheim, McAllen, Baker and Barletta (2009) reported survey research in surgical intensive care where 21% of the 220 nurses in the study reported that they have had received inadequate education on sleeve sizing, application, and duration of therapy. An additional reason for observed noncompliance was lack of available equipment. Nursing practice is pivotal in VTE prevention and research supports strategies to improve practice such as patient education, staff education and competency proficiencies in SCD therapy (Moore & Nichols-Willis, 2013).

Evaluation of an existing QI VTE prevention program provided information about some of the challenges and barriers associated with SCD non-compliance by nursing staff. SCDs were ordered by licensed independent providers and the bedside nurses place the SCDs on the patient, validating correct size and fit (Bartzak, 2018). The physician completes a risk screening on admission and based on risk, prescribes appropriate prophylaxis. It is the role of the nurse to assess, coordinate, plan, implement and evaluate delivery of patient care to promote healing and recovery. As part of nursing's clinical intervention, SCDs are applied to the patient with appropriate education to patient and family. Nurses must have the resource available i.e., the SCD pump to effectively carry out the plan of care specific to patient's orders. The QI VTE prevention

program presented in this project significantly assisted in closing the gap in practice with improving compliance with SCD therapy. Ultimately, the DNP project evaluated the effectiveness of implementing a nurse-driven protocol to provide direction and standardize the nurses workflow to increase compliance with SCDs, nursing documentation and decrease in VTE rates.

Local Background and Context

In the current practice area, hospital acquired VTE rates increased by 30% from calendar year 2016 to 2017. The increase in VTE rates predisposed patients to potential mortality. The harm caused to the patients impacted by the increased VTE rates was the primary determinant of exploring rationale for increase, gaps in current practice assessing organizational methods of VTE prevention. A QI prevention program was implemented which yielded an increase supply of SCD pumps, integration of a nurse-driven protocol, enhancements in EHR, development of patient and staff education tools.

The setting for the doctoral project was a level 1 trauma center. The hospital is an large public academic center with a vision to become the leading public academic health system in the United States. Governance of the practice setting is managed by a board of directors. The organization participates in a tri-annual survey by TJC for regulatory compliance and supports evidence-based measures to reduce VTE events. The Centers of Medicare and Medicaid Services are a very large payer resource requiring reporting of hospital acquired injuries. The annual organizational goals review include eliminating hospital acquired harm event to zero. The project implemented aimed to reduce the incidence of potentially preventable VTE events. Prior to implementation of VTE

prevention program, there were no existing prevention protocols or specific risk assessment tools. Implementation of the VTE prevention program was aimed at reducing VTE rates on a surgical trauma unit.

Role of the DNP Student

My professional context with the doctoral project began in 2017 with an organizational leadership development opportunity to become certified as a green belt in Lean Six Sigma Process Improvement. A team of interdisciplinary members were selected by senior leadership to identify an organizational goal performance measure to improve current practice. The team brainstormed for ideas and the decision was made to select a problem identified in my department. I was designated as the nurse facilitator for the proposed QI project. My department specific experience with increased VTE events was the primary reason for appointment to assigned role as the nurse leader for project. My role as the DNP project leader included analyses of data to determine if the QI project was successful or unsuccessful in its aim to increase compliance with SCDs, nursing documentation and overall decrease in VTE harm events. As the project leader, a secondary analyses of the practice setting's operational and archival data was conducted to summarize and present findings to the senior leadership team.

Role of the Project Team

An interdisciplinary QI team at the site met weekly over a period of time to scope out the project charter and strategies to gather information to have a clear understanding of the problem and barriers leading to increased VTE events. The QI team used a Lean Six Sigma approach to identifying potential root causes for the increase in VTE rates.

The QI team used the DMAIC, and other tools to problem solve. The problem statement, background information, current state and root cause (Define, measure and analyze phases of DMAIC) went well . Future state was identified with an action plan (Improve phase). The focus of the DNP project was a continuation of the work of the QI team at the site, to retrospectively evaluate the impact of the DVT prophylaxis team on the actual VTE rate, the documentation of the protocol and the results of a chart audit on nursing documentation. The DNP project focused on the extent of improvement over an 18 month period of time, and recommendations for next steps on how to address sustainment of improvement initiatives (Control phase).

Summary

Providers, clinicians and patients' roles in DVT prophylaxis are essential in closing the gap in practice. The translation of knowledge to practice is imperative in achieving a reduction in VTE events. Assessment of current practice and future state practice requires integration of evidenced-based research and guidelines to improve practice for patients at risk for VTE. The VTE QI project aimed to increase awareness, knowledge, and compliance with existing VTE guidelines to close the gap in clinical practice. Thus, the next section will focus on the collection and review of the evidence to demonstrate the impact of a nurse-driven protocol on compliance with SCDs and on DVT events.

Section 3: Collection and Analysis of Evidence

Introduction

VTE remains a problematic complication for the acute care setting, especially for surgical patients. VTE is a term used to describe DVT and PE and is the leading cause of postoperative preventable deaths in the United States (Restrepo et al., 2015). DVT and PE occur due to an alteration in physiologic conditions causing VTE or blood clots resulting from immobility, surgery or traumatic injury. Blood clots form because of three reasons: venous stasis, hypercoagulability, and venous trauma; these three reasons are also known as the Virchow Triad. (Greenall, 2017). VTE prevention is recognized by the AHRQ as the highest rank safety practice (Brockheim et al., 2009). There is overwhelming evidence that VTE prevention reduces complications of VTE as well as reduces the overall cost to health care systems. Although, there is overwhelming evidence to support efficacy of VTE prophylaxis, the incidence rates remain alarming. The purpose of this DNP Project is to retrospectively evaluate an existing QI initiative implemented to reduce the incidence of VTE and improve compliance with nursing documentation.

The practice setting in which the QI program was implemented had an increase in VTE rate by 30% when compared to the prior year. The evidence overwhelmingly supported the use of preventive measures to reduce the incidence of VTEs (Grenall, 2017). The practice setting implemented a multidisciplinary QI project to assess gaps in practice and evaluate for improvement opportunities. AHRQ recommended that a successful QI framework should include a risk assessment tool and appropriate selection for pharmacological and/or mechanical prophylaxis for VTE prophylaxis (AHRQ,

2014b). This section will review the practice setting problem of low compliance with SCDs and increased VTE rates, gaps in practice with identification of a practice-focused question. Sources of evidence are included to support and address strategies to improve compliance with SCDs and reduce VTE rates. A systematic review of the literature is presented with relevant findings to the DNP project. Archival and operational data are presented with associated relevance of practice setting problem. The evidence generated for the DNP proposal included participants, procedures and protections. This section also includes analysis and synthesis of system data.

Practice-Focused Question

The guiding practice-focused question that addressed lack of compliance with sequential compression devices was: To what extent did a nurse-driven protocol for VTE prophylaxis improve compliance with nursing documentation of SCDs and patient adherence to mechanical prophylaxis with SCDs? The gap in practice addressed in the doctoral project was available resources of SCD pumps, nursing documentation and patient safety and quality outcomes. VTE is a public health and preventable patient safety problem that can be eliminated or significantly reduced with the implementation of routine prevention strategies (CDC, 2019). Clinical performance is linked to reimbursement; therefore, healthcare providers must ensure safe and quality care is provided. The practice setting site's payor mix includes 30% Medicaid and 27% Medicare funding according the site's published reporting data. Poor outcomes with VTE events has a significant impact on reimbursement as well as costs in providing care of hospital acquired conditions. The CMS requires the practice setting site to report on

clinical quality measures as established in the Medicare Hospital Inpatient Prospective Payment System for Acute Care Hospitals Final Rule. VTE consists of 2 of the total 16 clinical quality measures required for reporting (CDC, 2020). The DNP project is aimed at closing the gap in care of patients at risk for VTE.

Sources of Evidence

The purpose of the DNP project was to evaluate an existing QI initiative VTE prevention program to improve compliance with application of mechanical prophylaxis (specifically SCDs), and nursing documentation of a VTE preventive nurse-driven protocol. The goal of the VTE program aimed to reduce the overall incidence of hospital acquired VTEs. To achieve this goal, the QI team initiated an assessment strategy using lean six sigma methodology to collect and analyze data. Data collection and analysis were required to determine potential contributing factors to noncompliance in use of SCDs and nursing documentation on patients with physician orders for mechanical prophylaxis.

Published Outcomes and Research

The literature review for this project was comprehensive and thorough. Several databases were used including Cochrane Database, EBSCOhost, MEDLINE, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Ovid Journals, PsychINFO, ProQuest Dissertations and Embase. Keywords used to obtain articles for the review were *deep vein thrombosis, mechanical prophylaxis, prevention or prophylaxis, sequential compression devices, documentation compliance, patient compliance* and *nurse*. A total of 75 articles were reviewed with 20 identified for the literature review. Within the

literature review of peer-reviewed scholarly journals, all publication dates from 2014 to 2019 and all languages were included. The search provided an extensive list for best practice guidelines and research on strategies to improve prevention of VTE with pharmacological and mechanical prophylaxis.

Archival and Operational Data

Current processes at the organization result in accurate and ongoing data on the incidence of VTE at the site. The data that is reported to an external vendor and ultimately reported to CMS is abstracted on discharged patients with diagnosis of VTE that was not present on admission which is determined by an inclusion set of ICD-10 codes captured on discharges. The patient's chart is carefully reviewed by the quality department to assure that the discharge coding matches the patient's condition and to strengthen validity of the data. In this DNP project, VTE rates were reviewed over a 3 year period from 2016 to 2020. The QI project was implemented in 2017; the purpose of the DNP project was to retrospectively evaluate the data for a 3-year period of time to evaluate the impact of the QI team on VTE outcomes 18 months before and 18 months after the work of the QI initiative. The relevance of data from a data collection vendor served to establish an assessment of current VTE rates and tracking anticipated improved outcomes postimplementation of the VTE QI project to reduce incidence of VTEs. Data for VTE rates were obtained from the Quality and Patient Safety Department's monthly executive dashboard which includes monthly and annual performance of organizational goals.

Chart audit data were available and accessed for a 6-week period prior to the full implementation of the VTE prophylaxis QI team and for a 6-week period of time after full implementation. These data, in the form of EHR reports, after analyzed, showed significant impact of the VTE prophylaxis team's work on the full implementation of the nurse-driven protocol in real time. Compliance with the nurse-driven protocol included documentation of an initial assessment of all admitted inpatients for VTE risk and evidence of VTE prophylaxis within 24 hours of admission to inpatient status. A review of physician orders on admission was used to verify compliance with risk assessment and prophylaxis orders within the initial 24 hrs. A review of the daily care flowsheet was audited to assess compliance with application of mechanical prophylaxis with SCDs and compliance with patient education of VTE prophylaxis. A data collection tool was developed to obtain baseline information. The data collection tool consisted of 7 questions designed to collect essential information related to VTE prophylaxis. The tool included information on whether or not patient was admitted with a VTE, if a physician order for mechanical prophylaxis was present, documentation of contraindication if prophylaxis not ordered, presence of nursing documentation of SCD use, and SCDs applied within 24 hrs of admission if ordered.

Evidence Generated for the Doctoral Project

Participants. To present the findings of the retrospective secondary data analysis, as DNP project manager, a meeting with the senior leadership team was organized to review findings from this evaluation of the QI project for VTE prevention and my evaluation of it. The participants included the Chief Nursing Officer, Executive Sponsor

of the VTE QI Project, Vice President of Medical-Surgical & Oncology, Vice President of Critical Care, Vice President of Womens & Infant Services, Vice President of Quality & Patient Safety, Chief of Surgery and Chief Medical Officer.

Procedures. The project summary to the senior leadership team consisted of a one-hour brief overview of the QI team's scope of project and analyses of data related to compliance with SCDs, nursing documentation and overall VTE rates. Results of secondary analysis of de-identified data included documentation from EHR; performance indicators and VTE complication rates as presented in archival and operational evidence. In addition to the slides, an executive summary of progress relative to the practice setting's annual goals was included in the presentation. After the presentation, predefined questions (see Appendix A) were used to generate open discussion from the senior leader team, providing feedback on project summary and recommendations to improve or sustain the gains. Next steps and implications for clinical practice and social change were also part of the overview.

Protections. The project followed the criteria outlined in the DNP Walden University Evaluation of an existing QI Program Manual. No ethical issues were identified that compromised completion of the program evaluation. The practice setting and location was generalized to insure that it is not identifiable. All organizational data was de-identified. The DNP project followed the institutions guidelines including Walden's and site IRB policies. IRB approval was granted by the practice site and Walden as evidenced by IRB #06-04-20-0996202. Walden's IRB provided oversight of data analysis and results reporting.

Analysis and Synthesis

Data analysis for VTE rates over the 3-year period reviewed were provided by the Quality Data Specialist to establish a baseline and evaluate impact of the VTE DNP project. Primary data source for VTE rates was the Clinical Database Resource Manual from discharge coding of ICD-10 codes. The rates of VTE events were tracked by using ICD codes VTE-6 (182) and PSI12 (126). The IC D 10 codes were measured using tools from an external data collection vendor. The incidence of VTE was illustrated with run charts to show performance over time. Run charts offer a prompt image of how interventions are working in relation to the baseline and are used in the presentation of data (see Section 4; AHRQ, 2014b).

The DNP project evaluated the impact of increasing supply of SCD pumps and implementation of a nurse-driven protocol to increase compliance of SCD application and nursing documentation. Data collection to determine measures of success included the presence of physician order for SCD; presence of SCD pumps on every patient bed; observation of compression therapy per physician order and documentation of SCD compliance by nursing staff. Data collected post implementation of protocol and increased availability of pumps were compared to data collected prior to improvement initiatives. VTE rates per calendar year were plotted on a run chart over time to show patterns in performance from pre and post-implementation of nurse-driven protocol. In the practice site, VTE events were measured by the actual number of events per month for internal reporting and external reporting is measured as the number of patients with a VTE diagnostic code per 1000 discharges. The data review were shared in the senior

leader presentation to support the work of DNP project and the importance of organizational engagement to eliminate harm events to patients during their hospital stay. At the conclusion of the leadership presentation, the leaders' reaction to the qualitative questionnaire were used to assess effectiveness of the DNP project in aligninig with organizational priorties in safe patient care and overall patient experience. The reactions and recommendations were communicated to the VTE QI team to prioritize committee goals and scope of service.

Summary

Venous Thromboembolism affects up to nearly one million people in the U.S. per year and is the leading cause of preventable hospital deaths (CDC, 2017). The gap in nursing practice associated with increased rates of DVTs and PEs is noncompliance with implementation of VTE Prophylaxis. Nurses play a critical role in the initial risk assessments and implementation of mechanical prophylaxis with application of sequential compression devices. The aim of this project was to improve compliance with SCDs and nursing documentation with a primary objective to improve health outcomes by reducing the rate of VTE in the organization. In the next section, findings and implications were reviewed to support closing the gaps identified in practice and improve goal of reducing the incidence of hospital acquired VTE.

Section 4: Findings and Recommendations

Introduction

Blood clots have devastating effects in the United States. VTE affects as many as 900,000 Americans each year and is responsible for as many as 100,000 deaths each year (CDC, 2020). VTEs are the leading cause of preventable deaths in hospitals. VTE presents a burden on hospital expenditures costing the United States up to $10 billion every year. Treatment for VTE range from $15,000 to $20,000 per person and many times result in hospital readmission. In the hospital setting, SCDs have been proven to be an effective preventive measure for VTEs and recommended for adjunct therapy with anticoagulants (Dhakal, et al, 2019). Prophylaxis for VTE may be achieved in various approaches including pharmacological, mechanical and early mobilization in postsurgical trauma patients.

At the practice setting that is the subject of this DNP project, the gap in nursing practice included lack of available devices and lack of standardized guidelines outlining the process from time of MD order to daily adherence of SCD compliance by both nurses and patients. Low compliance rates with application of SCDs by nurses were common. The guiding practice-focused question that addressed lack of compliance with SCDs was: To what extent did a nurse-driven protocol for VTE prophylaxis improve compliance with nursing documentation of SCDs and patient adherence to mechanical prophylaxis with SCDs? The purpose of the DNP project was to conduct a retrospective analysis and evaluation over a 3-year period from 2016 – 2019 to determine the impact of a nurse-driven protocol on nursing documentation of SCDs, compliance of SCDs, and VTE

events. Data for VTE events were obtained from the Quality and Patient Safety Department's monthly executive dashboard which includes monthly and annual performance of organizational goals.

Chart audit data from the EHR was available and assessed pre- and postimplementation of the VTE prophylaxis QI Project. Descriptive statistics were used to analyze the data collected from the project. Descriptive statistics analyses large amounts of data and summarize it. It showed median and standard deviation for continuous data and percentage and frequency for categorical data. A comparison using mean and standard deviation to display impact of the QI project on outcomes pre- and postproject interventions of increasing availability of SCD pumps and nurse-driven protocol was used.

Findings and Implications

The findings from an analysis and synthesis of the evidence served to evaluate two objectives. The first objective was to determine if a nurse-driven protocol would improve nursing documentation compliance with the application and use of SCDs. The second objective was to evaluate if compliance with SCDs would have an impact on reducing the number of VTE events in the practice setting. The findings also revealed an unanticipated outcome that physicians ordered mechanical prophylaxis greater than 90% of the time pre- and post-VTE QI project implementation. The consistent compliance with MD orders were due to VTE order sets which were developed and implemented as a mandatory field in the EHR for all admission orders. The compliance rates for SCD orders by physicians support that technology had a positive impact on performance. The

overall results shown in Table 1 reflect a retrospective audit of 120 medical records pre- and postintervention. In the preintervention review of 60 medical records, only 37% of nursing documentation demonstrated evidence of SCD use when ordered by physician. A post project implementation audit was also conducted with a review of 60 medical records. Postimplementation findings resulted in 88% of the records audited were compliant with nursing documentation of SCD use when ordered by physician.

Results of the Chi square inferential test show a statistically significant improvement when the preintervention data were compared to the postintervention data on both the presence of an order (likelihood ratio 4.236, 1*df*, *p*=.040). Documentation also improved from preintervention to postintervention (Likelihood ratio 36.69, 1*df*, *p*<.0001). Thus, the interventions of the QI team showcased in the DNP project demonstrate successful improvement on these two process measures.

Table 1

*Chart Audit Results (*N*=120)*

Measure	Pre Intervention (*n*=60)	Post Intervention (*n*=60)	Improvement
PhysicianOrder	98%	100%	2%
SCDDocumentation	37%	88%	51%

Opportunities to further improve documentation included recommendation to enhance the options available for nurses to select related to SCD use. For example, 12% of charts with noncompliance in documentation revealed nurses provided documentation but selected the incorrect option. In the EHR flowsheet, the options are on, off, patient

refused and anticoagulation therapy in use. The option selected was anticoagulation therapy in use which does not provide an accurate response for mechanical prophylaxis. The recommendation was made to remove selection to assist in further improvements in documentation.

In relation to the project's impact on VTE events, a secondary retrospective analysis over a 3-year period was reviewed to assess if mechanical prophylaxis contributed to reduced VTE events. Data were collected 18 months prior to QI project implementation and 18 months after project implementation. Figure 1 and Table 2 show the incidence of VTE-06 which are potentially preventable VTEs acquired during hospitalization was reduced after project implementation.

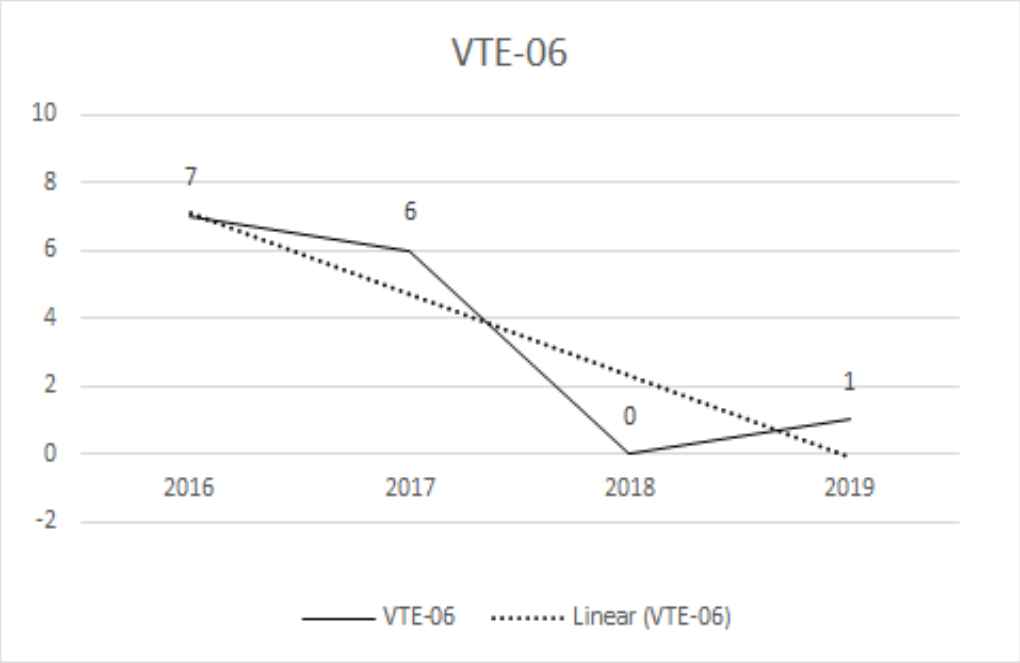

Figure 1. VTE-06 Events per year from 2016 – 2019. Potentially preventable VTE events acquired during hospital stay.

Table 2

VTE-06 Events per Year

Year	# of Events
2016	7
2017	6
2018	0
2019	1

The senior leaders engaged in a discussion in response to questions that were developed to determine the priority of project evaluation as it related to organizational goals. The senior leader team responded to the list of questions in the following manner:

1. How does this evaluation of existing project influence performance on VTE Prevention?

   Discussion: The evaluation of the VTE project was very successful in identifying all measures implemented by the project team to reduce and eliminate the incidence of VTE events. The evaluation also provided essential information on gains made with VTE rates and opportunities to sustain gain and further improve VTE outcomes. Recommendations were accepted and senior leaders agreed to support ongoing efforts by the existing QI Team.

2. How does our current practice reflect quality of care in VTE Prevention as it relates to evidence-based practice presented in summary?

   Discussion: Senior leaders discussed the improvements observed in the number of VTE events since implementation of the existing QI VTE project.

The leaders discussed the significance of implementing a nurse-driven protocol and the impact on nursing documentation and compliance to use of SCDs. The interventions implemented by the VTE team were reflective of evidence-based practice recommendations in the literature and supported by agencies and organizations that promote patient safety initiatives to reduce harm events, reduce cost and improve overall patient experience.

3. How are VTE rates used at practice site?

   Discussion: Senior leaders discussed the process of reporting VTE rates to a third party vendor who assists organizations to transform healthcare with data-driven solutions. The vendor's clinical database serves as a platform to improve quality by benchmarking against peers to promote reducing variation and accelerate improvements. The CMS also require reporting of hospital acquired conditions that are preventable through the application of evidence-based guidelines. The senior leaders use VTE data to determine the impact on reimbursement from CMS based on the Inpatient Prospective Payment System (IPPS).

4. How do VTE rates relate to the organization's annual goals?

   Discussion: Senior leaders shared the annual goals which include reduction in hospital acquired conditions including catheter associated urinary tract infections (CAUTIs), Falls with Injury, VTEs and central line associated bacterial infections (CLABSIs).

5. How does VTE rates impact quality and safe patient care?

Discussion: VTEs cause harm and injury to paitents which adversely impact the quality of care, unnecessary cost to patients, increased length of stay, and overall dissatisfaction with hospital experience.

6. How does VTE impact the organization financially?

   Discussion: VTEs create additional cost to patients with the necessary treatment and additional labs and increase in the number of days in hospital. VTE expenses can be estimated as high as $20,000 per patient.

7. How does VTE impact the patient's overall experience?

   Discussion: In addition to increased costs to patients, senior leaders presented that patient satisfaction is compromised for various reasons. Patients experiencing VTEs may experience pain, swelling and potentially death.

8. What are the barriers to moving forward with recommendations to improve or sustain gains?

   Discussion: The senior leaders shared their readiness to move forward with recommendations to enhance improvements. Senior leaders acknowledged that the recommendations are budget neutral; however, the return on investment will create an opportunity to eliminate VTEs, lower costs of care and improve overall patient experience. One barrier identified was related to the organization's recent experience with an internal flood which 200 SCD pumps were destroyed. Fortunately, the pumps were covered by insurance and will be replaced; however, the timeframe to re-open the closed beds from the flood presented a delay in pump replacement.

Implications

Individuals. The project was designed to evaluate an existing QI initiative to improve nursing documentation for SCD compliance and reduce VTE events. Organizations make decisions based on data. An important step in obtaining senior leadership buy-in, it was imperative to provide information and data regarding organizational performance to fully understand the impact at the patient's overall experience level. Nurses were critical to success in the level of awareness and knowledge base of deficits, which adversely affected compliance with SCDs and documentation. Nurses and techs were educated on the nurse driven protocol and documentation requirements to meet compliance. Patients were educated on the purpose and importance of wearing SCDs to reduce VTEs. Patients were also educated on the signs and symptoms of VTEs during the initial project implementation. The significance to individuals was the increased awareness and knowledge to improve nursing documentation and clinical outcomes. Integration of a nurse-driven protocol allowed the patient and clinicians to utilize evidenced-based practice to guide performance.

Institution and System. As a result of the acquisition of additional SCD pumps, implementation of evidenced-based practice change, development of a nurse-driven protocol, development of mechanical prophylaxis for VTE, enhanced flowsheets for nursing documentation in the EHR, development of patient education material, partnership created with World Thrombosis Day, and implementation of a system-wide VTE Committee for ongoing performance improvement the QI team demonstrated statistically significant improvement in SCD ordering and documentation as well as

decrease in the VTE rate that has been sustained over an 18 month period. The success of the DNP project and project questions was largely supported by the initial buy-in of all stakeholders including senior leadership team. As a result of the improvement, the organization realized cost savings as the VTE rate plummented.

Community. VTE is a public health problem and preventable patient safety problem. The project implications for the community has a significant impact on patients transition from hospital to home. The increased knowledge and awareness of VTE prevention contributes to the overall reduction in VTE events.

Social Change. VTE is a significant health concern that afflicts approximately 900,000 patients in America yearly leading to nearly 300,000 fatalities. Development of a nurse-driven protocol to guide nursing practice in VTE Prophylaxis contributed to improving nursing documentation, increasing compliance with application of devices and hence, the incidence of VTEs. Reduced incidence of VTEs positively support the mission of Walden University in promoting positive social change by applying strategies and interventions that promote improvement of human and social conditions. VTE is a significant cause of morbidity and mortality in the inpatient hospital stay. VTE Prevention remains a common cause of preventable deaths (Arnold et. al, 2017).

During the project evaluation, an unanticipated limitation presented during a major flood at the practice site. As a result of local flood that occurred in the organization in 2020 approximately five inpatient areas were negatively impacted including damage to over 200 SCD pumps. The unanticipated limitation significantly and temporarily reduced the number of available SCD pumps to comply with physician orders.

Recommendations

Based on the project evaluation, implementation of a nurse-driven protocol was significant in improving nursing documentation of SCD compliance and reduction in VTE events. Recommendations to further improve compliance include updating the protocol to include guidance when SCDs are no longer required (i.e. when the patient is ambulatory and participates in mobility programs) and adding VTE education to the patient eduation portal. It was also recommended that Biomed conduct regularly scheduled preventive maintenance and inventory of SCD pumps to maintain functionality of pumps and accountability for inventory. A significant recommendation was made to the Environmental Service staff on cleaning SCD pumps when performing a terminal patient room cleaning. The Environmental Services (EVS) staff turnover rate had an adverse effect on the cleaning process from initial project implementation. It was important to note that recycling of SCD tubing ceased with the onset of the COVID-19 Pandemic. It was highly recommended that the process of recycling tubing resumed with recovery from COVID-19. Related to documentation, a recommendation was made for the VTE Committee to collaborate with nursing informatics to remove nonessential options from the list of selections for SCD compliance such as “anticoagulation” from the flowsheet for SCD use. Anticoagulation specifically refers to pharmacological prophylaxis and can be assessed from the medication administration record or physician active med orders. The final recommendation to support documentation compliance was to integrate components of the nurse-driven protocol in the electronic health record to streamline efficiency by having the required elements of compliance embedded in their

workflow. Currently the staff have to go to a secondary source (online policy manager) to review the protocol and return to electronic health record to complete documentation. The recommendation submitted provided solutions to address the gaps in practice that were not resolved with the current DNP project.

Contribution of the Doctoral Project Team

The doctoral project team were highly engaged in the program evaluation findings and recommendations. The project team consisted of the Chief Nursing Officer, Chief Medical Officer, Vice President of Quality and Patient Safety, Nursing Informatics, Vice President of Medical Surgical Nursing & Oncology, Vice President of Women's Services, Physician Liaison, Director of Pharmacy and the Lean Six Sigma Coach. The responsibility of the team was to provide historical context to the barriers with VTE events. One of the organization's annual goal is to decrease hospital acquired conditions and harm events which include VTEs. The doctoral project team added VTE as a performance measure on the executive dashboard for monthly reporting and ultimately reporting to external performance improvement vendor. The project team played an integral role in the final recommendations by providing insight on the level of influence and buy-in with the DNP project and it's impact on eliminating harm events. The project team also requested that the VTE Committee continue working to further understand the gaps in practice with physician compliance with start and stop times with anticoagulation during the perioperative period. The scope of the DNP project will extend to include VTE Committee's review of patient safety indicator-12 (PSI-12) which is defined as a VTE event associated with a perioperative procedure.

Strengths and Limitations of the Project

Strengths of the DNP Project included an increase awareness, processes, resources, barriers, implications and financial impact of project evaluation to the executive team. The stake-holder buy-in at the executive level paved the way to a seamless process of addressing all recommendations by the project team. Additional strengths included the existence of a cohesive interprofessional & collaborative team providing valuable insight from diverse perspectives, such as identification of processes like comprehensive order sets that increase the opportunity for compliance in risk assessments on all patients admitted to the organization. The financial viability of the organization provided the opportunity of acquisition of SCD pumps for every inpatient hospital bed as part of the existing QI Project initiated in 2017. The project also showed statistical improvement in documentation and SCD compliance.

A limitation of the project was the lack of evaluation at the departmental level. The project evaluation included sample population from all areas within patient care division and were not categorized by departments. Further review is warranted at the departmental level of specificity to provide opportunity for direct feedback and reporting to identified areas. Recommendations for future projects addressing VTE prophylaxis should include evaluation of anticoagulants start and stop times for perioperative procedures. In the practice site, a standardized approach to start and stop times vary from each specialty services. The proposed recommendations to integrate components of the nurse-driven protocol into the electronic health record should be evaluated to determine impact on nursing documentation.

Summary

The DNP project was essential to determine the impact of a nurse-driven protocol to improve nursing documentation and compliance with the use of SCDs. The interventions by the project team were critical to eliminate the incidence of VTEs at the practice site. An analysis of the data supports statistical significance in improvement in nursing documentation compliance, use of SCDs and reduction of VTEs. In summary, the program evaluation of the existing QI project to implement a nurse-driven protocol was effective addressing the Triple Aim's goal to prevent harm, reduce cost and improve patient experience.

Section 5: Dissemination Plan

The findings from the project evaluation were disseminated to the Performance Improvement Oversight Committee which included executive membership: Chief Medical Officer, Chief Nursing Officer, Vice President of Quality and Patient Safety, Nursing Leadership, Executive Director of Education, Director of Pharmacy, Quality Specialists, Vice President of Medical Surgical Nursing & Oncology, Vice President of Women's Services, and Physician Liaison. The dissemination plan included a brief executive summary of findings with recommendations for further interventions to fully close gap in practice. The audience selected are critical to success in continued achievement of organizational goals to reduce and eliminate incidence of VTEs. The appropriate venue for dissemination during the COVID-19 pandemic was a WebEx during which all participants were able to engage with and see the presentation. The organization's VTE Committee was assigned to disseminate the findings and recommendations to the frontline staff champions. The clinical educators were assigned to continue integration nurse-driven protocol and provide SCD education in new employee orientation and ongoing annual competency validation.

A dissemination plan was developed to include external channels to communicate results from the program evaluation. The dissemination plan include the publication of an article in the official journal of the American Nurses Association (ANA), the American Nurse ,which is read by 175,000 nursing professionals and also includes the opportunity to present at the ANA Quality and Innovation Conference. The dissemination plan also

includes a plan to submit a poster presentation to IHI's National Forum on Quality Improvement in Healthcare.

Analysis of Self

The DNP project experience has been challenging but yet very rewarding. I have experienced tremendous growth in many areas of my life. The pursuit of the DNP journey has given me the opportunity to develop my role as a practitioner, scholar and leader. The knowledge and skills gained from this experience has led to fulfillment of the competencies on the DNP Essentials. As a candidate for the DNP degree, I have attained knowledge embedded in science and now possess the ability to influence to translate that knowledge from the evidence into clinical practice to improve patient outcomes. I am prepared as a scholar and leader to address current issues in nursing practice. The confidence gained has been valuable in strengthening my communication skills to become more effective in leading teams and facilitating processes to improve efficiency, reduce variation in practice and implement evidenced-based practices. I was very blessed not to have any challenges in completing the project. The insights gained from the overall experience have been instrumental in review of the literature for best practices and interprofessional collaboration to increase stakeholders engagement and yielding comprehensive interventions to influence individual, system and social influence.

Summary

The DNP Project provided perspective on the evaluation of an existing QI project to increase compliance with nursing documentation and decrease VTE events at the practice site. The evaluation's conclusion showed overall improvement in both nursing

documentation and reduction in VTE events with implementation of a nurse-driven protocol.

References

Adriance, S. & Murphy, C. (2013). Prophylaxis and treatment of venous thromboembolism in the critically ill. *International journal of critical illness and injury science*, *3*(2), 143-151. doi:4103/2229-5151.114274

Agency for Healthcare Research and Quality. (2014b). *Prevention of vte in orthopedic surgery patients: Antithrombotic therapy and prevention of thrombosis, 9th ed: American College of Chest Physicians evidence-based clinical practice guidelines.* Retrieved from http://www.guideline.gov/content.aspx?id=35265

American Association of Critical Care Nurses. (2016). Preventing thromboembolism in adults. Retrieved from http://ccn.aacnjournals.org/content/36/5/e20.full.pdf+htm

Arnold, P. M., Harrop, J. S., Tetreault, L. A., Kwon, B. K., Casha, S., Palmieri, K., ... Norvell, D. C. (2017). Efficacy, safety, and timing of anticoagulant thromboprophylaxis for the prevention of venous thromboembolism in patients with acute spinal cord injury: A systematic review. *Global Spine Journal, 7*, 1385-1505. doi:10.1177/2192568217703665.

Bartzak, P. J. (2018). A renewed respect for sequential compression devices. *Med-Surg Matters*, *27*(3), 1–3. Retrieved from https://www.amsn.org/publications/med-surg-matters.

Brockheim, H., McAllen, K., Baker & Barletta, J. (2009). Mechanical prophylaxis to prevent thromboembolism in surgical patients: a prospective trial evaluating compliance. *Journal of Critical Care, 24*(2), 192-196. doi:10.1016/j.jcrc.2009.001.

Centers for Disease Control and Prevention. (2020). What is Venous Thromboembolism. Retrieved from https://www.cdc.gov/ncbddd/dvt/facts.html

Centers for Disease Control and Prevention. (2019). Learn about Healthcare-Associated Venous Thromboembolism. Retrieved from https://www.cdc.gov//ncbddd/dvt/ha-vte.html

Centers for Disease Control and Prevention. (2018). What is Epidemiology? Retrieved from https://www.cdc.gov/careerpaths/k12teacherroadmap/epidemiology.html

Centers for Disease Control and Prevention. (2017). *Venous thromboembolism (blood clots).* Retrieved from https://www.cdc.gov/ncbddd/dvt/data.html

Dasta, J., Pilon, D., Mody, S., Lopatto, J. Laliberte, F., Germain, G., Bookhart,B., Lefebvre, P., & Nutescu, E. (2015). Daily hospitalization costs in patients with deep vein thrombosis or pulmonary embolism treated with anticoagulant therapy. *Thrombosis Research, 135*, 303-310.

Dhakal, P., Wang, L., Gardiner, J., Shrotriya, S., Sharma, M., & Rayamajhi, S. (2019). Effectiveness of sequential compression devices in prevention of venous thromboembolism in medially ill hospitalized patients: a retrospective cohort study. *Journal of Hematology, 36*, 193-198.

Eppsteiner, R.W., Shin, J.J., Johnson, J., & van Dam, R.M. (2010) Mechanical compression versus subcutaneous heparin therapy in postoperative and posttrauma patients: A systematic review and meta-analysis. *World Journal of Surgery, 34*(1):10-19. doi:10.1007/s00268-009-0284-z

Grabo, D. J., Seery, J. M., Bradley, M., Zakaluzny, S., Kearns, M. J., Fernandez, N., &

Tadlock, M. (2018). Prevention of deep venous thromboembolism. *Military Medicine, 183*(suppl_2), 133–136. doi:10.1093/milmed/usy072

Greenall, R. (2017). Prevention, diagnosis and treatment of venous thromboembolism. *Nursing Older People, 29*(1), 21. doi:10.7748/nop.2017.e872

Henke, P. K., & Pannucci, C. J. (2010). Venous thromboembolism risk factor assessment and prophylaxis. *Phlebology, 25*(5), 219–223. doi:10.1258/phleb.2010.010018

Henshall, A. (2017, November 27). DMAIC: The Complete Guide to Lean Six Sigma in 5 Key Steps. *Process.st*. Retrieved from https://www.process.st/dmaic/

Ibrahim, M., Ahmed, A. K., Mohamed, W.Y., & Abduo, S.E. (2015). Effect of compression devices on preventing deep vein thrombosis among adult trauma patients: a systematic review. *Dimensions of Critical Care Nursing, 34*(5), 290-300. doi:10.1097/DCC.000000000000127.

Improta, G., Balato G., Romano, M., Ponsiglione, A., Raiola, E., Russo, M., Cuccaro, P., Santillo, L., & Cesarelli M. (2017). Improving performances of the knee replacement surgery process by applying DMAIC principles. *Journal Of Evaluation In Clinical Practice, 23*(6), 1401-1407. doi:10.1111/jep.12810.

Institute of Healthcare Improvement. (n.d.). Guide to Measuring the Triple Aim: Population Health, Experience of Care, and Per Capita Cost. Retrieved from Retrieved from www.IHI.org

Lloyd, N., Douketis, J., Cheng, J., Schünemann, H., Cook, D., Thabane, L., Pai, M., Spencer, F., Haynes, R. (2012). Thromboprophylaxis: survey on barriers. *Journal of Hospital Medicine, 7(1),28-34. doi:org/10.1002/jhm.929*

Meguid, C. (2011 , July - August). Best practice for deep vein thrombosis prophylaxis . The Journal for Nurse Practitioners, 7(7), 582-587. doi.org/10.1016/j.nurpra.2011.04.002

Moesker, M. J., Damen, N. L., Volmeijerc, E. E., Dreesens, D., de Loose, E. M., Vinkf, R., Kruiph, M. J. (2018, August). Guidelines' risk assessment recommendations for venous thromboembolism prophylaxis: A comparison and implementability appraisal . Thrombosis Research, 168, 5-13.

Moore, C., & Nichols-Willis, J. (2013). Enhancing patient outcomes with sequential compression device therapy. Retrieved from https://www.myamericannurse.com/enhancing-patient-outcomes-with-sequential-compression-device-therapy

Paz Rios, L. H., Fuentes, H. E., Oramas, D. M., Andrade, X. A., Al-Ogaili, A., Iskander, M., ... Caprini, J. A. (2018). Validation of a patient-completed caprini risk assessment tool for spanish, arabic, and polish speakers. . Clinical And Applied Thrombosis/Hemostasis: Official Journal Of The International Academy Of Clinical And Applied Thrombosis/Hemostasis, 24(3), 502-512. doi.org/10.1177/1076029617746505

Restrepo, P., Jameson, D., & Carroll, D. (2015). An evidence-based quality improvement project to improve deep vein thrombosis prophylaxis with mechanical modalities in the surgical intensive care unit. Journal of Nursing Care Quality, 30 (1), 31-37.

Sadaghianloo, N., & Dardik, A. (2016). The efficacy of intermittent pneumatic compression in the prevention of lower extremity deep venous thrombosis.

Journal of Vascular Surgery: Venous and Lymphatic Disorders, 4(2), 248-256.

Sisko, A. M., Keechan, S. P., Poisal, J. A., Cuckler, G. A., Smith, S. D., Madison, A. J., Hardest, J. C. (2019, February 20). National health expenditure projections, 2018-27: Economic and demographic trends drive spending and enrollment growth. Health Affairs, 38(3). doi.org/10.1377/hthaff.2018.05499

Statistical six sigma definition. (n.d). Retrieved from https://www.isixsigma.com/new-to-six-sigma/statistical-six-sigma-defiinition/

Suh, J., Desai, A., Desai, A., Cruz, J. D., Mariampillai, A., & Hindenburg, A. (2017). Adherence to thromboprophylaxis guidelines in elderly patients with hospital acquired venous thromboembolism: A case control study. *Journal of Thrombosis and Thrombolysis*, 43(2), 172-178. doi.org.ezp.waldenulibrary.org/10.1007/s11239-016-1432-6

The Centers for Medicare and Medicaid Services. (2020). Promoting Interoperability Programs. Retrieved from https://www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/Dopwnloads/CQM_PI_FactSheet.pdf.

The Joint Commission. (2017). Venous thromboembolism. Retrieved from https://www.jointcommission.org/venous_thromboembolism

Appendix A: Open Ended Qualitative Questionnaire

1. How does this evaluation of existing project influence performance on VTE Prevention?
2. How does our current practice reflect quality of care in VTE Prevention as it relates to evidence-based practice presented in summary?
3. How is VTE rates used at practice site?
4. How does VTE rates relate to the organization's annual goals?
5. How does VTE rates impact quality and safe patient care?
6. How does VTE impact the organization financially?
7. How does VTE impact the patient's overall experience?
8. What are the barriers to moving forward with recommendations to improve or sustain gains?