Spring 4-18-2023

Implementing Nurse-Specialist-Delivered-Education to Improve Application Compliance of Ordered Intermittent Pneumatic Compression

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Implementing Nurse-Specialist-Delivered-Education to Improve Application Compliance of Ordered Intermittent Pneumatic Compression

A Paper Submitted in Partial Fulfillment of the Requirements

For NURS 5382: Capstone

In the School of Nursing

The University of Texas at Tyler

by

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April 18, 2023

Contents

Acknowledgements

I would like to say a special thanks to all of my professors who have helped guide me through the evidence-based practice process. This includes Dr. Laura Hays, Dr. Pamela Lake, Dr. Kara Jones, Dr. Patricia Wilson, and of course Dr. Colleen Marzilli. You all have helped shape and mold me into the nurse that I am today. Not enough thanks can be expressed for Mr. Michael Skinner and the assistance he has provided me through the research process. I would like to thank my EBP team for being so willing and able to help me through the project's implementation. I would like to thank my beautiful wife, Elisa, for supporting me and ensuring that I never went to bed on an empty stomach, even when I was working through the wee hours of the night. Lastly, I would like to thank my Lord and a Christian faith that has kept me steadfast when faced against many of the trials and tribulations experienced during graduate school.

Executive Summary

Healthcare-associated (HA) venous thromboembolism (VTE) is the formation of a potentially deadly blood clot that can occur in patients as a result of hospitalization, surgery, procedures, or some other healthcare treatment (Centers for Disease Control and Prevention, 2022a). HA-VTE is the number one most preventable cause of death in hospitals, and it is the fifth most common reason for hospital readmission. Furthermore, the annual, national estimate of VTE occurrence is 900,000, 50% of which occur within the healthcare setting. In terms of national expenses, these events cost the United States' healthcare system approximately $7 to $10 billion annually (Centers for Disease Control and Prevention, 2022b; Link, 2018). Fortunately, the rate of HA-VTE can be reduced by 70% when correct VTE prophylaxis is applied (Centers for Disease Control and Prevention, 2022a). However, less than 50% of hospitalized patients actually receive appropriate VTE prophylaxis.

In terms of mechanical VTE prophylaxis (i.e., ambulation, compression stockings, foot pumps, and sequential compression devices), the use of intermittent pneumatic compression devices (IPCD) (i.e., sequential compression devices or SCDs) have been proven to reduce the risk of HA-VTE (Fan et al., 2020; Haykal et al., 2020). In fact, Fan et al. (2020) performed a systematic review and meta-analysis of eight randomized control trials assessing the effectiveness of SCDs plus pharmacologic VTE prophylaxis as opposed to pharmacologic VTE prophylaxis alone in surgical and medicine patients. Although no associated benefit could be determined with medicine patients, the outcome in surgical patients demonstrated a 43% reduction of DVT and a 54% reduction of PE.

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1. Rational

Despite the knowledge that SCDs can reduce the instance of HA-VTE, the use of SCDs is underutilized in practice (Kakkos et al., 2016). In fact, the organization at which this author is associated experienced 48 VTE events between the months of January and June of 2020 (Mainer, 2020). Over 50% of these events demonstrate a lack of appropriate physical or mechanical VTE prophylaxis application in spite of existing provider orders. Furthermore, this author works on a 36-bed, progressive cardiac floor that primarily cares for cardiothoracic surgical (CTS) and advance heart failure (AHF) patients. Baseline audits of 219 patients over a six-week period between the months of January and February in 2023 measured patient and nurse SCD application adherence for patients with existing SCD orders. The results demonstrate an average compliance rate of 3.72%.

1.1 Goals and Objectives

Before one can implement evidence-based research findings into practice, one must carefully assess the setting at which the evidence is to be implemented (Slayter, 2020). Once an appropriate and careful assessment of the setting has been completed, it is important to structure goals and measurable objectives with clients (or patients) and a collaborative based team. Goals depict the overarching wish; whereas, objectives are measurable elements that contribute to the larger goal.

Based on careful assessment of this organization’s needs, it is obvious that steps to reduce the instance of HA-VTE is needed. Therefore, the ultimate goal of this project is to improve patient outcomes by reducing the rate of annual HA-VTE. However, the assessment

also indicates that the application compliance of mechanical VTE prophylaxis (specifically SCDs) by patients and nurses for patients with existing SCD orders require immediate intervention. As a result, the primary objective of this project for the unit of interest is to achieve an SCD application compliance rate of 40% for patients with ordered SCDs by the end of a three-month period.

In order to achieve this objective, a PICOT question has been developed in an attempt to discover if educational interventions exist to improve this dilemma. The PICOT question is stated as follows: For bedside nurses who administer VTE prophylaxis (P), does nurse-specialist-delivered education about IPC effectiveness (I) compared to no additional education (C) improve ordered IPC application compliance (O) during a 3-month period (T)? Hopefully, improvement to the objective of this project will contribute to the ultimate goal of improving patient outcomes by reducing the instance of annual HA-VTE events

2. Literature Synthesis

There are several studies that demonstrate how nurse-specialist-delivered education directed toward patients and bedside nurses can improve the overall rate of SCD application compliance for patients with ordered SCDs. The results of this author's research based on the intervention PICOT question include a total of ten studies. These studies include one systematic review by Kahn et al. (2018); one randomized controlled trial by Pai et al. (2013); four quasi-experimental studies by Gibbs et al. (2009, 2013), Lockwood et al. (2018), Mokadem & EL-Sayed (2019), and Nahar et al. (2018); one prospective and quasi-experimental study by Gardiner & Kelly (2013); and three quality improvement studies by Beachler et al. (2017), Bohnenkamp et al. (2014a, 2014b, 2020), and Hamid et al. (2020).

All studies address IPC application compliance either directly or indirectly. All studies include interprofessional, multi-component, education interventions. All studies include a mix of education strategies (e.g., lecture, short education sessions, continuous education, case study, pamphlet, booklet, poster, information sheet, picture pathway, pocket cards, tent cards, education board, flyers, in-services, or video) and auditing strategies (e.g., electronic or paper heath record charting or direct observational) to improve and assess study outcomes. All studies include a target group of nurses and/or patients for their education interventions. Lastly, only two out of the ten studies appraised include education interventions that are not nurse-led or nurse involved (Kahn et al., 2018; Pai et al., 2013).

Indirect application compliance of intermittent pneumatic compression (IPC) (i.e., SCDs) is reserved for studies that focus on improving VTE prevention strategy compliance as a whole (which includes IPC) based on each study's specific VTE prevention guidelines (Gibbs et al., 2009, 2013; Kahn et al., 2018; Lockwood et al., 2018; Mokadem & ELSayed, 2019; Pai et al., 2013). The rest of the studies measure IPC application compliance as it relates to the proposed intervention directly (Beachler et al., 2017; Bohnenkamp et al., 2014a, 2014b, 2020; Gardiner & Kelly, 2013; Hamid et al., 2020; Nahar et al., 2018).

In terms of overall improved compliance, nine studies demonstrate an increase in VTE prophylactic or IPCD compliance as a result of the intervention (Beachler et al., 2017; Bohnenkamp et al., 2014a, 2014b, 2020; Gardiner & Kelly, 2013; Gibbs et al., 2009, 2013; Hamid et al., 2020; Kahn et al., 2018; Lockwood et al., 2018; Mokadem & EL-Sayed, 2019; Nahar et al., 2018). Additionally, six of these studies demonstrate such results with statistical significance (Beachler et al., 2017; Gardiner & Kelly, 2013; Gibbs et al., 2009, 2013; Lockwood et al., 2018; Mokadem & EL-Sayed, 2019; Nahar et al., 2018).

When considering the presentation of education interventions, eight studies demonstrate nurses as the primary instructors for VTE prevention education, or they include nurses in the education disseminating process (Beachler et al., 2017; Bohnenkamp et al., 2014a, 2014b, 2020; Gardiner & Kelly, 2013; Gibbs et al., 2009, 2013; Hamid et al., 2020; Lockwood et al., 2018; Mokadem & EL-Sayed, 2019; Nahar et al., 2018). When assessing post-intervention audit times, five studies examine VTE prevention or IPC compliance at six weeks or greater with positive results (Bohnenkamp et al., 2014a, 2014b, 2020; Gardiner & Kelly, 2013; Gibbs et al., 2009, 2013; Lockwood et al., 2018; Mokadem & EL-Sayed, 2019).

Overall, evidence obtained from the synthesis of all ten studies indicate the following. Implementation of an educational intervention through use of a multi-disciplinary, nurse-led (or nurse involved) team is the best approach for improving SCD application compliance amongst nurses and patients for patients with ordered SCDs. Additionally, the evidence indicates that a mixture of education strategies (e.g., lecture, information sheets, reminders, etc.) directed toward nurses, patients, or both can also improve SCD application compliance that is verified with pre- and post-intervention, direct observational audits (see Appendix A for synthesis of the evidence).

3. Stakeholders

Stakeholders include patients and patient's family and friends, for patients are the ones who will be expected to wear their ordered SCDs in order to reduce the risk of HA-VTE. Family members and friends will be interested in learning about VTE and SCDs to ensure their loved ones are receiving the best preventative care. Patients may also provide important feedback regarding the use of VTE education tools. Physicians, nurse practitioners, and physician's assistants, specifically those on the CTS and AHF teams, assess patients' VTE risk and place orders for SCDs when necessary. Additionally, their consultations influence decisions made

about developing and presenting VTE education and overcoming existing barriers. Bedside nurses have a stake in this project, for they will receive the education intervention and will be expected to improve the rate at which ordered SCDs are applied to their patients. Bedside nurses will also provide important feedback when evaluating the project's education intervention and VTE patient education tool.

Nursing leaders (i.e., manager, supervisor, director), the unit nurse educator, and the EBP nurse liaison are stakeholders. The EBP team, including this author as team leader, the unit director, unit manager, unit-based practice council (UPC) leader, CTS nurse practitioner, and unit nurse educator are essential for planning every aspect of the project's implementation. Everyone on this team will have a role in contributing to the Plan-Do-Study-Act model for EBP implementation. Additionally, since SCD application compliance is now a new metric on the unit, the results of this project will reflect in the metric for other administrators and nursing leaders to review. The EBP nurse liaison is a stakeholder, for she is a valuable resource who must also review the ethics, weighing the risk versus benefit of project implementation.

Central service is affected, for this department cleans and supplies the unit's SCD machines for distribution to patients with SCD orders. Marketing must evaluate any patient education tools before they can be circulated into practice. Lastly, the hospital and organization for which this hospital is associated is a stakeholder, for the results of this project could influence the practice of other units in this hospital and others across the organization. Furthermore, if this project helps in reducing future cases of HA-VTE, the organization could stand to save hundreds of thousands of dollars in HA costs. Thus, every stakeholder mentioned will not only be affected by the results of this project, but they are also instrumental towards accomplishing this project's primary objective and overarching goal.

4. Implementation Plan

This section includes a detailed narrative of the EBP project implemented on the EBP team leader's unit of practice. This project utilizes the PDSA model for project implementation; therefore, events are sectioned based on the cycle and stage with which they occurred. Furthermore, each decision, event, intervention, etc. that took place is denoted with a specific date and associated week of project implementation to indicate the length of time required to accomplish each step. Lastly, a flowchart depicting a graphical representation of the project can be observed at the end of this section.

4.1 Cycle 1, Stage 1: Plan

Approval for research of this project occurs September, 2020. At this time, the number of VTE events experienced by the healthcare organization between the months of January and June of 2020 are discussed with the unit manager and unit supervisor. Additionally, poor SCD application compliance rates are noted in relation to many of the VTE events experienced. Furthermore, observations made about the unit of interest for this project (i.e., progressive cardiac care unit) indicate the need to improve application compliance of ordered SCDs. As a result, the aforementioned intervention PICOT question is developed on September 18, 2020, in order to begin research, following the appropriate EBP methods.

Based on evidence gathered from the literature, appraisal of the evidence, identification of patient preference, incorporation of clinical expertise, and synthesis of the evidence, VTE intervention tools are developed. These intervention tools include the SCD application compliance audit form, VTE nurse education PowerPoint presentation, and VTE patient education tool. Development of the pre-intervention, SCD application compliance audit form is

completed by the beginning of January, 2023. Furthermore, development of the initial education tools occurs between December, 2022, and February, 2023.

The overall plan for implementation utilizes the Plan-Do-Study-Act (PDSA) model of research implementation. Official approval for project implementation is received by the unit director on January 14, 2023. As a part of cycle 1, stage 1 of the PDSA model, an EBP team is recruited, and a baseline audit measuring current SCD application compliance is conducted. The EBP team includes the team leader, the unit director, unit manager, UPC leader, CTS nurse practitioner, and unit nurse educator. The first email discussion between all members of the team is not held until after the education tools are complete and baseline audits are nearly complete. Pre-intervention, baseline audits begin on January 12, 2023, and end February 21, 2023. These audits are conducted one to two times a week for six weeks by the EBP team leader and UPC leader. Thus, cycle 1, stage 1 audits occur between week 1 and week 6 of project implementation.

On February 14, 2023, an email discussion between the EBP team is initiated. This discussion covers the following topics: overall objective, education tool approval and critiques, best way to initiate the VTE nurse education PowerPoint presentations, and best way to initiate the VTE patient education tool. In terms of the overall objective for this project, it is decided that an SCD application compliance rate of 40% for patients with ordered SCDs by the end of a three-month period will demonstrate project success. In terms of the education tools that have been developed, everyone from the EBP team expressed their unanimous approval after review of the tools. In order to answer when and how the project's interventions should be implemented, it is determined a face-to-face meeting between the EBP team leader, unit educator, and EBP

nurse liaison should occur. This meeting takes place on February 19, 2023, initiating week 7 of project implementation.

Based on the results of this meeting, an official plan to initiate the nurse VTE PowerPoint presentation is solidified. However, in regards to the VTE patient education tool, it is determined that approval from the hospital's marketing team is required before it can be distributed to patients. Consequently, the approval process for the VTE patient education tool takes place over the course of several weeks. Nevertheless, specifics regarding the meeting's details are emailed to the rest of the EBP team, and initiation of the nurse VTE PowerPoint presentation ensues.

4.2 Cycle 1, Stage 2: Do

Education utilizing both the VTE nurse education PowerPoint presentation and the VTE patient education tool is supposed to occur at the same time. However, marketing's refusal of the initial VTE patient education tool prevents this from occurring. As a result, implementation of the VTE nurse education PowerPoint presentation intervention has to be implemented first. The VTE nurse education PowerPoint presentation intervention is first initiated on February 22, 2023, week 7 of project implementation. Thus, presentation of the VTE nurse PowerPoint marks the beginning of cycle 1, stage 2 of the PDSA model.

The VTE nurse PowerPoint presentation is presented twice a week, once or twice a day on Sundays and Wednesdays for three weeks during mid-day shift huddle, marking weeks 7 through 9 of project implementation. The goal is to reach at least 90% of the nurses with this education intervention. The EBP team leader presents the PowerPoint during day shift, and the UPC leader and unit manager present during night shift. The presentation includes 11 slides, and it takes seven to fifteen minutes to review (depending on the number of questions asked). Presentation information covers the following topics: HA-VTE definition, consequences,

supporting research of SCD effectiveness, appropriate SCD use, how to educate patients, and education prompts for nurses to follow when educating their patients with SCD orders (see Appendix B for full presentation).

Mid-day shift huddle occurs in the staff huddle room. During cycle 1, stage 1, 20 copies of the presentation were printed front and back, two slides per page for a total of 6 pages per PowerPoint print out. Before each presentation begins in cycle 1, stage 2, copies of the PowerPoint are handed to each of the nurses for ease of review and understanding. After each presentation is complete, attending nurses are asked to identify barriers that prevent them from applying SCDs to their patients with active orders. Furthermore, they are asked for suggestions on how to overcome these barriers. Nurses' responses are written down and filed to be reviewed at a later stage. The printed PowerPoints are then collected to be re-used during the next presentation.

Ideally, the presentation would have included a review of the admission packet, VTE patient education tool. However, this tool was still under development between the EBP team leader, unit educator, and marketing at this time. Nevertheless, when the topic of how to educate the patient is reached during the VTE nurse education PowerPoint presentation, nurses are reminded of the VTE patient education tool that is still under development. Thus, attending bedside nurses are still highly encouraged to utilize this tool when educating their patients about VTE and VTE prophylaxis once it is finally approved for use. Once 90% of the nursing staff has heard the VTE nurse education PowerPoint presentation, SCD application compliance audits are resumed. Thus, the final round of presentations is completed March 8, 2023, and audits are resumed on March 9, 2023, occurring week 9 of project implementation. Cycle 1, stage 2, SCD

application compliance audits continue until March 28, 2023, ending week 12 of project implementation.

4.3 Cycle 1, Stage 3: Study

After the first cycle 1, stage 2 audit, cycle 1, stage 3 ensues shortly after that same day. Thus, cycle 1, stage 3 begins during week 9 of project implementation. During this stage, the initial audit results from cycle 1, stage 2 are calculated and compared to those collected during cycle 1, stage 1. These comparisons are evaluated and measured for evidence of improvement. Granted, audits from cycle 1, stage 2 will continue through week 11 and will therefore be reevaluated at that time. However, the barriers to SCD application compliance collected by nurses during cycle 1, stage 2 and their suggestions for overcoming these barriers need to be addressed sooner rather than later. As a result, the barriers and suggestions listed by nurses are organized into seven different categories, which are organized in order of greatest number barriers and suggestions to least number barriers and suggestions.

An email is sent the evening of March 9, 2023, to the EBP team that includes current pre- and post-cycle 1 intervention audit results and a categorized list of stated nursing barriers to SCD application compliance and their suggestions for improvement. A meeting between the EBP team leader, unit director, unit manager, and unit educator occurs the following morning for further evaluation and discussion of the results up-to-date. Further review of data collection, specific results, and evaluation will be discussed in greater detail in the data collection methods, results, and discussion sections of this study.

4.4 Cycle 1, Stage 4: Act

Cycle 1, stage 4 is initiated March 10, 2023, week 9 of project implementation, when a scheduled meeting between the EBP team leader, unit director, unit manager, and unit educator

occurs. During this meeting, comparative SCD audit results calculated in stage 3 are discussed and evaluated. Furthermore, existing barriers against SCD application compliance and suggested solutions shared by nursing staff are also reviewed, discussed, and evaluated. Based on discussion held during this meeting, it is decided that the cycle 1, stage 1 plan requires revision.

4.5 Cycle 2, Stage 1: Plan

Upon determining that revision to the cycle 1, stage 1 plan is needed, cycle 2, stage 1 is initiated with discussion of a new plan. Thus, cycle 2, stage 1 begins week 9 of project implementation during the March 10, 2023, meeting. Several points of revision are discussed. First, it is determined that not enough SCD units are stocked on the floor; thus, the central service manager is emailed by the unit director for more floor stock units. Second, it is decided that nurse aids should have more responsibility in SCD application. Thus, the unit manager agrees to discuss this topic to the nurse aids during their next meeting. Third, in an effort to place more emphasis on the importance of adhering to SCD application compliance, the unit manager suggests making this a new metric for the unit. Fourth, although VTE nurse education PowerPoint presentations have been completed by this point, the EBP team does not want this information to be forgotten. As a result, the unit educator agrees to make printed copies of the presentation to be distributed into piles at each of the nurses' stations. The PowerPoints will therefore be available for nurses to review and keep for themselves if needed.

Fifth, an acceptable VTE patient education tool has been agreed upon between marketing and the EBP team. Marketing would not accept any of the edits made to the VTE patient education tool. It was thus stated that any patient education had to come from pre-approved sources that already existed within the hospital's charting system. Current education material regarding information about this topic in the charting system comes from Elsevier. The

information included in this education tool is good, but it is still too much information for the average patient to digest in one sitting. In total, it is four pages in length with no graphics to illustrate deep vein thrombosis or pulmonary embolism. As a result, relevant information that is important for the patient to know during their hospitalization is highlighted. This also helps nurses stay on track when educating their patients using this tool. The VTE patient education tool takes 5 to 10 minutes to review with patient, depending on how many questions the patient has. Additionally, they are only printed in English; therefore, they require a certified translator if used to educate in any other language.

Upon discussing the education tool's distribution, it is decided during the March 10, 2023, meeting that instead of including the education tool in admission packets, a laminated copy of the tool will be made and distributed to each room on the unit for permeant, easy access. As a result, the unit secretary agrees to make laminated copies of the VTE patient education tool. Similar to the VTE nurse education PowerPoints, it is decided that copies of the VTE patient education tool should also be printed and distributed into piles at each of the nurses' stations for nurses to familiarize themselves and keep if needed. Thus, the unit educator agrees to also make printed copies of the patient education tool for dispersal until the laminated copies are distributed to each room (see Appendix B for full VTE patient education tool). Consequently, Cycle 2, stage 1 takes some time to prepare, for laminated copies of the VTE patient education tool are not distributed to each room until March 29, 2023, during week 12 of project implementation.

4.6 Cycle 2, Stage 2: Do

During various mid-day shift huddles that occur between weeks 10 and 11 of project implementation, the unit manager announces SCD application compliance as the new metric included on the metric board located in the huddle room. The metric's initial objective matches

that of the project for a sustained compliance rate of 40% by the end of a three-month period. This metric has been added to provide transparency and accountability for everyone responsible with ensuring SCD application compliance is met.

Furthermore, copies of the PowerPoint and patient education tool did not become available for distribution at the nursing stations until March 19, 2023, initiating week 11 of project implementation. Nurses are therefore encouraged during shift and mid-day huddles to familiarize themselves with the new VTE patient education tool before the laminated copies are distributed to each room for patient use. Cycle 2, stage 2 is not considered officially active until March 29, 2023, when the laminated copies are active for patient use, occurring during week 12 of project implementation. Similar to the education copies, nurses are notified of the laminated VTE patient education tools located in each room during shift and mid-day huddles. SCD application compliance audits for the cycle 2, stage 2 intervention begin April 3, 2023, and, due to time restraints, end April 13, 2023, occurring between weeks 13 and 14 of project implementation.

4.7 Cycle 2, Stage 3: Study

Cycle 2, stage 3 is initiated near the end of week 14 of project implementation. Audit results are calculated and evaluated. Additionally, evaluation forms are sent to nurses who attended the VTE nurse education PowerPoint presentations. These forms contain evaluation questions pertaining to the VTE nurse education PowerPoint presentation and VTE patient education tool. A total of 15 evaluations have been completed and returned to the EBP team leader for review. Also, during this time, 10 patients with SCD orders are evaluated by the EBP team leader, utilizing a different evaluation tool to obtain data about the patients' opinions and perceptions of the VTE patient education tool. Further review of data collection, specific results,

and evaluation will be discussed in greater detail in the data collection methods, results, and discussion sections of this study.

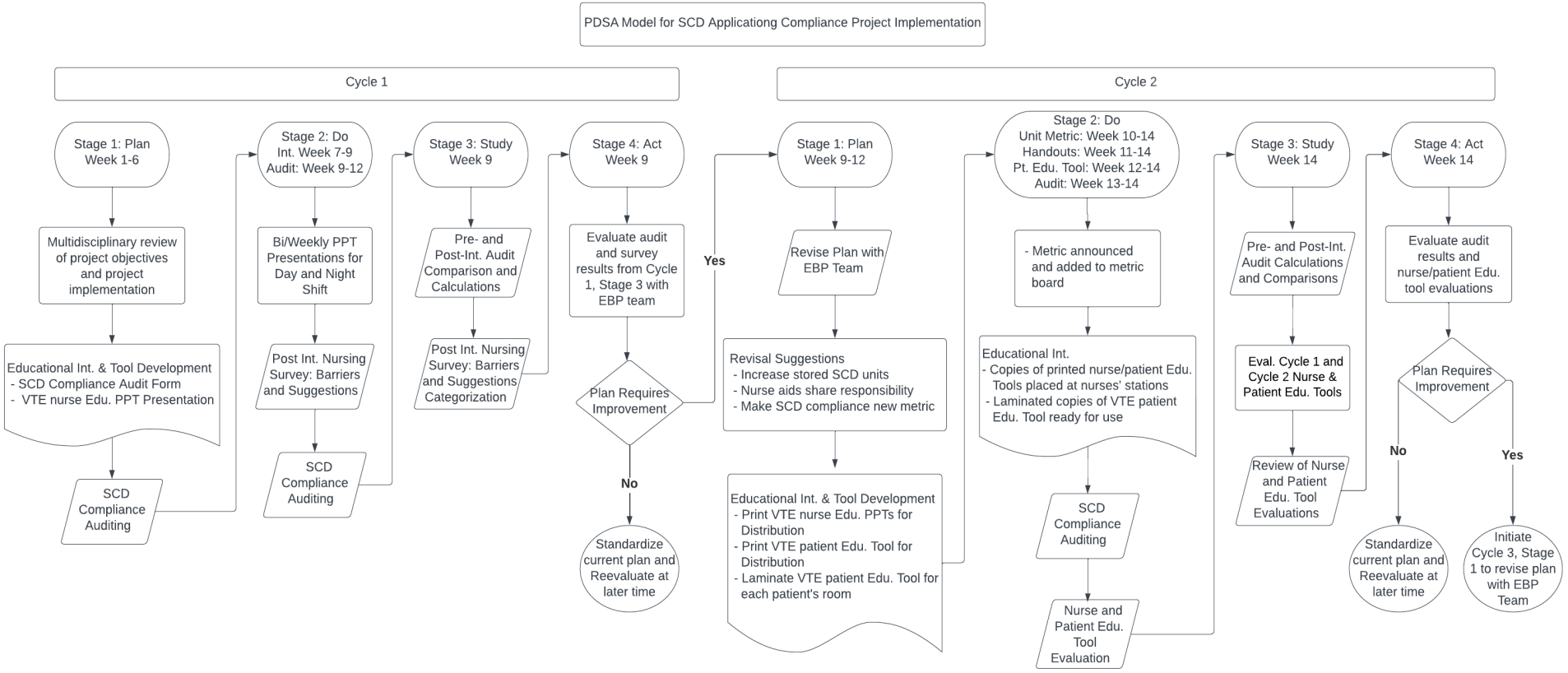
Lastly, an unexpected barrier against SCD application compliance is evaluated during this stage. During one of the shifts occurring in cycle 2, stage 2 (the intervention stage), a lack of SCD units is noted in the supply room. Thus, the central service team is notified to re-supply the floor with more SCD units. The central service team responds, stating that they have no more SCD units to distribute amongst the rest of the hospital. As a result, this marks an important barrier to address for the next cycle period.

4.8 Cycle 2, Stage 4: Act

Cycle 2, stage 4 is initiated by the occurrence of a short meeting between the EBP project leader and the unit director. This meeting also occurs during the end of the 14th week of project implementation. The unit director is notified of current trends in the results, nurse and patient education tool evaluations, and the unintended barrier discovered against SCD application compliance. The unit manager states he will reach out to the central service manager again in regards to the hospital's current lack of SCD units. Furthermore, it is decided an official email update will be sent to the rest of the EBP team once additional audits and evaluations have been completed. Additional topics to refer at the next meeting for this stage include follow-up with the unit manager about shared responsibility of SCD application with the nurse aids. Also, a follow-up regarding the details associated with keeping SCD compliance a unit metric and what that means for the floor need to be discussed with the unit manager and the rest of the EBP team. Because of the hospital's insufficient supply of SCD units, a cycle 3 of the PDSA model addressing this issue will need to occur at some point in the near future.

Figure 1

5. Flowchart for EBP Project Implementation



Note. Flowchart of the implementation process utilizing the PDSA model.

Legend: EBP = Evidence-Based Practice; Edu. = Education; Eval. = Evaluate; Int. = Intervention; PDSA = Plan-Do-Study-Act; PPT = PowerPoint; Pt. = Patient; SCD = Sequential Compression Device; VTE = Venous Thromboembolism

6. Data Collection Methods

Development and initiation of the SCD application compliance audit forms occur January, 2023. The audit forms are designed to measure current SCD application compliance for patients with ordered SCDs (see Appendix C). Pre-intervention audits are conducted one to two times per week at random dates and times during the first 6 weeks of project implementation, which occurs during cycle 1, step 1 of the PDSA model. Pre-intervention audits are designed to provide a baseline of the floor's SCD application compliance before the initial intervention is implemented during cycle 1, stage 2. The EBP leader performs pre-intervention audits during day shift, and the UPC leader performs pre-intervention audits during night shift. Those performing the audits have access to report sheets located in the charting system (i.e., Epic charting system). These report sheets have the ability to filter all patients with active SCD orders. Thus, the room numbers of each patient with SCD orders located on the progressive cardiac unit for which this project is being implemented are written on the audit sheet.

Auditors (i.e., the EBP leader and UPC leader) enter each patient's room with SCD orders to verify whether the device is applied and running correctly or not. The SCD is considered on if the machine is appropriately applied to the patient and running properly. The SCD is considered off if the machine is not in the room or not attached to the patient; it is also considered off if the machine is attached to the patient but is not running appropriately (i.e., device is turned off or only one of the sleeves is compressing). Furthermore, rooms with patients who are ambulating, standing, or using the commode or bedside commode during the time at which the audit is being performed are not included with that particular audit. This is because the SCDs utilized by this unit of practice are wall powered and therefore have to come off when the patient performs any sort of ambulation or standing maneuvers. Only patients who are sitting in

the chair, sitting at the bedside, or lying in bed are assessed for appropriate SCD application compliance.

The next round of auditing occurs during weeks 9 through 12 of project implementation, spanning cycle 1, stage 2–4, cycle 2, stage 1, and part of cycle 2, stage 2. These audits are conducted to measure the rate of SCD application compliance after the cycle 1, stage 2 interventions are complete. However, the last two weeks of post-cycle 1 intervention auditing overlap with the unit metric and nurse/patient education handout implementation of cycle 2, stage 2. The last round of auditing occurs during week 13–14 of project implementation, spanning cycle 2, stage 2–3. These audits are conducted to measure the rate of SCD application compliance after the cycle 2, stage 2 interventions are complete.

6.1 Evaluations

Three primary evaluations are conducted during this EBP project. First, nursing surveys are performed at the end of each VTE nurse PowerPoint presentation of cycle 1, stage 2. For this survey, attending nurses are asked two questions, “What barriers exist that prevent you from applying ordered SCDs to your patients?” and “What suggestions do you have to overcome these barriers?” A list of responses are compiled over the course of three weeks, the same time at which the VTE nurse PowerPoint presentations are being presented. During cycle 1, stage 3, the collection of responses is divided into seven separate categories (i.e., device availability, admission related, perceived culture and culture change, nurse aid education, patient education, and patient safety). This list is ordered from category of most responses (i.e., the top of the list) to category of least responses (i.e., the bottom of the list).

Second, nurse evaluations of the VTE nurse education PowerPoints presented during cycle 1, stage 2 and the VTE patient education tool utilized during cycle 2, stage 2 are completed

during cycle 2, stage 3. This is achieved by sending nurses who attended one of the cycle 1, stage 2 PowerPoint presentations evaluation forms to complete. This form is broken into two parts both of which use a Likert scale to measure their response.

The first part asks nine questions about the VTE nurse education PowerPoint presentation. These questions ask about the presentation's design and effectiveness; furthermore, they ask how the presentation has influenced their knowledge and practice related to VTE and SCD application compliance. The second part of the evaluation tool asks six questions about the VTE patient education tool. These questions ask about the tool's use in practice, effectiveness, and potential need for improvement. A total of 15 nurse evaluations have been collected to date.

Third, patient evaluations of the VTE patient education tool that is utilized in cycle 2, stage 2 are completed during cycle 2, stage 3. Patients complete this evaluation with the help of the EBP team leader. The EBP team leader begins the evaluation process by selecting patients with SCD orders to review the VTE patient education tool. The EBP team leader initiates his conversation about the topic by asking if anyone has reviewed the VTE patient education tool with them. If no one has reviewed the patient education tool with the patient, then the EBP team leader takes 5 to 10 minutes (depending on how many questions the patient asks) to review the tool with the patient.

After the EBP team leader has reviewed the VTE patient education tool with the patient, he asks if the patient will answer five questions from the evaluation tool about their experience using the education tool. Similar to the nurse completed evaluation tool, patients answer each question by responding to their associated Likert scale number. These questions ask about the patient's understanding of VTE. Questions also ask about the patient's attitude and reaction

towards the tool's effectiveness and SCD application compliance. A total 10 patient evaluations have been collected to date.

7. Data Collection and Evaluation Results

This EBP project seeks to achieve a SCD application compliance rate of 40% for patients with SCD orders during a three-month period. Review of the literature indicates that implementation of an educational intervention through use of a multi-disciplinary, nurse-led (or nurse involved) team is the best approach. Additionally, a mixture of education strategies directed toward nurses, patients, or both can also improve compliance. Audits are conducted three separate occasions to measure the education intervention's impact on SCD application compliance.

Table 1

SCD Compliance Results

Pre-Intervention - SCD Compliance			
Date	Time	Ratio	Percent %
12-Jan	1420	1:20	5%
16-Jan	1945	1:25	4%
20-Jan	1830	1:18	5.60%
25-Jan	1930	1:19	5.30%
3-Feb	2000	1:22	4.50%
5-Feb	0200	0:22	0%
9-Feb	2300	1:24	4.20%
14-Feb	0030	1:28	3.60%
15-Feb	0100	0:21	0%
21-Feb	0030	1:20	5%
	N = 219		*3.72%*

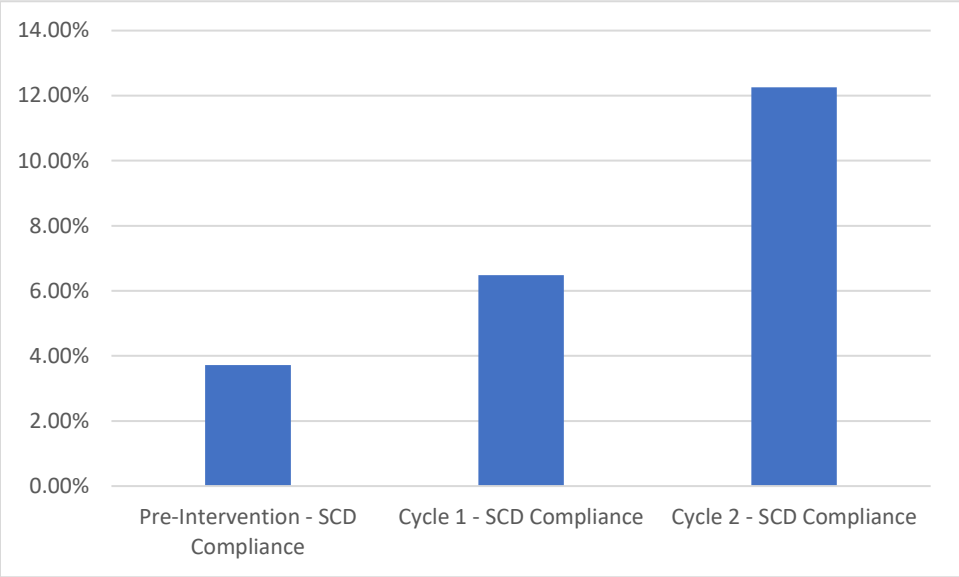
Cycle 1 - SCD Compliance			
Date	Time	Ratio	Percent %
9-Mar	1520	2:19	10.50%
14-Mar	1916	0:19	0%
19-Mar	1130	1:17	5.88%
28-Mar	1626	2:21	9.52%
Population = N		**Average %**	
N = 76		*6.48%*	

Cycle 2 - SCD Compliance			
Date	Time	Ratio	Percent %
3-Apr	1749	0:15	0%
4-Apr	0100	0:22	0%
12-Apr	1300	4:21	19.05%
13-Apr	1100	6:20	30%
N = 78			*12.26%*

Note. Pre-intervention versus post-cycle 1 and 2 intervention, SCD application compliance results. Total population (N) equals 373 patients with SCD orders.

Figure 2

SCD Compliance Results: Average %



Note. This column graph represents Table 1, SCD compliance results.

Post-cycle 1, stage 2 intervention nursing surveys are conducted to evaluate existing barriers against SCD application compliance along with suggested interventions to overcome these barriers.

Table 2

Nursing Survey: Barriers Against SCD Application Compliance and Suggested Solutions

Total	# Response	
		Device Availability Barriers and Suggestions
9	3	Not enough SCDs kept on par
	5	Assign SCD to each room
	1	Unable to locate devices
		Admission Related Barriers and Suggestions
5	1	Nurses are not looking for SCD orders
	1	Make required admission documentation (i.e., like C-diff question)
	1	Apply as soon as patient arrives to unit
	1	SCDs are not always in admitting orders
	1	Place SCDs in room before patient arrives
		Perceived Culture and Culture Change Barriers and Suggestions
3	1	No push from management
	1	SCDs do not seem important compared to other care interventions
	1	Make new metric for SCD compliance
		Nurse Aid Education Barriers and Suggestions
3	2	PCTs need to be educated
	1	PCTs should include SCD use in shift report
		Patient Education Barriers and Suggestions
3	2	Patient refuses to wear device
	1	Provide education pamphlet
		Patient Safety Barriers and Suggestions
3	2	Fear SCDs will increase fall risk
	1	Leave sleeves on when detaching for bathroom or ambulating

Note. The left column is the total number of responses for that category. The middle column is the total number of specific responses shared by one or more nurses. The right column demonstrates responses that are categorized based on topic.

Nurse completed evaluation tools with Likert scales are used to evaluate effectiveness of both the VTE nurse PowerPoint presentation and VTE patient education tool.

Table 3

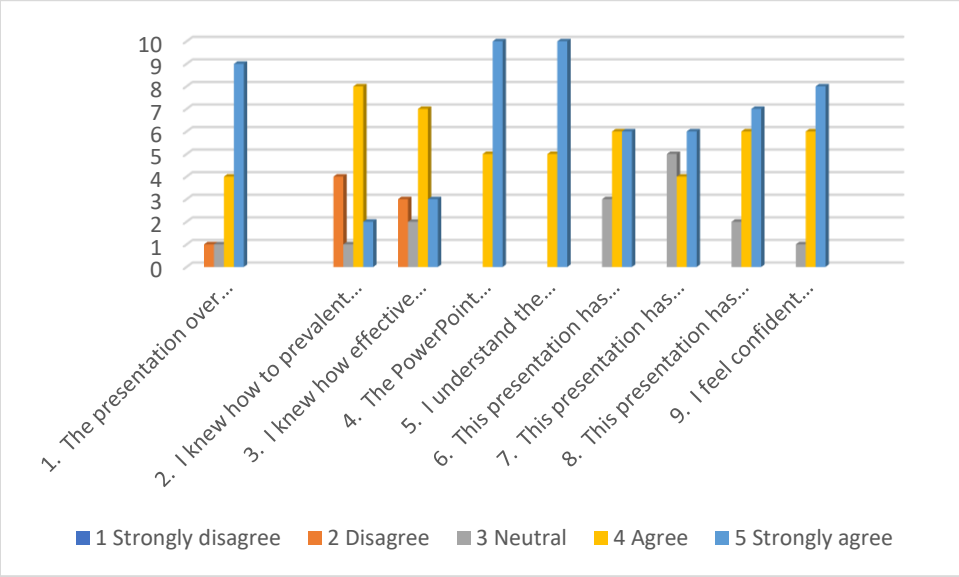
Bedside Nurse Completed Evaluation Tool: Evaluation of VTE Nurse Education Presentation and VTE Patient Education Tool

Evaluation items for nurse VTE presentation	1 Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly agree
1. The presentation over VTE prophylaxis taught me something about HA-VTE and SCDs that I did not know before.		1	1	4	9
2. I knew how to prevalent HA-VTE was before listening to the presentation.		4	1	8	2
3. I knew how effective SCDs were for surgical patients before listening to this presentation.		3	2	7	3
4. The PowerPoint handouts allowed me to comprehend the presentation easier.				5	10
5. I understand the importance of applying ordered SCDs to help prevent HA-VTE as a result of this presentation.				5	10
6. This presentation has made me more conscientious about determining if my patient has SCD orders.			3	6	6
7. This presentation has been useful in helping me identify how to locate SCDs that have been ordered for my patients.			5	4	6
8. This presentation has influenced my priorities to ensure SCDs ordered for my patients have been applied.			2	6	7
9. I feel confident educating my patients about SCDs after attending the presentation.			1	6	8
Evaluation items for VTE patient education tool					
1. I feel confident educating my patients about SCDs after reviewing the VTE patient education tool.			2	4	9
2. I have used the VTE patient education tool (located in each room) to educate those with SCD orders about VTE and SCDs.	1	2	3	3	6
3. The VTE patient education tool is useful.			2	5	8
4. Patients seem to understand the VTE patient education tool.			6	2	7
5. The patient education tool requires improvements.	3	3	8	1	
6. Patients are more compliant about wearing their ordered SCDs after the VTE patient education tool has been utilized.		1	5	6	3

Note. This evaluation form demonstrates the collective, total number of responses completed by 15 nurses.

Figure 3

Nurse Evaluation Results for the VTE Nurse Education Presentation



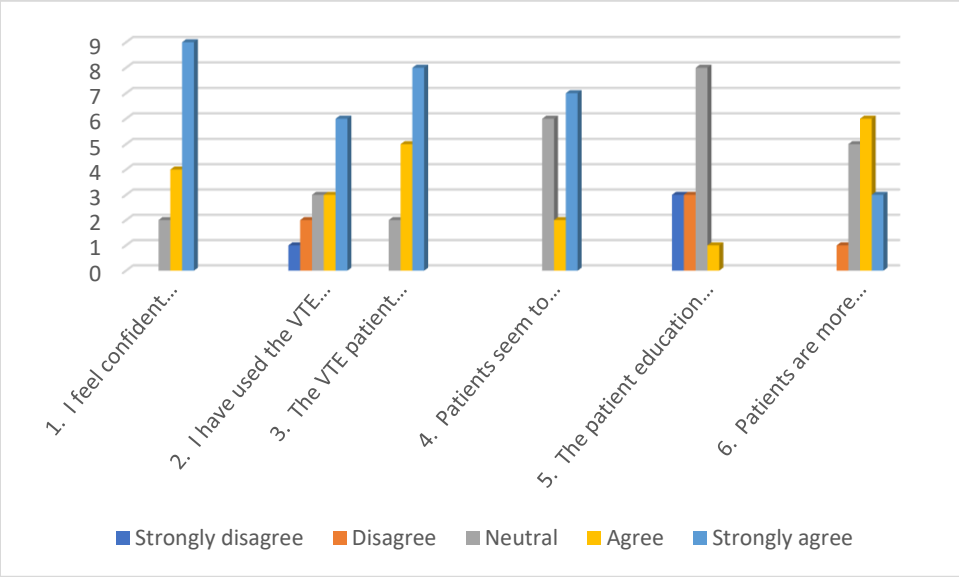
1. The presentation over VTE prophylaxis taught me something about HA-VTE and SCDs that I did not know before.
2. I knew how prevalent HA-VTE was before listening to the presentation.
3. I knew how effective SCDs were for surgical patients before listening to this presentation.
4. The PowerPoint handouts have allowed me to comprehend the presentation easier.
5. I understand the importance of applying ordered SCDs to help prevent HA-VTE as a result of this presentation.
6. This presentation has made me more conscientious about determining if my patient has SCD orders.
7. This presentation has been useful in helping me identify how to locate SCDs that have been ordered for my patients.
8. This presentation has influenced my priorities to ensure SCDs ordered for my patients have been applied.
9. I feel confident educating my patients about SCDs after attending the presentation.

Legend.

Note. This column graph represents Table 3, evaluation form results for the VTE nurse PowerPoint education presentation. Right of the graph is a legend that lists each question along the x-axis in its entirety.

Figure 4

Nurse Evaluation Results for the VTE Patient Education Tool



Legend.
1. I feel confident educating my patients about SCDs after reviewing the VTE patient education tool.
2. I have used the VTE patient education tool (located in each room) to educate those with SCD orders about VTE and SCDs.
3. The VTE patient education tool is useful.
4. Patients seem to understand the VTE patient education tool.
5. The patient education tool requires improvements.
6. Patients are more compliant about wearing their ordered SCDs after the VTE patient education tool has been utilized.

Note. This column graph represents Table 3, evaluation form results for the VTE patient education tool. Right of the graph is a legend that lists each question along the x-axis in its entirety.

This patient completed evaluation tool with a Likert scale is used to evaluate effectiveness of the VTE patient education tool.

Table 4

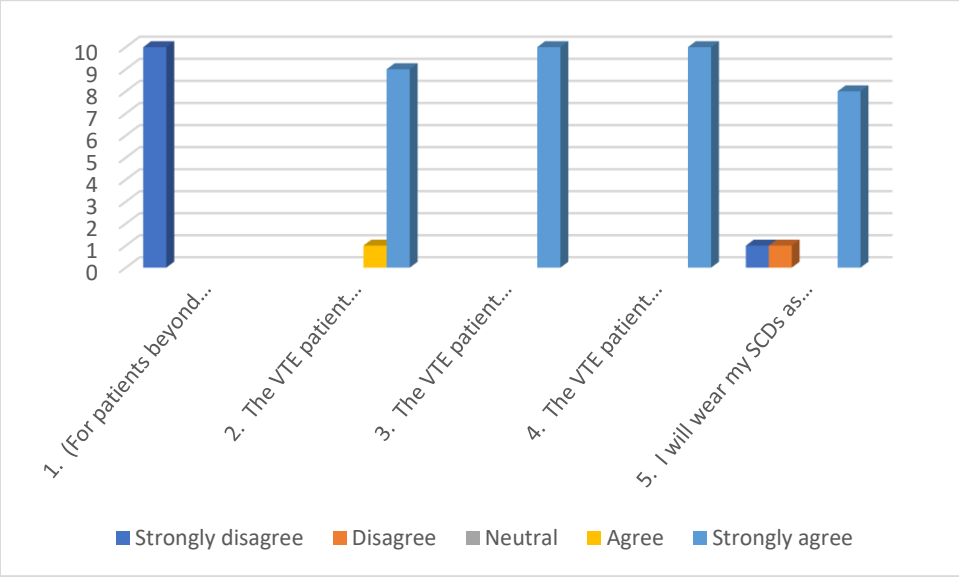
Patient Completed Evaluation Tool: Evaluation of VTE Patient Education Tool

Evaluation items for patient VTE education tool	1 Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly agree
1. (For patients beyond their first day of admission on the unit): Someone has already reviewed this VTE education tool with me.	10				
2. The VTE patient education tool has helped me to understand what VTE is.				1	9
3. The VTE patient education tool has helped me to understand the risks factors and consequences of VTE.					10
4. The VTE patient education tool has helped me to understand the importance of wearing my SCDs.					10
5. I will wear my SCDs as a result of the information learned from this VTE patient education tool.	1	1			8

Note. This evaluation form demonstrates the collective, total number of responses completed by 10 patients with aid from the EBP team leader.

Figure 5

Patient Evaluation Results for the VTE Patient Education Tool



1. (For patients beyond their first day of admission on the unit): Someone has already reviewed this VTE education tool with me.
2. The VTE patient education tool has helped me to understand what VTE is.
3. The VTE patient education tool has helped me to understand the risks factors and consequences of VTE.
4. The VTE patient education tool has helped me to understand the importance of wearing my SCDs.
5. I will wear my SCDs as a result of the information learned from this VTE patient education tool.

Legend.

Note. This column graph represents Table 4, evaluation form results for the VTE patient education tool. Right of the graph is a legend that lists each question along the x-axis in its entirety.

SCD application compliance results nearly quadruple between cycle 1, stage 1, pre-intervention audits and cycle 2, stage 2, post-intervention audits. The vast majority of nurses who responded to the post-nurse presentation surveys provide suggestions related to improved SCD availability. The nurse completed education presentation and patient education tool evaluations demonstrate mostly positive perceptions of the education interventions. Lastly, patients respond positively in their evaluations of the patient education tool; however, each patient who completed an evaluation indicate no-one ever reviewed the tool with them prior.

8. Cost/Benefit Discussion

One ream of paper with 500 sheets cost about $10 (Staples, 2023). Black, brother TN730 standard-yield toner costs approximately $45 at Sam's Club, and three standard color toners cost approximately $240 at BestBuy (BestBuy, 2023; Sam's Club, 2023). Lastly, a 200 pack of clear laminating sheets costs approximately $25 on Amazon (Amazon, 2023). The max amount for each of these items has not been used, and no additional need for laminating sheets is anticipated. An approximate, collective number of hours that everyone associated with this project has spent working is at least 200 hours. Estimating $40 an hour, this equates to $8,000 in time. Lastly, if it is concluded that more SCD units will need to be purchased, this could prove quite expensive at approximately $1,000 per unit (United Infusion; 2023). If it turns out the hospital needs another 50 to 100 units, then a one-time payment of $50,000 to $100,000 may occur.

Assuming no other costs are needed, the average cost of first-year VTE survivors is $12,000-$15,000 (Link, 2018). As previously mentioned, the hospital organization experienced 48 HA-VTE events within the first six months of 2020 (Mainer, 2020). The exact number of events associated with the EBP team leader's hospital of practice is unknown. Regardless, if this pattern continues, approximately 100 patients may experience a HA-VTE event each year. Calculating the average cost of first-year VTE survivors by 300 for the past three years, the organization has spent approximately 3.6 to 4.5 million dollars on just the first year of care for these patients alone. Therefore, even if the EBP project costs the highest approximation and results in only a small increase in SCD application compliance, the benefit in potential savings for reducing HA-VTE still outweighs the initial and ongoing cost for this project.

9. Discussion

9.1 Discussion of Audit and Evaluation Results

The rate of compliance nearly doubles between pre-intervention audits and post-cycle 1, stage 2, intervention audits. Granted, the last two weeks of post-cycle 1 intervention auditing overlap with the unit metric and nurse/patient education handout implementation of cycle 2, stage 2. However, some overlap had to occur; otherwise, only one week of cycle 1, post-intervention audits will have been conducted due to how quickly cycle 2, stage 2 is initiated. Therefore, post-cycle 1, stage 2 intervention audits do not truly assess the influence of VTE nurse education PowerPoint presentations alone. As a result, weeks 10–12 of the post-cycle 1, stage 2, intervention audit results may also be influenced by the unit metric and nurse/patient education handout implementation of cycle 2, stage 2.

These audit results do not necessarily reflect the VTE nurse education PowerPoint presentation evaluation results. The overwhelming majority of nurses mark that they agree or strongly agree with question eight, stating that the presentation has influenced them to ensure ordered SCDs are applied to their patients. Additionally, the evaluation indicates that the majority of nurses agree or strongly agree that the VTE nurse PowerPoint presentation has helped them learn something new about HA-VTE and SCDs, understand the importance of applying SCDs, become more conscientious about verifying their patient's SCD orders, locate SCDs that have been ordered for their patients, and improve their confidence to provide patient education about HA-VTE and SCDs. If the results from this evaluation are true, one would expect a higher rate of SCD compliance. It is possible that nurses are applying SCDs initially; however, perhaps patients are refusing them after a certain length of time.

Regardless, the nurse completed evaluation results of the VTE nurse education PowerPoint presentation indicate largely positive responses in terms of improving knowledge, understanding, and nursing practice related to HA-VTE and SCDs. In addition, most nurses found the PowerPoint handouts received during presentations helpful to follow along. Again, this does not necessarily reflect in the cycle 1, stage 2 audit results; however, it does indicate that the majority of nurses perceived the presentation as beneficial.

Higher rates of compliance may have also been witnessed if more suggestions by nurses recorded after each nurse education presentation were implemented. For instance, the survey identifies SCD availability as the largest barrier against application compliance. However, the EBP team was unable to increase the number of SCDs kept on par, much less assign an SCD to each room. This is discussed in greater detail in the next section. In terms of the request for a new metric, this did occur during cycle 2, stage 2, week 10 of project implementation. Furthermore, the unit manager states during the cycle 2, stage 1 meeting that she is going to discuss with the nurse aids about sharing the responsibility of SCD application compliance with them. However, no progression has been observed with this proposed intervention. Thus, nurses felt heard when their suggestions and barriers to compliance were recorded; however, they may not feel valued as a result of no interventions being implemented as per their most recommended suggestions.

In terms of cycle 2 compliance rates, the rate of SCD compliance nearly doubles again between the post-cycle 1, stage 2, intervention audits and the post-cycle 2, stage 2, intervention audits. However, cycle 1, stage 2, post-intervention audits begin the third week of intervention implementation. Cycle 2, stage 2, post-intervention audits also begin the third week of intervention implementation. However, the difference is that three separate interventions are

implemented during cycle 2, stage 2, during different weeks of the cycle/stage. Therefore, cycle 2, stage 2, post-intervention audits begin three weeks post-unit metric implementation, two weeks post-patient/nurse education handout intervention, and one week post-laminated VTE patient education tool intervention. Additionally, cycle 1, stage 2, post-intervention audits last for four weeks, whereas, cycle 2, stage 2, post-intervention audits last for two weeks. Thus, a higher average rate of SCD application compliance may have been seen if two more weeks of post-cycle 2, stage 2, intervention auditing could have taken place.

Despite potential influences experienced by each post-intervention audit, the rate of SCD compliance nearly quadrupled between cycle 2, stage 2, post-intervention audits and cycle 1, stage 1, pre-intervention audits. Larger increases of SCD application compliance are not seen until after laminated VTE patient education tools are made available for use. This indicates that educating patients about VTE (i.e., how blood clots form, risk factors, complications, consequences, and preventative measures) influences their decision to wear the device. This is supported by the evaluation results obtained by patients in reference to the education tool. The overwhelming majority of patients who answered the evaluation questions state they will where their ordered SCDs as a result of the information learned about VTE from the patient education tool. This begs the question of what type of results might have been achieved if the patient education tool were utilized earlier.

Additionally, nurse evaluations of the VTE patient education tool are mostly positive. The majority of nurses claim they are using the education tool and that it is useful. However, none of the patients who have evaluated the education tool state any nurses have reviewed it with them. Despite the positivity shared by nurses about the education tool, over half of them either agree or are neutral about improvements that need to be made to the tool. It is therefore worth

discussing with the EBP team if any other avenues exist to replace the new patient education tool with the original.

9.2 Other Considerations

The original VTE patient education tool includes verbiage designed not to exceed a third to fifth grade reading level. This is done by attempting to use all basic definitions with words that do not exceed one or two syllables. Some three-syllable words were required to incorporate when developing the original VTE patient education tool. Additionally, the original patient education tool is only one page in length with larger font. This is done to improve comprehension, ease of understanding, and visualization. This also increases the ease and flow of education by the nurse without having to flip through different pages.

In contrast, the final version of the VTE patient education tool accepted by marketing contains more medical terminology than is included in the original. Additionally, it is four pages in length and the font is smaller. As a result, relevant information necessary for patients to know during their hospitalization is highlighted to deter from the larger amounts of less important information included in the tool. As previously mentioned, the majority of patients appreciate the tool when it is used by the nurse to help them understand VTE and VTE prophylaxis; this is evident per the evaluations collected during week 14 of project implementation. Therefore, one should consider how much more effective a shorter, simpler, easier to read VTE patient education tool can be.

Lastly, the lack of SCD units to meet the hospital's total average of active SCD orders is alarming. Even if all the SCD machines seen in patients' rooms were attached to the patient and running properly, the floor would still have never be able to obtain a rate of 100% compliance. This is because there are not enough SCD machines in central service. In other words, central

service has enough SCD machines to meet this floor's ordered demands alone. However, central service does not have enough machines when ensuring each available device is distributed evenly amongst all hospital units. This may answer the question as to why the unit director can never seem to garner a response from the central service manager when requesting additional units be kept on par. In fact, the number one suggestion made by nurses during cycle 1, stage 2, post-presentation surveys is to assign an SCD to each room. Until the hospital acquires more SCDs, this can never happen. Thus, resolving this issue will need to take priority during cycle 3. As a result, SCD application compliance growth will always be limited until enough devices are obtained by the hospital.

Recommendations

In terms of future direction, there are several talking points that need to be addressed during cycle 3, stage 1 with the EBP team. For instance, important discussions related to acquiring more SCDs for the hospital need to occur. Detailed discussion inquiring the actions taken since SCD compliance was made a unit metric and how this will help sustain compliance needs to occur. Follow-up in regards to education about the new responsibilities shared with nurse aids to help with SCD compliance needs to occur. Lastly, further attempts to utilize the original patient education tool over the current one requires follow-up discussion.

By the end of the three-month period, this project did not meet its objective to achieve a sustained rate of 40% SCD application compliance. However, the compliance rates still demonstrated improvement from approximately 3% to 12%. The nurse and patient education interventions that have been developed and implemented per evidence obtained from the literature review are therefore somewhat successful. These education interventions and tools demonstrate an overall positive response per audit and nurse/patient evaluation results.

Additionally, the final audit began to demonstrate some significant increases in SCD compliance. Therefore, if more nurses continue to utilize the patient education tool and the hospital purchases an adequate supply of SCDs, then continuation of the project is recommended.

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Appendix A

	A♦	B♦	C	D	E	F	G	H	I	J
VTEPC	⇧	N/I	⇧*	NE	⇧*	⇧*	NE	NE	NE	NE
IPCDC	NE	NE	NE	⇧*	NE	NE	⇧*	⇧	⇧	⇧*
Contain MI w/EI (or EI alone) w/Audit component	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Nurse Led or Involved VTEP/IPCDC EDU	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
VTEP EDU Aimed Toward (MD/RN/ PharmD/PT)	MD/RN	MD/RN/ PharmD	RN/PT	PT	RN	MD/RN/PT	RN/PT	MD/RN/PT	PT	RN/PT
VTEP EDU Tool	-Lecture -Exam -Poster -Pocket cards -RAA Forms	-Lecture -Poster -Pamph -RAA Forms	-Lecture -Booklet -Pamph -Picture Pathway	-Pamph. -Cont. EDU	-Lecture	-Case studies -Posters -RAA -Booklet	-Online Curriculum -PT Info. Sheet -Tent Card -EDU Board -Booklet -Video	-Video -Poster -Info. Sheet -Cont. EDU	-Flyer -Short EDU Session	-Flyer -In-Service
EHR/PHR, OBS, or POB Auditing	POB	POB	EHR/PHR	OBS	OBS	EHR/PHR	OBS	OBS	OBS	OBS
Post-INT Audit Time	NIS	Within 24-hr	2 yr for VTE	Post-Op Day 1	2, 4, and 6 wk (Avg. Score)	4 mo	6 mo	6 mo, 2 yr, and 4 yr	18 days	2 wk
SD	NIS	16 wk	2 yr	1 yr	12 wk	13 mo	1 yr	2 yr	4 wk	3 wk 5 days
Post INT VTE complications	⇩	NE	N/I	NE	NE	NE	NE	NE	NE	NE

Legend: A = Kahn et al., (2018), B = Pai et al., (2013), C = Lockwood et al., (2018), D = Nahar et al., (2018), E = Mokadem et al., (2019), F = Gibbs et al., (2009, 2013), G = Gardiner & Kelly, (2013), H = Bohnenkamp et al., (2014a, 2014b, 2020), I = Hamid et al., (2020), J = Beachler et al., (2017) Avg. = Average; Cont. = Continuous; Legend: * = Statistically Significant; ♦ = Higher Level Evidence; CPG = Clinical Practice Guidelines; Cont. = Continuous; EI = Educational Intervention; DCR/⇩ = Decrease(d); DS = Descriptive Study; DVT = Deep Vein Thrombosis; EBG = Evidence-Based Guideline; EDU = Education/Educational; EHR = Electronic Health Record; HCP = Health Care Provider; hr = Hour; INT = Intervention; IPC = Intermittent Pneumatic Compression; IPCD = Intermittent Pneumatic Compression Device; IPCDC = Intermittent Pneumatic Compression Device Compliance; Info. = Information; INCR/⇧ = Increase(d); KAB = Knowledge and Behavior; MD = Medical Doctor; MI = Multifaceted Intervention; NE = Not Evaluated; N/I = No Improvement; NIS = Not in Study; OBS = Observational; OP = Operative; Pamph. = Pamphlet; PDSA = Plan-Do-Study-Act; PharmD = Pharmacist; PHR = Paper Health Record; PO = Primary Outcome; POB = Provider Order Based; PT = Patient; RN = Registered Nurse; RAA = Risk Assessment Algorithm; RCT = Randomized Control Trial; RTC = Related to Compliance; SD = Study Duration; SO = Secondary Outcome; SOC = Standard of Care; SR = Systematic Review; VTE = Venous Thromboembolism; VTEP = Venous Thromboembolism Prophylaxis; VTEPC = Venous Thromboembolism Prophylaxis Compliance; w/ = with; wk = Week; yr = Year; + = Plus

Appendix A. Outcomes and Comparison Table: VTEP/IPC Compliance.

Appendix B

Healthcare-Associated Venous Thromboembolism Education

In this appendix, the educational tools utilized for the interventions in this EBP project can be seen.

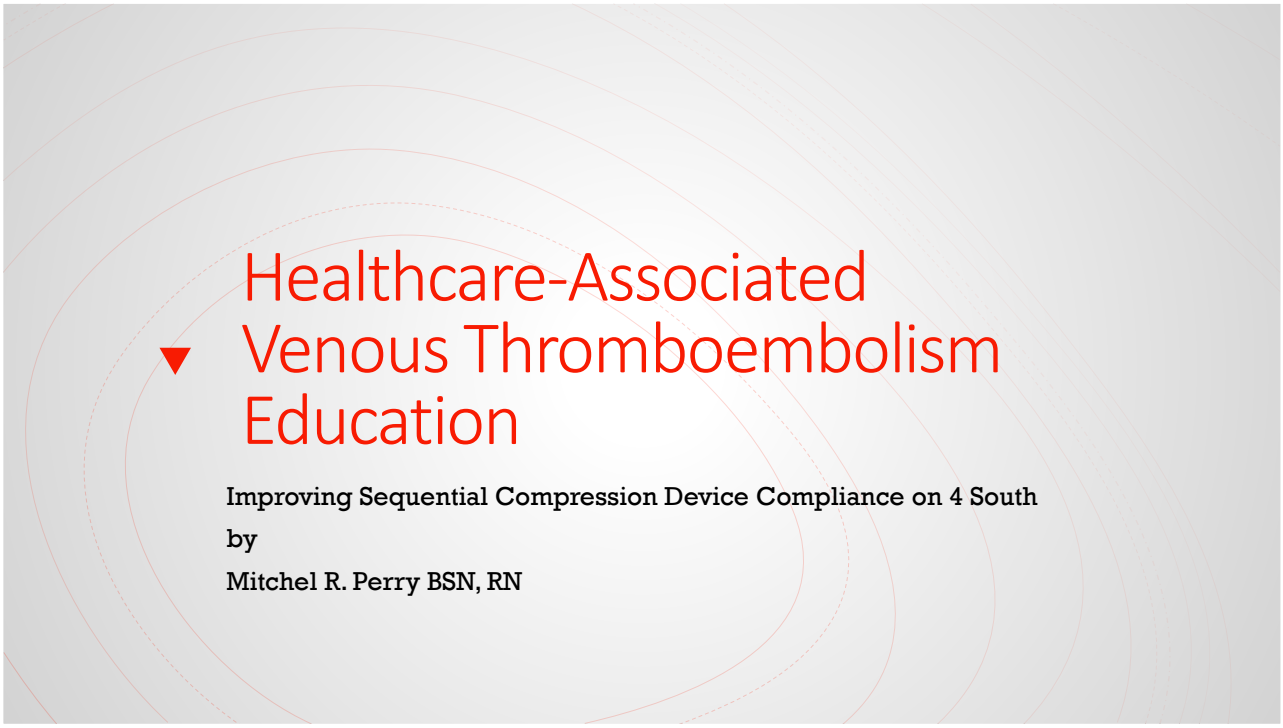


Figure B1. HA-VTE, nurse education PowerPoint presentation for use during cycle 1, stage 2 of the PDSA model.

Venous Thromboembolism Prevention

Venous thromboembolism (VTE) is a condition that includes deep vein thrombosis (DVT) and pulmonary embolism (PE). A DVT is a blood clot, also called a thrombus, that occurs in a deep vein. It usually occurs in the leg but can also occur in the pelvis, arm, or neck.

Sometimes, pieces of a blood clot can break off and travel through the bloodstream to other parts of the body. When that happens, the blood clot is called an embolus. An embolus that travels to the arteries of the lungs is called a pulmonary embolism, and it can severely impair the function of the lungs, heart, and blood vessels. An embolism can block the blood flow in the blood vessels of other organs as well.

How can this condition affect me?

VTE is a serious health condition that can cause disability or death. It is very important to get help right away. **Do not** ignore your symptoms.

What can increase my risk?

You are more likely to develop this condition if you:

- Have had recent major surgery.
- Have had recent major trauma, such as a broken bone (*fracture*) or an injury to an organ.
- Have certain health conditions, such as cancer or a blood disorder that increases the risk for blood clots.
- Are hospitalized for an illness.
- Are wearing a splint or cast for a bone fracture and are unable to move that extremity for long periods of time.
- Have a personal or family history of VTE.
- Are 60 years of age or older.

Other risks include:

- Taking certain medicines, such as birth control pills or hormone replacement therapy.
- Being pregnant or recently giving birth.
- Being overweight.
- Using products that contain nicotine and tobacco.
- Not moving for a long period of time. This may include being on bed rest or long-distance travel in an airplane or car.

What actions can I take to prevent this?

If you are in the hospital:

A VTE may be prevented by taking medicines that are prescribed to prevent blood clots (*anticoagulants*). You can also help to prevent VTE while in the hospital by taking these actions:

- Get out of bed and walk. This keeps blood moving through the veins, which decreases the risk of developing VTE. Ask your health care provider if this is safe for you to do.
- Ask your health care provider if you should use a sequential compression device (SCD). This is a machine that pumps air into compression sleeves that are wrapped around your legs.
- Ask your health care provider if you should wear tight, elastic stockings that apply pressure to the lower legs (*compression stockings*). Compression stockings are sometimes used with SCDs.

At home after a surgery

If you had surgery, understand that you have an increased risk for VTE for the first 4–6 weeks after the surgery. During this time:

- Avoid traveling for more than 4 hours. If you must travel after surgery, ask your health care provider about additional preventive actions that you can take, such as frequent breaks to move around and walk.
- Avoid sitting or lying still for too long. If possible, get up and walk around one time every hour. Ask your health care provider when this is safe for you to do.
- Stay active as directed by your health care provider.

While traveling

Travel that takes more than 4 hours can increase the risk of a VTE. To prevent VTE when traveling:

- Exercise your arms and legs every hour. You can do this by standing, stretching, and bending and straightening your arms and legs. If you are traveling by airplane, train, or bus, walk up and down the aisle as often as possible to get your blood moving. If you are traveling by car, stop and get out of the car every hour to walk, stretch, and exercise your arms and legs. Other types of exercise might include:
  - Keeping your feet flat on the ground and raising your toes.
  - Switching from tightening the muscles in your calves and thighs to relaxing those same muscles while you are sitting.
  - Pointing and flexing your feet at the ankle joints while you are sitting.
- Drink enough water to keep your urine pale yellow.
- Wear compression stockings during long travel periods.
- Avoid drinking alcohol during long travel.

Generally, it is not recommended that you take medicines to prevent DVT during routine travel.

Other tips

Some other actions you can take in your daily life to help prevent blood clots include:

- Stay active.
  - Avoid sitting or lying in bed for long periods of time without moving your arms and legs.
  - Exercise by moving your arms and legs for 30 minutes or more every day.
- Avoid crossing your legs when you are sitting.
- Wear compression stockings as told by your health care provider. These stockings help to prevent blood clots and reduce swelling in your legs. **Do not** let them bunch up when you are wearing them. Avoid wearing other tight clothing around your legs or waist.
- **Do not** use any products that contain nicotine or tobacco. These products include cigarettes, chewing tobacco, and vaping devices, such as e-cigarettes.
  - This is especially important if you take estrogen medicines.
  - If you need help quitting, ask your health care provider.
- Avoid using medicines that contain estrogen if you do not need them. These include birth control pills and hormone replacement therapy.
- Maintain a healthy weight.

Where to find more information

- Centers for Disease Control and Prevention: www.cdc.gov
- American Heart Association: www.heart.org
- National Heart, Lung, and Blood Institute: www.nhlbi.nih.gov

Get help right away if:

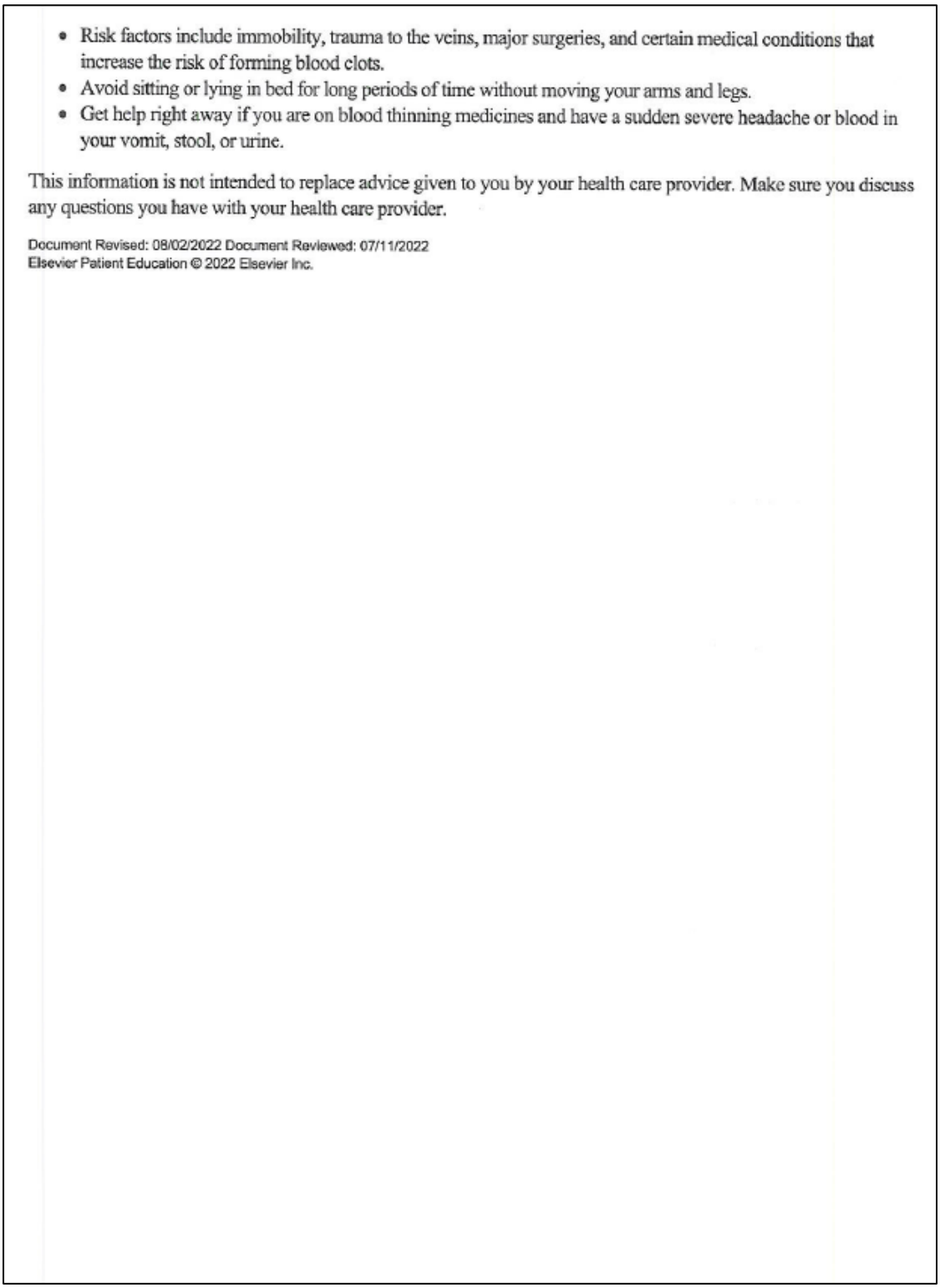
- You have chest pain or shortness of breath.
- You cough up blood.
- You have a rapid or irregular heartbeat.
- You feel light-headed or dizzy.
- You have new or increased pain, swelling, or redness in an arm or leg.
- You have numbness or tingling in an arm or leg.
- You are on blood thinning medicines and have a sudden severe headache or blood in your vomit, stool, or urine.

These symptoms may be an emergency. Get help right away. Call 911.

- **Do not wait to see if the symptoms will go away.**
- **Do not drive yourself to the hospital.**

Summary

- Venous thromboembolism (VTE) is a condition that includes deep vein thrombosis (DVT) and pulmonary embolism (PE).
- VTE is a serious health condition that can cause disability or death. It is very important to get help right away. **Do not** ignore your symptoms.



- Risk factors include immobility, trauma to the veins, major surgeries, and certain medical conditions that increase the risk of forming blood clots.
- Avoid sitting or lying in bed for long periods of time without moving your arms and legs.
- Get help right away if you are on blood thinning medicines and have a sudden severe headache or blood in your vomit, stool, or urine.

This information is not intended to replace advice given to you by your health care provider. Make sure you discuss any questions you have with your health care provider.

Document Revised: 08/02/2022 Document Reviewed: 07/11/2022
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Figure B2. HA-VTE, highlighted patient education tool for use during cycle 2, stage 2 of the PDSA model.

Appendix C

SCD Application Compliance Audit Form Date:_____ Time:_____

Room #	SCD is on and running	SCD is on but not running; SCD is present but not on; SCD is not present

Appendix C. Audit form used for cycle 1, stage 1; cycle 1, stage 2; and cycle 2, stage 2 SCD application compliance checks.