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Keep It Moving and Remember to P.A.C. (Pharmacology, Ambulation, and Compression) for Venous Thromboembolism Prevention

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The purpose of this article is to describe in detail how an academic hospital system took on the challenge of deep vein thrombosis (DVT) prevention. A VTE Prevention Task Force was formed in response to an increased incidence of hospital acquired DVTs. The interdisciplinary team reviewed the literature and examined the current state of organizational venous thromboembolism (VTE) prevention to identify gaps in process, determine opportunity and approaches for practice and process improvements, and develop standardized VTE prevention protocols. The article discusses the process taken in developing a highly motivated interdisciplinary team, the implementation of a care bundle, and the highly effective educational and surveillance tools used that helped improve patient outcomes by driving down the VTE rate.

Introduction

Venous thromboembolism (VTE) is a preventable hospital-acquired complication that is frequently attributed to surgery, prolonged hospitalizations, and other comorbidities. The other comorbidities include, but are not limited to, obesity, smoking, bed rest, and hypercoagulability. It can contribute to increased length of stay, increased cost, and death. Venous thromboembolism occurs in about 100 people per 100,000 every year in the United States, 24% of which are attributed to a postoperative complication. About two thirds of VTE are deep vein thromboses (DVTs), which can be problematic for patients, causing increased pain, immobility, and anxiety, whereas about one third of VTE manifest as life-threatening pulmonary embolism (Quaseem et al., 2011).

As acute care nurses, we need to be mindful of this potentially life-threatening complication and must direct our assessment and interventions toward prevention and early detection. As orthopaedic nurses who oftentimes work with patients who are postoperative or have had injuries or other comorbidities, it is critical that we bundle our care and ensure that the latest evidence is being evaluated and implemented in order to prevent DVT. Much of the literature supports the notion that implementation gaps and common barriers exist between verified best practice and actual practice (Maynard, 2015). The purpose of this article is to describe in detail how an academic hospital system took on the challenge of DVT prevention through an interdisciplinary approach. We discuss the process taken in developing a highly motivated interdisciplinary team, the implementation of a care bundle, and the highly effective educational and surveillance tools used that helped improve patient outcomes by driving down the VTE rate.

Review of the Literature

Patients who are immobile are at risk for thrombus formation. A thrombus is an accumulation of platelets, fibrin, clotting factors, and the cellular elements of the blood attached to the interior wall of a vein or artery, which can occlude the inner lumen of the vessel that

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The authors have disclosed no potential conflicts of interest, financial or otherwise.

DOI: 10.1097/NOR.0000000000000497

causes a DVT. Three factors that contribute to venous thrombosis formation are damage to the cell wall, alterations in blood flow, and alternations in blood constituents; this is known as Virchow's triad (Lewis, Dirksen, Heitkemper, & Bucher, 2014). It is important to be aware of various conditions related to each category of Virchow's triad because it can identify patients who are at a higher risk for VTE. Surgery, prior VTE, central line placement, or trauma can all cause damage to the cell wall. Such damage would release clotting factors and activate platelets, increasing the risk for thrombosis (Buesing, Mullapudi, & Flowers, 2015). Alterations in blood constituents or hypercoagulable states could be caused by cancer, high estrogen states, inflammatory bowel, nephrotic syndrome, sepsis, smoking, pregnancy, and thrombophilia. In such conditions, there is an increase in fibrin production (Buesing et al., 2015). Finally, risk factors for alterations in blood flow, or stasis, include immobility, congestive heart failure, stroke, paralysis, spinal cord injury, polycythemia, severe chronic obstructive pulmonary disease, obesity, and varicose veins (Buesing et al., 2015). As orthopaedic nurses, we need to ensure that all care be based on these physiological principles.

Flack-Ytter et al. (2012) discussed and defined the best practices for preventing VTE in orthopaedic surgery patients. They discussed that the interventions need to be both pharmacological and mechanical depending on the risk assessment. Utilizing a VTE risk stratification system to implement interventions has shown to decrease the prevalence of VTE. Assessment and appropriate intervention based on risk level can help healthcare institutions focus their efforts and resources on the proper management for a wide variety of patients and improve their rates (Maynard, 2015). There are many VTE assessment tools available, for example, the Caprini and Padua scales. Both tools are used to evaluate the likelihood of a patient developing a DVT, given his or her risk factors. The Caprini tool calculates a total risk factor score and groups patients into low-, moderate-, or high-risk categories for postoperative VTE (Caprini, Arcelus, Hasty, Tamhane, & Fabrega, 1991). The Padua prediction score similarly assesses VTE risk but in hospitalized medical patients (Barbar et al., 2010). In both scales, the total score is used to evaluate the overall risk of DVT development and to guide care.

Staff nurses do not prescribe the VTE prevention treatment, but they are in a key position to help maintain adherence to the VTE patient care bundles and integrate it into the overall plan of care. Dunn and Ramos (2017) discussed the role that nursing plays in preventing VTE with intermittent pneumatic compression devices (IPCDs), which have been shown to be just as effective in preventing VTE as pharmacology interventions (Cassidy, Rosenkranz, & McAneny, 2014; Ho & Tan, 2013; Ibrahim, Ahmed, Mohamed, El-Sayed Abu, & Ibrahim, 2015). Given the effectiveness of mechanical prophylaxis, nurses must pay close attention to the application and maintenance of IPCDs in particular when pharmacological interventions are contraindicated such as high risk for bleeding. Yet, compliance with IPCD usage remains a barrier to effective VTE prophylaxis. Brady, Carroll, Cheang, Straight, and Chelmow (2015) reported on why patients were not compliant with using IPCDs: "The nurse said they did not need them anymore, no one reapplied them and that they felt since they were walking they did not require the prescribed treatment any longer." This study clearly shows that patient and clinician education is highly warranted.

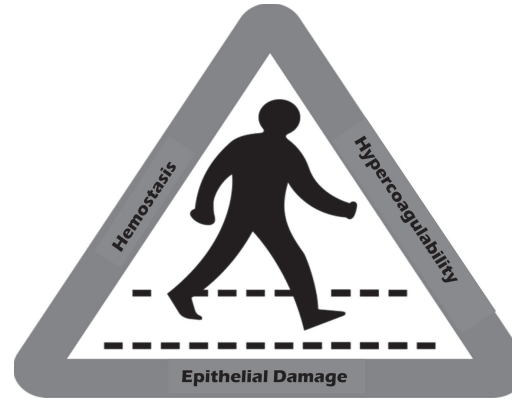

Figure 1. P.A.C. staff campaign slogan. (Copyright RWJBarnabas Health, The Center for Professional Development, Innovation and Research, New Brunswick, NJ. Used with permission.)

Another key nursing intervention in the prevention of VTE is mobilization. This can be a challenge for patients and nurses. It seems very logical that early mobilization does have many benefits to patients that include a sense of independence, decreased length of stay, decreased pain, as well as decreased pulmonary complications (Floyd, Craig, Topley, & Tullmann, 2016; Labarere et al., 2007; Pashikanti & Von Ah, 2012; Stewart, 2012). Limited research exists regarding the relationship between early ambulation and VTE prevention in the postoperative orthopaedic patient. It is clear that there is an opportunity to explore and evaluate nursing interventions related to VTE prevention. Being able to take a creative approach to preventing this potentially life-threatening complication is critical for patient outcomes. The approach must be rooted in the latest evidence and bundled in such a way to ensure easy implementation.

Implementation Gaps

In response to an increased incidence in postoperative VTE rates, an interdisciplinary VTE Prevention Task Force was formed. Members included executive leadership, physicians, nurse educators, clinical nurses, performance improvement coordinators, and nursing informatics specialists. Physical therapy, although not on the task force, served as expert consults for all aspects related to mobility. After a review of the literature, the task force evaluated the organization's current state of VTE prevention practices and identified that multiple implementation gaps existed. In light of the known best practices, a lack of standardized protocols and order sets, VTE risk assessment tools, appropriate anticoagulation administration, optimal patient mobilization, and consistent use of IPCDs was identified. As a result, the "Keep It Moving and Remember to P.A.C. (Pharmacology, Ambulation, Compression)" campaign was initiated (see Figure 1).

Planning Phase

Task force members met biweekly to establish specific goals and aims related to the pharmacology, ambulation, and compression components. Collaboration fostered innovative strategies to implement standardized practices and solutions to overcome common barriers associated with VTE prevention. A "plan, do, check, adjust" approach was utilized to manage each individual component of P.A.C. Reliable data collection and performance tracking were consistently audited. A comprehensive VTE prevention bundle was developed over a 2-year period.

Components of the P.A.C.

Pharmacology

Upon evaluation of anticoagulant prophylaxis, inconsistent practices were revealed. The absence of a standardized protocol and stratified risk assessment caused variation in practice due to differences in clinician knowledge and perception. Anticoagulant prophylaxis doses were frequently missed if a patient was not on the unit, refused, or was going for a procedure. Clinical nurses did not recognize the importance of maintaining consistent prophylaxis as prescribed and were concerned more with bleeding risk and patient satisfaction. In addition, anticoagulant prophylaxis orders by licensed independent practitioners (LIPs) were diverse based on presence, dose, frequency, duration, and indication. The need for a structured protocol among clinicians was evident.

All clinicians, nursing and medical staff, were educated about the significance of VTE and the threat it poses to patients. Current practice recommendations for anticoagulation administration and supporting evidence were disseminated. Once a common understanding and knowledge base was achieved, a stratified risk assessment tool and standardized clinical practice guidelines were successfully implemented in phases.

In the electronic medical record, a VTE risk assessment is completed upon admission and once per shift by the clinical nurse. On the basis of the resulting score, the patient is characterized as at low, moderate, or high risk for VTE consequence. The clinical nurse is then given a reminder to verify appropriate VTE prevention orders and notify the LIP if necessary (see Figure 2). In addition, if pharmacological prophylaxis is indicated and not administered, an alert/hard stop is generated to instruct the clinical nurse to notify the LIP, obtain an order to hold, and document the appropriate rationale (see Figure 3).

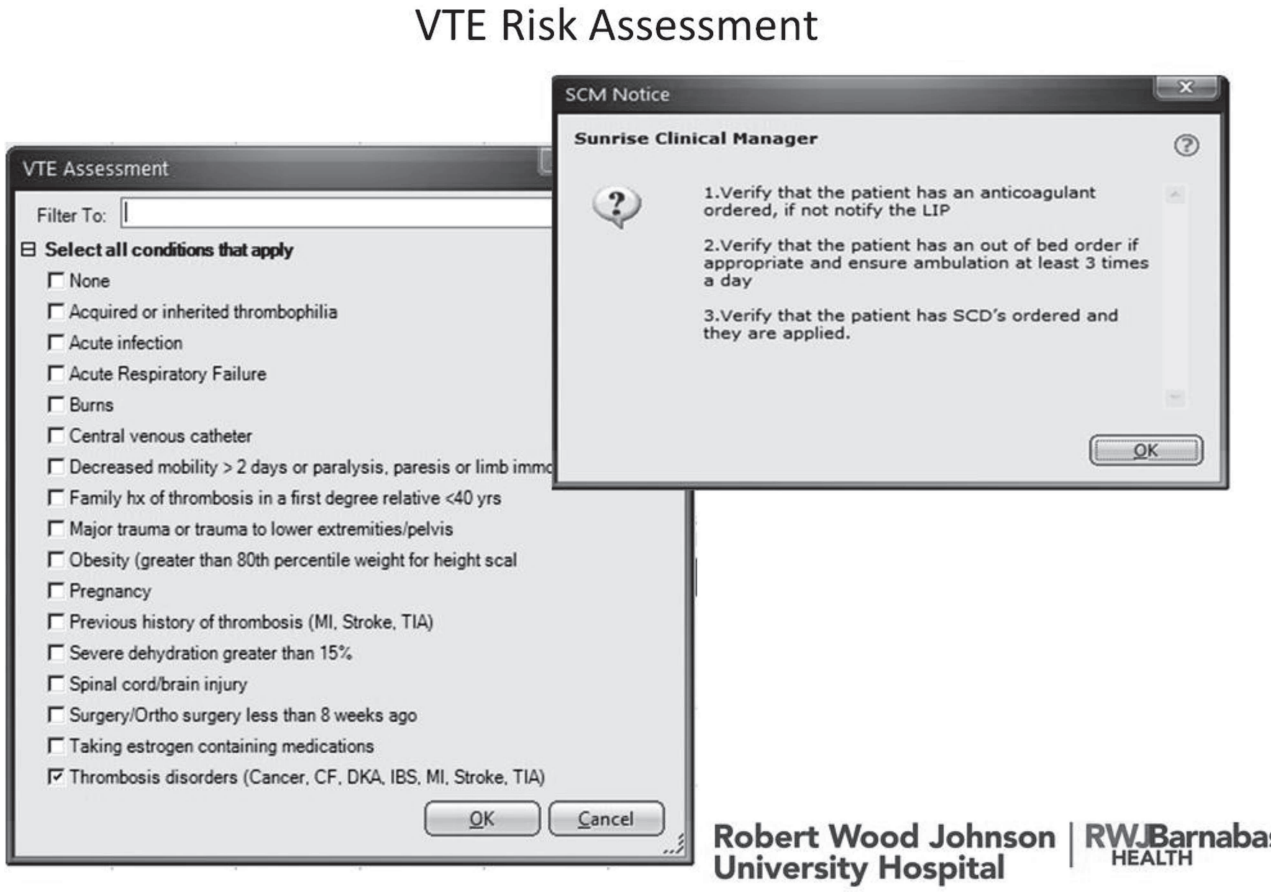

Figure 2. VTE assessment. VTE = venous thromboembolism. (Copyright RWJBarnabas Health, The Center for Professional Development, Innovation and Research, New Brunswick, NJ. Used with permission.)

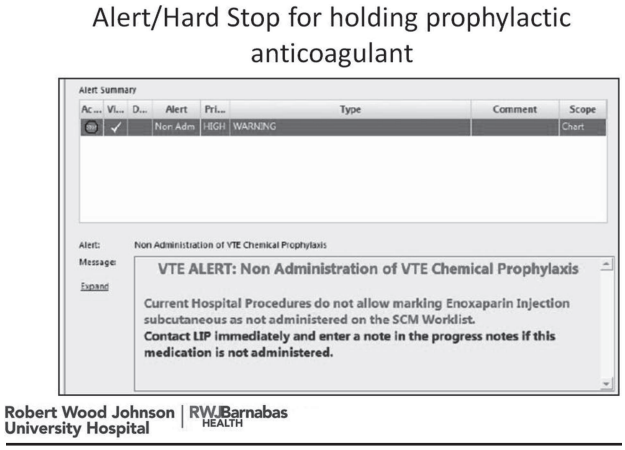

FIGURE 3. Alert/hard stop. VTE = venous thromboembolism. (Copyright RWJBarnabas Health, The Center for Professional Development, Innovation and Research, New Brunswick, NJ. Used with permission.)

AMBULATION

Although clearly evident that ambulation and mobilization promote venous flow, restrictions exist for the hospitalized postoperative patient. Clinical nurses were surveyed regarding limitations associated with patient mobilization at an annual education fair. The most frequent responses included staffing, patient willingness, environmental space, equipment, safety concerns that include patient fall risks, and the lack of a uniform mobility plan of care. Based on these concerns and barriers, the "Keep It Moving" slogan became an integral part of the organization's culture in order to enhance patient mobilization.

To overcome the barrier of staffing concerns, a team approach among physical therapists, nurses, and clinical care technicians was used to encourage daily mobility, making it a shared responsibility. Patient education also proves to be an effective tool that allows patients to engage in their own exercises even when not ambulating. Inpatient units were reorganized to create pathways for patient ambulation as well as clearly delineate walking distances so that patients and staff could map activity. Activity orders of the LIP were limited to activity as tolerated or complete bed rest in order to eliminate ambiguity in ordering. If bed rest was ordered, the LIP was to reevaluate the patient every 24 hours and, if indicated, reenter the order. To determine the patient's activity tolerance level, a mobility scale was created and built into the electronic medical record. This provided the clinical nurse with a systematic approach to determine and implement the most appropriate mobilization practices with their patients. Depending on the mobility scale score, patients were categorized as dependent, borderline, or independent. Within each of these categories, safe and appropriate mobilization activities were defined (see Figure 4).

COMPRESSION

Intermittent pneumatic compression devices are an excellent way to maintain venous flow during periods of inactivity. However, the drawbacks are equipment functionality, availability, and compliance of use. To overcome these challenges, the organization invested in updated IPCDs and increased the inventory. A

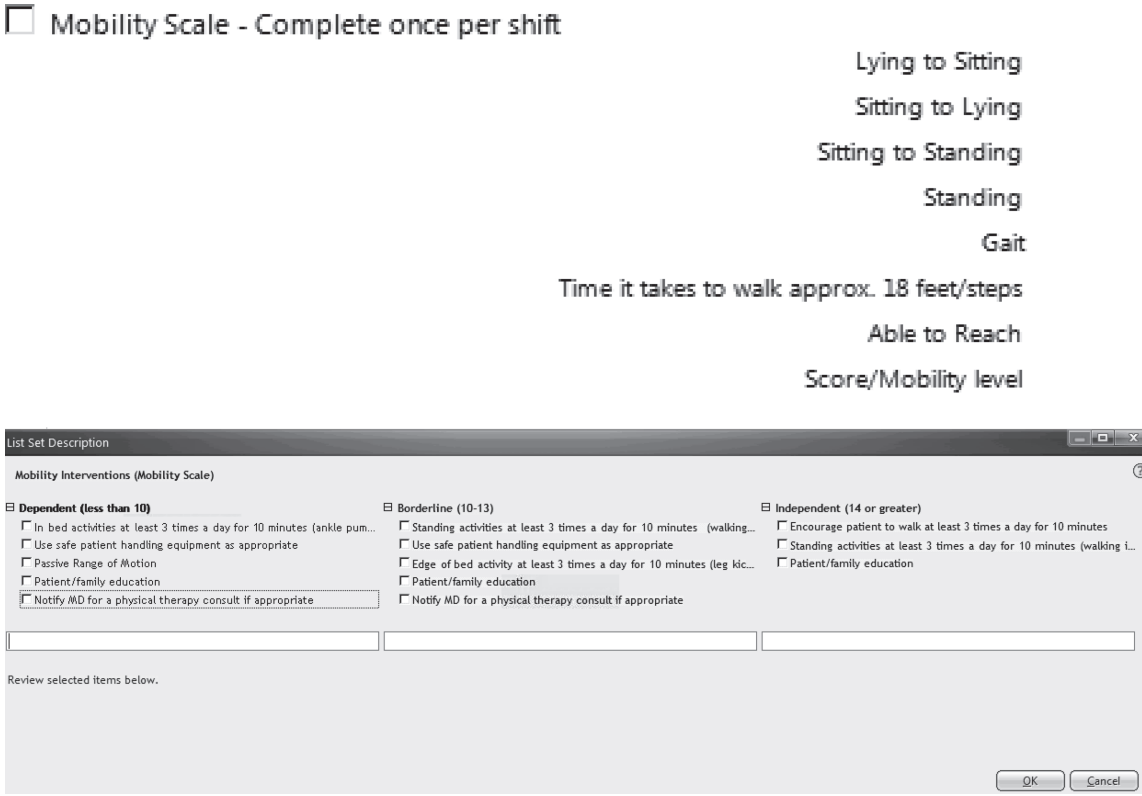

FIGURE 4. Mobility scale. (Copyright RWJBarnabas Health, The Center for Professional Development, Innovation and Research, New Brunswick, NJ. Used with permission.)

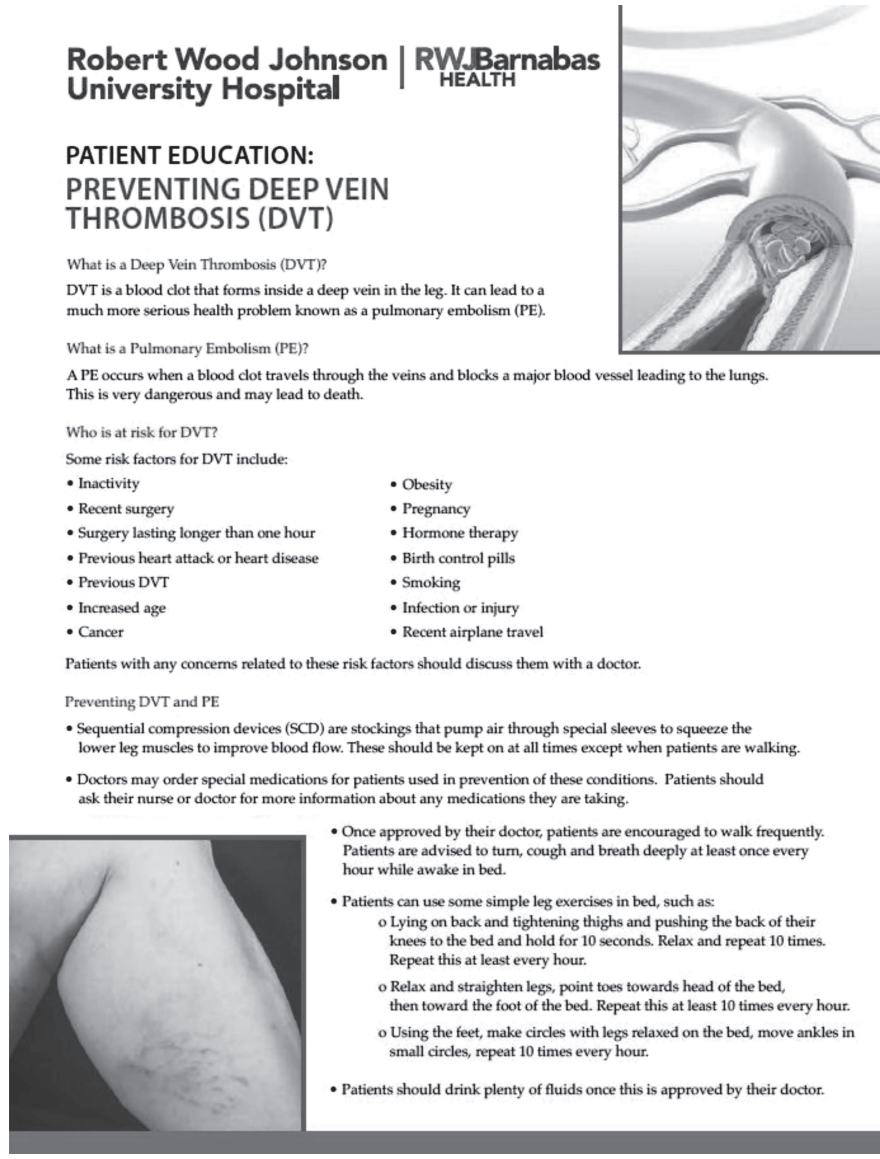

FIGURE 5. Patient education flyer. (Copyright RWJBarnabas Health, The Center for Professional Development, Innovation and Research, New Brunswick, NJ. Used with permission.)

standard of care was maintained to ensure that, if indicated, IPCDs were applied during all periods of inactivity. An area to document IPCD usage was added to the electronic medical record, and quality assurance was provided through audits to determine compliance.

A Patient/Family-Centered Care Approach

Patients and families play a vital role in VTE prevention. Providing education and including them in the plan of care are essential. Patients' lack of knowledge and understanding may have a direct effect on their VTE prevention compliance. For example, subcutaneous injections of prophylactic anticoagulants can be frequent and painful; however, patient refusals can be lessened after adequate teaching. Patients often express a dislike for IPCDs due to feelings of discomfort, excessive heat, and restriction of movement. Furthermore, postsurgical patients often experience, pain, lethargy, weakness, fear, and anxiety, which can inhibit their desire and ability to engage in activity.

The "Keep It Moving and Remember to P.A.C." campaign took a patient/family-centered approach toward driving down VTE rates. Patient education pamphlets were developed and were located in all admission packets as well as on an intranet-based nurse resource site for ease of access (see Figure 5). Activity maps were created to engage patients, families, and staff in the setting and achieving realistic mobility goals (see Figure 6). These forms showcased the "Keep It Moving" slogan and were posted in patient rooms. The purpose of this worksheet was to encourage patients to take an active role in their recovery and to provide a reminder of the importance of VTE prevention. Comprehensive patient education should be provided during the presurgical preparation time period and reinforced throughout the hospital stay.

Room #_____

Patient & Family Goal:_____

	Date:_____	Date:_____	Date:_____
Walking in Room or in Hall	Time:_____ Laps:___ Time:_____ Laps:___ Time:_____ Laps:___ Total Distance: _____Laps _____Ft.	Time:_____ Laps: ___ Time:_____ Laps: ___ Time:_____ Laps: ___ Total Distance: _____Laps _____Ft.	Time:_____ Laps: ___ Time:_____ Laps: ___ Time:_____ Laps: ___ Total Distance: _____Laps _____Ft.
Chair Exercises	Time:_____ Time:_____ Time:_____	Time:_____ Time:_____ Time:_____	Time:_____ Time:_____ Time:_____
Range of Motion Bed Top Exercises	Time:_____ Time:_____ Time:_____	Time:_____ Time:_____ Time:_____	Time:_____ Time:_____ Time:_____

FIGURE 6. Activity map. (Copyright RWJBarnabas Health, The Center for Professional Development, Innovation and Research, New Brunswick, NJ. Used with permission.)

Data

The data in Figure 7 represents the AHRQ Patient Safety Indicator (PSI 12) Perioperative Pulmonary Embolism or Deep Vein Thrombosis rate at our institution for the past 3 years. This rate is per 1,000 surgical discharges for patients 18 years and older, with exclusions for cases with principal diagnosis of pulmonary embolism or proximal DVT, cases with secondary diagnosis of pulmonary embolism or proximal DVT present on admission, cases in which interruption of vena cava occurs before or on the same day as the first operating room procedure, and obstetric discharges. This graph highlights the implementation dates for the various efforts initiated during this time period. To note that the Caprini tool was requested to be used by the surgical team whereas the Padua scale was requested by the medical team, thereby explaining the need to incorporate both tools into our practice. As demonstrated by the decreasing slope of the line, the reduction is based on the bundled interventional approach addressing all elements of the P.A.C. campaign.

Conclusion

As in any project that involves multidisciplines, sustainability is vital. The task force continues to meet and discover new opportunities to help improve patient care related to VTE prevention. As an example, it was found that there were long-standing order sets in the electronic medical record that did not have the appropriate anticoagulation dosing or correct ambulation orders. The task force worked with Nursing Informatics to correct this process. In addition, the task force continues to audit and investigate processes that can impact VTE prevention.

Although VTE prevention continues to be a challenge for healthcare providers, the continued work from this task force has had lasting impact on patient outcomes. The VTE task force collaborated with multiple disciplines in order to create a systematic and thoughtful approach. The success of our approach to VTE prevention was done through engaging nurses and ancillary staff through education, modifying the documentation system to reflect the need for VTE prophylaxis, and obtaining real-time surveillance and feedback. The continuous review of current data enabled us to target interventions and provide further education where most necessary. Although there are still hurdles to overcome, we created a framework for the clinicians to utilize in order to help maintain positive outcomes for our patients. It is clear through the work of this task force that there is room for nursing research that can explore the impacts of interventions on our orthopaedic patient population.

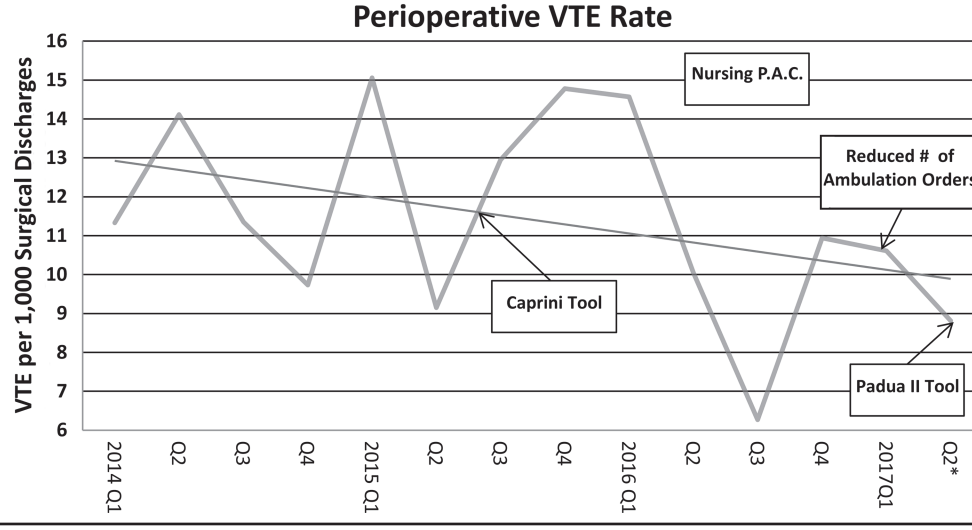

FIGURE 7. Overall VTE hospital rate with matching intervention timeline. VTE = venous thromboembolism. (Copyright RWJBarnabas Health, The Center for Professional Development, Innovation and Research, New Brunswick, NJ. Used with permission.)

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