



Mimi Jordan, *Hope*

Mimi's painting process was a form of meditation, training her mind to focus and redirect her thoughts. She passed away in 2020.

M. Jordan

Optimizing Outcomes in Venous Thromboembolism Among Hospitalized Medically Ill Patients Through an Integrated Risk Assessment Program

OVERVIEW, EPIDEMIOLOGY, AND BURDEN OF VENOUS THROMBOEMBOLISM AMONG HOSPITALIZED MEDICALLY ILL (NONSURGICAL) PATIENTS

Venous thromboembolism (VTE) is one of the most common preventable causes of death in hospitalized patients.^{1,2} Defined as a serious and potentially fatal development of 1 or many blood clots in the veins, VTE can manifest as deep vein thrombosis (DVT), in which a blood clot forms in a deep vein within the body.¹ If part of the clot eventually breaks off and travels to the lungs, it may induce a pulmonary embolism by partially or fully blocking a pulmonary artery.^{1,3}

Although surgery is a well-known risk factor for VTE, acutely ill medical patients experience about 20% of VTE events.⁴⁻⁶ **Acutely ill medical patients**, also referred to as **medically ill**, include hospitalized patients 40 years of age or older with any of the following⁷⁻⁹:

- an infectious process,
- chronic obstructive pulmonary disease,
- heart failure,
- inflammatory bowel disease,
- rheumatic disease,
- an ischemic stroke, or
- sometimes, cancer.

Acute illnesses or infectious processes (eg, pneumonia) are associated with an increased risk of VTE.^{10,11} Consequent to these illnesses, abnormal clot formation may occur due to decreased blood flow (venous/circulatory stasis, immobility), vessel (endothelial) injury or inflammation, or hypercoagulability (changes in the blood via inherited genetic mutations or certain disease states).^{11,12}

Patients may be at risk of VTE both during and after their hospital stay. The results of a retrospective claims analysis of hospitalized acutely ill medical patients found that VTE risk remained elevated in all patients for 30 to 40 days after admission, with nearly two-thirds of confirmed VTE events occurring within 40 days of hospital admission.^{13,*} The most recent data

available (2018) showed that the average hospital length of stay in the United States was 5.5 days; thus, the risk of VTE among medically ill patients extends well beyond discharge.¹⁴

The risk of VTE extends BEYOND discharge. 

Nearly two-thirds of confirmed VTE events occur within 40 days of hospital admission.¹³ 

The average hospital length of stay is 5.5 days.¹⁴ 

Patients who experience VTE during their hospital stay also have a greater chance of readmission. The results of another claims data analysis found that patients hospitalized with acute medical illness who experienced VTE during index hospitalization were over 4 times more likely to have a VTE-related readmission within 6 months vs those who did not have an index hospitalization VTE event.^{15,*}

 **Estimated first-year direct medical costs of 1 VTE event are \$14,000 to \$18,200.**^{16,17,*}

VTE events also can be costly to healthcare systems. In the United States, the overall annual economic burden of VTE and associated complications is estimated to be \$8.2 billion to \$12.0 billion (adjusted to 2022 US\$).^{16,17} The direct medical costs (adjusted to 2022 US\$) of 1 VTE event is estimated to be approximately \$14,000 to \$18,200 during the first year after the event occurred, rising to about \$21,900 to \$28,200 in total costs to treat subsequent complications

over several years after the event.^{16,17,*} The mean (SD) cost for any VTE-related readmission within 6 months of discharge is estimated to be \$42,158 (\$75,614), according to the results of a 2019 study.¹⁵ The mean length of stay for the readmission was 9.4 days (10.4 days).^{15,*}

In addition, VTE events may impact quality measure ratings that are required to maintain Medicare reimbursement.^{2,18,19} Key measures specific to VTE focus on the incidence of hospital-acquired VTE, the appropriate management of VTE events, and evidence of appropriate VTE prophylaxis.² Because VTE events may indirectly impact 30-day readmission rates, hospitals with higher VTE rates may receive reduced reimbursement.^{11,12,19,20}

Although VTE is treatable, it may be prevented in at-risk patients through appropriate pharmacologic or mechanical prophylaxis.^{1,6,21,22} However, rates of VTE prophylaxis are low among patients with medical illness. The results of 1 claims database analysis found that approximately 60% of hospitalized acutely ill medical patients were not prescribed pharmacologic prophylaxis during their hospital stay, and only 7.1% were prescribed both inpatient and outpatient (extended) prophylaxis.^{13,*}

60% **60% were not prescribed pharmacologic prophylaxis.**¹³

Only 7.1% were prescribed both inpatient and outpatient prophylaxis.¹³ **7.1%**

An analysis of nearly 6 million US hospital discharges in patients with acute medical illness found that approximately 1.9 million patients were eligible for extended VTE prophylaxis; of those patients, 58.5% had infection reported as the qualifying primary medical diagnosis, and those with infections comprised 65.4% of

patients with high VTE risk.²³ The number of patients at risk of VTE may be even higher now due to the COVID-19 pandemic.^{23,24} The results of several international meta-analyses reported the prevalence of VTE among hospitalized patients with COVID-19 to range from 13% to 21%.²⁵⁻²⁸

Furthermore, the results of a retrospective analysis of hospital electronic health record data showed that 17.5% of VTE prophylaxis doses ordered on medical floors were not administered.²⁹ This was a significantly higher proportion of unadministered doses (8.1%; $P < 0.0001$) than noted for other floors examined in the study. On medical floors, documented refusals—most commonly by patients or caregivers—comprised the reasoning for more than two-thirds of the unadministered doses.^{29,**} Thus, low rates of VTE prophylaxis among medically ill patients may be due to patient refusal as well as underprescribing by providers, underscoring the value of initiatives aimed at educating both groups on the risk of VTE and the importance of appropriate prophylaxis.

In 2020, the American Heart Association published a call to action to reduce VTE incidence in hospitalized patients by 20% by 2030, in part through universal risk assessment.¹⁰

Risk assessment models (RAMs) can identify surgical or medically ill patients who are potentially at risk of VTE through risk score calculation based on weighing several known risk factors.²

Factors considered for risk of VTE in different RAMs include¹⁰:

- **previous VTE**
- **family history of thrombosis**
- **current cancer**
- **thrombophilia**
- **patient age**
- **cardiac and pulmonary function**
- **obesity**
- **recent stroke or trauma (including surgery)**
- **mobility level**

Each risk factor is assigned a value, and the total of these values is a patient's overall risk score.^{10,30} The score indicates to the provider whether a patient is at risk of VTE as well as their level of risk from low to high.³⁰ Each VTE risk score can then be tied to an order set of prophylactic measures recommended by guidelines that the provider can choose to accept or not, depending on a patient's bleeding risk.² RAMs also can serve to identify those patients who are not at risk of VTE to prevent overprophylaxis. Likewise, use of a RAM can aid in determining which patients may benefit from extended prophylaxis.²

Multiple RAMs are available to assess the risk of VTE. A complete VTE prevention protocol includes both VTE risk assessment and bleeding risk assessment, as well as clinical decision support to guide appropriate prophylactic choices based on the identified risk factors.² Thus, the goal of this publication is to provide an actionable resource for provider organizations seeking to implement a VTE prevention protocol to reduce the incidence of preventable VTE in hospitalized medically ill (nonsurgical) patients.

Footnotes:

*This study analyzed hospital discharge data from the Truven Health Analytics MarketScan Inpatient Drug Link databases between 2012 and 2015, which revealed that 830 VTE events occurred in 17,895 hospitalized acutely ill medical patients (total incidence, 4.6%). Prescription of VTE prophylaxis was determined from pharmacy records (inpatient) and pharmacy claims within 15 days after VTE diagnosis (outpatient). This analysis is limited by the inherent possibility of coding errors, the lack of information about patient immobility, and the chance that databases used may not be representative of the US population as a whole. Low vs high VTE risk could not be ascertained due to database limitations and lack of standardized RAMs used during the study period.¹³

*This analysis examined Truven Health MarketScan Commercial and Medicare Supplemental healthcare claims data from 2011 to 2015 in 12,785 patients (age, ≥ 40 years) hospitalized with acute medical illness. The results showed that 268 patients experienced VTE during index hospitalization. The odds ratio (OR) of a VTE-related readmission within 6 months was 4.65 (95% CI, 3.00-7.21; $P < 0.001$). This study is limited by the inherent possibility of coding errors and associated overestimation of VTE and associated costs. Databases used may not be generalizable to the US population as a whole. Furthermore, some patients may have experienced VTE events beyond the follow-up period that were not captured. Finally, the overall VTE recurrence cost burden may have been underestimated, as analyzed costs were for final payment amounts and not costs incurred or charged.¹⁵

*The inflated numbers are based solely on dollar amounts and do not account for other influences on medical costs (eg, new treatments or management strategies).

**Analysis of US National Inpatient Sample data in 2014. The claims database used may include biases (eg, misclassification), and does not contain robust immobility data; in addition, there is no standardized immobility status evaluation in the literature. Thus, the analysis defined immobility as hospitalization (≥ 3 days), which may have led to an overestimation of patient risk. Finally, data used may not be generalizable to non-US patients hospitalized for acute medical illness.²³

**This analysis examined electronic medication administration records and computerized provider order entry system data on hospitalized patients who received VTE prophylaxis (December 1, 2007, to June 30, 2008). Among doses of VTE prophylaxis ordered on medicine floors, 17.5% were not administered. This was significantly higher than the 8.1% of unadministered doses from surgery, neurology, and intensive care unit (ICU) floors combined (OR, 2.1; 95% CI, 2.0-2.2; $P < 0.0001$). This study is limited by its retrospective nature, which did not provide context for reasoning of unadministered doses, and the sequential nature of ordered doses could not be analyzed. Furthermore, patient floor location reflected the discharge location; therefore, it would not account for patients who were moved to different floors during a single hospital stay (eg, patients moved into and out of ICU floors).²⁹

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REDUCING HOSPITAL-ASSOCIATED VENOUS THROMBOEMBOLISM THROUGH AN AUTOMATED RISK ASSESSMENT MODEL: THE VTE RISK ASSESSMENT PROGRAM AT NORTHSHORE UNIVERSITY HEALTHSYSTEM*

To facilitate risk assessment of venous thromboembolism (VTE) in all patients, healthcare professionals at NorthShore University HealthSystem in Evanston, Illinois, integrated an automated VTE risk assessment model (RAM) into their electronic health record in 2020. The integrated RAM includes a series of questions about a patient's current medical condition and past medical history that may point to increased risk of VTE. The answers to these questions are assigned a value, and the total of these values compose a patient's VTE risk score. This determines if the patient is at low, medium, or high risk of developing VTE during or after hospitalization. Order sets for appropriate prophylaxis are tied to each patient's individual risk score and include appropriate pharmacological or mechanical VTE prophylaxis as recommended by clinical guidelines (eg, from the American Society of Hematology or American College of Chest Physicians).

The VTE Risk Assessment Program at NorthShore University HealthSystem aligns with the Agency for Healthcare Research and Quality's guidance, "Preventing Hospital-Associated Venous Thromboembolism," which includes the following¹:

- ensuring institutional support and administrative buy-in;
- identifying previous or ongoing efforts and resources;
- assembling a team and setting the scope, goals, and timeline;
- structuring the framework and implementing the protocol; and
- tracking hospital-associated VTE and the appropriate prophylactic prescription with metrics.

Key cross-functional stakeholders from NorthShore University HealthSystem who were involved in developing the automated RAM were interviewed to learn the process used to successfully implement this tool. NorthShore's integrated RAM program was created with the goal of decreasing preventable VTE in hospitalized patients, and the subsequent discussion around its development may serve as an example for other health systems that wish to design similar initiatives.

*Individual participants from NorthShore were compensated by Janssen Pharmaceuticals, Inc., for their involvement in this publication.

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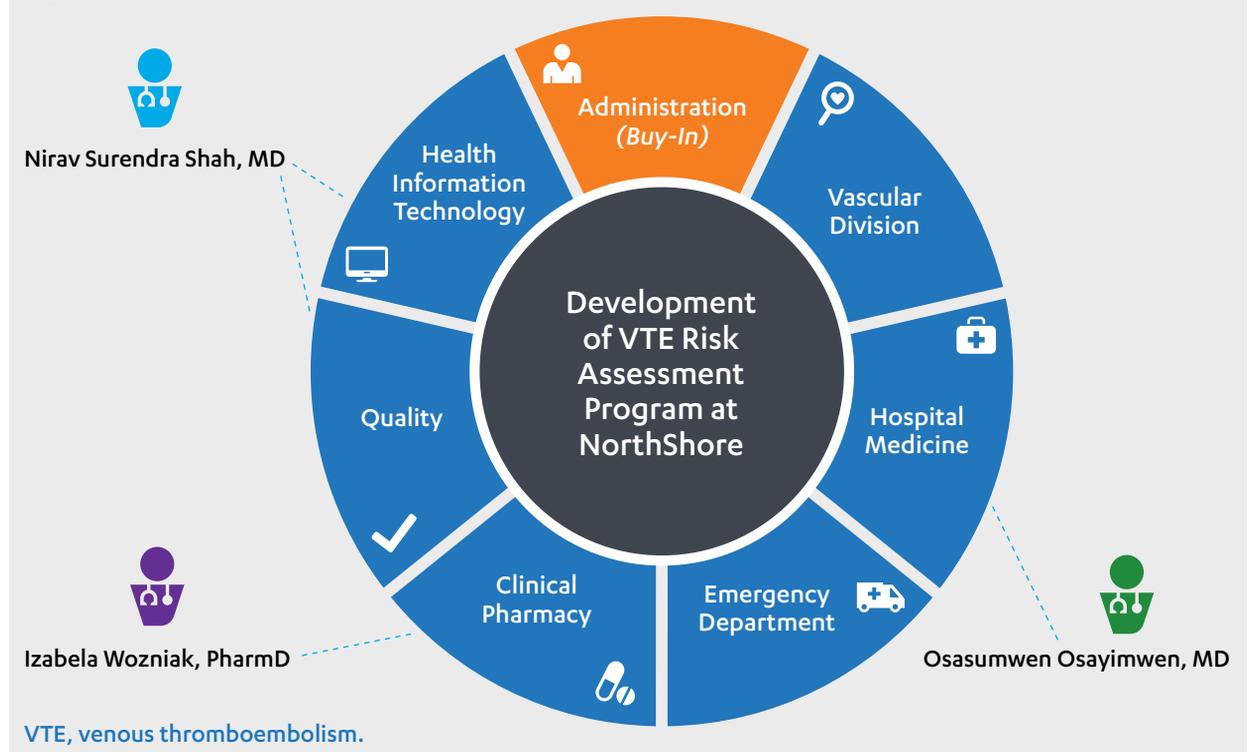
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The VTE Risk Assessment Program at NorthShore University HealthSystem began with the surgical team, who wanted a standardized and automated VTE risk stratification tool to use for patients undergoing surgery. In conjunction with members of the surgical team, the health information technology (HIT) team began developing a tool that could be integrated into the electronic health record (EHR). Because of the increased incidence of VTE seen among patients with COVID-19 at NorthShore University HealthSystem around the same time, the vascular team requested a similar tool for risk assessment in medically ill patients. Requests related to COVID-19 were fast-tracked with support and resource allocation from the administration, so this project received prioritization. A multidisciplinary task force was created to accelerate development of the project (**Figure**).

Figure. NorthShore University HealthSystem Task Force Departments and Key Stakeholders



To garner additional buy-in from departmental leadership, HIT, and all clinicians, the multidisciplinary task force implemented multiple pilot programs to manually collect relevant data on patients with VTE. Shah described the team’s process once the RAM was automated. “We compared the automated scoring against a human collecting the data on the same patients,” he explained. “Our results showed that the [automated] tool could more accurately predict patients’ risk than [could] a busy clinician, nurse, resident, or physician who attempted to manually capture this information on each patient.” These results, indicating that the automated tool was better at capturing some basic data elements, helped garner acceptance of the program, according to Shah. Moreover, the automated RAM proved easy to use, indicating the potential to decrease the time burden of VTE risk assessment for providers. Both factors were key to gaining sponsorship and support both from the administration and from key opinion leaders.

IDENTIFY PREVIOUS OR ONGOING EFFORTS AND RESOURCES

For more than 10 years before this program was implemented, staff manually assessed patient VTE risk using a paper-based model or employed a simplistic automatic scoring system. However, Shah emphasized that manually completing a robust risk assessment was burdensome due to time constraints, and this created a major barrier to mandatory implementation. “There was so much resistance to execute [robust VTE risk assessments] manually by the hospitalist team, because it’s just so burdensome,” he explained. “It can take 15 minutes to go through each questionnaire.” However, variables in these questionnaires such as family history, immobility, comorbid conditions, and information about

recent surgery or trauma are vital to determining a patient’s risk of VTE and their need for prophylaxis. According to Shah, the disconnect between the time required to complete a manual assessment and the importance of the resultant information helped spur the movement toward automation. The multidisciplinary task force began to brainstorm whether it was possible to enable extraction of these important variables from the EHR in a step toward automatically calculating risk and increasing the ease and accuracy of the VTE risk assessment.



ASSEMBLE A TEAM, AND SET THE SCOPE, GOALS, AND TIMELINE

Once the decision was made to create an automated VTE risk assessment process, the task force needed to determine how to operationalize the RAM within Epic, NorthShore University HealthSystem’s EHR software. The goal was to make it easy for providers to change their established behavior during patient admission with seamless RAM integration and automatic risk calculation. As a clinician and Epic build expert, Shah was the ideal bridge between the clinical side—the vascular, clinical pharmacy, and hospital medicine departments, as well as the process owners (point-of-care personnel) who would be using the program daily—and the HIT experts who would be developing the EHR framework structure. These HIT experts would act as the quality improvement facilitators by examining the results.

According to Shah, the process took about a year from initial presentation of the idea to implementation within the EHR, including 2 to 3 months of data capture followed by time for the task force members to address concerns and implement considerations from

other stakeholders before broad deployment of the program. “The HIT team worked in conjunction with the task force to develop the electronic version of the [RAM] as well as the logic behind the recommendations, the related order sets, and the best practice alerts [BPAs],” shared Osayimwen. “By a large extent, the success of this initiative lay in the hands of HIT, who made for a seamless and meaningful change in behavior for the staff.”

Wozniak discussed some of the challenges with integration, sharing that, “although we could speak of all the factors that should be [in the RAM], we did not know how to manipulate [the EHR] to incorporate these factors and to communicate the risk to the user.” Shah attested that he personally reviewed thousands of data elements to group similar diagnosis codes (eg, unspecified infection, urinary tract infection, pneumonia) and validated the results. The HIT team was key to translating diagnosis codes and other data elements from the EHR into calculable risk factors in the model.





The goal of the electronic RAM was to accurately detect all patients at risk of VTE while reliably excluding patients who would be unlikely to develop VTE. This also would allow for minimization of inappropriate prophylaxis in patients who are at lower risk of VTE, which Wozniak described as crucial.

To circumvent challenges with adjusting long-standing behaviors among providers, the task force prioritized use of a systemwide RAM. This meant that providers in different departments all would be trained and become accustomed to the electronic RAM that would be used for all patients, regardless of surgical or medical admission. Because VTE risk assessment is part of the admissions protocol, every patient who is admitted receives a risk score, which then accompanies the patient in the EHR through every step of their stay. Osayimwen emphasized, “This culture of VTE risk prevention is not new to our institution,” and he explained that providers appreciated the electronic RAM integration, as it made their jobs easier. Each department trained their clinicians (including physicians, nurses, and pharmacists) on the tool, using talks and demonstrations at meetings as well as by providing accessible protocols for reference. Osayimwen also shared that “the program uses several levels of provider oversight to ensure we are providing safe care.” There also is a patient portal available in multiple languages, which allows patients to input additional health history information.

Risk scores are linked with order sets that provide appropriate prophylaxis options based on VTE prevention guidelines and clinical trial data results. The ordering physician for every patient is required to either prescribe VTE prophylaxis for that patient or to record in the EHR the reason for not prescribing prophylaxis (eg, high bleeding risk, low VTE risk). With assistance

from the vascular division, Wozniak provided pharmacologic insight for designing the order sets, as special populations (eg, patients who are underweight, or those who have obesity or renal dysfunction) may require different interventions.

The goal of the electronic RAM was to accurately detect all patients at risk of VTE while reliably excluding patients who would be unlikely to develop VTE.

For the tool to be useful, easy identification of patients at high risk of VTE and clear decision support were crucial. Over multiple iterations, the task force worked to ensure that the interface would clearly state a patient’s VTE risk as either low, medium, or high. BPAs with suggested order sets of recommended VTE prophylaxis are tied to the patient’s risk status. In addition, if a patient’s risk score changes, a new BPA may appear to suggest appropriate adjustment of VTE prophylaxis.

According to the key stakeholders, a major benefit of the tool is that risk scores are continuously and automatically updated throughout a patient’s stay. Shah gave an example: “If a patient is admitted, and they have a low-risk score that does not require VTE prophylaxis, but they [later] require a PICC [peripherally inserted central catheter] line or they have some infection or they develop a variety of different criteria that start adding to their score, we can now attach decision support,” due to the automated risk scoring of the tool based on EHR updates. He continued, “We know at the right time when the patient should be on VTE prophylaxis.” Providers also receive BPAs on when to stop prophylaxis; for example, if it is recorded in the EHR that a patient on an

anticoagulant experienced a brain hemorrhage, the patient's VTE prophylaxis may change.

Patients' bleeding risk also must be considered, according to all stakeholders interviewed. Some of the bleeding risk factors included in the RAM are active gastroduodenal ulcer, recent intracranial bleed, and low platelet count; this assists providers in making the best clinical decision for each patient.

For the tool to be useful, **easy identification of patients** at high risk of VTE and **clear decision support** were crucial.

BPA's also are triggered to encourage providers to document their reasoning behind their treatment decisions. Shah explained that when a provider makes the decision not to prescribe prophylaxis, or to stop anticoagulation treatment in a patient at risk of VTE, they will receive a BPA reminding them to record their reason for doing so. "Based on the criteria for the reason why a provider would not want a patient on VTE prophylaxis, that then determines whether the BPA fires again, either during that encounter or in a day or 2 days," he said.

To avoid alert fatigue, Osayimwen stressed the importance of meeting with a committee that regularly reviews BPA's "to balance the utility and the nuisance element of the alerts." Prior to the initial program rollout, this committee approved the BPA's that would be included in the RAM; after rollout, the multidisciplinary task force continues to work with the committee to fine-tune the sensitivity of the alerts.

The stakeholders explained that it is crucial to remain abreast of VTE prophylaxis recommendation changes in all patients to best balance prevention of VTE while safeguarding

against increased risk of bleeding. There are multiple RAMs to choose from.² Current guidelines do not make recommendations about which RAM to use or which prophylaxis agent to prescribe based on VTE risk score. Therefore, the multidisciplinary team determined appropriate VTE prophylaxis recommendations, explained Wozniak. As such, order sets may look different among separate institutions based on input from various teams. Furthermore, as the order sets are integrated into the EHR, institutions that use different EHR platforms will likely have different order set designs.

In addition to recommending treatment during a patient's hospital stay, the program provides decision support to providers for patients who may need extended prophylaxis after discharge; these individuals include those who are at high risk of VTE. Currently, it is a manual process to create a discharge summary with extended prophylaxis orders at NorthShore University HealthSystem; however, Wozniak confirmed that the team is working to develop an automated process within the EHR.



Integrated into the program is internal coding that allows for assessment of 3-month VTE and thrombosis/bleed-related readmittance rates within the health system. The goal of capturing this is to use these data to improve the decision support structure where needed. For example, data may show that a certain patient population is more prone to hospitalization from anticoagulant prophylaxis–associated bleeding; subsequently, the system can be updated to recommend mechanical prophylaxis in this group. The ability to monitor outcomes across all patients may provide useful population-specific insights for prophylaxis, particularly among populations that are underrepresented in VTE prophylaxis clinical trials (eg, patients with renal insufficiency or those with a body mass index $<18.5 \text{ kg/m}^2$ or $>30 \text{ kg/m}^2$), and may require separate considerations when determining appropriate prophylaxis based on renal function and weight.

Key to allowing for upgrades and improvement of the framework was ensuring that the structure of the tool was straightforward.

According to Shah, the Quality team also tracks rates of appropriate prophylaxis prescription across the institution and VTE incidence during and after hospitalization at 30-day intervals. These results can motivate program review. For example, a thorough program evaluation recently occurred at NorthShore University HealthSystem because of a registered increase

in some deep vein thrombosis/pulmonary embolism outcomes.

The availability of informatics and analytics of VTE risk in every patient since the program's inception allowed for parsing the data to identify education- or process-related issues. "The multidisciplinary leadership team made some recommendations based on the analysis results," Shah explained. "The changes have since been implemented, and we found that our VTE rates decreased after we modified and enhanced our decision support system."

Key to allowing for upgrades and improvement of the framework was ensuring that the structure of the tool was straightforward. One vital update to the system was automatically scoring patients with COVID-19 who were admitted to the intensive care unit as being at high risk for VTE. This was in accordance with published data on increased thrombosis risk in this patient population.³ Aside from prophylactic guideline recommendation changes, Wozniak said that order sets will ideally be reviewed and updated every 2 years.



The team at NorthShore University HealthSystem emphasized the benefits of automation in continuous VTE risk assessment. Integration of the RAM into the EHR facilitated analysis of data on decision support and VTE prophylaxis, enabling the team to address gaps and areas of focus to help improve outcomes for patients. The key was designing the framework to make implementation of program changes simple after the system was in place. This also enabled back-end changes to be made without having to re-educate providers. “If you [are] able to look at the whole picture, you have a very good idea of what changes you need to make to potentially improve your outcomes,” said Shah.

Wozniak stressed that other institutions considering implementation of similar integrated VTE RAMs should not be intimidated to start a program, despite the inherent complexity. “Choose a RAM, choose as many of the points that you can automate as possible; you will always have room to improve,” Wozniak said.

“The automated RAM is definitely something that is going to be a work in progress and that needs a multidisciplinary team of people, not only to initiate the program, but then also to help maintain it so that it remains usable and friendly for the user,” she added.

Osayimwen also emphasized the multidisciplinary input needed for success. “I think a big part of the success we had was how we leveraged HIT to create an electronic risk-scoring tool, easy-to-follow order sets, and, [crucially,] the BPAs in the background nudging us and ensuring that the rules were followed to make sure we’re providing safe care to our patients.”

“Choose a RAM, choose as many of the points that you can automate as possible; you will always have room to improve.”

– Izabela Wozniak, PharmD

Results from the evaluation of the RAM, including patient outcomes, are planned for scientific presentation in the future.

References

1. Maynard G. Preventing hospital-associated venous thromboembolism: a guide for effective quality improvement, 2nd ed. AHRQ Publication No. 16-0001-EF. Agency for Healthcare Research and Quality. Reviewed August 2016. Accessed July 26, 2022. <https://www.ahrq.gov/patient-safety/resources/vtguide/index.html> 2. VTE prophylaxis for the medically ill patient. AC Forum. Updated December 2021. Accessed July 21, 2022. https://acforum-excellence.org/Resource-Center/resource_files/-2021-12-07-085003.pdf 3. Al-Samkari H, Karp Leaf RS, Dzik WH, et al. COVID-19 and coagulation: bleeding and thrombotic manifestations of SARS-CoV-2 infection. *Blood*. 2020;136(4):489-500. doi:10.1182/blood.2020006520

RESOURCES FROM JANSSEN

In support of standardized venous thromboembolism (VTE) prophylaxis risk stratification of hospitalized and post hospital-discharged medically ill patients, Janssen has developed a VTE prophylaxis order set build guide that leverages recommendations made by the Anticoagulation Forum. Leveraging health information technology (HIT) to streamline the ordering process may help drive provider workflows, provide clinical decision support, and guide standard orders for treatment of a particular condition or group of conditions.¹

**Venous Thromboembolism (VTE)
Prophylaxis Order Set Guide**

janssen PHARMACEUTICAL COMPANY OF
JOHNSON & JOHNSON

**Using Electronic Health Records (EHRs) to Support VTE
Prophylaxis Order Sets**

- Allscripts Sunrise
- Cerner
- Epic

This Guide provides a high-level overview of what to consider and how to configure an order set tool within 3 EHR systems to support providers in ordering VTE prophylaxis for at-risk patients during hospitalization and post hospital discharge.

There may be opportunity to facilitate standardization of VTE risk stratification of hospitalized and post hospital discharged medically ill patients. Leveraging Health Information Technology (HIT) to streamline the ordering process may help drive provider workflows, provider clinical decision support, and guide standard orders for treatment of a particular condition or group of conditions.¹

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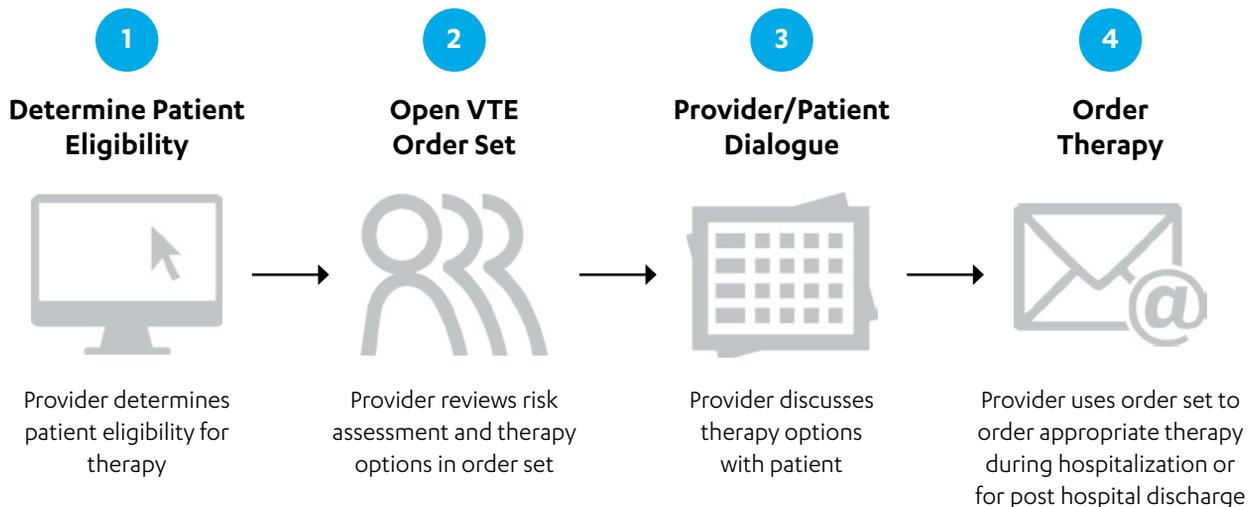
The VTE Prophylaxis Order Set leverages recommendations made by the Anticoagulation Forum.²

References

1. Bobb AM, Payne TH, Gross PA. Viewpoint: controversies surrounding use of order sets for clinical decision support in computerized physician order entry. *J Am Med Inform Assoc.* 2007;14(1):41-47. doi:10.1197/jamia.M2184.
2. VTE prophylaxis for the medically ill patient. AC Forum. Updated December 2021. Accessed July 21, 2022. https://acforum-excellence.org/Resource-Center/resource_files/-2021-12-07-085003.pdf

VTE Prophylaxis Order Set

The VTE Prophylaxis Order Set leverages recommendations made by the Anticoagulation Forum.¹



Potential Benefits of Order Sets

- May facilitate standardization of VTE prophylaxis risk stratification of hospitalized medically ill patients¹
- May standardize ordering workflows by providing complete and consistent order sets to providers at the point of care²
- May encourage and facilitate interactions between providers and patients and other providers to contribute to more coordinated care³

References

1. VTE prophylaxis for the medically ill patient. AC Forum. Updated December 2021. Accessed July 21, 2022. https://acforum-excellence.org/Resource-Center/resource_files/-/2021-12-07-085003.pdf 2. Kleinberg KA. Order sets: a key component of CPOE. The Advisory Board Company. 2010. 3. Health IT: advancing America's Health Care. Office of the National Coordinator for Health Information Technology. Accessed July 21, 2022. <https://www.healthit.gov/sites/default/files/pdf/health-information-technology-fact-sheet.pdf>

HIT Evaluation Considerations

Organizations may consider evaluating the impact of implementing electronic health record (EHR) order sets.



Improved Patient Care

Measure outcomes for medically ill patients who are prescribed therapy through the order set (eg, length of stay, readmission rates)



Provider Uptake of HIT Tools

Use EHR system reporting tools to measure provider utilization of implemented tools (eg, number of times the order set was accessed, number of orders placed)



Quality Measure Dashboard

Measure and track the performance data relative to the electronic clinical quality measures as generated by a provider's EHR¹



Overall Patient Engagement

Utilization of order sets may facilitate measurable patient engagement and overall satisfaction

Reference

1. Electronic clinical quality measures basics. Centers for Medicare & Medicaid Services. Accessed July 21, 2022. <https://www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/ClinicalQualityMeasures>.

ADDITIONAL RESOURCES

Resources for Providers

Agency for Healthcare Research and Quality: Preventing Hospital-Associated Venous Thromboembolism

<https://www.ahrq.gov/patient-safety/resources/vtguide/index.html>

Anticoagulation Forum

<https://acforum.org/web>

***Journal of Hospital Medicine*—Volume 11 (issue S2): Preventing Hospital-Acquired Venous Thromboembolism: Lessons From the Field**

<https://shmpublications.onlinelibrary.wiley.com/toc/15535606/11/S2>

Online Training

Centers for Disease Control and Prevention: Venous Thromboembolism (Blood Clots)

<https://www.cdc.gov/ncbddd/dvt/training.html>

Online Webinars

Centers for Disease Control and Prevention: Public Health Webinar Series on Blood Disorders

<https://www.cdc.gov/ncbddd/blooddisorders/webinar.html>

Resources for Patients

National Blood Clot Alliance/Centers for Disease Control and Prevention: Stop the Clot, Spread the Word

<https://www.stoptheclot.org/spreadtheword/>

This Is Serious: How Can I Prevent DVT?

<http://thisisserious.org/prevention>

Centers for Disease Control and Prevention: Learn About Healthcare-Associated Venous Thromboembolism

<https://www.cdc.gov/ncbddd/dvt/ha-vte.html>

American Society of Hematology: Deep Vein Thrombosis: Myths vs. Facts

<https://www.hematology.org/education/patients/blood-disorders/deep-vein-thrombosis>



Prashanthi Suganthan, *Pleasant Walk*

Prashanthi, who works for Janssen in Global Regulatory Affairs, is active in cancer advocacy and shares her paintings to bring about joy and positivity.