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Inaccuracies of Venous Thromboembolism Risk Assessment and Prevention Practices Among Medically Ill Patients

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Abstract:
Venous thromboembolism (VTE) is a common cause of preventable harm among hospitalized, medically ill patients. The purpose of this study is to evaluate the accuracy of Padua VTE risk assessments, VTE prevention practices, and outcomes. In this retrospective analysis of consecutively hospitalized, medically ill patients at The Johns Hopkins Hospital from January 1 through April 30, 2019, a hematologist subject matter expert (SME) retrospectively completed a Padua VTE risk assessment for every patient. Results were compared with risk assessments completed by the admitting provider. The primary outcome was agreement between the SME and admitting provider on overall VTE risk. Secondary outcomes included agreement on VTE risk factors, risk-appropriate VTE prophylaxis prescription and administration, and VTE outcomes. Of 4,021 patients included, agreement between admitting providers and the SME on overall VTE risk was 65.3%. The SME identified 1,156 (28.7%) patients as high risk who were categorized on admission as low risk. Risk factors with the lowest agreement were reduced mobility and acute infection. 2,141 (53.2%) patients were prescribed appropriate VTE prophylaxis. Thirty-six patients developed in-hospital VTE, including 21 who had been misclassified as low risk. Significantly more doses of prescribed VTE prophylaxis were not administered among patients who developed VTE (19.6% vs. 15.2%, p=0.007). Inaccurate VTE risk assessment leads to inappropriate VTE prevention practices and preventable VTE. Leveraging existing, structured data to autopopulate VTE risk assessments can assist providers in improving accuracy. Quantitative measures of patient mobility should be incorporated into VTE risk assessment.

Conflict of interest: COI declared - see note

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Data Sharing Statement

For original de-identified data, please contact mstreif@jhmi.edu

KEY POINTS

- VTE risk assessments completed by admitting providers are often inaccurate, leading to inappropriate VTE prevention and development of VTE
- Reduced mobility is a major VTE risk factor frequently misjudged on admission, and should be evaluated throughout hospitalization

ABSTRACT

Venous thromboembolism (VTE) is a common cause of preventable harm among hospitalized, medically ill patients. The purpose of this study is to evaluate the accuracy of Padua VTE risk assessments, VTE prevention practices, and outcomes. In this retrospective analysis of consecutively hospitalized, medically ill patients at The Johns Hopkins Hospital from January 1 through April 30, 2019, a hematologist subject matter expert (SME) retrospectively completed a Padua VTE risk assessment for every patient. Results were compared with risk assessments completed by the admitting provider. The primary outcome was agreement between the SME and admitting provider on overall VTE risk. Secondary outcomes included agreement on VTE risk factors, risk-appropriate VTE prophylaxis prescription and administration, and VTE outcomes. Of 4,021 patients included, agreement between admitting providers and the SME on overall VTE risk was 65.3%. The SME identified 1,156 (28.7%) patients as high risk who were categorized on admission as low risk. Risk factors with the lowest agreement were reduced mobility and acute infection. 2,141 (53.2%) patients were prescribed appropriate VTE prophylaxis. Thirty-six patients developed in-hospital VTE, including 21 who had been misclassified as low risk. Significantly more doses of prescribed VTE prophylaxis were not administered among patients who developed VTE (19.6% vs. 15.2%, p=0.007). Inaccurate VTE risk assessment leads to inappropriate VTE prevention practices and preventable VTE. Leveraging existing, structured data to autopopulate VTE risk assessments can assist providers in improving accuracy. Quantitative measures of patient mobility should be incorporated into VTE risk assessment.

INTRODUCTION

Venous thromboembolism (VTE), composed of deep vein thrombosis (DVT) and/or pulmonary embolism (PE), is a common condition among hospitalized patients.[1] When used appropriately, VTE prophylaxis has been shown to significantly reduce the incidence of DVT and PE, including fatal PE among hospitalized medically ill patients.[2] Comprehensive, evidence-based VTE risk assessment models exist to help clinicians calculate VTE risk and determine what, if any, VTE prophylaxis is appropriate for each patient.[3-6]

The Padua VTE risk assessment model was developed and validated for medically ill patients.[4] The Johns Hopkins Hospital implemented Epic as its electronic health record (EHR) system and, expanding upon previous work,[7-9] included a Padua risk assessment model, coupled with computerized clinical decision support, to guide providers to prescribe risk-appropriate VTE prophylaxis when admitting medically ill patients. For this risk assessment tool to be valid, it is crucial that risk assessments are completed accurately and consistently for every hospitalized patient.

The purpose of this study is to evaluate the accuracy of VTE risk assessments completed for medically ill patients, the appropriateness of VTE prophylaxis prescription based on each patient's risk profile, and factors associated with the development of VTE. We hypothesize that some individual risk factors included in the Padua risk assessment model are not appropriately identified by providers, leading to suboptimal VTE prophylaxis prescription and ultimately, potentially preventable harm from VTE.

METHODS

This was a retrospective study of consecutively hospitalized medically ill patients at The Johns Hopkins Hospital, a quaternary care medical center in urban Baltimore, Maryland. Patients were identified by use of the general medicine VTE risk assessment tool from January

1 through April 30, 2019. This study was approved by the Johns Hopkins Medicine Institutional Review Board.

When completing a mandatory VTE risk assessment orderset, a checklist of VTE risk factors and contraindications to pharmacologic VTE prophylaxis are selected by the admitting provider in the EHR at the time of admission and stored as discrete data elements. Patient demographics, clinical characteristics, VTE risk factors, initial prophylaxis prescribed, and administration of prescribed VTE prophylaxis were retrieved from the EHR. VTE outcomes were identified using ICD-10 codes and incidence of clinically relevant bleeding were manually validated via chart review independent of the VTE risk assessment data. A hematologist (MBS) subject matter expert (SME) retrospectively reviewed the chart of all patients and completed an independent risk assessment applying the criteria used by the Padua risk assessment model.[4] The patient's recorded age and BMI at the time of admission were used. The admission history and physical examination was reviewed for applicable VTE risk factors for each patient.

One of the VTE risk factors in in the Padua risk assessment model is "reduced mobility". To standardize and quantify mobility, we utilized the Johns Hopkins-Highest Level of Mobility (JH-HLM) scale, which is a reliable and validated 8-point scoring system to describe patient mobility from bed rest (JH-HLM score 1) to ambulating ≥ 250 feet (JH-HLM score 8).[10] This score is required to be documented at least once during each nursing shift.[11] To align with the Padua risk assessment model definition of reduced mobility, immobility was defined as ≥3 consecutive days where the documented JH-HLM score was ≤3 which indicates only bed-level mobility.[12] To complete the Padua risk assessment in real time, providers used their clinical judgement about the patient's expected level of mobility and did not have access to the JH-HLM scores at time of admission; however, when the SME retrospectively completed the Padua risk assessment, the JH-HLM score was used in determining patient mobility.

To avoid missing patients who would benefit from VTE prophylaxis, an institutional multidisciplinary VTE prevention workgroup previously agreed to implement a Padua score

cutoff of 3 points rather than the standard cutoff of 4 points to identify patients at high risk for VTE. As such, in this study patients were identified as low risk (Padua score <3) or high risk (Padua score ≥3) for developing VTE, and were assessed for contraindications to pharmacologic VTE prophylaxis, renal function, and weight. Compliance with the appropriate prophylaxis was determined following a pre-defined algorithm (Figure 1) which is built into the institutional clinical decision support tool. The EHR system requires documentation of all administered and non-administered prescribed prophylaxis doses, and the reason when not administered.

Statistical Analysis

Descriptive statistics were used for demographic and clinical characteristics. Agreement on individual VTE risk factors between the admitting provider and the SME was described using Cohen's kappa. Categorical data were reported as counts and proportions, and were analyzed using Chi-squared tests. Continuous data were reported as medians and interquartile ranges, and were analyzed using Wilcoxon rank sum tests. A receiver operator curve and c-statistic were generated to determine the discrimination between the Padua risk scores for developing VTE assigned by the admitting provider and by the SME. A c-statistic value <0.7 was considered weak, a value between 0.7 and 0.8 was considered good, and a value >0.8 was considered excellent.[13] All analyses were performed using STATA Statistical Software, version 18 (Stata Corp LP, College Station TX, USA).

RESULTS

A total of 4,021 patients were included (Table 1). Admitting providers identified 1,058 (26.3%) as high risk for VTE and 2,963 (73.7%) as low risk. Upon SME review, 1,974 (49.1%) were identified as high risk for VTE and 2,047 (50.9%) were identified as low risk. The distribution of the Padua scores between the SME and admitting providers is shown in the Supplemental Figure and Table.

Agreement was achieved between admitting providers and the SME that 818 (20.3%) patients were high risk and 1,807 (44.9%) were low risk (agreement 65.3%, $\kappa = 0.2996$, $p<0.001$). Upon review by the SME, 1,396 (34.7%) patients were found to have been misclassified which ultimately affected the appropriate VTE prophylaxis regimen recommended. A total of 1,156 (28.7%) patients were identified by admitting providers as low risk for VTE, but upon review were identified as high risk by the SME. Additionally, 240 (6.0%) patients who were identified as high risk for VTE were determined to be at low risk by the SME (Table 2).

Based on the initial risk assessment completed by the admitting provider, 1,894 (47.1%) patients were prescribed the appropriate VTE prophylaxis regimen. Overall, 2,141 (53.2%) patients were prescribed risk appropriate prophylaxis as determined by the SME. Among the 2,625 patients who were accurately risk assessed, 50.7% were prescribed appropriate VTE prophylaxis for their risk level. For patients at high risk for VTE for whom there was agreement between admitting providers and the SME, 81.5% were prescribed appropriate VTE prophylaxis and this group also had the highest proportion of contraindications to pharmacologic VTE prophylaxis identified (44.6%). Among patients where there was agreement of low VTE risk, only 36.7% were were prescribed risk appropriate prophylaxis due to the inappropriate prescription of pharmacologic VTE prophylaxis (Table 2).

Among 1,396 patients who were inaccurately risk assessed, 58.0% were prescribed appropriate VTE prophylaxis for the risk level determined by the SME. For patients who were ultimately determined to be at high risk, 67.2% were prescribed appropriate prophylaxis; for patients who were determined to be at low risk, 13.8% were compliant with appropriate VTE prevention (Table 2).

Among individual VTE risk factors, the strongest agreement was observed in age ≥70 years ($\kappa = 0.9842$). However, there was significant disagreement between the admitting providers and the SME on respiratory or heart failure ($\kappa=0.4054$), reduced mobility ($\kappa=0.0419$), acute infection or rheumatologic disorder ($\kappa=0.1398$, Table 3).

A total of 36 (1.5%) patients developed in-hospital VTE. Patients with VTE had a significantly longer median length of stay, and had a significantly higher median Padua score as determined by the SME (5 vs. 2, p<0.001); however, the median Padua score determined by the admitting providers was not different between patients with and without VTE (1 vs. 1, p=0.61, Table 4). The Padua score determined by the admitting providers showed weak discrimination for in-hospital VTE (c-statistic = 0.52) while the Padua score determined by the SME showed good discrimination (c-statistic = 0.74).

A total of 13 (0.3%) patients were prescribed pharmacologic VTE prophylaxis on admission and experienced clinically-relevant bleeding during hospitalization. The SME determined that 6 patients were at high risk for VTE and 7 patients were at low risk on admission.

Significantly more patients with hospital-acquired VTE were prescribed prophylaxis (86.1% vs. 57.5%, p<0.001); however, a significantly higher proportion of prescribed VTE prophylaxis doses were not administered among patients who developed VTE (19.6% vs. 15.2%, p=0.007). Significantly more doses of prescribed VTE prophylaxis were documented as having been refused among patients with VTE (16.9% vs. 11.9%, p=0.001, Table 4).

DISCUSSION

We found that 34.7% of medically ill patients were inaccurately assessed for their VTE risk on admission to the hospital resulting in an inappropriate VTE prophylaxis regimen recommendation. Only half of patients (53.2%) were prescribed risk appropriate VTE prophylaxis as determined by the SME. This discrepancy was due to inadequate VTE prophylaxis prescribing for high-risk patients and unnecessary VTE prophylaxis prescribing for low-risk patients. Major VTE risk factors most commonly missed by providers on admission were acute infection and reduced mobility. Among patients who developed VTE, the majority

were prescribed prophylaxis but missed significantly more prescribed doses than those without VTE.

We found that providers frequently misjudged immobility on admission, leading to significant errors in determining overall VTE risk. This was largely due to the fact that immobility is one of the most heavily weighted factors, contributing 3 points in the Padua risk assessment model. Immobility alone would categorize a patient as being at high risk for VTE at our institution. This underscores the importance of re-assessment of VTE risk throughout hospitalization, giving consideration not only to how the patient presents on admission but how their clinical condition improves or worsens. If patients are categorized as low risk, but are subsequently immobile for three days, their VTE risk score should be increased and prophylaxis initiated. Future efforts to improve VTE risk assessment should leverage existing documentation of known risk factors and measures, such as the JH-HLM mobility score. Additionally, clinical decision support tools should incorporate dynamic assessments of VTE risk factors to proactively prompt reassessment when clinically meaningful changes in VTE risk assessment scoring occur. To improve the accuracy of risk assessment, several VTE risk factors that are already discrete fields in the EHR, including age and obesity, should be auto-populated in the risk assessment tool when applicable. Other risk factors including history of VTE, active cancer, heart failure, and infection were identified in the admission history and physical examination by the SME, but were frequently missed by the admitting provider. Efforts should be made to leverage EHR data regarding past medical history and new diagnoses to guide risk assessment and minimize the likelihood that risk factors will be overlooked during the busy admission process.

To our knowledge, this is the first study to explore the accuracy of VTE risk assessment by providers and its impact on patient outcomes among medically ill patients. A previous study demonstrated that admitting providers were largely unable to predict immobility when admitting patients to the hospital.[12] Similarly, in the neurosurgical population, inaccuracies in VTE risk

assessments occurred leading to incorrect prophylaxis recommendations and inappropriate prescription.[14] These inaccuracies undermine efforts to provide decision support at the time decisions are being made to prescribe or not prescribe VTE prophylaxis.

A systematic review of the accuracy of risk assessment models for predicting VTE among hospitalized patients in real-world settings reported low accuracy.[15] Our findings support the notion that VTE risk may not be entirely quantifiable on admission, but may require ongoing monitoring during hospitalization. The Padua score calculated based on the risk assessment completed by providers on admission showed weak discrimination for in-hospital VTE, whereas the Padua score calculated based on the retrospective review by the SME showed good discrimination. While the second review was done by a subject matter expert with expertise in the field of VTE prevention and treatment, which may have contributed to greater accuracy, they also had the benefit of retrospective data to objectively quantitatively assess immobility during the initial days of hospitalization, data which were not available to providers completing VTE risk assessment at the time of hospital admission. While some may characterize this as bias with the benefit of hindsight, our study highlights the difficulty providers have identifying patients who will or will not have poor mobility To date, we are unaware of any validated prediction tool that can be used when admitting a patient to identify patients who will have ongoing immobility that puts them at risk for VTE.

A previous study showed significant differences in risk-appropriate VTE prophylaxis prescription among surgical residents for hospitalized surgical patients.[16] These results led to the provision of individualized feedback to admitting providers, resulting in significant improvement in appropriate VTE prophylaxis prescription;[17-20] however, these efforts assumed that the VTE risk assessment was performed accurately. The current findings suggest that a more robust assessment of both prescription compliance and risk assessment accuracy is warranted to ensure optimal VTE prevention practice.

Alarmingly, significantly more doses of prescribed VTE prophylaxis were missed among patients who developed VTE. Previous studies have identified non-administration of prescribed VTE prophylaxis as a common occurrence in a variety of hospital settings.[21-23] In particular, non-administration of VTE prophylaxis seems to be most common among medically ill patients and, consistently, the leading documented reason for non-administration is patient refusal.[24-26] Previous work has suggested that nurses may underappreciate the harms of VTE and benefits of prophylaxis, inaccurately communicating to patients that ambulation may be sufficient for VTE prevention.[27,28] However, there is no evidence to demonstrate the comparative effectiveness of ambulation versus pharmacologic prophylaxis to prevent VTE among hospitalized patients.[29] Furthermore, a growing body of evidence suggests that missed doses of prescribed VTE prophylaxis may be associated with developing VTE in surgical populations.[30-32] This study now shows the association of missed doses of prophylaxis is also associated with in-hospital VTE events in medically ill patients.

Several approaches have been tested and demonstrated to be effective for significantly reducing missed doses of prescribed VTE prophylaxis, with varying levels of resources required corresponding with varying magnitudes of effectiveness. Providing broad education to nurses using learner-centric, scenario-based education to ensure that all nurses have a common understanding of the harms of VTE and benefits of VTE prophylaxis required a limited amount of time and was associated with a 17% reduction in missed doses of prescribed VTE prophylaxis.[33] Providing monthly individualized feedback in the form of a scorecard to nurse managers to share with nurses on their floor required slightly more effort and was associated with a 28% reduction in missed doses.[34] Finally, leveraging transactional data from the EHR to notify a healthcare provider when a dose of VTE prophylaxis is missed, providing just-in-time, patient-centered education has been tested in numerous settings and has been repeatedly associated with a reduction in missed doses by more than 40%.[34-36]

Our study had several limitations. First, the SME assessment for immobility was based on data documented over the course of hospitalization that were not available to the provider at the time of admission. When the Padua risk assessment model was developed and validated, their method for determining immobility ≥3 days was based on retrospective review of patient medical records as well. The same limitation is true of other VTE risk factors such as active infection. Second, our VTE risk assessment tool at Johns Hopkins uses a Padua score cutoff of 3 to categorize patients as high risk for VTE. This institution-specific practice was implemented due to provider concerns at the time of VTE risk assessment tool development that too few patients would receive prophylaxis if the original threshold of 4 points was used. Future efforts should focus on improving the prediction of immobility and leveraging EHR data for dynamic re-assessment throughout hospitalization. Third, our approach required manual review of all VTE risk factors for all hospitalized, medically ill patients by an individual SME to assess accuracy. This is impractical for future quality improvement efforts to assess risk assessment accuracy. Finally, the overall number of VTE events was low, and the study was underpowered to determine what processes are associated with developing VTE. Contributing to our reported low numer is that we were only able to reliably identify in-hospital events as many VTE likely occur after discharge, diagnosed in outpatient settings or outside hospitals.

CONCLUSION

Among consecutively hospitalized medically ill patients, we found that inaccurate VTE risk assessment and VTE prophylaxis non-administration were common care defects. These data highlight the importance of accurate continual VTE risk assessment throughout hospitalization. Immobility is a major risk factor for developing VTE and future efforts should focus on identifying predictors of immobility to better guide VTE risk assessment on admission. Until improved predictors of immobility are identified, routine measurement of mobility and documentation in the EHR should be required and incorporated into VTE risk assessment

clinical decision support such that real-time notifications are generated when mobility changes significantly during the hospital stay. In addition, the impact of the duration and severity of immobility on the risk of VTE remain unclear. Future research efforts to develop quantitative measures of mobility and their association with VTE risk are warranted. Incorporation of validated quantitative assessments of mobility in future VTE risk assessment models may help target VTE prophylaxis to patients at greatest risk.

AUTHOR CONTRIBUTIONS

BDL, JCY, EHH, ERH, and MBS made substantial contributions to the conception or design of the work. BDL, AB, JCY, RN, KED, JL, DLS, PSK, EHH, ERH, and MBS participated in acquisition, analysis, or interpretation of data. BDL drafted the manuscript. AB, JCY, RN, KED, JL, DLS, PSK, EHH, ERH and MBS reviewed it critically for important intellectual content. All authors gave final approval of the version to be published.

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CONFLICTS OF INTEREST

Mr. Lau, Ms. Shaffer, Drs. Streiff and Haut were/are supported by contracts from the Patient-Centered Outcomes Research Institute (PCORI) entitled “Preventing Venous Thromboembolism: Empowering Patients and Enabling Patient-Centered Care via Health Information Technology” (CE-12-11-4489) and/or “Preventing Venous Thromboembolism (VTE): Engaging Patients to Reduce Preventable Harm from Missed/Refused Doses of VTE Prophylaxis” (DI-1603-34596). Dr. Haut and Mr. Lau received research grant support for a project titled “The Pathogenesis of Post-Traumatic Pulmonary Embolism: A Prospective

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Table 1: Demographic and clinical characteristics of patients included (N=4,021)

Median Age (IQR), years	57 (43-69)
Female, n (%)	2,023 (50.3)
Race, n (%)	
Black	2,088 (51.9)
White	1,572 (39.1)
Other	361 (9.0)
Median Weight (IQR), kg	76.8 (63-93.2)
Median BMI (IQR), kg/m2	26.6 (22.3-32.3)
Median LOS (IQR), days	4 (3-8)
Median Expert Padua Score (IQR)	2 (1-4)
Median Prescriber Padua Score (IQR)	1 (0-3)
Mortality, n (%)	75 (1.9)

BMI: body mass index; IQR: interquartile range; kg/m2: kilogram per square meter; LOS: length of stay

Table 2: VTE risk scoring and prophylaxis prescription on admission by differences in VTE risk stratification between admitting providers and the subject matter expert

	Discordant High* (n=1,156)	**Discordant Low** (n=240)**	**Concordant High (n=818)**	**Concordant Low (n=1,807)**
Median Padua Score (IQR)				
Expert	4 (4-5)	1 (1-2)	5 (4-7)	1 (1-2)
Prescriber	1 (0-1)	3 (3-4)	4 (3-5)	1 (0-1)
Prophylaxis Prescribed, n (%)				
Heparin 5000u q8h	325 (28.1)	70 (29.2)	208 (25.4)	383 (21.2)
Heparin 5000u q12h	33 (2.9)	11 (4.6)	32 (3.9)	32 (1.8)
Enoxaparin 40mg q24h	259 (22.4)	96 (40.0)	208 (25.4)	473 (26.2)
Other prophylaxis	8 (0.7)	3 (1.3)	10 (1.2)	16 (0.9)
Mechanical prophylaxis only	124 (10.7)	23 (9.6)	79 (9.7)	231 (12.8)
Therapeutic AC	138 (11.9)	28 (11.7)	196 (24.0)	154 (8.5)
No prophylaxis	269 (23.3)	9 (3.8)	85 (10.4)	518 (28.7)
Pharmacologic Prophylaxis Contraindication, n (%)	231 (20.0)	63 (26.3)	365 (44.6)	326 (18.0)
Prescribed Pharmacologic Prophylaxis, n (%)	625 (54.1)	180 (75.0)	458 (56.0)	904 (50.0)
Prescription Compliance, n (%)	777 (67.2)	33 (13.8)	667 (81.5)	664 (36.7)

*Subject matter expert assessed high risk, admitting provider assessed low risk
**Subject matter expert assessed low risk, admitting provider assessed high risk

AC: anticoagulation; IQR: interquartile range; VTE: venous thromboembolism

Table 3: Individual Padua VTE risk factors identified by admitting prescribers and the subject matter expert

	Admitting Provider n (%)	**Subject Matter Expert n (%)**	**Agreement (%)**	**kappa**
Age ≥70 Years (1 point)	945 (23.5)	968 (24.1)	99.4	0.9842
Ongoing Hormone Treatment (1 point)	2 (<0.1)	38 (0.9)	99.0	0.0491
Recent Surgery or Trauma (2 points)	29 (0.7)	53 (1.3)	98.2	0.0891
Known Thrombophilia (3 points)	103 (2.6)	26 (0.6)	97.5	0.2246
Acute MI or Ischemic Stroke (1 point)	5 (0.1)	178 (4.4)	95.4	-0.0024
Active Cancer (3 points)	78 (1.9)	277 (6.9)	94.2	0.3174
History of VTE (3 points)	615 (15.3)	596 (14.8)	92.5	0.7054
Obesity (1 point)	1137 (28.3)	1368 (34.0)	88.9	0.7430
Respiratory or Heart Failure (1 point)	1069 (26.6)	824 (20.5)	78.5	0.4054
Reduced Mobility (3 points)	187 (4.7)	1284 (31.9)	67.8	0.0419
Acute Infection or Rheumatologic Disorder (1 point)	255 (6.3)	1681 (41.8)	63.1	0.1398

MI: myocardial infarction; VTE: venous thromboembolism

Table 4: Patient characteristics, VTE risk, and prophylaxis use between patients with and without VTE

	In-Hospital VTE (n=36)	No In-Hospital VTE (n=3985)	P-value
Median Age (IQR), years	51 (35-67)	57 (43-69)	0.25
Female, n (%)	23 (69.9)	2000 (50.2)	0.13
Race, n (%) Black White Other	 17 (47.2) 15 (41.7) 4 (11.1)	 2071 (52.0) 1557 (39.1) 357 (9.0)	0.82
Median BMI (IQR), kg/m2	26.6 (22.6-30.8)	26.6 (22.3-32.3)	0.67
Median LOS (IQR), days	14.5 (8.5-26.5)	4 (3-8)	<0.001
Median Padua Score (IQR) Expert Prescriber	 5 (4-6) 1 (0-3)	 2 (1-4) 1 (0-3)	 <0.001 0.61
Patients VTE Risk Level, n (%) Discordant High Discordant Low Concordant High Concordant Low	 21 (58.3) 0 (0) 11 (30.6) 4 (11.1)	 1135 (28.5) 240 (6.0) 807 (20.3) 1803 (45.2)	 <0.001
Patients prescribed any prophylaxis during hospitalization, n (%)	31 (86.1)	2293 (57.5)	<0.001
Number of Doses Prescribed	504	23,513	
Doses Given, n (%)	405 (80.4)	19,945 (84.8)	0.007
Doses Missed, n (%)	14 (2.8)	779 (3.3)	0.62
Doses Refused, n (%)	85 (16.9)	2,789 (11.9)	0.001

IQR: interquartile range; LOS: length of stay; VTE: venous thromboembolism

Figure 1: Determination of risk-appropriate VTE prophylaxis prescription

Figure 1