

Venous Thromboembolism Prophylaxis: Inadequate and Overprophylaxis When Comparing Perceived Versus Calculated Risk

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Abstract

Guidelines for venous thromboembolism (VTE) prophylaxis recommend appropriate risk stratification using risk estimation models as high risk or low risk followed by initiation of chemical or mechanical prophylaxis, respectively. We explored adherence to guidelines on the basis of the documentation of VTE prophylaxis. A retrospective medical record review of 437 consecutive adult patients (≥ 18 years) admitted to general medical wards under medicine service between January 1, 2015, and March 1, 2015, was performed. The primary outcome was appropriateness of risk stratification using the Padua Prediction Score. Secondary outcomes were appropriateness of type of prophylaxis (chemical vs mechanical) and cost-benefit analysis. We observed appropriate stratification based on the documented risk (compared with the calculated risk) in 54.9% of the patients (40.8% with low risk vs 72.1% with high risk; $P < .001$). Overall, 182 of 240 low-risk patients received unnecessary chemical prophylaxis, whereas 23 of 197 high-risk patients without contraindications for chemical prophylaxis received mechanical or no prophylaxis. No clinical VTE events were noted in the patients inappropriately assigned to mechanical or no prophylaxis. Also, 67.3% of patients with both low documented and low calculated risk and 74.5% of patients with low documented and high calculated risk received chemical prophylaxis, consistent with a tendency toward overtreatment. A total of 4068 annualized patient-days (\$77,652/y) of inappropriate chemical prophylaxis were administered. In conclusion, estimation of the risk of VTE based on clinical impression was not congruent with the risk calculated using risk prediction models and was associated with a tendency toward overtreatment. These data support the inclusion of VTE risk calculators in electronic health record systems.

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Deep venous thrombosis and pulmonary embolism, together referred to as venous thromboembolism (VTE), are important causes of disability and death in hospitalized patients.¹ The incidence of VTE in hospitalized medical patients is approximated to be 1 in 1000 patients; however, current measurements underestimate the actual incidence of VTE due to the nonspecific symptoms that are often missed.^{2,3} For many years, the American College of Chest Physicians (ACCP) has recommended VTE prophylaxis for medical patients in whom the benefits appear to outweigh the risks. In 2012, the ACCP recommended that patients hospitalized under medical services should undergo appropriate risk stratification followed by

anticoagulant VTE prophylaxis in patients with high-risk features and without contraindications to anticoagulants.⁴ In 2014, the Centers for Medicare & Medicaid Services introduced quality-based reimbursement based on the presence or absence of VTE prophylaxis documentation.⁵ Following the introduction of quality-based reimbursement, an increasing rate of compliance with VTE prophylaxis (from 10% to 60%) has been observed.^{6,7} We hypothesized that in low-risk patients with VTE, chemoprophylaxis is prescribed more often than mechanical prophylaxis. In this study, we examined the extent and appropriate use (type and dosage) of VTE prophylaxis in hospitalized medically ill patients in a large teaching hospital in Baltimore, Maryland.

TABLE 1. Padua Prediction Score^{a,b}

Risk factor	Points
Active cancer ^c	3
Previous VTE (with the exclusion of superficial vein thrombosis)	3
Reduced mobility ^d	3
Already known thrombophilic condition ^e	3
Recent (≤ 1 mo) trauma and/or surgery	2
Elderly age (≥ 70 y)	1
Heart and/or respiratory failure	1
Acute myocardial infarction or ischemic stroke	1
Acute infection and/or rheumatologic disorder	1
Obesity (BMI ≥ 30)	1
Ongoing hormonal treatment	1

^aBMI = body mass index; VTE = venous thromboembolism.

^bIn the Padua Prediction Score risk assessment model, high risk of VTE is defined by a cumulative score of ≥ 4 points.

^cPatients with local or distant metastases and/or in whom chemotherapy or radiotherapy had been performed in the previous 6 mo.

^dAnticipated bed rest with bathroom privileges (either because of patient's limitations or on physician's order) for at least 3 d.

^eCarriage of defects of antithrombin, protein C or S, factor V Leiden, G20210A prothrombin mutation, antiphospholipid syndrome.

METHODS

We performed a retrospective medical record review of 500 consecutive adult patients (aged ≥ 18 years) admitted to general medical wards between January 1, 2015, and March 1, 2015. The exclusion criteria included admission to a nonmedical service; admission for pulmonary embolism or deep venous thrombosis; active bleeding or recent blood loss; anticoagulation therapy; presentation with systolic blood pressure of more than 200 mm Hg or diastolic blood pressure of more than 120 mm Hg; and pregnancy. After exclusion, a total of 437 patients were eligible for analysis. The individual patient's risk for VTE was calculated using the guideline-suggested Padua risk prediction model at the time of admission (Table 1).⁸ The score was then compared with the documented risk of VTE in the electronic medical record. The documentation of patient risk was compulsory for every patient and was predominantly based on physicians' clinical judgment with the noncompulsory provision of a supportive tool (Padua prediction model) to assist in decision making. The medical record of each patient was then examined to determine whether pharmacologic (chemical) or mechanical VTE prophylaxis was ordered and received. The Medication

Administration Record was used to check for prophylaxis received. This study was approved by the Institutional Review Board at Sinai Hospital of Baltimore.

Definitions

Appropriate risk stratification was a composite of low documented, low calculated risk with high documented, high calculated risk groups. Inappropriate risk stratification was a composite of low documented, high calculated risk with high documented, low calculated risk groups. The VTE prophylaxis was defined to include both pharmacological and mechanical means. The former category consisted of low-molecular-weight heparin, unfractionated heparin, and fondaparinux at prophylactic doses (dalteparin, $\leq 15,000$ IU/d; enoxaparin, ≤ 40 mg/d; and fondaparinux, < 5 mg/d, respectively). The mechanical measures included ambulation, graduated compression stockings, and intermittent pneumatic compression devices.

Primary and Secondary Outcomes

The primary end point was the appropriateness of risk stratification. The secondary end point was appropriateness of type of prophylaxis received. For a calculated Padua risk score of 4 or more, chemical prophylaxis (unless contraindicated) was considered appropriate, and for a score of less than 4, mechanical or no prophylaxis was considered appropriate. A cost-benefit analysis was conducted for inappropriate prophylaxis.

Statistical Analyses

Categorical variables are expressed as number (percentage) and continuous variables as mean \pm SD, with $P \leq .05$ considered statistically significant. Fischer exact test was used for comparison of categorical variables. Student *t* test was used to compare normally distributed continuous variables, whereas a Wilcoxon rank sum test was used to compare continuous variables that were not normally distributed. Percent total agreement, percent positive agreement, and κ statistics were calculated to assess the agreement between physicians' perceived risk for VTE and calculated risk. IBM SPSS, version 22.0, was used to perform all statistical analyses.

RESULTS

Appropriate risk stratification based on electronic documentation was observed in only

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