



A Review of the IMPROVE Risk Score to Reduce Hospital Readmissions from Venous Thromboembolism: A Community Hospital Quality Improvement Initiative

BY

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Abstract

Hospitalization is one of the highest risk factors for acquiring venous thromboembolisms (VTEs) in the United States. Approximately two-thirds of newly diagnosed VTEs occur within 30 to 60 days after a patient's hospital discharge. Financially, medical institutions are scrutinized for every 30-day readmission and frequently penalized with reductions in insurance reimbursement. The objective of this study is to evaluate the incidence of hospital readmissions with newly found VTEs and apply the International Medical Prevention Registry on Venous Thromboembolism (IMPROVE) Risk Score to assess for preventive measures. 348 patients met the inclusion criteria for readmission with a primary or secondary VTE diagnosis. The patients were further sub-categorized based on their risk of VTE development: Low Risk, Moderate Risk, or High Risk. By incorporating the IMPROVE Risk Score, our study demonstrated that even Low-Risk patients were subjected to VTE development. In conclusion, all hospitalized patients need to be assessed for VTE risk and provided individual mitigation strategies prior to discharge.

Introduction

Hospitalization is one of the highest risk factors for acquiring venous thromboembolisms (VTEs) in the United States^{1,2}. VTEs consists primarily of deep vein thrombosis (DVTs) and pulmonary embolism (PEs). Approximately two-thirds of newly diagnosed VTEs occur within 30 to 60 days after a patient's hospital discharge^{1,2}. The prevalence is perhaps greater as asymptomatic VTEs are often not recognized and consequently not treated, leading to increased morbidity and mortality.

Financially, medical institutions are scrutinized for every 30-day readmission and frequently penalized with reduction in insurance reimbursements¹⁻³. Finding an algorithm to identify patients who are at risk for developing VTEs upon hospital discharge would be beneficial for both the patient and the medical institution. The objective of this study is to evaluate the incidence of hospital readmissions with newly found VTEs and applying the International Medical Prevention Registry on Venous Thromboembolism (IMPROVE) Risk Score to assess for potential preventive measures. The IMPROVE Risk Score is a validated assessment formula created to predict the 3 month risk of VTE development in hospitalized patients.

Methods

This was a single-center retrospective cohort study conducted at a 430-bed community hospital from January 2020 through December 2021. Using the hospital's electronic medical record system, we screened for a patient population who were readmitted with a new primary or secondary VTE diagnosis within 30 days or 60 days after hospital discharge. For each patient identified, we retrospectively calculated their IMPROVE Risk Score prior to hospital discharge (Table 1).

The final cumulative score will consist of associated risk factors that are labeled in Table 1. These risk factors include if they have had a previous VTE, previous thrombophilia such as Factor V Leiden mutation or Anti-Phospholipid syndrome, had evidence of lower-limb paralysis, current cancer diagnosis, and if they were treated at any point in the Intensive Care Unit during their hospitalization. Additionally, if they were more than 60 years old, immobilized for 7 days or more (which includes bed rest immediately prior to and during hospitalization), and if their hospital length of stay was 7 days or more. Each category is assigned a point value and the cumulative score determines their VTE risk.

Results

348 patients (males, n=149, 42.8%), met the inclusion criteria for readmission with a primary or secondary VTE diagnosis. Of these patients, 296 (85.1%) were readmitted within 30

days after hospital discharge and 52 (14.9%) within 60 days. The average patient’s age for readmission within 30 and 60 days was 60.3 (19-87) years and 59.6 (21-83) years, respectively.

214 (61.5%) were found to have one or more DVTs and 134 (38.5%) were found to have one or more PEs. Of the patients readmitted with DVTs, 33.6% were Low Risk, 8.6% were Moderate Risk, and 19.3% were High Risk (p<0.05). Of the patients readmitted with PEs, 22.7% were Low Risk, 7.5% were Moderate Risk, and 8.3% were High Risk (p<0.05).

16 total patients had died from all-cause mortality: four (1.1%) were from the High-Risk group, six (1.7%) were from the Moderate Risk group, and another six patients (1.7%) were from the Low-Risk group.

DISCUSSION

It is estimated that approximately eight million hospitalized acutely ill medical patients are at risk annually for developing VTEs⁵. Identifying patients who are at risk for VTE development prior to hospital discharge and subsequently applying preventative measures would be beneficial to the patient and will help reduce hospital readmissions. The advantage of using the IMPROVE Risk Score is having an objective algorithm to properly identify patients at risk for VTE development while also reducing potential harm from administering thromboprophylaxis for patients at low risk⁵.

Even though the IMPROVE Risk Score had been validated previously for assessing VTE risk, our study provided further evidence that even Low-Risk patients were subjected to VTE development. Therefore, in this study, including the Low-Risk cohort, we demonstrated that all patients would need mitigation strategies to prevent VTE development prior to hospital discharge.

One benefit of this study is that it further contributes to previous clinical trials yet, uniquely, derives data from a community hospital perspective. The methods can be reproduced fairly easily and without much commitment. One considerable weakness in this study was that it was conducted during the SAR-CoV-2 pandemic (January 2020 – December 2021) which, in itself, is a prothrombotic illness⁴.

In conclusion, the IMPROVE Risk Score can objectively stratify patients at risk for VTE development upon discharge and should be used as a guide for applying preventative measures. Recently, the IMPROVE Risk Score was modified and now has incorporated the D-dimer lab value, which clinical trials have concluded that it is superior to its predecessor³. A follow-up to this current study should assess the added benefit of including a D-dimer lab in a community hospital setting. Additionally, a follow-up study that compares pre and post SAR-CoV-2 pandemic groups may help further validate the IMPROVE Risk Score.

TABLE 1. IMPROVE RISK SCORE [3]. The IMPROVE Risk Score provides quantitative data to help determine risks for VTE development prior to hospital discharge.

VTE RISK FACTOR	VTE POINTS	
Previous VTE?	+3	
Known Thrombophilia?	+2	
Current Lower-Limb Paralysis?	+2	
Current Cancer?	+2	
Prior ICU/CCU stay?	+1	
Age > 60 years	+1	
Immobilized ≥ 7 days?	+1	
TOTAL VTE POINTS	VTE RISK	
Low Risk Score:	0 – 1	1.0%
Moderate Risk Score:	2 – 3	1.7%
High Risk Score:	≥ 4	≥ 2.9%

The research involves minimal risk, as the review of subjects’ medical records is for limited information. The information is not sensitive in nature. There is an extremely low probability of harm to subjects’ status, employment, or insurability. The precaution taken to limit the record review to specified data further minimizes the major risk, which is a breach of confidentiality. Contacting subjects to obtain their consent could be considered an invasion of privacy and cause subjects undue anxiety.

Conflict of Interest: The authors have no financial, professional, or personal conflicts of interest to report.

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