

Defining Venous Thromboembolism in the Electronic Health Record: An Informatics Approach

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Introduction

- Venous thromboembolism (VTE), consisting of pulmonary embolism (PE) and deep vein thrombosis (DVT), is a common, preventable public health problem.¹
- VTE affects approximately 300,000 – 600,000 individuals in the United States each year, and requires timely and adequate treatment.¹



- To improve VTE detection and diagnosis, informaticians and researchers leverage healthcare databases to identify instances of VTE for research and quality reporting purposes.
- Traditionally, identifying cases of VTE has relied mainly on the use of ICD codes.^{2,3}

The Problem

- Previous studies have demonstrated that the use of ICD codes alone are often subject to error resulting from:
 - Limitations in available clinical data
 - Diagnostic errors
 - Coding errors made by human operations.



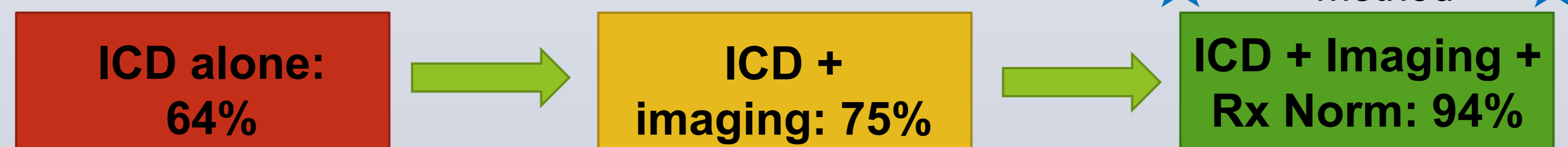
Defining VTE in the EHR

- Given the limitations in ICD codes, studies have found that using ICD codes alone to define a VTE provides a poor Positive Predictive Value (PPV) of only **64%**.⁴
- Other studies have proposed methods to improve this PPV by defining a VTE as the combination of an ICD code and an imaging code for VTE within a given encounter. Utilizing this method results in a notable improvement, raising the PPV from 64% to **75%**.⁵

The Solution:

- The team at Brigham and Women's Hospital (BWH) attempted to increase this PPV further through adding an additional feature, medication data, via the presence of an anticoagulant order (RxNorm code) prior to or following the imaging scan. The following steps were performed to test our hypothesis:
 - Select patients who had an ICD code for VTE (Table 1) from December 2016 to January 2020.
 - Examine patients who had an imaging code for VTE linked (Table 1) to that same encounter.
 - Examine the patients who had an anticoagulant order (Table 1) 6 hours prior to or following their imaging scan.
 - Perform chart review to see if these patients had a true VTE.

Results



Discussion

- This poster describes a novel method for accurately defining a VTE based on the use of billing, imaging, and medication information.
- This method for defining a VTE provides a notable increase in PPV when compared to previous methods for defining a VTE, such as using the combination of ICD and imaging codes, or ICD codes alone (75% and 64% respectively).

Next Steps

- The team at BWH is currently working on conducting further reviews in order to quantify this method's Negative Predictive Value.
- The team at BWH is exploring opportunities for further improving this diagnosis pipeline by utilizing natural language processing on the imaging indication.

Tables

Table 1

VTE Codes	I26.9, I80.2, I80.3, I82.4, I82.5, I82.6, I82.7, I80.1, I82.8, I80.9, I82.9, I26.0
Imaging Procedure Codes	173016, 146694, 146692, 142167, 147498, 142161, 142163, 144330, 142182, 173016, 146694, 146692, 142167, 147498, 142161, 142163, 144330, 142184, 352026, 142294, 147036, 173052, 173050
Anticoagulant Rx	Warfarin, Heparin, Enoxaparin, Dalteparin, Fondaparinux, Rivaroxaban, Apixaban,

Citations

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