Published in final edited form as:

Med Care. 2017 December ; 55(12): e137–e143. doi:10.1097/MLR.0000000000000524.

Validity of Using Inpatient and Outpatient Administrative Codes to Identify Acute Venous Thromboembolism: The CVRN VTE Study

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Abstract

Background—Administrative data are frequently used to identify venous thromboembolism (VTE) for research and quality reporting. However, the validity of these codes, particularly in outpatients, has not been well-established.

Objective—To determine how well ICD-9 codes for VTE predict chart-confirmed acute VTE in inpatient and outpatients.

Patients/Methods—We selected 4642 adults with an incident ICD-9 diagnosis of VTE between years 2004 and 2010 from the Cardiovascular Research Network Venous Thromboembolism cohort study. Medical charts were reviewed to determine validity of events. Positive predictive values (PPVs) of ICD-9 codes were calculated as the number of chart-validated VTE events divided by the number with specific VTE codes. Analyses were stratified by VTE type (pulmonary embolism, deep venous thrombosis [DVT]), code position (primary, secondary), and setting (hospital/emergency department [ED], outpatient).

Results—The PPV for any diagnosis of VTE was 64.6% for hospital/ED patients and 30.9% for outpatients. Primary diagnosis codes from hospital/ED patients were more likely to represent acute VTE than secondary diagnosis codes (78.9% vs. 44.4%, p<0.001). Primary hospital/ED codes for pulmonary embolism and lower extremity DVT had higher PPV than for upper extremity DVT

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(89.1%, 74.9%, and 58.1%, respectively). Outpatient codes were poorly predictive of acute VTE: 28.0% for pulmonary embolism and 53.6% for lower extremity DVT.

Conclusions—ICD-9 codes for VTE obtained from outpatient encounters or from secondary diagnosis codes do not reliably reflect acute VTE. More accurate ways of identifying VTE in outpatients are needed before these codes can be adopted for research or policy purposes.

Background

Venous thromboembolism (VTE) is a major public health problem in the United States, affecting an estimated 300,000 to 600,000 people nationally each year[1–3]. Due to the significant morbidity and mortality resulting from pulmonary embolism (PE) and deep venous thrombosis (DVT), VTE has become a target for active surveillance and quality reporting[2, 4–6]. Governmental and regulatory agencies such as the Agency for Healthcare Research and Quality, the Joint Commission, and the Centers for Medicare & Medicaid Services (CMS) have adopted measures of VTE to assess hospital quality[7, 8]. Identifying VTE events for the purposes of quality reporting and research relies heavily on the use of administrative codes, primarily using *International Classification of Diseases, Ninth Revision* (ICD-9) diagnosis codes[1, 5, 9]. However, the validity of using ICD-9 codes to identify VTE events remains questionable[5]. While some studies have found that ICD-9 codes are reasonably concordant with medical chart review, others have found much lower rates of validity, and rates that vary by the type and position of the code[5, 10–13].

Moreover, most studies addressing the validity of VTE ICD-9 codes have been conducted only in hospital or post-operative settings and in earlier treatment eras. As the diagnosis and management of VTE moves increasingly to the outpatient arena, it is vital to determine whether outpatient VTE codes are reliable proxies for true clinical events before these diagnostic codes can be depended on for research, policy and quality reporting purposes. The objective of our multicenter study was to examine the validity of VTE ICD-9 diagnosis codes in both inpatient and outpatient settings based on medical chart review.

Methods

Identification of potential VTE events

We obtained clinical and administrative data from four integrated healthcare delivery systems that participated in the Cardiovascular Research Network Venous Thromboembolism (CVRN VTE) study. The four systems represented diverse geographic health plan members from: Kaiser Permanente Northern California, which during the study period served >3.2 million members in Northern California; Kaiser Permanente Colorado, which served >460,000 members in the Denver, Colorado metropolitan area; Marshfield Clinic, which served >550,000 members in central and northwest Wisconsin; and Geisinger Health System, which served approximately 2.5 million members in central and northwest Pennsylvania.

We included adult health plan members (age ≥ 21 years) who were enrolled for at least 12 months and with continuous pharmacy benefits, who had a least one clinical encounter with a diagnosis code for VTE during the time period October 1, 2004 through December 31,

2010. The index VTE event was defined as the first encounter associated with a VTE diagnosis code during the study time period. In order to focus on incident VTE events, we excluded patients with a prior diagnostic code for VTE while enrolled in the health plan, or who were prescribed relevant anticoagulants, within 4 years of the index event.

VTE codes were categorized as *pulmonary embolism* (ICD-9 code 415.1x), *lower extremity DVT* (451.1x, 451.2, 451.81, 453.4x, 453.5x), *upper extremity DVT* (451.83, 451.84, 451.89, 453.72, 453.73, 453.74, 453.75, 453.76, 453.77, 453.82, 453.83, 453.84, 453.85, 453.86, 453.87), and *other venous thrombosis* (451, 451.9, 452, 453, 453.0, 453.1, 453.2, 453.3, 453.79, 453.8, 453.89, 453.9). Codes for pregnancy-related VTE and superficial thrombophlebitis were not included in this study. All encounters with a VTE diagnosis were included in the search, including from hospital, emergency department (ED), and outpatient settings.

Validation of VTE events

Out of 42,941 individuals with an index VTE encounter, 5,264 were selected for manual medical record review. For two of the sites, all available charts with a VTE encounter were reviewed. For the other two sites, a random sample of the charts were selected for review due to the large number of potential events. Electronic medical record systems were available at all clinical sites during the time period of the study. Research staff obtained all available hospital admission, transfer, and discharge notes, as well as emergency department notes, outpatient encounter notes, and relevant radiology reports within 72 hours before and after the VTE encounter date. Records were then reviewed by trained physician and pharmacist reviewers who used a structured data abstraction tool to determine whether encounters represented valid, acute VTE events. An event was considered to be valid if there was radiologic, operative, or autopsy evidence of acute VTE, or if a physician documented in the medical record that an acute VTE occurred during that episode of care. VTE events whose acute management was not contiguous with the current episode (such as patients with a history of previously treated VTE) were not considered valid events. Superficial venous thrombophlebitis was not considered to be a valid VTE.

If a reviewer determined that the encounter did not represent a valid, acute VTE, he/she then categorized the event as one of the following: past history of VTE but not an acute event, superficial venous thrombophlebitis, non-VTE alternative diagnosis, “rule-out VTE” (where VTE was suspected but the diagnostic test was negative), or insufficient information in the medical documentation to confirm an acute VTE event.

Subject characteristics

Characteristics of the subjects were obtained from clinical and administrative databases, including demographic features (age, gender, race and ethnicity) and coexisting medical conditions identified by the presence of relevant ICD-9 diagnosis codes up to 4 years prior to the index VTE event. Anticoagulant use was ascertained by searching health plan pharmacy databases for filled outpatient prescriptions for anticoagulants within 7 days of the VTE encounter. Anticoagulants were categorized as oral (warfarin sodium) or parenteral (low-molecular-weight-heparins and fondaparinux). During the time period of the study, the

target-specific oral anticoagulants such as dabigatran, rivaroxaban, apixaban, and edoxaban were not yet approved by the US Food and Drug Administration for use in acute VTE and so were not included.

Statistical analysis

All analyses were conducted using SAS statistical software version 9.1 (Cary, NC). We reported the positive predictive value of specific VTE codes compared to medical record review. Positive predictive value was calculated as the number of valid VTE events divided by the total number of patients within a set of VTE diagnosis codes. Subjects whose clinical documentation was unavailable for chart review were excluded from the analysis. We examined whether positive predictive value varied according to VTE-type (i.e., PE, lower extremity DVT, upper extremity DVT, and other venous thrombosis), clinical setting (hospital/ED versus outpatient), and, for hospital/ED encounters, by position of the code (primary versus secondary). We did not distinguish between primary or secondary code positions for outpatient encounters, as outpatient visits frequently do not have a single, leading diagnosis. We then tested whether the positive predictive value of diagnosis codes changed when we included a criterion of a filled prescription for anticoagulant within 7 days of the VTE encounter. Finally, we tested whether there were changes in positive predictive value after October 9, 2009, when additional VTE codes became available to further specify superficial venous thrombophlebitis, chronic VTE, and upper extremity VTE[14].

This study was approved by the institutional review boards of the participating institutions and waiver of informed consent was obtained due to the nature of the study.

Results

We reviewed the medical charts of 5,264 subjects who had an encounter with a VTE diagnosis code during the study time period and who met study eligibility criteria. Clinical characteristics of these individuals are presented in Table 1. A total of 622 encounters lacked clinical documentation related to the VTE episode and were excluded from the analysis. The final analytic cohort therefore comprised 4,642 individual patient encounters, of which 2,890 were hospital/ED encounters and 1,752 outpatient encounters.

Positive predictive value of VTE codes

The overall positive predictive value of any VTE code, inpatient or outpatient, was 51.9% and varied widely by clinical setting and VTE type (Table 2). Primary discharge diagnosis codes for PE, and to a lesser degree, lower extremity DVT, obtained from a hospital/ED encounter had reasonably high positive predictive values (89.1% and 74.9%, respectively). Outpatient codes on the other hand were unlikely to represent acute VTE; the highest positive predictive value in outpatients was for lower extremity DVT, which reflected chart-confirmed events only 53.6% of the time (Table 2).

When we restricted the analysis to the 1,974 patients who had an anticoagulant prescription within 7 days after being discharged from the VTE encounter, the positive predictive value for VTE increased for both inpatients and outpatients (87.6% and 75.5%, respectively, Table 3). Using the criteria of anticoagulant prescription did, however, miss a substantial number

of patients with valid VTE: out of the 2410 patients with chart-validated VTE, 744 (30.9%) did not have a filled anticoagulant prescription. Of the 2410 patients, 146 (20%) had a diagnosis or procedure code for interruption of the vena cava within 3 days of the encounter end. Extending the ascertainment period for anticoagulant prescription to 30 days did not change the results substantively, with 644 (26.7%) of patients lacking a filled anticoagulant prescription.

When we examined the positive predictive value of individual diagnosis codes, several codes were especially poor predictors of acute VTE (Table 4). In particular, codes denoting phlebitis or thrombophlebitis, even of specified deep veins, had low positive predictive values, as did codes for “other venous thrombosis” (Table 4). When we compared the positive predictive value of VTE codes pre-October 2009 and post-October 2009, the largest change was seen in the predictive value of hospital/ED diagnostic codes for upper extremity DVT, where the positive predictive value of a primary diagnosis code of upper extremity DVT increased from 31.3% to 86.7%, and from 18.3% to 56.7% for a codes in a secondary position.

Reasons encounters with VTE codes were not considered valid VTE events

There were 2,606 encounters that after review were not considered valid VTE events. The reasons for being coded as invalid varied widely by setting and VTE type (Table 5). For hospital/ED encounters, alternative non-VTE diagnoses were the most common reasons for not being considered valid. In outpatient encounters, codes for PE or lower extremity DVT often reflected a past history of VTE. Patients with an upper extremity DVT code were frequently determined to have superficial venous thrombophlebitis after chart review (Table 5).

Discussion

Our study found that ICD-9 codes for PE in a primary position during a hospital or ED encounter accurately reflected acute VTE nearly 90% of the time when compared to chart review. However, codes for other types of VTE, and codes that were in the secondary position or from an outpatient encounter, were much less likely to represent acute VTE.

The validity of VTE ICD-9 codes increased when we added the criteria of an anticoagulant prescription dispensed shortly after discharge, and linking the presence of an ICD-9 code for VTE with an anticoagulant prescription may be one way to increase the likelihood that an event reflects a true acute VTE. The downside, however, of restricting to patients who received anticoagulants would be to inappropriately exclude approximately 30% of patients with valid VTE events who did not fill a prescription for anticoagulants within a week.

There was substantial variation in how well individual ICD-9 codes correlated with chart-confirmed VTE events. ICD-9 codes that were for phlebitis or thrombophlebitis (even of deep veins) or referred to unspecified or “other” locations, were in general poorly predictive of true VTE events. Although ICD-9 codes for phlebitis and thrombophlebitis have been used in prior studies of VTE and have also been adopted for quality reporting purposes, the results of our study argue that these codes are unlikely to represent true VTE events.

Our findings have significant implications for research and policies that rely on administrative codes for VTE[6]. Studies that use both inpatient and outpatient codes to identify VTE may be substantially overestimating the actual burden of disease[15, 16]. More parsimonious sets of codes, validation via chart review, or incorporating additional criteria, such as anticoagulant prescription, may help to improve the accuracy of using administrative data to identify actual VTE events. In 2007, CMS introduced present-on-admission (POA) indicator codes to help distinguish hospital-acquired events from pre-existing conditions. The use of POA codes appeared to improve identification of incident hospital-acquired VTE, but these codes were not always accurately applied[17]. In addition, POA codes are applicable only for acute hospitalizations and thus do not apply to outpatients, where the greatest need for accurate codes exists.

Our study had several limitations. Some codes were infrequently observed in our sample, including codes for venous thrombosis in unusual sites like the renal vein. We were unable to review the medical charts of 622 patients, and because unavailable medical charts were more often for outpatient encounters, it is possible that a review of these charts would have increased our estimated positive predictive value for outpatient VTE from its very low level of 30.9%. However, we note that even if all missing charts were considered to be valid VTE events, the predictive value of outpatient codes would not be high enough for policy and research applications. Finally, an expanded set of VTE codes was introduced in October 2009, most notably to help delineate chronic from acute VTE and superficial from deep venous thrombosis. While we found some modest effects, others have reported much higher positive predictive values associated with the use of these codes[14]. As these codes were only available for slightly more than one year of our study period, it is possible that accuracy of inpatient VTE codes has improved even more since then.

Administrative databases are increasingly used for outcomes research and quality measurement in VTE. It is important to acknowledge the limitations of using such databases. Outpatient VTE codes, in particular, should not currently be relied upon to provide accurate representations of acute VTE and additional ways to confirm VTE events in outpatients are needed.

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Table 1

Characteristics of 5,264 Adults with an ICD-9 Diagnosis Code for Venous Thromboembolism, Stratified by Encounter Setting.

Subject Characteristics	Hospital/Emergency Department (N=3175)	Outpatient (N=2089)	P-Value*	Overall (N=5264)
	n (%)			
Age, yrs			<0.001	
21–49	503 (15.8)	434 (20.8)		937 (17.8)
50–59	478 (15.1)	448 (21.4)		926 (17.6)
60–69	700 (22.0)	465 (22.3)		1165 (22.1)
70–79	849 (26.7)	464 (22.2)		1313 (24.9)
≥ 80	645 (20.3)	278 (13.3)		923 (17.5)
Women	1639 (51.6)	1238 (59.3)		2877 (54.7)
Race			<0.001	
White/European	2543 (80.1)	1574 (75.3)		4117 (78.2)
Black/African-American	123 (3.9)	73 (3.5)		196 (3.7)
Asian/Pacific Islander	22 (0.7)	17 (0.8)		39 (0.7)
Other/Unknown	487 (15.3)	425 (20.3)		912 (17.3)
Hispanic ethnicity			<0.001	
Hispanic	154 (4.9)	94 (4.5)		248 (4.7)
Non-Hispanic	2203 (69.4)	1334 (63.9)		3537 (67.2)
Unknown	818 (25.8)	661 (31.6)		1479 (28.1)
Diagnosis in primary position			<0.001	
Pulmonary embolism	976 (30.7)	87 (4.2)		1063 (20.2)
Lower extremity DVT	583 (18.4)	369 (17.7)		952 (18.1)
Upper extremity DVT	35 (1.1)	29 (1.4)		64 (1.2)
Other venous thrombosis	271 (8.5)	583 (27.9)		854 (16.2)
Diagnosis in secondary position			<0.001	
Pulmonary embolism	384 (12.1)	222 (10.6)		606 (11.5)
Lower extremity DVT	388 (12.2)	266 (12.7)		654 (12.4)
Upper extremity DVT	101 (3.2)	30 (1.4)		131 (2.5)
Other venous thrombosis	437 (13.8)	503 (24.1)		940 (17.9)
Filled anticoagulant prescription within 7 days	1513 (47.7)	536 (25.7)	<0.001	2049 (38.9)
Medical chart unavailable for review	285 (9.0)	337 (16.1)	<0.001	622 (11.8)
Medical diagnoses				
Hypertension	1998 (62.9)	1114 (53.3)	<0.001	3112 (59.1)
Diabetes mellitus	834 (26.3)	404 (19.3)	<0.001	1238 (23.5)
Systemic cancer	1113 (35.1)	592 (28.3)	<0.001	1705 (32.4)
Prior ischemic stroke	99 (3.1)	52 (2.5)	0.18	151 (2.9)
Coronary heart disease	304 (9.6)	149 (7.1)	<0.01	453 (8.6)
Chronic heart failure	467 (14.7)	191 (9.1)	<0.001	658 (12.5)

Subject Characteristics	Hospital/Emergency Department (N=3175)	Outpatient (N=2089)	P-Value*	Overall (N=5264)
	n (%)			
Chronic lung disease	878 (27.7)	386 (18.5)	<0.001	1264 (24.0)
Chronic liver disease	138 (4.3)	67 (3.2)	<0.05	205 (3.9)
Inflammatory bowel disease	71 (2.2)	28 (1.3)	<0.05	99 (1.9)
Diagnosed thrombophilia	19 (0.6)	38 (1.8)	<0.001	57 (1.1)
Acute sepsis	162 (5.1)	36 (1.7)	<0.001	198 (3.8)

* P value comparison between hospital/emergency department and outpatient

Table 2

The Positive Predictive Value of VTE Codes Based on Medical Records Review, Stratified by Encounter Setting and Position of Code (n=4642)

Numbers in parentheses refer to the (number of chart confirmed VTE events/number of reviewed encounters with an ICD-9 code for VTE), excluding charts without available clinical documentation for review.

	Hospital/Emergency Department N=2890		Outpatient N=1752
	Primary Position N=1696	Secondary Position N=1194	
Any VTE code	78.9% (1338/1696)	44.4% (530/1194)	30.9% (542/1752)
Pulmonary embolism codes *415.1x*	89.1% (800/909)	55.8% (196/351)	28.0% (74/264)
Lower extremity DVT codes *451.1x, 451.2, 451.81, 453.4x, 453.5x*	74.9% (387/517)	50.1% (179/357)	53.6% (297/554)
Upper extremity DVT codes *451.83, 451.84, 451.89, 453.72, 453.73, 453.74, 453.75, 453.76, 453.77, 453.82, 453.83, 453.84, 453.85, 453.86, 453.87*	58.1% (18/31)	31.1% (28/90)	6.5% (3/46)
Other venous thrombosis codes *451, 451.9, 452, 453, 453.0, 453.1, 453.2, 453.3, 453.79, 453.8, 453.89, 453.9*	55.6% (133/239)	32.1% (127/396)	18.9% (168/888)

Table 3

The Positive Predictive Value of VTE Codes + Anticoagulant Prescriptions Compared to Medical Chart Review (n=1974)

Numbers in parentheses refer to the (number of chart confirmed VTE events/number of reviewed encounters with an ICD-9 code for VTE), excluding charts without available clinical documentation for review.

	Hospital/Emergency Department N=1451		Outpatient N=523
	Primary Position N=1080	**Secondary Position N=371**	
Any VTE code	92.4% (998/1080)	73.6% (273/371)	75.5% (395/523)
Pulmonary embolism codes *415.1x*	95.4% (617/647)	84.8% (117/138)	54.5% (55/101)
Lower extremity DVT codes *451.1x, 451.2, 451.81, 453.4x, 453.5x*	89.6% (276/308)	71.6% (83/116)	89.7% (234/261)
Upper extremity DVT codes *451.83, 451.84, 451.89, 453.72, 453.73, 453.74, 453.75, 453.76, 453.77, 453.82, 453.83, 453.84, 453.85, 453.86, 453.87*	81.8% (9/11)	55.2% (16/29)	100% (2/2)
Other venous thrombosis codes *451, 451.9, 452, 453, 453.0, 453.1, 453.2, 453.3, 453.79, 453.8, 453.89, 453.9*	84.2% (96/114)	64.8% (57/88)	65.4% (104/159)

Table 4

Positive Predictive Values of Individual ICD-9 Codes for VTE. n/a indicates that there were no subjects with that code.

Code	Definition	Hospital/Emergency Department	Outpatient
Pulmonary embolism			
415.1	Pulmonary embolism and infarction	0.0% (0/1)	n/a
415.11	Iatrogenic pulmonary embolism and infarction	79.0% (64/81)	28.6% (2/7)
415.19	Other pulmonary embolism and infarction	79.1% (932/1178)	28.0% (72/257)
Lower extremity DVT			
451.11	Phlebitis and thrombophlebitis of femoral vein	10.7% (3/28)	8.3% (1/12)
451.19	Phlebitis and thrombophlebitis of deep veins of lower extremities, other	36.4% (24/66)	38.5% (40/104)
451.2	Phlebitis and thrombophlebitis of lower extremities, unspecified	7.1% (2/28)	8.8% (3/34)
451.81	Phlebitis and thrombophlebitis of iliac vein	50.0% (1/2)	n/a
453.40	Venous embolism and thrombosis of unspecified deep vessels of lower extremity	58.8% (190/323)	61.1% (187/306)
453.41	Acute venous embolism and thrombosis of deep vessels of proximal lower extremity	83.6% (199/238)	80.9% (38/47)
453.42	Acute venous embolism and thrombosis of deep vessels of distal lower extremity	79.7% (145/182)	56.3% (27/48)
453.5	Chronic venous embolism and thrombosis of deep vessels of lower extremity	0.0% (0/4)	50.0% (1/2)
453.51	Chronic venous embolism and thrombosis of deep vessels of proximal lower extremity	50.0% (1/2)	0.0% (0/1)
453.52	Chronic venous embolism and thrombosis of deep vessels of distal lower extremity	100% (1/1)	n/a
Upper extremity DVT			
451.83	Phlebitis and thrombophlebitis of deep veins of upper extremities	71.4% (10/14)	0.0% (0/3)
451.84	Phlebitis and thrombophlebitis of upper extremities, unspecified	3.9% (2/51)	0.0% (0/22)
451.89	Phlebitis and thrombophlebitis of other upper extremity site	40.7% (11/27)	10.5% (2/19)
453.72	Chronic venous embolism and thrombosis of deep veins of upper extremity	100% (2/2)	n/a
453.73	Chronic venous embolism and thrombosis of upper extremity, unspecified	n/a	n/a
453.74	Chronic venous embolism and thrombosis of axillary veins	n/a	n/a
453.75	Chronic venous embolism and thrombosis of subclavian veins	0.0% (0/1)	n/a
453.76	Chronic venous embolism and thrombosis of subclavian veins	n/a	0.0% (0/1)
453.77	Chronic venous embolism and thrombosis of other thoracic veins	n/a	n/a
453.82	Acute venous embolism and thrombosis of deep veins of upper extremity	100% (4/4)	100% (1/1)
453.83	Acute venous embolism and thrombosis of deep veins of upper extremity	60.0% (3/5)	n/a
453.84	Acute venous embolism and thrombosis of axillary veins	80.0% (4/5)	n/a
453.85	Acute venous embolism and thrombosis of subclavian veins	100% (5/5)	n/a
453.86	Acute venous embolism and thrombosis of internal jugular veins	50.0% (2/4)	n/a
453.87	Acute venous embolism and thrombosis of other thoracic veins	100% (3/3)	n/a
Other venous thrombosis			

Code	Definition	Hospital/Emergency Department	Outpatient
451.9	Phlebitis and thrombophlebitis of unspecified site	12.9% (4/31)	4.0% (12/303)
452	Portal vein thrombosis	58.5% (38/65)	42.9% (9/21)
453.0	Budd-Chiari syndrome	11.1% (1/9)	0.0% (0/1)
453.1	Thrombophlebitis migrans	n/a	0.0% (0/1)
453.2	Other venous embolism and thrombosis of inferior vena cava	62.5% (10/16)	33.3% (1/3)
453.3	Other venous embolism and thrombosis of renal vein	66.7% (4/6)	33.3% (1/3)
453.79	Chronic venous embolism and thrombosis of other specified veins	50.0% (1/2)	n/a
453.8	Acute venous embolism and thrombosis of other specified veins	47.9% (172/359)	31.1% (118/379)
453.89	Acute venous embolism and thrombosis of other specified veins	20.0% (1/5)	0.0% (0/2)
453.9	Other venous embolism and thrombosis of unspecified site	20.4% (29/142)	15.4% (27/175)

Table 5

Encounters with a VTE Diagnosis Code but Not Considered Valid Acute VTE Events after Chart Review (n=2,606)

	Hospital/Emergency Department (N=1229)			
Reason why events were not considered valid	**Pulmonary embolism N=338**	**Lower extremity DVT N=379**	**Upper extremity DVT N=88**	**Other venous thrombosis N=424**
Prior history of VTE but not acute	14.2% (48/338)	15.6% (59/379)	5.7% (5/88)	9.4% (40/424)
Alternative non-VTE diagnosis	43.8% (148/338)	38.0% (144/379)	39.8% (35/88)	46.5% (197/424)
Superficial venous thrombophlebitis	2.1% (7/338)	13.5% (51/379)	25.0% (22/88)	14.9% (63/424)
Initial concern for VTE but subsequently excluded	19.2% (65/338)	15.3% (58/379)	4.5% (4/88)	10.6% (45/424)
VTE suspected, but not confirmed	3.6% (12/338)	0% (0/379)	0% (0/88)	0.5% (2/424)
Insufficient documentation available in chart	17.2% (58/338)	17.7% (67/379)	25.0% (22/88)	18.2% (77/424)

	Outpatient Encounters (N=1377)			
Reason why events were not considered valid	**Pulmonary embolism N=213**	**Lower extremity DVT N=303**	**Upper extremity DVT N=49**	**Other venous thrombosis N=812**
Prior history of VTE but not acute	68.1% (145/213)	35.0% (106/303)	2.0% (1/49)	15.8% (128/812)
Alternative non-VTE diagnosis	18.8% (40/213)	24.8% (75/303)	22.4% (11/49)	22.3% (181/812)
Superficial venous thrombophlebitis	2.3% (5/213)	12.9% (39/303)	51.0% (25/49)	44.7% (363/812)
Initial concern for VTE but subsequently excluded	4.7% (10/213)	16.5% (50/303)	4.1% (2/49)	7.0% (57/812)
VTE suspected, but not confirmed	0% (0/213)	0% (0/303)	0% (0/49)	0.2% (2/812)
Insufficient documentation available in chart	6.1% (13/213)	10.9% (33/303)	20.4% (10/49)	10.0% (81/812)