ICD-10 hospital discharge diagnosis codes were sensitive for identifying pulmonary embolism but not deep vein thrombosis

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Abstract

Objective: To estimate the sensitivity of International Classification of Diseases, Tenth revision (ICD-10) hospital discharge diagnosis codes for identifying deep vein thrombosis (DVT) and pulmonary embolism (PE).

Study Design and Setting: We compared predefined ICD-10 discharge diagnosis codes with the diagnoses that were prospectively recorded for 1,375 patients with suspected DVT or PE who were enrolled at 25 hospitals in France. Sensitivity was calculated as the percentage of patients identified by predefined ICD-10 codes among positive cases of acute symptomatic DVT or PE confirmed by objective testing.

Results: The sensitivity of ICD-10 codes was 58.0% (159 of 274; 95% CI: 51.9, 64.1) for isolated DVT and 88.9% (297 of 334; 95% CI: 85.6, 92.2) for PE. Depending on the hospital, the median values for sensitivity were 57.7% for DVT (interquartile range, IQR, 48.6−66.7; intracluster correlation coefficient, 0.02; $P = 0.31$) and 88.9% for PE (IQR, 83.3−96.3; intracluster correlation coefficient, 0.11; $P = 0.03$). The sensitivity of ICD-10 codes was lower for surgical patients and for patients who developed PE or DVT while they were hospitalized.

Conclusion: ICD-10 discharge diagnosis codes yield satisfactory sensitivity for identifying objectively confirmed PE. A substantial proportion of DVT cases are missed when using hospital discharge data for complication screening or research purposes. © 2010 Elsevier Inc. All rights reserved.

Keywords: Pulmonary embolism; Venous thrombosis; Sensitivity; Medical record systems, computerized; International classification of diseases; Hospitals

1. Introduction

Venous thromboembolism (VTE), consisting of deep vein thrombosis (DVT) and pulmonary embolism (PE), is a common cardiovascular disease, with an estimated annual incidence of 128−243 cases per 100,000 persons [1]. Community-acquired VTE is a frequent reason for hospital admissions, whereas hospital-acquired VTE, which accounts for one-fourth of all cases [2], is a major and often preventable cause of mortality and morbidity among hospitalized patients [3,4].

The use of computerized administrative hospital discharge data is considered a convenient and inexpensive alternative to retrospective chart abstraction for collecting data on various conditions [5]. Over the past decade, the International Classification of Diseases, Ninth revision, Clinical Modification (ICD-9-CM) and ICD-10 codes of DVT and PE have been used for elucidating VTE epidemiology [6,7], conducting outcome research [8], and monitoring safety and quality of care [9,10].

Concerns exist regarding the validity of routinely collected health administrative data for complication screening or research purposes [11,12]. Indeed, current evidence suggests that ICD-9-CM diagnosis codes have low to moderate accuracy for identifying DVT when using retrospective

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What is new?

Key findings
Using prospectively collected data as the reference, ICD-10 discharge diagnosis codes yield satisfactory sensitivity for identifying patients with objectively confirmed PE (89%).

In contrast, using ICD-10 codes recorded in the hospital discharge abstract would miss approximately 4 of 10 acute episodes of DVT confirmed by compression ultrasonography.

What this adds to what was known
This study suggests that coding sensitivity has been preserved in the transition from ICD-9-CM to ICD-10 for PE.

What is the implication
Using ICD-10 discharge diagnosis codes is a sensitive method for identifying patients with PE for epidemiologic research purposes.

chart abstraction as the reference [13,14]. To our knowledge, very few studies have assessed the positive predictive value [15,16], and none has assessed the sensitivity of ICD-10 hospital discharge diagnosis codes for VTE, even though the 10th revision of ICD has been adopted by many countries since its introduction in 1992 [5].

Retrospective chart review has been used as the reference method for assessing discharge diagnosis code validity by many authors. However, the completeness and validity of medical records have raised questions for decades [17]. Because chart review does not capture errors that could occur when clinicians record information on charts, it only reflects a part of the validity of administrative data [18]. Physicians are more likely to record medical conditions that relate to their specialty and therefore a condition that is present in a patient may not be recorded in the chart [17,18]. Hence, prospectively collected information is now considered a ''truer'' reference method than retrospective chart review for assessing discharge diagnosis code validity [5].

In this study, we assessed the sensitivity of ICD-10 coding in routinely collected hospital discharge data for identifying acute DVT and PE confirmed by objective tests. For this purpose, we used the original data from a multicenter prospective cohort study as the reference.

2. Methods

2.1. Study population

The OPTImisation de l'interrogatoire pour l'estimation du risque de Maladie thrombo-Embolique Veineuse (OPTIMEV) study is a prospective cohort study of consecutive patients referred for clinical suspicion of acute VTE to vascular medicine physicians practicing in hospitals or offices evenly distributed throughout France (ClinicalTrial.gov registration number: NCT00670540). Depending on the site, the enrollment period consisted of one to several predefined days distributed between November 2004 and January 2006. Suspicion of PE was defined as acute onset of new or worsening shortness of breath, chest pain, hemoptysis, or syncope without another obvious cause, whereas suspicion of DVT was defined as acute leg pain, swelling, redness, or warmth. Patients referred for screening of asymptomatic DVT were not eligible for this study.

The present analysis focused on the patients who were enrolled at 25 hospitals in metropolitan France, including 13 general hospitals, 10 university-affiliated hospitals, and 2 private hospitals. Patients were admitted to the hospital for clinical suspicion of VTE or developed clinical suspicion of VTE during their stay while they were hospitalized for surgical or medical conditions other than VTE.

Vascular medicine physicians prospectively collected baseline characteristics, clinical examination findings, pre-existing comorbidities (including a previous history of VTE), relevant laboratory test results, and long-term ongoing or new anticoagulant treatments using standardized definitions. Vascular medicine specialists are board-certified physicians with knowledge and technical skills necessary for the evaluation and management of all peripheral vascular diseases. Vascular medicine physicians practicing in hospitals examine patients clinically, perform and interpret ultrasound vascular imaging, are skilled in the interpretation of other imaging modalities (computed tomographic angiography, conventional contrast angiography, etc.), and initiate medical treatments. Each patient underwent bilateral compression ultrasonography of both proximal and distal veins of the lower extremities using a standardized examination protocol [19,20].

The diagnostic criterion for a patient's first episode of DVT was the incompressibility of the vein in the transverse plane. For gastrocnemius and soleal vein thrombosis only, the diagnostic criterion was incompressibility of the vein combined with the absence of venous flow after distal compression. The diagnostic criterion for recurrent DVT was the incompressibility of a previously normal venous segment in patients with a previous history of DVT. Clinical suspicion of PE was confirmed based on findings on computed tomographic angiography, ventilation–perfusion scanning, pulmonary angiography, or lower limb compression ultrasonography using validated criteria [21–23]. Although superficial vein thrombophlebitis (i.e., thrombosis of the greater or lesser saphenous vein) was recorded in the OPTIMEV study, it was not considered VTE in the present analysis. Patients with clinical suspicion of DVT of the upper extremity were excluded from the present study.