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Outcomes in Adults with Acute Pulmonary Embolism Discharged from Emergency Departments: The CVRN VTE Study

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To the Editor

Patients with acute pulmonary embolism (PE) have conventionally been hospitalized for initial management and initiation of anticoagulants(1). A recent clinical trial found that PE patients who were considered low risk by the PE severity index (2) could be safely managed as outpatients(3). However it is unclear how often outpatient PE management occurs in real-world settings or whether outcomes are as favorable as in the clinical trial. Our study describes short-term rates of death and hospital admission of patients with acute PE who were discharged from emergency department (ED) settings.

Methods

We obtained data from the Cardiovascular Research Network Venous Thromboembolism (CVRN VTE) Study, a collaboration of four integrated healthcare delivery systems (Kaiser Permanente Northern California, Kaiser Permanente Colorado, Marshfield Clinic Research Foundation, and Geisinger Health System) and identified all adults (age ≥ 21 years) with a primary *International Classification of Diseases Ninth Revision* (ICD-9) diagnosis of pulmonary embolism (415.1x) during an ED visit from January 1, 2004 to December 31, 2010. We restricted the analysis to patients who were discharged from EDs with an anticoagulant prescription within 7 days. Exclusion criteria were <12 months continuous

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pharmacy benefits, prior venous thromboembolism diagnoses, or outpatient anticoagulant prescriptions within 4 years. Anticoagulants included warfarin, low-molecular-weight heparins, and fondaparinux (as target specific oral anticoagulants were not yet approved for use in PE). Data on patient demographics, medication use, and ICD-9 diagnoses were obtained from electronic databases. Primary outcomes for this analysis included hospital admission within 30 days and death within 90 days of the index ED encounter. We used descriptive statistics to report outcome rates. This study was approved by institutional review boards of participating sites and waiver of informed consent was obtained due to the nature of the study.

Results

Of 5927 patients with a primary diagnosis of PE, 494 (8.3%) were discharged from ED settings. The proportion of ED-discharged PE patients increased over time, from 37/657 (5.6%) in 2004 to 110/994 (11.1%) in 2010 (P value for trend <0.001). Characteristics of ED-discharged patients are presented in Table 1. Within 30 days of ED-discharge, 92 of the 494 PE patients (18.6%) had another ED visit and 39 (7.9%) were hospitalized. Eleven patients (2.2%) had a primary diagnosis of hemorrhage during a subsequent ED or hospital visit within 30 days. Mortality was low - none died within 7 days and 2 (0.4%) within 90 days.

Discussion

Patients with acute PE discharged from ED settings in four geographically diverse healthcare delivery systems had mortality rates comparable to outcomes observed in a clinical trial examining outpatient management of PE(3). Although still representing a relative minority of PE patients, the proportion of ED-discharges nearly doubled over the 7-year study period. Shifting appropriate patients to outpatient management may have benefits in terms of improved quality of life, enhanced physical and social functioning, and reduced costs of medical care(5). We note that at least 23% of the patients in our study would not have been eligible for outpatient management in the clinical trial due to having a higher PE severity index risk class(3).

Limitations to our study include identification of PEs using ICD-9 codes and pharmacy data alone, the lack of detailed physiologic data required to calculate a full PE severity risk class, and the inability to determine specific reasons for patient disposition plans.

Conclusion

Our study confirms that selected patients with PE can be managed as outpatients with favorable short-term outcomes.

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Dr. Fang had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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Table 1

Clinical characteristics of 494 adults with acute pulmonary embolism discharged from Emergency Departments during years 2004–2010

Clinical characteristic	N=494
Age, median years [interquartile range]	61.5 [48.0–73.0]
Female, n (%)	243 (49.2)
Race, n (%)	
White/European	365 (73.9)
Black/African-American	33 (6.7)
Asian/Pacific Islander	16 (3.2)
Other/Unknown	80 (16.2)
Year of diagnosis, n (%)	
2004	37 (7.5)
2005	35 (7.1)
2006	50 (10.1)
2007	77 (15.6)
2008	90 (18.2)
2009	95 (19.2)
2010	110 (22.3)
Diagnosed medical conditions, n (%)	
Prior ischemic stroke	6 (1.2)
Ischemic heart disease	14 (2.8)
Chronic lung disease	55 (11.1)
Heart failure	21 (4.3)
Hypertension	218 (44.1)
Sepsis in hospital	3 (0.6)
Diabetes mellitus	61 (12.3)
Malignant neoplasm	131 (26.5)
Concomitant deep venous thrombosis	252 (51.0)
Hospitalization within 30 days prior to event	50 (10.1)
PE severity index(3) risk class (modified)*	
Class II or higher (≥66 points)	294 (59.5)
Class III or higher (≥86 points)	116 (23.4)
Class IV or higher (≥106 points)	17 (3.4)
Charlson comorbidity index(4) mean (SD)	1.5 (2.3)
Baseline medication use, n (%)	
ACE inhibitor	86 (17.4)
Angiotensin II receptor blocker	16 (3.2)
Beta blocker	114 (23.1)
Calcium channel blocker	54 (10.9)
Diuretic	118 (23.9)
Aldosterone receptor antagonist	5 (1.0)

Clinical characteristic	N=494
Alpha-2 adrenergic receptor agonist	29 (5.9)
Statin	106 (21.5)
Other lipid-lowering agent	7 (1.4)
Non-aspirin antiplatelet agent	14 (2.8)
Diabetic therapy	45 (9.1)

* Modified PE severity index score was calculated using age, sex, and clinical diagnoses alone (e.g., without physiologic data) and equaled +1 (for each year of age) + 10 (if male) +30 (if malignant neoplasm) +10 (if heart failure) + 10 (if chronic lung disease). The actual proportion of patients in each risk class likely higher if physiologic data were incorporated.