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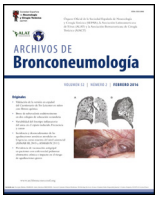

Original Article

Factors Influencing Hospital Stay for Pulmonary Embolism. A Cohort Study☆

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ABSTRACT

Introduction: The aim of this study was to identify factors influencing hospital stay due to pulmonary embolism.
Methods: We performed a retrospective cohort study of patients hospitalized between 2010 and 2015. Patients were identified using information recorded in hospital discharge reports (ICD-9-CM codes 415.11 and 415.19).
Results: We included 965 patients with a median stay of 8 days (IQR 6–13 days). Higher scores on the simplified Pulmonary Embolism Severity Index (sPESI) were associated with increased probability of longer hospital stay. The probability of a hospital stay longer than the median was 8.65 (95% CI 5.42–13.79) for patients referred to the Internal Medicine Department and 1.54 (95% CI 1.07–2.24) for patients hospitalized in other departments, compared to those referred to the Pneumology Department. Patients with grade 3 on the modified Medical Research Council dyspnea scale had an odds ratio of 1.63 (95% CI: 1.07–2.49). The likelihood of a longer than median hospital stay was 1.72 (95% CI: 0.85–3.48) when oral anticoagulation (OAC) was initiated 2–3 days after admission, and 2.43 (95% CI: 1.16–5.07) when initiated at 4–5 days, compared to OAC initiation at 0–1 days.
Conclusions: sPESI grade, the department of referral from the Emergency Department, the grade of dyspnea and the time of initiating OAC were associated with a longer hospital stay.

Factores que influyen en la estancia hospitalaria por embolia pulmonar. Un estudio de cohortes

Palabras clave:
Embolia pulmonar
Estancia hospitalaria
Pulmonary Embolism Severity Index simplificado (sPESI)
Inicio de anticoagulación oral
Disnea

RESUMEN

Introducción: El objetivo de este estudio fue analizar qué factores influyen en la estancia hospitalaria tras una embolia pulmonar.
Métodos: Se diseñó un estudio retrospectivo de cohortes en pacientes ingresados entre 2010 y 2015 por embolia pulmonar. Los enfermos se identificaron utilizando los códigos de información registrados en los informes de alta hospitalaria (códigos CIE-9-CM 415.11 y 415.19).
Resultados: Se incluyó a 965 pacientes. La mediana de la estancia fue 8 días (rango intercuartílico 6-13 días). Las puntuaciones más altas en el *Pulmonary Embolism Severity Index* simplificado (sPESI) se asociaron

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con mayor probabilidad de aumento de la estancia hospitalaria. En comparación con la derivación al Servicio de Neumología, la *odds ratio* (OR) de una estancia hospitalaria superior a la mediana fue de 8.65 (IC 95%: 5,42-13,79) para los pacientes derivados al Servicio de Medicina Interna y de 1,54 (95%CI: 1,07-2,24) para los pacientes hospitalizados en otros servicios. Los pacientes con grado 3 en la escala de disnea modificada de la *Medical Research Council* tenían una OR de 1,63 (IC 95%: 1,07-2,49). La probabilidad de una estancia hospitalaria más larga que la mediana fue de 1,72 (IC 95%: 0,85-3,48) cuando la anticoagulación oral se inició 2-3 días después del ingreso y 2,43 (IC 95%: 1,16-5,07) cuando se inició los días 4-5, en comparación con la iniciada los días 0-1 desde el ingreso.

Conclusiones: El grado de sPESI, el servicio de derivación desde Urgencias, el grado de disnea y el momento de inicio de la anticoagulación oral se asociaron con una estancia hospitalaria más larga.

Introduction

Pulmonary embolism (PE) is a public health problem of the first magnitude,[1] and is associated with a high economic burden.[6,7] It occurs at an incidence of 1–1.4 cases/1000 inhabitants/year,[2,3] and normally requires hospitalization.[4] Three-month mortality is estimated at 17%.[5]

Admissions due to PE in Spain and in other developed countries have increased in recent years,[8–15] although length of hospital stay has been steadily reducing.[14,16] This reduction in mean hospital stay in Spain suggests that the management of a patient with acute PE has improved. Several studies have shown that most of the costs derived from PE stem from hospitalization, the number of diagnostic procedures that need to be performed, and the comorbidities of these patients.[7,14,17–19]

The prognosis of PE can be estimated using the Pulmonary Embolism Severity Index (PESI) and the simplified PESI (sPESI), both of which measure 30-day mortality.[20] It is generally accepted that when the risk class is low (PESI) or zero (sPESI), patients can be treated as outpatients, or at least receive early discharge.[21] However, despite the wide variations in hospital stays, no predictive models are available to estimate length of hospital stay in PE.

The aim of this study was to identify factors that might affect length of stay in patients admitted due to PE. Identification of patients who may need short stays will help optimize hospital management.

Materials and Methods

Study Design

This was a retrospective cohort study that included patients admitted to the Complejo Hospitalario Universitario de Santiago de Compostela (Spain) for PE between 1 January 2010 and 31 December 2015. This is a 1145-bed tertiary level hospital with a Department of Respiratory Medicine that admits 2500 patients every year.

Inclusion and Exclusion Criteria

Individuals were included if they had a confirmed diagnosis of PE using ventilation/perfusion scintigraphy with high clinical probability (according to the Prospective Investigation of the Pulmonary Embolism Diagnosis criteria),[22] proximal lower-extremity deep vein thrombosis, demonstrated on compression ultrasonography in patients with inconclusive findings on ventilation/perfusion scintigraphy,[23] or acute PE diagnosed by chest spiral computed tomography with contrast medium.[24] Cases in which PE was not the reason for admission but rather a complication occurring during the hospital stay were excluded.

Our study was approved by the Research Ethics Committee of the hospital (registry 2016/007).

Data Collection

The International Classification of Disease, 9th revision (ICD-9-CM codes 415.11 y 415.19) hospital discharge codes were used to identify patients in the hospital database. The hospital stay of each patient was retrieved from the discharge report archived in the electronic clinical records.

Statistical Analysis

A multivariate logistic regression was used to predict the influence of different variables on the possibility of a longer- or shorter-than-average hospital stay for patients with PE. The dependent variable was a hospital stay of 8 days or more, or less than 8 days (median length of stay), and independent variables taken into account were: sPESI score (calculated according to Jiménez et al.),[20] sex, Charlson index (in 4 categories),[25] hospital department to which the patient was transferred from the emergency room (Respiratory Medicine, Internal Medicine, or other departments), temperature (higher or lower than 36 °C on admission), respiratory rate (higher or lower than 30 breaths/min), altered mental state (yes/no), and dyspnea grade (5 categories).[26] Odds ratios (OR) and corresponding 95% confidence intervals (CI) were calculated.

A subanalysis was performed to clarify the possible effect of starting an oral anticoagulant as soon as possible. For this analysis, patients in whom start of oral anticoagulation (OAC) was unknown and participants who started OAC after day 5 of hospitalization were excluded, our reasoning being that patients who started OAC on day 6 or later would have a much higher probability of a hospital stay lasting more than 8 days (the median). Covariates included in this analysis were the same as those of the overall analysis. Results are expressed as OR with corresponding 95% CIs. The analysis was performed using the IBM SPSS Statistics v20 software.

Results

The study included 965 patients with PE diagnosed between 2010 and 2015. Median age was 75 years (range 19–97), interquartile range was 63–83, 584 were women, and 381 (39.5%) were men. A Charlson index of 3 or more was observed in 20.4% of the patients. In total, 61.1% of the patients were transferred from the emergency room to the Department of Respiratory Medicine, 19.1% to Internal Medicine, and the others to other hospital departments. Median length of stay was 8 days (interquartile range 6–13). Table 1 shows a detailed description of patient characteristics.

Table 2 shows the results of the multivariate model analyzing the effect of the different variables on length of stay. A significant relationship was found between the sPESI score and the probability of a prolonged stay. It seems that the higher the sPESI, the greater the probability of a longer-than-average hospital stay. The