Respiratory Medicine (2013) **107**, 717–723

Available online at www.sciencedirect.com

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Trends in hospital admissions for acute exacerbation of COPD in Spain from 2006 to 2010

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Received 17 October 2012; accepted 11 January 2013
Available online 17 February 2013

KEYWORDS
Cost;
Mortality;
Outcome research;
Spain;
COPD;
Exacerbation

Summary
Objective: We aim to analyze changes in incidence, comorbidity profile, length of hospital stay (LOHS), costs and in-hospital mortality (IHM) of patients hospitalized for acute exacerbations of chronic obstructive pulmonary disease (AE-COPD) over a 5-year study period in Spain.
Methods: We selected all hospital admissions for AE-COPD between 2006 and 2010 from the National Hospital Discharge Database covering the entire population of Spain.
Results: We identified a total of 215,835 patients. Overall crude incidence had decreased from 2.9 to 2.4 exacerbations of COPD per 10.000 inhabitants from 2006 to 2010 ($p < 0.001$). In 2006, 17.9% of patients had a Charlson Index >2 and in 2010, the prevalence had increased to 25.0% ($p < 0.001$). Regarding to treatment, we detected a significant increase in the use of non-invasive ventilation from 2.1% in 2006 to 5.3% in 2010 ($p < 0.001$). The median LOHS was 7 days in 2006 and it remained stable until 2010. During the period studied, the mean cost per patient increased from 3747 to 4129 Euros. Multivariate analysis showed that incidence of hospitalizations for AE-COPD and IHM had significantly decreased from 2006 to 2010.
Conclusions: The current study provides data indicating a decrease in incidence of hospital admissions for AE-COPD in Spain from 2006 to 2010 with concomitant reduction in IHM, despite increasing comorbidity during this period, with no variations in LOHS. The mean cost per patient has risen significantly.

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http://dx.doi.org/10.1016/j.rmed.2013.01.007

Background

Chronic obstructive pulmonary disease (COPD) is a leading cause of morbidity and mortality worldwide and it remains a major public health problem. The prevalence of COPD is about 10%[1] and it is expected to increase rapidly in the near future due to the persistence of risk factors of COPD and changes in the age characteristics of the world population.[2] Actually, COPD is the fourth leading cause of death in the United States and is projected to become the third leading cause of death by 2020.[3] A large proportion of morbidity and mortality from COPD results from acute exacerbations.[4]

Acute exacerbation of COPD (AE-COPD) is defined as a sustained worsening of the patient's condition, from the stable state and beyond normal day-to-day variations, that is acute in onset and requires a change in regular medication in a patient with underlying COPD.[5] Exacerbations are major events in the disease course, especially when the patient needs hospitalization. Indeed, AE-COPD is associated with a decline in lung function, impaired health-related quality of life, and increased mortality and elevated costs.[6,7] Hospitalizations for AE-COPD account for a large proportion of COPD-related hospital healthcare expenditure. The number and duration of hospitalization, severity of airway obstruction, smoking, mechanical ventilation, admission to the ICU, and comorbidities affect the cost of COPD significantly.[8] Therefore, to improve outcomes and reduce mortality due to COPD, we need to optimize the management of acute exacerbations.

Collecting data about hospitalizations for AE-COPD is important at a country level to evaluate the incidence, patient characteristics and outcome of the hospital admissions in variables such as length of stay (LOHS), complications, mortality and burden of disease. For example, data obtained from the French national hospital discharge database, showed that hospitalizations rates for AE-COPD have increased between 1998 and 2007, especially among women.[9] The US National Hospital Discharge Survey has also reported that the hospitalizations rates for COPD increased over the lasts decades, and the gap between men and women disappeared.[10] Comparisons of hospital admissions for AE-COPD and outcomes between countries could provide information that would help to understand the possible differences and would also aid for planning the provision of healthcare services. The discharge database provides a large alternative information source to describe and analyze the trends and characteristics of hospitalizations for AE-COPD at a national level.

The aim of this study was to analyze national representative hospital discharge data, collected from 2006 to 2010 years, to elucidate changes in the incidence, comorbidity profiles, length of hospital stay (LOHS), costs and in-hospital mortality (IHM) of patients hospitalized for AE-COPD in Spain over a 5-year study period.

Methods

According to the Spanish Health System Organization, each physician must declare, at the time of discharge of each hospitalization all diagnoses and procedures performed, using the code of the International Classification of Disease, 9th revision (ICD-9CM). This information is collected by the Spanish National Hospital Database, namely "Conjunto Minimo Basico de Datos" (CMBD) that compiles all the public and private hospital data covering over 95% of hospital discharges.[11] The CMBD database includes patients' variables (sex, date of birth), date of admittance, date of discharge, discharge destination (home, decease or other health/social institution), up to 14 discharge diagnosis and up to 20 procedures performed during the admission.

We selected all patients hospitalized for AE-COPD (ICD-9-CM procedure code 491.21) during 2006—2010 year period. We calculated the yearly age- and sex-specific incidence rates by dividing the number of cases per year per sex and age group, with the corresponding number of person in that population group according to the National Institute of Statistics (INE) reported at December 31 of each year.[12] The incidence rates were expressed in terms of 10,000 inhabitants. The proportion of patients that died during the hospital admission (in-hospital mortality), LOHS, and costs were also estimated for each year studied. Costs were calculated using Diagnosis-Related Groups (DRG) for the disease. DRG represents a medical-economic entity concerning a set of diseases requiring analogous management resources.[13] All costs shown are adjusted for the increment of the inflation in the same period in Spain.

We analyzed the use of ventilatory support during AE-COPD hospitalization. Use of non-invasive positive pressure ventilation (NIPPV) and invasive mechanical ventilation (IMV) was determined based on procedure codes 93.90 and 96.04, respectively. If both procedures were used the patient was included in the IMV group. Clinical characteristics included information in overall comorbidity at the time of the hospitalization, which was assessed by computing the Charlson comorbidity index. We calculated the Charlson comorbidity index (CCI) based on coded data available in the discharge register using the codes and methods described by Deyo et al.[14] The index applies to 19 disease categories that are summated to obtain an overall score for each patient. We divided patients into 3 categories: low index, which corresponds to patients with no previously recorded disease categories in the Charlson comorbidity index; medium index, patients with one or two disease categories; and high index, patients with more than two disease categories. The validity of information on comorbidity derived from ICD-9 administrative data has been assessed comparing this information with that recoded in the patient medical history, finding that administrative data generally agree with patient chart data for recording of comorbidities although comorbidities tend to be under-reported in administrative data.[15] The Charlson comorbidity index is very frequently used in epidemiological investigation to reduce potential confounding. However, residual confounding by comorbidity is inevitable; given how these score is derived.[16]

Statistical analysis

Quantitative variables are expressed as means, medians, range and inter-quartile range (IQR). Qualitative variables are expressed as frequencies and percentages.