The costs of hospitalization in patients with acute exacerbation of chronic obstructive pulmonary disease

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Introduction: Chronic obstructive pulmonary disease (COPD) is a major public health problem. It imparts a substantial economic burden on individuals and society. Acute exacerbations are the main cause of hospital admissions and hospitalizations in patients with COPD in Turkey.

Objectives: We aimed to determine the costs of hospitalization in patients with acute exacerbations of COPD (AECOPD).

Results: A total of 7832 (1556 women, 6276 men) patients were hospitalized due to acute exacerbations of COPD between 2005–2009 in the Samsun Chest Diseases and Thoracic Surgery Hospital, northern Turkey. The mean age was 64.6 ± 19.8 years old and median length of hospital stay was 14.8 ± 9.5 days. The mean cost per admission was US$718 ± 364. Drug costs accounted for the largest portion (53.5%) of the mean cost, followed by bed cost (19.6%). One hundred seventy-four (2.2%) of the total hospitalized patients with AECOPD died in hospital.

Conclusion: AECOPD continues to have both significant economic burden and high mortality rate.

Keywords: COPD, acute exacerbation, hospitalization, costs

Introduction
Although chronic obstructive pulmonary disease (COPD) is a preventable and treatable disease, it remains a significant public health problem. COPD is a major chronic cause of mortality and morbidity and it has been identified as the fourth leading cause of mortality and morbidity. Unlike many leading causes of death and disability, COPD is projected to increase in much of the world as smoking habits rise and the population ages.1,2 It was estimated by the World Health Organization (WHO) in 2000 that 274 million people worldwide died of COPD.3 Acute exacerbation is the main cause of hospitalization in patients with COPD. The number of patients hospitalized for acute exacerbation of COPD (AECOPD) accounts for 13% of all admitted patients.4 It imparts a substantial economic burden on individuals and society. Hospitalization for acute exacerbations represents a major component of the socioeconomic burden related to COPD.5 Hilleman et al reported that hospitalization costs represent 40.4% of total health care costs for patients with mild COPD, and 62.6% of total costs for patients with severe COPD.6 Very few studies have quantified the economic and premature mortality associated with COPD. The aim of this study was to determine the costs of hospitalization in patients with AECOPD.

Material and methods
Samsun is the biggest city in the Black Sea region of Turkey. Samsun Chest Diseases and Thoracic Surgery Hospital is the reference hospital for chest diseases and thoracic...
surgery in northern Turkey. More than 100,000 patients with respiratory problems are referred to the hospital per year. Diagnosis of AECOPD (emphysema and/or chronic bronchitis) was based on the presence of any combination of the following symptoms: increased dyspnea and increased production and purulence of sputum that led to a change or increase in treatment. This study aimed to investigate the costs in hospitalized patients with AECOPD. Data on AECOPD management were retrospectively taken and evaluated directly from the medical records. Costs in this analysis were identified for drugs (including short-acting and long-acting $\beta$-agonists, ipratropium, theophylline, inhaled and oral steroids, and antibiotics), oxygen therapy, non-invasive mechanical ventilation, emergency department visit, laboratory tests, diagnostic tests, and hospitalizations. The Institutional Review Board approved the use of medical records. As a state hospital, all expenditure was at prices set by the state. Expenditure was calculated in US dollars (exchange rate at the time of the study, 1.5 Turkish liras per US dollar).

### Results

The results of the study and characteristics of patients are presented in Table 1. A total of 60,529 patients with COPD were seen in the Samsun Chest Diseases and Thoracic Surgery Hospital. 7832 (12.9%) patients were hospitalized due to mild and moderate AECOPD; 19.8% of patients were women ($n = 1556$) and 80.1% of patients were men ($n = 6276$). The mean age of patients was $64.6 \pm 19.8$ years. The median length of hospital stay was $14.8 \pm 9.5$ days. The numbers of patients hospitalized per year were 1061, 1952, 1794, 1144, and 1181 in 2005, 2006, 2007, 2008, and 2009, respectively. The mean hospital costs per admission were $668 in 2005, $765 in 2006, $768 in 2007, $667 in 2008, and $682 in 2009. The mean cost of hospitalization over 5 years was $718 \pm 364$/per admission. The percentages of mean costs are demonstrated in Figure 1. Drug costs were the highest (53.5%) followed by bed cost (19.6%), laboratory (9.8%), radiology (6.2%), examination (4.6%) and emergency department costs (3.9%), and other (non-invasive ie, ventilation) costs (2.4%). Of the total hospitalized patients with AECOPD, 174 (2.2%) patients died in hospital. Progressive respiratory failure, lung cancer, pulmonary infections, and cardiovascular comorbidities were major causes of death in hospitalized patients with AECOPD.

### Table 1 Characteristics of patients

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>n (%)</th>
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<tbody>
<tr>
<td>Total number of COPD patients</td>
<td>60529</td>
</tr>
<tr>
<td>Hospitalized COPD patients</td>
<td>7832 (12.9)</td>
</tr>
<tr>
<td>Premature mortality</td>
<td>174 (2.2)</td>
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<tr>
<td>Age (mean ± SD years)</td>
<td>64.6 ± 19.8</td>
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<tr>
<td>Male</td>
<td>6276 (80.1)</td>
</tr>
<tr>
<td>Female</td>
<td>1556 (19.8)</td>
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<tr>
<td>Costs by year (US$)</td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>$668</td>
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<tr>
<td>2006</td>
<td>$765</td>
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<tr>
<td>2007</td>
<td>$768</td>
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<tr>
<td>2008</td>
<td>$667</td>
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<tr>
<td>2009</td>
<td>$682</td>
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<tr>
<td>Mean cost (US$)</td>
<td>$718 ± 364</td>
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### Distribution of costs

- **Drug**: 53.5%
- **Bed**: 19.6%
- **Laboratory**: 9.8%
- **Radiology**: 6.2%
- **Examination**: 4.6%
- **Emergency department**: 3.9%
- **Other**: 2.4%

**Abbreviation:** COPD, chronic obstructive pulmonary disease.

### Discussion

COPD is a major public health problem. It is a costly disease with both direct costs (value of health care resources devoted to diagnosis and medical management) and indirect costs (monetary consequences of disability, missed work, premature mortality, and caregiver or family costs resulting from the illness). According to reported articles, hospital admission rates are suitable for detecting the health burden of COPD.4 Acute exacerbations are the main cause of hospitalization in patients with COPD. Hospitalization-related costs are the largest portion of all expenditure for patients with COPD. Hospitalization costs
In these studies, the high mortality rates were caused by mechanical ventilation and ICU.

In conclusion, acute exacerbations of COPD continues to have both significant economic burden and high mortality rate.

Disclosure

The authors report no conflicts of interest in this work.

References


