Asthma and Chronic Obstructive Pulmonary Disease Overlap Syndrome: Doubled Costs Compared with Patients with Asthma Alone

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A B S T R A C T

Background: Patients with asthma and chronic obstructive pulmonary disease (COPD) overlap syndrome (ACOS) have more rapid disease progression and more exacerbations than do those with either condition alone. Little research has been performed, however, in these patients. **Objective:** The objective was to summarize the health care utilization, costs, and comorbidities of patients with uncontrolled asthma and patients with ACOS. **Methods:** This retrospective analysis used medical and pharmacy claims from large commercial health plans. The study included patients 6 years or older with a diagnosis of asthma and one or more asthma exacerbation (index event). Patients were classified as having asthma alone or ACOS, and the two groups were matched for age, sex, region, index year, index month, and health plan type. Outcomes included rates of comorbid disease, health care utilization, and costs during the 12 months before and after the index exacerbation. **Results:** Among the matched patients with asthma (6,505 ACOS; 26,060 without COPD), mean annual all-cause health care costs were twice as high as for patients with ACOS ($22,393 vs. $11,716; P < 0.0001). Asthma-related costs, representing 29% of total costs, were nearly twice as high among patients with ACOS ($6,319 vs. 3,356; P < 0.0001). Cost differences were driven by large differences in the proportions of patients with an inpatient hospitalization (34.0% vs. 14.6%; P < 0.0001) or emergency department visit (29.6% vs. 19.9%; P < 0.0001). Nearly all prespecified comorbid conditions were more prevalent in the ACOS group. **Conclusions:** Patients with asthma and COPD had nearly double the health care costs as did patients with asthma without COPD. The overall disease profile of patients with asthma should be considered when managing patients, rather than treating asthma as a solitary condition.
Keywords: asthma, claims data, COPD, overlap syndrome.

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Introduction

An estimated 25.5 million Americans have been diagnosed with asthma [1], and nearly 18 million adults have been diagnosed with chronic obstructive pulmonary disease (COPD) [2]. These diseases impose a substantial burden on both the health care system and the society. The latest estimate in 2007 cited a total cost of $57.28 billion annually for asthma, including $43.57 billion in direct costs for medications and health care services and $13.7 billion in indirect costs associated with lost productivity because of missed days of school or work [3]. In 2007, asthma was the source of 13.9 million outpatient visits, 1.75 million emergency department (ED) visits, and 456,000 hospitalizations [4]. COPD carries a similarly large economic burden, with a projected economic impact of $49.9 billion due to the direct and indirect costs of COPD in 2010 [5], and it has been estimated that patients with COPD incur an excess of $6000 in annual health care costs per patient than do those without COPD [6]. In addition, there were more than 15 million outpatient visits and 739,000 hospitalizations due to COPD in 2009, and in 2008 COPD accounted for 56.7% of all deaths due to lung disease [7].

Despite advances in asthma management, up to 50% of the patients with asthma have uncontrolled disease, where *control* has been defined as having no marker for moderate to severe exacerbations (an ED visit for asthma, a hospital admission for asthma, or a filled prescription of an oral corticosteroid [OCS] over a 12-month period) and no more than 3 or 10 doses of short-acting β_2-agonists (SABA) per week depending on the severity of asthma [8]. Of patients with uncontrolled asthma, 70% had at least one unscheduled office visit, 36% had at least one ED visit, and 14% had at least one hospitalization in 2005 [9]. Patients with uncontrolled asthma had more absences from work or school, used greater health care

resources, and had more than double the health care costs than did patients with controlled asthma [10,11]. Reasons for the lack of control have generally focused on the undertreatment of asthma, while the impact of comorbidities has not been thoroughly explored.

Although asthma and COPD are distinct conditions, their symptoms are similar and the differential diagnosis may therefore be difficult [12,13]. Furthermore, asthma and COPD often occur together, referred to as asthma-COPD overlap syndrome (ACOS), and with other comorbid conditions [12–15]. Prevalence of the asthma-COPD overlap has been reported at rates higher than 50% in other observation studies [16–18], while clinical studies have also identified this overlap pattern. In a recent Italian study, the prevalence of comorbid asthma and COPD was 1.6% among people aged between 20 and 44 years, 2.1% in those 45 to 64 years old, and 4.5% in those aged 65 years or older, accounting for 16%, 30%, and 61% of all asthma cases in each age group, respectively [12]. Soriano et al. [19] found that 17% of a US population and 19% of a UK population surveyed demonstrated more than one obstructive airway disease, and the prevalence of asthma-COPD overlap increased with age for both men and women. Compared with those who have only asthma or COPD, individuals who have both conditions have more rapid disease progression, more exacerbations, increased hospitalizations, a greater number of comorbidities, and a lower health-related quality of life [12,13,15,20]. All these are expected to lead to an increase in costs.

The present study used recent medical and pharmacy insurance claims data from a large US health plan to analyze differences in health care utilization and resulting costs of patients with ACOS versus patients with asthma without COPD, among those with *uncontrolled disease*, defined as having at least one asthma exacerbation during a 4-year intake period. The results of this study aim to fill an evidence gap for ACOS by providing real-world data regarding demographic characteristics, comorbidities, health care costs, and resource use of uncontrolled patients with asthma exacerbations, and to serve as a foundation for future clinical trials and observational studies.

Methods

Study Design and Setting

This retrospective cohort analysis used administrative claims data obtained from the HealthCore Integrated Research Environment (HIRE). HIRE contains a broad, clinically rich, and geographically diverse spectrum of longitudinal claims data for approximately 35.9 million members of commercial health plans in the United States. The database represents claims from the largest commercially insured population in the United States and includes lines of business such as health maintenance organizations, point-of-service, preferred provider organizations, and indemnity plans.

Researchers had access to only a limited data set. Strict measures were taken to preserve patient anonymity and confidentiality as well as to ensure full compliance with the 1996 Health Insurance Portability and Accountability Act.

Patient Selection

The study includes patients aged 6 years and older who had a diagnosis of asthma between January 1, 2007, and December 31, 2010. All patients had at least one asthma exacerbation during the 4-year intake period, which was defined as a prescription fill for an OCS, or an ED visit with an asthma diagnosis (defined using *the International Classification of Diseases, 9th Revision, Clinical Modification* codes 493.0x, 493.1x, and 493.9x), or an inpatient visit with a

primary diagnosis of asthma [21]. The date of the first exacerbation during the intake period was considered the index date.

For inclusion in the study, patients were also required to have at least one asthma diagnosis and at least one pharmacy claim for an asthma medication within the 12 months before the index date and at least 12 months continuous health plan enrollment before and after the index event. There were no exclusion criteria for this study.

ACOS Cohort

Patients with asthma were split into two mutually exclusive cohorts on the basis of their COPD status in the preindex period. Patients with at least one medical claim including a diagnosis of COPD (*International Classification of Diseases, 9th Revision, Clinical Modification* code 491.xx [chronic bronchitis], 492.xx [emphysema], 494.xx [bronchiectasis], or 496.xx [chronic airway obstruction NOS]) during the 12-month preindex period were categorized as patients with ACOS; patients with no diagnosis of COPD were categorized as patients with asthma without COPD.

Outcome Measures

The primary outcome was the utilization (inpatient, ED visits, and outpatient visits, and asthma-related prescription fills) and resulting health care costs (total costs paid by the patient and the health plan) in the 12 months before and after the exacerbation. Asthma-related health care resource utilization and costs were defined as any medical claim with at least one diagnosis of asthma or a pharmacy claim for respiratory-related medication. Prescriptions are not linked to medical diagnoses in the database, and thus medications were considered respiratory-related medications on the basis of their medication class and indication, not a diagnosis. Respiratory medication use was identified by at least one pharmacy claim for controller medication, including inhaled corticosteroids (ICS), long-acting β_2-agonists, combination ICS/long-acting β_2-agonist agents, leukotriene receptor antagonists, theophylline, and omalizumab, or rescue medication, including SABA and OCS. All-cause health care costs include the costs of all resource utilization (outpatient and office visits, inpatient hospitalizations, ED visits, skilled nursing facility stays, and prescription fills) for any reason or diagnosis. All-cause pharmacy costs include the costs of all medications, for the treatment of any disease or condition, filled in a pharmacy. For both asthma-related and all-cause events, the costs for laboratory testing and all procedures are included within the setting they were performed (physician's office, other outpatient setting, ED, inpatient hospitalization, etc.).

Statistical Analysis

To examine differences in comorbid conditions, health care utilization, and costs between patients with ACOS and patients with asthma without COPD, a technique similar to that of propensity score matching was used to create comparable ACOS and non-COPD cohorts. Because part of the objective of this study was to observe differences in patient comorbidities, the goal of the matching was not to balance on all potential covariates as is commonly the case when using propensity scores to match two treatment groups, but rather to achieve balance on a few very general characteristics between two disease groups. Because of these differences, we refrain from calling this propensity score matching. Because the number of patients without COPD greatly outnumbered those with the condition, patients were matched 1:4 (ACOS: asthma without COPD). A logistic regression model was used to model the probability of a patient having COPD (similar to a propensity score) predicted by age (continuous), sex, geographic region, index year, index month, health plan type,