Original Article

Characteristics and Outcomes of HEDIS-Defined Asthma Patients with COPD Diagnostic Coding

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What is already known about this topic? The asthma-COPD overlap syndrome (ACOS) is described clinically as persistent airflow limitation combined with features of both asthma and COPD. Patients with persistent asthma who also have a COPD diagnosis code (AS-COPD) may share clinical characteristics similar to ACOS. Patients with AS-COPD can be identified in administrative databases, but are not sufficiently understood or characterized.

What does this article add to our knowledge? Patients with AS-COPD exhibited, compared with those with persistent asthma only, significantly more comorbidities, a higher intensity of asthma treatments, and more uncontrolled asthma, based on both risk and impairment domains. Moreover, elevated blood eosinophil count in AS-COPD was a risk factor for future asthma exacerbations as previously reported for patients with persistent asthma only.

How does this study impact current management guidelines? These findings document a greater disease burden associated with elevated blood eosinophils in AS-COPD and suggest a common inflammatory component between AS-COPD and PA only.

BACKGROUND: Little is known of the disease burden of patients with persistent asthma (PA) who also have a chronic obstructive pulmonary disease (COPD) diagnosis code (AS-COPD).

OBJECTIVE: The objective of this study was to characterize and compare patients with AS-COPD with those with PA without COPD diagnosis, and determine in AS-COPD the relationship between blood eosinophil count and future asthma exacerbations.

METHODS: This retrospective cohort study used administrative pharmacy and health care utilization data to identify, characterize, and compare the burden and asthma exacerbations in adults with AS-COPD (N = 901) with those with PA (N = 2392). Negative binomial regression and Poisson regression models were used to evaluate the relationships between baseline blood eosinophil counts (high vs low) based on various cutoff points and asthma exacerbations in the follow-up year, adjusting for demographics, comorbidities, and asthma burden.

RESULTS: Compared with patients with PA, those with AS-COPD were significantly (all $P < .001$) older, more frequently female, less well educated, more likely to be or have been a smoker, had more comorbidities, received more asthma controller medications, and had greater rates and frequencies of asthma exacerbations, but had similar blood eosinophil counts. The rate of asthma exacerbations/person-year in AS-COPD during follow-up was 1.61 (95% CI, 1.18-2.20). Patients with AS-COPD with a blood eosinophil count ≥400 cells/mm^3 had an increased rate of future asthma exacerbations compared with those whose blood eosinophil count was <400 cells/mm^3 (adjusted rate ratio, 1.44, 95% CI, 1.09-1.90).

CONCLUSIONS: Compared with patients with PA, those with AS-COPD had more disease burden, but a similar relationship of high blood eosinophil count to more future asthma exacerbations. These findings suggest a common inflammatory component between AS-COPD and PA. © 2015 American Academy of Allergy, Asthma & Immunology (J Allergy Clin Immunol Pract 2015;■:■-■)

Key words: *Asthma; Asthma control; Asthma guidelines; Asthma impairment; Asthma risk; COPD; Eosinophils; GINA step-care level; Managed care*

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Abbreviations used
ACOS- Asthma-COPD overlap syndrome
AS-COPD- Persistent asthma patients with ICD-9 diagnosis codes for chronic bronchitis, emphysema, chronic airway obstruction, or chronic obstructive asthma
AMR- Asthma Medication Ratio
COA- Chronic obstructive asthma
COPD- Chronic obstructive pulmonary disease
ED- Emergency department
GINA- Global Initiative for Asthma
HEDIS- Healthcare Effectiveness Data and Information Set
ICD-9- The International Classification of Diseases, 9th Revision
ICS- Inhaled corticosteroids
KPSC- Kaiser Permanente Southern California
LABA- Long-acting β_2-agonist
NCQA- National Committee of Quality Assurance
PA- Persistent asthma without chronic obstructive pulmonary disease ICD-9 diagnosis codes
RR- Rate ratio
SABA- Short-acting β_2-agonists

INTRODUCTION

The National Committee of Quality Assurance (NCQA) has developed the Healthcare Effectiveness Data and Information Set (HEDIS) tools to measure the performance and delivery of medical care between US health plans with an adoption rate of more than 90%. Specific HEDIS tools were created to identify persistent asthma (PA) and chronic obstructive pulmonary disease (COPD).[1] The 2-year administrative data HEDIS criteria to identify patients with PA require at least one of the following events to occur in each of 2 consecutive years: (1) 4 or more asthma rescue or controller medications dispensed, (2) 1 or more emergency department (ED) visits or hospitalizations with a diagnosis of asthma, or (3) 4 or more outpatient visits with a diagnosis of asthma and 2 or more asthma medications dispensed.[1] In addition to the above patient ascertainment for PA, HEDIS measures also require exclusion of patients with the International Classification of Diseases, 9th Revision Codes (ICD-9), for the spectrum of COPD, cystic fibrosis, and acute respiratory failure.[1] HEDIS applies the following ICD-9 codes administratively to identify patients with the COPD spectrum of illnesses (chronic airway obstruction [496], chronic obstructive asthma [COA] [493.2x], chronic bronchitis [491.x], or emphysema [492.x]).[2] Starting in 2013, NCQA decided to switch the COA diagnosis code (ICD-9, 493.2x) from the HEDIS PA specification measure to the COPD specification measure.[3] Speculations for this change include that COA may more closely align clinically and physiologically to COPD than PA.

Electronic medical records frequently note physician diagnosis coding of asthma or COPD in the same patient at different times.[4] Little is known of the disease characteristics and burden of patients with PA who also have received diagnosis coding for COPD (AS-COPD), and as such these patients need to be studied. Patients with AS-COPD identified administratively may share clinical characteristics similar to the asthma-COPD overlap syndrome (ACOS) that has been described clinically as persistent airflow limitation combined with features of both asthma and COPD.[5-9]

We recently reported the characteristics and asthma-related burden of an HEDIS defined adult PA cohort and suggested that blood eosinophil counts of $\geq$400 cells/mm^3 appeared to be an independent risk factor for future asthma exacerbations.[10] The present report characterizes and compares administratively identified patients with AS-COPD with those with PA, and evaluates the relationship of blood eosinophil in patients with AS-COPD to future asthma exacerbations. We hypothesized that high blood eosinophil counts predict future exacerbations in patients with AS-COPD, as reported in patients with PA without a COPD diagnosis code.

METHODS

Study design

We conducted a retrospective cohort study to characterize patients with AS-COPD and evaluated the relationship between blood eosinophil counts at baseline (2010) and asthma exacerbations in the following 12 months (2011). The Kaiser Permanente Southern California (KPSC) Research Data Warehouse captured pharmacy and health care utilization data that allowed identification of adults with either AS-COPD or PA (Figure 1, *A*). The study was approved by the KPSC Institutional Review Board, with waiver of written consent.

Patients

Adults between 18 and 64 years of age were identified with either HEDIS-defined 2-year PA (2009 and 2010)[11,12] or AS-COPD if they had been excluded from the PA cohort by evidencing COPD ICD-9 diagnostic codes (chronic airway obstruction [496], COA [493.2x], chronic bronchitis [491.x], or emphysema [492.x])[2] during 2004-2010 (Figure 1, *B*). In addition, patients were required to have had continuous health plan enrollment and pharmacy benefit in 2009-2011 (no gap of >45 days within each calendar year).[11] Exclusions included encounter diagnoses of chronic conditions listed in the legend to Figure 1(*A*). The study included patients with a blood eosinophil determination in 2010.

Blood eosinophil counts

Blood eosinophil counts were calculated from the last complete blood count with differential obtained in 2010. The association between blood eosinophil count (high vs low) with cutoff points from 100 to 500 cells/mm^3 by 50 cell/mm^3 increments and asthma exacerbations in 2011 was determined for patients with AS-COPD. Four blood eosinophil cutoff points (150, 200, 300, and 400 cells/mm^3) were used for multivariable analyses. Because oral corticosteroids and infections influence blood eosinophil counts, we conducted sensitivity analyses excluding blood eosinophil count measured within 15 days before systemic corticosteroid courses, infections, or systemic antibiotics and/or antiviral medications (restricted eosinophils).[10]

Study measures

Education count and household income were determined by using address information geocoded to the census block level and linked to block group-level information about socioeconomic status provided by Nielsen (www.nielsen.com). The Asthma Medication Ratio (AMR) was defined as the number of dispensed asthma controller units (inhaled controller medication canisters or 30-day supplies of oral controller medications) divided by the total number of controller units and short-acting β_2-agonist (SABA) canisters dispensed and is an administrative data quality marker predictive of future ED and/or hospital care.[13] A ratio of $\geq$0.5 is the minimum recommended cutpoint.[13] ICS products were categorized into low,