Short communication

Sex and racial/ethnic differences in the reason for 30-day readmission after COPD hospitalization

Tadahiro Goto [a, *], Mohammad Kamal Faridi [a], Koichiro Gibo [b], Carlos A. Camargo Jr. [a, c], Kohei Hasegawa [a, c]

[a] Department of Emergency Medicine, Massachusetts General Hospital, Boston, MA, United States
[b] Biostatistics Center, Kurume University, Kurume, Fukuoka, Japan
[c] Harvard Medical School, Boston, MA, United States

ARTICLE INFO

ABSTRACT

Background: Reduction of 30-day readmissions in patients hospitalized for chronic obstructive pulmonary disease (COPD) is a national objective. However, there is a dearth of research on sex and racial/ethnic differences in the reason for 30-day readmission.
Methods: We conducted a retrospective cohort study using 2006—2012 data from the State Inpatient Database of eight geographically-diverse US states (Arkansas, California, Florida, Iowa, Nebraska, New York, Utah, and Washington). After identifying all hospitalizations for COPD made by patients aged ≥40 years, we investigated the primary diagnostic code for all-cause readmissions within 30 days after the original COPD hospitalization, among the overall group and by sex and race/ethnicity strata.
Results: Between 2006 and 2012, there was a total of 845,465 COPD hospitalizations at risk for 30-day readmissions in the eight states. COPD was the leading diagnostic for 30-day readmission after COPD hospitalization, both overall (28%) and across all sex and race/ethnicity strata. The proportion of respiratory diseases (COPD, pneumonia, respiratory failure, and asthma) as the readmission diagnosis was higher in non-Hispanic black (55%), compared to non-Hispanic white (52%) and Hispanics (51%) (p < 0.001). The proportion of asthma as the readmission diagnosis differed significantly by sex (6% in men and 9% in women; p < 0.001). Similarly, the proportion of asthma also differed significantly by race/ethnicity (5% in non-Hispanic white, 16% in non-Hispanic black, 15% in Hispanics, 13% in others; p < 0.001).
Conclusions: In this analysis of all-payer population-based data, we found sex and racial/ethnic differences in the reason for 30-day readmission in patients hospitalized for COPD.

1. Introduction

Approximately 700,000 patients are hospitalized for chronic obstructive pulmonary diseases (COPD) in the US annually [1], and 20% of those hospitalizations are readmitted within 30 days of discharge [2]. Reduction of 30-day readmissions in patients hospitalized for COPD is a national objective [3]. For example, the Affordable Care Act has developed the Hospital Readmissions Reduction Program to improve care and reduce costs for targeted conditions including COPD [4].

Recent studies have reported sex and racial/ethnic differences in COPD morbidity (e.g., rising rate of COPD-related hospitalizations in women and African-Americans) [5] and clinical features of COPD (e.g., higher incidence of asthma-COPD overlap in these same sub-populations) [6]. However, to the best of our knowledge, no prior study has examined the population-specific reasons for all-cause readmission after COPD hospitalization. In this context, we analyzed large, population-based, multi-payer databases from eight geographically-diverse US states to investigate the sex and

racial/ethnic differences in the coded reasons for 30-day readmission among patients hospitalized for COPD. A better understanding of the reasons for readmission may inform population-specific strategies to improve COPD management and reduce healthcare spending.

2. Methods

We conducted a retrospective cohort study using 2006–2012 data from the Healthcare Cost and Utilization Project's State Inpatient Database (SID) of eight US states (Arkansas, California, Florida, Iowa, Nebraska, New York, Utah, and Washington). The SID includes all inpatient discharges from short-term, acute-care, nonfederal, general, and other specialty hospitals. Additional details of the SID may be found elsewhere [7].

We first identified all hospitalizations made by patients aged ≥40 years with a principal discharge diagnosis of COPD (*ICD-9-CM* diagnosis code of 491.21, 491.22, 491.8, 491.9, 492.8, 493.20, 493.21, 493.22, and 496), or those with primary diagnosis of respiratory failure (*ICD-9-CM* diagnosis code of 518.81, 518.82, 518.84, and 799.1) and secondary diagnosis of COPD [8]. We excluded hospitalizations made by patients who left the hospital against medical advice, those who were transferred to another acute-care facility, those who died in-hospital at the index hospitalization, or who were out-of-state residents. Next, we identified readmission within 30 days of discharge from the index COPD hospitalization and investigated the primary reason, as reflected by the principal diagnosis code of the readmission. To make data interpretation more meaningful, we consolidated the principal diagnoses (>14,000 *ICD-9-CM* codes) into 285 mutually exclusive diagnostic categories using the Agency for Healthcare Research and Quality *Clinical Classifications Software* [9], as done previously [10,11]. We used Stata 14.1 (StataCorp; College Station, Texas) and chi-square test to examine sex and racial/ethnic differences in the coded reason of readmission. Our local institutional review board of approved this study.

3. Results

Between 2006 and 2012, we identified 845,465 hospitalizations at risk for 30-day readmissions (i.e., index hospitalizations) in eight states. Overall, the mean patient age was 69 years, 59% were women, and 74% were non-Hispanic white. The mean age was lower in non-Hispanic black compared to that in the other race/ethnicity groups (p < 0.001; Table 1). Overall, the 30-day all-cause readmission rate was 19.7%; the most frequent readmission diagnosis was COPD (28%), followed by respiratory failure (9%), pneumonia (8%), and asthma (8%). These respiratory diseases accounted for 53% of 30-day readmissions in this population. The proportion of these respiratory diseases as the readmission diagnosis differed significantly across the race/ethnicity strata. Non-Hispanic black patients were more likely to be readmitted for respiratory diseases (55%), compared to non-Hispanic white (52%) and Hispanic (51%) patients (p < 0.001). Among the most frequent readmission diagnoses, the proportion of asthma differed significantly across the sex and race/ethnicity strata. Compared to men, women had a higher proportion of asthma as the readmission diagnosis (6% vs 9%; p < 0.001). Likewise, compared to non-Hispanic white group, other race/ethnicity groups had a higher proportion of asthma as the readmission diagnosis (5% in non-Hispanic white, 16% in non-Hispanic black, 15% in Hispanics, and 13% in the others; p < 0.001). These racial/ethnic differences persisted after stratification by sex (Table 2).

4. Discussion

Consistent with a recent analysis of Medicare beneficiaries, which reported COPD exacerbation as the most frequent reason for readmissions in patients hospitalized for COPD [12], the current analysis of all-payer population-based data also demonstrated that respiratory diseases accounted for the majority of readmission diagnosis and COPD was the leading readmission diagnosis. Furthermore, our study extends the prior study by demonstrating, for the first time, significant differences in the coded reasons of readmission across sex and racial/ethnic groups. Specifically, we found that the proportion of respiratory diseases as the readmission diagnosis was higher in non-Hispanic black patients, compared to that in non-Hispanic white and Hispanic patients. The reasons of the observed differences are likely multifactorial. For example, compared to non-Hispanic whites, non-Hispanic blacks may have smaller lung volumes, lower socioeconomic status, and were less likely to receive medical advice from physicians and to be vaccinated for preventing pneumonia and COPD exacerbations [5,13].

We also found that the proportion of asthma as the readmission diagnosis was significantly 1.5-fold higher in women (as compared to men) and 2–3-fold higher in racially/ethnically minorities (as compared to non-Hispanic whites). These findings are consistent with emerging data indicating that these subpopulations have a higher prevalence of asthma-COPD overlap syndrome [6]. COPD patients with asthma overlap have more frequent exacerbations [6] and higher readmission rates compared to patients with COPD alone [14], and may have benefits from an adjunctive therapy (e.g., an inhaled corticosteroid/long-acting β2-agonist combination) [15]. Although readmission is a complex construct involving disease morbidity, hospital and outpatient care, and post-discharge environment, the identification of wide variations in the reason for readmission across subpopulations is an important finding and should facilitate further investigation into the underlying mechanisms.

Our study has several potential limitations. First, since we used administrative data, misclassification of hospitalization reasons is possible [16]. The labeling of respiratory conditions might have been influenced by patient's age and sex (e.g., younger patients and women are more likely to be diagnosed as asthma [17,18]). Nevertheless, while non-Hispanic black patients were younger compared to Hispanic patients, the proportion of asthma as the readmission diagnosis was comparable between these groups in both men and women. Second, the use of a 30-day interval is not supported by biological evidence and is, therefore, somewhat arbitrary. However, we used the time interval set by the CMS [4]. Third, we were unable to account for the competing risk of mortality on readmissions because the SID did not include out-of-hospital mortality data. Finally, our data were not random sample of all US patients with COPD. Nevertheless, our data were derived from geographically-dispersed eight states representing approximately 30% of the US population.

5. Conclusions

By using large, all-payer, population-based data of eight U.S. states between 2006 and 2012, we found that respiratory diseases accounted the majority of 30-day readmission diagnosis and COPD was the leading reason, both overall and across several different major subgroups. By contrast, the proportion of respiratory diseases was higher in non-Hispanic black, compared to non-Hispanic white and Hispanics. Additionally, asthma as the readmission diagnosis differed significantly; female, non-Hispanic black and Hispanic patients had a higher proportion of asthma as the coded