ANALYSIS OF COPD COMORBIDITIES AND THEIR IMPACT ON HOSPITAL 30-DAY READMISSION RATES USING ELECTRONIC HEALTH RECORD DATA

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Introduction

- Chronic Obstructive Pulmonary Disease (COPD) is a leading cause of hospitalizations in older adults, accounting for 720,000 hospitalizations and 1.5 million emergency department visits in the US in 2005. 1 It is a huge burden for both patients and health care. COPD hospitalizations are not only very costly but also costly. 2 The Medicare Hospital Readmission Reduction program aims to improve care quality and reduce cost by penalizing hospitals whose 30-day readmission rates are high. 3 This study seeks to explore the prevalence of COPD comorbidities and their impact on 30-day hospital readmission rates in recent years using Electronic Health Record (EHR) data, in order to gain insight on preventing COPD-related re-hospitalizations.

Methods

- Model Inputs and Data Sources
  - COPD patient records from 2009 to 2015 were extracted from a de-identified Carrier Health FactSet® EHR database. The ICD-9 codes used to define COPD patients were 491.x, 492.x, and 496.x. Patients from hospitals that were not for acute care or hospitals with no more than 5 beds were excluded.
  - Comorbidities of COPD patients were defined according to the Elixhauser algorithms. 4 Overall frequencies of hospital readmissions and the top 5 COPD comorbidities as well as the overall distribution of number of comorbidities for each patient were analyzed.

- Model Outcomes
  - The primary outcome of this study is 30-day all-cause readmission rate for COPD patients. Overall and by-year readmission rates were calculated by dividing the number of 30-day readmissions by the total number of COPD visits included in the study.

- Statistical Analysis
  - All analyses were carried out using SAS 9.4.
  - The associations of COPD comorbidities with 30-day hospital readmission rates were analyzed using chi-squared tests (for marginal effect of each comorbidity, data not shown) and three-level generalized linear mixed models.
  - The three-level generalized linear mixed model analyzes the effects of each comorbidity or number of comorbidities on 30-day readmission by adjusting for health system (1st level), hospital (2nd level), and hospital patient (3rd level) demographics such as age, gender, race, number of beds, and year of visit.

Results

- Table 1: Top 15 most common comorbidities and their prevalence in patients with COPD. Column Incidence (%) represents overall percentage of COPD patients with each of the 15 comorbidities.

- Figure 1: Overall distribution of the number of comorbidities in patients with COPD. 74.0% of COPD patients had at least 1 comorbidity, and 31.6% had 3 or more comorbidities.

- Table 2: Effects of each of the 28 COPD comorbidities on overall 30-day readmission rate in COPD patients after adjusting for health systems, hospitals, and demographics at both hospital and patient levels. Estimates of odds ratios (with versus without the indicated comorbidity), 95% confidence intervals for odds ratios, and P-values are listed.

- Figure 2: Overall 30-day readmission rate for COPD patients by number of comorbidities. For the overall, 30-day readmission rate is 10.9% for patients with 0 comorbidities, whereas for patients with 10 or more comorbidities it is 19.9%.

- Figure 3: Distribution of visits and 30-day readmissions by year. The overall 30-day readmission rate has decreased from 11.4% in 2001 to 2.5% in 2015.

Conclusion

- The top 5 COPD comorbidities in prevalence were hypertension (46.2%), diabetes w/ chronic complications (20.5%), fluid and electrolyte disturbances (17.5%), chronic obstructive pulmonary disease, 2008; Statistical Brief # 140: Medicare Hospital Readmission Reduction Program. N Engl J Med. 2014; 7:105

- The number of comorbidities had a critical impact on 30-day readmission rates (P<0.001). The higher the number of comorbidities, the higher the 30-day COPD readmission rate.

- COPD comorbidities significantly affect 30-day hospital readmission rates; therefore, effectively managing these comorbidities is essential for reducing COPD-related re-hospitalizations.

- The fact that hospital readmission rates have been markedly decreasing in recent years is encouraging.

- Detailed analysis of the EHR readmission data may help to evaluate the efficacy of health care management and prevent hospital readmission penalties.

- References