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Reply to Lindenauer *et al.*

From the Authors:

We thank Dr. Lindenauer and colleagues for their letter in reference to our publication (1). The authors suggest that the increase in chronic obstructive pulmonary disease (COPD) hospital-level 30-day postdischarge mortality (from here on out: 30-day mortality) found in our study during the Hospitals Readmission Reduction Program (HRRP) implementation period (October 2014 to November 2017) may be associated with changes in coding practices for COPD and pneumonia discharges, specifically, the guidelines published in the fall of 2016 by the American Hospital Association (AHA) regarding COPD with acute lower respiratory infection (International Classification of Diseases, tenth revision [ICD-10], code J44.0) (2). The guidance specified that for patients hospitalized with COPD and pneumonia, the ICD-10 code J44.0 needed to be used as principal discharge diagnosis, followed by the ICD-10 code to identify pneumonia. Therefore, that hospitalization would be counted toward the COPD measure (not the pneumonia measure) for the HRRP. Further guidance by the AHA in October 2017 allowed hospitals to code pneumonia as a primary discharge diagnosis (over COPD) if clinical documentation by providers supported that the patient with COPD was hospitalized for pneumonia (3).

Interestingly, the clinical presentation of an acute exacerbation of COPD (AECOPD) and community-acquired pneumonia may be indistinguishable (4, 5). Bacterial and viral infections can trigger AECOPD, and chest radiography that can help distinguish these two conditions has poor interobserver reliability for the diagnosis of pneumonia (6). In addition, the treatment of both illnesses involves steroids, bronchodilators, and antibiotics, making the final determination of a principal discharge diagnosis more thought-provoking (4, 5). The true impact of coding recommendations in the COPD cohort is unclear.

Dr. Lindenauer and colleagues propose that the additional patients added to the HRRP COPD measure (because of change in coding practices) may have contributed to the increase in the COPD mortality rates found in our analysis. Why is it important to separate AECOPD with and without pneumonia? Patients with pneumonia-related COPD exacerbations have a greater 30-day mortality than those with nonpneumonic COPD exacerbations. To evaluate this possible source of bias, we excluded from our cohort all COPD index admissions with ICD-10 codes J40.0 and J44.1 as a primary discharge diagnosis and those with any secondary ICD code for pneumonia during the HRRP periods that corresponded with the announcement and implementation. The percentages of index admissions excluded from our cohort were 21.25% (137,684 of 647,815), 18.29% (115,442 of 631,118), and 25.60% (175,346 of 685,027) during the announcement (January 2013 to August 2014), early implementation (October 2014 to April 2016), and late implementation (May 2016 to November 2017) periods of HRRP for COPD, respectively. The 30-day mortality rates for COPD (without pneumonia) were 6.03%, 6.39%, and 7.0%, correspondingly, compared with our published 30-day mortality rates of 6.71%, 6.81%, and 7.30% for the same periods. There was a modest reduction in the magnitude but a similar trend for an increase in mortality during the HRRP implementation period for COPD (Table 1).

We agree with Dr. Lindenauer and colleagues that the COPD HRRP cohort may have been altered during the short period when coding guidelines changed for COPD and pneumonia. However, as illustrated in the analysis of various cohorts obtained by combinations of COPD and pneumonia as primary discharge diagnosis, the trend in 30-day death rates was similar to that published in our study (1). This is irrespective of the principal discharge diagnosis (COPD or pneumonia) (Table 1).

Administrative claims are good for studying trends and can be useful in generating hypothesis for outcomes. Centers for Medicare and Medicaid Services should include the balancing measure of mortality, as they penalized hospitals using administrative claims for higher 30-day readmissions. ■

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Table 1. Cohort Selection of Patients Accounting for COPD and Pneumonia as Primary Discharge Diagnosis and 30-Day Mortality Rates by HRRP Periods from January 2013 to November 2017 in the United States

	HRRP Periods (Dates)	Announcement (January 2013–August 2014)	Implementation	
			October 2014–April 2016	May 2016–November 2017
A	Published cohort*			
	Index admissions, n	647,815	631,118	685,027
	Unique patients, n	510,344	502,149	543,445
	30-d mortality rate, % (±SD)	6.71 (0.8)	6.81 (0.9)	7.3 (1.1)
A.1	Published cohort without pneumonia†			
	Index admissions, n	510,131	515,676	509,681
	Unique patients, n	412,508	418,976	411,739
	30-d mortality rate, % (±SD)	6.03 (0.6)	6.39 (0.9)	7.00 (0.9)
B	COPD and/or pneumonia as primary discharge diagnosis cohort‡			
	Index admissions, n	385,431	383,873	367,363
	Unique patients, n	344,120	344,713	329,175
	30-d mortality rate, % (±SD)	8.77 (1.1)	9.13 (1.1)	9.89 (1.3)
B.1	Pneumonia primary discharge diagnosis cohort§			
	Index admissions, n	276,229	285,765	186,391
	Unique patients, n	254,798	263,671	175,106
	30-d mortality rate, % (±SD)	9.65 (1.1)	9.92 (1.05)	11.78 (1.3)
B.2	COPD primary discharge diagnosis cohort‖			
	Index admissions, n	109,202	98,108	180,972
	Unique patients, n	102,633	93,089	168,520
	30-d mortality rate, % (±SD)	6.06 (0.7)	6.26 (0.9)	7.59 (1.1)

Definition of abbreviations: CMS = Centers for Medicare and Medicaid Services; COPD = chronic obstructive pulmonary disease; HRRP = Hospital Readmissions Reduction Program; ICD = International Classification of Diseases; MEDPAR = Medicare Provider Analysis and Review.
Pneumonia ICD-9 codes = 4803, 4808, 4809, 481, 4820, 4821, 4822, 48230, 48231, 48232, 48239, 48240, 48241, 48249, 48281, 48282, 48283, 48284, 48289, 4829, 4830, 4831, 4838, 485, 486, and 4870. Pneumonia ICD-10 codes = A481, J1000, J1001, J1008, J1100, J1108, J120, J121, J122, J123, J1281, J1289, J129, J13, J14, J150, J151, J1520, J15211, J15212, J1529, J153, J154, J155, J156, J157, J158, J159, J160, J168, J180, J181, J188, J189, and J690. COPD ICD-9 codes = 49121, 49122, 4918, 4919, 4928, 49320, 49321, 49322, and 496. COPD ICD-10 codes = J418, J42, J430, J431, J432, J438, J439, J440, J441, and J449. COPD ICD-10 codes used to exclude pneumonia = J44.0 or J44.1 with secondary ICD-10 code for pneumonia. COPD ICD-10 codes for cohort selection = J41.8, J42, J43.0, J43.1, J43.2, J43.8, J43.9, J44.0, J44.1, and J44.9.
*A. Published cohort. The cohort we present in our published paper (1). Please refer to METHODS section of published main manuscript. Our data source, 100% Medicare beneficiary study files, only include inpatient claims (MEDPAR) and not Medicare Part B claims. Thus, unlike algorithms in CMS condition-specific measures updates and specifications report, we only require patients to have Part A continuous enrollment in the past 12 months before admission. We do not have a hospice claims file. Therefore, we could not strictly follow algorithms in CMS condition-specific measures updates and specifications report to exclude patients with hospice stay in 12 months before admission. Instead, we excluded direct transfers from hospice.
†A.1 Published cohort without pneumonia. This is a subset of our published cohort A. Before October 2015, we exclude COPD index admissions with a secondary diagnosis of pneumonia (ICD-9). After October 2015, we exclude COPD index admissions with a primary diagnosis of J44.0 or J44.1 (with secondary ICD-10 code for pneumonia).
‡B. COPD and/or pneumonia as primary discharge diagnosis cohort. This includes index admissions with COPD (ICD-9 and ICD-10) in primary discharge diagnosis and pneumonia (ICD-9 and ICD-10) in secondary diagnosis or pneumonia in primary discharge diagnosis and COPD in secondary diagnosis.
§B.1 Pneumonia Primary Discharge Diagnosis cohort: This is a subset of cohort B, with index admissions with pneumonia (ICD-9 and ICD-10) as the primary discharge diagnosis.
‖B.2 COPD Primary Discharge Diagnosis cohort: This is a subset of cohort B, with index admissions with COPD (ICD-9 and ICD-10) as the primary discharge diagnosis.

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Lack of Bacterial Colonization Measure in Randomized Controlled Trial on Inhaled Corticosteroids Effect in Patients with Chronic Obstructive Pulmonary Disease

To the Editor:

We read with great interest the article by Han and colleagues on the effect of inhaled corticosteroids (ICS) withdrawal and baseline inhaled treatment in the IMPACT (Once-Daily Single-Inhaler Triple versus Dual Therapy in Patients with COPD) study (1) as well as the three accompanying editorials on the topic (2–4) recently published in the *Journal*. Remarkably, most of the included patients in this study had severe chronic obstructive pulmonary disease (COPD) or had previous exacerbations (5). We would like to contribute to this debate by highlighting the following potentially relevant, but completely ignored, confounding factor: the role of bacterial colonization in these patients. This is based on the following observations: *1*) between 25% and 50% of patients with COPD (especially those with severe disease or multiple exacerbations) suffer chronic bronchial colonization, most frequently by *Haemophilus influenzae*, *Streptococcus pneumoniae*, *Moraxella catarrhalis*, and *Pseudomonas aeruginosa* (6); *2*) treatment with ICS in patients with COPD increases bacterial load (7, 8); and *3*) chronic bacterial colonization in patients with COPD is associated with an increase in the number and severity of exacerbations, accelerated decline of lung function, higher pneumonia incidence, worse quality of life, and higher mortality (6, 9), and these are the most common outcomes used in COPD trials. However, chronic airway infection is never measured or considered in most trials investigating the role of ICS in COPD. We propose, therefore, that future studies collect precise information on bacterial colonization before randomization and during follow-up. Sputum culture (quantitative if possible) is cheap and feasible (10) and can be obtained in a large proportion of patients. This information would likely help to determine which patients can benefit most from ICS or in whom their withdrawal would be safer. ■

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