In-hospital mortality in patients with idiopathic pulmonary fibrosis

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INTRODUCTION

- Hospitalizations are common in patients with idiopathic pulmonary fibrosis (IPF) and are associated with high mortality.[1-3]
- The Premier Healthcare Database (PHD) is a broadly representative dataset that includes >20% of hospital admissions in the US.
- Based on the PHD, among 6665 patients with IPF who were hospitalized between October 2011 and October 2014, in-hospital mortality was approximately 14% and average length of hospital stay was approximately 5 days.[3]
- Two antifibrotic drugs, nintedanib and pirfenidone, were approved for the treatment of IPF in the US in October 2014.

AIMS

- We used the PHD to:
  - Estimate the rate of in-hospital mortality, the length of hospital stay and the rate of hospital readmission among US patients with IPF in the era following FDA approval of antifibrotic drugs.
  - Determine patient-, hospital- and treatment-related factors associated with in-hospital mortality, hospital stay and readmission.

METHODS

- This was a retrospective cohort study of patients with IPF who were hospitalized at 740 hospitals in the US.

Inclusion criteria ✓
- Age ≥50 years
- Hospitalization discharge date between 1 January 2015 and 28 February 2018
- Diagnosis of IPF based on:
  - primary or secondary ICD-9 diagnosis code 516.3 or 516.31 or ICD-10 diagnosis code J84.111 or J84.112
  - billing code for chest CT and/or lung biopsy ≤3 years prior to index hospitalization

Exclusion criteria ✗
- ICD-9 or ICD-10 code for discharge diagnoses for an alternative cause of ILD during index hospitalization
- ICD-9 or ICD-10 procedure code for lung transplant surgery that occurred <1 day after hospital admission

ICD, International Classification of Diseases.

- The primary outcome was a composite of death during the index visit, lung transplant during the index visit but >1 day after admission, or death during a readmission (to the same hospital) within 90 days of the index visit.
- Secondary outcomes were length of stay during the index visit and readmission (to the same hospital) within 90 days of the index visit.

CONCLUSIONS

- Based on data from the PHD, in-hospital mortality rates and length of hospital stay among patients with IPF were similar in the eras prior to and following FDA approval of antifibrotic drugs.
  - More than 1 in 10 patients died during the index hospitalization.
  - Median length of hospital stay was 5 days.
- The risk of in-hospital mortality was higher in patients who were admitted to the ICU, who were attended by a critical care physician, who received mechanical ventilation, or who were being treated with IV steroids, IV antibiotics, or opioids.

RESULTS
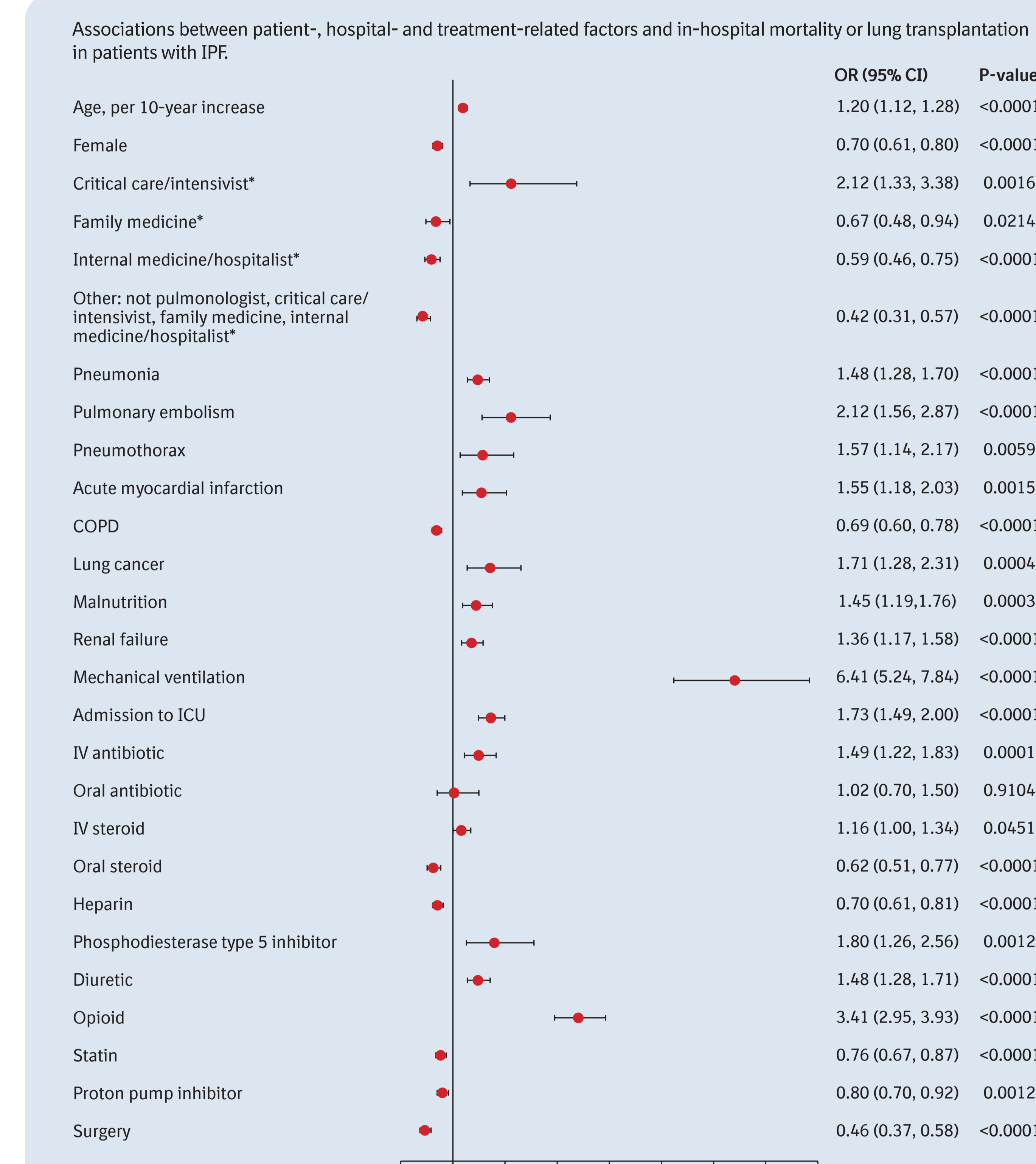
- **The cohort comprised 9667 hospitalized patients with IPF.**

- Median age 76 years
- 57% male
- 83% white
- 33% admitted to ICU
- Mechanical ventilation performed in 8%
- 72% attended by internal medicine/hospitalist

1414 patients (14.6%) met the primary outcome:

- 1036 (10.7%) died during the index visit
- 371 (3.8%) died during a readmission within 90 days
- 7 (0.1%) underwent lung transplantation

Factors associated with a higher/lower risk of in-hospital mortality

Associations between patient-, hospital- and treatment-related factors and in-hospital mortality or lung transplantation in patients with IPF.

	OR (95% CI)	P-value
Age, per 10-year increase	1.20 (1.12, 1.28)	<0.0001
Female	0.70 (0.61, 0.80)	<0.0001
Critical care/intensivist*	2.12 (1.33, 3.38)	0.0016
Family medicine*	0.67 (0.48, 0.94)	0.0214
Internal medicine/hospitalist*	0.59 (0.46, 0.75)	<0.0001
Other: not pulmonologist, critical care/intensivist, family medicine, internal medicine/hospitalist*	0.42 (0.31, 0.57)	<0.0001
Pneumonia	1.48 (1.28, 1.70)	<0.0001
Pulmonary embolism	2.12 (1.56, 2.87)	<0.0001
Pneumothorax	1.57 (1.14, 2.17)	0.0059
Acute myocardial infarction	1.55 (1.18, 2.03)	0.0015
COPD	0.69 (0.60, 0.78)	<0.0001
Lung cancer	1.71 (1.28, 2.31)	0.0004
Malnutrition	1.45 (1.19,1.76)	0.0003
Renal failure	1.36 (1.17, 1.58)	<0.0001
Mechanical ventilation	6.41 (5.24, 7.84)	<0.0001
Admission to ICU	1.73 (1.49, 2.00)	<0.0001
IV antibiotic	1.49 (1.22, 1.83)	0.0001
Oral antibiotic	1.02 (0.70, 1.50)	0.9104
IV steroid	1.16 (1.00, 1.34)	0.0451
Oral steroid	0.62 (0.51, 0.77)	<0.0001
Heparin	0.70 (0.61, 0.81)	<0.0001
Phosphodiesterase type 5 inhibitor	1.80 (1.26, 2.56)	0.0012
Diuretic	1.48 (1.28, 1.71)	<0.0001
Opioid	3.41 (2.95, 3.93)	<0.0001
Statin	0.76 (0.67, 0.87)	<0.0001
Proton pump inhibitor	0.80 (0.70, 0.92)	0.0012
Surgery	0.46 (0.37, 0.58)	<0.0001

*Compared with pulmonologist.
Analyzed using multivariable logistic regression.

Length of stay in hospital

- Median (Q1, Q3) length of stay in hospital was 5 (3, 8) days: 7 (4, 13) days for patients who died in hospital and 5 (3, 8) days for patients who did not.

Median length of hospital stay:
5 days

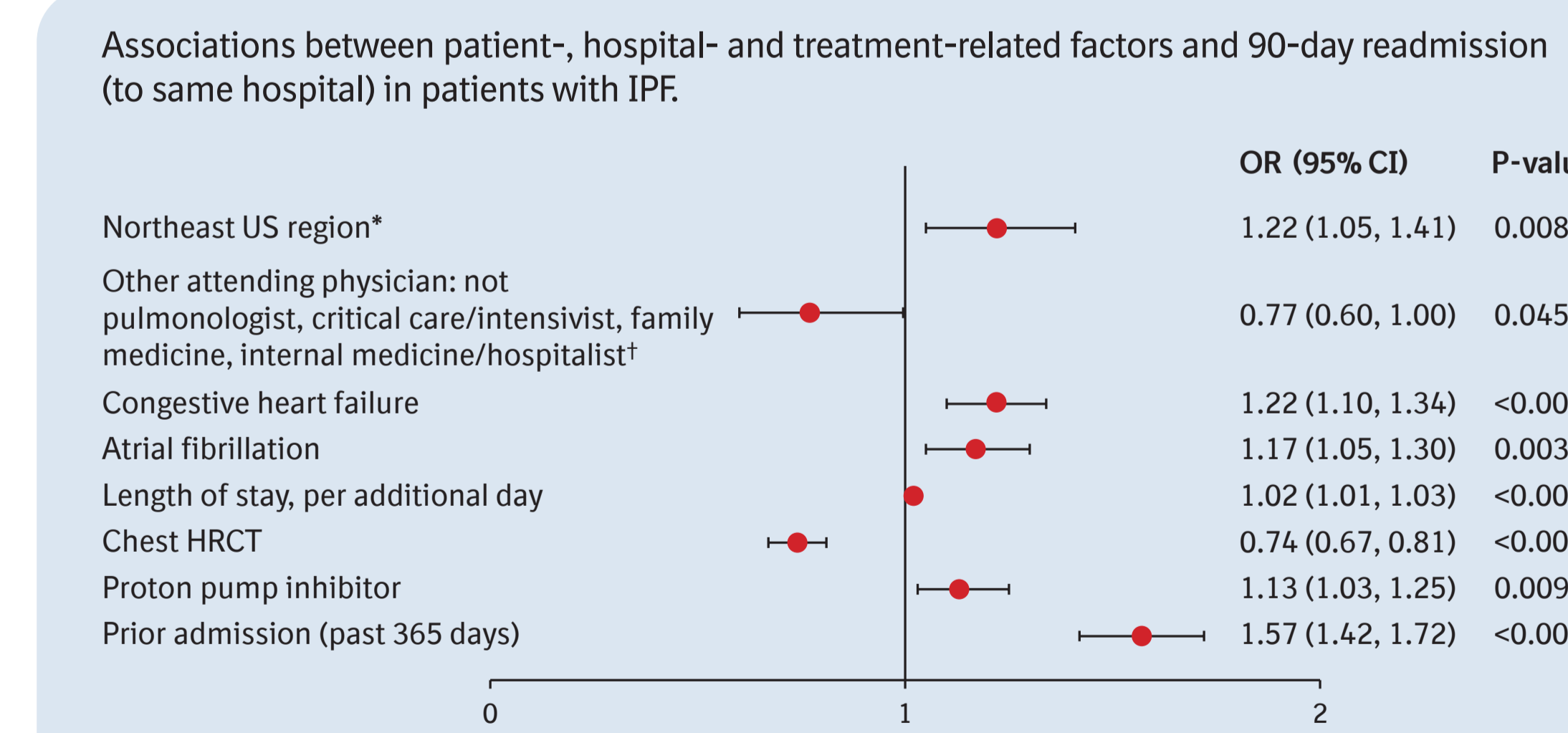### Factors estimated to increase length of stay in hospital

Pneumothorax: 61% longer length of stay

Mechanical ventilation: 23% longer length of stay

Intensive care: 20% longer length of stay

Pneumonia: 16% longer length of stay

Analyzed using a generalized linear model with a negative binomial distribution.

Readmissions

2756 patients (28.5%) were readmitted to hospital within 90 days of the index visit

Factors associated with a higher/lower risk of 90-day readmission

Associations between patient-, hospital- and treatment-related factors and 90-day readmission (to same hospital) in patients with IPF.

	OR (95% CI)	P-value
Northeast US region*	1.22 (1.05, 1.41)	0.0084
Other attending physician: not pulmonologist, critical care/intensivist, family medicine, internal medicine/hospitalist†	0.77 (0.60, 1.00)	0.0456
Congestive heart failure	1.22 (1.10, 1.34)	<0.0001
Atrial fibrillation	1.17 (1.05, 1.30)	0.0032
Length of stay, per additional day	1.02 (1.01, 1.03)	<0.0001
Chest HRCT	0.74 (0.67, 0.81)	<0.0001
Proton pump inhibitor	1.13 (1.03, 1.25)	0.0097
Prior admission (past 365 days)	1.57 (1.42, 1.72)	<0.0001

*Compared with south US region. †Compared with pulmonologist.
Analyzed using multivariable logistic regression.

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1. Brown AW et al. Chest 2015;147:173–79.
2. Mooney JJ et al. J Med Econ 2017;20:518–24.
3. Durheim MT et al. Lung 2019;197:699–707.

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