Mortality, Costs, and Length of Stay in Patients with Idiopathic Pulmonary Fibrosis

Joshua Mooney, MD[1]; Karina Raimundo, MS[2]; Eunice Chang, PhD[3]; Michael S. Broder, MD, MSHS[3]

[1]Stanford University, Stanford, CA, USA; [2]Genentech, Inc., South San Francisco, CA, USA ; [3] Partnership for Health Analytic Research, LLC, Beverly Hills, CA, USA

BACKGROUND

- Idiopathic pulmonary fibrosis (IPF):
  - Chronic, progressive, interstitial pneumonia of unknown cause that occurs predominantly in older adults[1]
  - Median survival from diagnosis is approximately 3-5 years[2]
- IPF patients are frequently hospitalized for respiratory worsening or other comorbidities
- Health care resource use and outcomes may vary depending on the reason for hospitalization

OBJECTIVE

- To report overall in-hospital mortality, length of stay (LOS), and hospitalization cost in patients with IPF admitted to hospitals in the US
  - Identify differences between patients admitted with or without a principal diagnosis of IPF
- To further examine the resource and economic burden, specifically LOS and cost, in a subset of patients hospitalized for what may be acute respiratory worsening.

METHODS

- Cross-sectional retrospective cohort study using the National Inpatient Sample (NIS)
- NIS is the largest publicly available all-payer US inpatient database[3]
  - ~1000 hospitals sampled from states representing 97% of the US population
  - Comprises clinical and resource-use information from discharge abstracts
  - Weighted to represent national estimates
- Charges adjusted to 2011 US $ and costs estimated using cost-to-charge ratio (CCR)
  - CCR constructed using all-payer, inpatient costs and charge information from the detailed reports by hospitals to the Centers for Medicare & Medicaid Services
- Data derived from individual hospital admissions from 2009 to 2011
- Study cohort comprises hospital admissions with a claim for IPF (ICD-9-CM: 516.3, 516.31) in *principal* or *other* diagnosis fields
  - Stratified by presence or absence of IPF as the *principal* diagnosis on the claim
  - Subset analysis: admissions for acute respiratory worsening in the study cohort
    - Principal diagnosis of respiratory disease (ICD-9-CM 460-519)[a]
    - Excluded from this subset if admitted for lung transplant
    - Linear regression models used to identify predictors of LOS and cost

RESULTS

Patient Characteristics

- Compared to patients with other principal diagnoses, patients with a principal diagnosis of IPF were:
  - More likely to undergo lung transplant
  - Younger
  - Less likely to have Medicare
  - More likely to be at a teaching hospital
- Clinical characteristics
  - Patients hospitalized with a principal diagnosis of IPF were less likely to have ICD-9-CM codes for COPD (26.2% vs. 35.7%; p<.001), bacterial pneumonia (23.2% vs. 31.4%; p<.001), lung cancer (0.9% vs. 3.7%; p<.001) or CV conditions (42.2% vs. 50.1%; p<.001)

Table 1: Patient Characteristics

	Principal Admission Diagnosis Among IPF Patients		All
	IPF	Other	
	N = 10,938	N = 31,986	N = 42,924
Age, mean (SE)	68.4 (0.57)	71.6 (0.33)	70.8 (0.38)
Female, no. (%)	5,058 (46.2)	16,320 (51.0)	21,378 (49.8)
Primary payer type, no. (%)			
Medicare	6,693 (61.2)	23,873 (74.6)	30,566 (71.2)
Medicaid	763 (7.0)	1,651 (5.2)	2,414 (5.6)
Other	3,482 (31.8)	6,461 (20.2)	9,943 (23.2)
Teaching hospital, no. (%)	6,024 (55.1)	14,360 (44.9)	20,384 (47.5)
Lung transplant, no. (%)	1,303 (11.9)	171 (0.5)	1,474 (3.4)

p<.001 for all comparisons

Respiratory Admission Subset

- Among 42,924 admissions with a claim for IPF in *any* diagnosis field
  - 22,350 had a principal diagnosis of respiratory disease (including IPF) and did not undergo lung transplant[b]
    - Mean (±SE) age was 70.0 (0.32) years and 49.1% were female
- Clinical Characteristics
  - ICD-9-CM codes for cardiovascular conditions were used in 45.0% of admissions, bacterial pneumonia in 38.5% and COPD in 38.2%
- 11.4% of patients required invasive mechanical ventilation and 8.9% required noninvasive ventilation
- Mean (±SE) LOS was 7.4 (0.15) days, charges were $55,506 ($2,782), and cost was $16,042 ($631)

Figure 1: Effects of Patient Characteristics on LOS

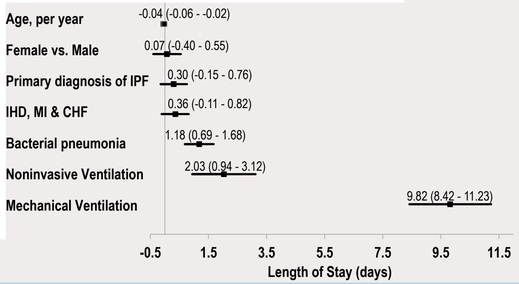
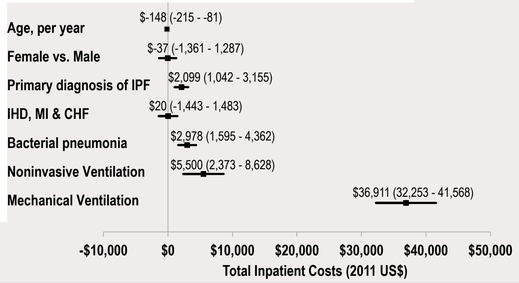


Figure 2: Effects of Patient Characteristics on Cost



LOS, Mortality and Cost

- Mean length of stay was 7.8 days among all IPF patients
  - Hospitalization with IPF principal diagnosis was 9.2 days vs. hospitalization with other principal diagnosis was 7.3 days; p<.001
- Mean per admission charges were $75,915 and cost was $20,698
  - For patients with a principal diagnosis of IPF, total inpatient charges were 1.9 times higher (IPF $118,125 vs. Other $61,436; p<.001) and costs were 1.7 times higher (IPF $29,829 vs. Other $17,582; p<.001)
- 45.5% of patients were routinely discharged home while 11% died in hospital
- In-hospital mortality was 3.8% greater in those with an IPF principal diagnosis
  - IPF principal diagnosis was 13.9% vs. other principal diagnosis was 10.1%; p<.001

CONCLUSIONS

- Overall, patients hospitalized with a diagnosis of IPF spent more than a week in the hospital at an average cost of $20,000 and more than 10% died before discharge
- IPF patients with a principal admission diagnosis of IPF had greater LOS, were more than twice as likely to die in the hospital, and incurred nearly double the cost compared to IPF patients with other principal admission diagnoses.
  - A potential limitation of this comparison is that in the group with a principal diagnosis of IPF, 11.9% had lung transplants (vs. 0.5%), and thus were younger and healthier than the group with “other” principal diagnoses and potentially had a higher cost and longer length of stay related to the lung transplant procedure.
- In the 52% of IPF patients admitted for a primary respiratory condition:
  - Mechanical ventilation users had more than twice as long LOS (16.1 vs 6.3 days) and cost more than 4 times as much ($48,772 vs $11,861) as non-users

Footnotes:

[a] IPF diagnosis codes are included.

[b] Lung transplant patients were younger, mostly male and had fewer comorbidity diagnosis codes

References:

1) Ley B. J Clin Epidemiol. 2013;5:483-92.
2) Ley B. Am J Respir Crit Care Med, 2011;183(4):431-40.
3) HCUP Databases; Accessed Feb 2016; www.hcup-us.ahrq.gov/nisoverview.jsp.

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