Mortality and Readmission in Adults During the First Year Following Hospitalization for Community-Acquired Pneumonia in the US

Sato R[1], Weycker D[2], Shaff M[2], Hanau A[2], Lonshteyn A[2], Pelton SI[3,4]

[1]Pfizer Inc., [2]Policy Analysis Inc. (PAI), [3]Boston University Schools of Medicine and Public Health, [4]Boston Medical Center

BACKGROUND

- Community-acquired pneumonia (CAP) is a leading cause of hospitalization and death among US adults[1,2]
- Increasing evidence suggests the impact of CAP extends beyond discharge from hospital and the acute phase of illness[3-7]
- Further understanding of longer term outcomes of CAP in adults, specifically hospital readmission and mortality, among a diverse US population, is needed

OBJECTIVE

- To characterize long-term risks of mortality and hospital readmission among US adults admitted for CAP, on a population-wide basis as well as stratified by age and comorbidity profile

METHODS

Study Design and Data Source

- Retrospective cohort design and data from Optum® de-identified Integrated Claims-Clinical Dataset (2012-2018)

Study Population

- Adults with ≥1 hospitalization for CAP, based on acute-care hospital records with:
  - 1° diagnosis of pneumonia (irrespective of 2° diagnoses); or
  - 1° diagnosis of bacteremia or respiratory failure, and a 2° diagnosis of pneumonia; and
  - Evidence of chest x-ray on day of, day after, or during the 3-day period before hospital admission
- Each qualifying CAP hospitalization separated by ≥365 days was included as a unique observation
- Hospitalizations were excluded if patient was transferred from another hospital, had <12 months of healthcare coverage prior to admission, or mortality data were not available

Study Outcomes

- Study outcomes included death for any reason and acute-care hospital readmission for any reason:
  - Death: ascertained during CAP hospitalization as well as during 360-day period following discharge from CAP hospitalization
  - Hospital readmission: ascertained during 360-day period following discharge from CAP hospitalization

Statistical Analyses

- Risks of mortality and readmission were summarized using incidence proportions and corresponding 95% confidence intervals (CIs), among all patients and by age and comorbidity profile:
  - Healthy: immunocompetent without chronic medical conditions
  - At-risk: immunocompetent with chronic medical conditions
  - High-risk: immunocompromised
- Patients who died during the initial CAP hospitalization were excluded from analyses of hospital readmission
- Patients lost to follow-up for reasons other than death were excluded from corresponding analyses

LIMITATIONS

- Algorithm for identifying CAP has not been formally evaluated against a "gold standard" and thus its accuracy is unknown
- Operational algorithms used to characterize comorbidity profiles undoubtedly resulted in some misclassification
- Some patients (28%) did not have mortality data, and thus were excluded from analyses:
  - Baseline characteristics were comparable between patients with and without mortality data
  - Risk of hospital readmission was comparable between all patients and subset with mortality data
- Patients with incomplete follow-up did not contribute data to selected analyses; informative censoring may bias study results

CONCLUSIONS

- 88% of hospitalized CAP occurred among adults with at-risk or high-risk conditions in the study population
- All-cause mortality up to 1 year following CAP hospitalization was substantial, and was associated with increasing age and greater comorbidity profile
- Risks of hospital readmission and mortality were greater in high-risk and at-risk subgroups compared with healthy counterparts
- Strategies that prevent CAP or modify persistent inflammatory changes following CAP, specifically among patients with comorbidities, have potential to reduce morbidity and mortality

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RESULTS

- Study population totaled 37,006 patients who contributed 38,809 CAP hospitalizations:
  - Mean age was 71 years, 51% were female, and 88% had at-risk (33%) or high-risk (55%) condition
- Mortality was 3.5% in hospital, 8.2% from admission to 30 days post-discharge, and 17.7% from admission to 360 days post-discharge:
  - Mortality increased with increasing age and complexity of comorbidity profile (Table 1, Figure)
- Hospital readmission was 12.5% during 30-day post-discharge period, and 42.3% during 360-day post-discharge period (Figure):
  - Readmission was highest for persons aged 65-74 years and persons with high risk conditions (Table 2, Figure)

Table 1. Risk of mortality for any reason during and following CAP hospitalization*

		Risk of Mortality, % (95% CI)					
	No. of CAP Patients	In-Hospital	30-Day Post-Discharge	60-Day Post-Discharge	90-Day Post-Discharge	180-Day Post-Discharge	360-Day Post-Discharge
Overall	38,809	3.5 (3.3-3.7)	8.2 (8.0-8.5)	10.1 (9.8-10.4)	11.4 (11.1-11.7)	14.1 (13.7-14.4)	17.7 (17.4-18.1)
Age							
18-49	3,340	0.6 (0.4-1.0)	1.9 (1.5-2.4)	2.4 (1.9-2.9)	2.7 (2.2-3.3)	3.1 (2.6-3.8)	4.1 (3.5-4.9)
50-64	7,728	2.3 (1.9-2.6)	4.7 (4.3-5.2)	5.8 (5.3-6.4)	6.6 (6.1-7.2)	8.2 (7.6-8.8)	10.2 (9.6-10.9)
65-74	8,361	3.2 (2.9-3.6)	6.9 (6.4-7.5)	8.6 (8.0-9.2)	10.0 (9.4-10.7)	12.5 (11.8-13.3)	15.7 (15.0-16.5)
75-84**	13,755	4.4 (4.1-4.8)	10.7 (10.1-11.2)	13.0 (12.5-13.6)	14.9 (14.3-15.5)	18.2 (17.6-18.9)	23.1 (22.4-23.8)
≥85**	5,625	5.0 (4.5-5.6)	12.8 (12.0-13.7)	15.4 (14.5-16.3)	16.8 (15.8-17.8)	20.8 (19.8-21.9)	26.0 (24.8-27.1)
Comorbidity profile							
Healthy	4,649	2.3 (1.9-2.8)	5.1 (4.5-5.8)	6.2 (5.5-6.9)	7.0 (6.3-7.8)	8.4 (7.7-9.3)	10.8 (10.0-11.7)
At-risk	12,758	3.3 (3.0-3.6)	7.2 (6.7-7.6)	8.5 (8.0-9.0)	9.5 (9.0-10.1)	11.7 (11.2-12.3)	14.8 (14.2-15.5)
High-risk	21,402	3.9 (3.6-4.2)	9.6 (9.2-10.0)	11.8 (11.4-12.3)	13.5 (13.0-13.9)	16.7 (16.2-17.2)	21.0 (20.4-21.5)

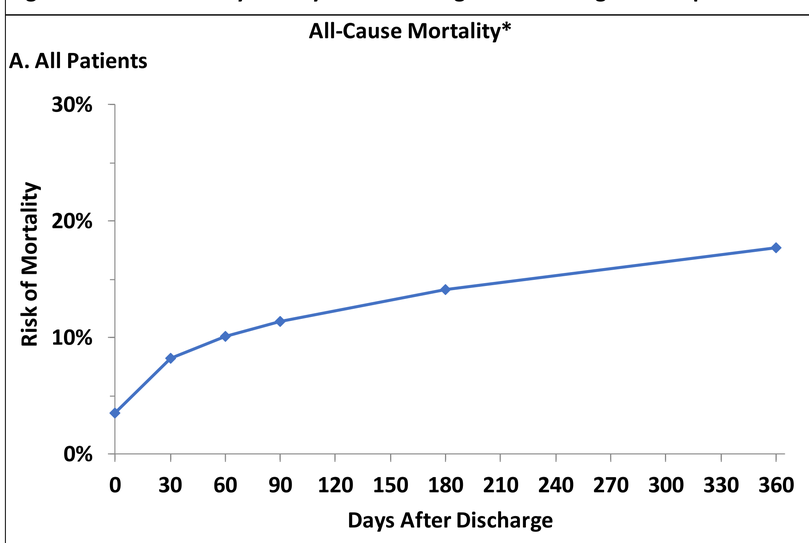
*Patients may contribute ≥1 hospitalization to analysis
**Due to HIPAA, specific year of birth is unavailable for persons born before 1930; therefore, some persons may be misclassified by age

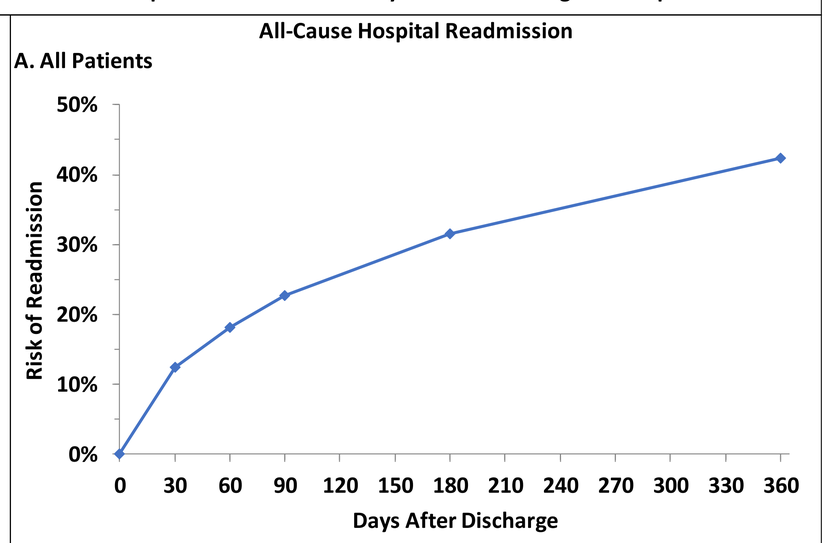
Table 2. Risk of hospital readmission for any reason following CAP hospitalization*

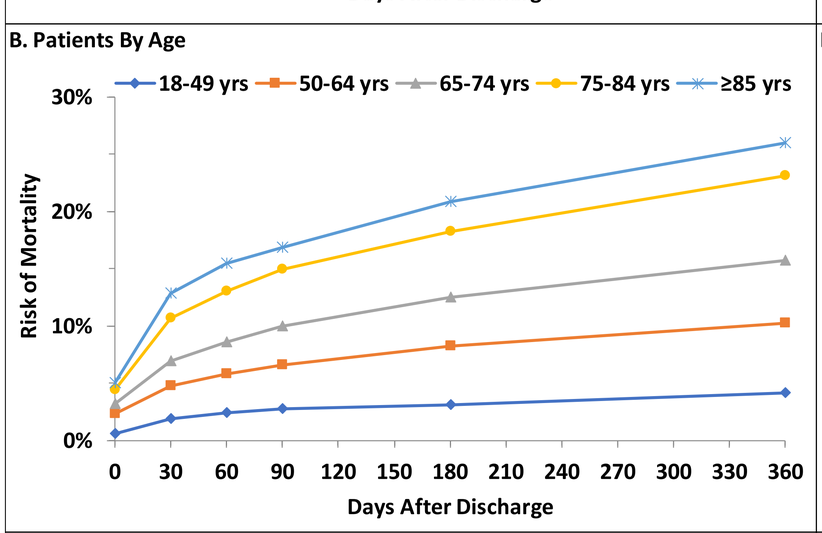
		No. of	Risk of Readmission, % (95% CI)				
	No. of CAP Patients	CAP Patients Discharged Alive	30-Day Post-Discharge	60-Day Post-Discharge	90-Day Post-Discharge	180-Day Post-Discharge	360-Day Post-Discharge
Overall	38,809	37,453	12.5 (12.2-12.8)	18.2 (17.8-18.6)	22.7 (22.3-23.1)	31.5 (31.1-32.0)	42.3 (41.7-42.8)
Age							
18-49	3,340	3,319	11.9 (10.8-13.1)	16.5 (15.2-17.8)	19.7 (18.4-21.1)	26.0 (24.5-27.5)	34.1 (32.3-35.8)
50-64	7,728	7,554	13.6 (12.9-14.4)	19.8 (18.9-20.7)	24.4 (23.5-25.4)	33.3 (32.2-34.4)	43.7 (42.5-44.9)
65-74	8,361	8,092	14.2 (13.4-14.9)	20.7 (19.8-21.6)	25.6 (24.6-26.5)	34.4 (33.3-35.4)	44.9 (43.7-46.0)
75-84**	13,755	13,144	11.7 (11.2-12.2)	17.1 (16.5-17.8)	21.7 (21.0-22.4)	31.3 (30.5-32.1)	42.8 (41.9-43.6)
≥85**	5,625	5,344	10.7 (9.9-11.6)	15.7 (14.7-16.7)	19.9 (18.8-21.0)	28.7 (27.5-30.0)	39.8 (38.4-41.2)
Comorbidity profile							
Healthy	4,649	4,543	6.4 (5.7-7.1)	8.9 (8.1-9.8)	11.6 (10.6-12.5)	17.2 (16.1-18.4)	24.9 (23.6-26.3)
At-risk	12,758	12,339	10.3 (9.8-10.8)	15.6 (15.0-16.3)	19.8 (19.1-20.6)	28.4 (27.6-29.2)	39.6 (38.7-40.6)
High-risk	21,402	20,571	15.1 (14.6-15.6)	21.7 (21.1-22.2)	26.8 (26.2-27.4)	36.5 (35.9-37.2)	47.6 (46.9-48.3)

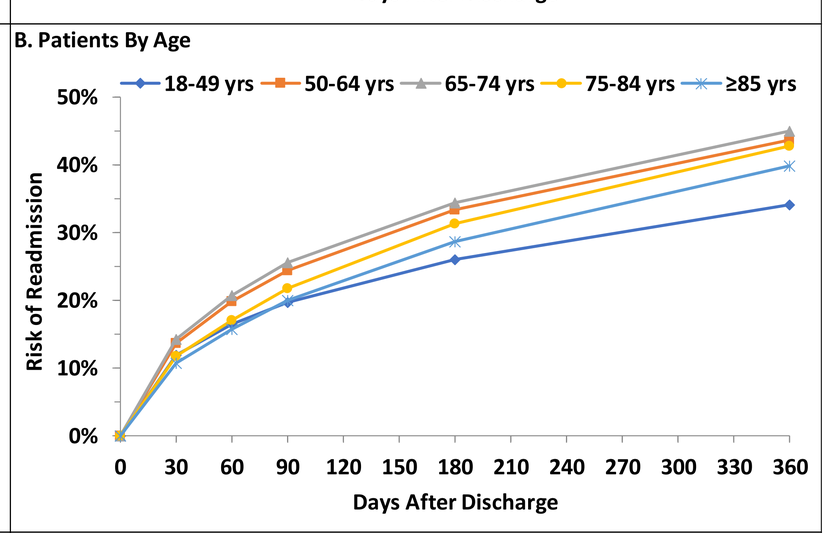
*Patients may contribute ≥1 hospitalization to analysis
**Due to HIPAA, specific year of birth is unavailable for persons born before 1930; therefore, some persons may be misclassified by age

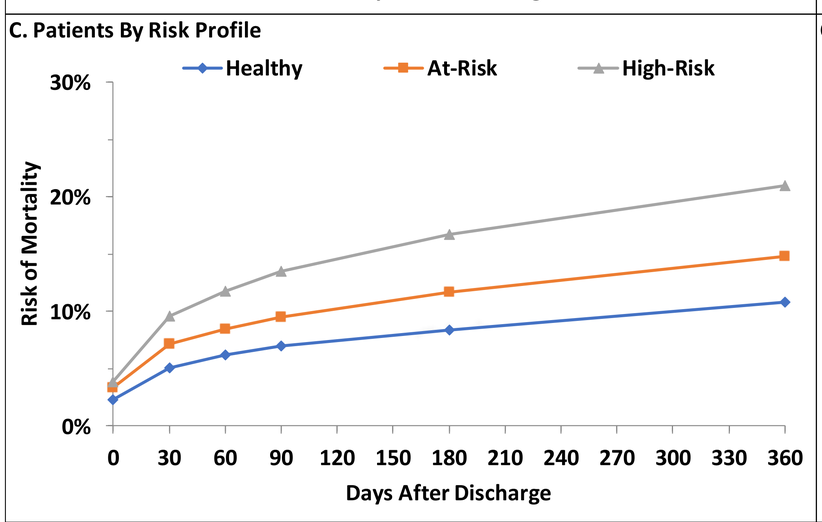
Figure. Risk of mortality for any reason during and following CAP hospitalization and risk of hospital readmission for any reason following CAP hospitalization

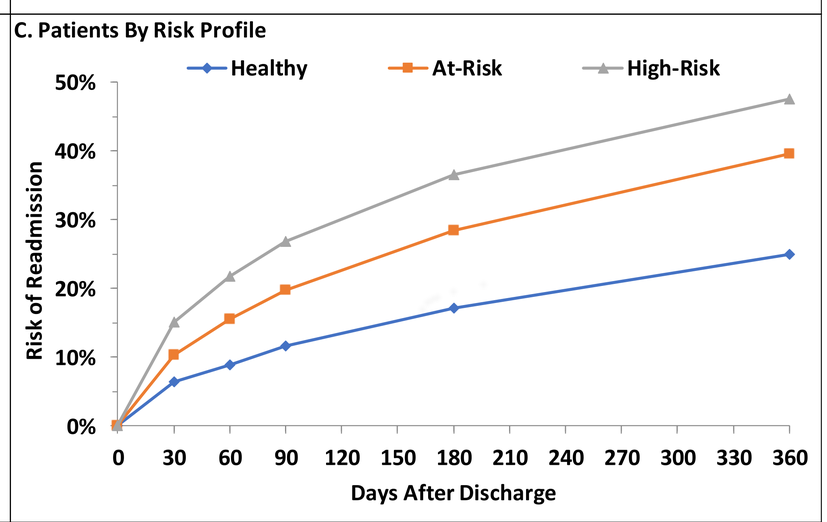












*Mortality at 0 days after discharge = mortality during CAP hospitalization

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