



# HHS Public Access

Author manuscript

*JAMA Intern Med.* Author manuscript; available in PMC 2016 May 01.

Published in final edited form as:

*JAMA Intern Med.* 2015 May ; 175(5): 851–853. doi:10.1001/jamainternmed.2015.114.

## Death Among Patients Hospitalized With Pneumonia: Implications for Hospital Outcome Measures

**Mihaela S. Stefan, MD, Randa Jaber, MD, Peter K. Lindenauer, MD, MSc, Jane L. Garb, MS, Janet Fitzgerald, RN, MS, and Michael B. Rothberg, MD, MPH**

Center for Quality of Care Research, Baystate Medical Center, Springfield, Massachusetts (Stefan, Lindenauer); Department of Medicine, Baystate Medical Center, Springfield, Massachusetts (Stefan, Jaber, Fitzgerald); Department of Epidemiology and Biostatistics, Baystate Medical Center, Springfield, Massachusetts (Garb); Center for Value-Based Care Research, Medicine Institute, Cleveland Clinic. Cleveland Ohio (Rothberg)

---

The Affordable Care Act established the Value-Based Purchasing Program, launched in 2013, which uses risk-standardized mortality rates as a benchmark to penalize or reward hospitals.<sup>1</sup> The risk-standardized mortality rate is calculated using administrative data and includes patients with life-threatening illnesses for whom pneumonia may be the last insult in the setting of terminal illness. Moreover preferences for limiting the use of or withdrawing life-sustaining therapy are considered only for patients already enrolled in hospice on the day of admission. Therefore, risk-standardized mortality rates measure the outcome of care but not necessarily the appropriateness and value of care.<sup>2</sup>

We sought to determine the proportion of patients identified with pneumonia by the Centers for Medicare & Medicaid Services risk-standardized mortality measures for whom pneumonia was a major contributor to death and to describe the intensity of care and patient preference for life-sustaining therapies.

---

**Corresponding Author:** Mihaela S. Stefan, MD, Department of Medicine, Baystate Medical Center, 759 Chestnut St, Springfield, MA 01199 (mihaela.stefan@baystatehealth.org).

**Author Contributions:** Dr Stefan had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

*Study concept and design:* All authors.

*Acquisition, analysis, or interpretation of data:* Stefan, Jaber, Garb, Fitzgerald Rothberg.

*Drafting of the manuscript:* Stefan, Jaber, Garb.

*Critical revision of the manuscript for important intellectual content:* Stefan Lindenauer, Garb, Fitzgerald, Rothberg.

*Statistical analysis:* Stefan, Garb.

*Administrative, technical, or material support:* Jaber, Fitzgerald.

*Study supervision:* Jaber, Lindenauer, Fitzgerald, Rothberg.

**Conflict of Interest Disclosures:** Dr Lindenauer receives support to develop hospital outcome measures from the Centers for Medicare & Medicaid Services No other conflicts were reported.

**Disclaimer:** The content of this article is solely the responsibility of the authors and does not represent the official views of the National Institutes of Health.

**Additional Contributions:** Anu Joshi, Clinical Research Coordinator, Center for Quality of Care Research, Baystate Medical Center, provided assistance in editing the manuscript and preparing the tables. Ms Joshi was not compensated for her contribution.

## Methods

Centers for Medicare & Medicaid Services criteria<sup>3</sup> were used to identify all adult patients who died with a principal diagnosis of pneumonia between January 1, 2008, and December 31, 2012, at 3 Massachusetts hospitals.

Guided by the Mortensen et al<sup>4</sup> classification schema, 2 of us (R.J. and J.F.) assessed patients' medical records to determine if pneumonia was a minor or major contributor to death. Pneumonia was considered a major contributor if the patient had stable medical conditions and death would not have occurred in the absence of pneumonia, and a minor contributor if the patient had advanced life-threatening illnesses (ie, met criteria for palliative care)<sup>5</sup> and pneumonia was on the final pathway to death.

The study was approved by the Baystate Medical Center Institutional Review Board. As this was a retrospective chart review, no patient consent was necessary.

## Results

A total of 202 deaths were included; mean patient age was 78.5 years, 54.5% of patients were female, and 56.4% had a do-not-resuscitate order at admission. During hospitalization, 30.2% were admitted to an intensive care unit, 23.8% were intubated, and 24.8% died in the intensive care unit (Table 1).

Most patients had severe debilitating illnesses: 24.1% had advanced dementia, 9.3% showed failure to thrive, 18.2% had cerebrovascular disease with severe functional impairment and 7.4% had lung cancer. In addition, 2.9% of patients had a feeding tube and 1.9% received long-term mechanical ventilation.

Pneumonia played a major role in the deaths of 37 patients (18.3%). Examples of deaths with pneumonia as a major and minor contributor appear in Table 2. Compared with patients with pneumonia as a minor contributor, patients with pneumonia as a major contributor received more intense care. Of 165 patients with life-threatening illnesses, 57.6% had do-not-resuscitate orders at admission and 57.0% refused intubation. Invasive and noninvasive mechanical ventilation were discontinued before death in 83.3% and 91.2% of the patients with life-threatening illnesses, respectively. Of the 202 deaths, 95 patients (47.0%) had life-limiting illnesses meeting the criteria for palliative care and had do-not-resuscitate orders at admission.

## Discussion

In this detailed retrospective medical record review of patients identified with pneumonia by the Centers for Medicare & Medicaid Services risk-standardized mortality rate measures, we found that pneumonia was a major contributor to death in only 18.3% of cases. Almost half of the deaths occurred among patients who, at the time of admission, had appropriately decided to forgo aggressive treatment. The deaths of these patients cannot be assumed to represent poor-quality care because survival was not necessarily the goal of therapy. In

many other cases, care was ultimately withdrawn, but we were unable to determine whether the overall quality of care contributed to the patient's death.

Only 57.6% of the patients with advanced illnesses had do-not-resuscitate orders and many of these patients received aggressive care, which suggests opportunities to improve end-of-life discussions. Currently, the mortality measures include patients with a terminal illness and may penalize hospitals that take a more patient-centered approach and use palliative care, while encouraging hospitals to provide inappropriately aggressive treatment when a patient is at the end of life.<sup>2,6</sup>

The findings of this study suggest that mortality measures could be enhanced by taking into account patient preferences for treatment and end-of-life care.

## Acknowledgments

**Funding/Support:** Dr Stefan is supported by grant 1K01HL114631-01A1 from the National Heart, Lung, and Blood Institute of the National Institutes of Health and by grant UL1RR025752 from the National Center for Research Resources and the National Center for Advancing Translational Sciences, National Institutes of Health.

**Role of the Funder/Sponsor:** The funding sources had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

## References

1. US Department of Health and Human Services, Centers for Medicare & Medicaid Services. Hospital Value-Based Purchasing Program. Report No. ICN 907664 [http://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNProducts/downloads/Hospital\\_VBPurchasing\\_Fact\\_Sheet\\_ICN907664.pdf](http://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNProducts/downloads/Hospital_VBPurchasing_Fact_Sheet_ICN907664.pdf). Published March 2013. Accessed September 2, 2014
2. Kupfer JM. The morality of using mortality as a financial incentive: unintended consequences and implications for acute hospital care. *JAMA*. 2013; 309(21):2213–2214. [PubMed: 23736729]
3. Lindenauer PK, Bernheim SM, Grady JN, et al. The performance of US hospitals as reflected in risk-standardized 30-day mortality and readmission rates for Medicare beneficiaries with pneumonia. *J Hosp Med*. 2010; 5(6):12–18.
4. Mortensen EM, Coley CM, Singer DE, et al. Causes of death for patients with community-acquired pneumonia: results from the Pneumonia Patient Outcomes Research Team cohort study. *Arch Intern Med*. 2002; 162(9):1059–1064. [PubMed: 11996618]
5. Weissman DE, Meier DE. Identifying patients in need of a palliative care assessment in the hospital setting: a consensus report from the Center to Advance Palliative Care. *J Palliat Med*. 2011; 14(1): 17–23. [PubMed: 21133809]
6. Lilford R, Pronovost P. Using hospital mortality rates to judge hospital performance: a bad idea that just won't go away. *BMJ*. 2010; 340:c2016. [PubMed: 20406861]

**Table 1**

Characteristics of Patients With Pneumonia as a Major or Minor Contributor to Death

Characteristic	No.(%)		
	Major (n = 37)	Minor (n = 165)	Total (N = 202)
Race			
White	33 (89.2)	143 (86.7)	176(87.1)
Black	1 (2.7)	8 (4.8)	9 (4.5)
Hispanic	2 (5.4)	5 (3.0)	7 (3.5)
Other	1 (2.7)	9 (5.5)	10 (5.0)
Female sex	20 (54.1)	90 (54.5)	110 (54.5)
Tertiary care hospital	32 (86.5)	135 (81.8)	167 (82.7)
Admitted from			
Home	12 (32.4)	57 (34.5)	69 (34.2)
SNF/NH	21 (56.8)	102 (61.8)	123 (60.9)
Other acute-care facility	4 (10.8)	6 (3.6)	10(5.0)
>1 Hospitalization in prior 6 mo	6 (16.2)	46(27.9)	52 (25.7)
Age, mean (SD), y	79.8 (15.6)	78.2 (13.8)	78.5 (14.1)
Admitted to intensive care unit	15 (40.5)	46 (27.9)	61 (30.2)
Refused intubation	15 (40.5)	94 (57.0)	109 (54.0)
Mechanical ventilation	12 (32.4)	36 (21.8)	48 (23.8)
Mechanical ventilation stopped, out of all intubated			
Day of death	7 (58.3)	14 (38.9)	21 (43.8)
1–6 d prior to death	2 (16.7)	12 (33.3)	14 (29.2)
1 wk prior to death	2 (16.7)	4 (11.1)	6 (12.5)
Noninvasive ventilation used	17 (45.9)	57 (34.5)	74 (36.6)
Noninvasive ventilation discontinued	17 (100.0)	52 (91.2)	69 (93.2)
Died in intensive care unit	15 (40.5)	35 (21.2)	50 (24.8)
Resuscitation order on admission			
None	1 (2.7)	3 (1.8)	4 (2.0)
Full resuscitation	17 (45.9)	67 (40.6)	84 (41.6)
DNR or DNI	19 (51.4)	95 (57.6)	114 (56.4)

Abbreviations: DNI, do not intubate; DNR, do not resuscitate; NH, nursing home; SNH, skilled nursing home.

**Table 2**

Examples of Scenarios of Deaths With Pneumonia as a Major or a Minor Contributor

Role of Pneumonia	Case Scenario
Minor	A 67-year-old man with metastatic lung cancer and advanced COPD who was receiving oxygen therapy experienced significant functional decline during the prior month. He had an advance directive with a do-not-resuscitate and do-not-intubate order. He was admitted for progressive shortness of breath and lethargy. Results of chest imaging showed bilateral infiltrate consistent with pneumonia He was treated with broad-spectrum antibiotics but did not improve and became severely short of breath and minimally responsive A family meeting with the hospitalist and the palliative care team on day 3 of hospitalization ensured that management matched the patient’s prior goals; dyspnea and other symptoms were treated. He died peacefully on day 5 of hospitalization.
	A 99-year-old frail bedbound woman with cachexia living in a nursing home had COPD, right heart failure, chronic kidney disease, and advanced dementia She had 3 admissions in the prior 6 months for altered mental status and staphylococcal bacteremia resistant to vancomycin hydrochloride She did not have an advance directive and her son wanted her to receive all life-sustaining measures. She was admitted for lethargy and found to be hypovolemic and hypernatremic. Results of chest imaging showed a right lower lobe infiltrate She was treated with broad-spectrum antibiotics and fluids but on day 2 of hospitalization she developed hypotension and treatment with vasopressors was started. She was intubated and transferred to the ICU. She remained in the ICU for 5 days, developed multiorgan system failure and died. Her resuscitation status was changed to do not resuscitate and then to comfort measures only 1 day before death.
Major	A 79-year-old woman with a history of diabetes mellitus, hypertension, and remote myocardial infarction lived at home and had good functional status at baseline. At admission, her status was to receive all life-sustaining measures. She was admitted for fever, cough, and shortness of breath. Results of chest imaging were consistent with pneumonia. She was treated with antibiotics but on day 3 of hospitalization she developed severe shortness of breath and had a fatal cardiac arrest during an intubation attempt.
	A 75-year-old man with a history of atrial fibrillation, diabetes mellitus, COPD, and mild dementia lived in an assisted-living facility and was able to perform most activities of daily living independently. At admission, his status was to receive all life-sustaining measures He was admitted for fever and cough; results of chest imaging showed a left lower lobe infiltrate. He was treated with antibiotics and developed <i>Clostridium difficile</i> colitis on day 4 of hospitalization. He then developed sepsis and multiorgan system failure and died after 5 days in the ICU.

Abbreviations: COPD, chronic obstructive pulmonary disease; ICU, intensive care unit.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript