

# Understanding Why Patients with Community - Acquired Pneumonia Are Admitted to the Hospital

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## A. Background

Community-Acquired Pneumonia (CAP) affects approximately 4 million adults in the United States yearly,<sup>1</sup> costing an estimated \$4 billion. Furthermore, inpatient antimicrobial costs are thought to exceed outpatient therapy nearly 20 times.<sup>2</sup> Several studies report a national average of between 485,000 and 1 million hospitalizations yearly, or between 12% and 25%.<sup>3</sup> There is substantial variability in admission rates for patients with CAP, with some institutional admission rates exceeding 50%.<sup>2,4,5</sup> In making the initial site-of-care decision, physicians use inconsistent criteria, giving varying degrees of importance to medical severity and psychosocial factors.<sup>2</sup> Medically, there is evidence that physicians tend to overestimate CAP patients' risk of short-term mortality and therefore tend to admit more than necessary.<sup>6</sup> Patients with low severity CAP or congestive heart failure are more likely to be admitted if they are nonwhite or have Medicaid.<sup>7</sup> Patient preference, inadequate home care support, doubts about patient reliability have all been cited as important admission criteria.<sup>8</sup>

There have been few studies trying to assess the reasoning used by physicians to admit patients for CAP and how they vary between institutions. Standardizing protocols may help reduce the number of hospital admissions and decrease the use of more costly hospital services. One step in that direction is the Pneumonia Patients Outcomes Research Team (PORT) prediction rule.<sup>1</sup> This algorithm categorizes CAP patients into classes based on risk of mortality, with certain exclusions. The intent of the prediction rule was to identify patients with objective criteria who are at sufficiently low-risk for mortality from CAP who could therefore be treated at home. A pilot study by Atlas et al<sup>5</sup> suggests that with use of PORT scoring initial hospitalization rate from CAP fell from 58% to 43% after implementation of the algorithm.

I am proposing a study to assess the reasoning behind the initial site-of-care decision made by emergency department (ED) physicians in the treatment of patients with CAP at this hospital. Currently, at this institution, there is no guideline for the management of patients with CAP. Anecdotal experience suggests that psychosocial factors are often weighted more heavily than medical severity. The results of this study could clarify ways to reduce the number of hospitalizations for low-severity CAP. The primary objective is to ascertain what ED physicians consider important in choosing the initial site-of-care for patients with CAP. A secondary outcome is to compare the ED physician's estimate of a patient's risk of death with CAP versus the PORT score. If PORT scoring is implemented as standard practice in the future this study will serve as a baseline reference if the rate of admission changes.

## B. Primary Hypothesis

Psychosocial factors play statistically significant roles in the decision to admit patients with CAP.

QUESTION #1: What is the relative importance of various criteria in the initial site-of care decision made by ED physicians in the treatment of patients with CAP?

QUESTION #2: Does the rate of admission at this institution vary directly with medical severity as predicted by PORT scoring?

## C. Methods

### a. Conceptual and Operational Definitions

The primary outcome for all patients who come through the ED with a principal diagnosis of CAP according to the *International Classification of Diseases, 9<sup>th</sup> Revision, Clinical Modification* (ICD-9-CM)

code will be admission to the hospital or no admission. From these charts or by interview, data as shown in Table I will be abstracted.

**Table I**

Age	Last visit to PCP (within past year or not)
Gender	Other medical illness
Ethnicity	Recent hospitalization (in past year)
Weight	Psychiatric illness
Home (home, homeless, nursing home)	Medications
Number of people at home	Number of Medications
Is patient a caregiver for a child or an adult?	Tobacco use
Insurance (Medicaid, private, or none)	Alcohol use (anything >3 drinks/week)
Primary care physician (PCP seen within one year)	Illicit drug use
Last site of medical care (ED or office)	Education
Last visit to ED (in past year)	Employment (yes or no)

After review of the chart, the patient will be assigned a PORT score<sup>1</sup> (please see page 4). Within one day of the patient's treatment in the ED, the treating physician will be asked to complete a questionnaire (page 5).<sup>10</sup> The validity and the quality of the questionnaire will be assessed by a pilot study of house officers in the emergency department.

This is a cross-sectional study, as risk factors and outcome are defined simultaneously.

#### **b. Statistical Analysis**

From the data obtained, univariate analysis will be performed on the variables listed in Table I, comparing those patients admitted for CAP and those not admitted. Dichotomous variables such as gender or substance use will be analyzed using chi-square analysis. A 2-sample t-test will be used to assess the effect of age, a continuous variable, on rate of admission. Logistic regression will be used to assess the effect of PORT score on the rate of admission. Any significant variables will be further analyzed by logistic regression to characterize its role in the rate of admission relative to other criteria. For the secondary outcome, physician estimate of mortality will be compared to the PORT score by correlation.

#### **c. Sample size**

The primary outcome of the study is admission. Approximately 250 patients visit the ED at CPMC yearly. Of all cases of CAP, about 25% are PORT I or II.<sup>1</sup> One study estimates that nearly 60% of these patients are admitted to a major urban hospital.<sup>5</sup> Assuming a similar rate of admission at CPMC for these patients and an admission rate of 75% for more severe cases (PORT III-V), this estimates an admission rate of 71%. With this Approximation, a sample size of at least 19 either admitted or not admitted, or 38 total, would be necessary. This was calculated for chi-square analysis for power of 80%, testing at P=0.05.

#### **d. Subject Selection**

Consecutive qualifying patients with CAP seen in the CPMC adult ED will be eligible for the study. Because medical severity will be assessed by PORT scoring, the inclusion criteria will be the same as for the Pneumonia PORT cohort. Patients must be at least 18 years old and be able to provide informed consent for baseline and follow-up interviews.<sup>1</sup> Patients must have one or more symptoms suggestive of CAP and have radiographic evidence of CAP (an infiltrate in one or more lobes) within 24 hours of presentation.<sup>1</sup> The triage nurse in the ED will notify a member of the research team who will then come to the ED for consent and base-line interviews. Patients discharged from an acute-care facility for CAP within the past 10 days or who are HIV positive will be excluded.

#### **e. Study Procedures**

All patients will need a chest radiograph. All patients who participate, if discharged will get car-fare home and \$10 for participation in the interview. Admitted patients will receive the same compensation upon discharge.

#### **D. Bibliography**

- <sup>1</sup> Fine MJ et al. A Prediction Rule to Identify Low-Risk Patients with Community-Acquired Pneumonia. *NEJM* 1997;336(4):243-250.
- <sup>2</sup> Auble TE, Yealy DK Fine MJ. Assessing Prognosis and Selecting an Initial Site of Care for Adults with Community-Acquired Pneumonia. *Infect Dis Clin N Amer* 1998; 12(3):741-59.
- <sup>3</sup> Dean NC. Use of Prognostic Scoring and Outcome Assessment Tools in the Admission Decision for Community Acquired Pneumonia. *Clinics in Chest Medicine* 1999;20(3):521-9.
- <sup>4</sup> Werinberg JE, Freeman JL, Culp WJ. Are Hospital Services rationed in New Haven or Over-Utilised in Boston? *Lancet* 1987; 1: 1185-9.
- <sup>5</sup> Atlas SJ, Benzer TI, Borowsky LK et al. Safely Increasing the Proportion of Patients with Community-Acquired Pneumonia Treated as Outpatients: An Interventional Trial. *Arch Intern Med* 1998;158:1350-6. <sup>6</sup> Fine MJ, Medsger AR, Stone RA et al. The Hospital Discharge Decision for Patients with Community Acquired Pneumonia. Results from the Pneumonia Patient Outcomes Research Team cohort study. *Arch Intern Med* 1997; 157(1):47-56.
- <sup>7</sup> Rosenthal GE, Harper DL, Shah A, Covinsky KE. A Regional Evaluation of Variation in Low-Severity Hospital Admissions. *J Gen Intern Med* 1997; 12:416-22.
- <sup>8</sup> Halm. EA, Atlas SJ, Borowsky LK et al. Understanding Physician Adherence with a Pneumonia Practice Guideline: Effects of Patient, System, and Physician Factors. *Arch Intern Med* 2000; 160:98-104.
- <sup>9</sup> Fine MJ, Singer DE, Hanusa BK Lave JR, Kapoor WN. Validation of a pneumonia prognostic index using the MedisGroups Comparative Hospital Database. *Am J Med* 1993;94:153-9.
- <sup>10</sup> Bordens KS, Abbott BB. *Research Design and Methods*. Mayfield Publishing Co 1988 3rd ed., USA.

### Questionnaire

This is a survey of physicians' reasoning for choosing the initial site-of-care for patients with community-acquired pneumonia (CAP), either inpatient or outpatient. This form is confidential, to be seen only by members of the research team.

Please rate the following criteria by degree of importance:

- 1 Strongly Disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly Agree

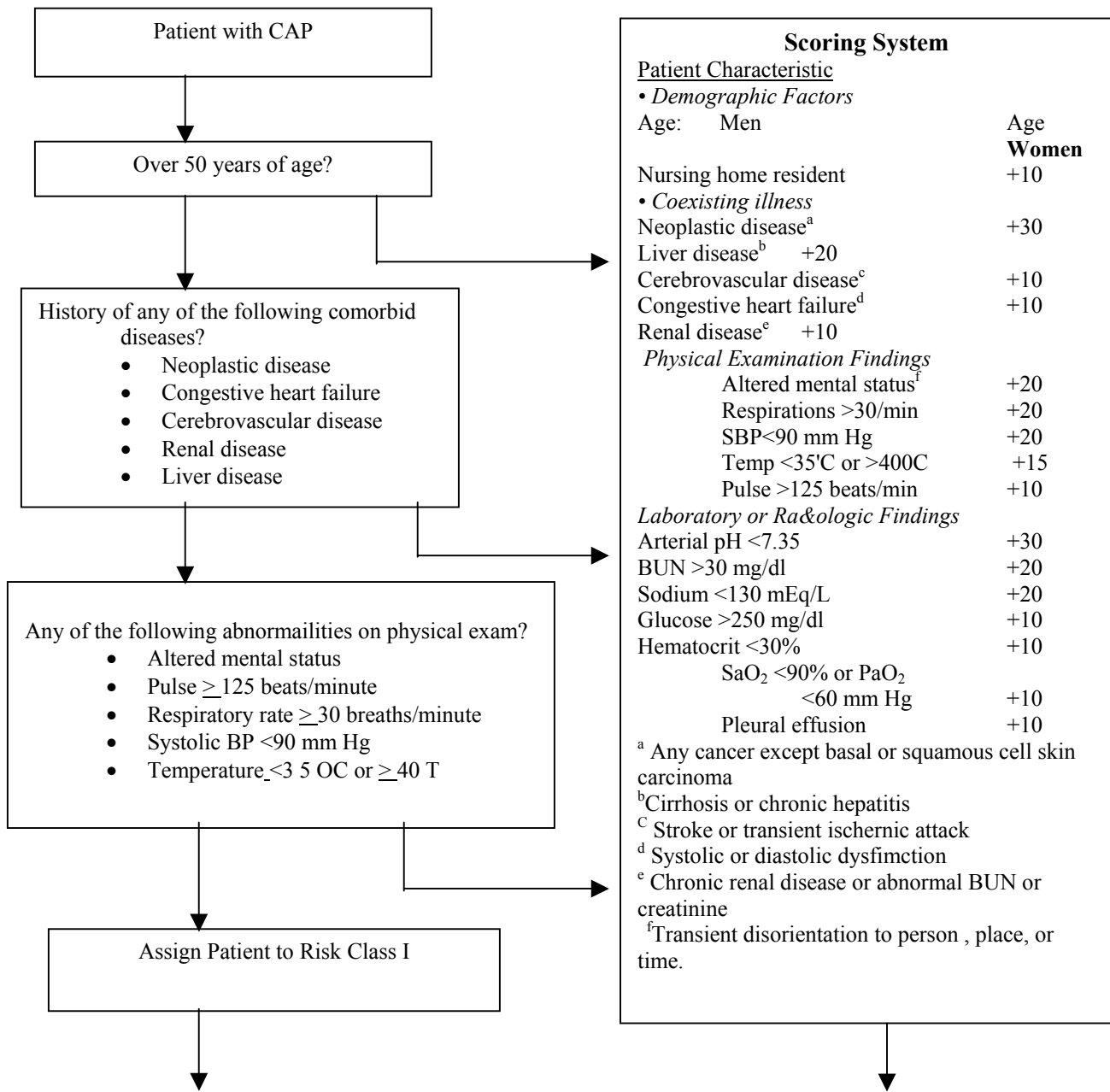
Your primary reason for choosing the initial site-of-care, admission or outpatient care, for this patient with CAP was because of .....

1. The patient's high risk of mortality (>10% in 5 days)
2. The patient's moderate risk of mortality (5-10% in 5 days)
3. The patient's low risk of mortality (1-5% in 5 days)
4. The patient's very low risk for mortality (<1% in 5 days)
5. The patient's hypoxemia
6. The patient's fever was greater than 101°F
7. The patient looks "sick"
8. The patient is likely to be "non-compliant" (at risk for returning to ED within one week)
9. The patient is unable to tolerate oral medications
10. The patient's age
11. The patient's body habitus
12. The patient's comorbid medical illness
13. The patient's comorbid psychiatric illness
14. The patient's use of alcohol
15. The patient's use of tobacco
16. The patient's use of illicit drugs
17. The patient understands his or her illness (can repeat diagnosis and instructions back to physician)
18. The patient's level of education
19. The patient does not have a primary care physician
20. The patient has visited the ED within the past month for the same complaint
21. The patient is frequently treated in the ED (more than one visit in past 6 months)
22. The patient does not have a primary care physician
23. The patient has a primary care physician
24. The patient's primary care physician asked you to admit the patient
25. The patient is employed
26. The patient is unemployed
27. The patient is insured by Medicaid
28. The patient has private medical insurance
29. The patient is uninsured
30. The patient is homeless
31. The patient lives alone
32. The patient has a home health aide
33. The patient has family members to help with medication
34. The patient is from a nursing home
35. The patient is a caregiver (cares for children or parent at home)

**Community Acquired Pneumonia (CAP) - Immunocompetent Patients**

**Risk Stratification Algorithm**

Pneumonia Patient Outcomes Research Team (PORT) Criteria<sup>1</sup>



**Scoring System**

Patient Characteristic

- *Demographic Factors*

Age: Men	Age
	<b>Women</b>
Nursing home resident	+10
Neoplastic disease <sup>a</sup>	+30
Liver disease <sup>b</sup>	+20
Cerebrovascular disease <sup>c</sup>	+10
Congestive heart failure <sup>d</sup>	+10
Renal disease <sup>e</sup>	+10
Altered mental status <sup>f</sup>	+20
Respirations >30/min	+20
SBP <90 mm Hg	+20
Temp <35°C or >40°C	+15
Pulse >125 beats/min	+10
Arterial pH <7.35	+30
BUN >30 mg/dl	+20
Sodium <130 mEq/L	+20
Glucose >250 mg/dl	+10
Hematocrit <30%	+10
SaO <sub>2</sub> <90% or PaO <sub>2</sub> <60 mm Hg	+10
Pleural effusion	+10

<sup>a</sup> Any cancer except basal or squamous cell skin carcinoma  
<sup>b</sup> Cirrhosis or chronic hepatitis  
<sup>c</sup> Stroke or transient ischemic attack  
<sup>d</sup> Systolic or diastolic dysfunction  
<sup>e</sup> Chronic renal disease or abnormal BUN or creatinine  
<sup>f</sup> Transient disorientation to person, place, or time.

<u>Risk Class</u>	<u>Points</u>	<u>30-day mortality</u>	<u>Site-of-care</u>
I	None	0.1%	Outpatient
II	<70	0.6%	Mostly outpatient
III	71-90	2.8%	May need brief inpatient
IV	91-130	8.2%	Inpatient
V	>130	29.2%	Intensive care unit