

ABSTRACT

Introduction: The literature clearly indicates that hospitalized patients with CAP are at risk for increased long-term mortality. Severity scores such as the Pneumonia Severity Index (PSI) and CRB-65 have been developed to predict the risk of short-term mortality (30 day). The ability of these scores to predict long-term mortality (1 year or 5 year) is not well defined.

Objective: The objective of this study was to evaluate and compare the ability of the PSI and CRB-65 for predicting 1 year and 5 year mortality in hospitalized patients with CAP.

Methods: This was a secondary data analysis of the Community-Acquired Pneumonia Organization (CAPO) International Cohort Study database. Receiver-Operating Characteristic (ROC) curves were used to evaluate the ability of the PSI and CRB-65 to predict long-term mortality.

Results: A total of 455 patients were included in the study. The PSI was significantly better at predicting 1 year and 5 year mortality compared to the CRB-65 (1 year mortality: Area Under the ROC curve for PSI, 74%, for CRB-65, 62%, $P < 0.001$; for 5 year mortality: Area Under the ROC curve for PSI, 69%, for CRB-65, 61%, $P < 0.001$).

Conclusions: This study indicates that the PSI is significantly better at predicting long-term mortality compared to the CRB-65. The best Area Under the ROC curve was for PSI predicting 1 year mortality (74%). These data suggest that the PSI is still a poor predictor of long-term mortality and new methods for predicting these outcomes in hospitalized patients with CAP are needed.

INTRODUCTION

- Community-acquired pneumonia (CAP) is a leading cause of death in the United States [1]. The literature clearly indicates that hospitalized patients with CAP are at risk for increased long-term mortality. [2-5] A summary of these studies can be found in Table 1.
- Severity scores such as the Pneumonia Severity Index (PSI) and CRB-65 have been developed to predict the risk of short-term mortality (30 day). However, there is less data on predictors of long-term mortality.
- The objective of this study is to develop a prediction score for one- year and five year mortality in hospitalized patients with CAP.

Table 1: Summary of published studies evaluating long-term mortality after CAP hospitalization

Author	Study population	Time	Method	1 year Mortality rate
Stacie K. Levine	Hospitalized older adults	1997- 2001	Prospective cohort study	14% - 46%
Louise C	Hospitalized older adults	1993-1997	Review of 2 studies	37- 64%
Grant W	Hospitalized 18 to >81 yrs	1998-2001	Prospective cohort study	0.4 to 12%
Thomas W	Hospitalized >65yrs	2005- -2009	Retrospective study	8.3 – 28.4%

METHODS

Study design and Study population
This was a secondary analysis of patients enrolled in the Community-Acquired Pneumonia Organization (CAPO) international cohort study. Data were between 2001 and 2006. In each participating center, non-consecutive medical records of hospitalized patients with the diagnosis of CAP were reviewed. A sample of the data collection form is available at the study website (www.caposite.com). Validation of data quality was performed at the study center before the case was entered in to the CAPO database. Institutional Review Board approval was obtained by each participating center.

Study definitions
CAP: Diagnosis of CAP required the presence of criterion A, B, and C:
A. New pulmonary infiltrate on imaging (CT scan or chest x-ray) at the time of admission to the hospital.
B. Signs and Symptoms of CAP (at least one of the following)
1. New or increased cough (per the patient)
2. Fever $>37.8^{\circ}\text{C}$ (100.0°F) or hypothermia $<35.6^{\circ}\text{C}$ (96.0°F).
3. Changes in WBC (leukocytosis $>11,000$ cells/ mm^3 , left shift $>10\%$ band forms/ μl , or leukopenia $<4,000$ cells/ mm^3)
3. Working diagnosis of CAP at the time of hospital admission with antimicrobial therapy given within 24 hours of admission.

Mortality: Defined as death by any cause after hospital admission for the CAP episode.

Mortality was evaluated at 1 and 5 years after CAP hospitalization.
Severity scores: The pneumonia severity index [PSI] or PORT Score is a clinical prediction rule that medical practitioners can use to calculate the probability of morbidity and mortality among patients with CAP. Figure 1 shows the steps for the score calculation.

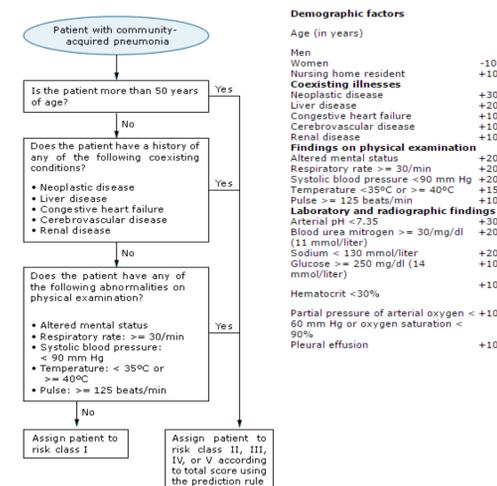


Figure 1 Pneumonia severity index (6)

The CURB-65 is a simple scoring system easily used in the outpatient office or emergency room setting. It helps to assess the severity of CAP (severity).

Clinical Factor	Points
C: Confusion	1
U: Urea nitrogen ≥ 20 mg/dL	1
R: Respiratory rate > 30 breaths/min	1
B: Blood pressure < 90 mm Hg or Diastolic BP < 60 mm Hg	1
65: Age ≥ 65	1

Figure 2 CURB-65 (7)

RESULTS

- A total of 455 patients were included in the study.
- The representation of the PSI and CURB-65 to predict 1-year mortality is shown in Figure 3.
- The representation of the PSI and CURB-65 to predict 5-year mortality is shown in Figure 4.
- The PSI was significantly better at predicting 1-year and 5-year mortality compared to the CURB-65 (1 year mortality: Area Under the ROC curve for PSI, 74%, for CRB-65, 62%, $P < 0.001$; for 5 year mortality: Area Under the ROC curve for PSI, 69%, for CURB-65, 61%, $P < 0.001$).

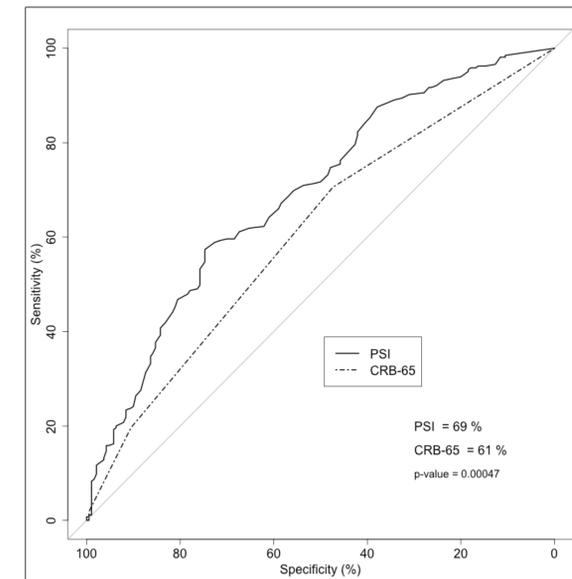


Figure 3 PSI and CURB-65 to predict 1-year mortality

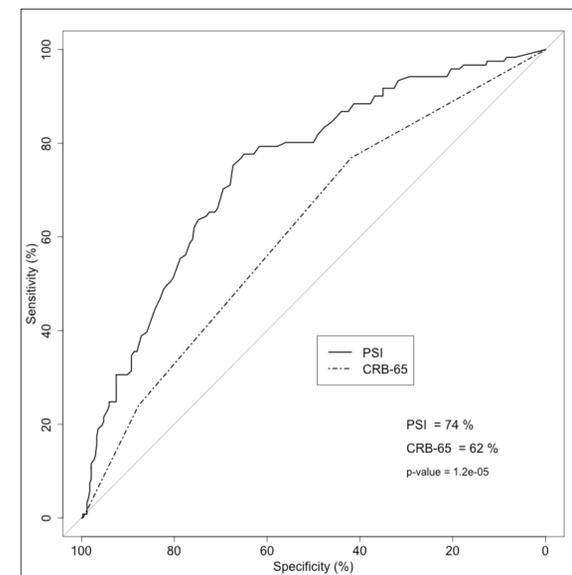


Figure 4 PSI and CURB-65 to predict 5-year mortality

CONCLUSIONS

- This study indicates that the PSI is significantly better at predicting long-term mortality compared to the CRB-65. However, the best area under the ROC curve was 74% for PSI predicting 1-year mortality. This data suggest that the PSI is still a poor predictor of long-term mortality and new methods for predicting these outcomes in hospitalized patients with CAP are needed.
- Further research is needed on prognostic markers as well as surveillance and rehabilitation for CAP patients who are considered clinically cured to reduce long term mortality.
- Early recognition of those patients at a high risk of mortality maximizes the potential for interventions to impact on subsequent morbidity and mortality.

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