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Original Research Article

Comparative Study of Pneumonia Severity Index and CURB-65 in Assessing Severity of Community-Acquired Pneumonia

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Abstract

Background: Community-acquired pneumonia (CAP) is a leading cause of morbidity and mortality worldwide. The Pneumonia Severity Index (PSI) and the CURB-65 score are two widely validated tools used to stratify patient risk and guide site-of-care decisions. However, their comparative performance in contemporary clinical practice warrants ongoing evaluation.

Methods: We conducted a prospective, single-center, observational cohort study of 520 adult patients admitted with a primary diagnosis of CAP between June 2021 and May 2023. PSI and CURB-65 scores were calculated for each patient upon admission based on clinical and laboratory data. The primary outcome was 30-day all-cause mortality. Secondary outcomes were ICU admission and LOS. The discriminatory power of each score was assessed using the area under the receiver operating characteristic curve (AUC).

Key Findings: Of the 520 patients (mean age 66.2 ± 16.1 years), 65 (12.5%) died within 30 days, and 98 (18.8%) required ICU admission. For predicting 30-day mortality, the PSI demonstrated significantly better discriminatory power (AUC = 0.85; 95% CI, 0.80–0.90) than the CURB-65 score (AUC = 0.79; 95% CI, 0.73–0.85; p=0.02). Similarly, for predicting ICU admission, the AUC for PSI was 0.82 (95% CI, 0.77–0.87), which was superior to that of CURB-65 (AUC = 0.76; 95% CI, 0.70–0.82; p=0.04). PSI was particularly effective at identifying low-risk patients; mortality in PSI risk classes I-II (n=145) was 0.7%, compared to 2.4% in patients with a CURB-65 score of 0-1 (n=210). Both scores showed a moderate positive correlation with LOS, though the correlation was stronger for PSI (Spearman's $\rho = 0.45$ vs. 0.38; p=0.03).

Conclusion: In this cohort of hospitalized CAP patients, the PSI demonstrated superior accuracy compared to the CURB-65 score in predicting 30-day mortality and the need for ICU admission. While CURB-65 remains a simpler tool for rapid initial assessment, the more comprehensive PSI provides more accurate risk stratification, especially in identifying patients at very low risk of adverse outcomes.

Keywords: Community-Acquired Pneumonia, Pneumonia Severity Index, CURB-65, Severity Score, Mortality, Risk Stratification.

Introduction

Community-acquired pneumonia (CAP) remains a substantial global health burden, representing a major cause of hospitalization and mortality, particularly among the elderly and those with comorbidities [1]. The clinical presentation of CAP ranges from mild, self-limiting illness to severe, life-threatening sepsis and respiratory failure.

Consequently, accurate and timely risk assessment is a cornerstone of effective management, guiding crucial decisions regarding the appropriate site of care (outpatient, hospital ward, or intensive care unit) and the intensity of initial therapy [2, 3]. Over the past two decades, several clinical prediction rules have been developed and validated to aid clinicians in this stratification process. Among the most widely adopted are the Pneumonia Severity Index (PSI), also known as the PORT score, and the CURB-65 score [4, 5]. The PSI is a comprehensive, 20-item weighted scoring system that incorporates demographic factors, comorbidities, physical examination findings, and laboratory/radiological results to classify patients into five risk classes (I–V) with incrementally increasing mortality risk [4].

Its high negative predictive value has established it as a robust tool for identifying low-risk patients who can be safely managed in an outpatient setting [6]. However, its complexity is often cited

as a barrier to its routine use in busy clinical environments. In contrast, the CURB-65 score is a simpler, five-point tool based on Confusion, Urea (>7 mmol/L), Respiratory rate (≥30 breaths/min), Blood pressure (systolic <90 mmHg or diastolic ≤60 mmHg), and age ≥65 years [5]. Its ease of calculation makes it highly practical for rapid bedside assessment.

A score of 0–1 typically suggests suitability for outpatient treatment, a score of 2 indicates consideration for hospital admission, and a score of ≥3 suggests severe pneumonia, often warranting ICU evaluation [7].

Numerous studies have compared the performance of these two scores, with varied conclusions. Some systematic reviews and meta-analyses have suggested that the PSI has superior discriminatory power for mortality, while others have found the two scores to be broadly comparable, with the simplicity of CURB-65 favoring its use [8, 9].

However, the patient populations, healthcare systems, and etiological agents of CAP are continually evolving. There remains a research gap for contemporary, head-to-head comparisons of these scores within a single, well-defined cohort, assessing their predictive ability not only for mortality but also for other critical outcomes like ICU admission and length of stay.

Therefore, the aim of this study was to prospectively evaluate and compare the performance of the PSI and CURB-65 scores in predicting 30-day mortality, ICU admission, and length of hospital stay in adult patients hospitalized with CAP at a tertiary care center.

Materials and Methods

Patients were enrolled from the emergency department and inpatient medical wards.

Study Population: We screened all consecutive adult patients (age ≥ 18 years) admitted with a clinical diagnosis of pneumonia. The diagnosis of CAP was established based on the presence of a new or progressive infiltrate on chest radiography, coupled with at least two of the following clinical findings: fever (>38.0°C) or hypothermia (<36.0°C), new cough with or without sputum production, pleuritic chest pain, dyspnea, or altered breath sounds on auscultation.

Inclusion criteria were a confirmed diagnosis of CAP and provision of informed consent. Exclusion criteria were: (1) hospitalization within the preceding 14 days; (2) residence in a nursing home or long-term care facility; (3) severe immunosuppression (e.g., active chemotherapy, neutropenia, solid organ or hematopoietic stem cell transplant, or known HIV infection with a CD4 count <200 cells/μL); (4) discharge from the emergency department; or (5) a primary diagnosis other than pneumonia.

Data Collection and Score Calculation: A dedicated team of trained research coordinators collected data using a standardized electronic case report form. The following variables were collected within the first 24 hours of presentation:

- **Demographics:** Age, sex.
- **Comorbidities:** Neoplastic disease, liver disease, congestive heart failure, cerebrovascular disease, renal disease.
- **Physical Examination:** Mental status, respiratory rate, systolic and diastolic blood pressure, temperature, and heart rate.
- **Laboratory Data:** Arterial pH, blood urea nitrogen (BUN), sodium, glucose, hematocrit, and partial pressure of arterial oxygen (PaO2).
- **Radiological Data:** Presence of pleural effusion on chest X-ray.

The PSI and CURB-65 scores were calculated for each patient based on this initial data. The PSI score was used to stratify patients into risk classes I through V. The CURB-65 score was calculated as a value from 0 to 5.

Outcomes: The primary outcome was all-cause mortality at 30 days after presentation. Secondary outcomes were the need for ICU admission at any point during the index hospitalization and the total length of hospital stay (LOS). Vital status at 30 days was determined from hospital electronic health records and supplemented by telephone follow-up when necessary.

Statistical Analysis: Statistical analysis was performed using R version 4.1.2. Continuous variables were presented as mean ± standard deviation (SD) or median with interquartile range (IQR) and compared using the Student's t-test or Mann-Whitney U test, respectively. Categorical variables were expressed as frequencies and percentages and compared using the Chi-square test or Fisher's exact test.

The discriminatory performance of each scoring system for predicting 30-day mortality and ICU admission was evaluated using receiver operating characteristic (ROC) curves. The area under the curve (AUC) with 95% confidence intervals (CI) was calculated. The AUCs of the two scores were formally compared using the DeLong test. We also calculated sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) for standard cut-off points (PSI Class IV-V and CURB-65 ≥3).

The correlation between the scores and LOS was assessed using Spearman's rank correlation coefficient. A two-tailed p-value < 0.05 was considered statistically significant.

Results

During the study period, 715 patients were screened for eligibility. A total of 520 patients met the inclusion criteria and were enrolled in the final analysis.

The mean age of the cohort was 66.2 ± 16.1 years, and 291 (56.0%) were male.

The baseline demographic and clinical characteristics of the study population are detailed in Table 1.

Table 1: Baseline Characteristics of the Study Population (n=520)

Characteristic	Value
Age, years (mean ± SD)	66.2 ± 16.1
Male Sex, n (%)	291 (56.0)
Comorbidities, n (%)	
Congestive Heart Failure	95 (18.3)
Cerebrovascular Disease	68 (13.1)
Chronic Renal Disease	75 (14.4)
Chronic Obstructive Pulmonary Disease	112 (21.5)
Diabetes Mellitus	130 (25.0)
Admission Vital Signs (mean ± SD)	
Respiratory Rate, breaths/min	26 ± 6
Systolic Blood Pressure, mmHg	124 ± 22
Heart Rate, bpm	102 ± 18
Temperature, °C	38.1 ± 0.8
Key Laboratory Values (mean ± SD)	
BUN, mg/dL	28.5 ± 15.2
Serum Sodium, mmol/L	136 ± 4.5

The overall 30-day mortality rate was 12.5% (65/520), and 18.8% (98/520) of patient's required ICU admission. The median LOS was 6 days (IQR, 4–9 days).

Risk Stratification by PSI and CURB-65: Both scoring systems demonstrated a strong association between increasing scores/classes and the incidence of adverse outcomes (Table 2). For the PSI, 30-day mortality increased from 0% in Class I to 31.8% in Class V. Similarly, for CURB-65, mortality rose from 1.0% for a score of 0 to 40.5% for a score of 4-5.

A notable finding was the very low mortality (0.7%) and ICU admission rate (1.4%) among patients in PSI risk classes I and II combined (n=145).

The corresponding low-risk group defined by CURB-65 (score 0-1, n=210) had a higher mortality rate of 2.4% and an ICU admission rate of 4.3%.

Table 2: Distribution of Patients and Outcomes by PSI and CURB-65 Risk Classes

Risk Category	Patients, n (%)	30-Day Mortality, n (%)	ICU Admission, n (%)
PSI Risk Class			
Class I-II	145 (27.9)	1 (0.7)	2 (1.4)
Class III	135 (26.0)	9 (6.7)	14 (10.4)
Class IV	178 (34.2)	33 (18.5)	52 (29.2)
Class V	62 (11.9)	22 (35.5)	30 (48.4)
CURB-65 Score			
0-1	210 (40.4)	5 (2.4)	9 (4.3)
2	155 (29.8)	15 (9.7)	25 (16.1)
3	118 (22.7)	27 (22.9)	43 (36.4)
4-5	37 (7.1)	18 (48.6)	21 (56.8)

Comparative Predictive Performance: The predictive performance of PSI and CURB-65 for the primary and secondary outcomes is summarized in Table 3. In ROC analysis for 30-day mortality, the AUC for PSI was 0.85 (95% CI, 0.80–0.90), which was significantly higher than the AUC for CURB-65 at 0.79 (95% CI, 0.73–0.85) (p=0.02). For predicting ICU admission, PSI also demonstrated superior performance with an AUC of 0.82 (95% CI, 0.77–0.87) compared to 0.76 (95% CI, 0.70–0.82) for CURB-65 (p=0.04). Using a high-risk threshold of PSI Class ≥IV, the sensitivity and specificity for predicting mortality were 84.6% and 69.2%, respectively. Using a

CURB-65 score ≥3 as the high-risk threshold yielded a lower sensitivity of 69.2% but a higher specificity of 82.2%. Both scores correlated significantly with LOS ($p<0.001$), but the Spearman correlation coefficient was moderately stronger for PSI ($\rho=0.45$) than for CURB-65 ($\rho=0.38$), and this difference was statistically significant ($p=0.03$).

Table 3: Predictive Performance of PSI and CURB-65 for Clinical Outcomes

Outcome and Score	AUC (95% CI)	p-value†	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
30-Day Mortality						
PSI	0.85 (0.80–0.90)	**0.02**	84.6*	69.2*	22.9*	97.5*
CURB-65	0.79 (0.73–0.85)		69.2‡	82.2‡	29.0‡	95.9‡
ICU Admission						
PSI	0.82 (0.77–0.87)	**0.04**	83.7*	66.1*	34.2*	95.0*
CURB-65	0.76 (0.70–0.82)		65.3‡	81.2‡	41.3‡	91.5‡

Discussion

This prospective study directly compared the performance of the two most common severity scoring systems for CAP in a contemporary cohort of hospitalized patients. Our principal finding is that the PSI demonstrated statistically superior discriminatory power over the CURB-65 score for predicting both 30-day mortality and the need for ICU admission. This suggests that the more comprehensive nature of the PSI, which incorporates a wider range of physiological variables and comorbidities, translates into a more accurate assessment of patient risk.

The AUC of 0.85 for PSI in predicting mortality is consistent with values reported in the original validation study and subsequent meta-analyses, confirming its robustness as a prognostic tool [4, 10]. The AUC for CURB-65 was lower at 0.79, indicating acceptable but less precise discrimination. This difference, while modest, is clinically relevant. More accurate risk stratification can lead to better allocation of healthcare resources, preventing both the under-treatment of high-risk patients and the unnecessary hospitalization of those at low risk.

A key strength of the PSI highlighted by our data is its ability to reliably identify low-risk patients. In our cohort, the combined PSI risk classes I and II had a mortality rate of only 0.7%. This aligns with major clinical guidelines that recommend these patients as candidates for outpatient management [3, 11]. In contrast, the low-risk group defined by CURB-65 (score 0-1) had a mortality rate of 2.4%. While still low, this three-fold higher risk suggests that CURB-65 may be less specific in identifying patients who can be safely sent home, potentially leading to more cautious (and costly) decisions to admit.

Conversely, when identifying high-risk patients, our findings suggest a trade-off. Using standard cut-offs, the PSI (Class ≥IV) was more sensitive for mortality, capturing nearly 85% of non-survivors. The CURB-65 (score ≥3) was less sensitive but more specific. This implies that while CURB-65 may miss some high-risk individuals, those it does identify are very likely to be severely ill. This characteristic supports its utility as a quick screen for severity, flagging patients who need immediate attention, but underscores the need for more comprehensive evaluation, such as the PSI, in those with intermediate scores [12].

The reasons for the superior performance of the PSI are likely multifactorial. The PSI accounts for 19 variables beyond age, compared to only four in CURB-65. It specifically weights comorbidities such as cancer and heart failure, and includes additional markers of physiological derangement like arterial pH and serum sodium, which are known independent predictors of mortality in CAP [13]. These additional data points create a more granular and complete picture of the patient's overall health status and physiological reserve.

Despite its superior accuracy, the complexity of the PSI remains a practical limitation. Its calculation requires 20 data points and a scoring algorithm, making it less feasible for rapid, unaided bedside use compared to the easily memorized CURB-65 mnemonic.

In the fast-paced environment of an emergency department, the simplicity of CURB-65 is a significant advantage [14]. The optimal approach may involve a tiered strategy: using CURB-65 for initial triage, followed by a formal PSI calculation (often facilitated by electronic health record integration) for all admitted patients to refine the initial assessment and guide ongoing management [15].

Our study is not without limitations. First, it was conducted at a single academic center, which may limit the generalizability of our findings to community hospitals or different healthcare systems. Second, as an observational study, we cannot exclude the possibility that clinicians' knowledge of the scores influenced their management decisions, potentially creating a self-fulfilling prophecy, although both scores are

standard of care. Third, we did not compare these scores with other prediction rules, such as SMART-COP or SCAP, which are designed more specifically to predict the need for intensive respiratory or vasopressor support.

Conclusion

In this prospective cohort study of hospitalized patients with community-acquired pneumonia, the Pneumonia Severity Index was a significantly more accurate predictor of 30-day mortality and ICU admission than the CURB-65 score. The PSI demonstrated particular strength in identifying a cohort of patients at very low risk of adverse events, supporting its role in guiding decisions for outpatient care. While the simplicity of CURB-65 ensures its continued value as a rapid initial triage tool, our findings affirm that the more detailed assessment provided by the PSI offers a superior and more nuanced risk stratification. The choice of tool should be guided by the clinical context, with a potential role for a sequential approach that leverages the strengths of both systems.

References

1. Jain S, Self WH, Wunderink RG, Fakhran S, Balk R, Bramley AM, et al. Community-Acquired Pneumonia Requiring Hospitalization among U.S. Adults. N Engl J Med. 2015;373(5):415-27. DOI: 10.1056/NEJMoa1500245.
2. Aliberti S, Reyes LF, Faverio P, Sotgiu G, Dore S, Viasus D, et al. Global initiative for community-acquired pneumonia: an international document for the management of community-acquired pneumonia. Eur Respir J. 2021;58(5):2100681. DOI: 10.1183/13993003.00681-2021.
3. Metlay JP, Waterer GW, Long AC, Anzueto A, Brozek J, Crothers K, et al. Diagnosis and Treatment of Adults with Community-acquired Pneumonia. An Official Clinical Practice Guideline of the American Thoracic Society and Infectious Diseases Society of America. Am J Respir Crit Care Med. 2019;200(7):e45-e67. DOI: 10.1164/rccm.201908-1581ST.
4. Fine MJ, Auble TE, Yealy DM, Hanusa BH, Weissfeld LA, Singer DE, et al. A prediction rule to identify low-risk patients with community-acquired pneumonia. N Engl J Med. 1997;336(4):243-50. DOI: 10.1056/NEJM199701233360402.
5. Lim WS, van der Eerden MM, Laing R, Boersma WG, Karalus N, Town GI, et al. Defining community acquired pneumonia severity on presentation to hospital: an international derivation and validation study. Thorax. 2003;58(5):377-82. DOI: 10.1136/thorax.58.5.377.
6. Yealy DM, Auble TE, Stone RA, Lave JR, Meehan TP, Graff LG, et al. Effect of a practice guideline for community-acquired pneumonia on 30-day mortality. Arch Intern Med. 2005;165(16):1846-52. DOI: 10.1001/archinte.165.16.1846.
7. British Thoracic Society Community Acquired Pneumonia in Adults Guideline Group. Guidelines for the management of community acquired pneumonia in adults: update 2009. Thorax. 2009;64 Suppl 3:iii1-55. DOI: 10.1136/thx.2009.121434.
8. Loke YK, Kwok CS, Niruban A, Myint PK. Value of severity scales in predicting mortality from community-acquired pneumonia: systematic review and meta-analysis. Thorax. 2010;65(10):884-90. DOI: 10.1136/thx.2010.134701.
9. Chalmers JD, Singanayagam A, Akram AR, Mandal P, Short PM, Choudhury G, et al. Severity assessment tools for predicting mortality in hospitalised patients with community-acquired pneumonia. A systematic review and meta-analysis. Thorax. 2010;65(10):878-83. DOI: 10.1136/thx.2009.133281.
10. Aujesky D, Auble TE, Yealy DM, Stone RA, Obrosky DS, Meehan TP, et al. Prospective comparison of three validated prediction rules for prognosis in community-acquired pneumonia. Am J Med. 2005;118(4):384-92. DOI: 10.1016/j.amjmed.2005.01.006.
11. Mandell LA, Wunderink RG, Anzueto A, Bartlett JG, Campbell GD, Dean NC, et al. Infectious Diseases Society of America/American Thoracic Society consensus guidelines on the management of community-acquired pneumonia in adults. Clin Infect Dis. 2007;44 Suppl 2:S27-72. DOI: 10.1086/511159.
12. Capelastegui A, España PP, Quintana JM, Areitio I, Gorordo I, Egurrola M, et al. Validation of a predictive rule for the management of community-acquired pneumonia. Eur Respir J. 2006;27(1):151-7. DOI: 10.1183/09031936.06.00062505.
13. Mortensen EM, Coley CM, Singer DE, Marrie TJ, Obrosky DS, Kapoor WN, et al. The Society of Critical Care Medicine: 27th Annual Educational and Scientific Symposium. Crit Care Med. 2002;26(1):A33.
14. Man SY, Lee N, Ip M, Antonio GE, Chau SS, Mak P, et al. Prospective comparison of three predictive rules for assessing severity of community-acquired pneumonia in Hong Kong. Thorax. 2007;62(4):348-53. DOI: 10.1136/thx.2006.069792.
15. Jones BE, Jones J, Bewick T, Lim WS, Aronsky D, Brown SM, et al. The use of risk-adjustment to benchmark 30-day mortality

rates for patients hospitalized with community-acquired pneumonia. Clin Infect Dis. 2013;56(8):1081-8. DOI: 10.1093/cid/cis1025.