STEMedicine

ORIGINAL RESEARCH ARTICLE

Clinical Predictors of Severe Community-Acquired Pneumonia Requiring Intensive Care Admission

Dr. Shivaraj Hadimani[1]*, Dr. Pragati Nalkamana[2], Dr. Manish Kumar[3]

[1]Assistant Professor, Department of General Medicine, S.R. Patil Medical College, Badagandi, Bagalkote, Karnataka
[2]House Surgeon, S.S. Institute of Medical Sciences, Davanagere, Karnataka
[3]Assistant Professor, Department of General Medicine, Balvir Singh Tomar Institute of Medical Science Research & Hospital, Jaipur - Delhi Highway, Jaipur, Rajasthan

Corresponding Author: Dr. Shivaraj Hadimani
Email: drshivarajhadimani@gmail.com

Abstract: Background: Early identification of patients with community-acquired pneumonia (CAP) who require intensive care is important for timely escalation of treatment. This study evaluated admission characteristics associated with ICU admission and compared the performance of established CAP severity scores.**Methods:** Adults hospitalized with CAP were evaluated using demographic, clinical, laboratory, and radiological variables. Logistic regression assessed factors associated with ICU admission. Discrimination of CURB-65 and SMART-COP was evaluated using receiver operating characteristic analysis.**Results:** Among 300 patients, 60 (20.0%) required ICU admission. ICU patients had higher respiratory rates, lower oxygen saturation and systolic blood pressure, higher blood urea nitrogen and C-reactive protein, lower serum albumin, and more frequent multilobar infiltrates. SMART-COP showed better discrimination than CURB-65 (AUC 0.703 vs 0.623). SMART-COP ≥3 had 65.0% sensitivity and 64.2% specificity, whereas CURB-65 ≥2 had 46.7% sensitivity and 75.0% specificity. ATS/IDSA severe-CAP criteria were present in 56.7% of ICU patients versus 7.9% of non-ICU patients.**Conclusion:** SMART-COP and ATS/IDSA severe-CAP criteria showed greater utility for identifying patients requiring intensive care than CURB-65 alone.

Keywords: community-acquired pneumonia; intensive care unit; SMART-COP; CURB-65; severity assessment.

Received:04.02.2026 | Revised:25.02.2026 | Accepted:10.03.2026 | Published:25.04.2026

Citation: Dr. Shivaraj Hadimani *et al* (2026). Clinical Predictors of Severe Community-Acquired Pneumonia Requiring Intensive Care Admission. STEMed, 7(1): 29-36.

Introduction

Community-acquired pneumonia (CAP) is an important cause of hospital admission and can deteriorate rapidly if respiratory failure, circulatory instability or multiorgan dysfunction occurs. Therefore, early identification of patients who require intensive care is a key element of correct monitoring and timely escalation of care. A clinical severity assessment is important especially since delayed transfer to the intensive care unit (ICU) in patients with severe CAP has been linked to poor outcomes [1].

There are a number of prediction tools available to assist with initial risk stratification. CURB-65 is a simple tool for assessing the severity of pneumonia and risk of death, based on confusion, blood urea, respiratory rate, blood pressure and age [2]. However, scores that are primarily based on mortality may not be the best indicators of those who later need intensive respiratory or circulatory support. SMART-COP was designed specifically to predict the need for intensive respiratory or vasopressor support and contains physiological, laboratory and radiological abnormalities that reflect the severity of the acute disease [3].

The ATS/IDSA framework offers an alternative definition of severe CAP, which is based on major criteria or the presence of a combination of minor

 © 2026 Dr. Shivaraj Hadimani et al. Open Access under the Creative Commons Attribution 4.0 International License.

physiological and laboratory abnormalities [4]. Validation studies have shown these criteria to be useful in discriminating for admission to an intensive care unit and hospital mortality, especially in those patients who were not initially mechanically ventilated or receiving vasopressors [5]. There have also been systematic reviews comparing the severity tools, which have demonstrated that scores that were developed specifically for severe CAP or intensive-care treatment generally perform better than traditional mortality-oriented scores in predicting intensive-care treatment [6,7]. Current ATS/IDSA guidelines thus focus on a structured severity assessment in addition to clinical judgment in deciding the level and location of care [8].

Even with these tools, ICU triage is still difficult due to the multidimensionality of disease severity. Each of these physiological abnormalities—tachypnoea, hypoxaemia, hypotension, altered mental status, azotaemia, systemic inflammation, hypoalbuminaemia, and multilobar pulmonary involvement—may represent a different aspect of physiological compromise. The contribution of each may also differ between patient populations and health care settings. Severity scores and individual admission variables may thus offer a more clinically meaningful assessment of patients who are at risk of deterioration.

The present study aimed to compare clinical, physiological, biochemical and radiological features of hospitalized adults with CAP according to ICU admission. It also compared the discriminatory performance of CURB-65 and SMART-COP, as well as the association between ATS/IDSA severe-CAP classification and need for intensive care.

Materials and Methods

Study Design and Setting

In the present methodological study, 300 adult patients with community-acquired pneumonia (CAP) admitted to Balvir Singh Tomar Institute of Medical Science Research & Hospital, Jaipur, Rajasthan, India were included. The study period was from November 2025 to February 2026.

Study Population

The study population included adults aged ≥18 years who were admitted to the hospital for CAP. Demographic data, clinical presentation, laboratory and radiological data and documented hospital outcomes were included. Cases were classified based on intensive care unit (ICU) admission during hospital stay.

Clinical and Laboratory Assessment

Baseline variables were age, sex, smoking status, comorbidities, symptom duration, vital signs, oxygen saturation and mental status. Laboratory tests included complete blood counts, blood urea nitrogen, serum creatinine, electrolytes, C-reactive protein, serum albumin, and arterial blood gas measurements. Radiological findings included multilobar involvement and pleural effusion. Oxygen saturation was measured on room air at initial assessment and the PaO_2/FiO_2 ratio was determined from the arterial oxygen tension and inspired oxygen fraction.

Severity Assessment

The severity of pneumonia was determined by the clinical and laboratory components of CURB-65 and SMART-COP scores. Confusion, blood urea, respiratory rate, blood pressure, and age were included in the CURB-65 score. SMART-COP included variables such as systolic blood pressure, multilobar involvement, serum albumin, respiratory rate, tachycardia, confusion, oxygenation, and arterial pH.

Severe CAP was defined as having at least one major criterion or three or more minor criteria according to the American Thoracic Society/Infectious Diseases Society of America (ATS/IDSA) criteria.

Outcome Measures

The main outcome was admission to the intensive care unit (ICU) during the index hospitalization. Secondary outcomes were invasive and non-invasive mechanical ventilation, vasopressor use, hospital stay, and in-hospital mortality. Patients were divided into two groups: those requiring admission to the ICU and those who were not admitted to the ICU, and the clinical characteristics, laboratory parameters, and severity scores were compared.

Statistical Analysis

Data were analyzed statistically in SPSS version 22. Means (SDs) or medians (IQR) were used to present continuous variables, depending on their distribution, and compared by Welch's t-test or Mann–Whitney U test. Categorical variables were summarized and presented as frequencies and percentages and compared by Pearson's chi-square or Fisher's exact test.

Univariable logistic regression was conducted to assess the associations with ICU admission. A multivariable logistic regression model was used and included age, respiratory rate, oxygen saturation, systolic blood pressure, altered sensorium, and blood urea nitrogen. Odds ratios (ORs) and adjusted odds ratios (aORs) with 95% confidence intervals (CIs) were expressed.

 © 2026 Dr. Shivaraj Hadimani et al. Open Access under the Creative Commons Attribution 4.0 International License.

To evaluate the discriminatory power of CURB-65 and SMART-COP, receiver operating characteristic (ROC) curves were drawn. The areas under the curve (AUCs) with bootstrap 95% confidence intervals were estimated using 2,000 resamples. The sensitivity, specificity, positive predictive value and negative predictive value were determined at the predefined thresholds of CURB-65 ≥2 and SMART-COP ≥3. Available-case analysis was performed in situations where measurements were missing. All statistical tests were two-tailed and $p<0.05$ was deemed statistically significant.

Results

Study population and baseline characteristics. The cohort comprised 300 hospitalized adults with community-acquired pneumonia; 60 (20.0%) required ICU admission and 240 (80.0%) were managed without ICU admission. The mean age was 53.9 (15.2) years, and 184 (61.3%) patients were male. Age and most comorbidities were comparable between groups. Chronic obstructive pulmonary disease and altered sensorium were more frequent in the ICU group (Table 1).

Admission clinical and laboratory profile. Patients admitted to ICU had greater respiratory and hemodynamic derangement, including faster respiratory rates, lower systolic blood pressure and reduced oxygen saturation. They also had higher blood urea nitrogen and C-reactive protein concentrations, lower serum albumin and more frequent multilobar pulmonary involvement (Table 2).

Severity classification and score discrimination. Both CURB-65 and SMART-COP scores were higher among patients requiring ICU care. ATS/IDSA severe community-acquired pneumonia criteria were met by 34 (56.7%) ICU patients and 19 (7.9%) non-ICU patients. SMART-COP showed numerically better discrimination for ICU admission than CURB-65 (AUC 0.703 versus 0.623). At a threshold of ≥3, SMART-COP had 65.0% sensitivity and 64.2% specificity, whereas CURB-65 ≥2 had 46.7% sensitivity and 75.0% specificity (Tables 3 and 4; Figure 1).

Predictors of ICU admission. In univariable logistic regression, increasing respiratory rate, decreasing oxygen saturation and systolic pressure, altered sensorium, elevated blood urea nitrogen and C-reactive protein, lower albumin and multilobar infiltrates were associated with ICU admission. Following adjustment for six admission variables, none retained a statistically significant independent association (Table 5; Figure 2).

Hospital outcomes. Invasive ventilation was required by 15 (25.0%) ICU patients, while 18 (30.0%) received noninvasive ventilation and 9 (15.0%) received vasopressor support. In-hospital mortality was higher in ICU than non-ICU patients (4 [6.7%] versus 2 [0.8%], Fisher exact p = 0.016). Median hospital stay was also longer in the ICU group (10 versus 6 days; Table 6).

Table 1. Baseline characteristics by ICU admission

Characteristic	Overall (n=300)	ICU (n=60)	Non-ICU (n=240)	Test	P
Age (years)	53.9 (15.2)	54.2 (15.9)	53.9 (15.1)	t=0.15	0.881
BMI (kg/m²)	23.1 (3.7)	23.8 (4.2)	23.0 (3.6)	t=1.32	0.189
Symptom duration (days)	6.4 (2.9)	6.3 (3.0)	6.5 (2.9)	t=−0.36	0.717
Diabetes mellitus	72 (24.0%)	16 (26.7%)	56 (23.3%)	χ^2=0.29	0.589
Hypertension	66 (22.0%)	16 (26.7%)	50 (20.8%)	χ^2=0.95	0.329
COPD	36 (12.0%)	13 (21.7%)	23 (9.6%)	χ^2=6.64	0.010
Chronic kidney disease	11 (3.7%)	2 (3.3%)	9 (3.8%)	Fisher exact	1.000
Cardiovascular disease	12 (4.0%)	2 (3.3%)	10 (4.2%)	Fisher exact	1.000
Chronic liver disease	5 (1.7%)	2 (3.3%)	3 (1.2%)	Fisher exact	0.262
Fever	229 (76.3%)	45 (75.0%)	184 (76.7%)	χ^2=0.07	0.786
Cough	251 (83.7%)	53 (88.3%)	198 (82.5%)	χ^2=1.20	0.274
Breathlessness	199 (66.3%)	46 (76.7%)	153 (63.7%)	χ^2=3.59	0.058
Altered sensorium	18 (6.0%)	8 (13.3%)	10 (4.2%)	χ^2=7.15	0.007

Values are n (%) or mean (SD). BMI was available for 290 patients. Fisher exact indicates a test without a χ^2 statistic.

 © 2026 Dr. Shivaraj Hadimani et al. Open Access under the Creative Commons Attribution 4.0 International License.

Table 2. Admission physiological, biochemical and radiological findings

Parameter	Overall (n=300)	ICU (n=60)	Non-ICU (n=240)	Test	P
Temperature (°C)	38.1 (0.8)	38.4 (0.7)	38.0 (0.8)	t=3.91	<0.001
Heart rate (beats/min)	100.2 (17.3)	105.0 (17.4)	98.9 (17.1)	t=2.43	0.017
Respiratory rate (breaths/min)	23.6 (6.0)	26.1 (6.5)	23.0 (5.7)	t=3.46	<0.001
Systolic BP (mmHg)	121.9 (17.6)	114.8 (18.9)	123.6 (16.8)	t=−3.29	0.001
Room-air SpO_2 (%)	93.5 (4.9)	91.0 (5.1)	94.2 (4.6)	t=−4.32	<0.001
Hemoglobin (g/dL)	12.3 (1.7)	12.5 (1.9)	12.3 (1.6)	t=0.69	0.490
WBC ($\times 10^3/\mu L$)	12.3 (4.2)	12.9 (4.4)	12.1 (4.1)	t=1.36	0.179
BUN (mg/dL)	17.2 [9.9–24.0]	22.8 [15.1–30.2]	16.1 [8.8–23.0]	U=9639	<0.001
Serum creatinine (mg/dL)	1.0 (0.2)	1.0 (0.3)	1.0 (0.2)	t=1.64	0.104
CRP (mg/L)	56.2 [37.6–86.2]	67.9 [49.2–106.9]	53.8 [36.2–83.0]	U=8670	0.003
Serum albumin (g/dL)	3.4 (0.5)	3.3 (0.5)	3.5 (0.5)	t=−3.33	0.001
Arterial pH	7.4 (0.1)	7.4 (0.1)	7.4 (0.1)	t=−3.87	<0.001
PaO_2/FiO_2 ratio	463.9 (112.1)	404.3 (121.0)	478.8 (104.8)	t=−4.37	<0.001
Multilobar infiltrates	110 (36.7%)	29 (48.3%)	81 (33.8%)	χ^2=4.40	0.036
Pleural effusion	53 (17.7%)	6 (10.0%)	47 (19.6%)	χ^2=3.03	0.082
Aggressive fluid resuscitation	15 (5.0%)	8 (13.3%)	7 (2.9%)	χ^2=10.96	<0.001

Values are mean (SD), median [IQR] or n (%). CRP was available for 294 patients; t denotes Welch t and U denotes Mann–Whitney U.

Table 3. Severity assessment by ICU admission

Severity index	Overall (n=300)	ICU (n=60)	Non-ICU (n=240)	Test	P
CURB-65 score	1.0 [0.0–2.0]	1.0 [0.0–2.0]	1.0 [0.0–1.2]	U=8976	0.002
SMART-COP score	2.0 [1.0–4.0]	4.0 [1.0–6.0]	2.0 [0.0–3.0]	U=10121	<0.001
ATS/IDSA severe CAP	53 (17.7%)	34 (56.7%)	19 (7.9%)	χ^2=78.43	<0.001

Severity scores are median [IQR]; severe CAP classification is n (%).

Table 4. Discrimination of CURB-65 and SMART-COP for ICU admission

Score	AUC (95% CI)	Cutoff	Sensitivity %	Specificity %	PPV %	NPV %
CURB-65	0.623 (0.543–0.702)	≥2	46.7	75.0	31.8	84.9
SMART-COP	0.703 (0.623–0.780)	≥3	65.0	64.2	31.2	88.0

AUC 95% confidence intervals were obtained by bootstrap resampling; PPV = positive predictive value, NPV = negative predictive value.

 © 2026 Dr. Shivaraj Hadimani et al. Open Access under the Creative Commons Attribution 4.0 International License.

Table 5. Univariable and multivariable logistic regression

Predictor	Unadjusted OR (95% CI)	P	Adjusted OR (95% CI)	P
Age, per 10 years	1.01 (0.84–1.22)	0.876	0.87 (0.71–1.08)	0.206
Respiratory rate, per 5/min	1.58 (1.23–2.03)	<0.001	1.17 (0.84–1.61)	0.353
SpO_2, per 5%	0.51 (0.38–0.70)	<0.001	0.71 (0.47–1.07)	0.104
Systolic BP, per 10 mmHg	0.74 (0.63–0.88)	0.001	0.90 (0.73–1.10)	0.300
Altered sensorium	3.54 (1.33–9.40)	0.011	1.98 (0.68–5.76)	0.208
BUN, per 10 mg/dL	1.86 (1.37–2.54)	<0.001	1.31 (0.88–1.96)	0.187
CRP, per 50 mg/L	1.43 (1.12–1.83)	0.004	—	—
Serum albumin, per 1 g/dL	0.37 (0.21–0.67)	0.001	—	—
Multilobar infiltrates	1.84 (1.04–3.26)	0.038	—	—
Diabetes mellitus	1.19 (0.63–2.28)	0.589	—	—
Chronic kidney disease	0.89 (0.19–4.21)	0.878	—	—

Multivariable predictors were age, respiratory rate, SpO_2, systolic BP, altered sensorium and BUN (n = 300). Adjusted ORs are not applicable to variables outside the prespecified model.

Table 6. Clinical outcomes by ICU admission

Outcome	Overall (n=300)	ICU (n=60)	Non-ICU (n=240)	Test	P
Invasive mechanical ventilation	15 (5.0%)	15 (25.0%)	0 (0.0%)	Fisher exact	<0.001
Noninvasive ventilation	33 (11.0%)	18 (30.0%)	15 (6.2%)	χ^2=27.66	<0.001
Vasopressor support	9 (3.0%)	9 (15.0%)	0 (0.0%)	Fisher exact	<0.001
In-hospital mortality	6 (2.0%)	4 (6.7%)	2 (0.8%)	Fisher exact	0.016
Hospital length of stay (days)	7.0 [5.0–9.0]	10.0 [8.0–12.0]	6.0 [4.0–8.0]	U=12115	<0.001

Values are n (%) or median [IQR]; Fisher exact used where expected frequencies were small.

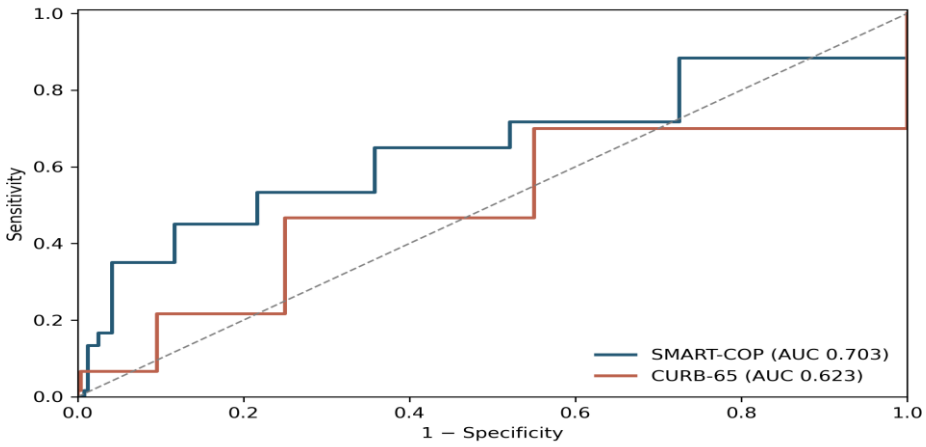

Figure 1. Receiver operating characteristic curves comparing CURB-65 and SMART-COP for ICU admission.

 © 2026 Dr. Shivaraj Hadimani et al. Open Access under the Creative Commons Attribution 4.0 International License.

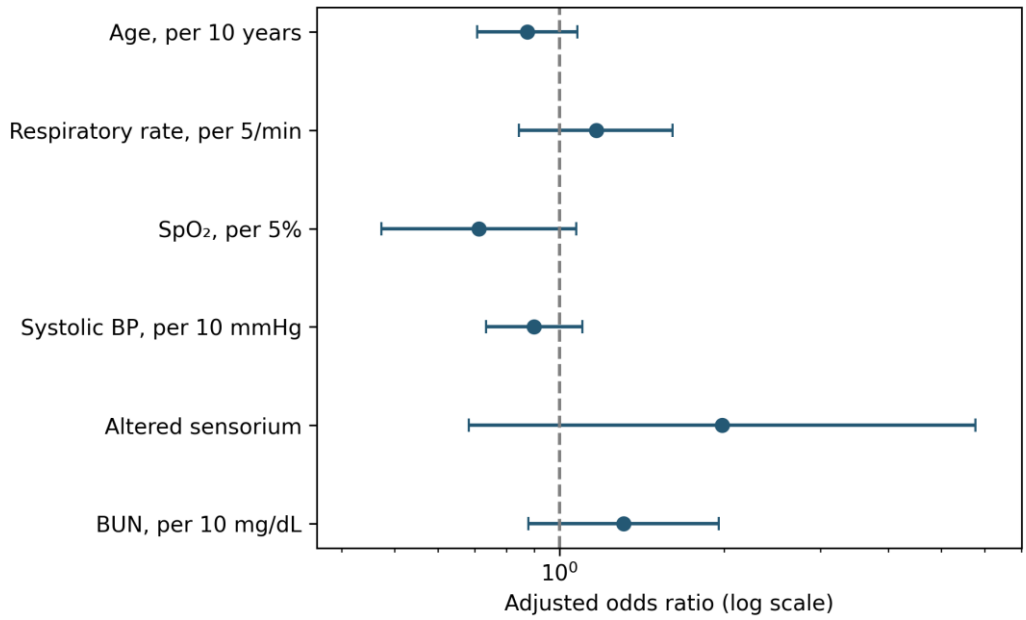

Figure 2. Adjusted odds ratios and 95% confidence intervals for admission predictors of ICU admission.

Discussion

Of the 300 hospitalized adults with community-acquired pneumonia (CAP) in this group, 20% were deemed to require admission to the intensive care unit (ICU). ICU patients exhibited more severe physiological disturbances, such as increased respiratory rate, decreased oxygen saturation, decreased SBP, increased BUN, increased C-reactive protein, decreased albumin, and increased multilobar involvement. Both SMART-COP and CURB-65 had modest accuracy with SMART-COP having better discrimination for ICU admission (AUC 0.703 versus 0.623). The clinical relevance of multidimensional severity assessment was supported by the fact that 56.7% of the patients in the ICU met the severe-CAP criteria of ATS/IDSA, while only 7.9% of those not in the ICU did.

The relative advantage of scores specifically developed for critical care needs is similar to previous studies. Liapikou et al. studied 2,102 CAP episodes of hospitalization, with 235 (11%) admitted to the ICU [9]. The IDSA/ATS severe-CAP rule classified 19% of episodes as severe and correctly identified 71% of the episodes that required admission to the intensive care unit, while the specificity was 88%. In 86% of cases, the agreement between the rule and the actual admission to the ICU was reached. The higher proportion of ATS/IDSA classification in the intensive-care group of our patients also indicates that the criteria used in ATS/IDSA are more likely to reflect intensive-care needs than mortality scores.

Our results of the higher sensitivity of SMART-COP compared to CURB-65 is also similar to Huaman et al. [10]. A composite SMRT-CO score had an AUC of 0.81, while CURB-65 had an AUC of 0.66 in 115 patients transferred to the ICU within 48 hours and 345 ward controls. SMRT-CO ≥2 had a sensitivity of 76.5% and a specificity of 67.5%, while CURB-65 ≥3 had a sensitivity of 36.5% with a specificity of 86.3%. The same was true for SMART-COP ≥3 compared to CURB-65 ≥2 (65.0% vs. 46.7%) in our analysis, but with a smaller difference in AUC.

Other prediction methods focus on the fact that there are several physiological domains that affect deterioration requiring ICU care. Renaud et al. created the REA-ICU index in CAP patients without an immediate need for ICU admission (6,560 patients) with 303 (4.6%) admitted to the ICU within 3 days [11]. Their 11-variable model included hypoxaemia, tachypnoea, tachycardia, azotaemia, acidosis, electrolyte disturbance, radiological extent and comorbidity, with an overall AUC of ~0.81. Labarère et al. externally validated the model in 850 patients, with an AUC of 0.76 [12]. Early ICU risk ranged from ~1–2% in the lowest REA-ICU class to ~27% in the highest class, and the score performed better than traditional pneumonia mortality scores, but did not clearly outperform other ICU-specific prediction scores. These observations highlight the need to consider multiple measures of respiratory, circulatory, metabolic and neurological abnormalities, rather than just one.

 © 2026 Dr. Shivaraj Hadimani et al. Open Access under the Creative Commons Attribution 4.0 International License.

In a similar study, España Yandiola et al. showed the advantage of outcome-specific severity assessment in 1,189 derivation patients and 671 external-validation patients [13]. The ICU admission and mechanical-ventilation rates for patients with a high risk score according to the SCAP score were 35.8% and 16.4%, respectively. For external validation, the AUCs of SCAP for admission to the intensive care unit and mechanical ventilation were 0.75 and 0.76, respectively. These values are greater than those seen in our cohort for SMART-COP, but reflect the overall pattern that severity scores have different values when used to predict mortality, admission to the intensive care unit, and organ-support requirement.

The separation is also strong in the classification with ATS/IDSA, which is biologically plausible. Sibila et al. investigated 787 CAP patients admitted to hospital with 156 (19.8%) requiring admission to the ICU [14]. The inclusion of arterial pH <7.30 in the major ATS/IDSA criteria increased the sensitivity from 61.5% to 71.8% and the AUC from 0.80 to 0.86. A composite of all major and minor criteria had a sensitivity of 92.9% and an AUC of 0.88. Similarly, lower arterial pH, greater hypoxaemia, hypotension, tachypnoea and altered sensorium were also more concentrated in the ICU cases in our cohort, reinforcing the notion that there is a greater severity signal in the accumulation of physiological abnormalities than in individual ones.

Recent prospective data provide further support for SMART-COP when the outcome is intensive organ support. Reddy et al. tested 98 adults with CAP and found that the sensitivity of SMART-COP was 85.7% for vasopressor use and 80.0% for mechanical ventilation, while CURB-65 had a sensitivity of 42.9% and 36.0%, respectively [15]. The AUCs were 0.782 compared with 0.612 for vasopressor support and 0.745 compared with 0.595 for ventilation. This is similar to our results, where SMART-COP, which adds oxygenation, albumin, radiographic extent, cardiovascular variables and arterial pH, discriminated ICU requirement better than CURB-65.

In univariable analyses, several admission variables were associated with ICU admission in our data, but none were significant in the prespecified multivariable model. This probably reflects the correlation between the markers of the same underlying physiological deterioration, especially respiratory rate, oxygen saturation, blood pressure, altered sensorium, and blood urea nitrogen. The results thus support composite assessment over interpretation of individual predictors. There was also clinical coherence in that those who were classified as ICU cases had more needs for invasive ventilation, noninvasive ventilation, and vasopressors, as well as longer hospital stays and higher mortality rates.

Limitations

The study is an observational study conducted in a single centre and may not be generalizable. Beyond disease severity, clinician judgement, availability of beds and local practice patterns may influence admission to ICU. In addition, the relatively small number of ICU events might have limited multivariable precision, especially given the interrelationship between several physiological predictors. In some cases, measurements were missing and were analyzed using available-case analysis. These results need to be confirmed in larger multicentre studies.

Conclusion

SMART-COP was more discriminating and sensitive for ICU requirement than CURB-65, and ATS/IDSA severe-CAP criteria had good separation between ICU and non-ICU cases. Multidimensional assessment seems to be more informative than admission variables alone.

References

1. Phua J, Ngerng WJ, Lim TK. The impact of a delay in intensive care unit admission for community-acquired pneumonia. *Eur Respir J.* 2010;36(4):826–833. **doi:10.1183/09031936.00154209.**
2. Lim WS, van der Eerden MM, Laing R, et al. Defining community acquired pneumonia severity on presentation to hospital: an international derivation and validation study. *Thorax.* 2003;58(5):377–382. **doi:10.1136/thorax.58.5.377.**
3. Charles PGP, Wolfe R, Whitby M, et al. SMART-COP: a tool for predicting the need for intensive respiratory or vasopressor support in community-acquired pneumonia. *Clin Infect Dis.* 2008;47(3):375–384. **doi:10.1086/589754.**
4. Mandell LA, Wunderink RG, Anzueto A, 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)–S72. **doi:10.1086/511159.**
5. Phua J, See KC, Chan YH, et al. Validation and clinical implications of the IDSA/ATS minor criteria for severe community-acquired pneumonia. *Thorax.* 2009;64(7):598–603. **doi:10.1136/thx.2009.113795.**
6. Chalmers JD, Mandal P, Singanayagam A, et al. Severity assessment tools to guide ICU admission in community-acquired pneumonia: systematic review and meta-analysis. *Intensive Care Med.* 2011;37(9):1409–1420. **doi:10.1007/s00134-011-2261-x.**
7. Marti C, Garin N, Grosgurin O, et al. Prediction of severe community-acquired pneumonia: a

 © 2026 Dr. Shivaraj Hadimani et al. Open Access under the Creative Commons Attribution 4.0 International License.

systematic review and meta-analysis. *Crit Care.* 2012;16(4). **doi:10.1186/cc11447.**

8. Metlay JP, Waterer GW, Long AC, 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)–e67. **doi:10.1164/rccm.201908-1581ST.**
9. Liapikou A, Ferrer M, Polverino E, et al. Severe community-acquired pneumonia: validation of the Infectious Diseases Society of America/American Thoracic Society guidelines to predict an intensive care unit admission. *Clin Infect Dis.* 2009;48(4):377–385. **doi:10.1086/596307.**
10. Huaman MA, Diaz-Kuan A, Hegab S, Brar I, Kaatz S. CURB-65 and SMRT-CO in the prediction of early transfers to the intensive care unit among patients with community-acquired pneumonia initially admitted to a general ward. *J Hosp Med.* 2011;6(9):513–518. **doi:10.1002/jhm.921.**
11. Renaud B, Labarère J, Coma E, et al. Risk stratification of early admission to the intensive care unit of patients with no major criteria of severe community-acquired pneumonia: development of an international prediction rule. *Crit Care.* 2009;13(2). **doi:10.1186/cc7781.**
12. Labarère J, Schuetz P, Renaud B, Claessens YE, Albrich W, Mueller B. Validation of a clinical prediction model for early admission to the intensive care unit of patients with pneumonia. *Acad Emerg Med.* 2012;19(9):993–1003. **doi:10.1111/j.1553-2712.2012.01424.x.**
13. España Yandiola PP, Capelastegui A, Quintana J, et al. Prospective comparison of severity scores for predicting clinically relevant outcomes for patients hospitalized with community-acquired pneumonia. *Chest.* 2009;135(6):1572–1579. **doi:10.1378/chest.08-2179.**
14. Sibila O, Meduri GU, Mortensen EM, et al. Improving the 2007 Infectious Disease Society of America/American Thoracic Society severe community-acquired pneumonia criteria to predict intensive care unit admission. *J Crit Care.* 2013;28(3):284–290. **doi:10.1016/j.jcrc.2012.09.010.**
15. Reddy KK, Prakash SS, Chandrasekaran ND, et al. Comparison of scoring systems (SMART-COP vs. CURB 65) in predicting the need for vasopressor and mechanical ventilation support in patients with community-acquired pneumonia. *Niger Postgrad Med J.* 2026;33(1):97–102. **doi:10.4103/npmj.npmj_401_25.**

 © 2026 Dr. Shivaraj Hadimani et al. Open Access under the Creative Commons Attribution 4.0 International License.