Original Article

Comparison of CURB65 and CURBS-65 Scoring Systems for Predicting the Severity of Community-Acquired Pneumonia

Muhammad Walleed Khan[1], Riffat Yasmin[2], Kanwal Shahid[3], Sumaira Iqbal[4], Sohaib Ahmed[5], Aysha Rani[6]

Contributions:
MWK RY SI - Conception, Design
KS SI SA AR - Acquisition, Analysis, Interpretation
KS SI - Drafting
MWK RY SA AR - Critical Review

All authors approved the final version to be published & agreed to be accountable for all aspects of the work.

Conflicts of Interest: None
Financial Support: None to report
Potential Competing Interests: None to report

Disclaimer: This study has not been published or submitted elsewhere for publication.

AI Disclosure: Artificial intelligence tools were used solely for language refinement and formatting. No AI tools were used for data analysis, interpretation, or result generation. All scientific content, analyses, and conclusions were developed and verified by the authors, who took full responsibility for the integrity and accuracy of the work.

Data Availability Statement: The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Institutional Review Board Approval
WMC/ERC/IRB/067
23-05-2025
Wah Medical College, Wah, Cantt

Review began 12/09/2025
Review ended 23/06/2026
Published 30/06/2026

How to cite this article: Khan MW, Yasmin R, Shahid K, Iqbal S, Ahmed S, Rani A. Comparison of CURB65 and CURBS-65 Scoring Systems for Predicting the Severity of Community-Acquired Pneumonia. JRMC. 2026 Jun. 30;30(2).

https://doi.org/10.37939/jrmc.v30i2.3024

Abstract

Objective: To compare the CURB-65 and CURBS-65 scoring systems for predicting the severity of community-acquired pneumonia (CAP).

Methods: The study recruited 150 patients using consecutive sampling, following the inclusion criteria, with pneumonia in the medical wards of POF Hospital, Wah Cantt, Pakistan, from April 2024 to July 2024. The study's inclusion criteria comprised patients above 18 years of age with a clinical diagnosis of CAP and who were admitted to medical wards, High Dependency Units (HDU), and ICU. All participants, including their guardians, gave written informed consent for the study usage or participation. All data were collected by the study author using a PACS system and by analysing patient data from hospital documents. Data analysis was done via SPSS 29.

Results: The mean age of the patients was 65.72 years. Among them, 60 were women and 90 were men. The mean CURB-65 and CURBS-65 scores in males were 1.81 and 2.33, respectively, whereas in females, they were 1.57 and 2.13, respectively. The relationships between length of stay, age, assisted ventilation, mortality, CURB-65, and CURBS-65 were statistically significant. The ROC curve showed that CURB-65 revealed more reliable results than CURBS-65.

Conclusion: In the evaluation of mortality in CAP by CURB-65 and CURBS-65, CURB-65 had a higher sensitivity and overall predictive capability.

Keywords: Community-Acquired Pneumonia, CURB-65, CURBS-65, Mortality Prediction, Severity Scoring, ROC Curve.

Introduction

Community-acquired pneumonia (CAP) is a grave health concern worldwide, leading to substantial illness, financial burden on patients, morbidity, and death. It is the leading cause of death in high-dependency units, intensive care units, immunocompromised patients, nursing homes, and transplant patients. To predict the severity of CAP, the initial assessment is the crucial step for adequate management. According to WHO statistics, 450 million cases of CAP are reported each year, with a mortality rate of 3.9 million. The incidence of CAP in Pakistan is 3-40%, with a mortality rate of 10% reported by Farooq et al.[1.] Early diagnosis and appropriate management help reduce the severity and related complications.[2] Proper management includes decisions regarding hospitalisation, antibiotic choice, and intensive care unit (ICU) or high-dependency unit admission.

Pneumonia is an infection of the lung parenchyma of sudden onset that can be caused by various infective and non-infective causes, presenting with clinical and radiological features compatible with the pulmonary consolidation of different parts of one or both lungs. It is one of the most common diseases presenting in hospitals, both in the outpatient and inpatient facilities, with the greatest load being handled by the intensive care units, where pneumonia is routinely a part of a patient's presenting symptoms and can also develop in non-respiratory patients owing to hospital-acquired pneumonia. Management varies between community-acquired and hospital-acquired pneumonia due to different pathogens coming into play in both pneumonias. Pneumonia can be caused by bacterial, viral, and fungal elements. In the recent past, COVID-related pneumonia during the COVID pandemic gave rise to many different scoring systems to gauge the severity of

the pneumonia and titrating management and intensive care treatment accordingly. CT chest scoring systems were routinely used to help physicians make decisions in starting antiviral treatment or not, and enabling them to make decisions on further titration in treatment in case of worsening CT severity scores. Scoring systems for pneumonia have been evaluated, citing early detection and prompt treatment for this. In order to help in the assessment of severity in CAP, whether it be viral or bacterial, a number of severity scores have been evaluated to predict the need for intensive-care unit (ICU) admission, choice of antibiotic, and mortality. CURB-65 is an important scoring system that can help in deciding which antibiotics to start based on the severity index. Several serum biomarkers and many validated risk scores have been assessed to calculate the severity of CAP to improve the management of CAP patients. Pneumonia Severity Index (PSI) was one of the first risk assessment systems, which includes twenty clinical and laboratory parameters and is recommended by the American Thoracic Society (ATS)/Infectious Diseases Society of America (IDSA). CURB-65 has been in use for many years and has been well established and validated in gauging the severity of pneumonia. A new and more effective scoring system, named CURBS-65, includes Confusion, Urea >7 mmol/L, Respiratory rate ⩾30/min, low systolic (<90 mmHg) or diastolic (⩽60 mmHg) Blood pressure, age ⩾ 65 years, and oxygen saturation,[3] has been explored, including oxygen saturations into the CURB-65 score. These scoring systems aim to assist the physician in deciding on hospitalisation, predicting the prognosis, and preventing mortality. However, the decision to hospitalise the patient in CAP depends on the opinion of the physician who evaluates the patient clinically.[4,5] The crucial step in the management of CAP includes early detection of high-risk patients who are at increased risk of death secondary to CAP. Suboptimal management is a major contributor to high mortality rates among patients receiving antibiotic treatment and those requiring intensive care unit admission. The early recognition can be helpful for appropriate and required management. If we focus on PSI, qSOFA, and CAP-PIRO scores, the limitations associated are the inclusion of many laboratory measurements that can only be performed in secondary or tertiary care and are difficult to recall and to use practically.[3,6,7]
This study aimed to compare the CURB-65 and CURBS-65 scores for predicting the severity of CAP.

Materials And Methods

This study employed a cross-sectional design to compare the CURB-65 and CURBS-65 scoring systems in predicting the severity and outcomes of patients diagnosed with community-acquired pneumonia (CAP) at POF Hospital. The study was conducted in the medical wards and critical care units over four months from April 2024 to July 2024. Patients aged > 18 years with a clinical diagnosis of community-acquired pneumonia (CAP) admitted to the medical wards, HDU, CCU, and ICU were included in the study. CAP was diagnosed based on clinical symptoms, signs, and radiological findings. Patients with hospital-acquired pneumonia who were not willing to participate were excluded from the study. A sample size of 150 patients was calculated and recruited for the study via consecutive sampling, where all eligible patients admitted during the study period were included. This sample size was calculated by comparing two paired ROC curves using a two-sided (95%) confidence level ((Z_{alpha/2} = 1.96)), an expected power of (80%) ((Z_{beta} = 0.84)), and an anticipated difference of (0.10) between the Area Under the Curve (AUC) of the two scoring systems (assuming a baseline mortality rate of (10%)). The minimum required sample size was determined to be 134, establishing that our final cohort (N=150) was adequately powered.
The clinical parameters evaluated were confusion, urea level, respiratory rate, blood pressure, oxygen saturation, and age of the patients. The CURB-65 and CURBS-65 scores were calculated for each patient at the time of admission. A structured data collection form was used to record patient information with laboratory and radiological findings, which were extracted from HMIS hospital records, and written informed consent was also obtained at the same time. The data were collected by the primary investigator and tabulated, with no absence of any parameter being evaluated for this study. No formal statistical adjustments were made for confounding variables in the preliminary analysis of the data used in this study. The impact of stacking comorbidities is addressed qualitatively in the discussion section as a limitation/contextual factor.
The CURB-65 and CURBS-65 scores were computed based on standard criteria:
CURB-65: Includes confusion, urea (>7 mmol/L), respiratory rate (≥30/min), systolic blood pressure (<90 mmHg) or diastolic blood pressure (<60 mmHg), and age ≥65 years.
CURBS-65: Adds blood oxygen saturation level(<90%) to the CURB-65 criteria.
Ethical approval was obtained from the Institutional Review Board (IRB) of POF Hospital/Wah Medical College before the commencement of the research (reference number: WMC/ERC/IRB/067). Written informed consent was obtained from all participants and their guardians. Patient confidentiality and anonymity were maintained throughout the study period. Data were analysed using SPSS version 29. Descriptive statistics were used to summarise the patient characteristics and scoring system results. The predictive accuracy of the two scoring systems for mortality and ICU

admission was compared using receiver operating characteristic (ROC) curve analysis, with the area under the curve (AUC) reported. Statistical significance was set at p <0.05.

Results

The mean age of the patients was 65.72 years. Among them, 60 were females, and 90 were males, with their mean CURB-65 and CURB-65S values as shown in Table 1.

Table 1: Mean CURB-65 and CURBS-65 in Males and Females

	Male	Female	P-Value
CURB-65	1.81	1.57	0.13
CURBS-65	2.33	2.13	0.33

*p value <0.05 is significant

The frequency of hospital settings and the length of patients' hospital stay with CAP are shown in Figures 1 and 2, respectively.

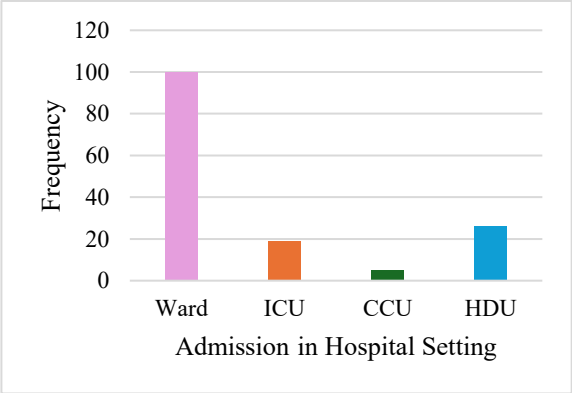

Figure 1: Frequency of Patients Admitted in Various Hospital Settings

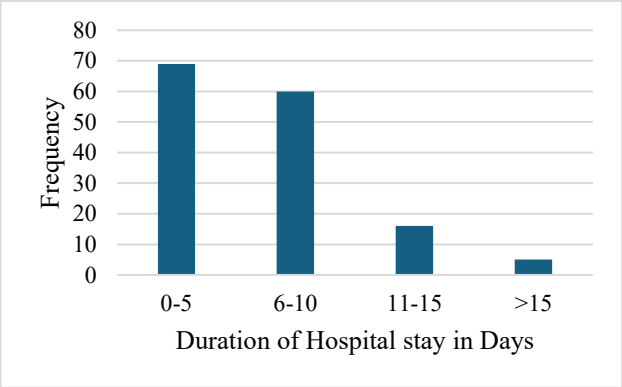

Figure 2: Duration of Stay in Hospital

The CURB-65 and CURBS-65 scores were higher in deceased patients, which was also significant. The correlations between age, oxygen saturation, and assisted ventilation with CURB-65 and CURBS-65 are shown in Table 2.

Table 2: Correlation of CURB-65 and CURBS-65 with Age, Oxygen Saturation, and Assisted Ventilation

	CURB-65	CURBS-65
Age	<0.001*	<0.001*
Oxygen Saturation	0.009*	<0.001*
Assisted Ventilation	<0.001*	<0.001*

The CURB-65 and CURBS-65 scores in patients below and > 90% were statistically significant, as shown in Table 3. The ROC curve shows the comparison of CURB-65 and CURBS-65 (Figure 3). This suggests that the CURB-65 model is better at identifying true positives without significantly increasing the false-positive rate.

Discussion

The stability of a patient with CAP depends on the resolution of vital signs, optimisation of oxygen saturation, length of stay in the hospital, and discharge from higher specialty care or coronary care units. In our study, we found that CURB-65 and CURBS-65 were both helpful in predicting patient prognosis by relating it to hospital stay, oxygen saturation, and assisted ventilation.[8] The predictors of severity were identified as CRP >100, hypoxia at triage, and clinical frailty score.[9] The length of stay for CAP inpatients depends on many factors, such as the time needed to reach clinical stability, which is profoundly associated with disease severity. CURBS-65 scoring, in addition to

CURB-65, may help provide a clinically based estimate of the optimal length of stay and outline a clinically relevant approach to improving the efficiency of inpatient management.[10] Our study revealed that low CURB-65 and CURBS-65 scores require critical care interventions, which was supported by a study by Zaki et al.[11] The oxygen saturation parameter, included in the CURBS-65 scoring system, aims to help physicians make decisions regarding treatment optimisation and shifting to higher care units in hospitalised patients, and whether to admit a patient or not from the ED or OPD.[12] Patients with low oxygen saturation cannot be easily discharged by the physician even if the CURB score is zero or one.[13] The sensitivity of CURB-65 scores greater than or equal to 2 in predicting the need for any critical intervention in our cohort suggested that greater than 20% of patients presenting with pneumonia ultimately requiring critical care intervention may be categorised as being at high risk.[12] CURB-65 is an easily applicable scoring system, but due to its low sensitivity in predicting mortality and intensive care unit (ICU) admission in low-risk patients, it was necessary to find and compare it with some other scoring systems and determine whether it had similar findings in comparison with other scoring systems. Many scoring systems are currently used by physicians, but CURB-65 is the most widely used scoring system for the prediction of pneumonia because of the ease with which all parameters can be attained within a short period of time once a patient presents with signs and symptoms of pneumonia.

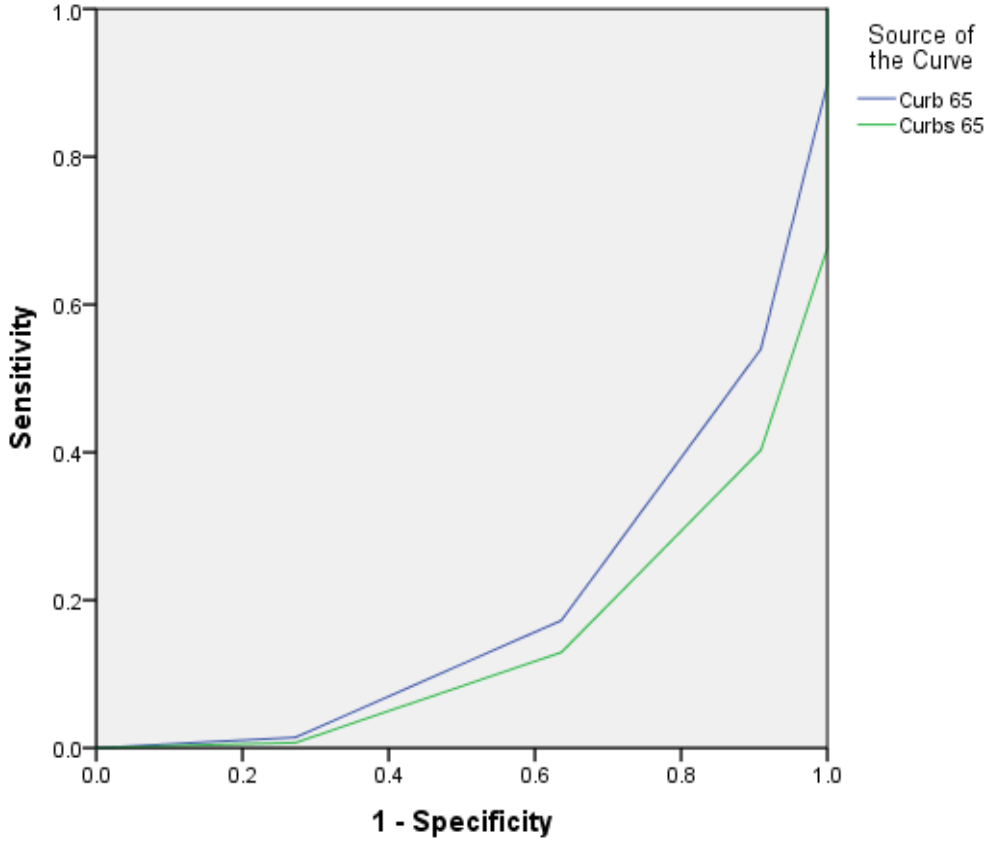

Figure 3: Comparison between CURB-65 and CURBS-65 in CAP

Studies that have attempted to modify the CURB-65 scoring system have been performed previously.[14] We assessed and compared the predictive performance of the CURB-65 and CURBS-65 scores in patients with community-acquired pneumonia with respect to the proximal endpoint of critical care intervention and related outcomes.[15] Contrary to our study, *Wang et al* showed better results for the PSI for predicting both death and the need for ICU admission for classes IV/V than for CURB-65 scores 3, as well as a lower risk of these in PSI classes I/II than in CURB-65 scores 0 or 1. Moreover, CURB-65 helps identify low-risk patients.[16] The CURB-65 also accurately predicted 30-day mortality, the requirement for mechanical ventilation, and the need for hospital admission.

Among the many complications of CAP, the frequency of parapneumonic effusion and empyema in industrialised countries has been documented in the range of 7.2 and 10.4%, which contributes to the mortality linked to poor CURB-65 and CURBS-65.[17] In addition, patients with CAP and multiple co-morbidities, such as diabetes, hypertension, malignancy, and end-stage renal disease, have a higher risk of developing non-respiratory

complications, such as pulmonary embolism, cardiac arrhythmia, myocardial infarction, stroke, and hospital-acquired infections.

An analysis comparing the CURB-65 and CURBS-65 mortality parameters revealed that the CURB-65 model demonstrated superior sensitivity and overall better predictive performance.[18]

The limitation of this study was that the findings may not be generalisable to other populations because it was a single-centre study. Additionally, the cross-sectional design limits the ability to assess long-term outcomes. The Scoring systems used in this study did not consider the underlying comorbidities of patients with severe pneumonia who were at a higher risk of complications such as diabetes, hypertension, end-stage renal disease, and malignancy. For prospects, a multi-centre study can be done, and other scoring systems such as PSI and NEWS can also be compared with CURB-65 and CURBS-65.

Conclusions

In this study, which compared CURB-65 with CURBS-65 in the evaluation of mortality in patients with CAP, it was established that CURB-65 had a higher sensitivity and overall predictive capability. Incorporation of oxygen saturation into the CURB-65 scoring model did not show any statistical significance in this study, and alone, CURB-65 was more sensitive in predicting mortality in our study.

Author Information

1. Lecturer, Wah Medical College, Wah, Cantt 2,4. Associate professor, Wah Medical College, Wah, Cantt 3. Senior Registrar, Wah Medical College, Wah, Cantt 5,6. Assistant Professor, Wah Medical College, Wah, Cantt
Corresponding author: Dr. Muhammad Waleed Khan waleedsajjadkhan@gmail.com

References

1. Farooq M. Characteristics and outcome of adult patients with community-acquired pneumonia. Pak J Med Health Sci. 2021 Jul;15(7):1534–1536. https://doi.org/10.53350/pjmhs211571534
2. File TM Jr, Ramirez JA. Community-acquired pneumonia. O'Malley PG, editor. N Engl J Med. 2023 Aug 17;389(7):632–641. https://doi.org/10.1056/NEJMcp2303286
3. Bahçecioğlu SN, Köktürk N, Baha A, Yapar D, Aksakal FNB, Gunduz C, et al. A new scoring system to predict mortality in community-acquired pneumonia: CURB (S)-65. Eur Rev Med Pharmacol Sci. 2023 Jul;27(13):6293–6302. https://doi.org/10.26355/eurrev_202307_33000
4. Blanc E, Chaize G, Fievez S, Féger C, Herquelot E, Vainchtock A, et al. The impact of comorbidities and their stacking on short- and long-term prognosis of patients over 50 with community-acquired pneumonia. BMC Infect Dis. 2021 Dec 1;21(1):949. https://doi.org/10.1186/s12879-021-06669-5
5. Eldaboosy S, Almoosa Z, Saad M, Al Abdullah M, Farouk A, Awad A, et al. Comparison between physiological scores SIPF, CURB-65, and APACHE II as predictors of prognosis and mortality in hospitalized patients with COVID-19 pneumonia: a multicenter study, Saudi Arabia. Infect Drug Resist. 2022 Dec 14;15:7619–7630. https://doi.org/10.2147/IDR.S395095
6. Zhang X, Yang L, Wu J, Mei X. CAP-PIRO scoring system's performance in predicting prognosis and severity of community-acquired pneumonia: a single-center prospective study. Infect Drug Resist. 2024 Nov 26;17:5335–5346. https://doi.org/10.2147/IDR.S497311
7. Gelaidan A. Comparative effectiveness of CURB-65 and qSOFA scores in predicting pneumonia outcomes: a systematic review. Med J Cairo Univ. 2024;92(1):125–133. https://doi.org/10.21608/mjcu.2024.341112
8. Lazar Neto F, Marino LO, Torres A. Community-acquired pneumonia severity assessment tools in patients hospitalized with COVID-19: a validation and clinical applicability study. Clin Microbiol Infect. 2021 Jul 1;27(7):1037.e1-1037.e8. https://doi.org/10.1016/j.cmi.2021.03.003
9. Baker C. P1 Community acquired pneumonia (CAP) & the advent of virtual hospital wards: how useful is the CURB-65 criteria for risk stratification in 2022? Thorax. 2022 Dec;77(Suppl 1):A81. https://doi.org/10.1136/thorax-2022-BTSabstracts.137
10. Carlos P. CURB-65 and long-term mortality of community-acquired pneumonia: a retrospective study on hospitalized patients. J Clin Med. 2023;12(4):1582. https://doi.org/10.3390/jcm12041582

11. Zaki HA. The battle of the pneumonia predictors: a comprehensive meta-analysis comparing the Pneumonia Severity Index (PSI) and the CURB-65 score in predicting mortality and the need for ICU support. Cureus. 2023 May 17;15(5):e39139. https://doi.org/10.7759/cureus.39139
12. Cetin EU. Advancing ICU mortality prediction in community-acquired pneumonia: combining fibrinogen-to-albumin ratio, CT severity score, PSI, and CURB-65. Biomol Biomed. 2025 Aug 5;25(9):2083–2091. https://doi.org/10.17305/bb.2025.12127
13. Piombi-Adanza SN.Analysis of oxygen blood saturation/ respiratory rate index, NEWS2, CURB65, and quick Sequential Organ Failure Assessment scores to assess prognosis in patients with mild coronavirus disease 2019. Rev Invest Clin. 2021 Nov 5;73(6):399–407. https://doi.org/10.24875/RIC.21000282
14. Kaal AG. Outcomes of community-acquired pneumonia using the Pneumonia Severity Index versus the CURB-65 in routine practice of emergency departments. ERJ Open Res. 2023 May 2;9(3):00051-2023. https://doi.org/10.1183/23120541.00051-2023
15. Bradley J. Pneumonia Severity Index and CURB-65 score are good predictors of mortality in hospitalized patients with SARS-CoV-2 community-acquired pneumonia. Chest. 2022 Apr 1;161(4):927–936. https://doi.org/10.1016/j.chest.2021.10.041
16. Wang D, Willis DR, Yih Y. The pneumonia severity index: Assessment and comparison to popular machine learning classifiers. International Journal of Medical Informatics. 2022 Jul 1;163:104778.https://doi.org/10.1016/j.ijmedinf.2022.104778
17. Limapichat T, Akman C. Comparison between the severity scoring systems A-DROP and CURB-65 for predicting safe discharge from the emergency department in patients with community-acquired pneumonia. Emerg Med Int. 2022 Apr 18;2022:1–8. https://doi.org/10.1155/2022/6391141
18. Ticona JH, Zaccone VM, McFarlane IM. Community-acquired pneumonia: A focused review. American journal of medical case reports. 2021;9(1):45. https://doi.org/10.12691/ajmcr-9-1-12 .