DOI: 10.7860/JCDR/2024/68302.19308

Original Article

Others Section

Comparison of Pneumonia-specific Scores, Sepsis Score and Generic Score in Predicting the Severity of Community-acquired Pneumonia: A Cross-sectional Study

DV PRATAPA REDDY[1], V VIJAYAKUMARI[2], R SUNIL KUMAR[3], CH RN BHUSHANA RAO[4], S GOWTHAM[5], SHALINI PERUMAL[6]

ABSTRACT

Introduction: Pneumonia is defined as inflammation of the pulmonary parenchyma caused by an infectious agent. Community-acquired Pneumonia (CAP) is a heterogeneous disease with a significant disease burden, morbidity, and mortality. Severe Community-acquired Pneumonia (SCAP) has been proven to be associated with increased Intensive Care Unit (ICU) admission, mechanical ventilation, and mortality. Although several severity assessment tools are available, there is a lack of evidence to support one tool over another in patients with pneumonia.

Aim: To compare the ability of pneumonia-specific scores {{Confusion, Urea, Respiratory rate, Blood pressure (CURB)-65 and Expanded CURB-65)}, Sepsis score {quick Sepsis-related Organ Failure Assessment (qSOFA)}, and Generic score {National Early Warning Score (NEWS)} in predicting SCAP patients at the time of hospital admission.

Materials and Methods: This was a hospital-based cross-sectional study conducted in the Department of Pulmonary Medicine, Government Hospital for Chest and Communicable Diseases, Andhra Medical College, Visakhapatnam, India, on 100 patients with clinically and radiologically diagnosed CAP over a period of six months from April 2023 to September 2023 after obtaining Institutional ethics clearance and informed consent. All four severity scores (CURB-65, eCURB-65, qSOFA, NEWS) were documented in each patient at the time of admission. Outcomes such as 30-day mortality and ICU admission were measured. Receiver Operating Characteristic (ROC) curve analysis was performed for mortality prediction and ICU admission for all four scoring systems, and statistical analysis was carried out using Statistical Packages for Social Sciences (SPSS) version 24.0.

Results: Out of 100 patients, 62 (62%) were males, and the remaining 38 (38%) were females with a mean age of 56±15 years. The number of patients with co-morbidities was 48 (48%). Regarding addictive habits, smoking and alcohol played a significant role at 38% and 33%, respectively. A 30-day mortality was observed in 18 (18%) patients, and 20 (20%) patients received ICU treatment. The frequency of patients with co-morbidities such as Diabetes Mellitus (DM), Hypertension (HTN), Ischaemic Heart Disease (IHD), and Chronic Obstructive Pulmonary Disease (COPD) was 21%, 33%, 5%, and 3%, respectively. For ICU admission as an outcome measure, the Area Under Receiver Operating Characteristics (AUROC) values were as follows: CURB-65: 0.977 (95% CI: 0.949-1.00, p-value <0.001); Expanded CURB-65: 0.966 (95% CI: 0.931-1.00, p-value <0.001); qSOFA: 0.935 (95% CI: 0.881-0.989, p-value <0.001); NEWS score: 0.967 (95% CI: 0.934-1.00, p-value <0.001).

Conclusion: In the present study, all four scoring systems were equally effective in detecting the need for ICU admission and predicting 30-day mortality among CAP patients at the time of admission. However, organ-specific tools (CURB-65 (2-3) moderate) have demonstrated valid and effective means of assessing severity compared to sepsis scores and generic tools.

Keywords: Assessment, Mortality, Scoring, Ventilation

INTRODUCTION

Community-acquired Pneumonia (CAP) is one of the most commonly encountered diseases and a leading cause of morbidity and mortality. Pneumonia ranks as the eighth leading cause of death and is the foremost infectious cause of death [1].

Pneumonia is defined as inflammation of the pulmonary parenchyma caused by an infectious agent. CAP is defined as an acute infection of the pulmonary parenchyma occurring in community-dwelling individuals [2].

A clinical definition of pneumonia consists of ≥2 of the following symptoms/physical findings: high-grade fever ± chills and rigor, pleuritic chest pain, productive cough, purulent sputum, dyspnoea or tachypnoea Respiratory Rate (RR)>25/min, along with a new opacity on a chest radiograph [3].

Streptococcus pneumoniae was considered the most common bacterial aetiology of CAP before the advent of antibiotics. Recently, it has been replaced by viruses and bacteria such as *Haemophilus influenzae, Legionella, Moraxella, Mycoplasma, Staphylococcus*, and Gram negative bacilli as the most common causes [2]. The clinical presentation of pneumonia is highly heterogeneous, ranging from mild pneumonia characterised by fever and productive cough to severe pneumonia characterised by respiratory distress and sepsis [2].

The overall incidence of CAP in adults is estimated to be around 16 to 23 cases per 1000 persons per year, with the rate increasing with age [4-6]. The reported incidence rate of CAP in India is four million cases per year.

In the United States, approximately 30% of CAP patients are hospitalised, with an overall incidence of around 5 to 7 hospitalisations per 1000 persons per year [4-6]. Data from the Centres for Medicare and Medicaid Services database estimate the 30-day mortality rate of CAP patients (≥65 years) requiring admission to the hospital in the United States to be approximately 12%. Overall mortality may

also vary according to geographic location. The all-cause mortality in CAP patients is as high as 28% within one year [4-6].

In recent times, the incidence of Severe Community-acquired Pneumonia (SCAP) requiring intensive care management has increased globally, particularly among the elderly, patients with co-morbidities, and the immunocompromised [7].

Among inpatients with CAP, 21% required ICU admission and 26% of them needed mechanical ventilation, as found in a large population-based surveillance study [8]. Mortality rates range from 25-50% in cases of severe CAP [9]. Therefore, it is significant for clinicians to accurately predict the severity and outcomes of CAP early to optimise therapeutic strategies.

In CAP, numerous tools for assessing severity have been developed specifically to identify individuals who could deteriorate due to sepsis [10]. A sepsis score for patients with suspected infections that could progress to sepsis outside the Intensive Care Unit (ICU) is the rapid Sequential Organ Failure Assessment (qSOFA) [11]. More generic tools, such as the National Early Warning Score (NEWS), are designed to predict deterioration regardless of the cause [12]. Disease-specific tools, such as CURB-65 and expanded CURB-65, are recommended by respiratory societies worldwide exclusively to assess the severity in Pneumonia [12]. Although evidence indicates early intervention and consideration of ICU by using severity assessment tools on appropriate CAP patients to guide decision-making, there is a lack of evidence to support one tool over another in patients with pneumonia.

The present study aimed to compare the ability of pneumonia-specific scores (CURB-65 and Expanded CURB-65), Sepsis score (qSOFA), and Generic score (NEWS) in prediction SCAP patients at the time of hospital admission, with the goal of reducing mortality in CAP patients by administering appropriate treatment at the appropriate site of care.

MATERIALS AND METHODS

This was a hospital-based cross-sectional study conducted in the Department of Pulmonary Medicine, Government Hospital for Chest and Communicable Diseases, Andhra Medical College, Visakhapatnam, Andhra Pradesh, India, for a period of 6 months from April 2023 to September 2023. Institutional Ethics Committee clearance was obtained (Serial Number: 285/IEC AMC/DEC 2023), and informed written consent was obtained from the study population.

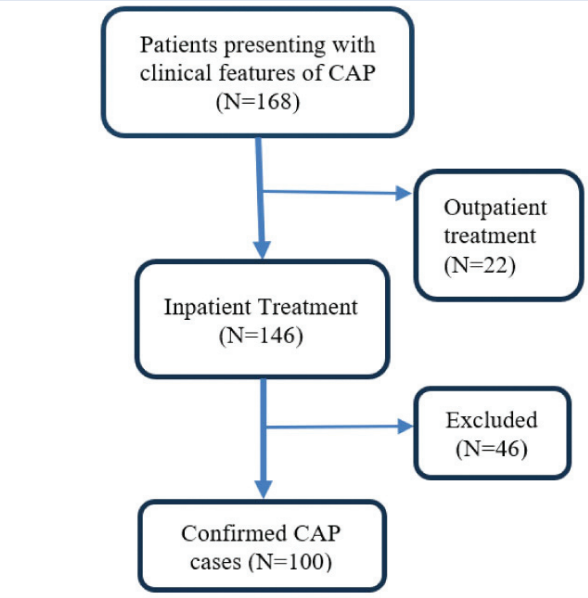
Sample size: One hundred patients who meet the inclusion criteria were selected using the consecutive sampling method.

Inclusion and Exclusion criteria: All patients with new radiological infiltration, along with symptoms and signs suggestive of pneumonia at the time of admission, were included in the study. Patients under the age of 18 years, those with Healthcare-associated Pneumonia (HCAP), Ventilator Associated Pneumonia (VAP), Coranavirus Disease-2019 (COVID-19), active tuberculosis, Human Immunodeficiency Virus (HIV), and progressive malignancy, as well as patients without radiological infiltration, were excluded from the study as mentioned in [Table/Fig-1].

Study Procedure

A proforma with details including history, examination findings, Chest X Ray (CXR) findings {Posteroanterior (PA) and Lateral)}, blood investigations {(Complete Blood Count (CBC), Renal Function Test (RFT), Liver Function Test (LFT)}, serum electrolytes, Arterial Blood Gas (ABG), blood culture), sputum analysis (sputum gram/stain (g/s), culture/sputum (c/s), and inflammatory biomarkers (C-reactive Protein (CRP), Procalcitonin, Serum Lactate Dehydrogenase (Sr. LDH), Neopterin) was prepared and used for each patient suspected to have pneumonia. All four severity scores (CURB-65, eCURB-65, qSOFA, NEWS) were used and documented for each patient at the time of admission. Their clinical and radiological progression and treatment modifications were assessed and documented over a 30-day period. Outcomes such as 30-day mortality and ICU admission were measured.

Severity scores: All of the following four risk assessment tools cited in [Table/Fig-2-5] were calculated for each patient with CAP at the time of admission [13-15].



[Table/Fig-1]: Flowchart showing included and excluded cases.

Variables	Points
Confusion	1
BUN>7 mmol/L	1
RR ≥30 (/minute)	1
SBP <90 and DBP ≤60 (mmHg)	1
Age ≥65 (years)	1

[Table/Fig-2]: CURB-65 score [13].
BUN; Blood urea nitrogen; SBP: Systolic blood pressure; DBP; Diastolic blood pressure; 0-1 Low-risk; 2-3 Moderate risk; >3 High-risk

Variables	Points
CURB-65	5
Serum LDH>220 IU/L	1
Platelets <1 lacs/μL of blood	1
Sr. Albumin<3.5 g/dL	1

[Table/Fig-3]: Expanded CURB-65 [13].
0-2 Low-risk; 3-4 Moderate risk; 5-8 High-risk; GCS: Glasgow coma scale

Variables	Points
Altered mental status (GCS <15)	1
RR ≥22/min	1
Hypotension (SBP ≤100 mmHg)	1

[Table/Fig-4]: qSOFA Score [14].
0-1 Low-risk; 2-3 High-risk

Variables	3	2	1	0	1	2	3
RR (BPM)	≤8		9-11	12-20		21-24	≥25
SPO2 (%)	≤91	92-93	94-95	≥96			
Supplemental O_2		Yes		No			
Temperature (°C)	≤35		35.1-36	36.1-38	38.1-39	≥39.1	
SBP (mmHg)	≤90	91-100	101-110	111-219			
HR (BPM)	≤40		41-50	51-90	91-110	111-130	≥131
LOC				A			V,P,U

[Table/Fig-5]: NEWS score [15].
1-4 Low; 5-6 Moderate; ≥7- High; SpO_2: Peripheral oxygen saturation, HR: Heart rate, BPM: Beats per minute

STATISTICAL ANALYSIS

To assess the discriminatory power of severity scores, ROC curve analysis was performed to predict mortality and ICU admission for all four scoring systems. Positive Predictive Value (PPV), Negative Predictive Value (NPV), Sensitivity, Specificity, Positive Likelihood Ratio (PLR), and Negative Likelihood Ratio (NLR) were calculated with various cut-offs in each scoring system. A 95% confidence interval and Area Under the Curve (AUC) were plotted. All statistical analyses were carried out using IBM SPSS Statistics version 24.0 for Windows.

RESULTS

In the six-month study period, a total of 100 patients with CAP were enrolled in the study. Of these, 62 (62%) were males and the remaining 38 (38%) were females. The mean age of these patients was 56±15 years, and the age distribution can be seen in [Table/Fig-6].

Age (years)	Frequency (%)
18-30	6
31-40	7
41-50	27
51-60	23
61-70	26
71-80	10
81-90	1

[Table/Fig-6]: Age distribution analysis in CAP patients.

The patients' baseline characteristics and demographic details are provided in [Table/Fig-7]. The prevalence of co-morbidities such as DM, HTN, IHD, and COPD was 21%, 33%, 5%, and 3%, respectively, while other co-morbidities were approximately 1% each, with hypertension being the most common co-morbidity.

Variables	n (%)		n (%)
Mean age (in years)	56±15	History of pneumonia in last year	2 (2%)
Age ≥65 (years)	30 (30%)	Antibiotic use before admission	12 (12%)
Sex (M/F)	62/38	History of viral disease before admission (in 3 months)	5 (5%)
Co-morbidities			
Diabetes	21 (21%)	Addictive habits	
Hypertension	33 (33%)		
Congestive heart failure	1 (1%)	Smoking	38 (38%)
Cerebro vascular disease	1 (1%)	Alcohol	33 (33%)
Ischaemic heart disease	5 (5%)		
COPD	3 (3%)		
Chronic liver disease	0		
Chronic kidney disease	0		
Old PTB	1 (1%)		
Bronchial asthma	1 (1%)		
Hypothyroidism	1 (1%)		

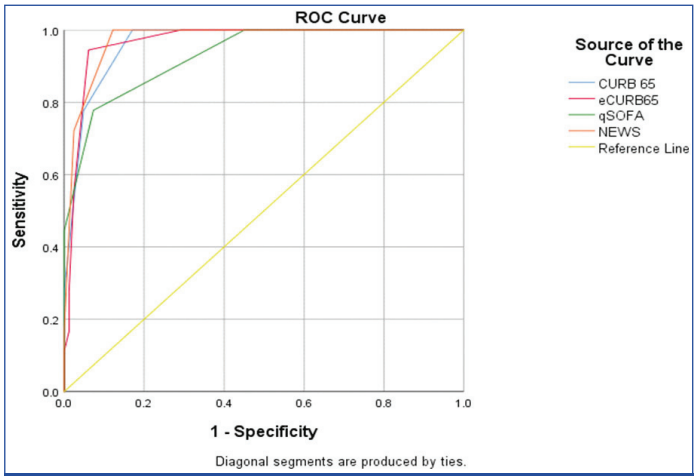
[Table/Fig-7]: Baseline characteristics of CAP patients (N=100).
PTB: Pulmonary tuberculosis

The distribution of the 30-day mortality rate and ICU admissions for each scoring system is outlined in [Table/Fig-8]. It was observed that the percentage of mortality is higher in the high-risk category of each score. The 30-day mortality observed in the high-risk category of CURB-65, Expanded CURB-65, qSOFA, and NEWS scores were 16 (88.88%), 5 (83.33%), 12 (60%), 13 (46.42%), respectively.

Regarding 30-day mortality as an outcome measure, the AUROC values were statistically significant with a p-value of <0.001 for all scoring systems, as mentioned in [Table/Fig-9,10].

	Total cases N=100	30-day mortality n=18	ICU admission n=20
CURB-65			
Low (0-1)	68	1	4
Moderate (2-3)	14	1	5
High (>3)	18	16	11
Expanded CURB-65			
Low (0-2)	78	1	5
Moderate (3-4)	16	12	11
High (5-8)	6	5	4
qSOFA			
Low-risk (0-1)	80	6	4
High-risk (2-3)	20	12	16
NEWS			
Low (1-4)	35	1	1
Moderate (5-6)	37	4	5
High (≥7)	28	13	14

[Table/Fig-8]: 30-day mortality and ICU admissions as per each scoring systems.



[Table/Fig-9]: Receiver Operating Characteristic (ROC) curves of severity scores in assessing overall accuracy on 30-day mortality.

Test result variable(s)	Area	Std. error	p-value	Asymptotic 95% confidence interval	
				Lower bound	Upper bound
CURB-65	0.963	0.017	0.001	0.931	0.996
eCURB-65	0.967	0.017	0.001	0.933	1.000
qSOFA	0.930	0.031	0.001	0.870	0.990
NEWS	0.973	0.014	0.001	0.946	1.000

[Table/Fig-10]: Comparison of severity scores as per accuracy on 30-day mortality.

It is evident from [Table/Fig-11] that CURB-65 and qSOFA are equally sensitive, and Expanded CURB-65 is the most specific score followed by CURB-65 in predicting 30-day mortality. High sensitivity is observed in the low categories of CURB-65, Expanded CURB-65, qSOFA, and in the low and moderate categories of the NEWS score, while high categories of all scores show high specificity, as shown in [Table/Fig-12].

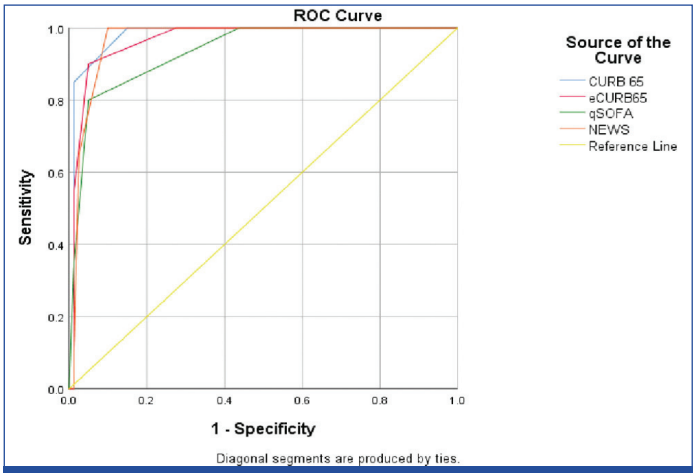
Regarding ICU admissions as an outcome, the AUROC values were statistically significant with a p-value of <0.001 for all four scoring systems, as seen in [Table/Fig-13,14].

CAP scores	Sensitivity, specificity, PPV, NPV
CURB-65 (moderate)	77%, 95.1%, 79%, 95%
NEWS (high)	72%, 92%, 86%, 94%
qSOFA (low)	77%, 92%, 70%, 95%
eCURB-65 (moderate)	55%, 97%, 83%, 90%

[Table/Fig-11]: Compared yields of all the scoring systems on 30-day mortality.

Parameters	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	PLR	NLR
CURB-65						
Low (0-1)	100	85	62.5	100	6.6	0.0
Moderate (2-3)	85	98.7	94.4	96.3	6.8	0.1
High (>3)	20	98.7	80	83.2	16	0.8
eCURB-65						
Low (0-2)	90	95	81.8	87.4	18	0.1
Moderate (3-4)	55	98.7	91.7	89.8	44	0.4
High (5-8)	15	98.7	75	82.3	12	0.8
qSOFA						
Low (0-1)	80	95	80	95	16	0.2
High (2-3)	35	98.7	87.5	85.9	28	0.6
NEWS						
Low (1-4)	100	43.7	30.8	100	1.7	0.0
Moderate (5-6)	100	90	71.4	100	10	0.0
High (≥7)	65	97.5	86.7	91.3	26	0.3

[Table/Fig-12]: Performance characteristics of severity scores on ICU admission. PPV: Positive predictive value; NPV: Negative predictive value; PLR: Positive likelihood ratio; NLR: Negative likelihood ratio



[Table/Fig-13]: Receiver Operating Characteristic (ROC) curves of severity scores in assessing accuracy on ICU admission.

Test result variable (s)	Area	Std. error	p-value	Asymptotic 95% confidence interval	
				Lower bound	Upper bound
CURB-65	0.977	0.014	0.001	0.949	1.000
eCURB65	0.966	0.018	0.001	0.931	1.000
qSOFA	0.935	0.028	0.001	0.881	0.989
NEWS	0.967	0.017	0.001	0.934	1.000

[Table/Fig-14]: Comparison of severity scores as per accuracy on ICU admission. Area under the curve

DISCUSSION

Community-acquired Pneumonia (CAP) is a serious illness that leads to significant mortality and prolonged hospital stays, with a substantial impact on both individuals and society [1]. To effectively manage patients and improve outcomes, it is essential for clinicians to identify patients with severe pneumonia early on using a severity assessment tool [10]. A risk assessment tool for CAP must meet specific criteria to function effectively. It should be easy to use and have high sensitivity and specificity, along with significant PPV and NPV.

The mean age of the studied population is 56±15 years, with approximately 80% of cases reported in the age group of 40-70 years. In a study conducted by Alici IO et al., (2015) on 84 patients, the mean age of the patients was 58.6±18.7 years, with about 75% of cases reported in the age group of 40-70 years [13]. In a study by Feldman C et al., on 114 patients, the mean age was 59, with about 75% of cases reported in the age group of 30-70 [16]. Guo Q et al., studied 1749 patients with a mean age of 50.1±22.7 [17]. The present study's mean age group is similar to the above studies, indicating that CAP is more common in the age group of 40-70 years compared to younger individuals, possibly due to old age, smoking, alcoholism, outdoor activities, underlying co-morbidities, and COPD.

In present study, among the 48 patients with co-morbidities, the percentage of patients with DM, HTN, IHD, and COPD are 33%, 21%, 5%, and 3% respectively, with others being around 1% each. Co-morbidities such as DM, COPD, HTN, CAD, CKD are reported more frequently in the age group of 40-70 years and all can contribute to a significant occurrence of CAP among middle and older age groups, as per the present study. Alici IO et al.'s study (n=84, patients with co-morbidities is 60) and Shehata SM et al.'s study show percentages of DM, HTN, IHD, COPD being 14.4%, 14%, 12%, 26% and 16.4%, 10%, 6.4%, 11.6%, respectively [13,18].

Out of the 100 CAP patients, 62% are males, and the remaining 38% are females. In Alici IO et al., out of 84 patients, 53 (63%) were males and 31 (37%) were females studied [13]. In Zhang ZX et al., among 1902 CAP patients, 56% were males and 44% were females [19]. In Zhou H et al., out of 336 patients, 64% were males, and 36% were females [20]. Males are most commonly affected in the study. Hence, male sex can be considered a risk factor for CAP compared to females. The possible risk factors in males for CAP incidences are smoking, alcoholism, substance abuse, outdoor activities, underlying co-morbidities, and COPD.

Outcome 1- 30-day mortality: Overall, for the prediction of 30-day mortality, the CURB-65 (2-3) moderate category as the cut-off has high sensitivity (77%), specificity (95.1%), PPV (79%), NPV (95%), AUROC (0.96), p<0.001 over all the other scoring systems. Also, the CURB-65 approach is considered ideal for identifying patients with a high mortality risk by respiratory societies globally. This is followed by the NEWS score (high) with sensitivity, specificity, PPV, NPV of 72%, 92%, 86%, and 94%, respectively. This is closely followed by the qSOFA (low) and eCURB-65 (moderate) scoring systems.

This result is in agreement with the studies by Grudzinska FS et al., and Barlow GD et al., where they found that CURB-65 is superior to other scoring systems (sepsis and generic tools) in predicting 30-day mortality [21,22]. Therefore, organ-specific scores have a greater predictive ability in the early identification of patients at risk of worse outcomes (30-day mortality) compared to sepsis and other generic tools. One pitfall of the CURB-65 scoring system is that it does not include any variables related to co-morbidities, hence it may not be reliable in older patients with a significant mortality risk even if they have low scores.

Outcome 2- ICU admission: Approximately 21% of patients with CAP require ICU admission, and 26% of them require mechanical ventilation, which poses a significant burden [8]. The mortality rate ranges from 25% to 50% in cases of severe CAP that require ICU admission [9]. Therefore, early identification of these patients is crucial for patient survival. For ICU admission, the number of cases in low, moderate, and severe groups are 4, 5, and 11, respectively, with the severe category (>3) alone constituting 68%. The ICU admission rate indicates that the rate of ICU admission is directly proportional to an increase in severity scores.

Overall, for ICU admission as an outcome measure, CURB-65 with a moderate (2-3) cut-off has higher sensitivity (85%), specificity (98.75%), PPV (94.4%), and NPV (96.3%), AUROC (0.97), p<0.001. This is followed by NEWS (high) risk category with sensitivity, specificity, PPV, NPV of 65%, 97.5%, 86.7%, and 91.3%, respectively, which is more similar to qSOFA as well. This is followed by eCURB-65 (3-4) with low sensitivity and NPV in ICU care prediction.

This result is in agreement with the studies by Grudzinska FS et al., and Barlow GD et al., where they concluded that sepsis and early warning scores cannot supplant CURB-65 in the initial prognostic assessment of patients with CAP regarding ICU admission [21,22].

Limitation(s)

The present study has a few limitations. It is unclear whether prior antibiotic usage before hospital admission will affect the course of adverse outcomes. Moreover, the data provided by the patients regarding prior antibiotic usage is not reliable.

CONCLUSION(S)

In the present study, all four scoring systems have performed well and are equally effective in detecting the need for ICU admission and predicting 30-day mortality among CAP patients at the time of admission. However, organ-specific tools, such as {CURB-65 (2-3) moderate}, have been demonstrated to be more valid and effective in assessing severity compared to sepsis scores and generic tools. Although many severity assessment tools have been proposed as more reliable, clinical assessments are still crucial in predicting adverse outcomes in CAP. Therefore, detailed professional evaluation by the clinician should always be considered superior to risk assessment tools.

REFERENCES

[1] Regunath H, Oba Y. Community-Acquired Pneumonia. [Updated 2022 Nov 15]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK430749/.

[2] Grippi MA. Fishman's Pulmonary Diseases and Disorders. 6th edition, New york: McGrawHill, 2023.

[3] Marrie TJ, Beecroft MD, Herman-Gyidic Z. Resolution of symptoms in patients with CAP treated on an ambulatory basis. J Infect. 2004;49(4):302-09.

[4] Marrie TJ, Huang JQ. Epidemiology of community-acquired pneumonia in Edmonton, Alberta: An emergency department-based study. Can Respir J. 2005,12(3):139-42.

[5] Ramirez JA, Wiemken TL, Peyrani P, Arnold FW, Kelley R. Adults hospitalized with pneumonia in USA. Clin Infect Dis. 2017;65(11):1806.

[6] Niederman MS, McCombs JS, Unger AN, Kumar A. The cost of treating CAP. Clin Ther. 1998;20(4):820-65.

[7] Laporte L, Hermetet C, Jouan Y, Gaborit C, Rouve E, Shea KM, et al. Ten-year trends in intensive care admissions for respiratory infections in the elderly. Ann Intensive Care. 2018;8(1):84. Doi: 10.1186/s13613-018-0430-6. PMID: 30112650; PMCID: PMC6093821.

[8] Jain S, Self WH, Wunderink RG, Fakhran S, Balk R, Bramley AM, et al; CDC EPIC Study Team. Community-acquired pneumonia requiring hospitalization among US Adults. N Engl J Med. 2015;373(5):415-27. Doi: 10.1056/NEJMoa1500245. Epub 2015 Jul 14. PMID: 26172429; PMCID: PMC4728150.

[9] Woodhead M, Welch CA, Harrison DA, Bellingan G, Ayres JG. Community-acquired pneumonia on the intensive care unit: Secondary analysis of 17,869 cases in the ICNARC Case Mix Programme Database. Crit Care. 2006;10(Suppl 2):S1. Doi: 10.1186/cc4927. PMID: 16934135; PMCID: PMC3226135.

[10] 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. Systematic review and meta-analysis. Thorax. 2010;65(10):878-83.

[11] Jiang J, Yang J, Jin Y, Cao J, Lu Y. Role of qSOFA in predicting mortality of pneumonia: A systematic review and meta-analysis. Medicine (Baltimore). 2018;97(40):e12634. Doi: 10.1097/MD.0000000000012634. PMID: 30290639; PMCID: PMC6200542.

[12] Zhou HJ, Lan TF, Guo SB. Outcome prediction value of National Early Warning Score in septic patients with community-acquired pneumonia in emergency department: A single-center retrospective cohort study. World J Emerg Med. 2020;11(4):206-15. Doi: 10.5847/wjem.j.1920-8642.2020.04.002. PMID: 33014216; PMCID: PMC7517400.

[13] Alıcı IO, Çapan N, Ertürk A, Canbakan S. Comparison of Severity Scoring Systems in community-acquired pneumonia. Eurasian Journal of Pulmonology. 2015;17(1):15-21. Doi:10.5152/ejp.2014.68077.

[14] Seymour CW, Liu VX, Iwashyna TJ, Brunkhorst FM, Rea TD, Scherag A, et al. Assessment of clinical criteria for sepsis: For the Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). JAMA. 2016;315(8):762-74.

[15] Smith GB, Prytherch DR, Meredith P, Schmidt PE, Featherstone PI. The ability of the National Early Warning Score (NEWS) to discriminate patients at risk of early cardiac arrest, unanticipated intensive care unit admission, and death. Resuscitation. 2013;84(4):465-70.

[16] Feldman C, Alanee S, Yu VL, Richards GA, Ortqvist A, Rello J, et al. Severity of illness scoring systems in patients with bacteraemic pneumococcal pneumonia: Implications for the intensive care unit care. CMI. 2009;15(9):850-57. Available from: https://doi.org/10.1111/j.1469-0691.2009.02901.x.

[17] Guo Q, Song WD, Li HY. Scored minor criteria for severe community-acquired pneumonia predicted better. Respir Res. 2019;20(1):22. https://doi.org/10.1186/s12931-019-0991-4.

[18] Shehata SM, Sileem AE, Shahien NE. Prognostic values of PSI, CURB-65 and expanded CURB-65 scores in CAP in Zagazig University Hospitals. 2017;66(3):549-55. Available from: https://doi.org/10.1016/j.ejcdt.2017.01.001.

[19] Zhang ZX, Zhang W, Liu P, Yang Y, Tan WC, Ng HS, et al. Prognostic value of Pneumonia Severity Index, CURB-65, CRB-65, and procalcitonin in community-acquired pneumonia in Singapore. Proceedings of Singapore Healthcare. 2016;25(3):139-47.

[20] Zhou H, Lan T, Guo S. Prognostic prediction value of qSOFA, SOFA, and admission lactate in septic patients with community-acquired pneumonia in emergency department. Emergency Medicine International. 2020;2020:7979353.

[21] Grudzinska FS, Aldridge K, Hughes S, Nightingale P, Parekh D, Bangash M, et al. Early identification of severe community-acquired pneumonia: A retrospective observational study. BMJ Open Respir Res. 2019;6(1):e000438. Doi: 10.1136/bmjresp-2019-000438. PMID: 31258921; PMCID: PMC6561385.

[22] Barlow GD, Nathwani D, Davey PG. The CURB65 pneumonia severity score outperforms generic sepsis and early warning scores in predicting mortality in community-acquired pneumonia. Thorax. 2007;62(3):253-59. Doi: 10.1136/thx.2006.067371.

PARTICULARS OF CONTRIBUTORS:

1. Assistant Professor, Department of Pulmonary Medicine, Andhra Medical College, Visakhapatnam, Andhra Pradesh, India.
2. Assistant Professor, Department of Pulmonary Medicine, Andhra Medical College, Visakhapatnam, Andhra Pradesh, India.
3. Professor and Head, Department of Pulmonary Medicine, Andhra Medical College, Visakhapatnam, Andhra Pradesh, India.
4. Professor, Department of Pulmonary Medicine, Andhra Medical College, Visakhapatnam, Andhra Pradesh, India.
5. Senior Resident, Department of Pulmonary Medicine, Aarupadai Veedu Medical College and Hospital, Puducherry, India.
6. Postgraduate Student, Department of Pulmonary Medicine, Andhra Medical College, Visakhapatnam, Andhra Pradesh, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. DV Pratapa Reddy,
Anchorage Apartments, D. No: 7-5-155, Plot No: 03, Ocean View Layout,
Pandurangapuram, Visakhapatnam-530017, Andhra Pradesh, India.
E-mail: dr.prathapreddy@gmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]

- Plagiarism X-checker: Oct 26, 2023
- Manual Googling: Jan 06, 2024
- iThenticate Software: Feb 15, 2024 (9%)

ETYMOLOGY: Author Origin

EMENDATIONS: 8

AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Oct 26, 2023**
Date of Peer Review: **Jan 03, 2024**
Date of Acceptance: **Feb 17, 2024**
Date of Publishing: **Apr 01, 2024**