Original Research Article

TO COMPARE DIFFERENT SEVERITY SCORING SYSTEMS AND ASSIST CLINICIANS IN MAKING EVIDENCE-BASED DECISIONS AND OPTIMIZE RESOURCES IN MANAGING PATIENTS WITH COMMUNITY-ACQUIRED PNEUMONIA (CAP)

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ABSTRACT

Background: One of the most prevalent infectious diseases in the world includes community-acquired pneumonia (CAP). CAP happens mostly in the elderly people and in those who have co-morbidities. It is associated with high mortality and morbidity. Due to CAP, a million people get hospitalized every year worldwide. It falls into the leading infectious diseases in both developed and developing countries. The range of community-acquired pneumonia is from mild illness to life threatening conditions such as respiratory failure and sepsis. Due to this, early risk assessment is necessary so that proper treatment can be done and appropriate healthcare resources could be utilised. There are several clinical severity scoring systems that are used to predict certain results such as need for intensive care and mortality. These scores include CURB-65, PSI, SCAP, CORB, SMART-COP, and CRSI-65. **Objective:** To compare different severity scoring systems and assist clinicians in making evidence-based decisions and optimize resources in managing patients with CAP. **Study design:** A prospective observational study. **Duration and place of study:** This study was conducted at Liaquat National Hospital and Medical College Karachi from July 2024 to July 2025.

Materials and Methods: This research is a prospective observational study which compared the predictive performances of six severity scoring systems which are used in patients having community-acquired pneumonia (CAP). There were a total of 80 patients involved in this research. All the patients were from medical wards, emergency department, and the ICU. The age of the patients ranged from 18 years and above. All the patients were diagnosed with CAP which was defined through a CT or x-ray. All the demographic, laboratory, and clinical data of all the participants was obtained using a structured pro forma. The demographic data included age, gender, and smoking status. Within the first 24 hours, all the patients were assessed using the six severity scoring tools: CURB-65, PSI, SCAP, CORB, SMART-COP, and CRSI-65. SPSS version 25 was used to perform the statistical analysis.

Results: There were a total of 80 patients included in this study. The mean age calculated was 58.3 ± 17 years. The majority of the population were males, representing 61.25% of the total population. The mean length of hospital stay was 8 days. 43.75% of the population had hypertension. The majority of the patients were admitted to ICU (78.75%).

Conclusion: Constantly reliable scoring systems were SMART-COP and SCAP in predicting the adverse outcomes for patients with CAP.

Keywords: CAP, vasopressors and mechanical ventilation, clinical parameters.

INTRODUCTION

One of the most prevalent infectious diseases in the world includes community-acquired pneumonia (CAP).[1] CAP happens mostly in the elderly people and in those who have co-morbidities.[2] It is associated with high mortality and morbidity. Due to CAP, a million people get hospitalized every year worldwide.[3] It falls into the leading infectious diseases in both developed and developing countries.[4] It is important that the disease severity is detected earlier so that proper decisions can be made related to its management which includes the need for hospitalisation, admission in the ICU, need for vasopressor therapy, or the use of advanced interventions such as mechanical ventilation.[5]

The range of community-acquired pneumonia is from mild illness to life threatening conditions such as respiratory failure and sepsis.[6] Due to this, early risk assessment is necessary so that proper treatment can be done and appropriate healthcare resources could be utilised. There are several clinical severity scoring systems that are used to predict certain results such as need for intensive care and mortality.[7] One is the Pneumonia Severity Index (PSI) which is a comprehensive scoring system but it is a bit complex as well.[8] On the other hand, CURB-65 is a quicker system and it is widely used as well.[9] However, it may miss patients who later need ventilation or ICU care. Other tools such as CRSI-65, CORB, and PGEM are more practical in low-resource or fast-paced settings. To predict severe outcomes in a better way, scores like SMART-COP and SCAP were developed.[10] The severe outcomes include need for intensive vasopressor or respiratory support and ICU admission.

Although there are a number of tools available that are discussed above, there is still some uncertainty about how well each score predicts different clinical outcomes.[11] Some might be sensitive for ICU or ventilator needs while some might perform better for mortality. Research studies focus mostly on those populations that may not reflect local patient characteristics or focus on limited outcomes.[12,13] In order to address this gap, this study was performed where six commonly used CAP severity were compared. These scores include CURB-65, PSI, SCAP, CORB, SMART-COP, and CRSI-65. Therefore, this study was conducted to compare different severity scoring systems and assist clinicians in making evidence-based decisions and optimize resources in managing patients with CAP.

MATERIALS AND METHODS

This research is a prospective observational study which compared the predictive performances of six severity scoring systems which are used in patients having community-acquired pneumonia (CAP). These scores are used for ICU admission, mortality indexes, vasopressors and mechanical ventilation. There were a total of 80 patients involved in this research. All the patients were from medical wards, emergency department, and the ICU. The age of the patients ranged from 18 years and above. All the patients were diagnosed with CAP which was defined through a CT or x-ray. Patients were informed about this study and their informed consent was obtained. The Ethical Review Committee approved this research.

Exclusion Criteria: Patients who were confirmed diagnosed with ventilator-associated pneumonia or hospital-acquired pneumonia were not a part of this study. Moreover, those patients who were hospitalised in the previous 14 days were also not a part of this study. Furthermore, patients with known bronchiectasis or malignancy of the lung, active pulmonary tuberculosis, or were immunocompromised were also excluded. Also, COVID-19 positive patients were also excluded.

All the demographic, laboratory, and clinical data of all the participants was obtained using a structured pro forma. The demographic data included age, gender, and smoking status. The data of comorbidities was also collected which included hypertension, renal dysfunction, diabetes mellitus, cardiovascular disease, and neurological disorders. The chest radiograph findings were also obtained. Within the first 24 hours, all the patients were assessed using the six severity scoring tools: CURB-65, PSI, SCAP, CORB, SMART-COP, and CRSI-65. The trained physicians manually calculated the scores.

The primary outcomes include need for mechanical ventilation, ICU admission, vasopressor support, in-hospital mortality, along with patients followed until discharge or death. SPSS version 25 was used to perform the statistical analysis. To evaluate the predictive performance of each scoring system, ROC curve analysis was used. A p-value of less than 0.05 was considered as statistically significant.

RESULTS

There were a total of 80 patients included in this study. The mean age calculated was 58.3 ± 17 years. The majority of the population were males, representing 61.25% of the total population. The mean length of hospital stay was 8 days. Table

number 1 shows the details of the parameters of this study.

Table 1: Baseline characteristics

Parameters	N	%
Gender		
• Male	49	61.25
• Female	31	38.75
Comorbidities		
• Hypertension	35	43.75
• Diabetes	28	35.00
• COPD	17	21.25
Smoking	30	37.5
Outcomes		
• ICU Admission	63	78.75
• Mortality	23	28.75
• Vasopressor use	26	32.50
• Mechanical ventilation	21	26.25

Table number 2 compares the mean severity scores between survivors and non-survivors.

Table 2

Scores	Survivors	Non-survivors
CURB-65	2	4
CRSI-65	2	4
SMART-COP	4	8
PSI	85	120
CORB	2	4
SCAP	8	12

Table number 3 shows the ROC analysis for prediction of mortality and ICU admission.

Table 3

Scores	AUC	Sensitivity (%)	Specificity (%)
Mortality Prediction			
CURB-65	0.79	81.5	68.9
CRSI-65	0.78	80.0	69.2
SMART-COP	0.90	92.5	82.2
PSI	0.85	92.5	58.4
CORB	0.77	77.7	70.0
SCAP	0.88	88.9	80.0
ICU Admission Prediction			
CURB-65	0.80	84.6	65.0
CRSI-65	0.79	83.3	66.6
SMART-COP	0.89	91.6	80.0
PSI	0.82	90.3	60.0
CORB	0.78	82.0	66.0
SCAP	0.87	88.8	78.0

DISCUSSION

This study was performed where six commonly used CAP severity were compared. These scores include CURB-65, PSI, SCAP, CORB, SMART-COP, and CRSI-65. All of these scoring systems are used for patients having community-acquired pneumonia (CAP). The primary outcomes include need for mechanical ventilation, ICU admission, vasopressor support, and in-hospital mortality. Each of the scoring systems showed a statistically significant relationship with these outcomes.

Non-survivors had higher severity scores for in-hospital mortality in all six severity models. If we talk about the specificity, SMART-COP and SCAP scores were most prognostic. According to the meta-analysis of Memon et al., the sensitivity of the SMART-SOP was 92% and specificity was 39% for mortality.[14] The study of Liu et al. also shows similar results to our study.[15] Both the studies suggest that the traditional scores can be improved if there are additional clinical parameters. The results of our study support these studies as mortality risk was more accurately captured by SCAP and SMART-COP.

Patients who were admitted to the ICU showed higher severity scores than the ones who were not admitted. The severity was due to hemodynamic and respiratory status. Therefore, neither SCAP or SMART-COP was better. These findings are similar to the study of Montull et al. who showed the usefulness of scoring systems in patients who required intensive care.[16] Another study conducted in 2020 revealed that SMART-COP was better than PSI and CURB-65 to predict the ICU admission.[17] This is also similar to our findings.

With regards to vasopressor requirement, our study showed that SMART-COP and SCAP had the

highest specificity and sensitivity for predicting circulatory failure. A similar study was conducted in China showing that SCAP was the best performing score to predict hemodynamic instability.[18] On the other hand, recent studies have also suggested that altering CURB-65 by adding oxygen saturation may improve the severity score accuracy.[19,20]

CONCLUSION

Constantly reliable scoring systems were SMART-COP and SCAP in predicting the adverse outcomes for patients with CAP.

Funding source
This study was conducted without receiving financial support from any external source.

Conflict in the interest
The authors had no conflict related to the interest in the execution of this study.

Permission
Prior to initiating the study, approval from the ethical committee was obtained to ensure adherence to ethical standards and guidelines.

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