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ORIGINAL RESEARCH

Assessment of Outcome of Septic Shock Patients by quick Sequential Organ Failure Assessment (q SOFA) and Acute Physiology and Chronic Health Evaluation II (APACHE II) Score

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Abstract

Background: Sepsis is a severe condition often leading to organ dysfunction and high mortality rates. Accurate and timely assessment of septic shock is crucial for effective management. Various scoring systems, including the quick Sequential Organ Failure Assessment (qSOFA) and Acute Physiology and Chronic Health Evaluation II (APACHE II), are used to predict outcomes in septic shock patients. This study evaluates the effectiveness of qSOFA and APACHE II scores in predicting the outcomes of septic shock patients.

Aims & Objectives:

- To assess the outcome of septic shock patients using the qSOFA score.
- To evaluate the outcome of septic shock patients using the APACHE II score.

Materials & Methods: A longitudinal study was conducted from December 2020 to June 2023. The study included 312 patients with septic shock, aged 18-60, excluding those with certain comorbidities. Data on clinical, demographic, and laboratory parameters were collected, and qSOFA and APACHE II scores were evaluated. Statistical analysis was performed to assess correlations between scores and patient outcomes.

Results: The mean age of patients was 51 ± 6.6 years, with a predominance of males (51.60%). The most common presenting complaints were breathlessness and cough with expectoration. qSOFA scores >2 correlated strongly with poorer outcomes ($p<0.0001$), as did APACHE II scores >17 ($p<0.0001$). Both scores showed significant predictive value for patient mortality.

Conclusion: The qSOFA score is a simple and effective tool for predicting outcomes in septic shock, correlating well with APACHE II scores and indicating severity and mortality risk. These findings support the use of qSOFA alongside APACHE II in clinical practice for early triage and management of septic shock patients.

Keywords: Sepsis, septic shock, qSOFA score, APACHE II score, mortality prediction, intensive care.

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Introduction

Sepsis is a critical and life-threatening condition characterized by a dysregulated host response to infection, leading to organ dysfunction and a high mortality rate. It is a significant cause of morbidity and mortality in intensive care units (ICUs) worldwide, emphasizing the need for effective diagnostic and prognostic tools[1]. The complexity of sepsis, often manifesting as multiple organ dysfunction syndrome (MODS), presents challenges in both diagnosis and management[2].

Historically, the diagnosis of sepsis relied on the Systemic Inflammatory Response Syndrome (SIRS) criteria, which included parameters such as fever, tachycardia, tachypnea, and leukocytosis or leukopenia[3]. However, the SIRS criteria have faced criticism for their lack of specificity and sensitivity, as they are not always indicative of sepsis and may lead to overdiagnosis or underdiagnosis[4]. This limitation has prompted the development of alternative scoring systems to better identify and assess sepsis.

Among these, the Sepsis-related Organ Failure Assessment (SOFA) score and the Acute Physiology and Chronic Health Evaluation (APACHE) II score are widely utilized. The SOFA score, introduced by Vincent et al., assesses organ dysfunction based on changes in laboratory values and clinical parameters[5]. The APACHE II score, on the other hand, is a more comprehensive tool that evaluates illness severity based on a combination of physiological measurements and chronic health conditions, and it has long been considered the gold standard for assessing critical illness[6].

In response to the need for a simpler and more rapid assessment tool, the quick Sequential Organ Failure Assessment (qSOFA) score was introduced by Seymour et al. in 2015. The qSOFA score includes three easily measurable parameters: respiratory rate, systolic blood pressure, and altered mental status[7]. Despite its simplicity, there has been ongoing debate regarding qSOFA's predictive performance compared to more comprehensive systems like APACHE II and SOFA. Some studies suggest that qSOFA may be less effective in predicting mortality, raising questions about its clinical utility[8].

This study aims to evaluate the outcomes of patients with septic shock using both the qSOFA and APACHE II scores. By comparing these tools, we seek to determine their efficacy in predicting patient outcomes and inform clinical decision-making.

Aims & objectives

Aim: To study the outcomes of patients with septic shock using qSOFA and APACHE II scores.

Objectives

- To assess the outcome of septic shock patients based on the qSOFA score.
- To evaluate the outcome of septic shock patients using the APACHE II score.

Materials & methods

Study Design: Longitudinal follow-up study.

Study Population: Male and female patients aged 18-60 years with evidence of septic shock.

Inclusion Criteria

- Age 18-60 years.
- Evidence of septic shock on admission.

Exclusion Criteria

- Pregnancy.
- Use of immunosuppressant medications.

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- Retroviral infection.
- Chronic liver or renal failure.
- Recent bicarbonate therapy.

Study Area: Conducted at a medical facility from December 2020 to June 2023.

Sample size

With reference to the study of **Divatia JV et al (2017**) [9] The INDICAP study analyzed 4038 patient data and reported a prevalence of severe sepsis of 28.3%. considering this sample is calculated by the following formula

n=z2pq/d2

Where Z= 1.96 at 95% confidence interval, p= 0.28, q=1-p=0.72, d= absolute error 5%

n= (1.96)2×0.28×0.72/ (0.05)2

n=312

Sample size =312

Sampling Technique: Convenience sampling method.

Study Tool: Pre-structured proforma and questionnaire for data collection, including clinical, demographic, and laboratory parameters, as well as qSOFA and APACHE II scores.

Ethical Consideration: Approved by the Institutional Ethical Committee. Written or verbal consent was obtained from all participants.

Methodology: Data collection involved medical records, physical examinations, and laboratory tests. The qSOFA and APACHE II scores were calculated, and correlations with patient outcomes were analyzed using appropriate statistical methods.

Observations & results

- In the present longitudinal follow up study, we have initially included total 312 cases of septic shock as per the sample size calculations to assess the outcome on qSOFA & APACHE II score s, important observations & results of which are presented below.

Table 1. Distribution of cases according to age groups.

Age group in years	Cases	
	No.	Percentage (%)
21-30	05	1.6
31-40	19	6.09
41-50	90	28.85
51-60	198	63.46
Total	312	100
Mean $\pm$ S.D.	51 $\pm$ 6.6 years.	

In the present study, majority, 198 (63.46%) of cases were from the age group of 51-60 years followed by 90 (28.85%) from the age group of 41-50 years, 19 (6.09%) from 31-40 years & least i.e. 05 (1.6%) were from 21-30 years. Mean age of the patients was 51 $\pm$ 6.6 years.

Table 2. Distribution of cases according to gender.

Gender	Cases	
	No.	Percentage (%)
Male	161	51.60
Female	151	48.40
Total	312	100

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In the present study, majority i.e. 161 (51.60%) cases were males and 151 (48.40%) were females.

Table 3. Distribution of cases according to comorbidities.

Comorbidities	Cases (n=312)	
	No.	Percentage (%)
Diabetes Mellitus	70	22.44
Hypertension	96	30.77
Old H/O of TB	50	16.03
CVD	56	17.95

Table 4. Distribution of cases according to total qsofa score.

qsofa score	Cases	
	No.	Percentage (%)
≥2	230	73.72
<2	82	26.28
Total	312	100
Mean ± S.D.	2 ± 0.7	

In the present study, majority, 230 (73.72%) cases had total qsofa score ≥2 indicating organ failure while 82 (26.28%) were having <2. Mean total qsofa score was 2 ± 0.7.

Table 5. Distribution of cases according to total APACHE score.

APACHE score	Cases	
	No.	Percentage (%)
≥17	103	33.01
<17	209	66.99
Total	312	100
Mean ± S.D.	13.2 ± 7.3	

In the present study, majority, 209 (66.99%) cases had total APACHE score <17 while 103 (33.01%) were having ≥17, indicating organ failure. Mean APACHE score was 13.2 ± 7.3.

Table 6. Distribution of cases according to outcome.

Outcome	Cases	
	No.	Percentage (%)
Died	129	41.35
Recovered	183	58.65
Total	312	100

In the present study, majority, 183 (58.65%) cases were recovered while 129 (41.35%) were died.

Table 7. Correlation of qsofa score with Outcome of patient

qsofa score	Outcome		Total	p
	Recovered	Died		
<2	79	3	82	0.000
≥2	104	126	230	
Total	183	129	312	

In the present study, qsofa scores were strongly correlated with outcome of patient and the results are statistically significant (p =0.000).

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Table 8. Correlation of APACHE score with Outcome of patient

APACHE score	Outcome		total	p
	Recovered	Died		
<17	168	41	209	0.000
≥17	15	88	103	
Total	183	129	312	

In the present study, APACHE scores were strongly correlated with outcome of patient and the results are statistically significant (p =0.000).

Table 9. Correlation of APACHE II score and qsofa score

APACHE score	q SOFA score		total	p
	<2	≥2		
<17	80	02	82	0.000
≥17	129	101	230	
Total	209	103	312	

In the present study, APACHE II scores strongly correlates with q sofa score (r=0.668, p value <0.00001).

Chart 1. Age groups wise distribution of cases.

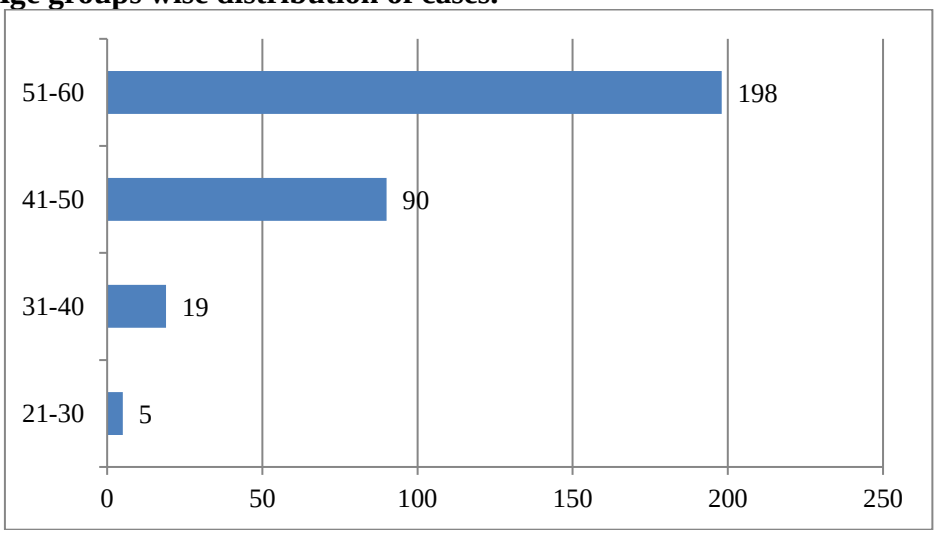

Chart 2. Pie diagram representing Gender wise distribution of cases.

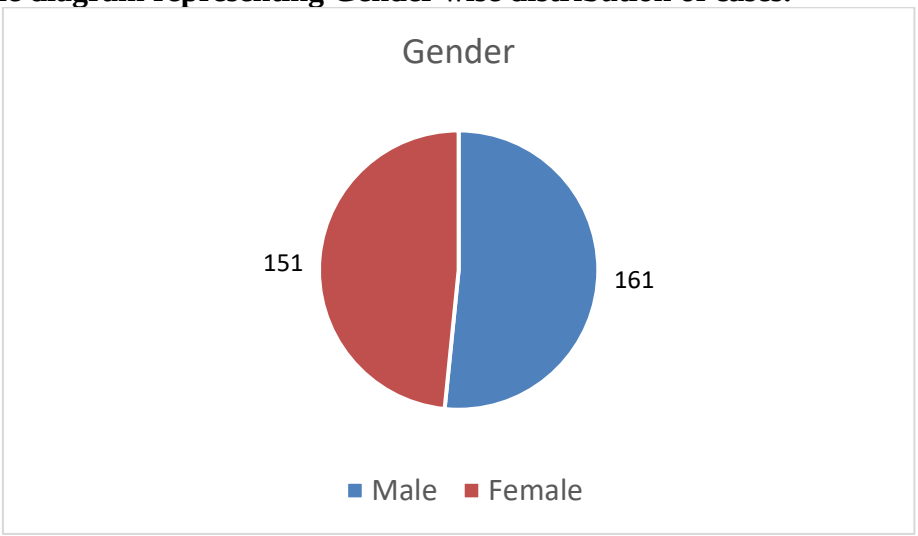

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Chart 2. Pie diagram representing distribution of cases according to comorbidities.

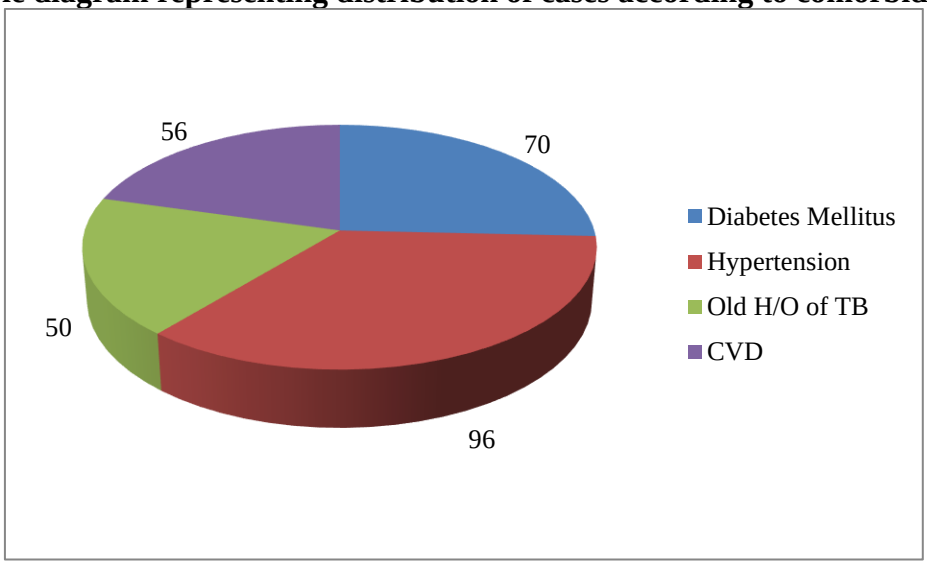

Chart 4. Total qsofa score wise distribution of cases.

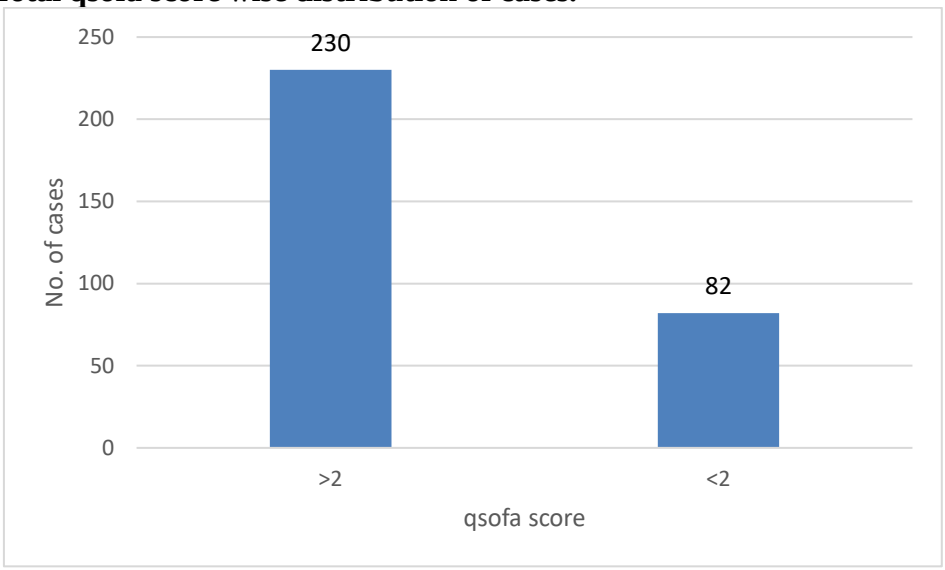

Chart 5. Apache score wise distribution of cases.

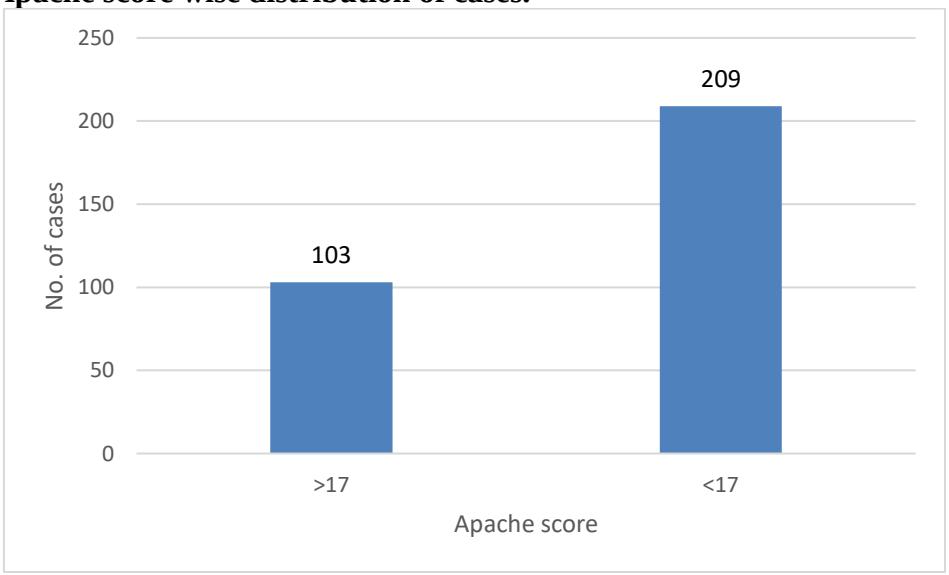

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Chart 6. Outcome wise distribution of cases.

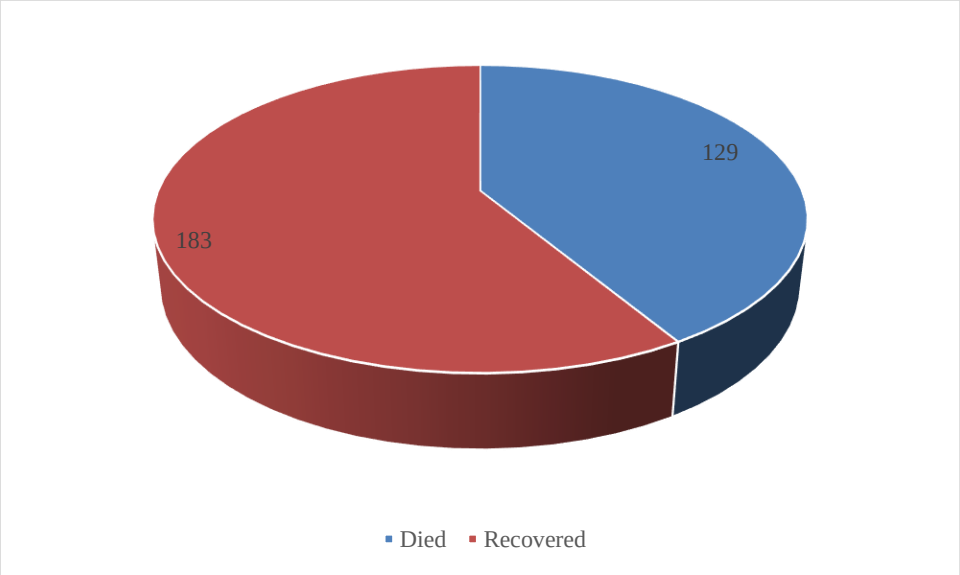
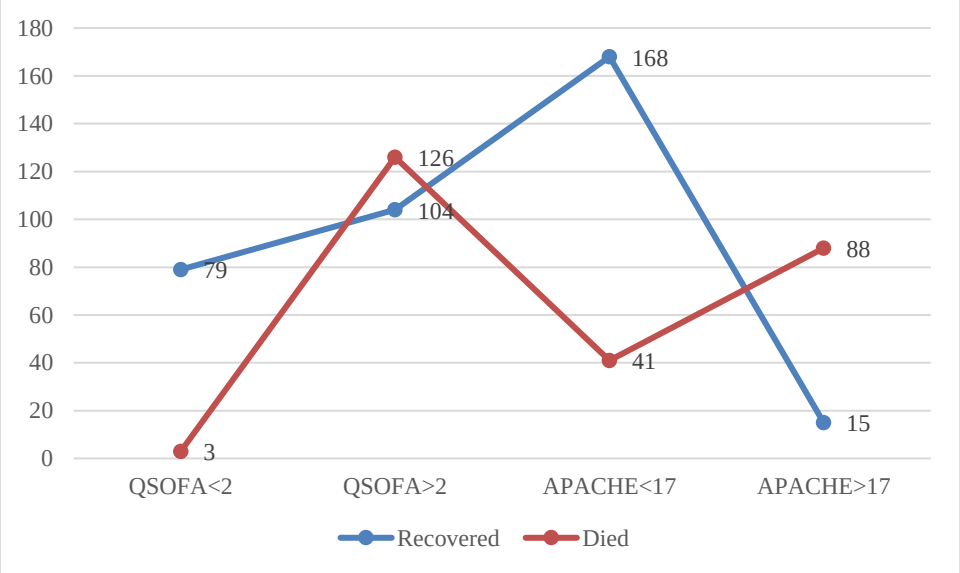


Chart 7. Correlation of apache and qsofa with outcome of patients



X axis: QSOFA with cut off value of 2
APACHE with cut off value 17
Y axis: Number of patients

Discussion

In our longitudinal follow up study, we have initially included total 312 cases of septic shock as per the sample size calculations to assess the outcome on qSOFA & APACHE II score , important observations & results of which are discussed below.

Majority (63.46%) cases were from the 5th to 6th decade followed by the age group of 41-50 years (28.85%). Mean age of the patients was 51 $\pm$ 6.6 years. Majority (51.60%) cases were males. This is in line with Javier Osatnik et al[10] who reported mean age of 62.9±19.2 years, In this study, most common presenting complaint was breathlessness (44.87%) followed by cough with expectoration (37.5%), fever (36.22%), abdominal pain (29.81%), altered sensorium (19.23%), nausea & vomiting (13.78%) etc. While, most common comorbidity was hypertension (30.77%) followed by diabetes mellitus (22.44 %), cardiovascular disorders (17.95 % each)and old h/o of tuberculosis (16.03%).

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In the present study, 127 (40.71%) cases had Altered sensorium, 189 (60.58%) cases had respiratory rate >22/min with the mean respiratory rate of 22.8 + 4.1 /min. 187 (59.94%) cases had systolic blood pressure <100/mmHg. So, majority 230 (73.72%) cases had total qsofa score >2 indicating organ failure.Mean total qsofa score was 2 + 0.7. Consistently, Javier Osatnik et al[10] in their study noted that 63.3% had a qSOFA score of ≥ 2 points. In this study, 103 (33.01%) cases were having APACHE score ≥ 17, indicating organ failure. Mean APACHE score was 13.2 + 7.3. In our study, majority, 183 (58.65%) cases were recovered while 129 (41.35%) were died. In our study ,

In the present study, qsofa scores, APACHE scores were strongly correlated with outcome of the patients. ($p<0.0001$). Javier Osatnik et al[10] in their study found that qSOFA AUC for predicting in-hospital mortality was 0.71, (95% CI 0.59-0.83)

Eli J. Finkelsztein et al[11] found that the discrimination of in-hospital mortality using qSOFA with area under the receiver operating characteristic curve (AUC), 0.74; 95% confidence intervals (CI), 0.66–0.81, was significantly greater compared with SIRS criteria.

Hwan Song et al[12] reported that the qSOFA score areas under the curves for the prediction of mortality was 0.720. The area under the ROC curve of qSOFA was lower than that of SOFA (0.720 vs. 0.845, P=0.004).

Christopher W. Seymour et al[13] in their study observed that predictive validity for in-hospital mortality of qSOFA was statistically greater than SOFA and SIRS.

Yao Tian et al[14] similarly reported that APACHE II score is an optimal biomarker to predict the outcomes of ICU patients; with 17 is the best cut-off for defining patients at high risk of mortality with AUROC is 0.743 ($P < 0.001$).

Conclusion

The qSOFA score is a practical and reliable tool for assessing septic shock severity and predicting patient outcomes, with strong correlation to the APACHE II score. These findings support the use of qSOFA in initial patient triage and management, complementing the APACHE II score for comprehensive patient assessment.

Conflict of Interest: Nil

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