ORIGINAL ARTICLE

Comparison of qSOFA Score and NEWS2 Score in Sepsis Patients Admitted in Emergency Department and ICU as Prognostic Markers of Patient Outcome

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Abstract

Background: Sepsis causes high short-term mortality in emergency and ICU settings. Quick sequential organ failure assessment (qSOFA) and national early warning score 2 (NEWS2) are bedside tools for early risk stratification, yet comparative evidence remains limited.

Objectives: To compare qSOFA and NEWS2 for predicting 7-day and 28-day mortality and length of stay in adult sepsis patients.

Methods: This prospective observational study was conducted over 1 year (March 2024–February 2025) at a tertiary care center in northern India. A total of 874 patients aged 18–65 years admitted with sepsis were enrolled. On-admission qSOFA and NEWS2 scores were recorded. Outcomes included 7-day, 28-day mortality and length of hospital stay.

Results: Among 874 patients, NEWS2 showed higher sensitivity than qSOFA for 7-day (63.1% vs 35.1%) and 28-day mortality (64.1% vs 37.3%), with comparable specificity (~86%). Area under receiver operating characteristic curve (AUROC) values favored NEWS2 for 7-day (0.627 vs 0.606) and 28-day mortality (0.629 vs 0.609).

Conclusion: In adults with sepsis, the NEWS2 score showed higher sensitivity and marginally better prognostic accuracy than qSOFA for predicting short-term mortality and hospital stay. NEWS2 may therefore serve as a more reliable bedside tool for early identification of high-risk patients in emergency and ICU settings.

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Introduction

Sepsis is a dysregulated host response to infection that can progress to septic shock and multiorgan dysfunction.[1–4] Despite advances, it continues to cause major global mortality. Globally, sepsis remains a significant public health concern, with an estimated 48.9 million new cases and 11 million related deaths in 2020—nearly 20% of all global deaths.[5] India alone reported about 11 million cases in 2017, with roughly 3 million fatalities.[6] Despite advances in management, in-hospital mortality remains 25–30%, reaching 58% in septic shock.[7] Continuous assessment of vital parameters—mean arterial pressure, respiratory rate, oxygen saturation, mental status, and body temperature—is critical for early detection and management.[8] These parameters form the basis of several early-warning systems that guide timely intervention. Among them, the quick sequential organ failure assessment (qSOFA) is a bedside tool that identifies patients with suspected infection who are at higher risk for poor outcomes outside the ICU. It consists of three variables: respiratory rate ≥22/min, systolic BP ≤100 mm Hg, and altered mental status (GCS < 15), each assigned one point. A qSOFA score ≥2 is associated with increased mortality and prolonged ICU stay, making it useful for triage and prognostication.[9–12] Similarly, the national early warning score 2 (NEWS2), developed by the Royal College of Physicians, is a standardized scoring system incorporating respiration rate, oxygen saturation, systolic BP, heart rate, consciousness level, temperature, and supplemental oxygen requirement.[13] It is increasingly adopted for its practicality and sensitivity in detecting clinical deterioration. Given the variability in prognostic performance, the present study compared qSOFA and NEWS2 scores in predicting outcomes among sepsis patients admitted to the emergency department and ICU. To test this hypothesis, a prospective observational study was conducted at a tertiary care center in North India, and the methodology is described below.

Methods

This prospective observational study was conducted at a tertiary-care center in North India from March 2024 to February 2025. The study was approved by the Institutional Ethics Committee, and written informed consent was obtained from all participants.

Inclusion Criteria

Adults aged 18–65 years admitted to the medicine emergency or ICU with a diagnosis of sepsis, septic shock, or organ dysfunction were enrolled according to the surviving sepsis-3 criteria.[1] Sepsis was defined as suspected infection with an increase in SOFA score ≥ 2. Septic shock was defined as persistent hypotension requiring vasopressor support to maintain mean arterial pressure ≥65 mm Hg with serum lactate >2 mmol/L despite adequate fluid resuscitation. Organ dysfunction included reduced platelet count, elevated serum bilirubin, deranged renal function, altered Glasgow Coma Scale score, hypotension or vasopressor requirement, or any acute change in total SOFA ≥ 2 points consequent to infection.

Exclusion Criteria

Patients younger than 18 or older than 65 years, those with recent surgery, trauma, or burns, known cardiac illness, pregnancy, malnutrition, malignancy, or organ transplantation, and patients unwilling to participate were excluded.

Data Collection

For every enrolled patient, demographic data, detailed clinical history, and examination findings were recorded. qSOFA parameters—respiratory rate ≥22/min, systolic blood pressure ≤100 mm Hg, and altered mental status (Glasgow Coma Scale <15)—and NEWS2 parameters—respiratory rate, oxygen saturation, use of supplemental oxygen, systolic blood pressure, heart rate,

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temperature, and level of consciousness—were documented on admission. Laboratory investigations included complete blood count, renal and liver function tests, serum electrolytes, C-reactive protein, and procalcitonin. All patients were treated in accordance with surviving sepsis guidelines. Follow-up continued until discharge or death to determine 7-day and 28-day outcomes and total hospital stay.

Sample Size

The sample size was calculated using the formula: $n = (Z_1-\alpha/2)^2 \times p \times q/d^2$, where p was 35.12% and $q = 64.88\%$ with $d = 4\%$. Based on this, the required sample size was 870, and 874 patients were finally included, using the prevalence from a previous study.[14]

Statistical Analysis

Data were entered in Microsoft Excel and analyzed using SPSS and GraphPad Prism 5. Descriptive statistics (mean, SD, percentages) were calculated. Because qSOFA (0–3) and NEWS2 (0–20) operate on different scales, direct comparison of mean values between the two was not performed. Each score was analyzed independently for association with outcomes. Chi-square and ANOVA-F tests were applied where appropriate. Receiver-operating-characteristic (ROC) analysis with area-under-curve (AUROC) values, sensitivity, specificity, and coefficient of variation were computed with 95% confidence intervals. A p-value < 0.05 was considered statistically significant.

Results

A total of 874 patients with sepsis were enrolled. Of these, 476 (54.5%) were males, and 398 (45.5%) were females. Most patients were aged 51–65 years (39.3%), followed by 31–50 years (31.4%) and 18–30 years (29.3%). Patients with a qSOFA score of 0–1 (n = 539) had favorable outcomes, with 242 discharged and 49 expired within 7 days, while at 28 days, 411 were discharged and 77 expired. The number of patients still hospitalized was 249 at 7 days and 52 at 28 days, indicating shorter hospital stays and better survival in those with lower scores. In contrast, patients with qSOFA scores of 2–3 (n = 334) showed poorer outcomes, with only 55 discharged and 47 expired within 7 days, and 196 discharged and 73 expired by 28 days. Hospitalization was prolonged in this group, with 232 patients admitted beyond 7 days and 65 at 28 days, confirming a clear association between higher qSOFA scores, increased mortality, and extended hospital stay.

Patients with a NEWS2 score of 0–4 (n = 290) had the best prognosis, with 184 discharged and 14 expired within 7 days, and 254 discharged and 21 expired at 28 days. The hospital stay in this group was short, with 92 patients admitted at 7 days and 15 at 28 days. Those with scores of 5–6 (n = 154) showed intermediate outcomes, with 33 discharged and 23 expired within 7 days, and 89 discharged and 40 expired by 28 days; 94 and 25 patients remained hospitalized at 7 and 28 days, respectively. Patients with scores of 7–20 (n = 430) had the worst outcomes, with 80 discharged and 59 expired within 7 days, and 264 discharged and 89 expired at 28 days. Hospital stay was longest in this group, with 291 patients hospitalized at 7 days and 77 at 28 days. This difference was statistically significant (p < 0.001) (Table 1).

National early warning score 2 demonstrated higher sensitivity than qSOFA for both 7-day (63.1% vs 35.1%) and 28-day mortality (64.1% vs 37.3%). Specificity was also marginally better for NEWS2 compared to qSOFA in both timeframes. This finding represents the central result of the study, emphasizing the superior ability of NEWS2 to identify high-risk sepsis patients early. Additionally, NEWS2 showed a lower coefficient of variation (55.1%) compared to qSOFA (72.4%), indicating greater consistency (Table 2).

Receiver operating characteristic (ROC) curve analysis showed that NEWS2 consistently outperformed qSOFA across all measured outcomes. For predicting 7-day mortality, the AUROC was 0.627 for NEWS2 versus 0.606 for qSOFA. Similarly, for 28-day mortality, NEWS2 had an AUROC of 0.629 compared to 0.609 for qSOFA (Table 3).

When analyzing the 7-day length of hospital stay prediction, NEWS2 again demonstrated slightly higher AUROC values than qSOFA (0.677 vs 0.671) in the overall patient group. A similar trend was observed among a group of sepsis patients, predicting 28-day length of hospital stay, where NEWS2 achieved an AUROC of 0.638 compared to 0.626 for qSOFA (Table 3). ROC analysis showed that NEWS2 consistently yielded higher AUROC values than qSOFA across all measured outcomes. Although the differences were modest, NEWS2 demonstrated greater consistency (lower coefficient of variation) and higher sensitivity while maintaining specificity, supporting its role as a more reliable prognostic tool for sepsis outcomes.

Discussion

A slight male predominance was observed (54.5%), a pattern consistent with findings by studies that associated this trend with greater exposure to risk factors such as smoking, alcohol use, and comorbidities among males.[14] Similarly, studies reported a male majority in their sepsis cohorts, with an even higher representation (around 60%).[15] Age-wise distribution revealed that mortality increased

Table 2: Diagnostic performance of qSOFA and NEWS2 for mortality

Category	*qSOFA (%)*	*NEWS2 (%)*
Sensitivity (7-day)	35.1	63.1
Specificity (7-day)	85.4	87.5
Sensitivity (28-day)	37.3	64.1
Specificity (28-day)	84.5	86.6
Coefficient of variation	72.4	55.1

Table 1: Association of qSOFA and NEWS2 with 7-day and 28-day outcomes

Sepsis score	*Score range (n)*	*7-day outcome*			*28-day outcome*			*p-value**
		Discharged (n)	*Expired (n)*	*Hospital stay (n)*	*Discharged (n)*	*Expired (n)*	*Hospital stay (n)*	
qSOFA	0–1 (539)	242	49	249	411	77	52	<0.001
	2–3 (334)	55	47	232	196	73	65	
NEWS2	0–4 (290)	184	14	92	254	21	15	
	5–6 (154)	33	23	94	89	40	25	
	7–20 (430)	80	59	291	264	89	77	

*p-value is between outcomes comparing qSOFA and NEWS2

Table 3: AUROC comparison of qSOFA and NEWS2 for outcomes

Outcome	*Score*	*AUROC (95% CI)*	*p-value*
7-day mortality	qSOFA	0.606 (0.546–0.665)	<0.001
	NEWS2	0.627 (0.570–0.684)	
28-day mortality	qSOFA	0.609 (0.561–0.656)	<0.001
	NEWS2	0.629 (0.583–0.675)	
7-day length of stay	qSOFA	0.671 (0.634–0.707)	<0.001
	NEWS2	0.677 (0.641–0.714)	
28-day length of stay	qSOFA	0.626 (0.589–0.663)	<0.001
	NEWS2	0.638 (0.601–0.675)	

progressively with advancing age. Patients aged 51–65 years exhibited the highest rates of prolonged hospitalization and mortality at both 7 and 28 days. These results mirrored the observations of previous studies, which reported significantly higher mortality in patients over 60 years.[14,15] Other studies also documented increased deaths among those aged >65 years, and some noted up to 70% mortality in elderly ICU patients.[16,17] Further research demonstrated a similar age-related mortality trend, supporting the assertion that age is an independent predictor of poor outcomes in sepsis.[18] When evaluating qSOFA scores, 61.6% of patients had scores of 0–1 at admission, and 38.2% had scores of 2–3. By day 7, early discharge was more frequent among those with low qSOFA scores, whereas patients with higher scores experienced prolonged hospital stays and comparable mortality. At day 28, mortality was modestly higher among the qSOFA ≥2 group. These findings were aligned with studies that reported a 53.6% mortality in qSOFA ≥2 patients.[14] Other research found increased mortality and longer hospitalization in patients with high qSOFA scores.[15] The relatively lower mortality observed in our cohort may reflect earlier intervention strategies or different baseline characteristics. The prognostic trend extended to NEWS2 scores as well.

Patients with scores ≥7 had significantly higher mortality and longer hospital stays at both 7-day and 28-day follow-ups. This aligned with studies that found a 56% mortality in NEWS2 ≥7 patients and demonstrated NEWS2's strong correlation with ICU admission and organ dysfunction.[14,15] Additional studies reported an AUC of 0.686 for NEWS2 in predicting mortality, consistent with our findings.[16] Further research documented a 62% mortality in ICU patients with NEWS2 ≥7 and showed that NEWS2 was more sensitive than qSOFA in early mortality prediction.[17] ROC analysis for 7-day mortality showed that qSOFA had an AUC of 0.606 and NEWS2 had a slightly higher AUC of 0.627. While both reached statistical significance ($p < 0.001$), their predictive strength was modest. For 7-day hospital stay prediction, qSOFA had an AUC of 0.671 and NEWS2 showed a slightly better AUC of 0.677. For 28-day hospital stay prediction, qSOFA had an AUC of 0.626 and NEWS2 showed a slightly better AUC of 0.638. This small difference nonetheless favored NEWS2, consistent with previous reports citing its superior sensitivity.[18] Similar trends were seen at the 28-day endpoint. NEWS2 maintained a marginally better AUC than qSOFA (0.638 vs 0.626 for length of stay; 0.629 vs 0.609 for mortality) reinforcing its reliability. These findings paralleled the results of previous studies, which demonstrated higher AUC values for NEWS2 (0.74) compared to qSOFA (0.66) with greater sensitivity and comparable specificity.[18]

Sensitivity and specificity assessments in our study further supported these trends. At day 7, NEWS2 showed a sensitivity of 63.1% versus 35.1% for qSOFA with both having similar specificity (~85%). At day 28, NEWS2 again had higher sensitivity (64.1%) than qSOFA (37.3%), with specificity remaining high for both. These values highlighted that although both scores reliably ruled out low-risk patients, NEWS2 was superior in identifying high-risk individuals, particularly in early phases. The performance metrics observed in our cohort were comparable to those reported by other studies, which noted higher sensitivity and AUC for NEWS2 than for qSOFA.[14] Similar findings also reported a higher AUC for NEWS2 (0.80) compared to qSOFA (0.70), while others echoed this superiority with consistent sensitivity and AUC trends.[15,17] The ANOVA F-scores at day 7 (qSOFA: 85.609; NEWS2: 88.425) and day 28 (qSOFA: 29.395; NEWS2: 31.296) confirmed statistically significant differences across outcome categories. The coefficient of variation (CV) was lower for NEWS2 (55.1%) than for qSOFA (72.4%), reflecting more stable score distribution and consistent prognostic reliability. The origin of NEWS2 as a standardized score from the Royal College of Physicians lends further support to its utility in structured emergency care.[13] Previous research demonstrated NEWS's ability to discriminate high-risk patients requiring ICU care, which is reaffirmed by our findings and by subsequent validation studies.[9,18]

In summary, the findings of our study supported the conclusion that while both qSOFA and NEWS2 are valuable for early risk stratification in sepsis, NEWS2 consistently demonstrated higher sensitivity, marginally better discriminatory power (via AUC), and more robust statistical behavior across various outcome measures. These results endorse the application of NEWS2 as a more effective early warning score in emergency and ICU settings, particularly when timely triage and intervention are essential. Given the limited evidence from Indian studies assessing the predictive accuracy of NEWS2 versus qSOFA in sepsis patients admitted to emergency and intensive care units, there is a pressing need for well-designed, multicentric trials involving larger sample sizes.

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