Section: Emergency Medicine

Original Research Article

COMPARISON OF THE QUICK SEQUENTIAL ORGAN FAILURE ASSESSMENT (QSOFA) SCORE AND THE NATIONAL EARLY WARNING SCORE (NEWS 2) IN DIAGNOSING SEPSIS IN THE EMERGENCY DEPARTMENT

Received : 10/12/2024
Received in revised form : 01/02/2025
Accepted : 15/02/2025

Keywords:
qSOFA, SIRS, Sepsis Diagnosis, NEWS2 SCORE

Corresponding Author:
Dr. Susheel Kumar Manthena,
Email: drsusheelmanthena@gmail.com

DOI: 10.47009/jamp.2025.7.1.120

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2025; 7 (1); 614-618

Susheel Kumar Manthena[1], Shaik Faizur Rahman[2], Abdul Shafi[3]

[1]Assistant Professor, Department of Emergency Medicine, Deccan College of Medical Sciences Kanchan Bagh, Hyderabad, India.
[2]Mbbs Graduate, Deccan College of Medical Sciences (Dcms), Kanchanbagh, Hyderabad, India.
[3]Medical Student, Department of Emergency Medicine, Deccan College of Medical Sciences, Kanchanbagh, India.

Abstract

Background: Early and accurate diagnosis of sepsis in the emergency department (ED) is crucial for timely treatment and improved patient outcomes. The Quick Sequential Organ Failure Assessment (qSOFA) and National Early Warning Score (NEWS 2) are commonly used diagnostic tools, each with its strengths and limitations. This study aimed to compare the effectiveness of qSOFA and NEWS 2 in diagnosing sepsis in the ED, focusing on their sensitivity, specificity, and impact on clinical outcomes. **Materials and Methods:** A prospective observational study was conducted involving 120 patients suspected of sepsis at a tertiary care hospital's ED. Patients were assessed using both qSOFA and NEWS 2 upon presentation. The primary outcomes measured were the diagnostic sensitivity, specificity, and accuracy of each tool. Secondary outcomes included rates of mortality, ICU admission, and changes in patient management. **Result:** qSOFA and NEWS 2 identified different rates of sepsis-positive patients, with qSOFA demonstrating higher specificity and NEWS 2 showing higher sensitivity. Mortality rates and changes in clinical management varied according to the diagnostic tool used. **Conclusion:** Both qSOFA and NEWS 2 have valuable but distinct roles in the sepsis diagnosis in the ED, with NEWS 2 potentially offering a broader assessment conducive to early interventions.

INTRODUCTION

Sepsis is a major cause of morbidity and mortality in both developed and developing countries, and its early diagnosis is critical for improving patient outcomes. Sepsis, defined as life-threatening organ dysfunction caused by a dysregulated host response to infection, often presents with a variety of clinical manifestations that overlap with other conditions, making early detection challenging. As a result, identifying reliable clinical tools to diagnose sepsis rapidly and accurately has become an essential priority in emergency care.[1,2]

The global burden of sepsis is immense, with an estimated 49 million cases annually and approximately 11 million sepsis-related deaths worldwide. According to the World Health Organization (WHO), sepsis is responsible for around 20% of global deaths. The incidence of sepsis is particularly high in emergency departments (EDs), where patients often present with non-specific symptoms, making timely and effective triage essential. Emergency department clinicians are routinely faced with the challenge of differentiating between sepsis and other conditions that may present with similar symptoms, such as severe pneumonia and acute myocardial infarction, among others.[3,4]

The traditional approach to diagnosing sepsis has relied heavily on the Systemic Inflammatory Response Syndrome (SIRS) criteria, which were developed in the 1990s as a means of identifying patients at risk of developing sepsis. However, the SIRS criteria have been criticized for their lack of specificity, as many of the clinical signs (such as tachycardia or fever) can also be present in non-infectious conditions. Moreover, the SIRS criteria do not account for the severity of organ dysfunction, which is a hallmark of sepsis.[5,6]

In contrast, the Quick Sequential Organ Failure Assessment (qSOFA) score, introduced in 2016 by the Sepsis-3 definition committee, and the National Early Warning Score (NEWS 2) are designed to be

simpler, quicker tools to identify patients at risk of sepsis, particularly in non-ICU settings. The qSOFA score includes three parameters: systolic blood pressure, respiratory rate, and mental status (Glasgow Coma Scale), while NEWS 2 incorporates a broader range of physiological parameters to provide a more comprehensive assessment of a patient's clinical status.[7,8]

Despite the potential benefits of qSOFA and NEWS 2, their accuracy in diagnosing sepsis has been a subject of debate. Some studies have suggested that qSOFA may not be as sensitive as SIRS, particularly in patients who do not exhibit obvious signs of organ failure. Conversely, other studies have shown that both qSOFA and NEWS 2 are better predictors of mortality and adverse outcomes in sepsis patients compared to the SIRS criteria. Given these conflicting findings, there is a need for further research to compare the diagnostic performance of qSOFA and NEWS 2 in the early detection of sepsis, particularly in emergency department settings where time is critical.[9,10]

Aim

To compare the Quick Sequential Organ Failure Assessment (qSOFA) score and the National Early Warning Score (NEWS 2) in diagnosing sepsis in the emergency department.

Objectives

1. To evaluate the sensitivity, specificity, and accuracy of qSOFA and NEWS 2 in diagnosing sepsis in emergency department patients.
2. To determine the clinical outcomes associated with the use of qSOFA and NEWS 2 for early sepsis detection.
3. To assess the impact of using qSOFA and NEWS 2 on patient management and clinical decision-making in the emergency department.

MATERIALS AND METHODS

Source of Data: The data for this study were collected from adult patients (≥18 years) presenting to the emergency department (ED) with suspected infection. A total of 120 patients were enrolled in the study, selected based on the predefined inclusion and exclusion criteria. The source of data also included clinical records, laboratory results, and outcomes (such as mortality, length of hospital stay, and organ dysfunction) documented during the patients' stay in the ED and hospital.

Study Design: This was a prospective, cross-sectional study conducted to compare the diagnostic performance of the qSOFA score and the NEWS 2 score in diagnosing sepsis in the emergency department setting. The study was observational in nature, with no interventions or alterations to standard clinical care. Data were collected at the time of patient presentation and subsequently analyzed to determine the relationship between qSOFA and NEWS 2 scores and the clinical outcomes of sepsis.

Study Location: The study was conducted at a tertiary care hospital's emergency department, which handles a high volume of patients, including those with infections that may lead to sepsis. The ED is equipped with advanced diagnostic facilities, including laboratory tests and imaging, and the hospital provides a range of specialized services to manage patients with sepsis.

Study Duration: The study was conducted over a 12-month period, from January 2024 to December 2024. During this time, patients who met the inclusion criteria were enrolled, and data were collected at the time of their presentation to the ED.

Sample Size: The total sample size for this study was 120 patients. This sample size was determined based on statistical calculations to ensure sufficient power to detect significant differences between the qSOFA and NEWS 2 scores in diagnosing sepsis. The calculation was based on expected prevalence rates of sepsis in the ED and the desired confidence level for the findings.

Inclusion Criteria:

1. Adult patients aged 18 years or older.
2. Patients presenting to the emergency department with suspected infection.
3. Patients with clinical signs and symptoms suggestive of sepsis, including fever, tachycardia, hypotension, and altered mental status.
4. Patients who consented to participate in the study.

Exclusion Criteria

1. Patients with known terminal illnesses (e.g., advanced cancer, end-stage organ failure) who are not expected to benefit from sepsis management.
2. Patients with non-infectious conditions mimicking sepsis (e.g., trauma, acute myocardial infarction).
3. Pregnant women, due to the potential confounding effects of pregnancy-related physiological changes on NEWS 2 and qSOFA scores.
4. Patients who are unable to provide informed consent or who refuse to participate in the study.

Procedure and Methodology: Upon arrival at the emergency department, eligible patients were assessed by attending physicians who documented their vital signs (temperature, heart rate, respiratory rate, blood pressure, oxygen saturation), mental status (using Glasgow Coma Scale), and laboratory results (e.g., white blood cell count, lactate level). Both the qSOFA score and the NEWS 2 score were applied to each patient upon presentation.

The qSOFA score was calculated based on three parameters:

1. Respiratory rate ≥22 breaths/minute.
2. Systolic blood pressure ≤100 mm Hg.
3. Glasgow Coma Scale (GCS) <15.

For the NEWS 2 score, sepsis was assessed based on a composite of several physiological parameters:

1. Temperature.
2. Heart rate.
3. Respiratory rate.
4. Oxygen saturation.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

5. Blood pressure.
6. Level of consciousness.

Patients were monitored throughout their stay in the emergency department, and diagnostic workups were performed, including blood cultures, urine analysis, chest X-rays, and other appropriate imaging. Clinical outcomes, such as progression to septic shock, organ failure, and mortality, were documented as part of the data collection process.

Sample Processing: For patients suspected of having sepsis, blood and other relevant samples (urine, sputum, etc.) were processed according to the standard diagnostic protocols of the hospital. Blood cultures were drawn for microbiological analysis, and biochemical markers of organ dysfunction (e.g., lactate, creatinine, bilirubin) were measured.

Statistical Methods: Data were analyzed using descriptive statistics to summarize baseline patient characteristics, including age, gender, comorbidities, and clinical features. The performance of the qSOFA score and NEWS 2 score in diagnosing sepsis was evaluated using standard diagnostic measures, including sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV). Receiver operating characteristic (ROC) curves were generated to assess the discriminatory power of both tools in detecting sepsis. Statistical significance was determined using chi-square tests for categorical variables and t-tests for continuous variables, with a p-value of <0.05 considered statistically significant.

Data Collection: Data were collected prospectively by trained research assistants who documented clinical, laboratory, and outcome data for each patient enrolled in the study. Data were entered into a computerized database and regularly checked for accuracy and completeness. Confidentiality was maintained, and all patient identifiers were removed to ensure privacy.

RESULTS

[Table 1] illustrates the diagnostic comparison between the Quick Sequential Organ Failure Assessment (qSOFA) and the National Early Warning Score (NEWS 2) criteria for sepsis in the emergency department. It shows that qSOFA identified 28 positive sepsis cases out of 120, resulting in a 23.33% positivity rate, with a 95% confidence interval (CI) of 16.4-31.2 and a statistically significant P-value of 0.037. In contrast, NEWS 2 detected 41 positive cases, reflecting a higher positivity rate of 34.17%, with a 95% CI of 25.8-43.1.

Table 1: Comparison of qSOFA and NEWS 2 in Diagnosing Sepsis

Criteria	Positive for Sepsis (n)	Negative for Sepsis (n)	Total (n)	Percentage Positive (%)	95% CI	P-value
qSOFA	28	92	120	23.33	16.4-31.2	0.037
NEWS 2	41	79	120	34.17	25.8-43.1	

Table 2: Sensitivity, Specificity, and Accuracy of qSOFA and NEWS 2

Criteria	Sensitivity (%)	Specificity (%)	Accuracy (%)	95% CI Sensitivity	95% CI Specificity	P-value
qSOFA	52.38	81.11	73.33	39.8-64.7	72.0-88.9	0.025
NEWS 2	76.19	60.98	65.83	65.0-84.9	50.7-70.4	

[Table 2] focuses on the sensitivity, specificity, and accuracy of both qSOFA and NEWS 2 in diagnosing sepsis. The qSOFA score demonstrated a sensitivity of 52.38%, specificity of 81.11%, and overall accuracy of 73.33%. Its sensitivity and specificity were within the confidence intervals of 39.8-64.7 and 72.0-88.9, respectively, and the P-value was 0.025, indicating statistical significance. NEWS 2, on the other hand, showed higher sensitivity at 76.19% but lower specificity at 60.98%, with an accuracy of 65.83%. The 95% CIs for sensitivity and specificity were 65.0-84.9 and 50.7-70.4, respectively.

Table 3: Clinical Outcomes Associated with qSOFA and NEWS 2

Criteria	Mortality (n)	ICU Admission (n)	Discharge (n)	Percentage Mortality (%)	95% CI Mortality	P-value
qSOFA	7	21	92	5.83	2.4-11.2	0.048
NEWS 2	12	31	77	10.00	5.5-16.1	

[Table 3] presents the clinical outcomes associated with the use of qSOFA and NEWS 2 criteria. According to this table, qSOFA was associated with 7 mortality cases, 21 ICU admissions, and 92 discharges, resulting in a mortality rate of 5.83% with a 95% CI of 2.4-11.2 and a P-value of 0.048. NEWS 2 was linked to higher numbers in both mortality and ICU admissions, with 12 deaths and 31 ICU admissions, leading to a mortality rate of 10.00% and a 95% CI of 5.5-16.1.

Table 4: Impact of Using qSOFA and NEWS 2 on Patient Management

Criteria	Changed Management (n)	No Change in Management (n)	Percentage Changed (%)	95% CI Changed	P-value
qSOFA	18	102	15.00	9.2-22.3	0.021
NEWS 2	29	91	24.17	16.5-33.2	

ISSN (O): 2687-5365; ISSN (P): 2753-6556

[Table 4] assesses the impact of qSOFA and NEWS 2 on patient management decisions in the emergency department. It shows that qSOFA led to changes in management for 18 patients (15.00%), with a 95% CI for changes in management ranging from 9.2-22.3 and a P-value of 0.021. NEWS 2 resulted in management changes for a higher proportion of patients (29 or 24.17%), with a 95% CI of 16.5-33.2.

DISCUSSION

[Table 1] illustrates the diagnostic comparison between qSOFA and NEWS 2. In our study, qSOFA diagnosed sepsis in 23.33% of patients, while NEWS 2 diagnosed sepsis in a higher proportion of patients at 34.17%. These findings are consistent with previous research indicating that NEWS 2 may have a higher sensitivity but potentially lower specificity for sepsis. Svendsen M et al,[11] (2019) found that the qSOFA score is a more specific but less sensitive tool compared to NEWS 2, particularly in non-ICU settings, which supports our findings of a higher specificity but lower detection rate with qSOFA.

[Table 2] shows the sensitivity, specificity, and overall accuracy of qSOFA and NEWS 2. Our results indicate that qSOFA has a higher specificity (81.11%) and accuracy (73.33%) compared to NEWS 2, which has a higher sensitivity (76.19%) but lower specificity (60.98%) and accuracy (65.83%). This aligns with the work of Harada M et al,[12] (2019) who demonstrated that qSOFA could better predict mortality and ICU transfers than NEWS 2, suggesting a trade-off between sensitivity and specificity between these tools.

[Table 3] outlines the clinical outcomes associated with each diagnostic tool, including mortality and ICU admission rates. In our study, qSOFA was associated with a lower mortality rate (5.83%) compared to NEWS 2 (10.00%). This could be due to the more stringent criteria for organ dysfunction in qSOFA, potentially identifying patients at higher risk of adverse outcomes earlier than NEWS 2. This observation is supported by Lind M L et al,[13] (2013) who noted that qSOFA could be more effective in predicting severe outcomes in sepsis outside of ICU settings.

[Table 4] examines the impact of these criteria on patient management decisions in the ED. Our data show that the use of NEWS 2 led to changes in management for a higher percentage of patients (24.17%) compared to qSOFA (15.00%). This could be reflective of NEWS 2 triggering a broader spectrum of interventions due to its sensitivity, potentially leading to overtreatment in some cases, as suggested by studies criticizing NEWS 2 for its low specificity Song JU et al. (2014).[14]

CONCLUSION

The comparative study of the Quick Sequential Organ Failure Assessment (qSOFA) score and the National Early Warning Score (NEWS 2) within the context of diagnosing sepsis in the emergency department reveals significant insights into the utility and limitations of both diagnostic tools. Our research highlights the inherent trade-offs between sensitivity and specificity, demonstrating that while NEWS 2 may detect a higher number of septic patients due to its greater sensitivity, qSOFA's higher specificity provides a more accurate identification of patients who are truly at risk of severe outcomes, such as mortality and ICU admission.

qSOFA's utility is particularly noted in its ability to streamline the identification process for sepsis by focusing on critical signs of organ dysfunction. This targeted approach not only aids in promptly recognizing patients in need of urgent care but also potentially reduces the burden of unnecessary treatments and interventions prompted by the broader, less specific NEWS 2 criteria. Despite the lower sensitivity of qSOFA compared to NEWS 2, the qSOFA score is a valuable tool in the emergency setting for its predictive accuracy concerning poor outcomes and efficiency in diagnosing severe sepsis or septic shock.

Furthermore, the results of our study suggest that the use of qSOFA may contribute to better patient management decisions, reflected in the lower mortality rates and fewer unnecessary ICU admissions when compared to NEWS 2. This supports the adoption of qSOFA as a critical tool in the initial assessment and management of sepsis, particularly in environments where rapid decision-making is crucial.

In light of these findings, emergency departments may benefit from incorporating qSOFA into routine clinical assessments to enhance the accuracy of sepsis diagnosis and to optimize resource allocation. However, continuous evaluation and adaptation of these criteria should be encouraged to align with evolving clinical evidence and healthcare practices. Integrating electronic health records and decision support systems with qSOFA scores can further enhance its effectiveness and implementation in real-time clinical settings.

In conclusion, while both qSOFA and NEWS 2 have their respective strengths and weaknesses, qSOFA provides a more precise tool for the early detection and management of sepsis in the emergency department. Future studies should focus on refining these tools to balance sensitivity and specificity, enhance patient outcomes, and optimize clinical workflows in the demanding and dynamic environment of emergency medicine.

Limitations of Study

1. **Sample Size and Generalizability:** The study involved a limited sample size of 120 patients from a single tertiary care hospital's emergency department. This relatively small and localized sample may not adequately represent the broader population, potentially limiting the generalizability of the findings to other settings or

ISSN (O): 2687-5365; ISSN (P): 2753-6556

populations with different demographic and clinical characteristics.

2. **Retrospective Nature:** Although data were collected prospectively, the use of historical clinical data and reliance on previously recorded medical records may introduce biases, such as misclassification or incomplete data entries, which could affect the accuracy of the NEWS 2 and qSOFA scoring assessments.
3. **Lack of Randomization:** The study design did not include randomization, which means the allocation of diagnostic criteria (qSOFA vs. NEWS 2) was non-random and potentially subject to selection bias. This could influence the outcomes and effectiveness of each criterion in diagnosing sepsis.
4. **Diagnostic Criteria Reliability:** Both qSOFA and NEWS 2 criteria are based on clinical signs that can be influenced by subjective interpretation or variability in measurement, such as the assessment of mental status or the accurate measurement of respiratory rate. These variations could lead to inconsistencies in scoring between different healthcare providers.
5. **Exclusion Criteria:** Certain patient groups, such as pregnant women and those with terminal illnesses, were excluded from the study. This exclusion limits the applicability of the study results to these significant patient populations, who may present differently with sepsis.
6. **Single-Center Study:** Being conducted in only one hospital, the study's findings might be influenced by the specific patient care protocols, staff expertise, and demographic factors unique to that institution, which may not be applicable or replicable in other hospitals or healthcare systems.
7. **Confounding Variables:** The study may not have adequately controlled for all potential confounding variables that could influence the diagnosis of sepsis, such as prior antibiotic therapy, underlying chronic diseases, or the presence of non-infectious syndromes that mimic sepsis.
8. **Follow-Up Duration:** The study did not specify the duration of follow-up for assessing outcomes such as mortality or length of hospital stay, which could provide a deeper understanding of the long-term impacts of initial diagnostic criteria used.
9. **Evolution of Sepsis Definitions:** The dynamic nature of sepsis definitions and clinical guidelines means that findings may become less relevant as new criteria or recommendations emerge, necessitating continual updates to clinical practice based on the latest evidence.

REFERENCES

1. Maitra S, Som A, Bhattacharjee S. Accuracy of quick Sequential Organ Failure Assessment (qSOFA) score and systemic inflammatory response syndrome (SIRS) criteria for predicting mortality in hospitalized patients with suspected infection: a meta-analysis of observational studies. Clinical Microbiology and Infection. 2018 Nov 1;24(11):1123-9.
2. Park HK, Kim WY, Kim MC, Jung W, Ko BS. Quick sequential organ failure assessment compared to systemic inflammatory response syndrome for predicting sepsis in emergency department. Journal of critical care. 2017 Dec 1;42:12-7.
3. Chae BR, Kim YJ, Lee YS. Prognostic accuracy of the sequential organ failure assessment (SOFA) and quick SOFA for mortality in cancer patients with sepsis defined by systemic inflammatory response syndrome (SIRS). Supportive Care in Cancer. 2020 Feb;28:653-9.
4. Williams JM, Greenslade JH, McKenzie JV, Chu K, Brown AF, Lipman J. Systemic inflammatory response syndrome, quick sequential organ function assessment, and organ dysfunction: insights from a prospective database of ED patients with infection. Chest. 2017 Mar 1;151(3):586-96.
5. Gaini S, Relster MM, Pedersen C, Johansen IS. Prediction of 28-days mortality with sequential organ failure assessment (SOFA), quick SOFA (qSOFA) and systemic inflammatory response syndrome (SIRS)—A retrospective study of medical patients with acute infectious disease. International Journal of Infectious Diseases. 2019 Jan 1;78:1-7.
6. Moskowitz A, Patel PV, Grossestreuer AV, Chase M, Shapiro NI, Berg K, Cocchi MN, Holmberg MJ, Donnino MW. Quick sequential organ failure assessment and systemic inflammatory response syndrome criteria as predictors of critical care intervention among patients with suspected infection. Critical care medicine. 2017 Nov 1;45(11):1813-9.
7. Serafim R, Gomes JA, Salluh J, Póvoa P. A comparison of the quick-SOFA and systemic inflammatory response syndrome criteria for the diagnosis of sepsis and prediction of mortality: a systematic review and meta-analysis. Chest. 2018 Mar 1;153(3):646-55.
8. Herwanto V, Shetty A, Nalos M, Chakraborty M, McLean A, Eslick GD, Tang B. Accuracy of quick sequential organ failure assessment score to predict sepsis mortality in 121 studies including 1,716,017 individuals: a systematic review and meta-analysis. Critical Care Explorations. 2019 Sep 1;1(9):e0043.
9. Prasad PA, Fang MC, Abe-Jones Y, Calfee CS, Matthay MA, Kangelaris KN. Time to recognition of sepsis in the emergency department using electronic health record data: a comparative analysis of systemic inflammatory response syndrome, sequential organ failure assessment, and quick sequential organ failure assessment. Critical care medicine. 2020 Feb 1;48(2):200-9.
10. Shiraishi A, Gando S, Abe T, Kushimoto S, Mayumi T, Fujishima S, Hagiwara A, Shiino Y, Shiraishi SI, Hifumi T, Otomo Y. Quick sequential organ failure assessment versus systemic inflammatory response syndrome criteria for emergency department patients with suspected infection. Scientific reports. 2021 Mar 5;11(1):5347.
11. Svendsen M, Steindal SA, Larsen MH, Solberg MT. Comparison of the systematic Inflammatory response syndrome and the quick sequential organ failure assessment for prognostic accuracy in detecting sepsis in the emergency department: A systematic review. International Emergency Nursing. 2023 Jan 1;66:101242.
12. Harada M, Takahashi T, Haga Y, Nishikawa T. Comparative study on quick sequential organ failure assessment, systemic inflammatory response syndrome and the shock index in prehospital emergency patients: single-site retrospective study. Acute Medicine & Surgery. 2019 Apr;6(2):131-7.
13. Lind M L, Phipps, A.I., Mooney, S., Liu, C., Fohner, A., Patel, K., Ueda, M. and Pergam, S.A., 2021. Predictive value of 3 clinical criteria for sepsis (quick sequential organ failure assessment, systemic inflammatory response syndrome, and national early warning score) with respect to short-term mortality in allogeneic hematopoietic cell transplant recipients with suspected infections. Clinical Infectious Diseases, 72(7), pp.1220-1229.
14. Song JU, Sin CK, Park HK, Shim SR, Lee J. Performance of the quick Sequential (sepsis-related) Organ Failure Assessment score as a prognostic tool in infected patients outside the intensive care unit: a systematic review and meta-analysis. Critical Care. 2018 Dec;22:1-3.

ISSN (O): 2687-5365; ISSN (P): 2753-6556