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STUDY OF NEWS 2 AS A TOOL FOR IDENTIFYING ACUTELY ILL PATIENTS IN EMERGENCY DEPARTMENT

Emergency Medicine

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ABSTRACT

The global healthcare system has been under significant pressure during the Covid-19 pandemic, particularly in emergency departments and ICUs. This crisis has exposed the limitations of traditional clinical risk assessment tools, highlighting the need for validated scoring systems to identify severe Covid-19 cases accurately. Our study focused on the National Early Warning Score 2 (NEWS2), widely used in emergency medicine, to evaluate its effectiveness in Covid-19 patients compared to other risk stratification tools. Conducted at PRS Hospital, Trivandrum, over two years, the study included approximately 200 patients with Covid-19 symptoms. Data were collected through decoder sheets and patient records, with ethical clearance from the Institutional Human Ethics Committee. The study's inclusion criteria were adults over 18 who consented, excluding those with certain arrhythmias or nylon allergies. The majority of participants were aged 55-64, predominantly male, with 41% having a NEWS2 score of 0, and 83% successfully treated and discharged. Chi-Square analysis showed a significant relationship between NEWS2 scores and mortality (p-value: 0.000). NEWS2 demonstrated 100% sensitivity, 88.55% specificity, 64.15% PPV, and 100% NPV, with an overall diagnostic accuracy of 90.5%. ROC curves showed high predictive capacity, with an AUROC of 0.962. The study concludes that NEWS2 is an effective tool for identifying acutely ill patients in the Emergency Department, emphasizing the need for validated scoring systems to enhance patient care and decision-making in critical health scenarios.

KEYWORDS

NEWS 2, Emergency Department, Acutely Ill Patients, Clinical Risk Tools

INTRODUCTION

The coronavirus disease 2019 (COVID-19) pandemic has placed unprecedented strain on healthcare systems worldwide, particularly in emergency departments (EDs) and intensive care units (ICUs). A significant proportion of patients presenting with COVID-19 develop acute respiratory failure and require close monitoring or advanced respiratory support, underscoring the importance of early identification of clinical deterioration [1].

Clinical risk stratification tools, traditionally used for triage and monitoring in infectious and critical illness, have gained renewed attention in this context. However, limited studies have evaluated their applicability in patients with COVID-19 or in the broader setting of acutely unwell patients in the ED [2]. Among these, the National Early Warning Score 2 (NEWS2) has emerged as a promising tool. NEWS2 is an aggregate scoring system based on six physiological parameters: respiratory rate, oxygen saturation, systolic blood pressure, pulse rate, temperature, and level of consciousness or new confusion, with an additional adjustment for supplemental oxygen use [3]. Higher scores are strongly associated with adverse outcomes, including need for critical care admission and mortality.

Originally developed to standardize the recognition and escalation of acutely ill patients across the United Kingdom, NEWS2 has since been recommended for use in various settings, including pre-hospital care, sepsis detection, and emergency medicine [4,5]. Despite its widespread implementation, there remain concerns about its performance in certain patient groups, such as those with chronic conditions or COVID-19, where baseline physiological parameters may already be deranged [6].

Early recognition of critical illness is vital, as timely intervention can significantly improve outcomes [7]. NEWS2 offers a structured approach to risk assessment, potentially supporting clinicians in decision-making and prioritizing care in the high-demand ED environment.

This study aims to evaluate the effectiveness of NEWS2 in identifying acutely ill patients presenting to the emergency department and to explore its role as a reliable clinical tool for predicting outcomes.

Aim

Aim of the study was to evaluate the effectiveness of the National Early Warning Score 2 (NEWS2) in identifying acutely ill patients in the Emergency Department. The objectives included assessing its predictive value for clinical deterioration and outcomes, and exploring its role in guiding monitoring and escalation of care.

Methodology

This was a single-centre, prospective observational study conducted in the Emergency Department of a tertiary care hospital in Kerala, India. The department is equipped with advanced facilities and staffed by well-trained personnel capable of managing medical and surgical emergencies around the clock. The study was carried out over a two-year period, from January 2022 to December 2023, after obtaining ethical clearance from the Institutional Human Ethics Committee. Patient data were collected from records and decoder sheets. The sample size was calculated using the formula $n = 4pq/d^2$, where $p = 90$, q = 100–p, and d = 5%, yielding a minimum requirement of 144 participants. To ensure robustness, a total of 200 patients presenting to the Emergency Department with fever, breathlessness, and confirmed COVID-19 positivity were included. Adult patients (≥18 years) who provided informed consent were eligible for the study. Exclusion criteria included unwillingness or inability to provide consent, known allergy to nylon, current diagnosis of sustained or non-sustained ventricular or atrial arrhythmias, weak peripheral pulse, infectious diseases requiring isolation (such as MRSA, *Clostridium difficile*, or ESBL), presence of implantable devices such as defibrillators or pacemakers, and neurological conditions such as Parkinson's disease or essential tremor.

RESULTS

A total of 200 patients were included in the study. The mean age of the study population was 59.2 ± 13.07 years, with the majority of patients belonging to the 55–64 years age group (28.5%), followed by those aged 65–74 years (27.5%). Younger patients (<45 years) accounted for only 16% of the study population, indicating that acute illness was more common in older individuals. With respect to gender distribution, 63% were males and 37% were females, showing a male predominance among those presenting with acute illness in the emergency department.

The mean NEWS2 score was 1.02 ± 1.09. On detailed analysis, 41% of patients had a NEWS2 score of 0, while 32.5% had a score of 1, and 17% recorded the highest score of 3. When categorized into risk groups, a large proportion (73.5%) of patients fell into the low-risk category, whereas 26.5% were identified as high risk. This distribution highlights that although most patients were stable on presentation, a significant proportion had severe physiological derangements, requiring close monitoring and escalated care (Table 1).

Table 1. Distribution Of NEWS2 Scores Among Study Participants

NEWS2 Score	Frequency (n)	Percent (%)
0	82	41.0
1	65	32.5
2	19	9.5
3	34	17.0
Total	200	100.0

When patient outcomes were analyzed, it was observed that mortality occurred in 34 patients (17%), while 166 patients (83%) survived. Importantly, all deaths occurred in the high-risk NEWS2 group, whereas no mortality was recorded in the low-risk group. This underscores the excellent negative predictive value (100%) of the NEWS2 score in ruling out mortality. Furthermore, patients in the high-risk group showed a significant association with adverse outcomes, including prolonged hospital stay, need for mechanical ventilation, and longer ICU admission.

Among those requiring hospitalization, 60.5% had a length of stay exceeding 5 days, with a significantly greater proportion belonging to the high-risk group ($p = 0.003$). Similarly, the requirement for mechanical ventilation was substantially higher in high-risk patients (49.1% vs. 32.0%, $p = 0.027$). ICU admissions beyond 5 days were also more common in the high-risk group ($p = 0.021$). Mortality was strongly associated with high NEWS2 scores, with a highly significant p-value (<0.001) (Table 2).

Table 2. Association Of NEWS2 Risk Category With Clinical Outcomes

Outcome	Low Risk (n=147)	High Risk (n=53)	p-value	Significance
Hospital Stay >5 days	98 (66.7%)	23 (43.4%)	0.003	Significant
Mechanical Ventilation	47 (32.0%)	26 (49.1%)	0.027	Significant
ICU Stay >5 days	32 (21.8%)	4 (7.5%)	0.021	Significant
Mortality	0 (0%)	34 (64.1%)	<0.001	Highly Significant

Diagnostic accuracy testing demonstrated that NEWS2 was highly effective in predicting mortality, with a sensitivity of 100%, specificity of 88.55%, positive predictive value of 64.15%, and negative predictive value of 100%, resulting in an overall diagnostic accuracy of 90.5%.

Receiver Operating Characteristic (ROC) analysis further confirmed the prognostic role of NEWS2. The area under the ROC curve (AUROC) was highest for mortality (0.962; 95% CI: 0.938–0.986; $p < 0.001$), indicating excellent discriminatory ability. In contrast, predictive accuracy was modest for prolonged hospital stay (AUROC 0.616; $p = 0.012$), ICU admission (AUROC 0.571; $p = 0.125$), and mechanical ventilation (AUROC 0.585; $p = 0.065$).

DISCUSSION

The NEWS2 scale, commonly employed in specific clinical scenarios such as sepsis, has consistently demonstrated a robust correlation with the early identification of patients at risk of deterioration [8, 9]. In the present study, we extended its application to a heterogeneous population of patients presenting to the emergency department with diverse pathologies.

Demographic analysis showed that the majority of participants (28.5%) belonged to the 55–64 years age group, with a mean age of 59.2 years, and that males predominated (63%). Distribution of NEWS2 scores revealed that 41% of patients scored 0, indicating stable physiology at presentation. Despite this, the study recorded a mortality rate of 17%, with 83% of patients surviving. Statistical testing using the Chi-square method demonstrated a highly significant association between NEWS2 score and mortality ($p < 0.001$).

The evaluation of NEWS2 in predicting in-hospital mortality among adult emergency admissions confirmed its excellent performance as both a triage tool and a prognostic score. Notably, NEWS2 achieved an AUROC of 0.962 (95% CI: 0.938–0.986), indicating outstanding discriminatory ability. A comparison of ROC curves highlighted its superior predictive capacity, with significance at $p < 0.001$. Diagnostic parameters were also highly favorable, with sensitivity of 100%, specificity of 88.55%, PPV of 64.15%, NPV of 100%, and overall accuracy of 90.5%. Collectively, these findings underscore the effectiveness of NEWS2 in identifying high-risk patients early and guiding timely intervention in the emergency department.

Our results align with findings from Martín-Rodriguez et al. [10], who compared multiple pre-hospital triage systems, including the Shock Index, Glasgow-Age-Pressure Score, Revised Trauma Score, and NEWS2. Their analysis demonstrated that NEWS2 had the highest predictive capacity, with an AUROC of 0.891 (95% CI: 0.84–0.94), sensitivity of 79.7%, and specificity of 84.5% at a cutoff of 9 points. They also reported a strong negative predictive value of 98.7%, similar to our findings. A subsequent study by the same group [11] confirmed that NEWS2 consistently maintained high predictive validity for early mortality, with AUROCs of 0.862, 0.885, and 0.835 at 1, 2, and 7 days, respectively (all $p < 0.001$).

Beyond mortality prediction, NEWS2 has also proven valuable in early sepsis recognition. Evidence suggests that it performs better than the Rapid Emergency Triage and Treatment System (RETTS) for sepsis identification [12]. Moreover, modifications in NEWS2, particularly the incorporation of oxygen saturation sub-scores, provide a more accurate assessment of patients with hypercapnic respiratory failure compared to the original NEWS scale. These enhancements explain the increasing adoption of NEWS2 in diverse emergency settings.

Interestingly, when comparing triage classification with NEWS2 scoring in our study, we observed a comparable mortality percentage between triage level 1 patients and those with NEWS2 ≥10. However, interpretation must account for the inherent differences between systems: lower triage scores indicate higher severity, whereas higher NEWS2 scores reflect increased severity. Despite this inverse scoring relationship, the observed mortality ratios were similar, reinforcing the clinical relevance of NEWS2 as an adjunct to traditional triage.

It is noteworthy that the cutoff point in our study population appeared higher than the threshold established in the United Kingdom, where a NEWS2 score of 7 is typically considered the marker of increased mortality risk [13]. This discrepancy highlights the need for population-specific validation of NEWS2 thresholds, as local variations in patient demographics, comorbidities, and disease spectrum may influence score performance [14].

Taken together, these findings support the robust role of NEWS2 in predicting mortality and guiding early intervention among acutely ill patients in the emergency department. Our data add to the growing body of evidence advocating for its widespread implementation while also emphasizing the importance of contextual adaptation to local patient populations.

CONCLUSION

The study highlights the effectiveness of NEWS2 as a reliable predictor of mortality among patients presenting to the Emergency Department. A threshold score of ≥4 was found to be significantly associated with a higher risk of adverse outcomes, underscoring the need for urgent escalation of care and close monitoring in this group. Conversely, patients with a NEWS2 score of 0–1 represented a very low-risk category, with minimal likelihood of deterioration, thereby

allowing for more efficient allocation of clinical resources. These findings emphasize the value of NEWS2 in risk stratification, enabling healthcare providers to tailor interventions based on severity and ensure timely, appropriate management. By establishing clear trigger points for escalation and low-risk identification, NEWS2 emerges as a practical, evidence-based tool for optimizing triage decisions and improving patient outcomes in the emergency setting.

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