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Original Research

Use National Early Warning Score In The Prognosis Of Stroke Patients In The Emergency Department

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ABSTRACT

Introduction: Few scoring systems are used in the emergency department to identify critically ill patients and anticipate patients' deterioration such as National Early Warning Score (NEWS). This study aimed to evaluate NEWS in patients with acute stroke and its relationship with treatment and type of stroke and patient outcome.

Methods: In this prospective cross-sectional descriptive-analytical study, all patients over 18 years of age with a diagnosis of ischemic stroke, who presented through the emergency department, were involved. The variables of interest were collected; the NEWs score was calculated for each patient.

Results: In assessing NEWS and its relationship with outcome based on the ROC curve, the area under the curve was equal to 0.417. Considering the high intensity of NEWS above 7, sensitivity, specificity, positive predictive value, negative predictive value, PLR, and NLR were 16.67%, 98.77%, 83.33%, 74.45%, 13.5, 0.84 respectively. In assessing NEWS and its relationship with stroke type on the ROC curve, the (AUC) was equal to 0.526. Considering the high intensity of NEWS above 7, sensitivity, specificity, positive predictive value, negative predictive value, PLR, and NLR were 8.33%, 94.95%, 16.67%, 88.53%, 1.65, and 0.97 respectively.

Conclusion: In terms of outcome, NEWS seems to have acceptable specificity and positive and negative predictive values. Regarding the type of stroke, NEWS has an acceptable specificity but it only has a negative predictive value about the non-hemorrhagic type of stroke. This means that if the NEWS number is LOW, the probability is that the type of stroke is ischemic and the patient outcome is good.

Keywords: national early warning score, stroke, early warning score, track and trigger system, stroke subtype.

INTRODUCTION

Worldwide, Stroke is the second most common cause of mortality and disability.[1] While the incidence of stroke is decreasing in high-income countries, the opposite is true in low-income countries.[2] In general, stroke-related deaths are descending worldwide, but the stroke-related disability and the problems that follow are increasing.[3] It seems that effectively organized stroke care from treatment to early secondary stroke prevention can reduce almost 25-30% mortality and morbidity in patients with stroke.[4]

An acute ischemic stroke (AIS) is an occlusion in one of the central nervous system's supplying arteries resulting in focal tissue infarction and relatively sudden neurological deficits.[5] For timely and effective action to be taken, high-risk patients must be identified and assessed immediately. Few scoring systems are used in the emergency departments (ED) that quickly and accurately diagnose critically ill patients and predict hospitalization, such as EWS and NEWS.

Early Warning Score (EWS); was first proposed in 1997. It assists with the detection of physiological changes including vital signs and the mental state of patients.[6] EWS was widely used in the field of first aid. Over the years, it has improved to a Modified Early Warning Score (MEWS). MEWS's accuracy

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was higher for assessing disease progression and diagnosis of critically ill patients in the emergency department, but it still had defects such as low prediction sensitivity.[7] Eventually, in 2012, The Royal College of Physicians in the UK created the National Early Warning Score (NEWS), considering oxygen saturation.[8] The National Early Warning Score (NEWS) is a track and triggers system that has a reliable ability to distinguish ward patients at risk of severe adverse events[9] and is a fast and credible prediction system for disease. It can be helpful to monitor patients throughout their stay in ED. NEWS can be used in different fields; since only one study has been performed on patients with acute stroke; this study aimed to evaluate NEWS in patients diagnosed with acute stroke and its relationship with treatment and type of stroke, and patients outcome.

MATERIALS & METHODS

This research was approved by the regional ethics committee of Tabriz University of Medical Sciences, registered under the number IR.TBZMED.REC.1399.269.

All patients' information was kept confidential, and consent was obtained from the patients.

A descriptive-analytical study was performed as a prospective cross-sectional research at the emergency department of Imam Reza hospital.

We included all patients over 18 years of age with a diagnosis of ischemic stroke (with symptoms of a neurological defect that has started acutely) who admitted to the ED. Patients who were under 18 years old, those who died before filling the checklist, those whose status did not allow filling of the checklist due to emergency interventions, and patients who entered the emergency room intubated, were excluded from the study. Then, the variables of data including age, sex, type of the stroke, indication for thrombolytic administration, receiving thrombolytic or not, the duration of hospitalization, and patient outcome were collected; also, NEWs scores were calculated for each patient based on six physiological parameters containing respiration rate, oxygen saturation, systolic blood pressure, pulse rate, level of consciousness or new confusion, and temperature.[10,11]

All the data were analyzed by SPSS® 15.0.0 software (SPSS Inc, Chicago). The Kolmogorov-Seminorov test was run for assessing normal distribution. Eventually, the mean, median of the data, standard deviation, and frequency were calculated descriptively. Logistic regression and Pearson's correlation were used to estimate the relationship between the data. The ROC curve was drawn for NEWS, type of stroke, and patients' outcomes. The p-value for statistical significance was considered less than 0.05.

RESULTS

A total of 333 patients who presented with signs or symptoms of acute stroke were studied. Age did not obey normal distribution. Inter Quartile Range

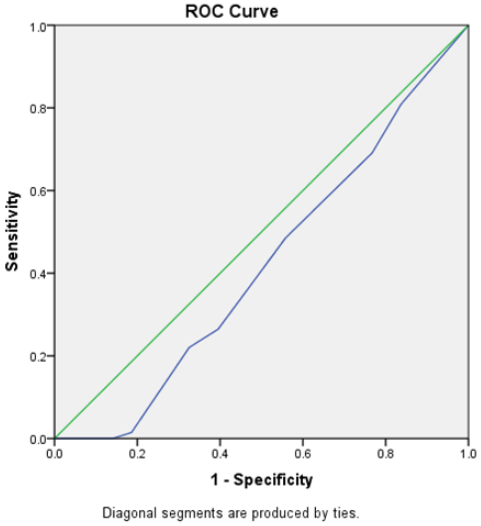

Figure 1 ROC curve between outcome and NEWS

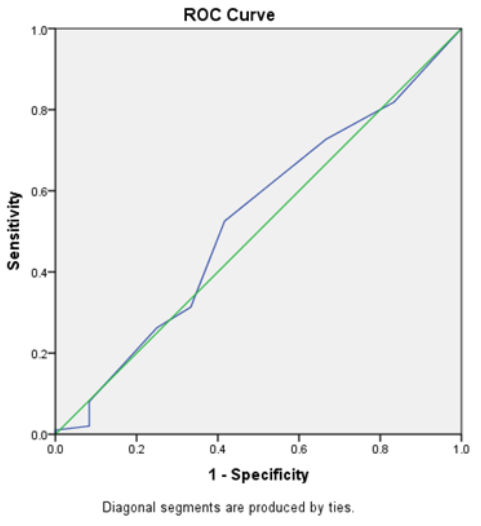

Figure 2 ROC curve between stroke type and NEWS

(IQR) of the population was between 34-76 years old. Gender diversity was 37.8% women and 62.2% men. The prevalence of stroke among patients included 11% hemorrhagic stroke and 89% ischemic stroke. Regarding assessing NEWS for the patients, 18 patients had an equal score or greater than 7. Out of 333 patients, 90 patients (27.0%) had died, and 40 patients (12%) left ED against physician advice.

Regarding assessing NEWS and its relationship with the outcome, based on the ROC curve (Figure 1), the area under the curve (ROC) was equal to 0.417. Considering the high intensity of NEWS above 7, specificity, sensitivity, positive predictive value, negative predictive value, Positive Likely-hood Ratio (PLR), and Negative Likely-hood Ratio (NLR) were 98.77%, 16.67%, 83.33%, 74.45%, 13.5, and 0.84 respectively.

Regarding assessing NEWS and its relationship with the type of stroke on the ROC curve (Figure 2), the area under the curve was equal to 0.526. Considering the high intensity of NEWS above 7, specificity, sensitivity, specificity, positive predictive value, negative predictive value, PLR, and NLR were 94.95%, 8.33%, 16.67%, 88.53%, 1.65, and 0.97 respectively.

Stroke type had a significant relationship with the outcome, but this relationship was weak ($p < 0.001$, correlation coefficient: 0.103). There was a relationship between the NEWS result and the outcome, and this relationship was also weak ($p = 0.033$, correlation coefficient: 0.277). There was a significant but weak relationship between sex and the outcome ($p = 0.023$, correlation coefficient: 0.029).

DISCUSSION

In most critical patients, early treatment is an essential determinant of successful intervention, and late interventions affect patients' outcomes and recovery; thus, having a system to warn us about these patients would be very helpful. Critical illness is often anticipated by physiological deterioration.[12] Track and trigger systems are designed to facilitate the timely realization of patients with possible or identified critical conditions.[13]

In recent years, (EWS) has become increasingly used in hospitalized patients around the world, providing tools for detecting potential deterioration. However, a proper clinical response, including experienced intensive care staff, can only be effective in responding to a changing clinical situation by reducing adverse outcomes.[14]

In Yuan's study, the performance of NEWS for predicting admission to the intensive care unit and 28-day mortality was lower than Acute Physiology and Chronic Health Evaluation II but better than MEWS. NEWS was able to quickly predict the prognosis of the disease and assess the progression of critical patients' condition in the resuscitation room. Therefore, potential critical patients could be evaluated in the early stages, leading to timely treatment and improved prognosis.[10]

Nickel et al. suggested that the combination of NEWS and D-dimer scores is potentially a capable tool in assessing the patient's risk of acute illness, and could identify patients with a low risk of mortality within 30 days; Furthermore, these patients could be taken care of, in an outpatient setting.[15]

The Sbiti-Rohr hypothesized that NEWS would correspond with short and long-term side effects in patients with CAP (community-acquired pneumonia) and was likely to develop patients' risk prediction compared to the score assigned to CAP. Their study aimed to compare the accuracy of NEWS with PSI and CURB-65 in the prediction of death rate and clinical side effects in a specific group of patients with CAP from a previous randomized controlled trial. Rohr et al. Used NEWS to provide additional prognostic information about the risk of empyema and ICU admission and its complications; thus, aiming to improve the traditional clinical CAP scoring in patient management in the ED.[16]

In a study conducted by Wang et al. about comparing NEWS and MEWS in patients with stroke, the predictive ability of the two scores was compared. When death was considered as a prediction index; the results were as follows: The area under the ROC curve of NEWS was AUC=0.906, the best-truncated point was 4.5 score, sensitivity was 84.1%, and specificity was 86.1%. The area under the ROC curve of MEWS was AUC=0.846, the best truncated-point was 2.5 score, sensitivity was 80.5%, specificity was 77.9%, and the difference between them was statistically significant ($Z = 3.324$, $p < 0.05$). It showed that NEWS had a higher predictive value than MEWS in the prediction prognosis of patients with stroke in the emergency department. Therefore, the NEWS score is a beneficial tool to predict the prognosis

of stroke patients in the emergency department and has a better value than MEWS.[17]

In our study, regarding assessing the correlation between News and the outcome of stroke, the area under the ROC curve was AUC = 0.417, the best-truncated point was 7; sensitivity and specificity were 16.67% and 98.77% respectively. Regarding assessing the correlation between News and type of stroke, the area under the ROC curve was AUC = 0.526, and the best-truncated point was 7; sensitivity and specificity were 8.33, and 94.95% respectively. There was a significant but not strong relationship between NEWS and outcome, type of stroke and outcome, and sex and outcome.

Fullerton et al. study suggested that no early warning score can take over clinical evaluation, and there are many conditions in which decisions regarding clinical management; must be made based on other criteria.[18]

A study by Wheeler et al. affirms that the scores calculated for a patient or healthcare system may not be usable in other communities or healthcare systems.[19]

No prognostic score can assess all at-risk patients with conflicting outcomes. Hence, NEWS should not replace clinical judgment, but can be used as a complete judgment criterion that helps physicians make more practical decisions.

Future studies should focus on the improvement of a simple, but valid EWS for the entire acute health care system, which may lead to improved care for all patients.

This study was done in the central hospital, which has most of the facilities; for check and recheck of these findings, it is better to run this study in a small hospital with defined facilities.

CONCLUSIONS:

Based on this study, in terms of outcome, NEWS seems to have acceptable specificity and positive and negative predictive value. Regarding the type of stroke, NEWS has an acceptable specificity but it only has a negative predictive value about the non-hemorrhagic type of stroke. This means that if the NEWS number is low, the probability is that the type of stroke is ischemic and the patient outcome is good, but if the NEWS number is high, it is not possible to make a proper judgment about the type of stroke and the patient outcome.

Conflicts of Interest

Authors declare no conflicts of interest or sources of funding.

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