10.5958/0974-9357.2019.00101.6

Modified Early Warning Score (MEWS) as Predictor of Deterioration Risk on Patient with Stroke in Emergency Unit in Malang

Rizka Hayyu Nafiah[1], Ahsan[2], Toni Suharsono[2]

[1]Master Student of Nursing, [2]Department of Nursing, Faculty of Medicine, University of Brawijaya

Abstract

Stroke is a acute nerve function disorder due to disruption of blood circulation in the brain that occurs suddenly or quickly causes symptoms and signs that correspond to the affected focal area. Stroke is one of the diseases that cause death, disability, reduce a person's productivity, and increase the economic burden. This is related to the deterioration condition of the patient while in the emergency unit.

This research is an observational analytic study with a cohort design through a prospective approach. The population in this study was stroke patients who entered the emergency unit in Malang. The number of samples of this study was 109 patients obtained by purposive sampling technique. Data were collected using observation sheets and analyzed by univariate and bivariate analysis.

The result of bivariate analysis used Mann-Whitney test shown that there was a significant correlation between MEWS and the risk of deterioration in emergency unit with a value of p=0.000. The ROC test results obtained AUC value 0.830, MEWS score was >4 and had sensitivity of 46.2% and specificity of 95.7%. Conclusion MEWS is a good predictor in detecting risk of deterioration, simple, easy and fast to do in the emergency unit.

Keywords: *MEWS, deterioration, stroke, emergency unit.*

Introduction

Stroke is one of the biggest health problems in the world which resulting in increasing of mortality, disability and reducing a person's productive time thus increase the socio-economic burden. The data survey of World Health Organization (WHO) during 2000-2016 stated that stroke was the second highest after ischemic heart disease with an increase of 4.56 million people from total of 569 million people during 2000 to 2016[(1)]. In Asia, the highest mortality rate for stroke patients in Mongolia reaches 222.6/100,000 people per year and Indonesia reaches 193.3/100,000 people per year[(2)].

The high mortality due to stroke is related to the deterioration condition of patient. The deterioration condition of patient is a condition that endangers the patient, increases the length of stay and the occurrence of disability in the body[(3)]. Deterioration can also increase the patient's risk of disability and even the death of the patient, so it is required to immediately refer to the unit of intensive care unit (ICU)[(4)]. Deterioration on patient can be determined based on deterioration clinical conditions. in the form of abnormalities of vital signs[(5)]. Thus, patients need special attention and strategies to prevent this deterioration in the emergency unit by using modified early warning score (MEWS).

The visit of stroke patients in the emergency unit from 2017-2018 reached 1252 patients with the number of patient deaths reaching 240 patients (19%). The results of interviews with health workers at the emergency unit stated that they had not used a scoring system to detect deterioration in patients. Based on this, it is necessary to conduct research to determine the correlation of MEWS to predict deterioration of patients with stroke in emergency unit.

Methodology

This study was an analytical observational study with a cohort design through a prospective approach. The population in this study was stroke patients who entered the emergency unit, the purposive sampling technique was used to obtain a total sample of 109 people. The selection of samples is based on inclusion

criteria, which were patients with stroke who enter the emergency unit with the age of 18 years or more, and patients with stroke who have medical record data which includes blood pressure, respiratory frequency, pulse frequency, level of consciousness, body temperature, history of hypertension, diabetes mellitus, and heart disease. The tool used in this study was in the form of patient observation sheet consisting of demographic data and table of measuring parameters result of clinical signs of respondents. The MEWS parameter consisted of measurement of consciousness, respiratory frequency, pulse frequency, systolic blood pressure, and temperature.

Result

1. **Univariate Analysis:** General description of respondent characteristics based on patient demographic data, pulse frequency, systolic blood pressure, respiratory frequency, temperature, level of consciousness, oxygen saturation, patient deterioration.

Table 1: Distribution of Characteristics of Respondents Based on Gender, Age, History of Disease, and Deterioration

Characteristic of Respondents	N	(%)
Gender		
Male	53	48,6
Female	56	51,4
Medical History None	33	30,3
Available:	76	69,7
• Cardiovascular (hypertension and heart disease)	58	76,3
• Diabetes Mellitus	3	3,9
• Hypertension and Diabetes Mellitus	13	17,1
• Diabetes Mellitus and Heart	1	1,3
• Hypertension, Diabetes Mellitus and Heart Disease	1	1,3
Deterioration		
Not experiencing deterioration	70	64,2
Experiencing deterioration	39	35,8
Gender		
Male	20	69
Female	19	31
Total	**109**	

Table 1 shows the prevalence of stroke patients in woman is 54,1%, 76,3% patients with history of cardiovascular disease, 35.8% patients who has risk of deterioration and 69% risk of deterioration occurred in men.

Table 2 Characteristics of Respondents Distribution by age

Characteristic of Respondents	Mean	Min-Max
Age (years)	62,14	31-97
Male	63, 37	38-97
Female	60,96	31-95

Table 2 shown the average age of respondents who had a stroke was 62 years old, with minimum and maximum is 31and 97 years old.

2. **Bivariate Analysis:**

Table 3 Tests Results for Correlation between MEWS and Deterioration Risk

Scoring	Mann-Whitney U	
	Median (Min-Max)	Nilai p
MEWS		
No	1 (1-4)	0,000
Deterioration	3 (0-9)	
Total	**109**	

*MEWS = modified early warning score

Table 3 was shown the value of p=0.000 indicated there was a significant correlation between MEWS and the risk of deteriorating condition of the patient.

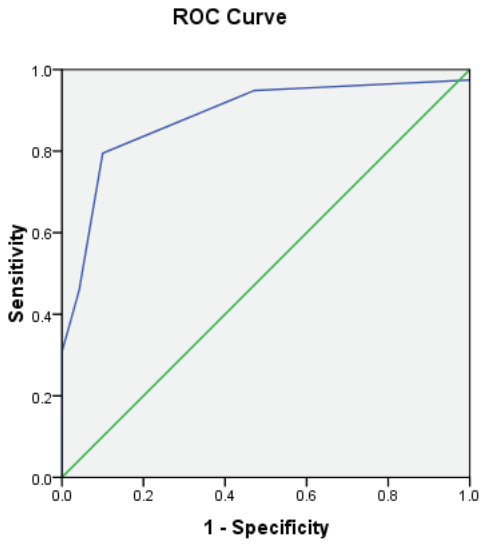

Table 4 Description of the AUC Value

	Area	Std. Error	p-value	IK 95%	
				Bottom	Up
MEWS	0,830	0,037	0,000	0,811	0,957

*MEWS = modified early warning score

Table 4 was shown that the AUC value of MEWS measurements was 0.830 (95% CI 0.811 - 0.957)

Table 5 Accuracy of MEWS Score in Detecting Deterioration

	Cut-off	Sensitivity	Specificity
Score of MEWS	4	0,462	0,957

*MEWS = modified early warning score

Figure 1 and table 5 were shown the value of cut-off point of MEWS, which was at a score of 3.4, which indicated that deterioration could be detected if the score of MEWS was 4, with sensitivity of 0.462 and the specificity of 0.957.

Discussion

MEWS was a simple, easy and fast scoring system used by nurses or other medical personnel, especially in the emergency unit. MEWS was used as early detection to determine the risk of deteriorating condition the patient, thus the medical staff could plan the right action for the patient. The deteriorating condition could be found based on the value of abnormalities of vital signs, as well as where the patient was treated.

In this study shown that 51.4% of the occurrence of stroke was more common in women than men. The prevalence was influenced by various factors, one of which was due to differences was sex hormones namely estrogen. Estrogen has an important role as neuroprotective and anti-inflammatory to reduce the occurrence of ischemic brain injury. When women entered menopause period, the production of the estrogen hormone decreased and the occurrence of atherosclerosis increased[6–8]. In line with this, the average age of women in this study was 61 years old and at that age a woman had entered menopause.

The medical history of the most diseases accompanying the respondent was a disorder in the cardiovascular system in the form of hypertension and heart disease which was 76.3%. This research was in line with the research of Khajedaluee et al., (2016) which stated that hypertension was more common in men[9]. Barker-Collo et al., (2015) also stated that ischemic strokes occurred higher in men than women and that these differences were caused by the presence of risk factors such as disorders of the cardiovascular system[10].

The results of the bivariate analysis shown that there was a significant correlation between MEWS and the risk of deterioration. MEWS had an AUC value of 0.884 (IK95% 0.739-0.920), with a cut-off score of 4, a sensitivity of 71.8% and a specificity of 92.9%. Patients who were in poor condition would be treated in a special unit such as the intensive care unit (ICU), but if the patient was stable and good enough they would be treated in the general care.

Subbe et al., (2001) stated that the score of MEWS that more than >4 was at high risk of experiencing catastrophic deterioration and ICU care should be conducted. Not only in ICU, MEWS could also be used in the operating unit[11]. According to Suwanpasu and Sattayasomboon (2016) the score of MEWS which more than >4 was more accurate than score of MEWS which more than >5. It was known that based on the AUC value of MEWS >4 was 0.778 (95% CI: 0.715 to 0.841) and MEWS >5 was 0.646 (95% CI: 0.611 to 0.682) in predicting mortality at hospital[12]. Lee & Choi's research (2014) used MEWS to predict the need or not to move patients to the ICU from the general care. The cut-off value obtained in this study was 6 with a sensitivity value of 89.5% and specificity of 67.7%. The study concluded that MEWS was an effective predictor for use in determining the transfer of patients to the ICU treatment unit[13].

Hurtado et al., (2016) stated that MEWS could be used by nurses in the emergency unit, general care and as a triage tool when medical personnel wanted to determine whether patients need to be hospitalized or not and determined the unit where patients would be treated[14]. Assessment of the condition of patients in the pre-hospital using clinical assessment had a low sensitivity in predicting critical illness, but if added to the MEWS score assessment it could improve predictions of future deteriorating conditions[15]. According to Galen et al., (2016) MEWS was a strong predictor of predicting hospitalization after 30 days, and concluded that MEWS could predict a deterioration of 83% with a negative predictive value of 98.1%, which indicated that MEWS was reliable as a screening tool[16].

Suppiah et al., (2014) stated that MEWS could predict a poor prognosis with AUC value of 0.924. The author found that if the MEWS score was more than > 3, then the sensitivity was 95.5%, the specificity was 90.8%. mentioned that MEWS had advantages that could be used to obtain new prognostic scores, easy and fast use, checks and calculations could be repeated,

detected hospitalizations in hospitals, and were reliable and might be superior to other scoring systems[17]. Besides being able to predict the incidence of mortality, MEWS had also been shown to predict the occurrence of heart attacks, survival, and length of stay in the hospital[14,16,18–20].

Conclusion

There was significant correlation between MEWS and deterioration of stroke patients during treatment at the emergency unit, thus MEWS could be used as an instrument to determine the risk of deterioration on patient with stroke.

Conflict of Interest: There is no conflict of interest in this study

Funding Source: This study uses researcher's personal funds and does not get funding from any party.

Etichal Clearance: This research has been declared eligible of ethics by the Health Research Ethics Commission of the Faculty of Medicine, Universitas Brawijaya.

References

1. WHO. The top 10 causes of death. World Health Organization. 2018.
2. Venketasubramanian N, Yoon W, Pandian J, Navarro C. Stroke Epidemiology in South, East, and South-East Asia : A Review. J Stroke. 2017;19(3):286–94.
3. Santos MD, Clifton DA, Tarassenko L. Performance of Early Warning Scoring Systems to Detect Patient Deterioration in the Emergency Department. 2014;159–60.
4. Singer AJ, Jr HCT, Viccellio P, Pines JM. The Association Between Length of Emergency Department Boarding and Mortality. Acad Emerg Med. 2011;18(12):1–6.
5. Henriksen DP, Brabrand M, Lassen AT. Prognosis and Risk Factors for Deterioration in Patients Admitted to a Medical Emergency Department. PLoS ONE 9(4) e94649. 2014;9(4):1–7.
6. Ljunggren M, Castrén M, Nordberg M, Kurland L. The association between vital signs and mortality in a retrospective cohort study of an unselected emergency department population. Scand J Trauma Resusc Emerg Med [Internet]. Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine; 2016;(May). Available from: http://dx.doi.org/10.1186/s13049-016-0213-8
7. Hosking J, Care GC, Considine J, Acutecare G. Recognising clinical deterioration in emergency department patients. Australas Emerg Nurs J [Internet]. College of Emergency Nursing Australasia; 2014;17(2):59–67. Available from: http://dx.doi.org/10.1016/j.aenj.2014.03.001
8. Jones D, Mitchell I, Hillman K, Story D. Defining clinical deterioration. Resuscitation [Internet]. European Resuscitation Council, American Heart Association, Inc., and International Liaison Committee on Resuscitation.~Published by Elsevier Ireland Ltd; 2013;84(8):1029–34. Available from: http://dx.doi.org/10.1016/j.resuscitation.2013.01.013
9. Khajedaluee M, Hassannia T, Rezaee A. The prevalence of hypertension and its relationship with demographic factors, biochemical, and anthropometric indicators : A population-based study Abstract Original Article. ARYA Atheroscler. 2016;12(6):259–65.
10. Barker-collo S, Bennett DA, Krishnamurthi V, Murray CJL, Roth A, Group W. Sex Differences in Stroke Incidence, Prevalence, Mortality and Disability-Adjusted Life Years : Results from the Global Burden of Disease Study 2013. Neuroepidemiology. 2015;45:203–14.
11. Subbe CP, Kruger M, Rutherford P, Gemmel L. Original papers QJM Validation of a modified Early Warning Score in medical admissions. Q J Med. 2001;94:521–6.
12. Suwanpasu S, Sattayasomboon Y. Accuracy of Modified Early Warning Scores for Predicting Mortality in Hospital : A Systematic Review and Meta-analysis Abstract. iMedPub Journals. 2016;2(2):1–11.
13. Ry JL, Ran CH. Validation of a Modified Early Warning Score to Predict ICU Transfer for Patients with Severe Sepsis or Septic Shock on General Wards. J Korean Acad Nurs. 2014;44(2):219–27.
14. Hurtado JJD, Berger A, Bansal AB. Emergency department Modified Early Warning Score association with admission, admission disposition, mortality, and length of stay. J Community Hosp Intern Med Perspect. 2016;1:1–5.
15. Fullerton JN, Price CL, Silvey NE, Brace SJ, Perkins GD. Is the Modified Early Warning

Score (MEWS) superior to clinician judgement in detecting critical illness in the pre-hospital environment? Resuscitation [Internet]. European Resuscitation Council, American Heart Association, Inc., and International Liaison Committee on Resuscitation.~Published by Elsevier Ireland Ltd; 2012;83(5):557–62. Available from: http://dx.doi.org/10.1016/j.resuscitation.2012.01.004

16. Galen LS Van, Dijkstra CC, Ludikhuize J, Kramer MHH. A Protocolised Once a Day Modified Early Warning Score (MEWS) Measurement Is an Appropriate Screening Tool for Major Adverse Events in a General Hospital Population. 2016;65:1–12.
17. Suppiah A, Malde D, Arab T, Hamed M, Allgar V. The Modified Early Warning Score (MEWS): An Instant Physiological Prognostic Indicator of Poor Outcome in Acute Pancreatitis. JOP J Pancreas. 2014;15(6):569–76.
18. Kyriacos U, Jelsma J, James M, Jordan S. Monitoring Vital Signs : Development of a Modified Early Warning Scoring (Mews) System for General Wards in a Developing Country. PLoS ONE 9(1) e87073. 2014;9(1):1–10.
19. Johnson S, Nileswar A. Effectiveness of Modified Early Warning Score (MEWS) in the Outcome of In-Hospital Adult Cardiac Arrests in a Tertiary Hospital. J Pulm Respir Med. 2015;(4):4–6.
20. Tavares RCF, Vieira AS, Uchoa LV. Validation of an Early Warning Score in Pre-Intensive Care Unit. Rev Bras Ter Intensiva. 2008;20:124–7.