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Research

Effect of Early Warning Score on Length of Stay and Mortality of Non-Surgical Patients in the Intensive Care Room at Dr. Moewardi Hospital Surakarta

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ABSTRACT

Background: One of the efforts to improve the quality of life and patient safety in hospitals is the use of the Early Warning Score (EWS). The purpose of this study was to analyze the effect of EWS on length of stay and mortality of non-surgical patients in the intensive care unit of Dr. Moewardi Hospital Surakarta.
Subjects and Method: This study is an observational study conducted using a prospective cohort study. A purposive sampling study conducted on June 10 - July 10 was carried out by taking a sample of 120 non-surgical patients in the ICU of Dr. Moewardi Hopital, Surakarta with inclusion and exclusion criteria. This study chose the early warning score as the independent variable and length of stay and mortality as the dependent variable. The method of collecting data on EWS, length of stay, and mortality was using an observation sheet filled out by the researcher. This study assessed differrences in baseline characteristics and outcomes using the Chi-Square test and one-way analysis of variance (ANOVA).
Results: There is a statistically significant effect of EWS on length of stay ($p = 0.024$). EWS also has a statistically significant effect on mortality $p<0.001$.
Conclusion: There is an effect of EWS on length of stay and mortality of non-surgical patients.

Keywords: EWS, length of stay, mortality, non-surgical patients, intensive care

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BACKGROUND

Non-surgical patients are patients without surgery who receive non-operative treatment as an initial management strategy for soft tissue injuries including rest, ice, compression, and elevation (RICE) (Chu & Rho, 2016). Patients with severe or critical conditions are treated in the intensive care room (Ministry of Health Republic of Indonesia, 2018). Intensive care rooms are grouped into ICU, ICCU, NICU, PICU, and HCU for the treatment of patients with injuries to potentially life-threatening illnesses (Listyorini, 2019). This room provides special medical facilities and infrastructure to improve the function of vital tools with the skills of trained and experienced medical personnel (Alfana et al., 2017). The highest referral patient scale in the ICU Dr. Moewardi Hospital Surakarta in 2014 was 2.7%

or 27 patients from a total of 1000 patient visits, while the highest mortality scale in 2015 and 2018 was 94% or 94 patients who died. of 100 people referred (Listyorini, 2019). The number of inpatients at Dr. Moewardi Hospital from 2018 to 2019 decreased by 3.32% or 1,243 people with a length of hospitalization of 3.90 days (Laporan Tahunan RSUD Dr. Moewardi, 2019).

Length of stay (LoS) is a measure of the efficiency of health service performance in hospitals. Hospitalization that takes longer shows that medical services to patients are not good so that the funds spent by patients are increasing (Virdania et al., 2018). Inpatient services are associated with patient mortality. Mortality is a widely used performance indicator because it has minimal measurement error, is easy to assess, and is very important for administrators, clinicians, and patients (Weaver et al., 2013). The age range of a person's death due to critical illness is between 30 to 70 years with a percentage of 40% chronic respiratory disease, 19% cardiovascular disease and cancer, and 5% diabetics (Alfana et al., 2017). Although death is still a "black and white" event, it is often the leading indicator of the general health and well-being of a population (Caswell, 2009). One of the efforts to improve the quality of life and patient safety in hospitals is the use of the Early Warning Score (EWS). EWS is a clinical tool designed to alert medical personnel to health problems in patients (Royal College of Physicians of London., 2012).

The application of EWS is based on seven clinical parameters namely 6 vital signs and AVPU scale (alert, voice, pain, unresponsive) and produces an overall score between 0 and 20. Low risk patients with an overall score of 4, moderate risk with an overall score of 5 and 6, and is at high risk if it reaches a value of 7 which means the patient requires continuous monitoring of vital signs so that it is possible to be transferred to the intensive care unit. Even so, EWS ratings below 7 can still be diagnosed with clinical problems such as patients with a score of 0-2 to more than 3 experiencing a tenfold increase in hospital mortality (Doyle, 2018). Based on this background, the effect of early warning scores on length of stay and mortality in non-surgical patients in the intensive care unit of Dr. Moewardi Hospital Surakarta.

SUBJECTS AND METHOD

1. Study Design

This study is an observational study conducted using a prospective cohort study. The place where the research was conducted was in the intensive care unit of Dr. Moewardi Hospital Surakarta because it has a large number of patients with a strategic location in the range of June to July 2022.

2. Population and Sample

The target population of this study was 120 non-surgical patients. The actual population is inpatients without surgery in the intensive care unit of Dr. Moewardi Hospital Surakarta. Based on this actual population, samples can then be taken using criteria that are suitable for research, namely inclusion and exclusion criteria. The inclusion criteria were non-surgical patients who were treated in the intensive care unit at least 18 years old, while the exclusion criteria were pregnant women. The research sample was obtained through purposive consecutive sampling technique. This technique is a sampling using research subjects based on the inclusion and exclusion criteria that have been set by the researcher within a certain period of time.

3. Study Variables

The dependent variables in this study were length of stay and mortality of non-surgical

patients. While the independent variable is the early warning score.

4. Operational definition of variables

Early Warning Score (EWS) with the definition of a simple scoring system to see the deterioration of the patient's physiological condition. The length of stay is a parameter of the number of days the patient receives hospitalization within a certain period of time.

Mortality is a state of permanent loss of signs of life.

5. Study Instruments

The scale used on the EWS is categorical with a range of measurement results for very low risk patients with a score of 0, low risk with an overall score of 4, moderate risk with an overall score of 5 and 6, and high risk if it reaches a value of 7. The scale used on the length of stay is numeric with measurement results in days. The scale used for mortality is categorical and the measurement results are for example 1 if the patient has died and 2 if the patient is still alive. The method of collecting data on EWS, length of stay, and mortality was using an observation sheet filled out by the researcher.

6. Data analysis

The data that has been obtained is then processed using the Kolmogorov-Sminorv test for normality test. This study assessed differences in baseline characteristics and outcomes using the Chi-Square test and one-way analysis of variance (ANOVA). If the ANOVA analysis showed significant differences, the researchers applied the Turkey post-hoc test to detect differences between risk categories. P value <0.05 was considered statistically significant. All statistical analysis in this study was performed using the IBM SPSS Statistics for Windows version 23.0 application.

7. Research Ethics

This research ethics approval letter was obtained from the Research Ethics Committee at Dr. Moewardi Hospital, Surakarta, Indonesia, No. 619/V/HREC/2022, on 20 May 2022.

RESULTS

1. Sample Characteristics

This research was conducted in the intensive care unit of Dr. Moewardi Hospital Surakarta. The intensive care room used is the ICU and HCU through 24-hour service. The ICU room is located on the 1st floor of The Mawar Building. This intensive service is intended for all cases of disease with adult and pediatric patients. While the HCU room is located on the 2nd floor of The Orchid Building. Intensive care in this room is intended for non-cardiac adult critical patients.

Table 1. Sample characteristics

Characteristics	Category	Frequency	Percentage
Age	18-24 years old	2	1.67
	25-44 years old	21	17.50
	45-59 years old	37	30.83
	≥ 60 years old	60	50.00
Gender	Male	70	58.33
	Female	50	41.67
Room	ICU	60	50.00
	HCU	60	50.00

There were 120 non-surgical patients who were treated in the intensive care unit of Dr. Moewardi Hospital found that patients aged 18-24 years were 2 people (1.67%), patients aged 25-44 years were 21 people (17.50%), patients aged 45-59 years were 37 people

(30.83%), and patients aged more than equal to 60 years were 60 people (50.00%). Non-surgical patients had 70 male gender (58.33%) and 50 female (41.67%). Intensive care rooms used are ICU and HCU with a percentage of 50.00% each. Characteristics of respondents can be seen in Table 1.

Table 2. Effect of EWS on Length of Stay

Variables	Category	Leng of Stay						p
		Low		Moderate		High		
		n	%	n	%	n	%	
EWS	Low	15	21.13%	12	44.44%	7	31.82%	
	Moderate	29	40.85%	12	44.44%	10	45.45%	0.024
	High	27	38.03%	3	11.11%	5	22.73%	

Table 3. Effect of EWS on Mortality

Variables	Category	Mortality				p
		Death		Life		
		n	%	n	%	
EWS	Low	6	12.24%	28	39.44%	<0.001
	Moderate	26	53.06%	25	35.21%	
	High	17	34.69%	18	25.35%	

2. Bivariate Analysis

Based on the results of table 2, the number of non-surgical patients in the ICU of RSUD Dr. Moewardi with low EWS as many as 34 people, as many as 51 people, and as many as 35 people with weight. EWS with statistically significant length of stay (p= 0.024).

The number of non-surgical patients in the ICU of RSUD Dr. Moewardi who died with a total of 49 people through details, namely low EWS as many as 6 people, moderate scores as many as 26 people, and severe scores as many as 17 people. The description of non-surgical patients who are still alive is 71 people, namely 28 people with low EWS, 25 people with moderate scores, and 18 people with severe scores.

DISCUSSION

This study aims to determine the effect of the early warning score on the length of stay and mortality of non-surgical patients in the intensive care unit of Dr. Moewardi Hospital Surakarta. Descriptively, it can be said that the non-surgical patients treated in the ICU and HCU rooms are mostly aged more than 60 years and there are more males. According to Kuan-Hung Lin (2020) inpatients are more common, namely males with a younger age or who receive acute reperfusion therapy (Lin et al., 2022). Studies from western countries have found that being younger and being male is strongly associated with prolonged length of stay and occurs more frequently in urban hospitals (Doctoroff et al., 2017). Hospitalized patients are slightly younger and more likely to be male with more underlying comorbidities, congestive heart failure, cerebrovascular disease, hemiplegia, dementia, upper gastrointestinal bleeding, liver disease, neoplasms, metastases and AIDS (Anderson et al., 2015). The difference in the number of hospitalizations for female and male patients is due to the characteristics of risk factors, disease presentation, severity, and causes of disease (Arboix et al., 2008). Men have higher mo-

bility compared to women so they are more likely to be exposed to disease (Dotulong et al., 2015). People over 60 years of age have a chronic and slowing disease with some bothersome symptoms (Jaul, 2017). Elderly patients are more susceptible to bacterial infections caused by biological changes that can damage the body's barrier system (Esme, 2019).

This study used the ANOVA statistical test to determine the effect of the early warning score on the length of stay of non-surgical patients in the intensive care unit of Dr. Moewardi Hospital Surakarta which showed that the length of stay had a significant effect on EWS. The results of research conducted by R Paterson (2006) stated that EWS was correlated with length of stay, which more than doubled to five days and above for a score of 4. In contrast, a score of 0–3 estimated a length of stay of two days (Paterson et al., 2006). The results of the study by UNICEF stated that EWS resulted in a 28.9% reduction in the average hospitalization of patients (United Nations Children's Fund (UNICEF), 2020). In the physiological changes of the patient's body in an inpatient room, a hospital still has a low percentage of 22.81% so that there has not been a significant effect on the use of EWS on length of stay (Hidayat et al., 2020). Another study on dengue hemorrhagic fever patients found the effect between the aggregate EWS and the length of stay of dengue hemorrhagic fever patients and the close relationship between the two variables in the EWS category with moderate risk. This is in accordance with the theory that the higher the aggregate value, the greater the impact on deteriorating conditions ((Harapan et al., 2019). Early warning scores are high risk in patients admitted to general hospital wards and are also associated with an increased risk of death in the hospital, ICU admission, and length of stay in hospital so it should increase awareness of medical and nursing staff (Gielen et al., 2021).

This study used the chi-square statistical test to determine the effect of the early warning score on the mortality of non-surgical patients in the intensive care unit of Dr. Moewardi Hospital Surakarta. A person's mortality has a correlation with the EWS he gets. The results of a study conducted by Fernando (2019) stated that EWS has a comparable sensitivity for mortality. This EWS will allow clinicians to properly contextualize its use in the care of patients with acute worsening (Fernando et al., 2019). EWS can strengthen evidence on the effectiveness of track and trigger systems and mortality assessments in head to head comparisons with NEWS used internationally (Nielsen et al., 2020). In other studies, it is stated that there is no clarity about the predictive ability of EWS on mortality and morbidity, but they provide a guarantee of a relationship between increased EWS and mortality (Jayasundera et al., 2018). A study covering 28 hospitals found that EWS had a major influence in the determination of mortality and ICU transfer. In addition, it can also improve the integration, training, and dissemination of early warning scores into clinical pathways that focus on identifying and treating patients at risk of worsening by health staff (Zhang & Liu, 2020). This study has not considered the influence of other factors that can affect the early warning score such as financing, comorbidities, patient prognosis which can affect the results. The subjects of this study had various diseases so that there were differences in the length of stay due to the type of disease.

There is an effect of the early warning score on the length of stay of non-surgical patients and mortality in the intensive care unit of Dr. Moewardi Hospital Surakarta. Health services such as hospitals should be

able to implement the use of early warning scores carefully and monitor patients regularly. Future research can add more detailed sub-variables such as type of disease, comorbidities, patient prognosis, and others.

AUTHOR CONTRIBUTION

Luthfiana Nadhiifa Khoirunnisa posed initial research questions, wrote manuscripts, managed data collection, performed analytical statistics, drew tables and graphs, and interpreted research results. Arifin as the main supervisor who has refined research questions, directed research implementation, and assisted in the interpretation of research results. Eti Poncorini Pamungkasari as a companion advisor who always provides time and thoughts to assist in the preparation of research, raises issues in discussions, and assists in the interpretation of research results.

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CONFLICT OF INTEREST

There is no conflict of Interest in this study.

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