Correlation of the Revised Trauma Score (RTS) and National Early Warning Score (News) on the Prognosis of Trauma Patients in the Emergency Department of the Haji Adam Malik Hospital Medan

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Abstract:-

➢ *Introduction*

Trauma is one of the main health problems in every country regardless of the level of socio-economic development. It continues to be a significant health problem that increases mortality and morbidity rates due to developments in technology, accidents and incidents of violence. Scoring systems for trauma patients have been used and these systems are constantly being improved in order to manage the diagnosis and treatment of trauma patients more efficiently.

➢ *Objective*

To assess the correlation of the use of Revised Trauma Score (RTS) and National Early Warning Score (NEWS) on prognosis in patients with trauma.

➢ *Method*

Cross-sectional study was conducted from February to March 2019 at the Haji Adam Malik General Hospital. The population of the study were brought to the Emergency Room (ER) room from the accident scene and agreed to participate in the study. The data needed for study were recorded within the first hour after the patient was first treated at ER. The data consisted of seven variables: level of consciousness, systolic blood pressure, heart rate, respiratory rate, oxygen saturation, use of supplemental oxygen and temperature. RTS and NEWS were measured and recorded in the first hour. RTS and NEWS were also measured and recorded on the first, second, third and fourth days. The relationships between RTS and NEWS of patients who died and who survived were compared, and the relationships between RTS and NEWS and prognosis on first day - fourth day were identified using statistical analysis.

➢ *Results*

Of 62 samples, 44 samples (71%) were male. The mean RTS value was $7,54\pm0,58$ for patients who survived and $5,65\pm1,12$ for patients who died. The mean NEWS value was $3,42\pm3,661$ for patients who survived and $12,44\pm3,321$ for patients who died. There was a statistically significant difference in RTS and NEWS of patients who died and who survived ($p<0.05$). On day one, there was a negative, strong and significant correlation between death and RTS, and a positive, strong and significant correlation between death and NEWS. There was a negative, strong and significant correlation between death and RTS, and a positive, strong and significant correlation between death and NEWS on day four as well.

➢ *Conclusions*

There was a statistically significant difference in RTS and NEWS of patients who died and who survived. Both RTS and NEWS had strong and significant correlation with death on day one and four. It can be said that these scoring systems had a significant role in the prognoses of patients.

Keywords:- Trauma, Prognosis, RTS, NEWS.

I. INTRODUCTION

The high mortality rate of trauma patients in the emergency department cannot be separated from the lack of a scoring system that is able to quickly and accurately diagnose or predict the severity of the trauma patient. In the intensive care unit, there are many assessment systems used to assess patient's prognosis such as the Acute Physiology and Chronic Health Evaluation (APACHE), unfortunately, the emergency unit has not used a scoring system to assess patient's prognosis.

The use of the Revised Trauma Score (RTS) began in early 1989. This is a scoring system that has high reliability in predicting disability and death. This assessment uses the patient's data consisting of the Glasgow Coma Scale (GCS), systolic blood pressure, and breathing rate. Although RTS has been used since 1989, is still frequently used in hospital triage systems. RTS is still used as one of the trauma scoring scales in North American Trauma Registries (Lecky *et al, 2014*).

The RTS scale is also still widely used for researchers to compare it with other trauma scales or as a tool to assess the prognosis of trauma patients. A study conducted by Orhon et al in 2014 in Turkey found that RTS was used as one of the scales for trauma patients to predict the morbidity and mortality of trauma patients. Another study conducted by Mohyuddin et al in 2015 in Pakistan also

used RTS to assess the outcomes of pediatric trauma patients (Mohyuddin *et al*, 2015; Orhon *et al*, 2014).

An early warning system to assess clinical decline in critical patients within 24 hours can reduce the incidence of cardiac arrest in hospitals. One system that can do that, the National Early Warning Score (NEWS), was developed by the Royal College of Physicians of London (RCPL) and is currently used in several countries. NEWS has a good ability to distinguish acute conditions that are at risk of clinical decline in 24 hours such as cardiac arrest, intensive care, and death (Lee et al, 2018). The NEWS component consists of seven physiological variables; systolic blood pressure, pulse rate, breathing rate, temperature, oxygen saturation, oxygen supplement use, and level of consciousness. The value of each component of the seven variables (0 - 3) is summed to get the value of NEWS. The risk group classification based on NEWS is low risk (1 - 4), moderate risk (5 - 6 or red score), and high risk (> 7) (Lee et al, 2018).

This study will compare the prognosis of trauma patients using the RTS and NEWS in the Emergency Department of Haji Adam Malik Hospital in Medan.

II.   RESEARCH METHODS

➤ Research Design
This research was a descriptive study with a cross-sectional research design to determine the prognosis correlation of trauma patients using the RTS and NEWS scoring scale.

➤ Place and Time of Research
The study was conducted in the Emergency Department of Haji Adam Malik Central Hospital Medan. The study was conducted in February 2019 until March 2019.

➤ Population and Research Sample
All trauma patients who were admitted to the Emergency Department of Haji Adam Malik Hospital Medan. The subjects of the study were the trauma patients admitted to the Emergency Department of Haji Adam Malik Hospital Medan who met the inclusion and exclusion criteria.

➤ Research Criteria
All trauma patients who were admitted to the Emergency Department of Haji Adam Malik Hospital Medan. The **Inclusion Criteria** were patients or families of patients who agree to participate in the study, patients who experience trauma that occur less than 24 hours, patients aged 18 - 65 years, patients indicated to undergo hospitalization. Whereas for the **exclusion criteria** were patients referred from other hospitals, patients who had trauma incidence more than 24 hours, trauma patients declared Death on Arrival, patients who had a trauma caused by non-mechanical trauma (pathological conditions, degenerative conditions, burns, drowning, or poisons). The

drop out was if the patient is not traeated according to the ATLS principle.

➤ Besar Sample
The sample size would be calculated by the proportion system, which considered the proportion of trauma patients in Emergency Services by 50%, and the estimated proportion in the population was 30%.

$$n = \frac{\left\{ z_{1-\alpha/2} \sqrt{P_o(1-P_o)} + z_{1-\beta} \sqrt{P_a(1-P_a)} \right\}^2}{\left(P_a - P_o\right)^2}$$

n   = sample size

$Z_{1-\alpha/2}$ = normal distribution at a certain α (1.96 for 95% confidence level)

$Z_{1-\beta}$ = normal distribution at a certain β (1.28 for 90% of power level)

P_0 = proportion in the population of the previous studies (50%)

P_a = the estimated proportion in the population (30%)

P_a-P_0 = the estimated difference in the proportion studied with the proportion in the population

Based on the formula above, the number of samples (n) were 62 samples

➤ Procedures
After obtaining approval from the ethics committee of Medical Faculty, North Sumatera University (No.53/TGL/KPEK FKUSU-RSUPHAM/2019) and Haji Adam Malik Hospital in Medan (LB.02.03/.II.4/195/2019), the research was started by collecting Research subjects according to inclusion and exclusion criteria. After the Research subjects received an explanation of the objectives, benefits and research procedures and signed an agreement to take part in the study, interviews were conducted with a questionnaire to obtain the data needed by the researcher. Then an assessment of vital signs is carried out in trauma patients who were admitted to the Emergency Department. The patients were treated in an Emergency Department based on the ATLS principle. Vital signs were grouped into each RTS and NEWS scoring scale. Vital signs observations were carried out for four days and the total values of RTS and NEWS were reassessed. Patients were followed up until the patient became outpatients or were passed away. The parameters assessed were the deaths assessed on the first day of treatment and the fourth day of treatment. The patients' data were collected then analyzed statistically

➤ *Research Ethics*

All participants who were included in this study were given an explanation, for the patients with a loss of consciousness, the education of the family is very necessary concerning the objectives, benefits, and risks of research and the responsibility of the researcher. After that, their approval was requested by signing a statement of consent that had been provided. Each patient had the right to know the results of the examination and might withdraw from the study if he/she was not willing to continue the research. This research was carried out with the approval of the ethics committee of Medical Faculty, North Sumatera University (No.53/TGL/KPEK FKUSU-RSUPHAM/2019) and Haji Adam Malik Hospital in Medan (LB.02.03/.II.4/195/2019).

➤ *Statistic Analysis*

The research variables were presented in the form of tabulations and described. The data were presented as mean ± standard deviation. The other data were presented in the form of frequency and percentage. Mann-Whitney U test was employed to assess the relationship between trauma scale (RTS and NEWS) in the prognosis and the level of correlation was tested by Spearman correlation test. Significance level $p < 0.05$ for all tests

III. RESEARCH RESULTS

➤ *Demographic characteristics of the study samples*

This research was conducted from February to March 2019 in the Emergency Department of Haji Adam Malik Hospital Medan. This research was conducted with a descriptive research method with a cross-sectional research design. The study had 62 samples who experienced mechanical trauma and were admitted to the Emergency Department of Haji Adam Malik Hospital Medan. The samples were assessed for their vital signs upon entering the Emergency Department until the fourth day of treatment. From the vital signs, the values of the Revised Trauma Score (RTS) and the National Early Warning Score (NEWS) were obtained. The observation was carried out at the first hour of the patient entering the Emergency Department, 24 hours later, and 96 hours later.

Based on Table 1, it can be seen that the 62 samples examined included 44 male samples (71%) and 18 female samples (29%). In this study it can also be seen that there were 21 samples (34%) in the age group of 18-24 years old, 10 samples (16%) in the age group of 25-31 years old, 6 samples (10%) in the age group of 32-38 years old, 5 sample (8%) in the age group of 39 - 45 years old, 8 samples (13%) in the age group 46 - 52 years old, 8 samples (13%) in the age group of 53 - 58 years old, and 4 samples (6%) in the group age of 59 - 65 years old. Research conducted by Bambang et al in 2017, Razente et al in 2017 and Karatas et al in 2018 regarding the system of trauma patients showed that the most cases of trauma were experienced by male patients, which might be due to more active in working, traveling and driving vehicles. Bambang et al. Also mentioned in their study that nearly 70% of

trauma patients in their studies were aged 20-55 years old who were of productive age.

Of the 62 samples, the mean value of the overall ages was 35.89±15.553, with the mean age of the sample who survived of 35.26±16.04 and the mean age of the sample who died of 39.56±12.41. 27 samples (44%) had head trauma, 4 samples (6%) had thoracic trauma, 0 samples (0%) had abdominal trauma, 11 samples (18%) had trauma in the upper limb, and 20 samples (32 %) experienced trauma in the lower extremities. The study conducted by Karatas et al in 2018 stated that the case that mostly occurred in their study was head and spine injuries, which was 62.9% of the total sample.

Variable	survive (n=53)	die (n=9)	P value
Age (years old)	36,21±15,4	34±17,1	0,521*
Gender			
Man	37 (70%)	7 (78%)	0,629*
Women	16 (30%)	2 (22%)	
Location of Trauma			
Head	24 (45%)	8 (89%)	0,428*
Thorax	4 (7%)	1 (11%)	
Abdomen	0 (0%)	0 (0%)	
Upper extremities	10 (19%)	0 (0%)	
Lower extremities	15 (29%)	0 (0%)	
Total	53	9	

Table 1:- Demographic characteristics of the study samples
(* *Mann Whitney test*)

Scale	Survive (*Mean±SD*) n = 53	Die (*Mean±SD*) n = 9	P value*
RTS	7,54±0,58	5,65±1,12	0,000
NEWS	3,42±3,661	12,44±3,321	0,000

Table 2:- Distribution of living and deceased samples based on RTS and NEWS scales (* *Mann Whitney U test*)

Based on table 2. it can be seen that there was a statistically significant difference between the scale of RTS and NEWS in patients who survived and patients who died (p <0.05). It can be concluded that both the RTS and NEWS scales can be used as a good tool to assess the patient's prognosis.

➤ *Correlation of the RTS and NEWS Scales on the first and fourth days of the patient's prognosis*

Prognosis	RTS Nilai r*/p	NEWS Nilai r*/p
Death (first day)	-0,631/0,000	0,560/0,000
Death (fourth day))	-0,632/0,000	0,533/0,000

Table 3:- Correlation of RTS and NEWS Scales on the first and fourth days (* *Korelasi Spearman test*)

Based on table 3., it can be seen the correlation between the RTS and NEWS scales on the first day. At the RTS scale, a correlation value of -0.631 showed a strong negative correlation between the RTS scale and mortality (p <0.05). While the NEWS scale found a correlation value of 0.560 which showed a strong positive correlation between the scale of RTS and mortality (p <0.05). Then it can be seen the correlation between RTS and NEWS on the fourth day. At the RTS scale, a correlation value of -0.632 showed a strong negative correlation between the RTS scale and mortality (p <0.05). While the NEWS scale found a correlation value of 0.533 which showed a strong positive correlation between the scale of RTS and mortality (p <0.05). From the assessment of these two scales on the first and fourth days, it shows that both the RTS and NEWS scales have the ability to assess the patient's prognosis well.

IV. CONCLUSIONS

➤ There is a statistically significant difference between the RTS and NEWS scales to the prognosis of trauma patients, which is in the mortality
➤ In this study the RTS and NEWS scales are equally good for assessing the patient's prognosis.

SUGGESTIONS

➤ Further research is needed on the comparison of other trauma assessment systems in Emergency Services to look for alternatives to the use of RTS as one of the trauma assessment systems that have long been used.
➤ In the future study, it is expected to assess the scale of trauma at the scene before the patient is taken to the hospital
➤ In the future study, it is expected to assess the other prognosis of the patients such as duration of stay in the hospital or duration of stay in the intensive unit.
➤ The easy-to-do RTS scale can still be used especially in areas with minimal facilities such as peripheral health services.

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