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ORIGINAL ARTICLE

PREDICTORS OF IN-HOSPITAL LENGTH OF STAY IN NSTEMI PATIENTS

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Abstract: As our population grows older, the rate of NSTEMI patients is rising. Risk stratification is an important process for patients with Non-ST Elevation Myocardial Infarction (NSTEMI). Global Registry of Acute Coronary Events (GRACE) scores in the best to predict mortality and myocardial infarction in NSTEMI Patients. On the other hand, NSTEMI Patients trends to be older with more co-morbidity. In this scenario, we need to predict the length of stay as it correlates with the patient's prognostic and cost. This study aims to analyze factors influencing the in-hospital length of stay in survivor NSTEMI Patients in four different hospitals (Adam Malik Medan National General Hospital, Pirngadi Medan General Hospital, Grandmed Lubuk Pakam General Hospital, and Aceh Tamiang Public General Hospital). This was an observational study with prospective design conducted on 44 patients in four different hospitals from March to May 2017. We only included the patients that discharged alive from the hospital. Statistical analysis was performed to assess the routine clinical and laboratory variables relations with the length of stay. Prolong length of stay was defined as more than 5 days. As mentioned in the previous study, older age, heart failure will prolong the length of stay. The limitations of this study were we didn't analyze the effect of revascularization, the co-morbidities, and the method of patient's payment. We should use GRACE and TIMI risk score routinely, optimizing therapy for heart failure and giving special attention to elderly patients in NSTEMI Patients.

Keywords: NSTEMI, GRACE, Length of Stay

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INTRODUCTION

The cardiovascular disease ranks the first cause of death worldwide. As many as 17.3 million people are estimated to have died of cardiovascular disease in 2008. Of all of these deaths, as many as 80% are due to heart attacks and strokes, and three-quarters of these occur in countries with a lower-middle economy.[1] These complications due to cardiovascular disease also have a bad economic and social impact especially on the middle to lower economic population.[2] This certainly requires optimal prevention and management strategies.

Coronary heart disease (CHD) in Indonesia ranks third cause of death after stroke and diabetes mellitus (DM) in the non-communicable disease group in the age range 45-54 years in urban populations, ranked fourth after tuberculosis, stroke, and hypertension in rural populations in Indonesia according to the results of basic health research in 2007.[3]

Based on history, physical examination, electrocardiogram (EKG), and cardiac enzyme examination, acute coronary syndrome (ACS) are divided into ST-segment-elevation myocardial infarction (STEMI), non-ST-segment elevation myocardial infarction (NSTEMI), and unstable angina pectoris (UAP). NSTEMI and UAP are classified into non-ST-segment elevation acute coronary syndromes (NSTE-ACS).[4]

The prevalence of NSTE-ACS covers about 70 percent of the incidence of ACS with the characteristics of patients who are usually older and have more comorbidities. Unlike patients with STEMI who receive more uniform therapeutic guidelines namely early revascularization, patients with NSTE-ACS undergo a therapeutic method more varied with the severity of coronary artery stenosis which is very varied. Even though management guidelines are available for the management of NSTE-ACS, there are still therapeutic behaviors that are inconsistent in the use of invasive and conservative strategies that illustrate the uncertainty in the initial evaluation and management of patients. NSTEMI itself has disease complications and coronary artery severity worse than UAP.[4,5]

Therefore early identification of complications from NSTEMI is important to do to prevent complications. This can then help in providing management strategy recommendations and improving post-treatment outcomes.[6]

Several ways of risk stratification have been developed and validated for ACS. Some of the most commonly used risk stratifications are the TIMI and GRACE scores. The TIMI score resulted from the TIMI 11b study and was validated in several trials such as TACTICS-TIMI 18.[7] The disadvantage of the TIMI score is its inability to discriminate risk in more detail. The GRACE score is the most recent but is more complicated and requires the use of a computer application in its calculation.[8] One score that is not very well known is the PURSUIT (Platelet glycoprotein IIb/IIIa score in Unstable angina: Receptor Suppression Using

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Integrilin Therapy). In a study by Goncalves et al who examined the use of GRACE, TIMI, and PURSUIT scores in the same population in a health center in 460 patients. The results show that the GRACE score is the best in assessing the risk of death or myocardial infarction within 1 year.[9] This is in line with the research of Aragam et al who saw that the discrimination power of GRACE scores was better than TIMI.[10] The parameters assessed on the GRACE score and their interpretation are shown in tables 1 and 2.

Life expectancy is increasing, causing our population to grow older. This is in line with the incidence of acute myocardial infarction non-ST elevation segments (NSTEMI). It must be remembered also that NSTEMI patients tend to be older with more comorbidities. With the characteristics of older patients and more comorbidities, NSTEMI patients need special attention. One of them is to predict the length of stay.[13]

The purpose of this study was to analyze the factors that influence the length of stay in NSTEMI patients who stayed in four different hospitals (Haji Adam Malik General Hospital, Medan Pirngadi General Hospital, Grandmed Lubuk Pakam General Hospital, and Aceh Tamiang General Hospital).

Table 1. GRACE Scores [11,12]

Prediktor	Skor
Usia dalam tahun	
<40	0
40-49	18
50-59	36
60-69	55
70-79	73
80	91
Laju denyut jantung (kali per menit)	
<70	0
70-89	7
90-109	13
110-149	23
150-199	36
>200	46
Tekanan darah sistolik (mmHg)	
<80	63
80-99	58
100-119	47
120-139	37
140-159	26
160-199	11
>200	0
Kreatinin (µmol/L)	
0-34	2
35-70	5
71-105	8
106-140	11
141-176	14
177-353	23
≥354	31
Gagal jantung berdasarkan Killip	
I	0
II	21
III	43
IV	64
Henti jantung saat tiba di RS	43
Peningkatan marka jantung	15
Deviasi segmen ST	30

Table 2. GRACE Scores Interpretations [11,12]

Prediktor Kematian di RS		Prediktor Kematian 6 bulan	
Skor	Risiko	Skor	Risiko
≤108	<1%	≤88	Rendah (<3%)
109-140	1-3%	89-118	Sedang (3-8%)
>140	>3%	>118	Tinggi (>8%)

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METHODS

This research is a prospective observational design that was carried out from March 1, 2017 to May 15, 2017, in four hospitals in three different districts/cities, namely the Haji Adam Malik General Hospital, Pirngadi General Hospital Medan, Grandmed Lubuk Hospital Pakam, and the Aceh Tamiang Regional General Hospital.

The sample collection is using consecutive sampling. Researchers only observe and record the data found in the patient. The entire examination is carried out by the doctor on duty, both the doctor on duty and the cardiologist.

The inclusion criteria were patients with a NSTEMI diagnosis based on the diagnosis criteria of PERKI that is if there was a complaint of acute angina accompanied by a significant increase in cardiac enzymes (CKMB or troponin) without any persistent ST-segment elevation in two adjacent leads and without a left branch beam block.[4] Exclusion criteria were patients with:[14]

1. Patients with 2nd and 3rd degree AV block
2. Patients who arrive with cardiogenic shock (Killip IV)
3. Patients who die during treatment by all causes
4. Patients with several other conditions that are the main cause of an increase in cardiac enzymes. These conditions include:
   a. Tachyarrhythmias
   b. Decompensated heart failure is not due to ACS
   c. Emergency hypertension
   d. Critical illnesses include sepsis, non-cardiogenic shock and burns
   e. Myocarditis
   f. Tako-Tsubo cardiomyopathy
   g. Aortic stenosis
   h. Pulmonary embolism
   i. Acute kidney disorder
   j. Coronary spasm
   k. Acute neurological events (stroke, subarachnoid hemorrhage)
   l. Heart, hypo and hyperthyroid surgery procedures
   m. Connective tissue diseases (scleroderma, hemochromatosis)
   n. Rhabdomyolysis.

The flow of research can be seen in Figure 1.

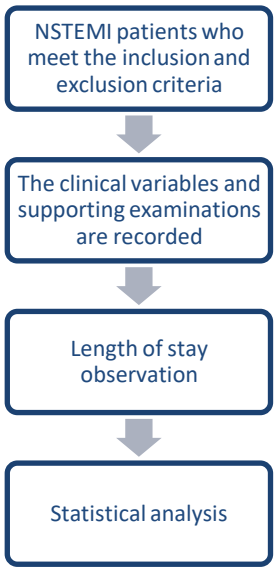

Figure 1. Research Flow

Statistical analysis was performed to assess the relationship between various variables and routine laboratories with the length of stay.

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The independent variables analyzed were age, sex, major complaints, onset of primary complaints, body mass index, pain scale, history of previous illnesses (hypertension, diabetes mellitus, CHD, and dyslipidemia), family history of coronary heart disease, smoking history, history previous drugs (beta-blockers and angiotensin-converting enzyme inhibitors), use of beta-blockers and angiotensin-converting enzyme inhibitors during treatment, TIMI score, GRACE score, Killip classification, simple hemodynamic parameters (systolic blood pressure, diastolic blood pressure, heart rate, mean blood pressure, shock index, and modified shock index), simple ECG parameters (rhythm, ST-segment depression, presence of left ventricular hypertrophy, and ventricular extrasystole), laboratory parameters (hemoglobin, leukocytes, platelets, blood sugar levels, urea, creatinine, and glomerular filtration rate), the presence of cardiomegaly based on chest x-ray examination, and there are bleeding during treatment.

Statistically, a significant difference was defined as a value of $p < 0.05$.[15]

Categorical variables are represented by the number or frequency (n) and percentage (%). Numerical variables are presented with a mean (average) and standard deviations for normally distributed data, while data that are not normally distributed using a median (middle value) with minimum and maximum values..[15]

Test for normality in all research subjects using Shapiro Wilk ($n < 50$). In numerical variables, a two-sample Independent Student's t-test was carried out on normally distributed data and the Mann Whitney U test if the data were not normally distributed. In the categorical variable, the analysis test is done using chi-squared or fisher test.[15]

Receiving operator characteristic (ROC) curve analysis is performed to determine the cut length value of the length of stay.[15]

RESULTS

The total samples collected were 49 people. A total of 16 samples came from the Pirngadi Hospital in Medan, 14 people from the Haji Adam Malik Hospital in Medan, 11 people from the Aceh Tamiang General Hospital, and 8 samples from the Grand Medistra Lubuk Pakam Hospital. Five people were excluded because they died during treatment so that the final sample numbered 44 people.

The length of stay is divided into the usual length of stay and the length of stay that is defined as more than 5 days based on the results of the ROC curve analysis test.

Data analysis of the relationship between clinical factors and supporting examinations on length of stay can be seen in Table 3. Variables that looked significantly different were age, history of suffering from hypertension, TIMI score, GRACE score, and the presence of cardiomegaly during treatment.

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Table 3. Analysis of The Predictive Factors for Length of Stay

Variable	Without Lengthening of Stay (≤ 5 days) (19 Patients)	Length of Stay (> 5 Days) (25 Patients)	P-value
Early Clinical Factors			
Age	53,4 ± 1,4	60,4 ±1,5	0,004*
Gender			
Male	16 (84%)	17 (68%)	0,191**
Female	3 (16%)	8 (32%)	
Chief complaint			
Chest Pain/Epigastric pain	15(79%)	16 (64%)	0,282**
Shortness of breath	4 (21%)	9 (36%)	
Onset of chief complaint (hour)	16 (2-336)	12 (0-120)	0,312***
Pain scale (numeric rating scale)	4 (1-8)	2 (1-8)	0,435***
Smoking history	12 (63%)	14 (56%)	0,632**
Hipertension history	9 (47%)	20 (80%)	0,024**
Diabetes history	7 (37%)	8 (32%)	0,737**
CHD history	2 (10,5%)	6 (24%)	0,498**
Dyslipidemia history	4 (21%)	8 (32%)	0,419**
Family history with premature CHD	2 (10,5%)	2 (8%)	0,419**
Body Mass Index	24,4 ± 2,9	24,9 ± 2,7	0,534*
Factors of Drug Use			
Beta-blocker usage history	0	2 (8%)	0,498**
Use of beta-blockers within 24 hours of treatment	13 (68%)	16 (64%)	0,759**
Use of angiotensin-converting enzyme inhibitors within 24 hours of treatment	13 (68%)	17 (68%)	0,976**
Prediction score for prognosis			
TIMI score	3 (1-5)	3 (1-6)	0,043***
GRACE score	92 (62-168)	123 (73-160)	0,030***
Hemodynamic Factor			
Systolic blood pressure	139 ± 25,7	140 ± 34	0,930*
Diastolic blood pressure	80 (26-100)	90 (40-124)	0,278***
Heart rate	86 ± 24,0	93 ± 22,7	0,362***
Average blood pressure	101 ± 13,9	106 ±21,0	0,419***
Shock index (heart rate/systolic blood pressure)	0,60 (0,32-1,2)	0,68 (0,36-1,2)	0,255***
Supporting examination factors			
Atrial fibrillation on initial ECG examination	1 (5%)	2 (8%)	0,684**
ST segment deviation on initial ECG examination	10 (53%)	15 (75%)	0,427**
Hemoglobin (mg/dL)	13,4 ± 1,7	12,8 ± 1,8	0,302*
Leukocytes (/$mm^{3)}$	9.823 ± 3.543	11.209 ± 3.936	0,234*
Plateletes (/$mm^{3)}$	259.684 ± 39.102	274.560 ± 41.930	0,549*
Blood glucose level (mg/dL)	124 (90-417)	102 (78-527)	0,213
Ureum (mg/dL)	34 (11-125)	39 (17-235)	0,214***
Creatinin (mg/dL)	1,12 (0,3-4,57)	1,34 (0,71-2,90)	0,218***
Glomerulus filtration rate (mL/min/1.73 m^2)	65,5 (14-252)	63,3 (15-102)	0,241***
Cardiomegaly on chest x-ray examination	12 (63%)	23 (92%)	0,024**

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Factors of complications during treatment			
Occurrence of bleeding	1 (5%)	0	0,432

** Two Samples Independent Student's t-test*
** Chi-square / *Fisher exact test*
*****Mann Whitney U test*

DISCUSSION

In the era of National Health Coverage in Indonesia, it is very important to control the quality and cost of health services. As mentioned in previous studies, older age and heart failure will prolong the length of stay.[13]

Older age shows an increased length of stay. This is due to the age factor itself reduces the body's physiological ability in the healing process. The age factor itself is included in the GRACE and TIMI scores. This shows that age is consistently a factor that affects the prognosis of patients.

GRACE and TIMI scores were proven to be able to predict the length of stay in this study. Calculation of this score becomes a tool for clinicians in stratifying risk to patients. With an increase in scores, the clinician needs to pay special attention to patient care.

The presence of cardiomegaly on chest x-ray examination is also a predictive factor. Cardiomegaly is associated with the presence of heart failure in patients in line with previous studies that showed the same thing. This is supported by the results of this study which show that the history of suffering from hypertension affects the length of stay. The limitation of this study is that we did not analyze the effects of revascularization, comorbidities, and patient payment methods. Some patients were discharged and then electrocuted revascularization. patient care. Likewise, with the patient financing method, we do not take notes. As it is known that self-financing can be a confounding factor that affects the length of stay.

CONCLUSIONS

Routine use of GRACE and TIMI risk scores, optimization of therapy for heart failure and special attention for elderly patients and hypertensive patients in NSTEMI patients are expected to reduce the length of stay and improve patient outcomes.

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