

Analysis and Improvement of Time Frames Management for Ischemic Stroke Services in the Emergency Room at Budi Medika Hospital, Bandar Lampung

Luther Theng^{1*}, Yanuar Jak², Grace Rumengan²

Respati Indonesia University, Indonesia^{1,2}

Email: dr.luther.theng@gmail.com*

ABSTRACT

Stroke is a catastrophic disease and a major health problem both in Indonesia and in the world. Stroke causes a high number of morbidities and mortalities. The philosophy of stroke "Time Is Brain", it requires good time frames management according to the world guidelines related to ischemic stroke services in emergency departments (ED). The design of the study is a quantitative descriptive with retrospective method within the period from January to December 2023, continued qualitatively a mix method explanatory sequential sequential. The number of samples is 150 which meets the inclusion criteria. Quantitative analysis with SPSS V29 for mac and quantitative with NVIVO 14. The Median of door to triage time at study point was 1(1-5) minutes, door to physician 2 (0-10) minutes, Door to CT scan 19.5 (2 -50) minutes, Door To CT interpretation wa 20.5 (2-200) minutes and Door To Drug was 63 (12-267) minutes. Logistics regression analysis of time frames showed that the most significant result was door to CT scan (OR:14.5,95%CI5.3-39.4,p<0.001). Moderated Regression Analysis (MRA) showed significant time frame influences p<0.001 and R² 96% with ischemic stroke service in IGD. To provide the good performance of Door to drug time ≤60 minutes requires good time frames management, role of five (5) M management (man, method, material, machine and money) and good stroke code implementation.

Keywords: ED, ischemic stroke, time frames

INTRODUCTION

Stroke is a 10% cause of death worldwide and the sixth cause of disability. Without proper treatment and prevention, stroke can become the fourth cause of disability in 2030. World Stroke Organization (WSO) data shows that every year there are 13.7 million cases. new stroke, and around 5.5 million deaths occur due to stroke. Approximately 70% of strokes and 87% of deaths and disabilities due to stroke occur in low- and middle-income countries (Firdaus, 2023). Stroke is part of cardiocerebrovascular disease which is classified as a catastrophic disease because it has broad economic and social impacts (Khoeriyah, 2021).

Successful treatment of acute stroke begins with the knowledge of the public and health workers that stroke is an emergency situation, such as acute myocardial infarction and trauma (Fonarow et al., 2011). The philosophy that must be adhered to is time is brain and the golden hour. (Saver, 2006) by having a common understanding that stroke and TIA are medical emergencies, it will play a big role in saving lives and preventing long-term disability.

Patients who experience a stroke will usually come to the hospital and the first location they visit is the Emergency Room (IGD). The ER is the main gate of a hospital. The ER is also the busiest department in the hospital. The accumulation of patients (overcrowding) in the emergency room can cause hospital losses and have a negative impact on patient services such as prolonged waiting times, increased treatment time, increased medical errors and can increase patient mortality rates (Singh et al., 2023).

The importance of maintaining a hospital's preparedness when treating stroke cannot be underestimated. A guideline developed by the National Institute of Neurological Disorders and Stroke (NINDS), states that patients with stroke symptoms should be evaluated by a triage doctor within <5 minutes, and evaluated by Neurology doctor within 10 minutes of arrival in the ER and CT-Scan must be started within 25 minutes and interpreted within 45 minutes of arrival, so that therapy can be optimal (Jauch et al., 2013).

Budi Medika Hospital is a type C non-educational hospital located in the city of Bandar Lampung. This hospital was founded in 2020 and has a capacity of 101 beds. Over time the hospital has accepted general, insurance and BPJS patients. The number of patient visits is increasing so that there is a diversity of diseases. Among them, stroke is one of the contributors to disease diagnosis and is in the top ten in both outpatient and inpatient units for the period January to December 2023. In the outpatient unit, stroke diagnosis is in fifth position, while in inpatient care it is in sixth position. Stroke management itself at Budi Medika Hospital still does not have good standards, even though there are several general practitioners who have undergone stroke code training.

The aim of this research is to describe, analyse and improve the Time Frame Management component in accessing ischemic stroke services in the emergency room at Budi Medika Hospital Bandar Lampung, so that it can provide input to hospital management regarding deficiencies in the service system, especially for stroke patients, so that it is hoped that fast, responsive and quality services can be provided in accordance with existing stroke patient service standards in the world.

RESEARCH METHODS

The design of this research is descriptive-quantitative, retrospective data from January to December 2023 by describing and analysing time frames management and elements of 5M hospital operational management (man, method, material, machine and money) in ischemic stroke services in the ER. After getting the results of quantitative data analysis, it is continued qualitatively, namely explanatory sequential design, called the mix method.

The inclusion criteria for the study were: sufferer ≥ 18 years old with symptoms of acute ischemic stroke Exclusion Criteria that is, stroke sufferers who brought a CT-Scan from another hospital, received antiplatelet therapy, GCS < 7, oxygen saturation < 95% with the threat of respiratory failure and severe hemodynamic disorders, bleeding stroke, Space Occupying Lesion (SOL), stroke and additional diseases such as fractures and head injuries. All were recorded in the medical record and were willing to sign informed consent.

Statistical analysis using SPSS version 29 (IBM Corp, NY, USA). Descriptive, namely the distribution of basic characteristics of research subjects such as gender, age,

education, employment, arrival, NIHSS, stroke onset and time distribution of various activities in the ER, distribution of time frames, distribution of 5M management elements followed by testing the suitability of time frames for ischemic stroke services. Bivariate using Chi-square whether time frames and management elements (5M) are significant for ischemic stroke services in the ER. Next, a multivariate model was carried out using logistic regression and moderated regression analysis (MRA). The relationship is said to be significant if the p-value <0.05 and in MRA there is an increase in R square. This was continued quantitatively by conducting interviews (in depth interviews) with informants, namely the head of the emergency room, duty doctor, nurse, head of radiology installation, radiographer, administrative officer (registration) and pharmacist. Recording was carried out using audio, translation through writing followed by analysis of NVIVO version 14, a codebook of interview results was carried out, the informant's codebook obtained project map graphs and hierarchy charts.

RESULTS AND DISCUSSION

Of the 150 patients with acute ischemic stroke who came to the emergency room at Budi Medika Hospital Bandar Lampung during the period January to December 2023 in (Table 1). There were 82 (54.7%) men, 91 (60.7%) aged 45-64 years, 47 (31.3%) had an education level of elementary school, 47 (31.3%) had other jobs (gojek, parking attendant and teacher) as many as 49 (32.7%) people and clinical characteristics in the form of coming without a referral as many as 136 (90.7%) people, the severity of stroke on the NIHSS scale was moderate (6-14) as many as 76 (50.7) people and stroke onset was <4.5 hours and 24 hours each by 53 (35.3%) people.

Table 1. Demographic and Clinical Characteristics

Subject Characteristics	Number (n=150)
Gender	
Man	82 (54.7)
Woman	68 (45.3)
Age	
<45 years	8 (5.3)
45-64 years old	91 (60.7)
>65 years	51 (34)
Education	
No school	13 (8.7)
elementary school	47 (31.3)
JUNIOR HIGH SCHOOL	33 (22)
SENIOR HIGH SCHOOL	36 (24)
D3	3 (2)
Bachelor	17 (11.3)
S2	1 (0.7)
Work	
Doesn't work	25 (16.7)
Farmer	3 (2)
Laborer	19 (12.7)

Self-employed	15 (10)
IRT	39 (26)
Other	49 (32.7)
Arrival	
Reference	14 (9.3)
Come alone	136 (90.7)
Clinical characteristics	
NIHSS	
< 5 Light	63 (42)
6-14 Medium	76 (50.7)
15-24 Weight	11 (7.3)
Onset	
<4.5 hours	53 (36.3)
4.5-6 hours	19 (12.7)
<12 hours	25 (16.7)
>24 hours	53 (35.3)

Elementary School; Junior High School; High School High School; D3 Diploma; Postgraduate Masters, Housewife Housewife; NIHSS National Institutes of Health Stroke Scale

Others are Gojek, drivers and teachers

In (Table 2) regarding the distribution of time for various activities in the ER, what is of sufficient concern is timePatient registration (registration) takes 14.19 minutes, with a variation of 0.6 minutes, the fastest is 5 minutes and the longest registration is 20 minutes with an average time between 12.8 minutes to 15.5 minutes.

Table 2. Distribution of time for various activities in the ER

Activities in the ER	Mean (minute)	elementary school	Minimum-Maximum	95%CI
Examination by a nurse	1.55	0.70	1-5	1.42-1.69
Waiting for the doctor on duty	1.27	0.12	0-5	1.03-1.52
Examination by the attending physician	4.26	0.10	2-10	4.05-4.47
Patient registration registration	14.19	0.67	5-20	12.87-15.52
NIHSS examination	4.25	0.12	1-10	4-4.49
GDS check	3.39	0.23	0-15	2.93-3.86
ECG examination	2.07	0.14	0-11	1.78-2.35
IV Line Installation	3.59	0.20	0-15	3.19-3.99
Waiting for the porter	1.73	0.20	0-10	1.32-2.14

Go to the CT scan room	1.05	0.38	1-5	0.98-1.13
Arrive at the CT scan room	1	0.00	1-1	1-1
Carrying out a CT scan	7.89	0.32	5-25	7.25-8.52
CT scan interpretation	38.42	3.24	2-200	02.32-44.82
Back to the ER	1	0.00	1-1	1-1
Re-examination by Dr. keep	5.35	0.16	1-10	5.02-5.68
Administration of antiplatelet therapy	10	0.60	1-35	8.81-11.19

CT Computed Tomography; NIHSS National Institutes of Health Stroke Scale; GDS Current Blood Sugar; ECG Electrocardiography; IV Intravenous IGD Emergency Department; Dr. doctor

The distribution of time frames in acute ischemic stroke (Table 3) shows that door to triage is 1.5 minutes with a variation of 0.07 minutes, the fastest is 1 minute and the longest is 5 minutes with an average time of 1.4 minutes and 1.7 minutes. door to Physician is 2.9 minutes with a variation of 0.17 minutes, the longest is 10 minutes with an average time of 2.6 and 3.3 minutes. The door to head CT scan was carried out for 21.3 minutes with a variation of 0.8 minutes, the fastest was 2 minutes and the longest was 50 minutes with an average time of 19.7 minutes and 22.9 minutes. door to CT interpretation by a radiology specialist is 37 minutes with a variation of 3.1 minutes, the fastest is 2 minutes for expertise and the longest is 200 minutes with an average time of 31 minutes and 43.5 minutes. door to drug, which is 73.6 minutes with a variation of 3.83 minutes, the fastest is 12 minutes and the longest is 267 minutes with an average of 66 minutes and 81.2 minutes.

Table 3. Distribution of Time Frames in Acute Ischemic Stroke

<i>Time Frames</i>	Mean (minute)	elementary school	Minimum – Maximum	95%CI
<i>Door to triage</i>	1.57	0.07	1-5	1.43-1.70
<i>Door to Physician</i>	2.98	0.17	0-10	2.64-3.32
<i>Door to CT scan</i>	21.34	0.82	2-50	19.71-22.97
<i>Door to CT Interpretation</i>	37.28	3.14	2-200	31.06-43.50
<i>Door to drugs</i>	73.67	3.83	12-267	66.08-81.25

SD Standard deviation; CI Confidence Interval

The distribution of management elements (5M) (Table 4) can be seen for the man variable related to the doctor on duty, nurse in the emergency room, porter in charge of delivering or pushing the bed (gurney) and radiology officer (radiographer).

For the method variable, it is related to the flow and registration process of patients in the ER, the material is related to the availability of gurneys and antiplatelet drugs, both clopidogrel and aspirin. The machine is related to the CT scan tool and the money is related to the health insurance used by the patient, namely the BPJS guarantee. In (Table 5), the bivariate chi square test, the significant variables with a p-value <0.05 are the man variable related to nurses and porters, the method variable for the registration process, and the material variable, namely the availability of gurneys and anti-platelet drugs.

Table 4. Distribution of Management Elements (5M) for Acute Ischemic Stroke Services

Variable	Observations in the ER (n=150)	
	Yes	No
Man		
1. Is the doctor on duty on site and immediately examining the patient?	145 (96.7)	5 (3.3)
2. Does the doctor on duty report the patient's condition to Dr Sp.N Onsite?	150 (100)	0 (0)
3. Is the emergency room nurse on site and immediately carrying out the doctor's order?	112 (74.7)	38 (25.3)
4. Is the ER so busy with patients that nurses can't immediately carry out doctor's orders?	44 (29.3)	106 (70.7)
5. Is the porter on site and immediately takes the patient to the radiology room after the doctor on duty orders it?	119 (79.3)	31 (20.7)
6. Is the radiology officer on site?	150 (100)	0 (0)
Method		
1. Do emergency room staff (health workers/non-medical workers) immediately direct stroke patients to the doctor on duty?	150 (100)	0 (0)
2. Does the registration process take a long-time queuing in the registration room?	53 (35.3)	97 (64.7)
Material		
1. Are gurneys available in the emergency room?	140 (93.3)	10 (6.7)
2. Is Aspilet/Clopidogrel available at TPO ER or pharmacy?	134 (89.3)	16 (10.7)
Machine		

1.	Can a CT scan operate?	149 (99.3)	1(0.7)
----	------------------------	---------------	--------

Money

1.	Does the patient use BPJS?	135 (90)	15 (10)
----	----------------------------	----------	---------

5M Man, Method, Money, Material and Machine; Dr Sp.N Neurology Specialist; Emergency Room ER; TPO: Place of Drug Administration; CT Computed Tomography; BPJS Social Security Administering Body

Table 5. Distribution of Subjects According to Ischemic Stroke Management and Service Elements (chi square test)

The Role of Management Elements (5M)		Ischemic Stroke Services				Total		OR (96%CI)	P value
		It is not in accordance with		In accordance		n	%		
		n	%	n	%			n	%
Man1 Doctor on duty	No	5	100	0	0	5	100	4,649 (1.6-2.2)	0.089
	Yes	74	51	71	49	145	100		
	Amount	79	52.7	71	47.3	150	100		
Man3 Nurse	No	32	84.2	6	15.8	38	100	7,376 (2.8-19)	<0.001
	Yes	47	42	65	58	112	100		
	Amount	79	52.7	71	47.3	150	100		
Man4 Nurse	No	45	42.5	61	57.5	106	100	15,122 (0.097-0.48)	<0.001
	Yes	34	77.3	10	22.7	44	100		
	Amount	79	52.7	71	47.3	150	100		
Man5 Porter	No	24	77.4	7	22.6	31	100	9,604 (1.5-9.9)	0.04
	Yes	55	46.2	64	53.8	119	100		
	Amount	79	52.7	71	47.3	150	100		
Method2 Registration	No	44	45.4	53	54.6	97	100	5,878 (0.2-.08)	0.024
	Yes	35	66	18	34	53	100		
	Amount	79	52.7	71	71	150	100		
Materials1 Safe	No	9	90	1	10	10	100	5,990	0.034
	Yes	70	50	70	50	140	100		

								(1.1-72.9)	
Amount		79	52.7	71	47.3	150	100		
Material2	No	14	87.5	2	12.5	16	100	8,718	0.007
Drug	Yes	65	48.5	69	51.5	134	100	(1.6-33.2)	
Amount		79	52.7	71	47.3	150	100		
Machine (CT Scan)	No	0	0	1	100	1	100	1,120	0.957
	Yes	79	53	70	47	149	100	(1.7-2.5)	
Amount		79	52.7	71	47.3	150	100		
Money	No	5	33.3	10	66.7	15	100	2,499	0.191
BPJS	Yes	74	54.8	61	45.2	135	100	(0.1-1.2)	
Amount		79	52.7	71	47.3	150	100		

CT Computed Tomography; OR Odds ratio; BPJS Social Security Administering Agency

Conformity of time frames for ischemic stroke services to the guidelines (Table 6), namely door to triage with a median value of 1 minute and an average of 1.57 minutes with a variation of 0.07 minutes for a total of 150 (100%) people in accordance with the NINDS guidelines ≤ 5 minutes. In the door to physician variable, the median value is 2 minutes and the average is 2.98 minutes with a variation of 0.17 minutes, a total of 150 (100%) people comply with the NINDS guideline ≤ 10 minutes. In the door to CT scan activity, the mean value was 19.5 minutes and the average was 21.34 minutes with a variation of 0.82 minutes which was suitable for 103 patients (68.7%) and not suitable for 47 (31.3%) people, according to the NINDS guideline ≤ 25 minutes. In the door to CT interpretation activity, the mean value was 20.5 minutes with an average of 37.2 minutes with a variation of 3.1 minutes, namely 108 (72%) people were suitable, and 42 (28%) people were not suitable, where according to the NINDS guideline ≤ 45 minutes. In the door to drug activity, the mean value was 63 minutes with an average of 73.6 minutes with a variation of 3.8 minutes, namely 79 (47.3%) were suitable and 79 (52.7%) people were not suitable, where according to the NINDS guidelines ≤ 60 minutes. In the bivariate chi square test (Table 7), it was found that there was a significant relationship between door to CT scan and door to CT interpretation on ischemic stroke services in the ER, namely with each p-value < 0.001 (< 0.05). In the door to CT scan, OR=25,228 was obtained, which means that an appropriate door to CT scan has a 25 times greater chance of producing appropriate ischemic stroke services compared to an inappropriate door to CT scan. In door to CT interpretation, OR=52,426 was obtained, which means that an appropriate door to CT interpretation has a 52.4 times greater chance of producing appropriate ischemic stroke services than an inappropriate door to CT interpretation.

Table 6. Conformity of Time Frames for Ischemic Stroke Services to the Guideline

Activity (n=150)	Minute	Conformity to Guideline	
		In accordance (%)	Elongation (%)
<i>Door to triage</i>		150 (100)	0 (0)
Median	1		
Mean(\pm elementary school)	1.57 (\pm 0.07)		
<i>Door to Physician</i>		150 (100)	0 (0)
Median	2		
Mean(\pm elementary school)	2.98(\pm 0.17))		
<i>Door To CT scan</i>		103 (68.7)	47 (31.3)
Median	19.50		
Mean	21.34(\pm 0.82)		
<i>Door to CT Interpretation</i>		108 (72)	42 (28)
Median	20.50		
Mean(\pm elementary school)	37.28 (\pm 3.14)		
<i>Door to drugs</i>		71 (47.3)	79 (52.7)
Median	63.00		
Mean(\pm elementary school)	73.67(\pm 3.83)		

CT Computed Tomography; SD Standard Deviation

Table 7. Distribution of subjects according to Time Frames and Ischemic Stroke Services (Chi square test)

Time Frames		Ischemic Stroke Services				Total	OR (96%CI)	P value
		It is not in accordance with		In accordance				
		n	%	n	%			
<i>Door to CT Scan</i>	It is not in accordance with	39	83	8	17	47	100	<0.001
	In accordance	40	38.8	63	61.2	103	100	
Amount		79	52.7	71	47.3	150	100	

Door to CT Interpretation	It is not in accordance with In accordance	42 37	100 34.3	0 71	0 65.7	42 108	100 100	52,426 (2.2-3.7)	<0.001
Amount		79	52.7	71	47.3	150	100		

CT Computed Tomography; OR Odds ratio; CI Confidence Interval

The bivariate correlation test in this research is conducting bivariate analysis for independent variables of the numerical type door to triage, door to physician, door to CT initiation and door to CT interpretation. The results of bivariate analysis with correlation obtained p-values for the variables door to triage (p=0.128), door to physician (p=<0.001), door to CT scan (p= 0.06) and door to CT Interpretation (p=0.06) . From these results we can conclude that the time frame variables in the form of door to triage, door to physician, door to CT Initiation and door to CT Interpretation have a p value < 0.25, thus these four variables can proceed to multivariate modeling.

Table 8. Bivariate Time Frame Correlation Test

Correlation Test (Correlations)		Door to triage	Door to physician	Door to CT scan	Door to Interpretation
<i>Door to triage</i>	Pearson Correlation	1	,660**	,520**	.125
	Sig. (2-tailed)		<.001	<.001	.128
	N	150	150	150	150
<i>Door to physician</i>	Pearson Correlation	,660**	1	,560**	,287**
	Sig. (2-tailed)	<.001		<.001	<.001
	N	150	150	150	150
<i>Door to CT scan</i>	Pearson Correlation	,520**	,560**	1	,154
	Sig. (2-tailed)	<.001	<.001		,060
	N	150	150	150	150
<i>Door to CT Interpretation</i>	Pearson Correlation	.125	,287**	,154	1
	Sig. (2-tailed)	.128	<.001	,060	
	N	150	150	150	150

CT Computed Tomography; Sig. Significance

In the multivariate modeling using logistic regression (Table 9), it was found that there was 1 variable, namely door to triage with a p-value of 0.598 ($p > 0.05$) so that in further modeling the door to triage variable was removed from the model. From the latest multivariate modeling, it turns out that the time frame variable (X1) that is most related and significant to ischemic stroke services in the emergency room at Budi Medika Hospital Bandar Lampung is the door to CT scan variable (X1.3) with p-value = < 0.001 (< 0.05) and has an Odds Ratio (OR) of 14.5 (95% CI: 5.3-39.4), meaning that a prolonged door to CT scan is 14 times more likely to provide inappropriate ischemic stroke services in the ER (Table 10).

Table 9. Logistic Regression Time Frames

Variable	Unstandardized Coefficients		Standardized Coefficients Beta	t	Sig.
	B	Std. Error			
(Constant)	7,520	1,843		4,081	<0.001
<i>Door to triage</i>	-.605	1,147	-0.11	-.528	0.598
<i>Door to physician</i>	1,506	,490	,068	3,074	0.003
<i>Door to CT scan</i>	1,020	,008	,219	11,637	<0.001
<i>Door to CT Interpretation</i>	1,096	.019	,899	56,618	<0.001

CT Computed Tomography; Sig. Significance

Table 10. Last Time Frames Logistic Regression Modeling

Variable	Unstandardized Coefficients		Wald	Df	Sig.	Exp (B)	95% CI for Exp (B)	
	B	Std. Error					Lower	Upper
<i>Door to CT scan</i>	2,677	,509	27,616	1	<0.001	14,538	5,357	39,455
<i>Door to CT Interpretation</i>	22,210	5706.430	0,000	1	,997	44235940.0	,000	
<i>Constant</i>	-4819.6	11412.861	,000	1	,997	,000		

CT Computed Tomography; Df degree of freedom; Sig. significance; CI Confidence Interval

Moderated Regression Analysis (MRA) was carried out in this study to see whether the 5M management elements strengthen the time frame variable for ischemic stroke services in the ER. In (Table 11) it is known that the significance value of the time frames variable is <0.001 (<0.05), so the conclusion is that the time frames variable has a significant effect on ischemic stroke services in the emergency room at Budi Medika Hospital Bandar Lampung and with an R square value of 0.966, it means that The contribution of time frames to acute ischemic stroke services was 96.6%.

In the MRA regression equation II (Table 12) it is obtained:

1. It is known that the significance value of the time frames variable is 0.002 (<0.05), so it is concluded that the time frames variable has a significant effect on ischemic stroke services in the emergency room at Budi Medika Hospital Bandar Lampung.

2. $Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_1 X_1 X_2 + \varepsilon \rightarrow Y = 9.089 + 1.606 - 0.176 - 0.024$

It is known that the significance value of the interaction variable between the 5M management elements and time frames is 0.308 (>0.05), so it can be concluded that the 5M management element variable (X_2) is unable to moderate the time frames on the acute ischemic stroke service variable in the Emergency Room at Budi Medika Hospital Bandar Lampung

3. Because the moderator variable is not significant and the interaction variable is not significant, the type of moderation is potential moderation (Homologist Moderator), meaning that this variable has the potential to become a moderating variable.
4. It is known that the R square value is 0.967, which means that the contribution of the influence of time frames and 5M management elements to acute ischemic stroke services after the moderating variable is 96.7%, where there is an increase from the previous 96.6% to 96.7%, it can be concluded that after the presence of Moderating variables (5M management elements) can strengthen the influence of time frames variables and 5M management elements on ischemic stroke services at IGS Budi Medika Hospital Bandar Lampung.

After carrying out the quantitative analysis, it was continued with qualitative analysis (mix method sequential explanatory). The results of the qualitative analysis were obtained from structured interviews with several informants. In (Table 13), categories of various variables have been obtained which have been coded according to interview references and coding has also been carried out for 7 informants, namely the head of the ER installation, the head of the radiology installation, the ER attending doctor, the ER nurse, the radiology officer (radiographer), the administration (registration) and pharmacy staff.

From the coding results, visualization results and data in the form of graphs are obtained *project map* (Figure 1). From these results, it can be seen that there is a relationship between the informants and the time frames variable and it is also related to the 5M management elements for ischemic stroke services in the ER.

The hierarchical results of time frames are greater than the 5M management elements but both have an influence on ischemic stroke services. This strengthens the previous quantitative analysis where time frames have an influence on ischemic stroke services in the emergency room at Budi Medika Hospital Bandar Lampung and time

frames coupled with 5M management elements are able to provide increased acute ischemic stroke services in the emergency room. In the orange box, if you look at the hierarchy, door to CT scan has the most influence compared to other variables, while in the gray box, the management elements (5M) man and material have the most influence, which is also in accordance with the previous quantitative results.

Discussion

The distribution of basic characteristics of the subjects in this study was dominated by male patients. Of the total 150 samples, 82 (54%) people were male, which is in accordance with several previous studies where stroke cases were dominated by male patients. In research conducted in Saudi Arabia regarding "Demographic characteristics and types of strokes in southwestern Saudi Arabia, and the potential demand of neuro endovascular specialists" a sample of 562 stroke patients, 352 (62.6%) of whom were male (Alnaami et al., 2021). Men have a 1 in 5 risk of experiencing a stroke during their lifetime compared to women. Women are at risk of stroke at older ages and tend to have a higher life expectancy (Roy-O'Reilly et al., 2018). In this study, the largest age range was 45-64 years, 91 (60.7%) people, followed by 51 (34%) people aged >65 years. This is in accordance with several studies, namely that usually patients who experience a stroke are on average over 60 years old, most are 60-80 years old (Alnaami et al., 2021). Age is one of the main factors causing stroke (Boehme et al., 2017).

Several other studies say that stroke is usually in the seventh decade and the youngest is between 30-40 years old (Yi et al., 2020). The education level in this study was predominantly at the elementary school (SD) level with 47 (31.3%) followed by 36 (24%) high school graduates. Several studies say there is a non-linear relationship between education level and stroke risk factors for both men and women, this is usually due to lifestyle patterns or behavior (Jackson et al., 2018). The jobs in this study were dominated by other jobs such as online divers, teachers, retirees and others, 49 (32.7%) people, followed by housewives 39 (26%) people.

In research in Thailand for 1 year, it was suspected that work factors related to quality of life were psychosocial stress and Effort Reward Imbalance (ERI) (Naknoi et al., 2023). ERI is an imbalance between a person's effort and reward (salary) (Ramírez-Moreno et al., 2020). In this study, the average number of patients who came without a referral or on their own was 136 (90.7%). Studies show that the importance of pre-notification by emergency medical services (EMS) can increase the time to good treatment by a hospital's stroke service. Patients who come alone without notification can slow down ED door to stroke-team activation (DTA) (Tennyson et al., 2019). In this study, the severity of stroke when assessed from the NIHSS scale was mostly moderate grade (NIHSS) 6-14 for 76 (50.7%) people. NIHSS is used as inclusion criteria for patients undergoing thrombolysis. NIHSS >5 can be included in the inclusion criteria for thrombolysis, but there are still several check lists to assess whether a patient is eligible for this or not. (Boehme et al., 2017). For onset (time from the first incident until being taken to the emergency room) it was equal between <4.5 hours and >24 hours for 53 (35.3%) people. Several studies revealed that the onset time for stroke in the emergency room for most patients was more than 12 hours due to some indications of a lack of knowledge of the patient and his family (Alnaami et al., 2021).

Of the several activities in the ER, there are several which, if you look at the average (mean) time, are quite long, including the patient registration time, which is 14.19 minutes, with a variation of 0.6 minutes, the fastest is 5 minutes and the longest registration is 20 minutes. with an average time between 12.8 minutes to 15.5 minutes. For patients with suspected stroke or other patients who come to the emergency room who need immediate treatment, the administration or registration process should be accelerated. Registration time is the time from patient registration until the medical record book/status is available.(Novita et al., 2023)If registration is prolonged then the data that appears in the electronic medical record will also be prolonged, while the patient needs to undergo an examination immediately, for example a head CT scan or laboratory examination. Some studies do not explain the ideal registration time for stroke cases in the ER, some only explain the time required from the patient coming to the ER, a decision is made until hospitalization (ED boarding) and the total length of stay (door to disposition time). which is less than 4 hours (Nhdi et al., 2021). There was also research in Austria that conducted research on the door triage to administration time variable, which found a median value of 5 minutes (Kienbacher et al., 2022). Below are the results of interviews with administrative (registration) officer respondents:

"...In my opinion, emergency room registration should be placed in the emergency room environment, that means it should be one. So sometimes the patient's family gets lost and ends up queuing at the outpatient registration. Then maybe at the beginning you need to explain which room the patient wants to be treated in, whether they need an HCU or ICU or maybe isolation. Because sometimes to be honest it takes time and communication requires you to call the emergency room and then confirm with the rooms..."

In several studies it has been said that registration is an important thing in registering patients in the emergency room. An effective registration model in the emergency department can increase patient satisfaction levels (Delice et al., 2021).Research in China said that patient registration in the ER was located near the ER triage room, and they even created a new model of stimulation, namely with a flow chart. This research states that the time required from patient triage to registration decreased from 4.75 minutes to 1 minute (He et al., 2016).

The influence of human factors, namely, human resources play a very important role in the emergency installation of a hospital. The emergency department is the gateway to the hospital where there are crowds, varied cases and emergency actions (Liao et al., 2022). Stroke is one of the emergencies in neurological cases, which requires quick treatment. It requires human resources who have been trained in treating strokes. Stroke requires a team of human resources who come from various scientific backgrounds such as skilled stroke nurses, duty doctors who have been exposed to code stroke training and so on. This is in line with the statement of the respondent, namely the Head of the IGD Installation:

"....Eeee, usually it's because human resources are lacking, doc. "Because sometimes stroke patients come in at the same time as other patients, right, doc, together..."

The influence of method factors, namely, Standard Operating Procedures (SPO)

are procedures carried out chronologically to complete a job which aims to obtain the most effective work results from workers (Helen Robinson et al., 2020). In emergency services, especially for ischemic stroke patients, a stroke SOP is needed that is in accordance with guidelines and hospital conditions. Research in Africa says that the implementation of SPO is a reality, it can improve the quality of the emergency management process in the field of neurology (Lamin ES Jaiteh, 2017). Several studies used activation of the stroke code. Code Stroke is an activation of a stroke incident in a hospital involving a multi-disciplinary team from various backgrounds (Seah et al., 2019). At Budi Medika Hospital there is no SPO for ischemic stroke services that is comprehensive and in accordance with guidelines, currently it is still in accordance with the normal flow.

The influence of material factors, namely, means are everything that is used as a tool to achieve goals, infrastructure is everything that is the main support for the implementation of a process. The condition of work facilities and infrastructure that meet the work needs of each employee is one of the elements that influences employee performance. (Helen Robinson et al., 2020) In this case, the emergency room installation at Budi Medika Hospital already has adequate facilities and infrastructure. In terms of pharmaceutical services, antiplatelet drugs are available at the pharmacy TPO and emergency room. However, Budi Medika Hospital does not yet have a stroke unit.

The influence of the Machine factor in terms of stroke services is electronic medical records and head CT scans. Budi Medika Hospital has been using an electronic medical record (RME) system since 2020 but was further refined using Terra Medic in early 2024. Meanwhile, head CT scans use a CT scan 192 Multi Slice with Cinematic Rendering which is operational 24 hours. The procedure is still entered via the electronic medical record system by the attending doctor.

In this case money is a financial factor used by the patient. Budi Medika Hospital has facilitated inpatient and outpatient services in the form of BPJS, general and insurance services. Of course, stroke is a disease that requires long-term treatment. Stroke requires laboratory examination, CT scan of the head, chest X-ray, EKG and others. Stroke also requires treatment for medical rehabilitation. It cannot be denied that stroke is one of the causes of patients' length of stay (LOS) in hospital. Several factors cause LOS such as severity, stroke volume, infection, various complications, demographic factors and the patient's emergency status (Rochmah et al., 2021). Several studies say that a prolonged LOS can cause more economic losses. The shorter the LOS, the more effective and efficient it is for the hospital. The financial aspect of stroke patients is divided into two, namely direct costs and hospital costs. Direct costs include the health system, social factors, family, and individual costs. Individual costs are further divided into health costs and non-health costs. Health costs include medical expenses such as diagnosis, treatment and rehabilitation. In this case, the majority of patients are BPJS users so these financial factors need to be considered.

Timely management of acute ischemic stroke is the key. "Time is brain lost" applies to both ischemic strokes and haemorrhagic strokes. A fast response time in stroke treatment is associated with good patient outcomes and reduced hospital mortality. (Rasyid et al., 2022). However, delays inevitably occur in patients with acute ischemic stroke, especially in hospitals that still have limited facilities and resources.

At door to triage the average (mean) of this study was 1.57 minutes. Based on the door to needle time quality improvement project initiative target: Stroke American Heart Association patients with symptoms of acute stroke should be evaluated by a triage doctor (anamnesis, brief physical examination) in less than 5 minutes. (Liang et al., 2022), (Powers et al., 2019). In the Austrian study "Factors influencing door-to-triage-and triage-to-patient administration-time" it was found that the median time was 6 minutes for door to triage. Door to triage is influenced by weekdays and weekends. On weekdays door to triage is shortened, other factors that influence this are the activity of the referring ambulance and the patient's own emergency.

The time required from the patient coming to the ER until being examined by the doctor on duty is <10 minutes (Powers et al., 2019). The average time (mean) in this study was 2.98 minutes. In a study conducted in Lebanon, researchers used lean management as a door-to-physician intervention. After implementing lean management, there was a significant reduction in the average door to doctor time measure (40 minutes \pm 53.44 VS 25.3 minutes \pm 15.93 p<.001) (Sayed et al., 2015). In research conducted in Türkiye door to doctor ranged from 3.3 to 19 minutes. With appropriate door to doctor, door to needle time (DTN) can be reduced (Acar, 2018).

In this study, the average door to CT scan time was 21.34 minutes. According to the guidelines, the time required from when a patient arrives with a suspected stroke until a CT scan of the head is < 25 minutes (Powers et al., 2019). In research entitled "Door to Imaging Time for Acute Stroke Patients Is Adversly Affected by Emergency Department Crowding" in 2017, it was stated that overcrowding in the ER influences the delay in Door to Imaging Time (DIT). There are several predictors of DIT, namely, the resuscitation room that is being used, type of arrival (EMS), NIHSS >2, increase in systolic blood pressure per 10 mmHG, arrival on weekends and female gender (Reznek et al., 2017). In another study, it was said that door to CT decreased from a median of 38 minutes to 17 minutes using quality improvement projects such as pre-alert systems, pagers, FAST registration, new CT ordering codes, etc (Hennebry et al., 2022). A study conducted at Cipto Mangunkusumo Hospital (RSCM) Jakarta was obtained from 310 research subjects in acute stroke patients who had DTC less than 25 minutes, 56.77% of which were affected by the remote location of the CT scan and the need for refreshment by health workers regarding the stroke code (Rasyid et al., 2022).

The average (mean) Door to CT Interpretation time in this study was 37.28 minutes, which according to the guideline is the time required from when the patient arrives with a suspected stroke until a CT scan of the head is carried out and expertise is carried out by a doctor Sp. Rad is < 45 minutes. (Powers et al., 2019) In a study conducted in China, it was said that for the management of acute ischemic stroke according to the NINDS guidelines, namely door to CT result <45 minutes, an important role is needed from Community Healthcare Practitioners (CHP) as the front guard of services in the ER. Increasing the ability to manage acute ischemic stroke can be an advantage for increasing the good "Time Window" (Yang et al., 2022). At Budi Medika Hospital itself, CT interpretation is hampered on holidays or when the Sp Rad is on leave, because they only have 1 Sp Rad, so sometimes while waiting for the results of the expertise it can be done with a temporary expertise from the Sp. N onsite.

Some studies say that every minute of an acute ischemic stroke, 1.9 million brain cells are damaged. Diagnostic examination in the form of neuroimaging is the most vital component in stroke management. According to the American Heart Association (AHA) guidelines, a CT scan should be performed on patients with suspected stroke ≤ 25 minutes from arrival to the ER (Kleindorfer et al., 2021; Rasyid et al., 2022).

Researchers conducted another moderated regression analysis (MRA), namely with time frames as the independent variable, 5M management elements as the moderator for the dependent variable, namely ischemic stroke services (door to drug) ≤ 60 minutes). The type of moderation is in the form of potential moderation (Homologist Moderator) where this variable does not interact with the predictor variable and does not have a significant relationship with the dependent variable (Sugiyono, 2022).

However, the 5M management elements definitely have an influence on ischemic stroke services in the emergency room at Budi Medika Hospital. In this study, stroke services were not good, namely marked by door to drug ≥ 60 minutes. To achieve services in accordance with the NINDS guidelines, namely ≤ 60 minutes requires a comprehensive system or flow, which is currently determined throughout the world with a stroke code. This study also recommends that every hospital should try to implement it because it is very simple, very cost effective and can train health and non-health workers in acute stroke management with good outcomes (Gurav et al., 2018). This is also in line with respondent Ka's statement.

CONCLUSION

To provide acute ischemic stroke services in the Emergency Department which is well marked with door to drug ≤ 60 minutes, good time frame management is required in accordance with the NINDS guidelines starting from door to triage ≤ 5 minutes, door to physician ≤ 10 minutes, door to CT ≤ 25 minutes and door to CT interpretation ≤ 45 minutes. Hospital management elements in the form of 5 (M) man, method, material, machine and money strengthen the influence of time frames on ischemic stroke services. In terms of improving ischemic stroke services in the emergency room, appropriate SOPs, a special registration process, implementation of stroke codes, training of human resources and creating special priorities for special services (VIP stroke) are needed. It is also important to consider special SOP alternatives if a CT scan cannot be used so as not to delay immediate treatment and treatment in accordance with the acute stroke philosophy, namely "Time is Brain".

BIBLIOGRAPHY

- Pickles, B. A. (2018). Impact of Emergency Room Meetings on Improvement of Door-to-Needle Times in Acute Ischemic Stroke Patients: A Single Center's Experience. *Northern Clinics of Istanbul*. <https://doi.org/10.14744/nci.2017.00378>
- Alnaami, I., Alhazzani, A., Alburaidi, I., Alkhayri, M., Dibssan, H., Alqahtani, MS, Alqahtani, M., Alqahtani, S., Shehata, SF, Gaber, A., & Alqahtani, S. A. (2021). Demographic characteristics and types of stroke in southwestern Saudi Arabia, and the potential demand of neuro endovascular specialists. *Neurosciences*, 26(1), 62–68. <https://doi.org/10.17712/nsj.2021.1.20200104>

- Boehme, A. K., Esenwa, C., & Elkind, M. S. V. (2017). Stroke Risk Factors, Genetics, and Prevention. In *Circulation Research* (Vol. 120, Issue 3, pp. 472–495). Lippincott Williams and Wilkins. <https://doi.org/10.1161/CIRCRESAHA.116.308398>
- Delice, O., Shams Vahdati, S., Arslan, S., Alireza, A., Hosseinifar, H., Houshmand, F., Habtemariam, S., & Rezabakhsh, A. (2021). A Comparative Study of the Registry System effect on Patient Satisfaction Rate in Two Emergency Department Settings. *Bulletin of Emergency and Trauma*, 9(3), 138–144. <https://doi.org/10.30476/BEAT.2021.84704.1076>
- Fonarow, G.C., Smith, E.E., Saver, J.L., Reeves, MJ, Hernandez, A.F., Peterson, E.D., Sacco, R.L., & Schwamm, L.H. (2011). Improving door-to-needle times in acute ischemic stroke: The design and rationale for the American Heart Association/American Stroke Association's target: Stroke initiative. *Stroke*, 42(10), 2983–2989. <https://doi.org/10.1161/STROKEAHA.111.621342>
- Gurav, SK, Zirpe, KG, Wadia, R.S., Naniwadekar, A., Pote, P.U., Tungenwar, A., Deshmukh, A.M., Mohopatra, S., Nimavat, B., & Surywanshi, P. (2018). Impact of 'Stroke Code'-Rapid response team: An attempt to improve intravenous thrombolysis rate and to shorten Door-to-Needle time in acute ischemic stroke. *Indian Journal of Critical Care Medicine*, 22(4), 243–248. https://doi.org/10.4103/ijccm.IJCCM_504_17
- He, Y., Cai, B., & Wang, M. (2016). Research on Optimization of Registration Procedure in Emergency Department Based on System Simulation. *Procedia Computer Science*, 91, 37–46. <https://doi.org/10.1016/j.procs.2016.07.039>
- Hennebry, J., Stoneman, S., Jones, B., Bambrick, N., Stroiescu, A., Crosbie, I., & Mulcahy, R. (2022). Quality improvement project to improve patient outcomes by reducing door to CT and door to needle time and increasing appropriate referrals for endovascular thrombectomy. In *BMJ Open Quality* (Vol. 11, Issue 1). BMJ Publishing Group. <https://doi.org/10.1136/bmjopen-2021-001429>
- Jackson, C. A., Sudlow, C. L. M., & Mishra, G. D. (2018). Education, sex and risk of stroke: A prospective cohort study in New South Wales, Australia. *BMJ Open*, 8(9). <https://doi.org/10.1136/bmjopen-2018-024070>
- Jauch, EC, Saver, JL, Adams, HP, Bruno, A., Connors, JJB, Demaerschalk, BM, Khatri, P., McMullan, PW, Qureshi, AI, Rosenfield, K., Scott, PA, Summers, DR, Wang, D. Z., Wintermark, M., & Yonas, H. (2013). Guidelines for the early management of patients with acute ischemic stroke: A guideline for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke*, 44(3), 870–947. <https://doi.org/10.1161/STR.0b013e318284056a>
- Kienbacher, C.L., Steinacher, A., Fuhrmann, V., Herkner, H., Laggner, A.N., & Roth, D. (2022). Factors influencing door-to-triage administration- and triage-to-patient-time. *Australasian Emergency Care*, 25(3), 219–223. <https://doi.org/10.1016/j.auec.2022.01.001>
- Kleindorfer, D.O., Towfighi, A., Chaturvedi, S., Cockroft, K.M., Gutierrez, J., Lombardi-Hill, D., Kamel, H., Kernan, W.N., Kittner, S.J., Leira, E.C., Lennon, O., Meschia, J.F., Nguyen, T.N., Pollak, P.M., Santangeli, P., Sharrief, A.Z., Smith, S.C., Turan, T.N., & Williams, L.S. (2021). 2021 Guideline for the Prevention of Stroke in Patients With Stroke and Transient Ischemic Attack: A Guideline From the American Heart

- Association/American Stroke Association. *Stroke*, 52(7).
<https://doi.org/10.1161/STR.0000000000000375>
- Liang, X., Gao, W., Xu, J., Saymuah, S., Wang, Feng, L., & Li, S. (2022). Triage Nurse-Activated Emergency Evaluation Reduced Door-to-Needle Time in Acute Ischemic Stroke Patients Treated with Intravenous Thrombolysis. *Evidence-Based Complementary and Alternative Medicine*, 2022. <https://doi.org/10.1155/2022/9199856>
- Liao, P.H., Chu, W., & Ho, C.S. (2022). An Analysis of Waiting Time for Emergency Treatment and Optimal Allocation of Nursing Manpower. *Healthcare (Switzerland)*, 10(5). <https://doi.org/10.3390/healthcare10050820>
- Naknoi, S., Li, J., ramasoota, P., Liu, X., Chen, L., Phuanukoonnon, S., Soonthornworasiri, N., & Kaewboonchoo, O. (2023). Associations of effort-reward imbalance at work and quality of life among workers after stroke: a one-year longitudinal study in Thailand. *BMC Public Health*, 23(1). <https://doi.org/10.1186/s12889-023-16784-4>
- Nhdi, N. Al, Asmari, H. Al, & Thobaity, A. Al. (2021). Investigating indicators of waiting time and length of stay in emergency departments. *Open Access Emergency Medicine*, 13, 311–318. <https://doi.org/10.2147/OAEM.S316366>
- Novita, N., Ika, IM, & VIA, SH (2023). Analysis of Factors that Influence Patient Waiting Time in the Emergency Room (IGD) at Dr. General Hospital. Zainoel Abidin Banda Aceh. *Journal of Medical Science*, 4(2), 71–81. <https://doi.org/10.55572/jms.v4i2.100>
- Powers, W.J., Rabinstein, A.A., Ackerson, T., Adeoye, O.M., Bambakidis, N.C., Becker, K., Biller, J., Brown, M., Demaerschalk, B.M., Hoh, B., Jauch, E.C., Kidwell, C.S., Leslie-Mazwi, T.M., Ovbiagele, B., Scott, P.A., Sheth, K.N., Southerland, A.M., Summers, D.V., & Tirschwell, D.L. (2019). Guidelines for the Early Management of Patients With Acute Ischemic Stroke: 2019 Update to the 2018 Guidelines for the Early Management of Acute Ischemic Stroke: A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association. *Stroke*, 50(12). <https://doi.org/10.1161/STR.0000000000000211>
- Ramírez-Moreno, J.M., Muñoz Vega, P., Espada, S., Bartolomé Alberca, S., Aguirre, J., & Peral, D. (2020). Association between self-perceived psychological stress and transitory ischemic attack and minor stroke: A case-control study. *Neurology*, 35(8), 556–562. <https://doi.org/10.1016/j.nrl.2017.09.012>
- Rasyid, A., Kurniawan, M., Mesiano, T., Hidayat, R., Rilianto, B., & Harris, S. (2022). Performance of door-to-CT time of code stroke in Indonesian tertiary referral center hospital. *Egyptian Journal of Neurology, Psychiatry and Neurosurgery*, 58(1). <https://doi.org/10.1186/s41983-022-00583-6>
- Reznek, M.A., Murray, E., Youngren, M.N., Durham, N.T., & Michael, S.S. (2017). Door-to-imaging time for acute stroke patients is adversely affected by emergency department crowding. *Stroke*, 48(1), 49–54. <https://doi.org/10.1161/STROKEAHA.116.015131>
- Rochmah, TN, Rahmawati, IT, Dahlui, M., Budiarto, W., & Bilqis, N. (2021). Economic burden of stroke disease: A systematic review. In *International Journal of Environmental Research and Public Health* (Vol. 18, Issue 14). MDPI. <https://doi.org/10.3390/ijerph18147552>

- Roy-O'Reilly, M., Mccullough, L.D., & Royal, M. (2018). Age and Sex Are Critical Factors in Ischemic Stroke Pathology Age and Sex in Ischemic Stroke Age and Sex Are Critical Factors in Ischemic Stroke Pathology. <https://doi.org/10.1210/en.2018-00465/5051605>
- Saver, J. L. (2006). Time Is Brain—Quantified. *Stroke*, 37(1), 263–266. <https://doi.org/10.1161/01.STR.0000196957.55928.ab>
- Sayed, M.J.E., El-Eid, G.R., Saliba, M., Jabbour, R., & Hitti, E.A. (2015). Improving emergency department door to doctor time and process reliability: A successful implementation of lean methodology. *Medicine (United States)*, 94(42), e1679. <https://doi.org/10.1097/MD.0000000000001679>
- Seah, H.M., Burney, M., Phan, M., Shell, D., Wu, J., Zhou, K., Brooks, O., Coulton, B., Maingard, J., Tang, J., Yazdabadi, G., Tahayori, B., Barras, C., Kok, HK, Chandra, R., Thijs, V., Brooks, DM, & Asadi, H. (2019). CODE STROKE ALERT—Concept and Development of a Novel Open-Source Platform to Streamline Acute Stroke Management. *Frontiers in Neurology*, 10. <https://doi.org/10.3389/fneur.2019.00725>
- Singh, R.R., Yadav, P.K., & Yadav, S. (2023). Management Strategies for Overcrowding in Emergency Medicine Departments: A Narrative Review. *JOURNAL OF CLINICAL AND DIAGNOSTIC RESEARCH*. <https://doi.org/10.7860/jcdr/2023/61518.18333>
- Sugiyono. (2022). *Management Research Methods*. Alfabeta Publishers.
- Tennyson, JC, Michael, SS, Youngren, MN, & Reznek, MA (2019). Delayed recognition of acute stroke by emergency department staff following failure to activate stroke by emergency medical services. In *Western Journal of Emergency Medicine* (Vol. 20, Issue 2, pp. 342–350). eScholarship. <https://doi.org/10.5811/westjem.2018.12.40577>
- Xian, Y. (2011). Association Between Stroke Center Hospitalization for Acute Ischemic Stroke and Mortality. *JAMA*, 305(4), 373. <https://doi.org/10.1001/jama.2011.22>
- Yang, H., Huang, X., Yang, C., Zhu, S., Chen, X., Zhang, M., Yu, X., & Wang, HHX (2022). Time Window for Acute Stroke Management: A Cross-Sectional Study Among Community Healthcare Practitioners in Primary Care. *International Journal of General Medicine*, 15, 4483–4493. <https://doi.org/10.2147/IJGM.S361189>
- Yi, X., Luo, H., Zhou, J., Yu, M., Chen, X., Tan, L., Wei, W., & Li, J. (2020). Prevalence of stroke and stroke related risk factors: A population based cross sectional survey in southwestern China. *BMC Neurology*, 20(1). <https://doi.org/10.1186/s12883-019-1592-z>

Copyright Holder:

Luther Theng, Yanuar Jak, Grace Rumengan (2024)

First Publication Right:

Jurnal Health Sains

This article is licensed under:

