

Factors Associated with Onset to Hospital Delay among Stroke Patients in the Emergency Department

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ABSTRACT

Ischemic stroke is the most common neuro-emergency in the world. The only treatment approved for an acute stroke is thrombolysis, which has a narrow window. Thrombolysis to treat acute ischemic stroke is underutilised. There are many factors associated with delays in treatment. In Indonesia, thrombolysis is not commonly used for acute stroke treatment. The study aimed to know what time is needed from the onset of the stroke condition to the Emergency Department in a stroke patient and the factors associated with the hospital delays. All stroke patients admitted to Dr. Soetomo General Hospital and Universitas Airlangga Hospital between October 2016–March 2017, who agree to participate in the research and were aged >18 y.o. are included. We reviewed all of the subjects for the demographic characteristics, distance to hospital, stroke risk factors and clinical data. All of the subjects will be asked for the time of stroke onset and the time when the patient arrived at the emergency department. We will also measure the stroke using a specialised scale.

Results: There were 107 subjects included in this research. The data was inadequate in 4 subjects. The mean age was 55.97±11.9 years, and there were more women (54.2%) than men. The distance from the patient's home to the hospital was mostly <15 km (65.1%). 63.6% of the subjects were referred from other hospital or clinic. Most of the patients had hypertension (71.4%) and diabetes (31.7%). Onset from the ictus of the stroke to the Emergency Department was 712.3±1324.6 minutes. A factor associated with the delay was the medical services accessed before the patient was referred to the hospital (0.215; p=0.026) and their pre-admission score (0.242; p=0.012)

Conclusion: Time from onset to the Emergency Department was longer than the treatment time window for thrombolysis. The factors associated with the onset of hospital delays was primary medical services and the pre-mRS score.

Keywords: Acute stroke, thrombolysis, hospital delays

INTRODUCTION

Ischemic stroke is the most common neurological emergency in the world¹. In 2008, stroke was the third leading cause of death². In the US, there are 780.000 cases of stroke every year, and the cost of stroke treatment in 2008 was an estimated \$65.5 billion¹. An estimated 88% of stroke patients have an ischemic stroke³. There are many stroke patients who remain functionally dependent after a stroke, although around 50-70% return to their previous functional status. There is a susceptibility to an increased mortality and morbidity after having a stroke¹. Stroke is also the leading cause of morbidity among adults. About 30% of stroke patients need assistance

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during their daily activities, and 16% need long-term hospital or home care ^{1,3}.

Thrombolysis using r-TPA is the only drug approved by the FDA for ischemic acute stroke treatment for all patients who meet the inclusion and exclusion criteria ³⁻⁷ by 30 days, 33 (14.7%). There is a strong correlation between arterial recanalisation and the improvement of neurological status in an ischemic stroke patient ¹. Iv-rTPA is recommended to be given within 3 hours of onset according to the NINDS criteria ⁸. Pool analysis from a NINDS-rTPA study concluded that earlier treatment with iv-rTPA correlates with a better outcome. According to the NNT ratio, iv-rTPA will benefit 8 patients out of 15, and for every 15 patients treated with iv-rTPA, only 1 patient will suffer an intracranial haemorrhage ⁴.

Although iv-rTPA is effective as a treatment for acute ischemic stroke, thrombolysis for acute stroke is still under-utilised; especially as there are many patients coming to the hospital beyond the treatment period. There is also the complexity of hospital bureaucracy involved^{1,9,10} in our tertiary care center, the time intervals preceding intra-arterial thrombolysis in order to accelerate and optimize the management of acute strokes. METHODS: Between January 1, 2000, and April 30, 2002, 597 patients with acute stroke were admitted to our stroke center. One hundred forty-eight patients underwent diagnostic arteriography, and 100 (16.8%). Chen et al. revealed that the factors associated with a delay in the community included a referral from another health facility, waking up with a stroke, having a stroke while having sex, the patient's address, transportation, history of stroke or coronary artery disease and the NIHSS score in the emergency department all had no predictive value ¹¹. Tan, et al. conducted a prospective study on 789 stroke patients and revealed that 26% of them had come within 2 hours of onset. A factor associated with hospital delays was a referral from another hospital, the stroke location, the onset of the stroke, the treatment in outpatient clinics and a lack of concern related to seeking help for stroke symptoms¹². Herlitz et al. reviewed existing stroke studies and acute myocardial infarction studies and showed that the onset of symptoms through to treatment for an acute stroke was longer than that for a myocardial infarction¹³ resulting in an infarction. Depending on the extent of the infarction, loss of organ function varies considerably. In both conditions, it is possible to limit

the extent of infarction with early intervention. In both conditions, minutes count. This article aims to describe differences and similarities with regard to the way patients, bystanders and health care providers act in the acute phase of the two diseases with the emphasis on the pre-hospital phase. METHOD: A literature search was performed on the PubMed, Embase (Ovid SP).

The chain of hospital services will prompt a good outcome in stroke patients, beginning with knowledge of stroke symptoms. The CASPR (the California Acute Stroke Pilot Registry) study showed that there was an increase in patients receiving thrombolysis from 4.3% to 28.6% ^{2,14}

Acute stroke services in the emergency department should be conducted in Triage with the same priority as a myocardial infarction or traumatic brain injury regardless of the neurological deficit severity. Service standards for acute stroke care according to the AHA/ASA guidelines are: from ER to meeting a medical doctor is less than 10 minutes; ER to meeting the stroke team is less than 15 minutes; ER to performing a CT scan is less than 25 minutes; ER to CT interpretation is less than 45 minutes; ER to thrombolysis is less than 60 minutes; and ER to admission to a stroke unit is less than 3 hours.

Thrombolysis in Indonesia is less frequently performed because there was no data available to determine the factors causing the ER admission delay in stroke patients. This study aimed to know the average time is from onset to ER admission in acute stroke patients.

METHOD

From October 2016 to March 2017, all acute stroke patients in Dr. Soetomo General Hospital and Airlangga University Hospital who were admitted to the ER were observed. All stroke patients older than 18 years old were included in this study. Stroke patients with mimicking conditions and who had a subdural haematoma were excluded. All patient data was collected including demographic data, the onset of the stroke, the duration of attack in order to know whether the patient had a stroke or a TIA, the distance from the patient's address to the hospital, the medical care received before the patient came to the ER, who was a witness to the stroke ictus, the response of patient after the stroke symptom onset, the patient or witness's knowledge about stroke attacks, the mode of transportation that patients used and the time taken to get

from the patient's home to the ER. We also collected their history of past illness, the NIHSS score when they were admitted to the ER, their pre-mRS (The modified Rankin Scale), mRS and the type of stroke. All of the data was analysed statistically to determine the mean, SD and normality, and we conducted correlational analysis.

RESULTS

We included 107 subjects from the period of November 2016 – March 2017. The mean age of this research was 55.97±11.9. All of the demographic characteristics have been shown in Table 1. There were more women (54.2%) in this research, most of patients were from Dr Soetomo General Hospital (98%) and most of patients had a low income (89%). Our subjects mostly had a level of education of senior high school level (34%). Most of the patients had an address distance that was less than 15 km (64.5%) from the ER.

Table 1: Demographic characteristics

Variable	n	%
Sex		
Male	49	45.8
Female	58	54.2
Hospital		
Airlangga University Hospital	2	1.9
Dr. Soetomo General Hospital	105	98.1
Income		
< 5 million rupiah	96	89.7
>5-10 million rupiah	8	7.5
>10-20 million rupiah	2	1.9
Education		
No education	11	10.3
Elementary school	27	25.2
Junior High School	22	20.6
Senior High School	34	31.8
Diploma - degree	11	10.3
Post Graduate education	2	1.9
Hospital Distance from Subject home		
<15 km	69	65.1
>15 km	37	35.5
Medical care before ER		
Hospital or outpatients clinics	68	63.6
Home	37	34.6
Unknown	2	1.8

Hypertension was a common risk factor (74.8%) in our research, followed by diabetes (29.9%) and history of acute cerebrovascular accidents (25.5%) (Table 2). We decided that the time taken to come to the ER was less than 15 minutes, 15-29 minutes, 30-60 minutes and more than 60 minutes for the respective groups. The most common time taken to get to the ER was 15-29 minutes. Although most of the patients came to the ER around 15-29 minutes, the mean time needed to get to the ER was 712.12±1324.6. This means that more patients were actually in the group of over 60 minutes. Some of the patients got to the ER 2-3 days after the stroke attack.

Table 2: Stroke Risk Factors

Variable	n	%
Hypertension	76	71.4
Diabetes Mellitus	33	31.7
TIA	4	3.7
Stroke	27	25.2
Jantung	11	10.3

We used statistical analysis to determine the correlation between the time needed to get to ER and the factors such as age and stroke type. There was the NIHSS score, pre-mRS score, mRS Score, the patient's income, their education level, the distance from the patient's home to the Emergency Department and also the medical care that the patient got before patient arrived at the ER. We used Spearman's correlation to analyse the variables. We found that the variables associated with ictus to hospital delays were pre-mRS Score ($r=0.242$; $p=0.012$), distance from the patient's home $r=0.195$ ($p=0.045$) and medical care before ER ($r=215$; $p=0.026$).

Table 3: Time needed to ER

Variable	Mean ± SD	p
Onset to ER	712.12 ± 1324.6	0.00
Time needed at ER	239.5 ± 151.3	0.00

Table 4: Correlation between the factors associated with time to ER

Variable	r	p
Age	-0.065	0.51
Stroke type	0.162	0.1
NIHSS 1	0.045	0.649

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Pre-mRS	0.242	0.012*
mRS	0.034	0.731
Income	0.051	0.605
Education	0.105	0.284
Distance	0.195	0.045*
Medical care before ER	0.215	0.026*

DISCUSSION

Our research showed that women were more common than men, so our data is different to that from the previous research which concluded men suffer stroke attacks more than women^{9,15-17}. Gender is one of the unmodified risk factors for stroke. Our study showed that women are more common. We used a hospital-based study and we recruited our subjects using consecutive sampling. Most of the patients in our study were referred from another hospital, so our patients were selected from other hospitals or clinics. Data from the Ministry of Health in Indonesia also showed that men more commonly suffer a stroke than women¹⁸, but because of the referral system in Indonesia, the patients should go to primary care before being referred to secondary or tertiary care.

The mean age of our subjects was 55.97±11.9, so our subjects were younger than those of Chen, et. The most common stroke patient age was >65 years old. Our data showed that there is a trend for stroke patients to be of a younger age in Indonesia compared with other countries.

The income of our subjects was consistently less than 5 million rupias. This data shows that most of our subjects had a lower income, although the income of the subject didn't correlate with time to ER. Our subject's education mostly was of a lower education level that will affect their awareness of stroke signs and symptoms, also affect their awareness of needing to seek help at a hospital.

The risk factors in our study included hypertension, diabetes, TIA, stroke, and a history of coronary artery disease. Our results are similar to those of another study^{17,19,20}.

The time from ictus to the Emergency Department was 712.12 ± 1324.6. This data shows that our subjects, on average, came to the Emergency Department beyond time window needed for thrombolysis. This delay can be the result of the referral system in our country. The

factors associated with time to ER was only significant in relation to the Pre-mRS score ($r=0.242$; $p=0.012$). This shows that the status before ictus affected the patient coming to the hospital earlier. Another factor associated with time to ER was the medical care received before the patient came to the ER (0.215 $p=0.026$). This result shows that our subject maybe had an awareness about stroke and so they came to the primary medical services, but the referral system also delayed the subject coming to thrombolysis-ready hospitals. Chen et al. found that sex, the subject's address, mode of transportation and history of stroke didn't have a significant association with time to hospital¹¹. This result is similar to our results, although the distance from the patient's home was significant in our study. The distance from the patient's home could significantly shorten the time taken to get to the hospital, but this does not affect anything clinically because the average of our study showed that the time taken to get to the hospital was consistently beyond the thrombolysis time window.

CONCLUSION

We conclude that the time taken to get to the Emergency Department is longer than the thrombolysis treatment window and that the only variables affecting the time taken to get to the ER was the Pre-mRS and the medical care accessed before the Emergency Department. Our study had limitations as it was performed at the tertiary hospital using consecutive sampling. The intervention was performed before thrombolysis became commonly performed in Indonesia.

Conflict of Interest: None.

Ethical Clearance: The study passed ethical clearance from Ethical Committee of the Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia.

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