Original

Factors Related to The Real Costs for Stroke Patients in The Hospitals, Yogyakarta City, Indonesia

[1]Muslimah Muslimah, [1]Nina Anggraeni Noviasari, [2]Satriya Pranata, [3]Sri Wahyuni, [1]Swasty Swasty, [2]Machmudah Machmudah

[1]Faculty of Medicine, Universitas Muhammadiyah Semarang, Semarang, Central Java, Indonesia
[2]Faculty of Nursing, Universitas Muhammadiyah Semarang, Semarang, Central Java, Indonesia
[3]Faculty of Health Sciences, Universitas YPIB Majalengka, Majalengka, West Java, Indonesia

Corresponding author: Muslimah Muslimah, Faculty of Medicine, Universitas Muhammadiyah Semarang, Semarang, Central Java, Indonesia. muslimah@unimus.ac.id:+6285641170070

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ABSTRACT

Background: Stroke is a main cause of mortality and disability, resulting in severe, moderate, and mild impairments that need expensive medical care. This research aims to identify the variables affecting the actual expenses of treating stroke patients in Indonesian hospitals in the Yogyakarta region.

Method: This study was carried out using a cross-sectional design and an analytical observational technique based on variable instruments used to measure the real costs for stroke patients. The total population amounted to 416 respondents using the total sampling method. Inclusion criteria include national health insurance patients, first-attack ischemic stroke, onset less than 24 hours and non-referral. Retrospective data collection of inpatients was observed from October 1, 2021, to March 31, 2022, for six months. Research data secondary data sourced from medical records, International Financial Reporting Standard (IFRS), and hospital Technology Units. Analysis of statistical data using the Chi-square test.

Result: Age, gender, length of stays, inpatient classes, and hospital type have been identified as variables related to the real cost of stroke patients in the hospitals with a p-value < 0.05.

Conclusion: All variables examined in this study are connected to the expenses incurred by stroke victims in hospitals. However, several files of medical records cannot be identified in the study which means that other variables like comorbidities might also related to inpatient costs of stroke patients and need to be analysed for future study.

Keywords: Ischemic Stroke, Real Cost, Hospitalization, Outpatient

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INTRODUCTION

Preventing early medical complications, minimizing the number of damaged cells through tissue healing, stopping additional bleeding in intracerebral hemorrhage, and speeding up the recovery of overall neurological function are the key goals of comprehensive stroke management. Effective overall stroke care is anticipated to improve the patient's prognosis.[1]

After heart disease and cancer, stroke is the third most common cause of death and the leading cause of disability.[2] Long-term rehabilitation and additional treatment are frequently needed by stroke survivors. The American Heart Association has released a policy statement projecting that by 2030, the cost of managing strokes will double and the incidence of strokes among Americans between the ages of 45 and 64 will rise. The cost of managing strokes in the United States increased to $183.13 billion in 2010 from 71.55 billion, the cost of lost productivity increased from 33.65 billion to 56.54 billion annually, and the prevalence of strokes among Americans increased by 5.1%. These are some of the reasons for this increase.[3] Per Riskesdas (2013), strokes also have the greatest death rate in Indonesia. Recurrent stroke and stroke caused by disability necessitate expensive treatment to address the issue. At Sardjito Hospital Yogyakarta, the average total cost of therapy for an ischemic stroke was Rp 4,3 million in 2007, while for a hemorrhagic stroke, it was Rp 5,3 million. The mean price of medications for ischemic stroke is Rp. 1,7 million, whereas hemorrhagic stroke costs Rp. 2,1 million.[4]

Stroke survivors have increased every year. The main cause is an unhealthy lifestyle, such as lack of exercise, smoking, drinking alcohol or consumption of fatty foods.[5] This disease influences the decline in productivity of sufferers becoming disabled, no longer able to earn a living, becoming dependent on others, and not infrequently becoming a burden on their families so that the family economy is disrupted. In addition, it can affect both the psychological and physical for both patients and families. Stroke requires long treatment, expensive costs and requires patience and high support from family.[6]

Disease cost analysis estimates The greatest amount that could be saved if it weren't prevented. Lots of research For the past 30 years, the cost of illness has been calculated.[7] The significance of the research The National Health Insurance Program (NHI), which policymakers frequently utilize, illustrates the cost of illness. Because they demonstrate the extent to which disease affects society, the majority of this research has contributed to the discussion of public health policies.[8] NHI Healthcare in Indonesia is a component of the National Social Security System, which attempts to safeguard all Indonesians by providing insurance coverage so they can cover their basic medical requirements through their contributions or government-funded contributions.[9] NHI financing for hospital payments uses prospective payment methods.

This study aimed to identify the variables associated with actual hospital expenditures for stroke patients. The hospitals analysed are ten hospitals representing government hospitals and private hospitals and are spread throughout the districts and municipalities in DI-Yogyakarta City, Indonesia. Information on factors related to the real cost for stroke patients can be used as valuable information to prevent high costs for stroke patients in hospitals.

METHODS

Design: This is an analytical approach using Cross-sectional design

Samples and locations: Analysis of hospital data used includes medical records and International Financial Reporting Standard (IFRS) in the hospitals in Yogyakarta during the six months from October 1, 2021, to March 31, 2022, the beginning hospitalization date of the patient.[10] The inclusion criteria of the study subjects were patients who were supported by NHI, first-attack ischemic stroke patients, 24-hour ≤ onset and non-referral. Exclusion criteria if the patient's direct medical cost data is incomplete. The research subjects used were patients with stroke in hospitals in the DI-Yogyakarta Region (including 5 government hospitals and 5 private hospitals representing all regencies and municipalities). The total samples are 416 samples were recruited from the total sampling method. The data of patients were taken from the stroke register for INA-CBG's data.

Data collection and analysis: Depending on the type of treatment needed and the severity of the stroke, hospital stroke treatment costs can vary. The average cost of treating a minor stroke is between IDR 5,000,000 and IDR 20,000,000 for the first few months of treatment and rehabilitation. Treating a more serious stroke can cost up to IDR 450,000,000. Stroke patients can receive completely paid treatment services if they need inpatient care at a hospital that partners with government health insurance.

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The data source in this research uses secondary data sources, namely analyzing patient medical record data. Researchers collected data in the period 1 October 2021 to 31 March 2022 at 10 hospitals by looking at the medical records of 619 stroke patients and the actual costs incurred by the hospitals for each patient. Calculation of the number of samples for this study for each location of health facilities. The total sampling method is used to collect data on direct medical costs. from 10 hospitals with medical record data for 619 stroke patients, researchers recorded and analyzed starting from data completeness, patient age, gender, length of stay, inpatient classes, hospital types and real costs for stroke patients. **Table 1** presents the data for reading.

Table 1. Calculation of the minimum sample count

Hospital Name	Bethesda Hospital	Yogya Hospital	Panti Rapih Hospital	Sleman Hospital	Rizki Amalia Medika Hospital	Wates Hospital	PKU Bantul Hospital	Pembahan Senopati Hospital	Nur Rohmah Hospital	Wonosari Hospital
Precision	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
CV	0,648	0,648	0,648	0,648	0,648	0,648	0,648	0,648	0,648	0,648
Z_(1-α/2)^2	1,96	1,96	1,96	1,96	1,96	1,96	1,96	1,96	1,96	1,96
N0	284	214	210	143	93	93	93	93	4	4
N	102,88	91,98	91,23	75,8	58,99	58,99	58,99	58,99	3,9	3,9
	103	92	91	76	59	59	59	59	4	4
Minimal Total Sample			606							

To characterize the overall cost of a stroke, descriptive analysis was used then correlation variables were analysed by chi-square tests. From 606 samples, only 416 samples with complete data and included in the study.

RESULTS

Patient characteristics: Characteristics of patients include age and gender, length of treatment, class of treatment, location of study, and average frequency of visits.

Table 2. Characteristics of ischemic stroke patients in 10 hospitals in DI-Yogyakarta, Indonesia (n = 619)

Patient characteristics	Group Variations	Number of Patients	Percentage (%)
Age (years)	< 41	8	1.92
	41-70	327	78.61
	> 70	81	19.47
Gender	Male	227	54.57
	Female	189	45.43
Length of Stay (days)	< 5 days	71	17.07
	5 – 10 days	330	79.33
	11 – 15 days	11	2.64
	> 15 days	4	0.96
Inpatient Classes	Class I	149	35.82
	Class II	79	18.99
	Class III	188	45.19
Hospital types	Government Hospital B	255	61.30
	Government Hospital C	16	3.85
	Private Hospital B	89	21.39
	Private Hospital C	50	12.02
	Private Hospital D	6	1.44

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Table 2 displays the features of the biggest population of ischemic stroke victims, aged 41 to 70 (78.61%). The proportion of males (54.57%) is greater than females. The length of treatment for ischemic stroke patients in hospitals in the DI-Yogyakarta area has the largest range at 5-10 (79.33%). Most ischemic stroke patients were treated in class III 188 patients (45.19%). The location of the most ischemic stroke treatment research in Type B Government hospitals was 89 patients (21.39%).

Table 3. The real cost of outpatient ischemic stroke patients in hospitals in Yogyakarta (n= 416)

Cost	Real Cost of Patients		P
	Sum (IDR)	Average (IDR)	
High	573.328.700	249.599	0,673
Middle	43.098.307	139.477	0,073
Low	12.567.854	129.566	0,154

Table 3. shows that in outpatient ischemic stroke patients with high real cost were Rp. 573.328.700, middle cost Rp. 43.098.307, and low cost Rp. 12.567.854.

Table 4. Relationship between factors with real cost of patient's ischemic stroke patients in hospitals in Yogyakarta

Variables	Real cost			Total (%)	p-value
	High (%)	Middle (%)	Low (%)		
Age (years)					0.025*
<41	3 (37.5%)	2 (25%)	3 (37.5%)	8 (100%)	
41-70	169 (39.58%)	142 (33.26%)	116 (27.17%)	427 (100%)	
>70	31 (51.67%)	27 (45%)	2 (3.33%)	60(100%)	
Gender					
Male	126 (55.51%)	75 (33.04%)	26 (11.45%)	227 (100%)	0.031*
Female	83 (43.92%)	43 (22.75%)	63 (33.33%)	189 (100%)	
Length of Stay (days)					
<5 days	28 (39.44%)	20 (28.17%)	23 (32.39%)	71 (100%)	0.017*
5-10 days	171 (51.82%)	60 (18.18%)	99 (30%)	330 (100%)	
11-15 days	6 (54.55%)	2 (18.18%)	3 (27.27%)	11 (100%)	
>15 days	2 (50%)	1 (25%)	1 (25%)	4 (100%)	
Inpatient Classes					
Class I	61 (40.94%)	38 (25.50%)	50 (33.56%)	149 (100%)	0.012*
Class II	33 (41.77%)	21 (26.58%)	25 (31.65%)	79 (100%)	
Class III	74 (39.36%)	51 (27.13%)	63 (33.51%)	188 (100%)	
Hospital types					
Government hospital B	95 (37.25%)	70 (27.45%)	90 (35.29%)	255 (100%)	0.019*
Government hospital C	6 (37.5%)	5 (31.25%)	5 (31.25%)	16 (100%)	
Privat hospital B	31 (34.83%)	25 (28.09%)	33 (37.08%)	89 (100%)	
Privat hospital C	21 (42%)	13 (26%)	16 (32%)	50 (100%)	
Privat hospital D	3 (60%)	1(20%)	2(20%)	6 (100%)	

Notes: * Significant (p<0.05), p-value (Chi-Square test)

DISCUSSION

Patient age has a significantly association on real costs in patients with ischemic stroke, with a p-value = 0.025

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(<0.05). Judging from the average cost value, the older the patient, the greater the costs incurred. This is because the older the patient, the body's function and metabolism decrease and often advanced patients are accompanied by several comorbidities,[11] So the cost of treatment is not only for treating stroke but also comorbid diseases because the quantity of comorbidities influences treatment costs as well.[12] According to a Chinese study, patients receiving treatment for up to two comorbidities or no comorbidities were charged 41,220 CNY (Chinese yuan), but patients receiving treatment for eight or more comorbidities were charged 137,389 CNY (Chinese yuan).[13] The amount of money needed to treat each comorbidity will rise as the number of comorbidities grows. A year later, the clinical status of stroke patients improved 1.0309 times more slowly than that of younger patients.

Age is a risk factor that cannot be controlled and modified because Age is a factor in the increased incidence of stroke in both men and women.[14] Strokes increased from 1.76 per 1000 individuals per year for individuals aged 55-64 years to 16.47 for those aged 85 years and over.[15] The risk of stroke increases every decade after the age of over 55 years until at least the age of 84 years. [16], but this can be a reminder that old age is a great risk of experiencing a stroke because the aging phase is a phase where anatomical and physiological conditions decline so the risk can be prevented by exercising. live healthy since young.

Gender also provides a significant difference in the real costs incurred with a significance of p = 0.03. These results are by research by Lucas-Noll et al. (2023) which states that the cost of stroke is influenced by gender.[17] Because men are more prone than women to acquire vascular disease and hence have a higher risk of having a stroke, the expenses associated with treating male patients are higher than those associated with treating female patients.[18]

The prevalence of stroke in men is higher than in women.[19] In women, hormonal factors, namely estrogen and progesterone in women during the fertile period, can protect the elasticity of blood vessels and organs in the body so that they can prevent strokes at a young age.[20] The hormone estrogen is thought to protect neuroprotective and anti-inflammatory properties, thereby preventing atherosclerosis and significantly lowering plasma cholesterol. This hormone quickly causes vasodilation by increasing the local production of nitrogen oxide (NO).[21] Men are more likely than women of the same age to have high blood pressure, which increases the risk of stroke. Men are more likely to have a stroke due to lifestyle factors in addition to hormones. Similar to smoking, this practice is growing among guys. One of the things that can cause a stroke in a person is smoking.[11] These gender factors include factors that cannot be controlled or cannot be modified. Therefore, it is natural that men are advised to be more aware of strokes.

The calculation results show that the average cost increases significantly with increasing length of patient care.[22] Length of Stay (LOS) is the period a patient remains in the hospital to receive medical care for their ailment until they are released from the facility.[23] The length of treatment also affects the real rates. This is because the length of treatment is calculated at real rates per day, so The longer a patient receives treatment, the more expensive it becomes. One day of inpatient care was counted for patients who were admitted to the hospital and released the same day.[24] In the calculation, the date of entry into inpatient services (admission) is counted, while the date of patient discharge (discharge) is not counted. Long inpatient days that are too long will cause losses, including increasing the burden of care costs for patients or the patient's family, reducing the coverage of hospital health services, BOR (Bed Occupancy Rate) will increase and become a waste for the hospital (operational costs from the hospital will bigger.[25]

This follows Ferreira's (2024) study that the length of hospitalization influences the amount of costs incurred for treatment. [23] It is also comparable to Kim's research which asserts a connection between the duration of stay and the total expenses incurred. [26] According to Cyganska, the calculation results show that average costs increase significantly with increasing length of patient care.[27] The health care service class consists of Three classes—classes one, two, and three. The division into three classes is not just about determining participants' monthly contributions.[28,29] But it also ensures the level of health facilities and services that can be accessed by participants, according to their respective financial capabilities.[30] Even though there are differences in the amount of contributions and facilities provided, the types of basic medical services provided by BPJS Health remain consistent for all class levels. This means that participants of all grade levels can access basic services such as doctor consultations, inpatient care, and

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medications in the same way. Patients with low economic status prefer to use class 3 treatment so according to health service standards there is a minimum treatment class.[31] However, even though there are differences in treatment classes, the quality of medical care should be the same for all classes. The difference in treatment classes only affects the patient's non-medical service facilities, such as room facilities, food, and treatment privacy. In class 1, treatment costs are more expensive because they have inpatient room facilities with 2-4 patients so that patients and their families who are waiting feel more comfortable.

Many hospitals in Indonesia were found to have more third-class treatment rooms than other treatment rooms because low-cost payments make them easier to afford and payments can be adjusted based on the patient's income level. [30] The class of care affects the real costs of hospitals because the higher the level of care, the more costs are incurred. Costs increase when accompanied by additional medicines or higher prices and longer treatment days so that the treatment costs incurred by the hospital increase.

Hospital classification Hospitals are categorized into classes A, B, C, and D based on their class. Class A general hospitals are those that are equipped to provide a wide range of specialized and subspecialty medical services.[31] Class B general hospitals are general hospitals with limited subspecialty capabilities and facilities capable of providing medical services in at least eleven disciplines. Public hospitals are classified as class D, while general hospitals are classified as class C. Class C general hospitals are those with basic medical service facilities and capabilities, including basic specialized medical services.[30] Hospitals with complete facilities and good service are the patient's main choice in determining a place of treatment. Insurance claims from the National Health Insurance (NHI) also influence the classification of the type of hospital. The differences in classification based on class affect service facilities and treatment costs so many hospitals are competing to improve their classification to help increase NHI claims. With increasing types of hospitals and health service facilities, the number of patients will also increase and this will increase NHI Hospitals claims. On the other hand, many hospitals are competing to provide the best facilities and quality to attract patients, even at a higher cost, but because patients need comfort, even though the costs are expensive, some patients will still choose to pay large costs for health services.

Implications of the findings of this study

The INA-CBGs scheme is the finance mechanism used by government health insurance. The amount of INA-CBGs, a prospective payment system for health services, is decided prior to the health service being rendered through capitation and base payment (casemix), specifically based on the classification of diagnoses and procedures according to clinical characteristics. Real hospital rates and INACBG rates for certain illnesses, including stroke, frequently diverge as a result of hospitals implementing the prospective payment system. Hospital charges were still higher than INA-CBGs rates for both inpatient and outpatient treatment, according to an evaluation or comparison of real expenses and INA-CBGs rates. In order for the government to assess INA-CBG rates for the sustainability of health services, hospitals must be able to control the major cost factors that affect direct medical expenditures.

Strengths and limitations of the study

The benefit of studying the cost of illness is that, given that the finance system in place makes use of the INA-CBGs system, it is crucial to assess the policies put in place during the construction of the national health insurance program. Secondary data was employed in this study; its drawbacks include the potential for analysis errors and the fact that the quantity of data found is not exhaustive.

CONCLUSION

Age, gender, length of stay, inpatient classes, and hospital type have been identified as variables related to the real cost of stroke patients in hospitals of DIY Yogyakarta, Indonesia. The problem faced by the researcher in the study process where many data medical records were not complete. Therefore, several files of medical records cannot be identified in the study. Moreover, other variables like comorbidities with inpatient costs of stroke patients etc cannot be analysed. This study was approved by the research ethics committee of Universitas Muhammadiyah Semarang on September 11, 2021, with ethic number No. 055/EC/KEPK-FK/UNIMUS/2023

Author contributions: Muslimah was involved in all aspects of the study. Nina Anggraeni Noviasari and Satriya Pranata were supervisors, Sri Wahyuni, Swasty and Machmudah reviewed the literature and final-

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checked the draft. Muslimah and Satriya Pranata were data curation.

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