

## Stroke Treatment Cost Analysis for Consideration on Health Cost Determination Using INA- CBGs

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### ABSTRACT

Indonesian Case Based Groups (INA-CBGs) implementation on hospital financing for stroke patient using *Jaminan Kesehatan Masyarakat* (Jamkesmas) at 3<sup>rd</sup> class hospitalization requires therapy plan management and cost analysis because stroke is a leading cause of death worldwide and need high treatment cost. It is proposed to skip the hospital expenditure and avoid deficit suffering. The study objectives was to determine the suitability cost between real stroke treatment cost and health financing based on INA-CBGs, and to determine the highest cost component on stroke treatment at Jogja hospital. This cross sectional observational study used retrospective sampling method. The subjects were taken from all stroke patient population using Jamkesmas insurance at Jogja Hospital, were hospitalized between January 2011 - April 2012 and met the inclusion criteria. The subject was then classified based on INA-CBGs. Patient's length of stay and costs (direct medical and direct non-medical costs) were defined as study variable. Data was analysed using descriptive analysis and Mann Whitney test. Through this study we conclude the average rate of real stroke treatment cost at Jogja Hospital was higher insignificantly than INA-CBGs based cost and the highest treatment cost was on the medicine and medical equipment.

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### 1. INTRODUCTION

Stroke was a major disease caused of death in the worldwide and the third leading cause of death in the United States after heart disease and all cancers. Stroke was occurred in more than 700,000 people per year with 150,000 mortality rate [1]. Stroke was the "expensive" disease as the patient often required further treatment and long-term rehabilitation. This because a stroke could cause physical and mental disability due to neurological damage as a result of acute interruption of cerebral blood flow due to occlusion or hemorrhage [2]-[4]. In 2000, patients with stroke in the United States were spent 30 billion US dollars for treatment [5]. Stroke's patient was often received polypharmacy because most of them also had complications or comorbid disease [2], [6].

Various stroke treatment guidelines were led to the various costs to be paid by the stroke patient or stroke patient's family or the insurance. If the drug's handling or selection was improper, then it would lead the patient into longer hospitalization or got more complications disease then would make higher hospitalization expenses. The amount of stroke treatment cost was influenced by the type of used drug therapy, type of given medical procedure by medical staff, medical team capability in diagnose accuracy and

rapidity, as well as the adherence of medical staff to the clinical pathways that have been previously approved by the hospital.

Based on Keputusan Menteri Kesehatan Nomor 989/Menkes/SK/IX/2007, the Financing System using INA-DRGs (Indonesia Diagnosis Related Groups) package system was applied on 1st July 2008 for the member of Jaminan Kesehatan Masyarakat (Jamkesmas) [7]. At the end of 2010, there was a replacement of using software grouper from INA-DRGs to INA-CBGs (Indonesia Case Based Groups) [8]. By the implementation of INA-CBGs on the hospital financing for 3rd class patients, the cost analysis of hospitalized treatment for patients with stroke was needed in treatment plan thus the hospital could make cost savings and didn't get any financial lost. The cost analysis gave a benefit in term of claim submission to the health insurance and provided proper treatment for the patients based on treatment cost list.

The study objectives was to determine the suitability cost between the stroke's real cost therapy and health financing based on INA-CBGs, and to determine the highest cost component on stroke treatment at Jogja hospital.

## 2. RESEARCH METHOD

This cross sectional observational study used retrospektif sampling method which the subject was taken from all stroke patient population who used Jamkesmas at Jogja Hospital and were hospitalized on January 2011-April 2012 and met with the inclusion criteria. The inclusion criteria of the study were acute stroke patient with Jamkesmas membership and with diagnosis code I619 for intracerebral hemorrhage, I639 for cerebral infarction, and I64 for not specific stroke between haemorrhagic stroke and stroke infarction, in male or female, with clinical diagnose stroke caused neurologic deficits and classified in the same diagnosis. The exclusion criteria were referred acute stroke patient with Jamkesmas membership or return to discharge with deceased status or discharge with no physician consent.

The subject then was classified using INA-CBGs. Patient's length of stay and costs (direct medical costs and direct non-medical costs) were defined as study variable. Medical record review at hospital aimed at demography characteristic data collection such as patient name, medical record number, age, sex, length of stay during hospitalization (date and time of admission and discharged), date and time of stroke onset, stroke risk factors, previous medication, nursing record, and laboratorium results. All data were recorded in case report form. Stroke treatment cost tracing was based on patient medical record. Cost of medications and medical equipments were traced from hospital pharmaceutical department, while medical procedure cost, nursing cost, additional examination cost (laboratorium, physiotherapy, and nutrition), administration cost, and hospitalization cost were traced from finance and administration department.

Data collected from patient medical record and from patient treatment cost tracing were processed and analysed according to the following analysis methods:

Descriptive analysis was done to determine the highest cost component on stroke treatment at Jogja hospital.

Treatment cost suitability analysis of INA-CBGs-based stroke treatment cost was conducted by comparing analytical treatment cost with INA-CBGs-based costs. Data analysis with Mann Whitney test was done for continuous variable that has been processed in descriptive analysis. This analysis will then used to seek the significant cost discrepancy between real stroke treatment and INA-CBGs-based.

## 3. RESULTS AND ANALYSIS

### 3.1. Stroke Patient Characteristic at Jogja Hospital

During January 2011 – April 2012 there were 67 stroke patients at Jogja Hospital who fulfilled the inclusion criteria. There were 6 patients with code I619 (Intracerebral Hemorrhage), 15 patients with code I639 (Cerebral Infarction), and 46 patients with code I64 (Unspecified Stroke). Stroke patient characteristic can be seen on the Table 1.

Table 1. Stroke Patient Characteristic with Jamkesmas membership at Jogja Hospital during January 2011 – April 2012

Characteristics	Intracerebral Hemorrhage (I619)		Cerebral Infarction (I639)		Unspecified Stroke (I64)	
	(n=6)	%	(n=15)	%	(n=46)	%
<b>Sex:</b>						
Male	6	100	5	33.3	20	43.5
Female	0	0	10	66.7	26	56.5
<b>Age :</b>						
≤ 55 years of age	3	50	5	33.3	17	37
> 55 years of age	3	50	10	66.7	29	63

Most of stroke patient with diagnosis code of I619 (Intracerebral Hemorrhage), I639 (Cerebral Infarction), and I64 (Unspecified Stroke) were aged 55. The risk of stroke might increase 2 times after age 55 [9]. At the elderly group, the risk of hypertension increases because the blood vessels become more rigid and less elastic [10], whereas the hypertension is the most important risk factor of stroke [11],[12]. According to the result of stroke patient's case study with cerebral infarction (I639) and non-specific stroke cases (I64), it has been known that female has higher stroke prevalences than men (66.7% and 56.5%). The condition is influenced by the increment of hypertension risk in women greater than men by their increasing age. Premenopause women tend to have higher blood pressure than men because they are influenced by the reduction of estrogen level in menopause period [10].

One of the factors affecting the length of stay in acute ischemic stroke patients was age of 65 years or more [13]. Another study stated an increase of length of stay in diabetic patients with the age of 60 years or more, and a decrease of length of stay in female patients [14].

### 3.2. Costs Analysis Based on INA-CBGs

The amount of INA-CBGs costs decided by the government varies for each diagnosis coding and is affected by the disease severity. While diagnosis code is determined by hospital's coding officer, INA-CBGs code and the disease severity was calculated by INA-CBGs owned by Jamkesmas central management. INA-CBGs code determination is done on concordance with the primary diagnosis code, secondary diagnosis code, medical procedures, and length of stay. Those variables are input by hospital coding officer along with Jamkesmas reporting in each day through hospital-owned INA CBGs software [15]-[17]. The average cost of patient care based on the average length of stay can be seen on Table 2.

Tabel 2. The average cost of patient care based on the average length of stay with Jamkesmas membership at Jogja Hospital during January 2011 – April 2012

Real Cost	Intracerebral Hemorrhage (I619)			Cerebral Infarction (I639)			Unspecified Stroke (I64)		
	Length of Stay		P	Length of Stay		P	Length of Stay		P
	< 9.5 Days	≥ 9.5 Days		< 8.5 Days	≥ 8.5 Days		< 7.5 Days	≥ 7.5 Days	
Mean (IDR)	2,189,891	6,799,948	0,042	3,271,208	4,921,042	0,014	2,488,256	4,666,393	0,000
DS (IDR)	214,697	283,797		598,071	1,443,718		897,986	2,812,384	

The relation between the length of stay and treatment cost was analysed using Spearman correlation test. The test methods were chosen because the data were not normally distributed. Based on Spearman analysis stroke with diagnose code I619 (Intercerebral Hemorrhage) had p value of 0,042 ( $p < 0,05$ ), diagnose code I639 (Cerebral Infarction) with p value of 0,014 ( $p < 0,05$ ), and diagnose code I64 (Unspecified Stroke) with p value of 0,000 ( $p < 0,05$ ). Those diagnose codes have positif correlation coefisien, and it can be concluded that there is a positive correlation between the length of stay and treatment cost which means the longer the patient stay the higher treatment cost would be [13],[18],[19].

Details of the average treatment cost of stroke patients consisted of direct medical and non-medical costs as seen in Table 3. The greatest components of stroke treatment cost from all the diagnostic codes were medicine cost and medical equipment cost (IDR 1,002,991 to IDR 3,086,948 or 35-48%), O<sub>2</sub> service fee (IDR 207,600 to IDR 972,000 or 7-17%), and nursing cost (IDR 210,250 to IDR 1,074,000 or 9-15%),

The costs of medicine and medical equipment, O<sub>2</sub> service, nursing were affected by the accuracy of diagnosis, treatment selection, and stroke comorbidities factors [13], [18]-[20]. Those factors then will directly affect the patient's length of stay and treatment cost as seen on Table 2.

Other studies have concluded that the length of stay for ischemic stroke patient in Sardjito Hospital was affected by stroke severity [18]. The difference in length of stay of general disease was affected by the disease severity and comorbid factor such as myocardial infarction and congestive heart failure [19],[21]-[23]. Some factors that might lengthen the hospitalization of acute ischemic stroke patients were diabetes mellitus, atrial fibrillation, type of stroke, stroke treatment, and stroke relaps [13].

The stroke therapy costs for all diagnose codes at Jogja Hospital are not only affected by the type and number of drugs used but also affected by other additional medications to treat the stroke comorbid factors. The more type of drugs used for stroke treatment the higher the treatment cost should be. Moreover, the more comorbid factors the higher the treatment cost should be as well [13],[18]-[20].

Table 3. Details of Direct Medical and Non-Medical Cost Stroke Patient Treatment with Jamkesmas Membership

Cost Variable	Intracerebral Hemorrhage (I619)				Cerebral Infarction (I639)				Unspecified Stroke (I64)			
	Real cost				Real cost (IDR.)				Real cost (IDR.)			
	< 9.5 Days		≥ 9.5 Days		< 8.5 Days		≥ 8.5 Days		< 7.5 Days		≥ 7.5 Days	
	Mean (IDR)	%	Mean (IDR)	%	Mean (IDR)	%	Mean (IDR)	%	Mean (IDR)	%	Mean (IDR)	%
<i>Direct Medical Cost</i>												
Visit fee	165,000	7	455,000	7	211,429	6	418,750	8	181,736	7	431,905	9
Electromedic Diagnostic Laboratory analysis	-	-	-	-	650,000	19	385,500	8	352,500	13	22,000	1
Rehabilitation medic	-	-	156,500	2	61,875	2	112,750	2	59,400	2	114,781	2
O <sub>2</sub> Service	376,650	17	972,000	14	413,490	12	707,404	14	207,600	7	470,800	10
Nursing	210,250	9	1,074,000	15	328,000	9	574,875	11	275,632	10	520,143	11
Radiology	53,000	2	53,000	0,8	53,000	2	53,000	1	58,600	2	64,316	1
Medicine, medical eq	1,002,991	44	3,086,948	44	1,239,289	35	2,055,451	40	1,165,888	42	2,302,665	48
Nutrition	94,875	4	328,500	5	104,429	3	183,438	4	84,560	3	178,786	4
<i>Direct Non Medical Cost</i>												
Room	180,000	8	640,000	9	245,714	7	415,000	8	198,400	7	396,190	8
Ambulance	60,000	3	60,000	1	60,000	2	72,000	1	60,000	2	72,000	2
Total	2,261,391		6,964,198		3,516,726		5,168,979		2,797,716		4,757,467	

As seen on Table 4, the most common comorbid factor in stroke, in diagnosis code of I619, I639, and I64 was hypertension (83.3%, 93.3%, and 73.9%). It was consistent with the theory stating hypertension were the most common comorbid factors in ischemic stroke as well as in hemorrhagic stroke [2],[18],[22],[24].

Table 4. Stroke comorbid factors of Jamkesmas membership at Jogja Hospital during January 2011 – April 2012

Comorbid Factors	Intracerebral Hemorrhage (I619)		Cerebral Infarction (I639)		Unspecified Stroke (I64)	
	(n=6)	%	(n=15)	%	(n=46)	%
Hypertension	5	83.3	14	93.3	34	73.9
Diabetes Mellitus			4	26.7	10	21.7
Dyslipidemia					6	13.0
Sepsis					2	4.4
Vertigo/migrain	3	50.0			9	19.6
Cardiac problem			1	6.7	1	2.2
Depression			2	13.3		
Seizure			2	13.3	2	4.4

Hypertension might cause intracranial vessel rupture or become stenotic. The ruptur vessel will cause intracranial haemorrhage, but when the the vessel become stenotic it might disturb intracranial blood flow and, eventually, brain cellular death. Moreover, the rise in blood pressure might faster the plaque formation process, endothelial layer damage, and finally plaque would be prone to rupture and causes thrombus. Thrombus then will occlude blood vessel locally, or become emboly in blood stream into cerebrovascular system [10].

Mann Whitney test result were used to find any significant discrepancy between real stroke treatment coast and the amount of INA-CBGs cost when t-test were not available due to abnormally distributed data. The analysis results can be seen in Table 5.

Table 5. Correlation Between Real Cost and INA-CBGs Cost

Cost	Intracerebral Hemorrhage (I619)			Cerebral Infarction (I639)			Unspecified Stroke (I64)		
	Mean	DS	p	Mean	DS	p	Mean	DS	p
Real Cost (IDR)	3.726.57	2.389.79		4.151.11	1.386.11		3.482.62	2.269.06	
INA-CBGs Cost (IDR)	2.227.48	70	0.305	4.599.52	1.088.48	0.108	2.936.80	6508.833	0.404

The amount of real stroke treatment cost at Jogja Hospital for diagnosis code of I619 and I64 (IDR 3.726.576 and IDR 2.389.797) were averagely higher than the amount of INA-CBGs cost for the same diagnosis code (IDR 2.227.484 and IDR 2.936.805), while it was lower for diagnosis code of I639 for real stroke treatment cost (IDR 4.151.119) compared with INA-CBGs's (IDR 4.599.523). Moreover, Mann Whitney test analysis for diagnose code I619 (Intracerebral Hemorrhage) with p value of 0.305 ( $p > 0.05$ ), diagnose code I639 (Cerebral Infarction) with p value of 0.108 ( $p > 0.05$ ), and diagnose code I64 (Unspecified Stroke) with p value of 0.404 ( $p > 0.05$ ). That meant there was an insignificant discrepancies between real stroke treatment cost at Jogja Hospital and the corresponding INA-CBG's cost. According to the aforementioned analysis it was concluded that the hospital was adequately capable of doing rate management determined by INA-CBGs. By doing so, the hospital did not have to bear too many cost deficits [9].

As seen on table 6, there are some losses need to be covered by Jogja Hospital during 16 months of the study (January 2011 – April 2012) for all stroke diagnosis codes and severity as much as IDR 27.376.167. The cost deficits might actually be anticipated if its causes and solutions were known before. One of its possible causes were branded medicine prescribing that might actually be substituted with generic medicine even though some of the prescribing has already used generic medicine [9].

Table 6. Total Real Cost and INA-CBGs Rate for Jamkesmas Membership with Stroke at Jogja Hospital during January 2011 - April 2012

Diagnosis Code	INA-CBGs Code	Number of Patient	Total Real Cost (IDR.)	Total INA-CBGs Rate (IDR.)
I619	G-4-13-I	6	22.359.460	13.364.898
I639	G-4-14-I	12	52.492.043	48.884.832
I639	G-4-14-II	3	9.774.746	20.108.010
I64	G-4-15-I	34	94.252.406	91.719.726
I64	G-4-15-II	10	48.339.509	33.499.920
I64	G-4-15-III	2	17.608.749	9.873.360
	Total		244.826.913	217.450.746
	Loss			27.376.167

The government-determined INA-CBGs code very depended with the diagnosis code reported by hospital coding officers, thus diagnosis writing accuracy and medical procedure writing completeness became the primary factors due to the discrepancy of INA-CBGs rate for every code and severity level determined by primary and secondary diagnosis and the medical procedures [15],[17],[18],[25]. This rate difference became the main problem in coding process. Management of Jogja Hospital had to socialize to doctors regarding the coding process and the importance of correct and detailed diagnosis writing that might cause inaccurate rate deciding. Thus, solving this problem might be a step to prevent hospital loss.

Based on the above discussion, there are some important factors to be concerned for managing Jamkesmas rate effectively: the accuracy of diagnosis, treatment decision and nursing care for the stroke's treatment and also its comorbid factors. They are also important issues to avoid hospital's financial loss. Hospital management is expected to demonstrate those important issues to their medical staf and paramedic to reach the same level of understanding and commitment in the medical team at Jogja Hospital.

#### 4. CONCLUSION

The average rate of real stroke treatment cost at Jogja Hospital was higher insignificantly than INA-CBGs based cost, with its highest treatment cost component on the medicine and medical equipment cost. Thus, the hospital was adequately capable of managing stroke treatment cost based on INA-CBGs even though they still had to close the cost deficit.

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