

IGSCPS SPECIAL EDITION

REVIEW

A comparative study of real hospital costs and INA-CBG rates for stroke in Indonesia

I Gusti Agung Putu Deddy Mahardika¹ , Yunita Nita², Yuni Priyandani² 

¹ Master of Pharmaceutical Science Programme, Faculty of Pharmacy, Universitas Airlangga, Surabaya, Indonesia

² Department of Pharmacy Practice, Faculty of Pharmacy, Universitas Airlangga, Surabaya, Indonesia

Keywords

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Correspondence

Yuni Priyandani
Department of Pharmacy Practice
Faculty of Pharmacy
Universitas Airlangga
Indonesia
yuni-p@ff.unair.ac.id

Abstract

Background: The claim payment method in JKN program uses the prospective Indonesian Case Base Groups (INA-CBG) method, in which the rate has been determined before health services are provided based on the diagnosis code group. This potentially causes a discrepancy in the costs incurred by health facilities. **Objective:** This systematic review aimed to provide an overview of the comparison of actual hospital costs with the INA-CBG rates of the JKN program for inpatient stroke. **Method:** The collection method used a PRISMA flowchart on several databases. This systematic review is a comparative study by comparing the significance of the average actual direct medical costs with the INA-CBG rates. **Result:** Cost differences on intracerebral haemorrhage (I619) and unspecified stroke diagnosis (I64) consistently give a negative difference around IDR 110,659–8,184,007/patient/episode. Medicine and medical equipment are the most significant components of stroke treatments. Factors that significantly influence direct medical costs are the length of stay (LOS), class of JKN, and age. **Conclusion:** The cost differences can be influenced by several factors that can affect the amount of direct medical costs from the hospital. The factor that has the most influence on the amount of direct medical cost is LOS.

Introduction

Stroke is ranked third among catastrophic diseases in The National Health Insurance Program of Indonesia (JKN) (BPJS, 2021). From 2016 to 2019, the cost of claims for stroke treatments in the JKN program increased from 2.1 trillion to 2.9 trillion Indonesian Rupiah (Kemenkes, 2022).

The payment method determined by The Health Social Assurance Administrator (BPJS Kesehatan) as a public legal entity administering the JKN program based on the Indonesian case-based groups (INA-CBG) prospective case-mix method (Kemenkes, 2014, 2016b), in which the rate for direct medical cost has been determined before health services are provided based on the diagnosis code group. This could cause a discrepancy in the direct medical costs incurred by hospitals with the INA-CBG rates. The INA-CBG rates for advanced referral health facilities (FKRTL) are reviewed

or adjusted at least once every two years according to developments and requirements (Kemenkes, 2016a).

Research related to INA-CBG rates in Indonesia is often a concern, especially regarding comparing the suitability of hospital costs incurred by hospitals with INA-CBG rates in treating specific disease diagnoses and high-cost catastrophic diseases (Negara *et al.*, 2021). Several factors can affect the efficiency and effectiveness of services, impacting the hospital's actual cost of the hospital (Patty *et al.*, 2022).

This systematic review aimed to provide an overview of comparing direct medical costs in hospitals with the INA-CBG rates for inpatient stroke and factors that can influence the actual direct medical costs in hospitals for stroke in Indonesia.

Methods

Search strategy

A literature search was conducted on several article search databases, namely PUBMED, SCIENCE DIRECT, PRO QUEST, and DOAJ. Manual tracking is also done on GOOGLE SCHOLAR and RESEARCHGATE. The keywords used in the search for articles are a combination of keywords in Indonesian and English: "analisis biaya", "biaya riil", "cost analysis", "real cost", "stroke", "INA-CBG", and "direct medical cost" contained in database title or abstract. Studies that meet the criteria are primary research with a result section that compares the actual direct medical costs with INA-CBG claims for cerebral infarction (I639), intracerebral haemorrhage (I619), or unspecified stroke (I64). Studies for which the full text could not be retrieved or only available abstracts were excluded.

Data extraction and standardisation of cost

Data extraction from this systematic review is described in the PRISMA flow in mapping the number of articles identified. The main results are the total direct medical costs, the total INA-CBG claims, and the difference between the total actual direct medical costs and the total INA-CBG claims. Quality assessment in each study used ten criteria as in previous studies (Hassard et al., 2018). To classify the quality of the

included reviews (Appendix A), the following three categories were used: good (aggregated scores between 16 and 20), average (8 to 15), or poor quality (1 to 7) (Hassard et al., 2018). The reported costs were transferred from the currency in the year of the costs to the inflated values in the money for 2022 using the consumer price index (CPI) (OECD, 2023).

Results

Study characteristics

Initial search results with predefined keywords produce 20 articles from four databases. Two duplicate articles were found. After screening titles, abstracts, full-text availability, and adding manual searches, ten pieces met the requirements for systematic review (Figure 1). The time horizon shown by each study ranged from 6 months to 12 months. Only one study used a time horizon of more than 12 months (Table I).

All studies included the cost of cerebral infarction (n = 10), with two studies on cerebral infarction haemorrhage and all types of stroke. All studies are retrospective designs (n=10) using medical records, pharmaceutical costs, financial data, and INA-CBG claim data as data sources with the hospital perspective used to collect cost data (Table I).

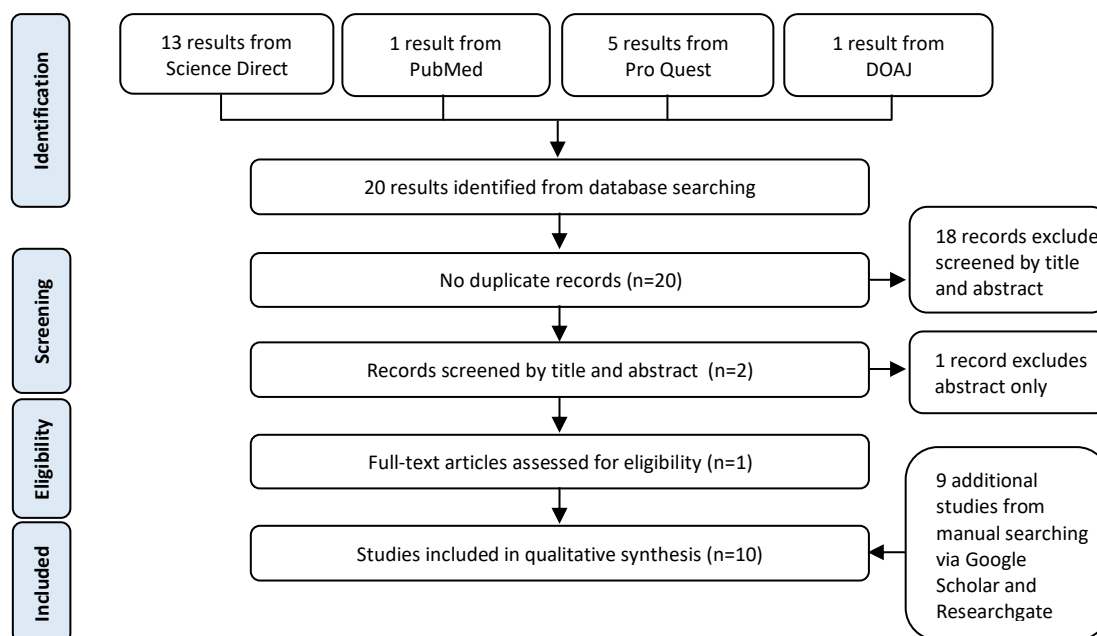


Figure 1: PRISMA flow chart (Liberati et al., 2009)

Table I: Characteristics of research articles

Study	City	Hospital type/region	Sample size	Time horizon	Stroke type	Data source	Study design
A	YOG	Government type - Regional 1	67	Jan 2011-Apr 2012	I639, I619, & I64	Medical records, pharmaceutical cost, financial data, and INA-CBG claim data	R
B	YOG	Private type - Regional 1	102	Oct 2015-Mar 2016	I639	Medical records, pharmacy, financial data	R
C	BWI	Government type - Regional 1	313	Jan-Dec 2017	I639, I619, & I64	Medical records, treatment cost, and INA-CBG claim data	R
D	JKTM	Government type - Regional 1	110	Jul-Dec 2018	I639	Medical records, financial data, and INA-CBG claim data	R
E	SMG	Private type - Regional 1	46	Jan-Jun 2017	I639	Medical records and INA-CBG claim data	R
F	YOG	Private type B Regional 1	49	Jan-Jun 2014	I639, I619, & I64	Medical records, pharmaceutical cost, financial data, and INA-CBG claim data	R
G	BAC	Government type - Regional 3	345	Jan-Dec 2019	I639	Medical records and INA-CBG claim data	R
H	SRG	Government type - Regional 1	214	Jan-Dec 2015	I639	Medical records, financial data, and INA-CBG claim data	R
I	PLU	Government type - Regional 3	134	2016-2017	I639, I619, & I64	Medical records, financial data, and INA-CBG claim data	R
J	YOG	Government type B Regional 1	145	Jan-Dec 2018	I639	Medical records, pharmaceutical cost, financial data, and INA-CBG claim data	R

A, (Hadning *et al.*, 2015); B, (Muslimah *et al.*, 2017); C, (Mazidah *et al.*, 2019); D, (Munawaroh *et al.*, 2019); E, (Wirastuti *et al.*, 2019); F, (Hadning *et al.*, 2020); G, (Mulyanti *et al.*, 2020); H, (Sofan & Syamsudin, 2021); I, (Tandah *et al.*, 2021); J, (Chetrine *et al.*, 2022); YOG, Yogyakarta; BWI, Banyuwangi; JKTM, Jakarta Timur; SMG, Semarang; BAC, Banda Aceh; PLU, Palu; R, Retrospective; I619, Intracerebral haemorrhage; I639, Cerebral infraction; I64, Unspecified stroke

Cost differences

The studies in this systematic review have differences in actual direct medical costs, and INA-CBG claims for each diagnosis, JKN class (the hospital treatment class is following the JKN membership class), and each INA-CBG claim code with currency adjustments in 2022 with units of difference in costs/patients/hospitalisation episodes. All studies provided cost comparison data based on stroke diagnoses, but only four studies provided data on the JKN class and six studies with varying *p*-values (Table II).

Cost differences on the I619 patients consistently show a negative difference in four studies with the INA-CBG code G-4-13-I (intracranial haemorrhage non-traumatic (mild), around IDR 992,924–7,119,791. However, only one study included the JKN class (class III) and one article with a significance value of $p > 0.05$ for diagnosing I619. The most significant negative cost difference in I619 was IDR 7,119,791, which occurred at Antapura Hospital Palu (Table II).

Three out of ten studies on the diagnosis of I639 gave varying differences (negative and positive) in each JKN class and INA-CBG code. Two studies showed negative differences, while the other five had positive differences. However, almost all JKN classes II and III provide a positive difference at all severity levels of the INA-CBG code G-4-14 (brain vessel injuries with infarct) around IDR 76,910– 8,422,216. The negative difference occurs in the INA-CBG code with mild severity (G-4-14-I) starting from IDR 352,416 to the most significant negative difference resulting in JKN class I with severe severity (G-4-14-III) of IDR 14,694,114 (Table II). The diagnosis of I64 was also consistently negative in the two studies. The INA-CBG code for G-4-15 (non-specific brain vessel injuries & pre-cerebral occupation without infarction) gives a negative difference around IDR 110,659–8,184,007. The positive difference only occurs in JKN class III with the INA-CBG codes G-4-15-I and G-4-15-II of IDR 71,263 and IDR 1,595,679 (Table II).

Table II: Cost differences, direct medical cost factors and highest component

Study	Diagnose	JKN class	INA-CBG code	Differences (IDR)	Differences CPI 2022 (IDR)	Diff sig.	DMC factors	DMC factors sig.	DMC highest component		
A	I619	-	G-4-13-I	-1.499.094/patient/episode	-2.226.967	-	LOS	0,042	Medicine and medical equipment		
			G-4-14-I	-300.601/patient/episode	-446.555	-	LOS	0,014			
	I64	-	G-4-14-II	3.444.421/patient/episode	5.116.833	-	LOS	0,000			
			G-4-15-I	-74.491/patient/episode	-110.659	-					
			G-4-15-II	-1.483.959/patient/episode	-2.204.484	-					
			G-4-15-III	-3.867.695/patient/episode	-5.745.623	-					
B	I639	I	G-4-14-I	-4.959.039/patient/episode	-5.907.725	0,000	Class	0,000	Room		
			G-4-14-II	-10.577.853/patient/episode	-12.601.442	0,002	LOS	0,000			
			G-4-14-III	-12.334.475/patient/episode	-14.694.114	1					
	I639	II	G-4-14-I	-430.392/patient/episode	-512.728	1					
			G-4-14-II	3.332.975/patient/episode	3.970.588	0,333					
	I639	III	G-4-14-I	684.044/patient/episode	814.905	0,05					
			G-4-14-II	3.044.075/patient/episode	3.626.420	0,2					
	C	I619	-	-	-865.688/patient/episode	-992.924	0,236	Class		0,000	Medicine and medical equipment
				I639	-	737.091/patient/episode	845.426	0,004		LOS	
D	I639	-	-	-1.057.948/patient/episode	-1.176.240	-	LOS	0,000	-		
E	I639	-	G-4-14-I	-307.257/patient/episode	-352.416	0,000	Class	0,009	-		
							LOS	0,019			
							Age	0,045			
F	I619	III	G-4-13-I	-1.368.953/patient/episode	-1.795.659	-	-	-	Medicine and medical equipment		
			I639	I	G-4-14-I	-1.016.465/patient/episode	-1.333.299	0,566			
	I639	II	G-4-14-II	2.225.945/patient/episode	2.919.777	0,180					
			I639	III	G-4-14-I	1.803.253/patient/episode	2.365.331	0,180			
	I64	I	G-4-14-II	5.070.317/patient/episode	6.650.746	0,000					
			G-4-15-I	-6.239.227/patient/episode	-8.184.007	0,121					
			G-4-15-II	-2.893.282/patient/episode	-3.795.124	0,090					
	I64	II	G-4-15-III	-4.467.086/patient/episode	-5.859.486	0,625					
			G-4-15-II	-1.982.356/patient/episode	-2.600.261	0,655					
	I64	III	G-4-15-I	54.329/patient/episode	71.263	0,500					
			G-4-15-II	1.216.495/patient/episode	1.595.679	0,025					
	G	I639	-	-	87.085/patient/episode	93.942	0,0001	-		-	Radiology
H	I639	I	G-4-14-I	791.892/patient/episode	976.403	-	Class	0,000	Medical Support		
			G-4-14-II	4.177.474/patient/episode	5.150.825	-					
			G-4-14-III	6.830.670/patient/episode	8.422.216	-					
	I639	II	G-4-14-I	554.848/patient/episode	684.128	-					
			G-4-14-II	2.977.941/patient/episode	3.671.801	-					
			G-4-14-III	4.930.264/patient/episode	6.079.016	-	Severity level	0,000			
	I639	III	G-4-14-I	589.918/patient/episode	727.369	-					
			G-4-14-II	3.322.631/patient/episode	4.096.804	-					
			G-4-14-III	4.964.746/patient/episode	6.121.532	-					
I	I619	-	-	-6.207.441/patient/episode	-7.119.791	-	-	-	Room		
			I639	-	67.055/patient/episode	76.910	-				
J	I639	I	G-4-14-I	23.288.466/INA-CBG code	25.892.406	0,012	-	-	Medicine and medical equipment		
			G-4-14-II	125.412.966/INA-CBG code	139.435.696	0,001					
	I639	II	G-4-14-I	459.868/INA-CBG code	511.287	0,715					
			G-4-14-II	29.841.707/INA-CBG code	33.178.381	0,039					
	I639	III	G-4-14-I	13.534.612/INA-CBG code	15.047.950	0,031					
			G-4-14-II	143.777.706/INA-CBG code	159.853.843	0,001					
			G-4-14-III	-2.403.235/INA-CBG code	-2.671.947	0,917					

A, (Hadning et al., 2015); B, (Muslimah et al., 2017); C, (Mazidah et al., 2019); D, (Munawaroh et al., 2019); E, (Wirastuti et al., 2019); F, (Hadning et al., 2020); G, (Mulyanti et al., 2020); H, (Sofan & Syamsudin, 2021); I, (Tandah et al., 2021); J, (Chetrine et al., 2022); I619, Intracerebral haemorrhage; I639, Cerebral infraction; I64, Unspecified stroke; LOS, Length of Stay; DMC, Direct Medical Cost

Direct medical cost factors and the highest component

Length of stay (LOS) is the most influential factor in direct medical costs in the hospitalisation of stroke patients. Five of the six studies that examined the relationship between factors affecting the amount of direct medical costs stated that LOS had a significant effect on the amount of direct medical costs ($p < 0.05$) (Table II). The study results state that the longer stroke patients receive treatment, the greater the direct medical costs that the hospital must incur. The longer stroke patients are treated, the greater the chance of loss for the hospital when making claims using INA-CBG (Hadning *et al.*, 2015). JKN class, severity level, and age positively correlate with direct medical costs.

The cost of medicines and medical equipment is one of the highest components in the four studies, accounting for between 27% and 45% of the total direct medical costs. Four other studies found that the cost of accommodation and medical support is also the highest component of the direct medical cost of treating stroke patients (Table II). Costs generated from medical support include laboratory, radiology, and CT scan costs.

Discussion

Since BPJS Kesehatan conducted the JKN program, many parties have been concerned that there is a change of possibility of mismatched claims leading to financial losses related to the INA-CBG payment model (BPJS, 2014). Several studies regarding the suitability of stroke care costs in Indonesia have been carried out several times. To our knowledge, this is the first systematic review in Indonesia of these studies which is expected to be useful in policy making. This systematic review shows four out of ten studies give a positive difference. Even if the studies are examined separately based on the INA-CBG code, there are more positive than negative differences.

Looking at the comparison of costs based on stroke type, I619 provides more negative differences than I639, which mostly provides positive differences. Based on previous research, I619 is the costliest type of stroke in both high-income and upper-middle-income countries so it requires more attention, especially in insurance-based financing systems (Strilciuc *et al.*, 2021). If we look at the latest adjustments to INA-CBG tariff in Minister of Health regulation No. 3 of 2023, it has increased for the I619 patients. Likewise, the claim rates for I639 have been adjusted (Kemenkes, 2023). The tariff adjustments made by the government were in line with the results of this systematic review that it

is necessary to readjust the INA-CBG tariff, especially for strokes because it has been almost seven years without any adjustments being made by the government. In establishing the INA-CBG tariff, aggregate financial data is collected, and the analysis of tariff adequacy must use aggregate data. This is because the INA-CBG tariff, comprises 1,075 tariff groups (Kemenkes, 2016b).

An important finding in this review is that although not all cost differences provide significant comparisons, the results of this systematic review can illustrate how factors such as LOS, JKN class, age, and patient severity affect the amount of direct medical costs that cause differences when an INA-CBG claim is made.

Several studies have shown that a longer LOS leads to higher economic losses. The longer the patient is treated, the more prices for treatment, medicine, medical support, and accommodation are generated. On the contrary, the less time the patient is hospitalised, the more effective and efficient the hospital's services are. Meanwhile, inefficient service is one of the causes of increased costs (Rochmah *et al.*, 2021).

Inaccuracy in diagnosis and treatment risks the emergence of complications, which result in wastage of therapy and types of drugs, errors in choosing the type of treatment result in wastage of medical equipment, and the presence of comorbidities that are not treated immediately surely increases the need for drug therapy. These factors would directly affect LOS and direct medical costs if the treatment decision is not carried out effectively (Huang *et al.*, 2013) (Hadning *et al.*, 2020)

Conclusion

In general, comparing the hospital's actual costs incurred by the hospital with the INA-CBG rates for stroke can produce a negative and a positive difference. This can be influenced by several factors that affect the direct medical costs of the hospital. Thus, LOS is the most influential factor in the direct medical cost. From the conclusion above, all components in the hospital must be able to work together to make efficient efforts, improve the service quality, and commit to efficiency because inefficiency in one part of the hospital will burden all components.

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Appendix A: study quality assessment scores (Hassard et al., 2018)

Checklist Item	Study Score										
	A	B	C	D	E	F	G	H	I	J	
1	2	2	2	2	1	2	2	2	2	2	
2	1	1	2	1	1	1	1	1	1	1	
3	2	2	2	2	2	2	2	2	2	2	
4	1	1	1	1	1	1	1	1	1	1	
5	2	2	2	2	2	1	2	2	1	1	
6	1	1	1	1	1	1	1	1	1	1	
7	1	1	1	1	1	1	1	1	1	1	
8	0	0	0	0	0	0	0	0	0	0	
9	1	2	1	1	1	1	1	0	0	1	
10	2	2	2	2	1	1	1	2	1	1	
Total	13	14	14	13	11	11	12	12	10	11	
Quality Category*	average	average	Average	average	average	average	average	average	average	average	

A, (Hadning et al., 2015); B, (Muslimah et al., 2017); C, (Mazidah et al., 2019); D, (Munawaroh et al., 2019); E, (Wirastuti et al., 2019); F, (Hadning et al., 2020); G, (Mulyanti et al., 2020); H, (Sofan & Syamsudin, 2021); I, (Tandah et al., 2021); J, (Chetrine et al., 2022); * good (16 to 20), average (8 to 15), poor (1 to 7)