

Costs of Stroke Treatment Under National Health Insurance at Dr. Mohammad Hoesin General Hospital

Pinto Desti Ramadhoni¹ , Achmad Junaidi¹, Lenny Octavinawaty¹, Apriyono Apriyono¹, Ardy Oktaviandi¹

¹ Department of Neurology, Faculty of Medicine, Sriwijaya University; Mohammad Hoesin General Hospital, Palembang, Indonesia

Corresponding Author:

Ardy Oktaviandi

Department of Neurology, Faculty of
Medicine, Sriwijaya University; Mohammad
Hoesin General Hospital, Palembang,
Indonesia

Email: ardyoktav@gmail.com

Introduction: Indonesia's National Health Insurance/*Jaminan Kesehatan Nasional* (JKN) consider stroke a catastrophic disease due to its high treatment costs and healthcare system burden. Stroke patients need extended hospitalization, advanced procedures, and long-term rehabilitation, making it financially and socially burdensome. Endovascular procedures like mechanical thrombectomy and coiling improve clinical outcomes but are expensive. **Objective:** To outline the characteristics and hospitalization costs of stroke patients—both ischemic and hemorrhagic—covered by JKN at Dr. Mohammad Hoesin General Hospital, focusing on cost differences among conservative therapy, thrombolysis, mechanical thrombectomy, and coiling. **Method:** A descriptive study with retrospective data collection was performed at a Type A hospital in South Sumatra, using patient records from January to April 2024. **Result:** Ischemic stroke was the most common type, with most patients aged 46-65 and male. Most patients stayed less than ten days on second-class wards. Conservative therapy was the most frequently used treatment. Hypertension and kidney disorders were the biggest risk factors and comorbidities. Hospital charges for mechanical thrombectomy and coiling exceeded INA-CBG (Indonesian Case Based Groups) reimbursement rates, highlighting a substantial gap between actual hospital costs and insurance coverage. For both stroke types, medication costs dominated total expenses. **Conclusion:** The significant gap actual hospital costs and INA-CBG reimbursement rates for stroke treatments, especially for mechanical thrombectomy and coiling, may affect hospital policies on these interventions. To ensure long-term stroke management, revisions to reimbursement schemes should take into account the high costs associated with endovascular therapy.

Keywords: Coiling, Hospital costs, Mechanical thrombectomy, National health insurance, Stroke

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Highlights

- Discrepancy in costs hospitalization
- Prevalence and risk factors

Introduction

Stroke is defined as a central nervous system infarction, which may involve brain, spinal cord, or retinal cell death attributable to ischemia. This definition is based on: (1) pathological, imaging, or other objective evidence of cerebral, spinal cord, or retinal focal

ischemic injury in a defined vascular distribution; or (2) clinical evidence of focal ischemic injury, based on symptoms persisting for ≥ 24 hours or until death, with other etiologies excluded.¹



Stroke remains to be the world's leading cause of death and disability. According to World Stroke Organization data, 13.7 million new cases of stroke occur each year, accounting for nearly 5.5 million deaths. Low- and middle-income countries account for about 70% of strokes and 87% of stroke-related deaths and disabilities.²

In an effort to ensure equitable access to healthcare services, the Indonesian Ministry of Health has committed to transforming the healthcare system by implementing a networked hospital referral program that prioritizes services for major diseases, including stroke. As part of this initiative, hospitals providing stroke services are classified into four categories based on their capabilities.³

According to data from the Social Health Insurance Administration Body (BPJS *Kesehatan*) in 2015, stroke is classified as a catastrophic disease (a high-cost disease), accounting for IDR 16.9 trillion of the National Health Insurance budget. Stroke is an expensive disease because patients frequently require long-term care and rehabilitation due to physical and cognitive impairments resulting from brain damage caused by vascular occlusion or hemorrhage.⁴

According to World Economic Forum calculations, Indonesia's economic loss from non-communicable diseases (NCDs) is expected to total USD 4.4 trillion (IDR 58,542 trillion) between 2012 and 2030. The cost of cardiovascular diseases, including stroke, is projected to reach IDR 1.7 trillion over this period. This economic burden includes medical expenses and lost productivity.⁴

The cost of stroke treatment is associated with length of hospital stay, inpatient class, type of ward, type of treatment, presence of comorbidities, and other exacerbating factors.⁵ Thrombolytic therapy has been shown to enhance clinical outcomes within three months post-treatment, as measured by the modified Rankin Scale (mRS), particularly when administered early.⁶ Additionally, mechanical thrombectomy has shown better clinical outcomes than conservative therapy, making it a more cost-effective option.⁷

For Indonesia, IVT (intravenous thrombolysis), EVT (endovascular thrombectomy), and coiling are vital investments. These interventions save lives, reduce long-term disability, and lower healthcare costs by preventing chronic care needs. Addressing geographic and financial barriers to access will amplify their cost-effectiveness, safeguarding both public health and economic stability. Early intervention leads to fewer disabilities and lower societal costs.

Dr. Mohammad Hoesin General Hospital in Palembang is a Class A referral hospital for stroke patients. Its combination of referral status, infrastructure, patient diversity, and geographic

significance in regions outside Java makes it an ideal "living laboratory" for studying stroke treatment in Indonesia. Insights from this center can guide national policies aimed at improving equity in stroke care access while also optimizing cost-effectiveness in LMIC (low/middle-income countries) settings. However, no previous studies have examined the cost of stroke care at this institution.

Endovascular Intervention Therapy

In addition to intravenous thrombolysis, recanalization can be achieved through endovascular interventions, including intra-arterial thrombolysis, mechanical thrombectomy, or mechanical aspiration. Mechanical thrombectomy can restore 41–54% of perfusion by rapidly removing an occlusive thrombus using aspiration catheters or stent retrievers. This procedure is recommended to accelerate recanalization and reduce the incidence of symptomatic hemorrhage, particularly in cases of large vessel occlusion (LVO), according to national and international guidelines.^{8,9}

Mechanical thrombectomy has been found to be more cost-effective than standard stroke care across Europe. The projected healthcare expenses for patients undergoing mechanical thrombectomy over a five-year period were \$13.8 billion, while those receiving standard treatment were estimated to incur \$15.5 billion. This might lead to an average cost savings of \$1.7 billion.¹⁰

In the United Kingdom, stroke patients who underwent thrombectomy were more likely to be discharged home and required fewer physiotherapy sessions. Mechanical thrombectomy has been proven to improve patient outcomes and significantly shorten hospitalization duration.¹¹

Cost of Stroke Care

Stroke is a costly disease because patients generally require extended medical treatment and long-term rehabilitation. This is primarily because stroke commonly causes physical and cognitive disabilities as a result of nerve damage caused by vascular occlusion or hemorrhage. Understanding the distribution of stroke-related expenses is crucial, as each incident generates both direct and indirect costs, which significantly contribute to the national economic burden over time.¹⁰ Stroke not only has an impact on the national healthcare system, but the treatment, medication, and rehabilitation that come with it also impose a substantial economic burden on both patients and their families. Stroke presents a major challenge for patients and their caregivers due to the high direct costs of acute treatment and rehabilitation, as well as indirect costs associated with loss of productivity for both patients

and family members. These financial pressures further strain the healthcare system and economic stability.¹²

Financing through Government Social Health Insurance Administration

The INA-CBG (Indonesia Case-Based Groups) system's implementation in healthcare services aims to encourage hospitals to maintain quality control, manage costs efficiently, and optimize patient care. INA-CBGs determine the healthcare costs covered by BPJS *Kesehatan* under the National Health Insurance (JKN) scheme. These costs are not calculated based on the number or variety of services provided, but are instead grouped according to predetermined diagnostic.¹³

Stroke is often classified as a catastrophic disease due to its high treatment costs and long-term care requirements. According to a BPJS *Kesehatan* report, in 2020, catastrophic disease claims accounted for 25% of BPJS *Kesehatan*'s total expenditure, amounting to IDR 20 trillion. Among all catastrophic diseases, stroke ranked as the third most expensive condition, contributing 13% of total claims, with two million cases and a total claim cost of IDR 2.5 trillion.¹²

The high prevalence, prolonged length of stay, morbidity, and mortality rates associated with stroke contribute significantly to the overall financial burden on the healthcare system.¹⁴

INA-CBG Stroke Treatment Cost Analysis

Kaban *et al.* reported that INA-CBG stroke treatment costs, categorized under INA-CBG codes G-4-14-I to G-4-14-III, ranged between IDR 5,073,300 and IDR 12,286,800 for Class B private hospitals.¹⁵ A separate study conducted by Muslimah *et al.* at Panti Rapih Hospital in Yogyakarta (Class B) found an average difference of IDR 84,199 between the actual costs and the INA-CBG tariffs for outpatient stroke care. This indicates that the INA-CBG tariffs were insufficient to cover all outpatient treatment expenses.¹⁶ For inpatient stroke care, INA-CBG tariffs were generally higher than actual treatment costs, except in mild cases. The cost differences in such cases were as follows: IDR 10,611,800 for Class 1, IDR 4,560,700 for Class 2, and IDR 2,288,600 for Class 3. The average length of stay (LOS) for stroke inpatients ranged between 5–10 days.¹⁶

A study of non-hemorrhagic stroke treatment for JKN inpatients at Dr. Soehadi Prijonegoro Regional Hospital in Sragen (Class B) found a discrepancy between actual hospital costs and INA-CBG tariffs, particularly in Class 3 severity levels I, where actual costs were lower than INA-CBG reimbursements. Positive cost differences resulted in financial surpluses for hospitals, were as follows: IDR 1,066,143 for

severity level I, IDR 766,848 for severity level II, and IDR 931,119 for severity level III.

These findings suggest that hospitals which efficiently manage stroke cases could benefit financially from INA-CBG reimbursements. Actual hospital costs are influenced by factors such as length of stay (LOS), secondary diagnoses, severity level, and inpatient class.¹⁷

A study by Chetrine observed a similar trend, which compared INA-CBG stroke tariffs at Class B government hospitals. The actual costs of ischemic stroke treatment under BPJS increased with prolonged hospitalizations.⁵ At Dr. Dradjat Prawiranegara Regional Hospital, the highest direct medical costs for ischemic stroke inpatients (Class 1) were attributed to the following: (1) Medical support services, including laboratory tests, radiology, and CT scans; (2) Medical devices and medications, such as primary stroke treatments, complication therapy drugs, and non-national formulary medications (e.g., citicoline); (3) Room charges, which were relatively high for Class 1 inpatients.¹⁸

Objective

This study aimed to describe the characteristics and hospitalization costs of stroke patients covered under the National Health Insurance scheme, including both ischemic and hemorrhagic strokes, at Dr. Mohammad Hoesin General Hospital, Palembang.

Method

This study employed a descriptive design with retrospective data collection, conducted at a type A hospital in South Sumatra. Data were collected from January to April 2024 using secondary data from the medical records of stroke patients hospitalized under the National Health Insurance (JKN) scheme, and were analyzed using SPSS 20. Inclusion criteria consisted of inpatients diagnosed with stroke—either ischemic or hemorrhagic—during the January–April 2024 period; patients with complete medical and financial record data; and patients who were participants in the National Health Insurance scheme. Exclusion criteria included inpatients who were discharged at their own request, died during treatment, used health insurance apart from the National Health Insurance, and upgraded to VIP or a higher class of care.

Ethical clearance for this study was obtained from the Institutional Review Board (IRB) of Dr. Mohammad Hoesin General Hospital, ensuring adherence to all relevant ethical standards and guidelines during the data collection and analysis process.

Result

A total of 420 stroke cases were analyzed in the study. Of these, 317 cases met the inclusion criteria, while 103 cases excluded based on the predefined exclusion criteria. The majority of hospitalized patients (78.55%) had an ischemic stroke, with an average hospital billing cost of IDR 25,315,200. The majority of patients (52.68%) were between the ages of 46 and 65, with 51.10% being male.

The most common inpatient class was Class 2 (38.80%), with an average hospital billing cost of IDR 53,728,728. Regarding hospitalization type, 68.77% of stroke patients were admitted to general wards, with an

average billing cost of IDR 23,543,577. The majority of patients (79.5%) had a hospital stay of less than ten days, with an average treatment cost of IDR 22,884,416.

Treatment Modalities and Costs

Conservative therapy was the most commonly administered intervention (84.86%), with an average treatment cost of IDR 27,359,187. Mechanical thrombectomy was performed in 1.58% of cases, with an average cost of IDR 66,839,409. Intravenous thrombolysis was administered in 1.90% of cases, with an average cost of IDR 22,730,785. Coiling was performed in 3.15% of cases, with an average cost of IDR 110,791,140.

Table 1. Characteristic of sociodemographic and clinical patients

Variants	n	%	Average Billing cost (IDR)
Age			
18-45 years old	70	22.08	29,142,574
46-65 years old	167	52.68	39,092,868
> 65 years old	80	25.24	33,292,896
Sex			
Male	162	51.10	35,708,400
Female	155	48.90	35,142,968
Diagnosis			
Ischemic stroke	249	78.55	23,315,200
Hemorrhagic stroke	68	21.45	72,476,997
Class			
Class 1	82	25.87	29,314,326
Class 2	123	38.80	53,728,728
Class 3	112	35.33	19,511,566
Room care			
Ward	218	68.77	23,543,577
Intensive	99	31.23	61,610,313
Length of stay			
< 10 days	252	79.50	22,884,416
> 10 days	65	20.50	84,077,660
Treatment			
Conservative	269	84.86	27,359,187
Surgery	27	8.51	84,955,791
Coiling	10	3.15	110,791,140
Thrombolysis	6	1.90	22,730,785
Thrombectomy	5	1.58	66,839,409
Risk factor			
Hypertension	248	78.23	36,786,650
Diabetes mellitus	85	26.81	28,957,009
Heart disease	57	17.98	41,479,471
Aggravating factor			
Kidney disease	33	10.41	43,150,846
Hypocalcemia	30	9.46	23,752,022
Epilepsy	18	5.67	38,717,910
Hypokalemia	11	3.47	24,326,225
Hyponatremia	8	2.52	43,383,053
Pneumonia	6	1.89	92,521,728
Sepsis	2	0.63	33,645,371

Risk Factors and Complications

Hypertension was the most prevalent risk factor (78.23%), with an average treatment cost of IDR 36,786,650. Kidney disease emerged as the most significant complication (10.41%), leading to an average treatment cost of IDR 43,150,846.

Cost Analysis based on Stroke Type and Treatment

Ischemic stroke cost breakdown (Table 2):

Class 1:
Average hospital billing cost: IDR 24,130,467
Standard INA-CBG cost: IDR 13,388,467

Class 2:
Average hospital billing cost: IDR 37,913,128
Standard INA-CBG cost: IDR 11,727,500

Class 3:
Average hospital billing cost: IDR 14,512,458
Standard INA-CBG cost: IDR 10,066,533

Hemorrhagic stroke cost breakdown (Table 3):

Class 1:
Average hospital billing cost: IDR 54,493,066
Standard INA-CBG cost: IDR 10,417,567

Class 2:
Average hospital billing cost: IDR 90,916,760

Standard INA-CBG cost: IDR 9,125,133

Class 3:
Average hospital billing cost: IDR 47,153,693
Standard INA-CBG cost: IDR 7,832,767

Mechanical thrombectomy cost breakdown (Table 4):

Class 1:
Average hospital billing cost: IDR 90,065,956
Standard INA-CBG cost: IDR 35,580,867

Class 2:
Average hospital billing cost: IDR 66,839,409
Standard INA-CBG cost: IDR 33,355,400

Class 3:
No patients underwent thrombectomy in Class 3.

Coiling cost breakdown (Table 5):

Class 1:
Average hospital billing cost: IDR 111,947,065
Standard INA-CBG cost: IDR 42,741,367

Class 2:
Average hospital billing cost: IDR 115,987,743
Standard INA-CBG cost: IDR 40,515,900

Class 3:
Average hospital billing cost: IDR 72,103,066
Standard INA-CBG cost: IDR 38,290,500

Table 2. Comparison of INA-CBGs and bills based on stroke ischemic hospitalization class

Class	INA-CBGs Cost (Average-IDR)	Billing Cost (Average-IDR)	Max Billing (IDR)	Min Billing (IDR)
Class 1 (n = 68)	13,388,467	24,130,467	116,558,72	4,138,452
Class 2 (n = 87)	11,727,500	37,913,128	240,559,967	3,184,275
Class 3 (n = 94)	10,066,533	14,512,458	64,459,386	1,281,209

Table 3. Comparison of INA-CBGs and bills based on stroke hemorrhagic hospitalization class

Class	INA-CBGs Cost (Average-IDR)	Billing Cost (Average-IDR)	Max Billing (IDR)	Min Billing (IDR)
Class 1 (n = 14)	10,417,567	54,493,066	123,520,197	9,887,686
Class 2 (n = 37)	9,125,133	90,916,760	240,559,967	3,184,275
Class 3 (n = 17)	7,832,767	47,153,693	64,459,386	1,281,209

Table 4. Comparison of INA-CBGs and bills based on thrombectomy procedure hospitalization class

Class	INA-CBGs Cost (Average-IDR)	Billing Cost (Average-IDR)	Max Billing (IDR)	Min Billing (IDR)
Class 1 (n = 1)	35.580.867	90.065.956	-	-
Class 2 (n = 4)	33.355.400	66.839.409	90.065.956	39.877.400
Class 3 (n = 0)	31.130.000	-	-	-

Table 5. Comparison of INA-CBGs and bills based on coiling procedure hospitalization class

Class	INA-CBGs Cost (Average-IDR)	Billing Cost (Average-IDR)	Max Billing (IDR)	Min Billing (IDR)
Class 1 (n = 2)	42.741.367	111.947.065	116.558.720	107.335.410
Class 2 (n = 7)	40.515.900	115.987.743	178.257.922	39.877.400
Class 3 (n = 1)	38.290.500	72.103.066	-	-

Medical Treatment Cost Components

Ischemic stroke patients (Table 6):

Medication: IDR 5,944,128 (highest cost component)
Electromedical procedures : IDR 5,517,382
Accommodation: IDR 4,365,028
Rehabilitation therapy: IDR 321,777 (lowest cost component)

Hemorrhagic stroke patients (Table 7):

Medication: IDR 21,807,042 (highest cost component)
IBS (Intensive care services): IDR 11,464,088
Accommodation: IDR 9,601,618
Rehabilitation therapy: IDR 412,500 (lowest cost component)

Table 6. Comparison of medical procedure costs for ischemic stroke

Cost (n = 249)	Average (IDR)	Maximum (IDR)	Minimum (IDR)
Medication	5,944,128	70,094,720	40,995
Electromedical	5,517,382	42,767,000	305,000
Accommodation	4,365,028	43,200,000	504,000
Consultation	1,244,153	13,588,000	54,000
Radiology	1,228,715	7,900,000	200,000
Laboratory	1,222,542	19,793,000	520,000
IBS	1,043,504	28,438,000	0
Nursing	376,525	8,320,000	25,000
Rehabilitation	321,777	3,195,000	82,500

Table 7. Comparison of medical procedure costs for hemorrhagic stroke

Cost (n = 68)	Average (IDR)	Maximum (IDR)	Minimum (IDR)
Medication	21,807,042	104,342,030	391,669
IBS	11,464,088	54,438,000	0
Accommodation	9,601,618	42,400,000	1,176,000
Electromedical	9,013,064	41,000	39,877,000
Laboratory	3,051,255	20,224,000	560,000
Consultation	2,317,324	9,730,000	195,000
Radiology	2,031,915	7,900,000	200,000
Nursing	543,221	3,750,000	45,000
Rehabilitation	412,500	1,830,000	82,500

Discussion

In this study, ischemic strokes accounted for 78.66% (249 cases), followed by hemorrhagic strokes at 21.45% (68 cases). In Indonesia, the incidence of ischemic stroke was 67% of all stroke cases from 2012 to 2014. This is in line with data from Dr. Cipto Mangunkusumo National General Hospital (RSCM) in 2014, which showed that ischemic stroke accounted for 71.4% of hospitalized stroke patients.⁷

The gender distribution of stroke patients in this study indicated that males were more affected than females, consistent with a study conducted by Prabowo, which found a higher prevalence of stroke in males (7.1%) compared to females (2.8%). This data suggests that women tend to have a longer life expectancy than men.¹⁸

The most affected age group was 45 to 65 years old comprising 52.68% (167 cases). This is similar with a study by Wirastuti, which found that 39.2% of stroke cases occurred in people aged 51 to 60. The ASEAN Neurological Association (ASNA) survey also reported

that 54.7% of stroke cases occurred in people aged 45 to 64.¹⁹

Regarding hospital class distribution, most stroke patients in this study were treated in Class 2 (38.80%), followed by Class 3 (35.33%), and Class 1 (25.87%). These findings differ from a previous study which reported a higher proportion of Class 3 patients. This is probably because many patients were previously enrolled in JAMKESMAS, a healthcare program for low-income people.²⁰

In terms of treatment location, 68.77% of patients were treated in general wards, while 31.23% required intensive care. This proportion is notably higher than the 15-20% typically reported in studies for stroke patients requiring intensive care unit (ICU) management. A prior study highlighted that stroke patients with severe conditions are prioritized for ICU admission or early transfer to hospital wards.²¹

The majority of hospitalization lasted less than ten days (79.5%), with 20.5% remaining for more than ten days. These findings are consistent with Muslimah *et al.*, who studied ischemic stroke patients in a Type B private hospital in Yogyakarta, where 46.88% of patients were

discharged within five days under the BPJS *Kesehatan* (National Health Insurance) scheme.²²

Regarding stroke treatment, 1.90% of patients in this study received thrombolysis, while 1.58% underwent thrombectomy. Intravenous thrombolysis was administered to 35 stroke patients between 2017 and 2021 (2.3% of ischemic stroke cases). Similarly, a study at Dr. Kariadi Hospital in Semarang reported that 36 stroke patients received intravenous thrombolysis between January 2017 and May 2018. In China (2019–2020), 5.64% of ischemic stroke patients received intravenous thrombolysis.²³

The most common risk factor in this study was hypertension (78.23%), followed by diabetes mellitus (26.81%) and heart disease (17.98%). These findings are similar to a study conducted by Mazidah, which reported hypertension as the most common risk factor (62.16%). Hypertension is an independent risk factor for both ischemic and hemorrhagic stroke, accounting for 50–60% of all strokes, especially when combined with elevated pulse pressure. It is the most prevalent modifiable risk factor for stroke, increasing with age and carrying a lifetime risk of 90% for those who reach 80 years of age.²⁴

Hemorrhagic stroke is the most expensive type of stroke to treat in high- and upper-middle-income countries. The annual per-patient cost is higher in high-income countries, averaging \$27,702 (IDR 423,785,196), against \$14,478 (IDR 221,484,444) in upper-middle-income countries.²⁵

This study found a significant discrepancy between hospital billing and INA-CBG reimbursement across stroke types, treatment classes, and intervention modalities. For both ischemic and hemorrhagic stroke, Class 2 patients had the highest average billing costs, while Class 3 had the lowest. These differences could be due to variations in medical resource utilization, clinical complexity, or case severity. Interestingly, coiling procedures incurred higher average costs than mechanical thrombectomy across all classes, with both substantially exceeding INA-CBG rates.

Furthermore, medications and electromedical procedures were the most expensive components of ischemic stroke, while for hemorrhagic stroke, medication and intensive care services dominated. These findings suggest that reimbursement schemes should consider both treatment modality and actual resource burden, as the standard INA-CBG tariffs may not sufficiently reflect actual costs, particularly for advanced endovascular therapies.

There is limited research on thrombectomy costs. A study in the United Kingdom estimated the cost of mechanical thrombectomy at £3,504 (IDR 68,362,150.23). Thrombectomy has been shown to significantly improve patient outcomes (mRS 0–2)

compared to conventional therapy. More patients in the thrombectomy group were discharged home with fewer rehabilitation sessions. Mechanical thrombectomy improves patient outcomes and shortens hospitalization duration.²⁴

For coiling procedures, hospital billing costs exceeded standard INA-CBG rates across all classes. In South Korea, surgical clipping may be more cost-effective for unruptured intracranial aneurysms, particularly for smaller aneurysms and when performed without complications.²⁶

The government's program is excellent; yet, given this data, there are concerns that several hospitals that are currently equipped to provide endovascular procedures will be unwilling to do so due to the very high deficit figures.

This study has several limitations that should be noted. First, the cost data were collected from hospital billing records rather than real cost accounting, thus they may not precisely reflect the actual resource usage or cost structure. Second, due to data limitations in the billing and coding database, we did not include clinical severity scores such as the NIHSS (National Institutes of Health Stroke Scale). Third, this was a single-center study done at a national referral hospital, which may limit the findings' applicability to other healthcare facilities or regions. Finally, the retrospective design relied on the accuracy and completeness of administrative records, which may create bias.

Given the substantial differences between hospital billing costs and INA-CBG reimbursement rates, future studies should be conducted to analyze actual cost structures in different hospital types and classes. A multicenter cost analysis using actual hospital accounting data would provide better insights into the cost-effectiveness of stroke treatments across diverse healthcare settings.

Conclusion

Stroke treatment is a substantial financial burden, particularly for cases that require mechanical thrombectomy and coiling. Hospital billing costs significantly exceed INA-CBG reimbursement rates, creating challenges for hospitals that provide endovascular stroke care. The sustainability of these advanced interventions is uncertain in the absence of policy adjustments. Optimizing the delivery of stroke care while ensuring the financial viability of healthcare facilities should be the focus of future studies that investigate cost-effectiveness strategies.

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Conflict of Interest

The authors declared no conflict of interest.

Ethic consideration

This study was approved by Institutional Review Board (IRB) of Dr. Mohammad Hoesin General Hospital with ethical approval number DP.04.03/D.XVIII.06.08/ETIK/108/2024.

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Author contribution

All authors contributed to all stages in this study, including patient management, manuscript drafting, editing, literature review, and manuscript finalization for publication.

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