



ANALYSIS OF THE DIFFERENCE BETWEEN ACTUAL COSTS AND INDONESIAN CASE-BASED GROUP (INA-CBG) RATES FOR INPATIENTS WITH STROKE

Muhammad Kahfiyansyah^{1*}, Ernani Hadiyati¹, Umi Muawanah¹, Yuni Kusuma Arumsari²

¹Master of Management Program, Universitas Gajayana, Jl. Mertojoyo Blk. I, Merjosari, Lowokwaru, Malang, Jawa Timur 65144, Indonesia

²Master's Program in Hospital Management, Universitas Gajayana, Jl. Mertojoyo Blk. I, Merjosari, Lowokwaru, Malang, Jawa Timur 65144, Indonesia

*aan.azlansyah@gmail.com

ABSTRACT

The implementation of the INA-CBGs prospective payment system requires hospitals to ensure that reimbursement tariffs adequately cover actual treatment costs, particularly for stroke, which is a high-cost catastrophic disease. Differences between INA-CBGs tariffs and actual hospital costs may affect hospital financial sustainability. This study aimed to analyse the differences between actual hospital costs and INA-CBGs tariffs in inpatient stroke cases and to identify the effects of length of stay, stroke severity, stroke type, complications, and Cost Recovery Rate (CRR) on these cost differences. This quantitative retrospective study used secondary data from medical records and BPJS claims of 101 inpatient stroke cases selected using total sampling, including all eligible stroke inpatients treated at RSUD dr. Abdul Aziz Singkawang in 2024. Data were analysed using descriptive analysis, t-tests, logistic regression, and CRR calculations. Total actual hospital costs exceeded INA-CBGs reimbursement, resulting in a financial deficit and an overall CRR of 93%. Stroke severity and stroke type significantly influenced cost differences, while length of stay and complications showed indirect effects through increased resource utilisation and prolonged hospitalisation. Severe haemorrhagic stroke cases generated the largest financial losses. Differences between actual costs and INA-CBGs tariffs are influenced by multiple interrelated factors. Severe stroke cases, particularly haemorrhagic stroke, create the greatest financial burden. Tariff evaluation and improved hospital cost management are required to enhance financial efficiency.

Keywords: actual cost; cost recovery rate; hospital financing; INA-CBGs; stroke; stroke severity

How to cite (in APA style)

Kahfiyansyah, M., Hadiyati, E., Muawanah, U., & Arumsari, Y. K. (2026). Analysis of the Difference Between Actual Costs and Indonesian Case-Based Group (INA-CBG) Rates for Inpatients with Stroke. *Indonesian Journal of Global Health Research*, 8(5), 1261–1270. <https://doi.org/10.37287/ijghr.v8i5.2471>.

INTRODUCTION

Hospitals are essential institutions that play a significant role in improving public health by providing comprehensive healthcare services, including outpatient, inpatient, and emergency care. In addition, hospitals function as centers for education and research for healthcare professionals. Achieving these roles effectively, efficiently, and sustainably depends on various factors, one of the most important being a well-managed healthcare financing system. According to Hidayati and Sari (2021), healthcare financing is a significant factor influencing the quality of a country's health system.

In Indonesia, hospital reimbursement is predominantly based on the Indonesian Case-Based Groups (INA-CBGs) payment system. INA-CBGs is a case-based reimbursement application used for submitting claims by hospitals, primary healthcare centers (Puskesmas), and other healthcare providers (PPKs) participating in the National Health Insurance (JKN) program. Under this system, reimbursement is determined according to Case-Based Groups (CBGs), in which patients with similar diagnoses or clinical conditions are grouped together. Hospitals receive predetermined payments based on the average cost of treating patients within each diagnosis-related group rather than on the actual costs incurred for individual patients (Wijayanti & Sugiarsi, 2013).

According to the Regulation of the Indonesian Ministry of Health (Kemenkes R.I., 2014), the INA-CBGs grouping system is based on the coding of the final diagnosis and medical procedures performed during patient care. Disease classification follows the International Classification of Diseases, Tenth Revision (ICD-10) for diagnoses and the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) for medical procedures. The grouping process is conducted using an information technology-based INA-CBGs application, which generates 1,077 case groups, consisting of 789 inpatient case groups and 288 outpatient case groups.

Addition to the INA-CBGs reimbursement system, hospital financing can also be assessed based on actual treatment costs. Actual treatment cost refers to the total of all direct medical cost components incurred during an individual patient's hospitalization period (Indahsari, Winarno, & Rosmi, 2024). Currently, stroke is one of the most common disease groups managed under both the INA-CBGs reimbursement system and actual cost calculations in hospitals. Despite advances in modern medical care, approximately 60% of stroke patients either die or experience permanent disability (WHO, 2020). In Indonesia, stroke is the leading cause of disability and the second leading cause of death worldwide. National data indicate that stroke accounts for 11.2% of all disabilities and 18.5% of all deaths, with a prevalence of 8.3 cases per 1,000 population (Ministry of Health of the Republic of Indonesia, 2024). Furthermore, stroke is classified as one of the country's catastrophic diseases, ranking third in healthcare expenditure after cardiovascular disease and cancer, with total treatment costs reaching IDR 5.2 trillion in 2023.

Given the substantial costs associated with stroke management, hospitals are likely to experience financial discrepancies between the actual costs incurred and the reimbursement provided through the INA-CBGs system. Mahardika, Nita, and Priyandani (2024) reported that intracerebral hemorrhagic stroke and unspecified stroke diagnoses consistently resulted in negative reimbursement differences ranging from IDR 110,659 to IDR 8,184,007 per patient episode. Medications and medical devices were identified as the largest contributors to stroke treatment costs. The study also found that length of stay (LOS), National Health Insurance (JKN) class, and patient age were significant determinants of direct medical costs. Similarly, Munawaroh, Sulistiadi, and Rachmad (2019) demonstrated that both length of hospital stay and stroke severity were significantly associated with reimbursement differences. The financial deficit attributable to length of stay reached IDR 125,844,628, while the deficit associated with stroke severity amounted to IDR 21,786,653. These findings indicate that INA-CBGs tariffs remain insufficient to fully cover the actual costs of ischemic stroke treatment.

The findings of the aforementioned study also demonstrated a substantial discrepancy between the actual treatment costs of patients with non-hemorrhagic stroke and the reimbursement provided under the INA-CBGs payment system. INA-CBGs tariffs are determined based on diagnosis codes, disease severity, and inpatient class. For Class I patients, the hospital incurred actual treatment costs of IDR 477,972,000, whereas the INA-CBGs reimbursement amounted to only IDR 212,232,087, resulting in a deficit of IDR 264,739,913. A similar pattern was observed for Class II patients, where actual costs reached IDR 533,407,410, exceeding the INA-CBGs reimbursement of IDR 193,701,293 by IDR 339,706,117. Although Class III patients incurred slightly lower actual costs (IDR 520,634,295), they experienced the largest reimbursement gap, amounting to IDR 395,786,957. Overall, the total discrepancy across all three inpatient classes reached IDR 1,000,232,987, highlighting a substantial financial burden on hospitals (Mubarok, Suryawati, & Harto, 2024).

Another study reported different findings regarding outpatient and inpatient reimbursement. Patient characteristics in outpatient care were not significantly associated with direct medical costs. In contrast, patient age, length of hospital stay, and inpatient class were significantly associated with direct medical costs among hospitalized patients. The comparison between INA-CBGs

reimbursement and actual costs also revealed contrasting patterns between outpatient and inpatient services. For outpatient care, the average INA-CBGs reimbursement was lower than the actual treatment costs, indicating that reimbursement was insufficient to cover hospital expenditures. Conversely, for inpatient care, the average INA-CBGs reimbursement exceeded the actual treatment costs, suggesting that the reimbursement was generally adequate to finance inpatient services, except for patients with mild stroke, where reimbursement remained insufficient (Fuad, Jayanti, & Maharani, 2022).

However, several studies have reported different findings regarding the adequacy of INA-CBGs reimbursement. Mazidah, Yasin, and Kristina (2019) concluded that INA-CBGs tariffs were insufficient to cover the treatment costs of hospitalized patients with hemorrhagic stroke, resulting in a financial deficit of IDR 89,165,865. In contrast, reimbursement for ischemic stroke generated a positive balance of IDR 154,789,069. Similarly, Indahsari et al. (2024) reported that, for non-hemorrhagic stroke inpatients, the overall INA-CBGs reimbursement exceeded the actual hospital costs, yielding a positive difference of IDR 32,355,523 across 28 patient cases.

Analyzing the discrepancy between actual hospital costs and INA-CBGs reimbursement is essential for hospitals to identify opportunities for optimizing resource allocation, improving operational efficiency, and ensuring long-term financial sustainability. This issue is particularly relevant for RSUD dr. Abdul Aziz Singkawang, where a substantial proportion of patients are covered under the INA-CBGs payment system. A heavy dependence on INA-CBGs reimbursement may reduce the financial contribution from non-INA-CBGs patients, thereby increasing the hospital's exposure to reimbursement deficits. Although a Cost Recovery Rate (CRR) exceeding 100% indicates that reimbursement exceeds treatment costs, this surplus should be carefully evaluated to ensure that all cost components, including indirect overhead expenses, are adequately covered to maintain the hospital's financial sustainability (Mubarok et al., 2024). Consequently, reimbursement tariffs should be periodically evaluated and aligned with actual treatment costs, while hospital resources and clinical care pathways should be optimized to improve both financial sustainability and the quality of healthcare services (Sunayya, 2024).

Another important determinant of hospital expenditure is the length of stay (LOS), defined as the number of days a patient is hospitalized from admission until discharge. A longer LOS generally requires greater resource utilization and increases direct medical costs. Mahardika et al. (2024) identified LOS as the most influential factor affecting direct medical costs for stroke patients. Similarly, Marwan, Prapanca, Himawati, and Widiyaningsih (2024) reported that prolonged hospitalization substantially increases unit costs and may exceed the allocated unit cost budget. In contrast, Utami and Fanny (2021) found that while different LOS categories were significantly associated with the magnitude of negative reimbursement differences between actual hospital costs and INA-CBGs tariffs, no significant differences were observed according to inpatient class, severity level, or the number of complication diagnoses.

RSUD dr. Abdul Aziz serves as the primary referral hospital for Singkawang City and the surrounding regions, including Sambas Regency, Bengkayang Regency, and Mempawah Regency. The hospital plays a strategic role in managing stroke cases because patients often require advanced medical services that are not available at lower-level healthcare facilities, making RSUD dr. Abdul Aziz the nearest referral center for these areas. Hospital records from 2024 showed a total of 101 hospitalized stroke cases at RSUD dr. Abdul Aziz. The total INA-CBGs reimbursement for these cases was IDR 690,420,500, whereas the total actual treatment cost reached IDR 916,677,167, resulting in a financial deficit of IDR 226,256,667. This substantial reimbursement gap underscores the need to evaluate the adequacy of INA-CBGs tariffs and to identify the factors contributing to the discrepancy between actual hospital costs and reimbursement for inpatient stroke care.

In addition, RSUD dr. Abdul Aziz operates under the Regional Public Service Agency Financial Management System (Pola Pengelolaan Keuangan Badan Layanan Umum Daerah, PPK-BLUD), which emphasizes efficiency, productivity, and financial sustainability in the delivery of public healthcare services. Evaluating the relationship between actual treatment costs and INA-CBGs reimbursement at this hospital can provide an important benchmark for assessing the financial sustainability of regional public hospitals. Based on hospital service statistics, stroke is among the most frequently treated conditions at RSUD dr. Abdul Aziz, making the evaluation of stroke-related treatment costs highly relevant for improving healthcare efficiency and optimizing resource utilization for the population of Singkawang and surrounding regions. Within the PPK-BLUD framework, the Cost Recovery Rate (CRR) is not merely a financial indicator but also a measure of fiscal sustainability that reflects the hospital's ability to maintain service quality, invest in medical equipment, and meet long-term operational expenditures (Government of Singkawang City, 2024).

Previous analyses of the differences between actual hospital costs and Indonesian Case-Based Groups (INA-CBGs) reimbursement for hospitalized stroke patients at RSUD dr. Abdul Aziz Singkawang have been limited to descriptive comparisons of cost differences, without comprehensively evaluating the adequacy of reimbursement or its implications for the hospital's financial sustainability. Cost comparisons alone do not adequately reflect the hospital's capacity to recover treatment expenditures under a case-based payment system. In this context, the Cost Recovery Rate (CRR) serves as a critical indicator of financial performance by measuring the proportion of actual treatment costs covered by INA-CBGs reimbursement. A CRR consistently below 100% indicates that reimbursement is insufficient to cover the actual costs of care, thereby posing a potential threat to the long-term sustainability of inpatient stroke services and increasing the risk of financial instability.

A low CRR in inpatient stroke services has implications that extend beyond financial losses at the individual patient level. Persistent reimbursement deficits may limit the hospital's ability to procure essential medicines and medical equipment, constrain investments in healthcare resources, increase pressure to improve service efficiency, and potentially compromise the quality of patient care. These consequences are particularly important for regional referral hospitals, which are responsible for delivering specialized healthcare services to a large catchment population. Therefore, the CRR can function as an early warning indicator of reimbursement inadequacy and financial vulnerability within the hospital. Accordingly, this study aims not only to analyze the differences between actual hospital costs and INA-CBGs reimbursement for hospitalized stroke patients at RSUD dr. Abdul Aziz Singkawang but also to establish the Cost Recovery Rate (CRR) as a key indicator for comprehensively evaluating hospital financial performance. By incorporating CRR into the analysis, this study integrates clinical, operational, and financial perspectives to provide a more comprehensive assessment of hospital financing. The findings are expected to provide robust empirical evidence for developing policies on reimbursement evaluation, cost control, resource optimization, and the long-term sustainability of healthcare services in regional public hospitals.

METHOD

This study employs a quantitative method with descriptive and analytical approaches. The quantitative approach is used to objectively measure the difference between INA-CBG rates and actual hospital costs using numerical data. The descriptive approach aims to illustrate patterns of cost differences and the Cost Recovery Rate (CRR), while the analytical approach is used to analyze factors influencing these differences, such as length of stay, severity level, stroke type, and complications. A retrospective design is used, utilizing existing data—specifically INA-CBG claim data and actual patient costs. This design was selected to evaluate the adequacy of INA-CBG rates in covering stroke patient care costs and to assess the hospital's financial strain via the Cost Recovery Rate (CRR) indicator.

The study population consists of all JKN-enrolled patients diagnosed with ischemic or hemorrhagic stroke who were hospitalized at RSUD dr. Abdul Aziz, Singkawang City, between January and December 2024. A total sampling technique was applied, resulting in a sample of 101 patients who met the inclusion criteria. Inclusion criteria comprised BPJS patients with ischemic or hemorrhagic stroke INA-CBG codes, while patients treated in the ICU were excluded. The study utilizes secondary data in the form of verified BPJS claims from 2024. Supporting data were obtained from the medical records department, the hospital information system, and the casemix unit of RSUD dr. Abdul Aziz, Singkawang City. Data collection was conducted through the review of documentation from the hospital's finance, medical records, and casemix departments.

The sampling technique employed was total sampling, drawing from a population of hospitalized BPJS-covered patients diagnosed with ischemic and hemorrhagic stroke; based on the established sampling criteria, the study included a total of 574 cases. Microsoft Excel was used to collect and present quantitative data and to prepare the data for processing.

Additionally, EViews software was utilized to conduct regression analyses—including N-Way ANOVA, Binary Logistic Regression, model selection, and panel data regression modeling—as well as hypothesis testing.

RESULT

Based on the data presented in Table 4.10, the majority of hospitalized stroke patients at RSUD dr. Abdul Aziz Singkawang were aged over 60 years, accounting for 293 patients (51%). This finding indicates that stroke predominantly affects older adults, who are physiologically at greater risk of cerebrovascular disorders due to age-related degenerative changes. Patients aged >60 years had a Cost Recovery Rate (CRR) of 93%, indicating that the revenue generated from this age group covered 93% of the actual cost of care, reflecting relatively efficient service delivery although it was still insufficient to fully offset hospital costs.

Characteristics of Hospitalized Stroke Patients

A total of 574 hospitalized stroke patients were included in the study at RSUD dr. Abdul Aziz Kota Singkawang. Based on age, the majority of patients were aged >60 years, comprising 293 patients (51%), followed by patients aged 45–60 years, with 229 patients (40%), and those aged <45 years, with 52 patients (9%). The CRR values for these age groups were 93%, 98%, and 80%, respectively.

Regarding sex, male patients accounted for 300 cases (52%), while female patients accounted for 274 cases (48%). The CRR was 97% among male patients and 88% among female patients.

Based on inpatient class, most patients were treated in Class III, comprising 364 patients (63%), followed by Class I with 149 patients (26%) and Class II with 61 patients (11%). The CRR was 102% for both Class I and Class II, whereas Class III had a CRR of 88%.

Regarding stroke type and severity, ischemic stroke was the predominant diagnosis, accounting for 460 cases (80%), while hemorrhagic stroke accounted for 114 cases (20%). Among ischemic stroke patients, 178 (31%) had mild stroke, 121 (21%) had moderate stroke, and 161 (28%) had severe stroke. Among hemorrhagic stroke patients, 11 (2%) had mild stroke, 52 (9%) had moderate stroke, and 51 (9%) had severe stroke.

The average CRR for ischemic stroke was 101%, whereas hemorrhagic stroke had an average CRR of 73%. For ischemic stroke, the CRR was 102% for mild cases, 109% for moderate cases, and 91% for severe cases. For hemorrhagic stroke, the corresponding CRR values were 65%, 70%, and 85%, respectively.

Regarding complications, 548 patients (95%) experienced one or more complications, while 26 patients (5%) had no recorded complications. The CRR was 94% among patients with complications and 93% among patients without complications.

Difference Between Actual Hospital Costs and INA-CBGs Reimbursement

The total INA-CBGs reimbursement claimed from BPJS Kesehatan for hospitalized stroke patients in 2024 amounted to IDR 4,386,707,300. In comparison, the actual hospital expenditure for stroke care reached IDR 4,700,230,197.

The difference between actual expenditure and INA-CBGs reimbursement was therefore negative, amounting to IDR 313,522,897. The overall Cost Recovery Rate (CRR) was 93%, indicating that INA-CBGs reimbursement covered only 93% of the actual costs incurred by the hospital.

Logistic Regression Analysis

The logistic regression analysis demonstrated that Length of Stay (LOS), stroke severity, and stroke type were statistically significant predictors of the discrepancy between actual hospital costs and INA-CBGs reimbursement, with significance values of $p < 0.001$. The odds ratio (Exp(B)) for LOS was 0.070. Severe stroke had an Exp(B) of 2.778, while moderate stroke had an Exp(B) of 3.766. Stroke type had an Exp(B) of 0.285. In contrast, complications were not statistically significantly associated with the discrepancy, with a significance value of $p = 0.820$ and an Exp(B) of 0.891.

The Nagelkerke R^2 was 0.378, indicating that the model explained approximately 37.8% of the variation in the dependent outcome. The overall classification accuracy was 75.1%. The Hosmer–Lemeshow goodness-of-fit test produced a significance value of 0.010.

Simple Linear Regression Analysis

The simple linear regression analysis demonstrated a statistically significant relationship between the discrepancy in actual hospital costs and INA-CBGs reimbursement and the Cost Recovery Rate (CRR), with $p < 0.001$. The coefficient of determination (R^2) was 93.1%, indicating that the discrepancy variable explained 93.1% of the variation in CRR. The regression coefficient was $B = 0.965$, indicating a positive linear relationship between the discrepancy variable and CRR.

DISCUSSION

Effect of Length of Stay on the Difference Between Actual Hospital Costs and INA-CBGs Reimbursement

The findings demonstrate that Length of Stay (LOS) significantly influences the difference between actual hospital costs and INA-CBGs reimbursement. This finding is consistent with Purwadi, Latief, and Nurlita (2018), who reported that longer hospitalization increases the financial burden incurred by hospitals.

Under the INA-CBGs prospective payment system, reimbursement is predetermined according to diagnosis and disease severity and does not increase proportionally with the duration of hospitalization. In contrast, actual hospital costs continue to accumulate throughout the patient's hospitalization. These costs include nursing services, medications, laboratory examinations, diagnostic procedures, medical supplies, and the utilization of hospital facilities.

This finding is also consistent with Lilissurian, Saputra, and Ruby (2017), Monica et al. (2021), Firman (2024), and Cahyani, Yuswar, and Nurmainah (2019), who reported that longer hospitalization was associated with increased actual treatment costs.

Therefore, effective LOS management is important for improving hospital efficiency. However, reducing LOS should not be implemented solely to reduce costs, but should remain consistent with patients' clinical conditions and quality-of-care requirements.

Effect of Stroke Severity on the Difference Between Actual Hospital Costs and INA-CBGs Reimbursement

Stroke severity was found to significantly influence the difference between actual hospital costs and INA-CBGs reimbursement. Patients with moderate stroke had 3.766 times higher odds of experiencing the outcome than patients with mild stroke, while patients with severe stroke had 2.778 times higher odds.

These findings indicate that greater clinical severity is associated with increased healthcare resource utilization. Patients with more severe stroke conditions may require more diagnostic examinations, medications, medical procedures, rehabilitation, and intensive care.

This finding is consistent with Kang et al. (2011), Murti Andayani et al. (2017), Dwidayati et al. (2016), Munawaroh et al. (2019), Mulyanti et al. (2020), and Zaqiah et al. (2024), who identified stroke severity as an important determinant of treatment costs and reimbursement discrepancies. The findings therefore suggest that stroke severity should be considered an important factor in hospital cost management and evaluation of INA-CBGs reimbursement adequacy.

Effect of Stroke Type on the Difference Between Actual Hospital Costs and INA-CBGs Reimbursement

Stroke type was significantly associated with the difference between actual hospital costs and INA-CBGs reimbursement. The descriptive findings showed a substantial difference in financial performance between ischemic and hemorrhagic stroke. The average CRR was 101% for ischemic stroke and 73% for hemorrhagic stroke.

The lower CRR among hemorrhagic stroke patients indicates that INA-CBGs reimbursement was generally insufficient to cover their actual treatment costs. This may be related to the greater intensity of medical management, diagnostic procedures, monitoring, and healthcare resource utilization required by hemorrhagic stroke patients.

These findings are consistent with Mazidah et al. (2019) and Tandah et al. (2021), who reported that the actual treatment costs of hemorrhagic stroke were generally higher than those of ischemic stroke and that INA-CBGs reimbursement was insufficient to fully cover these costs.

However, the effect of stroke type should be interpreted together with stroke severity and LOS. Therefore, stroke type should not be regarded as the sole determinant of reimbursement discrepancies.

Effect of Complications on the Difference Between Actual Hospital Costs and INA-CBGs Reimbursement

The logistic regression analysis showed that complications were not significantly associated with the difference between actual hospital costs and INA-CBGs reimbursement, with $p = 0.820$.

Although the statistical analysis did not identify complications as a significant independent predictor, complications may still increase actual healthcare expenditures through additional medications, diagnostic procedures, medical supplies, and other healthcare services.

The high proportion of patients experiencing complications, namely 95%, may have contributed to the lack of statistical significance because there was relatively little variation between patients with and without complications.

Therefore, the absence of a statistically significant association does not necessarily indicate that complications have no effect on treatment costs. Rather, after adjustment for other variables in the regression model, complications were not identified as an independent significant predictor of the reimbursement discrepancy.

Effect of the Difference Between Actual Hospital Costs and INA-CBGs Reimbursement on Cost Recovery Rate

The simple linear regression analysis demonstrated a statistically significant relationship between the difference between actual hospital costs and INA-CBGs reimbursement and the Cost Recovery Rate (CRR), with $p < 0.001$ and an R^2 of 93.1%.

The overall CRR of 93% indicates that INA-CBGs reimbursement did not fully cover the actual costs of stroke treatment. This condition reflects financial pressure on hospitals operating under the prospective payment system.

These findings are consistent with Mardiah and Rivany (2015), Arfiani et al. (2020), Aurelia and Pujiyanti (2017), and other previous studies reporting discrepancies between actual hospital costs and INA-CBGs reimbursement.

From a managerial perspective, hospitals should strengthen cost-control mechanisms, optimize resource utilization, implement evidence-based clinical pathways, improve BPJS claims management, and periodically evaluate hospital cost structures.

Hemorrhagic Stroke as the Stroke Type with the Greatest Financial Deficit

Hemorrhagic stroke demonstrated the poorest financial performance, with an average CRR of 73%, compared with 101% for ischemic stroke. This indicates that hemorrhagic stroke generated a greater financial burden for the hospital.

The greater financial burden may be associated with the need for intensive medical management, neurological monitoring, advanced diagnostic examinations, specialized medication, rehabilitation, and potentially intensive care. These requirements increase actual treatment expenditure while INA-CBGs reimbursement remains predetermined.

Therefore, hemorrhagic stroke patients represent an important group for hospital cost evaluation and financial management under the INA-CBGs payment system.

CONCLUSION

The findings of this study demonstrate that Length of Stay (LOS), stroke severity, and stroke type were significant predictors of the discrepancy between actual hospital costs and INA-CBGs reimbursement, whereas complications were not significantly associated with the discrepancy after adjustment for other variables. Stroke severity emerged as the strongest predictor, indicating that patients with moderate and severe stroke were substantially more likely to experience greater discrepancies between actual treatment costs and INA-CBGs reimbursement than patients with mild stroke.

Patients with hemorrhagic stroke and severe clinical conditions generally required more intensive treatment, prolonged hospitalization, and greater healthcare resource utilization, resulting in actual hospital costs that frequently exceeded the fixed reimbursement provided under the INA-CBGs

prospective payment system. In contrast, patients with mild ischemic stroke and shorter hospital stays tended to generate more favorable financial outcomes for the hospital.

The Cost Recovery Rate (CRR) analysis revealed that most hospitalized stroke cases had CRR values below 100%, indicating that INA-CBGs reimbursement was insufficient to fully recover the actual costs of patient care. These findings demonstrate a persistent gap between the standardized INA-CBGs reimbursement rates and the actual costs incurred by the hospital, particularly among patients requiring complex and resource-intensive treatment.

To improve financial sustainability, hospitals should strengthen cost-control strategies through effective implementation of evidence-based clinical pathways, optimization of the length of hospital stay without compromising quality of care, efficient utilization of healthcare resources, and continuous evaluation of hospital cost structures. Periodic review of INA-CBGs reimbursement policies is also recommended to ensure that reimbursement rates more accurately reflect the actual costs of managing hospitalized stroke patients.

REFERENCES

- Arfiani, M., Fahlevi, H., & Zuraida. (2020). Cost recovery rate dan pengendalian biaya di rumah sakit: Studi kasus pada rumah sakit pemerintah. *Jurnal Perspektif Ekonomi Darussalam*, 12, 372–383.
- Cahyani, D. P., Yuswar, M. A., & Nurmainah. (2019). Analysis the conformity of real costs against INA-CBGs tariffs in ischemic stroke treatment of JKN patients inpatient at Sultan Syarif Mohamad Alkadrie Hospital Pontianak in 2018.
- Darmapadmi, L. P. K., Widarsa, I. K. T., & Mulyawan, K. H. (2018). Analisis determinan lama rawat inap pasien stroke di Rumah Sakit Umum Daerah Klungkung menggunakan analisis kesintasan. *WMJ (Warmadewa Medical Journal)*, 5(1), 1–8.
- Dwidayati, A., Andayani, T. M., & Wiedyaningsih, C. (2016). Analisis kesesuaian biaya riil terhadap tarif INA-CBGs pada pengobatan stroke non hemoragik pasien JKN rawat inap RSUD dr. Soehadi Prijonegoro Sragen tahun 2015. *Jurnal Manajemen dan Pelayanan Farmasi*, 6(2), 139–149.
- Hadning, I., Fathurrohman, F., Ridwan, M., Rahajeng, B., Utami, P., & Cahyaningsih, I. (2020). Cost analysis of Indonesia case based groups (INA-CBGs) tariff for stroke patients. *Journal of Advanced Pharmaceutical Technology & Research*, 10(2), 137.
- Kang, H. Y., Lim, S. J., Suh, H. S., & Liew, D. (2011). Estimating the lifetime economic burden of stroke according to the age of onset in South Korea: A cost of illness study. *BMC Public Health*, 11, 646. <https://doi.org/10.1186/1471-2458-11-646>
- Limbong Allo, K. N., Wreksoatmodjo, B. R., & Sasmita, P. (2021). Faktor-faktor yang berhubungan dengan lama perawatan rawat inap pasien stroke di Rumah Sakit Atma Jaya. *Jurnal Kedokteran Meditek*, 27(2), 19–23.
- Mazidah, Z., Yasin, N. M., & Kristina, S. A. (2019). Analisis biaya penyakit stroke pasien Jaminan Kesehatan Nasional di RSUD Blambangan Banyuwangi. *Jurnal Manajemen dan Pelayanan Farmasi*, 9(2), 76–87. <https://doi.org/10.22146/jmpf.41984>
- Mubarok, C., Suryawati, C., & Harto, P. (2024). Efisiensi biaya dalam perawatan stroke non-hemoragik: Studi kasus di Rumah Sakit Islam Sunan Kudus. *Jurnal Ekonomi Kesehatan Indonesia*, 9(2). <https://doi.org/10.7454/eki.v9i2.1135>
- Mulyanti, Saputra, I., Syukri, M., Nurjannah, & Lestari, N. D. (2020). Comparison analysis of real costs with INA-CBG rate's ischemic stroke disease in hospitals X Banda Aceh. *Budapest International Research in Exact Sciences Journal*, 3(3), 2479–1715.
- Munawaroh, S., Sulistiadi, W., & Rachmad. (2019). Perbedaan tarif INA-CBGs dengan tarif riil rumah sakit pada pasien BPJS kasus stroke iskemik rawat inap kelas I di RS PON tahun 2018. *Jurnal Administrasi Rumah Sakit Indonesia*, 3(2), 155–165.

- Muslimah, M., Andayani, T. M., Pinzon, R., & Endarti, D. (2017). Comparison of real costs against the price of INA-CBG's ischemic stroke in Bethesda Hospital. *Jurnal Manajemen dan Pelayanan Farmasi*, 7(2), 105–114. <https://doi.org/10.22146/jmpf.30289>
- Setiani, S., Radne Rimba, I., & Dwinta, E. (2021). Analisis perbandingan biaya perawatan (cost of illness) stroke iskemik dengan stroke hemoragik pasien rawat inap di RSUD Panembahan Senopati. *Pharmaceutical Journal of Indonesia*, 7(1), 29–36. <https://doi.org/10.21776/ub.pji.2021.007.01.5>
- Tandah, M. R., Mukaddas, A., Angriani, D., & Mangoting, G. N. A. (2021). Cost evaluation of stroke therapy compared to INA-CBGs on inpatients at Anutapura Hospital. *The Indonesian Journal of Public Health*, 16(2), 285–296. <https://doi.org/10.20473/ijph.v16i2.2021.285-296>
- Yu, M., Huang, Z., Yang, Y., Wang, Y., Ren, H., & Tang, S. (2025). Influencing factors of hospitalization costs for intensive rehabilitation in patients with post-stroke disorder of consciousness. *Frontiers in Public Health*, 13, 1552148. <https://doi.org/10.3389/fpubh.2025.1552148>
- Zaqiah, F., Vita, L., Dewi, I., & Harsono, S. B. (2024). Analisis cost of illness pada pengobatan pasien stroke iskemik peserta JKN di RS X Surakarta tahun 2023. *Jurnal Ilmiah Manuntung*, 10(2), 338–34