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Original Research

Cost of Illness: Stroke Patients with Medical Rehabilitation

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ABSTRACT

Background: Cerebrovascular disease (ICD 10: I60–I69), is a medical condition that leads to limitations such as limited mobility and cognitive impairment. It is the most fatal disease in Indonesia. Medical rehabilitation has been clinically proven to be an effective strategy to minimize disability in stroke patients.

Methods: This research is a quantitative study with a cross-sectional design. The data source was obtained from BPJS Kesehatan sample data for 2022. The sample units for this study were all patients with a diagnosis of cerebrovascular disease. This study examined 3,528 patients, representative of a larger population of 339,707 patients.

Results: In 2022, healthcare costs for stroke patients in Indonesia, covered by BPJS Kesehatan, varied widely from Rp 1,937,400 to Rp 207,675,700, averaging Rp 8,487,531 per person. BPJS Kesehatan's total spending on stroke treatment and rehab in 2022 was Rp 2,883,269,825,972. The productive age group constitutes the majority of stroke cases, comprising 68.9% of the total, with males representing the predominant gender at 54.5%. The biggest group benefiting from this were those receiving Beneficiary Contribution Assistance (PBI), making up 46.5% of all National Health Insurance participants.

Conclusion: This study indicates that providing medical rehabilitation during the golden period yields greater efficiency compared to its absence. This recommendation extends beyond cost-saving measures, emphasizing a strategic investment in national welfare through the enhancement of individuals' quality of life. Therefore, policymakers, BPJS Kesehatan, hospitals, and healthcare professionals are encouraged to factor this insight into their decision-making processes.

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INTRODUCTION

Cerebrovascular diseases, commonly known as stroke, encompass a range of medical conditions affecting blood vessels and circulation within the brain. These conditions are classified under ICD-10 codes I60–I69. They can lead to serious health

implications, such as movement limitations and cognitive impairments, impacting overall quality of life. Stroke stands as a leading cause of disability globally (Langhammer et al., 2015).

Findings from the 2018 Riset Kesehatan Dasar (Riskesdas) estimate that approximately 2.1 million Indonesians aged 15 and above suffer from stroke. This figure equates to 10.9% of the total Indonesian population within this age group (Kemenkes RI, 2018). Riskesdas, (2018) further indicates that the risk of stroke increases with age, particularly between the ages of 55 and 75. Cerebrovascular diseases lead to movement limitations, resulting in a tendency towards dependence in daily living. The rate of dependence among stroke cases reaches 63.7% (Kemenkes RI, 2018).

Stroke patients often experience lingering symptoms such as hemiplegia, aphasia, cognitive dysfunction, and loss of ability for self-care, productivity, and leisure time utilization, all significantly affecting their quality of life. Scientifically, medical rehabilitation has proven to be an effective means of reducing disability levels in stroke patients (N. Liu et al., 2014). Stroke patients undergoing medical rehabilitation within three months of the event show recovery rates ranging from 48 to 91% (Lee et al., 2015). Neurologists recommend that stroke patients remain in bed as much as possible within the first 24 hours.

Proper rehabilitation planning commences as early as possible, depending on the severity of the stroke, with potential complications monitored and healthcare and medical teams integrated to effectively execute the medical rehabilitation plan. These steps facilitate complication prevention, reduce disability and mortality, and alleviate medical, familial, and economic burdens (Y. Liu et al., 2022). A study involving 6,153 stroke patients, of whom 4,266 received very early rehabilitation, reported that 41.2% significantly exhibited higher functional abilities upon hospital discharge following inpatient care (Momosaki et al., 2016).

The American Heart Association and American Stroke Association emphasize the criticality of early medical rehabilitation for stroke patients (Weinstein et al., 2016). In Indonesia, medical rehabilitation teams comprise physical medicine and rehabilitation specialists, physiotherapists, occupational therapists, speech therapists, orthopedic prosthetists, and other professionals. Collaborative team efforts in medical rehabilitation can restore post-stroke patient conditions (Singh et al., 2018). Other research indicates that medical rehabilitation can restore motor function in stroke patients within the first year (Langhammer et al., 2015).

One profession within medical rehabilitation is occupational therapy, which aims to enhance patient functional performance and increase their participation in daily life (Li & Xu, 2021). Individuals receiving medical rehabilitation on an outpatient basis within the first 30 days post-hospitalization have a lower likelihood of readmission compared to those not receiving therapy (Freburger et al., 2018). Medical rehabilitation interventions in stroke patients provide favorable prognoses for motor movement and recovery (Hatem et al., 2016).

The costs associated with medical treatment and rehabilitation services for stroke patients vary significantly, encompassing medication, care, and rehabilitation expenses. The cost burden incurred by stroke patients undergoing medical rehabilitation is more effective compared to those not undergoing such rehabilitation (Chen et al., 2020). Research in South Africa underscores that rehabilitation is not only about cost-effectiveness but also an investment for the nation, as it enhances the quality of life for its citizens (Louw et al., 2020).

This study analyzes the healthcare cost burden arising from stroke among patients with BPJS Kesehatan insurance, aiming to assess the magnitude of treatment and medical rehabilitation costs and potential losses for BPJS Kesehatan, thereby aiding policymakers in budgetary and national healthcare policy considerations.

MATERIALS AND METHOD

This study represents a quantitative investigation employing a cross-sectional design. Data sources were obtained from the BPJS Kesehatan sample data for the year 2022. The research sample unit comprises all patients diagnosed with cerebrovascular diseases, with an ICD-10 code of I60–I69. The total research sample consists of 3,528 patients, weighted to represent 339,707 patients.

The dependent variable in this study is patients diagnosed with cerebrovascular diseases and the total cost of illness, as verified by BPJS Kesehatan. The independent variables include patient age, treatment class, segmentation of BPJS Kesehatan participants, inpatient admissions, outpatient treatment at medical rehabilitation facilities, and total days of treatment. Potential losses are calculated by comparing patients receiving medical rehabilitation with those who do not.

This study investigated the cost of Cerebrovascular Disease (CVD) using a cross-sectional design, which examines data from a single point in time. Secondary data was obtained from a sample of BPJS Kesehatan enrollees diagnosed with CVD in 2022 (ICD-10 codes I60–I69). The sample (3,528 patients) was weighted to represent the broader population of 339,707 CVD patients.

The study focused on patient characteristics (age) and healthcare utilization (treatment class, BPJS segment, inpatient admissions, outpatient rehabilitation visits, and total treatment days) as potential factors influencing the total cost of illness (verified claims by BPJS). Potential cost reductions were assessed by comparing patients who received medical rehabilitation with those who did not.

RESULTS

Univariate analysis

The frequency distribution of research variables can be observed in Table 1. Patients diagnosed with cerebrovascular diseases or strokes are predominantly male, accounting for 54.5%; within the productive age range, comprising 68.9%; the largest participant segmentation is Beneficiary Contribution Assistance (PBI), at 46.5%; and class 3 represents 59.5%. Table 2 elucidates the associated costs. The incurred cost or total cost of illness for stroke ranges from Rp 1,937,400 to Rp 207,675,700, with an average per patient of Rp 8,487,531. During a single visit, the average cost borne by BPJS Kesehatan for each patient ranges from a minimum of Rp 340,523 to a maximum of Rp 207,675,700, with an average of Rp 7,050,342. Stroke patients experience a minimum of 1 and a maximum of 4 inpatient stays per year, with a length of stay ranging from 0-46 days. Outpatient visits for medical rehabilitation range from 0–20 times per year.

Table 1. Frequency Distribution of Research Variables (n= 339.707)

Variables	Amount	Percentage
Age		
Non-productive age (0-14 year)	293	0,1
Productive age (15-64 year)	234.126	68,9

Variables	Amount	Percentage
after productive age (>65 year)	105.287	31
Sex		
Male	185.236	54,5
Female	154.471	45,5
Number of inpatient admissions		
Once	308.401	90,8
More than once	31.305	9,2
Number of outpatient medical rehabilitation admissions		
Not outpatient	295.821	87,1
Once	38.323	11,3
More than once	5.563	1,6
Inpatient cases with severe severity level		
Ever	45.078	13,3
Never	294.628	86,7
Insurance Payment		
Class 1	86.179	25,4
Class 2	51.404	15,1
Class 3	202.123	59,5
Segmentation of JKN Participants		
PBI	157.993	46,5
BP	46.212	13,6
PBPU	70.430	20,7
PPU	65.072	19,2
Length of Stay (LOS)		
0-14 days (golden periode)	329.060	96,9
>15 days (non golden periode)	10.646	3,1

Tabel 2. *Total Cost of Illness* Pasien Diagnosa Cerebrovascular Diseases (n= 339.707)

Variables	n	Persen-tage	Mean (Rp)	Minimum (Rp)	Maximum (Rp)
Age					
Non-productive age (0-14 year	293	0,1	5.429.925	2.253.700	28.670.800
Productive age (15-64 year)	234.126	68,9	8.817.516	1.956.600	207.675.700
after productive age (>65 year)	105.287	31	7.762.253	1.937.400	94.602.200
Sex					
Male	154.471	54,5	8.444.965	1.956.600	148.339.800
Female	185.236	45,5	8.523.028	1.937.400	207.675.700
Number of inpatient admissions					
Once	308.401	90,8	7.458.348	1.937.400	207.675.700
More than once	31.305	9,2	18.626.387	4.232.200	164.687.500
Number of outpatient medical rehabilitation admissions					
Not outpatient	295.821	87,1	8.336.588	1.937.400	207.675.700
Once	38.323	11,3	9.629.840	1.956.600	164.462.000
More than once	5.563	1,6	8.644.980	3.051.300	48.288.400

Variables	n	Persen-tage	Mean (Rp)	Minimum (Rp)	Maximum (Rp)
Inpatient cases with severe severity level					
Ever	45.078	13,3	21.445.163	4.024.100	207.675.700
Never	294.628	86,7	6.505.003	1.937.400	103.562.000
Insurance Payment					
Class 1	86.179	25,4	10.614.534	2.780.400	207.675.700
Class 2	51.404	15,1	8.175.158	2.366.300	91.800.600
Class 3	202.123	59,5	7.660.085	1.937.400	148.339.800
Segmentation of JKN Participants					
PBI	157.993	46,5	7.663.658	1.937.400	148.339.800
BP	46.212	13,6	10.243.859	2.366.300	164.687.500
PBPU	70.430	20,7	8.259.388	2.059.100	98.474.100
PPU	65.072	19,2	9.487.524	2.633.400	207.675.700

Bivariate analysis

Table 3 presents the Pearson correlation analysis for each research variable. The correlation analysis results indicating negative correlations are as follows: age variable r = -0.072, inpatient cases with severe severity level r = -0.039, and JKN participant segmentation r = -0.055, significant at the 5% level. The Pearson correlation regression analysis results suggest that younger age groups receive more medical rehabilitation services; inpatient cases with less severe severity levels receive more medical rehabilitation services; and JKN Penerima Biaya Iur (PBI) receives medical rehabilitation services.

Table 3. Correlation Analysis of Independent Variables with Medical Rehabilitation Utilization

Variables	r
Age	-0,072**
Sex	0,040**
Number of inpatient admissions	0,096**
Number of outpatient medical rehabilitation admissions	0,008**
Inpatient cases with severe severity level	-0,039**
Insurance Payment	0,056**
Segmentation of JKN Participants	-0,055**

Note: ** 5% significance

Cost of Illness Analysis

The healthcare cost burden arising from stroke in this study was analyzed using direct costs. Direct costs encompass expenses covered by BPJS Kesehatan, including the use of medical equipment, treatment costs, doctor fees, medical rehabilitation costs, and other healthcare services at hospitals. These costs are verified claim expenses by BPJS Kesehatan.

From Table 4, it can be observed that the average cost for productive-age patients with a history of severe inpatient care who received medical rehabilitation during the golden period was Rp 18,841,529, compared to Rp 19,576,850 for the same category without medical rehabilitation. Costs escalate substantially when medical rehabilitation is received during the non-golden period, reaching an average of Rp 71,036,804. This

comparison indicates that patients receiving medical rehabilitation during the golden period are more cost-efficient than those who do not.

Similar trends are observed among non-productive-age patients (over 65 years old). Those experiencing severe inpatient cases during the golden period and receiving medical rehabilitation have an average cost borne by BPJS Kesehatan of Rp 11,734,922, compared to Rp 15,004,093 for those not receiving medical rehabilitation. Non-productive-age patients experiencing severe inpatient cases during the non-golden period receive more cost-efficient medical rehabilitation services, averaging Rp 19,264,057 compared to Rp 31,074,607 for those not receiving medical rehabilitation.

Table 4. Cost Analysis with Various Research Variables

Age					**Total Cost of Illness**	
					Not receiving medical rehabilitation services	**Receiving medical rehabilitation services**
Non-productive age (0-14 year)	Inpatient Cases with Severity Level	Ever	Leng of stay	Golden Periode	Rp 4.024.100	-
				Non Golden Periode	-	-
		Never	Leng of stay	Golden Periode	Rp 5.399.932	Rp 6.885.263
				Non Golden Periode	-	-
Productive (15-64 year)	Inpatient Cases with Severity Level	Ever	Leng of stay	Golden Periode	Rp 19.576.850	Rp 18.841.529
				Non Golden Periode	Rp 42.729.161	Rp 71.036.804
		Never	Leng of stay	Golden Periode	Rp 6.030.957	Rp 7.176.807
				Non Golden Periode	Rp 10.829.261	Rp 20.098.770
After Productive age (>65 year)	Inpatient Cases with Severity Level	Ever	Leng of stay	Golden Periode	Rp 15.004.093	Rp 11.734.922
				Non Golden Periode	Rp 31.074.607	Rp 19.264.057
		Never	Leng of stay	Golden Periode	Rp 6.123.632	Rp 7.329.945
				Non Golden Periode	Rp 13.816.506	Rp 14.275.012

CONCLUSION

Medical rehabilitation has been scientifically proven as an effective approach to reducing disability levels in stroke patients during the golden period (Y. Liu et al., 2022). Based on the above analysis, it is stated that medical rehabilitation services during the golden period for patients with severe levels of severity are more efficient compared to not receiving medical rehabilitation services. This aligns with research conducted by Morii et al., (2023) which suggests that medical rehabilitation services provided for 7 days per week for acute stroke patients are more cost-effective compared to long-term care costs (Morii et al., 2023).

A cohort study conducted in the Netherlands from 2014 to 2016 found that both inpatient and outpatient stroke patients improved their quality of life with medical rehabilitation services, but there were higher costs for inpatient stroke patients due to rehabilitation facilities and other amenities (van Meijeren-Pont et al., 2021). The healthcare costs associated with stroke in Indonesia in 2022, covered by BPJS Kesehatan, ranged from Rp 1,937,400 to Rp 207,675,700, with an average of Rp 8,487,531 per person. The total expenditure of BPJS Kesehatan for stroke treatment and rehabilitation in 2022 amounted to Rp 2,883,269,825,972. The largest segment benefiting from this were Beneficiary Contribution Assistance (PBI) recipients, or individuals whose healthcare insurance is subsidized by the government, constituting 46.5% of the total JKN participants.

This study provides policy implications for BPJS Kesehatan, hospitals, and healthcare professionals, suggesting that it is more efficient for patients to receive medical rehabilitation services during the golden period compared to not receiving such services. Medical rehabilitation should not only be viewed in terms of cost-effectiveness but also as an investment for the nation, as it enhances the quality of life for the population (Louw et al., 2020).

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