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Cost Analysis of Inpatient Heart Failure Treatment in Jogja Hospital Based On INA-CBG's Tariffs In 2023

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Abstract

Heart failure is a catastrophic disease that requires long-term care, resulting in high costs. This study is the first to evaluate the INA-CBG's tariff based on the Minister of Health Regulation Number 3 of 2023 for treating inpatient heart failure. This study aims to determine the difference in the actual costs of inpatient heart failure treatment in Jogja Hospital with INA-CBG's tariff based on Permenkes Number 3 of 2023. This study is an observational study with a cross-sectional research design and retrospective data collection of medical record data and patient cost data in 2023. Data were analyzed using descriptive analysis methods and a one sample t-test. Data were obtained from 104 patients. The results of this study found that the average real cost for the treatment of inpatient heart failure with code I-4-12-I class 1 is IDR10.302.093 ± Rp5.749.499, class 2 is IDR IDR4.184.959 ± Rp681.730, and class 3 is IDR5.123.572 ± Rp2.242.239. The average real cost for the treatment of inpatient heart failure with code I-4-12-II class 1 is IDR9.764.750 ± Rp5.208.499; class 2 is IDR6.734.834 ± Rp3.82.345, and class 3 is IDR8.549.362 ± Rp4.288.906. The average real cost for treating inpatient heart failure with code I-4-12-III class 1 is IDR6.073.828; class 2 is IDR16.885.496, and class 3 is IDR14.326.130±Rp7.565.598. The average real cost was higher than the INA-CBG's tariff, with a significant difference, so the hospital suffered a loss.

Keywords: Cost analysis; Heart failure; INA-CBG's tariff 2023; Real cost

1. INTRODUCTION

According to data obtained by the World Health Organization (WHO) states that in the world, 20 million people die per year due to cardiovascular disorders (Yunita et al., 2020). Based on data obtained (Lilik & Budiono, 2021), the incidence rate of heart disease in Indonesia is increasing from year to year with a prevalence of 1.5% or an estimated 1,017,290 people (Yunita et al., 2020).

One of the causes of heart failure is included in catastrophic disease, apart from being able to cause complications that cause re-hospitalization, also because it requires more serious treatment, which serves to reduce mortality and morbidity. So, treating patients with heart failure is considered the most expensive (Astuti et al., 2021). Factors affecting the cost of care for heart failure are found in long-term treatment patterns and the length of stay (Wulandari et al., 2015).

Since 2008, Indonesia has paid hospitals serving the Jamkesmas program with a prospective payment system, the Diagnosis Related Group System (DRG system), which aims to control costs and maintain service quality. This system continued in 2014 until now through the JKN program under the name Indonesia Case Based Groups (INA-CBG's), where BPJS Health will pay hospitals based on a predetermined amount by the diagnosis of the disease in the patient, along with the actions and drugs that will be given or used with the INA- CBG's system, which is explained in Permenkes Number 3 of 2023 (Kemenkes, 2014; Kemenkes, 2023). In its application of the BPJS Health system, there are still many incidents that show a mismatch between the INA-CBG's tariff and the actual costs, especially in the treatment of catastrophic diseases (diseases that require long-term medical care at a high cost) such as heart failure, stroke, cancer, and also kidney failure (Amalia, 2020).

This study is essential considering the high number of cases and the high cost of treatment for heart failure. This study is the first to evaluate the tariff using INA-CBG's in 2023 and wants to see the hospital's improvements with the new tariff. Previously, a cost analysis study was conducted (Rahman, 2017) at Jogja Hospital, which compared the average actual costs with the INA-CBG's tariff for 2014. The results showed that, based on the difference between direct costs and INA-CBG's rates, Jogja Hospital did not lose money and had established health services by government regulations. After confirming the new INA-CBG tariff in 2023, further research is needed to determine the improvements made by the hospital with the new tariff. This study aimed to determine the difference between the actual costs of inpatient heart failure treatment in Jogja Hospital and the INA-CBG's tariff in 2023. The benefits expected from this research are evaluating hospital services and new tariffs. This study was conducted at Jogja Hospital and compared previous studies that used the INA-CBG's tariff in 2014 with the latest tariff set by the government, namely the INA-CBG's tariff in 2023. Jogja Hospital is one of the government-owned type B regional public hospitals. In addition, Jogja Hospital has set the INA-CBG's tariff in 2023 and has received full accreditation (five stars) from the Hospital Accreditation Commission (KARS).

2. MATERIAL AND METHODS

The study employed an observational design with a cross-sectional approach, approve by the Jogja Hospital Ethics Committee (No. 54/KEPK/RSUD/IX/2023). Data were collected retrospectively by reviewing medical records and treatment costs of heart failure patients from February to September 2023. The sampling method was total sampling, with inclusion and exclusion criteria. Inclusion criteria included heart failure patients admitted to classes 1, 2, and 3 of the JKN program at Jogja Hospital who were diagnosed with mild heart failure, moderate heart failure, and severe heart failure included in INA-CBG's codes I-4-12-I, I-4-12-II, and I-4-12-III, heart failure patients with complete payment data for cost calculation of the exact cost component, and heart failure patients with medical records that could complete patient data. Exclusion criteria were patients who died during the hospitalization period, forced or self-discharged patients, patients who changed treatment classes, and patients who were referred to other hospitals.

The instruments used in this study are cost data, medical record data, patient data recording form, and the INA-CBG's rates based on the Minister of Health Regulation Number 3 of 2023 for heart failure disease. Cost data is the cost of treatment for heart failure patients during inpatient treatment in classes I, II, and III taken from the finance department at Jogja Hospital. The calculated costs are direct medical costs, which include room costs, nursing, laboratory, radiology, drugs and medical equipment costs, doctor visits, support, non-surgical procedures, surgical procedures, and blood services. The data collected from MR were data of heart failure patients in Jogja hospital who underwent hospitalization in class I, II, and III with mild, moderate, and severe severity with INA-CBG's code I-4-12-I, I-4-12-II, I-4-12-III. Patient data recorded included patient characteristics, primary and comorbid diagnoses, and treatment data.

Descriptive statistical analysis was used to describe the average actual cost of treatment for heart failure patients participating in JKN. Descriptive analysis was used to determine the suitability of the average actual cost of treating JKN heart failure patients in the inpatient pharmacy installation of Jogja Hospital with INA-CBG's rates based on the Minister of Health Regulation Number 3 of 2023. The data is appropriate if the average actual cost is less than or equal to the INA-CBG's tariff. To analyze the difference between the average actual cost of treatment for heart failure patients with JKN participants and the INA-CBG's tariff based on the Minister of Health Regulation Number 3 of 2023 at the inpatient pharmacy installation of the Jogja Hospital using the one-sample t-test and Wilcoxon test.

3. RESULTS AND DISCUSSION

3.1. Characteristics of heart failure patients at Jogja Hospital

From February to September 2023, 104 patients with heart failure at Jogja Hospital met the inclusion criteria. The characteristics of heart failure patients at Jogja Hospital are shown in Table 1.

Table 1. Characteristics of patients with heart failure hospitalized at Jogja Hospital in 2023.

Characteristic	Number of Patients (N=104)	Percentage (%)
Sex		
Male	58	55,77
Female	46	44,23
Age		
39-45	6	5,77
46-56	28	26,92
57-70	51	49,04
>70	19	18,27

Based on the results of the study, the incidence of heart failure is more common in male patients. The high incidence of heart failure in men is caused by risk factors such as a history of smoking and an unhealthy lifestyle and the presence of the hormone estrogen in women, which is thought to have an effect in preventing the incidence of cardiovascular disorders by reducing oxidative stress (Astuti Purnamawati et al., 2018).

In addition, in this study, patients who experienced heart failure were most prevalent at the age of> 56 years. The increasing age increases the risk of a person developing heart failure disease due to weakening heart function. With age, the time it takes for fat to accumulate in the arterial wall increases. The accumulation of which continues over time can cause heart disease and stroke (Putri, 2021).

Comorbidities often accompany heart failure, the process of which is the main which is the triggering factor for the primary diagnosis. These comorbidities can be interpreted as conditions outside the primary diagnosis, such as trigger factors and complications that need to be treated to not worsen the condition of heart failure (Sulistiyowatiningsih et al., 2016). Comorbid factors of heart failure patients at Jogja Hospital are shown in Table 2.

Table 2. Distribution of comorbidities among heart failure patients at Jogja Hospital in 2023.

Types of Comorbid	Total (N=342)	Percentage
Impaired Heart Function	119	34,80%
Impaired Kidney Function	38	11,11%
Diabetes Mellitus	38	11,11%
Impaired Pulmonary Function	35	10,23%
Dyslipidemia and Hyperuricemia	24	7,02%
Hypertension	21	6,14%
Infections	20	5,85%
Indigestion	15	4,39%
Anemia	13	3,80%
Skin disorders	7	2,05%
Stroke	4	1,17%
Without comorbidities	4	1,17%
Osteoarthritis	2	0,58%
Liver disorders	1	0,29%
Brain disorders	1	0,29%

This study shows that the most common comorbidities in heart failure patients are heart function disorders, kidney function disorders, and diabetes mellitus. Impaired renal function in heart failure patients can lead to more severe complications compared to those without renal impairment. Patients with both heart failure and impaired renal function often present with additional comorbidities such as hypertension, diabetes, and heart disease, all of which require appropriate management to prevent exacerbation of heart failure symptoms (Sulistiyowatiningsih et al., 2016).

3.2. Treatment cost analysis

This study categorized heart failure patients based on severity and treatment class to determine the average actual cost of each class. The data were grouped according to INA-CBG's code. Table 3 summarizes the average cost components of heart failure treatment. Table 3 shows several components of the highest costs in Jogja Hospital: medicine, room, and electromedical (echocardiography and electrocardiography).

Table 3. Actual cost components of heart failure patients hospitalized at Jogja Hospital in 2023.

Cost Variable (IDR)	Average Cost																	
	Class 1						Class 2						Class 3					
	Mean (IDR)	%	Mean (IDR)	%	Mean (IDR)	%	Mean (IDR)	%	Mean (IDR)	%	Mean (IDR)	%	Mean (IDR)	%	Mean (IDR)	%	Mean (IDR)	%
	I-4-12-I	N (5)	I-4-12-II	N (12)	I-4-12-III	N (1)	I-4-12-I	N (4)	I-4-12-II	N (9)	I-4-12-III	N (1)	I-4-12-I	N (28)	I-4-12-II	N (27)	I-4-12-III	N (17)
Room	2.354.000	22,8	2.193.583	22,4	1.145.000	18,8	661.250	15,8	1.225.000	18,1	2.605.000	15,4	783.107	15,2	1.130.370	13,2	1.980.764	13,8
Nursing	846.200	8,21	840.125	8,60	353.500	5,82	391.625	9,36	713.722	10,6	1.391.000	8,24	461.392	9,01	667.870	7,81	1.248.088	8,71
Laboratory	736.100	7,15	797.625	8,17	576.000	9,48	608.375	14,5	733.111	10,8	1.242.000	7,36	480.410	9,38	885.277	10,3	1.246.264	8,70
Radiology	495.000	4,80	184.583	1,89	1.430.000	23,5	146.250	3,49	195.555	2,90	2.150.000	12,7	175.910	3,43	350.740	4,10	621.764	4,34
Medicine	2.378.953	23,0	2.019.850	20,6	507.025	8,35	605.627	14,4	1.356.256	20,1	4.168.969	24,6	903.398	17,6	1.941.270	22,7	3.486.271	24,3
Visit fee	823.900	8,00	699.125	7,16	448.000	7,38	285.750	6,83	377.055	5,60	1.015.000	6,01	404.316	7,89	625.555	7,32	965.294	6,74
Electromedic	1.517.000	14,7	1.044.291	10,6	650.000	10,7	800.000	19,1	1.007.222	14,9	2.080.000	12,3	933.428	18,2	1.372.277	16,0	2.240.352	15,6
Non-surgical procedure	992.340	9,63	1.317.816	13,5	711.800	11,7	512.582	12,2	848.577	12,6	1.742.800	10,3	740.836	14,4	1.051.832	12,3	1.963.799	13,7
Surgical procedure	158.600	1,54	204.750	2,10	252.500	4,16	173.500	4,15	278.333	4,13	491.000	2,91	266.485	5,20	265.314	3,10	421.764	2,94
Blood service	-	-	463.000	4,74	-	-	-	-	-	-	-	-	9.017	0,18	258.851	3,03	151.764	1,06
Total Cost	**10.302.093**	**100**	**9.764.750**	**100**	**6.073.825**	**100**	**4.184.959**	**100**	**6.734.834**	**100**	**16.885.496**	**100**	**5.123.572**	**100**	**8.549.362**	**100**	**14.326.130**	**100**

Medication costs were the highest, likely due to the complexity of patient conditions, where multiple symptoms and comorbidities require increased medication use. Increased disease severity and a higher number of comorbidities are associated with more extended hospital stays and higher overall medication costs (Giusman & Nurwahyuni, 2022). In heart failure patients at Jogja Hospital, the most widely used drugs are antihypertensive, atrial fibrosis, anti-platelet, antianginal, and hyperlipid.

Table 4 shows five classes of antihypertensive drugs commonly recognized as first-line therapies, namely ACEI / ARB, Beta Blockers, CCBs, and diuretics. The most frequently prescribed at Jogja Hospital were the diuretic furosemide group, used in 102 patients (14.66%). This finding is consistent with research by Etika et al., 2020, which reported that the diuretic and the ACEI groups are the most frequently used medications in hypertension management, due to their established safety profile and efficacy in reducing blood pressure. The use of ACEI is always used as the first line for the treatment of heart failure. Still, it should be noted that this ACEI group can cause worsening of renal function, hyperkalemia, symptomatic hypotension, and angioedema. Therefore, ACEIs are only given to patients with adequate renal function and normal potassium levels (Kemenkes, 2021), as seen in Table 4, where impaired renal function is the second most comorbid type in patients after heart function disorders. Hence, there is more administration of diuretics than in the ACEI group.

Table 4. Treatment patterns among heart failure patients hospitalized at Jogja Hospital in 2023.

Indication	Class	Drugs	Total	Percentage
Antihypertensive	ACEI	Ramipril	34	4,89%
		Catopril	2	0,29%
	ARB	Candesartan	54	7,76%
		Valsartan	10	1,44%
		Irbesartan	6	0,86%
	Beta Blocker	Bisoprolol	59	8,48%
		Carvendilol	14	2,01%
		Propanolol	1	0,14%
	CCB	Amlodipin	27	3,88%
		Nifedipine	11	1,58%
		Diltiazem	1	0,14%
	Diuretics	Furosemid	102	14,66%
		Spironolakton	66	9,48%
		HCT	7	1,01%
Atrial Fibrosis	Digitalis	Digoxin	54	7,76%
Anti-platelet	Inhibitory COX	Aspirin/Aspilet	71	10,20%
	Inhibitory receptor ADP	Clopidogrel	47	6,75%
Anti Anginal	Nitrat	ISDN	52	7,47%
		Nitrogliserin	38	5,46%
Anti Hyperlipid	Statin	Atorvastatin	40	5,75%

The next group most widely used in heart failure patients at Jogja Regional Hospital is the atrial fibrillation drug digoxin group of 54 patients (7.76%). In heart failure patients with

atrial fibrillation, digoxin can be used to slow down the rapid ventricular rate. In addition, digoxin can reduce symptoms and reduce the number of hospitalizations due to worsening symptoms of heart failure (PERKI, 2023).

The treatment that is widely used in heart failure patients is the anti-platelet group, namely aspirin drugs for as many as 71 patients (10.20%). A meta-analysis by the Antithrombotic Trialists' Collaboration showed that aspirin administration could reduce serious vascular events and mortality rates in cardiovascular and cerebrovascular diseases. The response in patients with heart disease in one of the hospitals in Indonesia is also still good, according to the results of research conducted by (A. Yunita et al., 2020), proving that there are no patients who experience aspirin resistance (E. P. Yunita et al., 2015).

Then for the second, namely room costs. The cost of the room, besides being combined with nutritional costs, is influenced by the length of treatment class and the severity of the patient. The longer and higher the class of care and the severity of the patient, the greater the room costs paid (Astuti et al., 2021).

In this study, the electromedical costs (echocardiography and electrocardiography) were also included in the cost of the three most significant components. The total electromedical costs vary depending on how often patients perform electronic examinations such as echocardiography. The more often the patient conducts the electromedical examinations, the greater the treatment costs (Nisa, 2020).

The difference between actual costs and INA-CBG's rates is seen from the average actual costs patients require during hospitalization. Actual costs will be compared with INA-CBG's rates based on class and severity. The results of the difference between actual costs and INA-CBG's rates are listed in Table 5.

It can be seen in Table 3 that patients with code I-4-12-I class 1 and code I-4-12-II class 2 showed that the average actual cost is greater than the INA-CBG's tariff ($p>0.05$), meaning that the average actual cost is greater than the INA-CBG's tariff with a non-significant difference. Patients with code I-4-12-II class 1, code I-4-12-II class 3, and code I-4-12-III class 3 showed that the average actual cost is greater than the INA-CBG's tariff ($p<0.05$), meaning that the average real cost is greater than the INA-CBG's cost rate with a significant difference. Patients with code I-4-12-II class 2 showed that the average actual cost was smaller than the INA-CBG's tariff ($p>0.05$), meaning that the average actual cost was less than the cost rate with a non-significant difference.

The difference between the total real cost and the total INA-CBG's tariff in Table 5 determines whether the hospital experiences a surplus value (profit) or minus (loss). From Table 5, the total real cost of heart failure patients at Jogja Hospital in 2023 amounted to IDR 886.837.128, and the total INA-CBG's cost amounted to IDR 480.479.100. From the difference between the two data, the result is IDR 406.358.028, which means that the financing of heart failure patients in the 2023 period at Jogja Hospital suffered a loss because BPJS Kesehatan could not bear the total costs.

Similar research conducted by (Astuti et al., 2021) stated that the tariff difference was minus IDR 40.158.430 because the real cost of the hospital was more significant than the INA-

CBG's tariff. The real cost of the hospital is influenced by comorbidities that worsen the patient's condition and the length of treatment days—this impacts the increasing number of medical services and support provided.

Another study conducted by One way to overcome the cost difference is to make efficiency so that the tariff and quality of service are balanced. Efficiency can be achieved through drug efficiency, length of treatment, actions, and examinations. Increasing efficiency by implementing clinical pathways as a hospital protocol in implementing or selecting therapy for patients. The application of clinical pathways in heart failure cases is effective in reducing the length of hospitalization and health costs by up to 20%. A clinical pathway is used for cost control and quality control in hospitals. With the clinical path, care and treatment can be appropriately done (Agiwahyuanto et al., 2020).

Previous research by Rahman (2017), which utilized the INA-CBG's tariff based on the Indonesia Minister of Health Regulation Number 59 of 2014, reported a financial surplus. In contrast, using the INA-CBG's tariff established under the Indonesian Minister of Health Regulation Number 3 of 2023, the present study resulted in a financial deficit. The financial loss observed is attributed to a decrease in the government-set INA-CBGs tariff in 2023 compared to the INA-CBGs tariff in 2014. For example, the 2023 INA-CBG's rate for INA-CBG's code I-4-12-I in treatment class 1 is IDR 4,860,200, while the 2014 INA- CBG's rate for the same INA-CBG's code and treatment class is IDR 6,974,900. However, hospitals must also evaluate the components of medicines, rooms, and electromedical costs.

Table 5. Differences between actual costs and INA-CBG's tariff in 2023.

INA-CBG's code	Class	N	Total Cost		Average Cost		Sig. (normality)	P (2-tailed)
			Actual Cost (IDR)	INA-CBG's Tariffs (IDR)	Actual Cost (IDR)	INA-CBG's Tariffs (IDR)		
I-4-12-I	1	5	51.510.465	24.301.000	10.302.093 ±5.749.499	4.860.200	0,624	0,102
	2	4	16.739.836	17.028.800	4.184.959 ±681.730	4.257.200	0,933	0,846
	3	28	143.460.016	102.320.400	5.123.572 ±2.242.239	3.654.300	0,000	0,001
I-4-12-II	1	12	117.177.000	67.610.400	9.764.750 ±5.208.727	5.634.200	0,008	0,005
	2	9	60.613.506	44.416.800	6.734.834 ±3.820.345	4.935.200	0,271	0,219
	3	27	230.832.774	114.380.100	8.549.362 ±4.288.906	4.236.300	0,017	0,000
I-4-12-III	1	1	6.073.825	7.533.200	6.073.825	7.533.200	-	-
	2	1	16.885.496	6.598.700	16.885.496	6.598.700	-	-
	3	17	243.544.210	96.289.700	14.326.130 ±7.565.598	5.664.100	0,048	0,000
Total Cost Difference (+/-)			886.837.128	480.479.100 -406.358.028				

4. CONCLUSION

The results of this study indicated that the average actual cost for patients classified with code I-4-12-I class 1 and code I-4-12-II class 2 was greater than the INA-CBG's tariff, with no significant difference observed. In contrast, the average actual cost for patients with code I-4-12-II class 1, code I-4-12-II class 3, and code I-4-12-III class 3 were also higher than the INA-CBG's tariff, with significant differences. For patients with code I-4-12-II class 2, the average actual cost was smaller than the INA-CBG's tariff, though the difference was not statistically significant. The total actual cost was more significant than the total INA-CBG's tariff, suggesting that BPJS Kesehatan cannot fully cover the actual costs of treating heart failure patients at Jogja Hospital, which would lead to financial losses for the hospital. Therefore, it is recommended that the hospital reassess the 2023 INA-CBG's tariff and evaluate the cost components, including medicines, room charges, and electromedical costs, to better align with actual expenses.

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CONFLICT OF INTEREST

All authors declared that there was no conflict of interest.

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