

UNIT COST ANALYSIS OF HAEMODIALYSIS SERVICES BY ACTIVITY BASED COSTING APPROACH AS A STRATEGY FOR INCREASING HOSPITAL PROFITS

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ABSTRACT

Catastrophic diseases are diseases that require high funding and, if accompanied by complications, will result in threats that can even endanger lives. One of the catastrophic diseases that is the focus of health insurance financing is kidney failure. Haemodialysis is a type of kidney replacement therapy for chronic kidney disease using special equipment. One method of financing haemodialysis procedures is the National Health Insurance Program. Hospitals, as health service providers for JKN participants, have an interest in the INACBG rates. Based on the Regulation of the Minister of Health of the Republic of Indonesia Number 3 of 2023 concerning Health Service Tariff Standards in the Implementation of the Health Insurance Program, there are changes to tariffs for haemodialysis services. With the current tariff changes, single-use and re-use services are divided into two different tariffs (the tariff for re-use haemodialysis services is 85% of the tariff for single-use haemodialysis services). The research was conducted at Siloam Hospital Bali. The data taken is secondary data originating from the Financial Division of Siloam Hospital Bali, the Medical Records Department of Siloam Hospital Bali, and the Haemodialysis Department of Siloam Hospital Bali during the period January–April 2023. The data collected and the hypothesis formulated in this research will be tested using the MANOVA (Multivariate Analysis of Variance) test method, using SPSS software. The research results show that there is a significant difference in total costs for re-use and single-use haemodialysis services; there is a significant difference in the total INACBG rates per patient for re-use and single-use haemodialysis services; and there is no significant difference in the difference between INACBG rates and total costs in re-use and single-use haemodialysis services.

KEYWORDS Haemodialysis, INACBGs rates, Unit Cost



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INTRODUCTION

Catastrophic diseases are illnesses that require high financing, and when accompanied by complications, can pose a threat to life. Diseases that are classified as high cost, high volume, and high risk cause many policy makers to worry about the escalation of disease costs, thus receiving more attention from health insurance providers if these diseases are included in their benefit packages. There are nine catastrophic diseases that are the focus of health insurance financing: heart disease, kidney failure, cancer, stroke, liver cirrhosis, thalassemia, leukemia, hemophilia, and diabetes mellitus (PERSI, 2019). According to data from the Social Security Organizing Agency (BPJS) in the Health sector, during the implementation of the National Health Insurance (JKN), the number of cases of catastrophic diseases has consistently increased each year. In 2014, there were 7,339,017 cases, while in 2017, the number had reached 16,356,969 cases. The Basic Health Research (Risikesdas) in 2018 showed an increase in the prevalence of non-communicable diseases compared to Risikesdas 2013. The prevalence of chronic kidney disease increased from 2% to 3.8%. According to assumptions from PERNEFRI (Indonesian Nephrology Association) presented by the Chairman of PERNEFRI at the 2019 PERSI Seminar, the incidence rate of chronic kidney disease is 440 per 1 million population, which means an additional 116,160 cases per year for Indonesia. Indonesia is one of the countries with a relatively high incidence of kidney failure. According to data obtained from PERNEFRI in 2014, since 2007, there has been an average increase in the number of patients by 122% each year, with new kidney failure patients in Indonesia totaling 17,193 in 2014, with 11,689 active detected patients (Azizan et al., 2020). Hemodialysis is one of the kidney replacement therapies for chronic kidney disease using specialized equipment. One method of financing hemodialysis procedures is through the National Health Insurance program.

The National Health Insurance program is a government program to provide medical treatment funding assistance to the population in need of healthcare services. This program aims to ensure that participants receive the benefits of health maintenance and protection in meeting basic health needs. In the era of National Health Insurance (JKN), implementation in healthcare financing is an important part. Improving the quality of healthcare services, as well as patient-oriented services, promoting efficiency, and encouraging team services are the goals of healthcare financing. A good healthcare financing system is expected to improve the quality of healthcare services. JKN financing will continue to increase due to increased awareness of health among the population, the increase in certain diseases, especially catastrophic diseases that incur very high costs, the economy's development, population mobility, and population growth itself. Hospitals, as providers of healthcare services for JKN participants, are concerned with the magnitude of IN-ACBGs tariffs. If the INACBGs tariff is higher than the hospital's tariff, then the hospital benefits. Conversely, if the INACBGs tariff is lower than the hospital's tariff, then the hospital will incur losses. Tariff control is very important for healthcare providers to maintain financial sustainability in economic competition (PERSI, 2019). Cost calculation using the activity-based costing system approach

is more accurate in determining cost structures because in the ABC system, costs are calculated according to actions, activities, and products used (Marvia, 2015).

Activity-based costing (ABC) is a cost calculation system in which the allocation of indirect costs or overhead costs, which are more than one, is done using bases that include one or more factors unrelated to volume (non-volume related factor). Simply put, the ABC system is said to have a much higher precision level compared to traditional cost calculation techniques. This is because traditional cost systems allocate overhead costs based on existing working hours, so the final cost burdened will be less accurate. The ABC system addresses this deficiency by allocating costs in two different stages and using unit level drivers, batch level, and product level to obtain better calculation accuracy for managerial decision-making (Hakim, 2018). Based on research conducted by (Marvia, 2015), it was found that unit cost calculation using the ABC method is the most accurate, and from the results of unit cost calculation of hemodialysis services at PKU Muhammadiyah Yogyakarta Hospital, it was found that the unit cost value is smaller when compared to Jamkesmas tariffs. However, this is different from the research revealed by (Verdika et al., 2022), which stated that the comparison of unit cost of hemodialysis procedures at Puri Asih Hospital in 2020 was higher compared to INACBGs tariffs.

Based on the Regulation of the Minister of Health of the Republic of Indonesia Number 3 of 2023 concerning Standard Tariffs for Health Services in the Implementation of Health Insurance Programs, there are changes in tariffs for hemodialysis services. In the previous regulation, PMK No. 64 of 2016, hemodialysis services used a single tariff for both single-use and re-use services. With the current tariff changes, single-use and re-use services are differentiated into 2 different tariffs (the tariff for re-use hemodialysis services is 85% of the single-use hemodialysis service tariff) (STANDAR TARIF PELAYANAN KESEHATAN DALAM PENYELENGGARAAN PROGRAM JAMINAN KESEHATAN, 2023). Therefore, it is interesting to conduct further studies to assist hospital management in determining healthcare service decisions, especially hemodialysis services.

In-depth assessment of unit cost calculations in hemodialysis services as kidney replacement therapy using the Activity-Based Costing (ABC) system is the main focus in efforts to increase hospital profits. The aim of this study is to compare the results of unit cost analysis between single-use and re-use hemodialysis services using the ABC approach to achieve more accurate results, in line with the revised INACBGs tariffs according to Ministerial Regulation Number 3 of 2023, as part of the hospital profit improvement strategy. This research has significance for science because it is expected to provide insights, information, and additional references in determining the unit cost of healthcare services. In addition, for practical improvement, this research is expected to assist hospital management in analyzing the unit cost of hemodialysis services as a basis for a strategy to increase hospital profits.

RESEARCH METHOD

Research Location

The research was conducted at Siloam Bali Hospital located at Jalan Sunset Road Number 818 Kuta, Badung, Bali. Siloam Bali Hospital was chosen as the research location, which is an internationally accredited private hospital that has been operating in Bali for the past 10 years and is one of the hospitals collaborating with the National Health Insurance (JKN) program, namely BPJS Kesehatan since 2014.

Population and Sample

The research population was taken from secondary data of Siloam Bali Hospital originating from the Financial Division, Medical Records Department, and Hemodialysis Department during the period from January to April 2023.

Table 3.1 Number of Regular Hemodialysis Patients at Siloam Bali Hospital

Month	Number of Patients
January	52 people
February	52 people
March	52 people
April	52 people
Total	208 people

Operational Definition of Variables

Table 3.1 Operational Definition of Variables

Variable	Definition
Unit Cost Single-use	The total cost associated with all activities performed for single-use hemodialysis services at Siloam Bali Hospital.
Unit Cost Re-use	The total cost associated with all activities performed for re-use hemodialysis services at Siloam Bali Hospital.

Data Collection

The data collected are secondary data originating from the Financial Division of Siloam Bali Hospital, the Medical Records Department of Siloam Bali Hospital, and the Hemodialysis Department of Siloam Bali Hospital.

Data Analysis Technique

From the collected data, the next step is to process both direct and indirect cost data for both single-use and re-use Hemodialysis services, and analyze them using the Activity Based Costing method. The data collected and hypotheses formulated in this research will be tested using the MANOVA (Multivariate Analysis of Variance) test method, using SPSS software. MANOVA is a statistical technique used to calculate the significance of differences in means simultaneously between groups for two or more dependent variables.

RESULT AND DISCUSSION

Research Results

This research involved 208 secondary data obtained from the Financial Division, Medical Records Department, and Hemodialysis Department of Siloam Bali Hospital. The data obtained were analyzed statistically using the Kolmogorov-Smirnov test to determine the normality distribution of the data. Furthermore, data homogeneity was tested using the Levene test. Lastly, MANOVA analysis was conducted with a significance level of 95%.

Different activities in single-use and re-use hemodialysis services were identified by observing activities during hemodialysis procedures in the Hemodialysis Department of Siloam Bali Hospital. The differences in activities were related to the differences in costs found in the hospital's financial data. The following table presents the differences in resources and activities in single-use and re-use hemodialysis services.

Table 4.1 Difference in Direct Costs

Different Direct Activity Costs	Re Use	Single Use
Cost of Renatron for re-use dialyzer	21.583	-
Total HD per Month	450	450
Different Direct Costs per Month	9.712.350	-

Table 4.2 Difference in Overhead Costs

Different Overhead Costs in HD Procedure	Re Use	Single Use
Medical Waste Cost	2.059.050	4.490.690
Cleaning Services Cost	3.578.600	5.367.900
Inventory Handling Cost	1.357.940	2.715.880
Total Costs in Different Activities	6.995.590	12.574.470
Total HD per Month	450	450
Different Overhead Costs per HD procedure	15.546	27.943

Characteristics of Respondents

Respondent characteristics were used to assess the general diversity of the respondents. From the 208 data used in this research, differentiation was made based on gender, age category, and type of service. The results of respondent characteristics are presented in the following table.

Table 4.3 Characteristics of Respondents

Category		Frekuensi	Persentase
Gender	Male	149	71,6%
	Female	59	28,4%
Age	21 – 30 Year	8	3,8%
	31 – 40 Year	23	11,1%
	41 – 50 Year	42	20,2%
	51 – 60 tahun	48	23,1%
	> 60 tahun	87	41,8%
Pelayanan	<i>Re-Use</i>	156	75,0%

<i>Single-Use</i>	52	25,0%
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Based on the table 4.3 results of respondent characteristics above, it is known that:

1. Based on gender category, respondents with male gender were 149 people (71.6%), while respondents with female gender were 59 people (28.4%).
2. Based on age category, the number of respondents aged 21–30 years was 8 respondents (3.8%), the number of respondents aged 31–40 years was 23 respondents (11.1%), the number of respondents aged 41–50 years was 42 respondents (20.2%), the number of respondents aged 51–60 years was 48 respondents (23.1%), and the number of respondents aged over 60 years was 87 respondents (41.8%).
3. Based on the service category, respondents receiving Re-Use hemodialysis services numbered 156 respondents (75.0%), while respondents receiving Single-Use hemodialysis services numbered 52 respondents (25.0%).

Descriptive Statistics

Table 4.4 Descriptive Statistics

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Total HD	208	2.00	13.00	8.6394	1.63884
Total Cost	208	715619.16	7239869.00	3807839.6507	1184207.56524
Count of Dialyzer	208	.00	13.00	4.7308	3.30197
Total Tarif INACBGs per patient	208	1617210.00	12366900.00	7289793.605	1468293.968
Difference Tarif INACBGs with Total Cost	208	901590.84	6393809.01	3481953.9551	899399.84628

Based on the descriptive statistics table 4.4 above, it is known that:

1. The mean value of the Total HD variable is 8.639 with a minimum value of 2.00 and a maximum value of 13.0, and a standard deviation of 1.63884.
2. The mean value of the Total Cost variable is 3807839.6507 with a minimum value of 715619.16 and a maximum value of 7239869.00, and a standard deviation of 1184207.56524.
3. The mean value of the Count Dialyzer variable is 4.7308 with a minimum value of 0.00 and a maximum value of 13.0, and a standard deviation of 3.30197.
4. The mean value of the Total Tarif INACBGs per patient variable is 7289793.6058 with a minimum value of 1617210.00 and a maximum value of 12366900.00, and a standard deviation of 1468293.96875.
5. The mean value of the Difference Tarif INACBGs with Total Cost variable is 3481953.9551 with a minimum value of 901590.84 and a maximum value of 6393809.01, and a standard deviation of 899399.84628.

Normality Test

A normality test is conducted to determine whether the data has a normal distribution or not. The normality test used is the Kolmogorov-Smirnov test, where if the significance value (Sig.) is greater than 0.05, the data distribution is considered normal. If the data is normally distributed, hypothesis testing will be conducted using MANOVA, or using the Kruskal-Wallis multivariate non-parametric test if the data is not normally distributed

Table 4.5 Normality Test

Variable	Kolmogorov-Smirnov		
	Statistic	df	Sig.
Total Cost	.082	208	.002
Total Tarif INACBGs per patient	.241	208	.000
Difference Tarif INACBGs with Total Cost	.048	208	.200

Based on the Kolmogorov-Smirnov normality test, the significance test results for total cost and total Tarif INACBGs are 0.002 and 0.000, respectively. Thus, it can be concluded that the data does not meet the normality criteria. However, the significance value for the difference Tarif INACBGs with total cost is 0.200, indicating that the data meets the normality criteria. Since there are variables that do not meet the normality assumption, the alternative non-parametric test, namely multivariate Kruskal-Wallis, will be used for further analysis.

Kruskal-Wallis Test

The Kruskal-Wallis test is conducted to determine if there is a significant difference among groups in a research variable. The decision criterion is if the significance value < 0.05 , then at least one group has a significant difference. Below is the Kruskal-Wallis test conducted on total cost, total Tarif INACBGs per patient, and the difference Tarif INACBGs with total cost.

Table 4.6 Kruskal-Wallis Test

	Total Cost	Total Tarif INACBGs per patient	Difference Tarif INACBGs with Total Cost
<i>Kruskal-Wallis</i>	44.202	52.115	2.126
<i>df</i>	1	1	1
<i>Asymp. Sig.</i>	.000	.000	.145

Based on the results of the Kruskal-Wallis hypothesis test above, the following conclusions are drawn:

1. The significance value for the total cost variable is $0.00 < 0.05$ (α), thus it can be concluded that there is a significant difference in total cost between hemodialysis services of re-use and single use.
2. The significance value for the total Tarif INACBGs per patient variable is $0.00 < 0.05$ (α), thus it can be concluded that there is a significant difference

in total Tarif INACBGs per patient between hemodialysis services of re-use and single use.

3. The significance value for the difference Tarif INACBGs with total cost variable is $0.145 > 0.05 (\alpha)$, thus it can be concluded that there is no significant difference in the difference Tarif INACBGs with total cost between hemodialysis services of re-use and single use.

Mean-Rank Test

The mean-rank test is conducted to see the ranking of the mean values for each type of service provided (single-use and re-use). The results of the mean-rank test are presented in the table below.

Table 4.7 Kruskal-Wallis Mean Rank

	Service	N	Mean Rank
Total Cost	<i>Re-Use</i>	156	88.48
	<i>Single Use</i>	52	152.56
	Total	208	
Total Tarif INACBGs per patient	<i>Re-Use</i>	156	87.67
	<i>Single Use</i>	52	154.98
	Total	208	
Difference Tarif INACBGs with Total Cost	<i>Re-Use</i>	156	108.01
	<i>Single Use</i>	52	93.96
	Total	208	

Based on the mean-rank test results above, the following can be concluded:

1. The mean rank value for the total cost variable shows that the average ranking of single-use hemodialysis services is higher than that of re-use hemodialysis services. Thus, it can be concluded that the total cost of single-use is higher compared to re-use.
2. The mean rank value for the total Tarif INACBGs per patient variable also indicates that the average ranking of single-use hemodialysis services is higher than that of re-use hemodialysis services, concluding that the total Tarif INACBGs for single-use services is higher than re-use services.
3. The mean rank value for the difference Tarif INACBGs with total cost variable shows that the average ranking of re-use hemodialysis services is higher than that of single-use hemodialysis services, suggesting that the difference Tarif INACBGs with total cost for re-use services is higher than single-use services.

Discussion

This study aims to compare the results of the analysis of unit cost for single-use and re-use hemodialysis services using an activity-based costing approach to obtain more accurate results, with INACBGs rates that have undergone changes (in accordance with Regulation of the Minister of Health Number 3 of 2023) as a

strategy to increase hospital profit. The research was conducted at Siloam Hospital Bali located at Jalan Sunset Road Number 818 Kuta, Badung, Bali. Siloam Hospital Bali was chosen as the research location, which is an internationally accredited private hospital that has been operating in Bali for the past 10 years and is one of the hospitals collaborating with the National Health Insurance program (JKN), namely BPJS Kesehatan since 2014.

The findings of this study are consistent With the findings of several previous studies that have examined the costs of hemodialysis services. In previous studies such as those conducted by Rohenti et al. (2019), it was found that the cost of hemodialysis services tends to be lower compared to INACBGs rates. However, it is important to note that this study shows a significant difference in total costs between re-use and single-use hemodialysis services. This finding is consistent with the analysis conducted by Verdika et al. (2022), which found that the unit cost of hemodialysis services at certain hospitals is greater than the INACBGs rates.

Furthermore, the findings of this study also support the findings of Azizan et al. (2020), which highlight the economic benefits of implementing a KSO system in hemodialysis services. This suggests that, although the re-use method may reduce operational costs, single-use services may have certain advantages in improving process efficiency and service quality. Therefore, the choice between the re-use and single-use methods in hemodialysis services needs to be carefully considered, taking into account economic aspects, service quality, and overall patient satisfaction.

The results of the second hypothesis indicate that the total INACBGs rate for single-use services is higher than for re-use services, consistent with previous findings indicating that operational costs for single-use services tend to be higher. This is also consistent with the findings of Azizan et al. (2020), which state that although the re-use method may reduce operational costs, single-use services may have higher total INACBGs rates because they require a larger initial investment, namely the use of disposable dialyzers. Therefore, the results of this study provide further confirmation of the cost differences between the two methods, which can be an important consideration in decision-making regarding hemodialysis service strategies in hospitals.

The Kruskal-Wallis statistical test results show that the significance value of the variable difference in INACBGs rates with total cost obtained is $0.145 < 0.05$, indicating that there is no significant difference between the difference in INACBGs rates with total cost in re-use and single-use hemodialysis services. The mean-rank results, which show that the average ranking of re-use hemodialysis services is higher than single-use hemodialysis services, contradict the Kruskal-Wallis statistical test results that found no significant difference in the distribution of the variable difference in INACBGs rates with total cost between the two types of services. This suggests that although the average ranking of re-use services may be higher, this difference is not statistically significant. In other words, although there is a difference in rankings, it is not statistically strong enough to conclude that the relative costs between re-use and single-use services differ based on the difference in INACBGs rates with total cost. The higher average ranking of re-use hemodialysis services than single-use hemodialysis services may be due to the characteristics and differences in the clinical conditions of each patient regarding the method of reusing

the dialyzer. However, when we statistically examine using the variable difference in INACBGs rates with total cost, we do not find a significant difference between the costs of the two types of services.

CONCLUSION

Based on the research conducted, this study aims to compare the unit cost values of single-use and re-use hemodialysis services using an activity-based costing approach with INACBGs rates adjusted according to PMK Number 3 of 2023, as a strategy to increase hospital profits. Utilizing 208 secondary data from Siloam Bali Hospital, statistical analysis was performed using multivariate non-parametric Kruskal-Wallis tests. The analysis results concluded several key findings: first, the total cost of single-use hemodialysis services is higher than re-use; second, the total INACBGs tariff per patient for single-use services is also higher than re-use; third, there is no significant difference between the INACBGs tariff difference and the total cost in both services. Suggestions for further research include expanding the scope by considering more detailed variables, such as overhead costs related to overall hemodialysis patient management. For hospitals, it is important to consider safety and cleanliness aspects in the selection of service methods, although re-use may offer financial benefits, while single-use can provide additional confidence in maintaining cleanliness and preventing disease transmission. Therefore, the decision between the two methods should be considered holistically, taking into account financial, safety, and cleanliness aspects.

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