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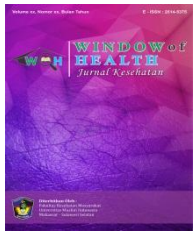

ARTICLE RESEARCH
URL artikel: http://jurnal.fkmumi.ac.id/index.php/woh/article/view/woh8019

Comparison of Hemodialysis Service Cost Effectiveness Using Activity-Based Cost Approach with Hospital Cost and Cost Recovery Rate in Regional Public Hospital IA Moeis Samarinda

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ABSTRACT

The determination of service rates in hospitals is often not based on unit cost calculations, but rather on fixed rates used by other hospitals for practicality and ease of implementation. This leads to the problem of differences between INA-CBGs rates and hospital rates in the era of the National Health Insurance (JKN). The study aimed to determine the unit cost of Hemodialysis services using the Activity-Based Costing method, and compare with hospital rates and INA CBGs, and calculate the recovery rate cost.

This is a descriptive research study employing a case study approach. This research was conducted to describe the current condition of the hospital costing system, revealing the cost structure and calculation of service unit costs using the Activity-Based Costing method. The Hospital's financial transaction reports of 2023 were used as a data source. Data is grouped based on fixed costs, semi-variable costs, and variable costs, and then translated into direct costs and overhead costs to calculate the unit costs of hemodialysis. The results of the Hemodialysis unit cost calculation were compared with hospital rates and INA CBGs. The cost recovery rate was then calculated. The study results showed that the unit cost of Hemodialysis, calculated using the Activity-Based Costing method, was Rp1,364,257. The comparison result was that the unit cost was higher than the hospital rate (86%) and also than the INA CBGs rate (61%). The results of the cost recovery rate (CRR) calculation are still below 100%. Influencing factors include direct costs, overhead costs, and the number of actions.

Keywords: Unit cost; activity-based costing; INA CBGs; cost recovery rate; Hemodialysis.

PUBLISHED BY :
Faculty of Public Health
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Article history
Received 20 May 2024
Received in revised form 20 June 2025
Accepted 16 October 2025
Available online 22 October 2025

INTRODUCTION

Hemodialysis is a critical healthcare service for patients suffering from kidney failure. However, it often results in a significant discrepancy between hospital service charges and the rates covered by the INA-CBGs system (1). Over the past five years (2014–2018), the incidence of kidney disease in Indonesia has increased by 260%, with the number of hemodialysis treatments rising from 765,000 to 2,754,409 during the same period (2). This increase in hemodialysis services is also evident at IA Moeis Regional General Hospital (RSUD IA Moeis) in Samarinda. According to medical records, in the past three years, Chronic Kidney Disease (CKD) ranked fourth among the top ten outpatient diagnoses, following Acute Respiratory Infections (ARI), digestive system diseases, and nervous system disorders.

Hemodialysis is considered an essential and urgent medical intervention for patients with kidney failure to sustain their lives. However, in 2022, RSUD IA Moeis reported a tariff discrepancy of IDR 656,964,097 between hospital billing and the INA-CBGs reimbursement, from a total bill of IDR 4,345,298,097. The observed discrepancy arises from the fact that the prevailing hospital tariff for hemodialysis services exceeds the reimbursement rate established by BPJS Kesehatan (the Indonesian National Health Insurance System). To date, RSUD IA Moeis has not implemented a cost calculation method based on the Activity-Based Costing (ABC) approach for its hemodialysis services. Instead, the hospital's tariffs continue to be determined through conventional estimations, primarily by benchmarking against service charges in comparable regional hospitals.

In addition, the hemodialysis tariff currently recorded in the hospital's billing system is structured as a bundled package that ostensibly includes pharmaceutical costs and medical consumables (Bahan Habis Pakai/BHP). Nevertheless, in actual practice, the costs of medications and consumables are frequently billed separately outside the bundled tariff. This inconsistency contributes to a substantial discrepancy between the nominal tariff and the actual resources utilized. Such divergence between the hospital's cost structure and the INA-CBGs reimbursement framework poses a significant financial risk. It has the potential to reduce the hospital's revenue stream, thereby compromising operational sustainability and potentially affecting the overall quality and continuity of healthcare service delivery.

Therefore, a method is needed to identify the root causes of this discrepancy through cost analysis, which can serve as a reference in assessing the adequacy of the applied tariff in covering unit costs. The purpose of unit cost calculation is to determine the actual cost required to produce a product—whether goods or services—and to assess budgeting efficiency (3). The Activity Based Costing (ABC) method enables accurate cost measurement by linking costs directly to specific activities, thus improving the precision of cost calculation and allocation (4). This pricing discrepancy illustrates a mismatch between hospital service costs and the INA-CBGs reimbursement package. Therefore, a study is needed to calculate the Cost Recovery Rate (CRR), which compares total service costs with revenue received through both INA-CBGs tariffs and hospital tariffs for hemodialysis services (5).

Based on the explanation above, it is clear that the exact hemodialysis service cost at RSUD IA Moeis, calculated using the Activity Based Costing method, is still unknown. Similarly, the cost recovery rate for hemodialysis services at this hospital has not yet been determined.

This study aims to determine the cost per hemodialysis service at RSUD IA Moeis Samarinda using the Activity Based Costing approach, compare these costs with the INA-CBGs reimbursement rates and the hospital's tariff and Evaluate the Cost Recovery Rate (CRR) of hemodialysis services.

METHODS

This study was conducted in Regional Public Hospital I.A Moeis Samarinda, East Kalimantan Province, from November 2023 to February 2024. This study's protocol was reviewed and approved by the Ethics Committee of the Faculty of Medicine, Mulawarman University. This research was a quantitative descriptive design with a case study approach.The population and samples used in this study were all costs related to Haemodialysis patient service activities during 2023. The data sources used in this study are primary data derived from the INA CBG application output and financial transactions sourced from the hospital information system application on the billing system menu. The analysis method used a comparative descriptive analysis method that shows and compares the method of determining the cost of Hemodialysis actions using the activity cost approach with the INA CBGS package amount, and calculates the cost recovery (CRR) (6). Furthermore, the data is presented in the form of frequency distribution tables with explanations, including tables per unit cost driver, BOP tables, Hemodialysis action cost tables, comparison rates of Hemodialysis ABC rates with INA CBGs rates, and cost recovery rates (Cost Recovery Rate).

RESULTS

Analysis of Hemodialysis service unit costs and determining the cost of Hemodialysis service using the Activity Cost Approach. The step taken in the preparation of unit costs is to determine direct costs such as the data in the table below: This study's protocol was reviewed correctly and granted by the Ethics Committee of the Faculty of Medicine, Mulawarman University. Permission was also obtained from respondents by providing full information at the beginning of the opening form about the scope of the study and its benefits before they voluntarily participated in the research.

Table 1. Direct Costs of Hemodialysis Units in 2024

Category	Cost (IDR)	Percentage (%)
Specialist Doctor Service	Rp 375.900.000	8%
General Practitioner Service	Rp 125.300.000	3%
Nursing Service	Rp 125.300.000	3%
Consumambels	Rp 3.081.288.857	70%
Drugs	Rp 674.483.712	15%
Laboratory Examination	Rp 44.358.060	1%
Total Cost	Rp 4.426.630.629	100%
Number of Patients (5012)	Rp 883.206	

Based on Table 1 above, it is known that the direct cost for one Hemodialysis action is IDR 883,206. Next, determine the overhead costs consumed for each activity as shown in the table below :

Table 2. Direct Resources Overhead Hemodialysis Unit in 2023

Overhead Costs	Cost Driver	Hemodialysis Direct Cost	Percent (%)
Labour Related			
Labor Costs	Number of employee	1,707,244,462	**71**
Training Costs		12,045,000	
Sub Total		**1,719,289,462**	
Equipment Related			
Maintenance of Medical & Non-Medical Equipment	Number of visits	690,000	**11**
Depredation of Medical & Non-Medical Equipment	Working hours	260,384,671	
Sub Total		**261,074,671**	
Space Related			
Maintenance Working Hours	Working hours	6,517,000	**9**
Depreciation of Building	Working hours	214,334,162	
Sub Total		**220,851,662**	
Service Related			
Office Costs (ATK)	Number of visits	5,958,900	**9**
Telephone Costs	Number of visits	14,922	
Water Costs	M^3	19,673,728	
Electricity Costs	Kwh	55,108,674	
Laundry Costs	Kg	129,054,000	
Total		2,411,026,018	100
Number of hemodialysis service = 5012		481,051	

Haemodialysis direct resources overhead costs at RSUD I.A Moeis Samarinda in 2023, the Haemodialysis unit received a charge of Rp2,411,026,018 which will be charged to all Haemodialysis patients. Direct resources overhead costs will be charged to patients based on the number of Haemodialysis actions during 2023. So that the direct resources overhead cost for each action is Rp481,051.

Furthermore, to determine the proportion of revenue that will be used as the basis for the allocation of direct resource costs for the Hemodialysis unit in 2023, you must first know the total revenue of the hospital during 2023 and the total revenue of the Hemodialysis unit in 2023. The data is obtained in the 2023 financial statements, as shown in Table 3.

In Table 3, it is known that the Indirect Resources Overhead Costs of I.A Moeis Samarinda Hospital, based on Revenue Proportion, the Hemodialysis unit gets a proportion of 6.75%. The indirect resources overhead cost of the Hemodialysis unit in 2023 amounted to Rp162,800,997. The total value of indirect resources overhead is then divided by the number of Hemodialysis patients in 2023, 5012, so that the value of Hemodialysis indirect resources overhead in 2023 is Rp32,482.

Table 3. Indirect Resources Overhead Costs

Description	Total
Revenue of RSUD I.A Moeis Samarinda in 2023	Rp 71.641.545.265
Hemodialysis Revenue	Rp 4.837.490.300
Proportion	6,75%
Direct Resource Overhead Hemodialysis	Rp 2.411.026.018
Indirect Resource Overhead Hemodialysis	Rp 162.800.997
Number of Hemodialysis patients 2023	5.012 persons
Charger per patient *Indirect Resource Overhead,* Hemodialysis	Rp 32.482

This value can still be lower, by making efficiency in variable costs, and in performing Hemodialysis services, it is necessary to standardize to reduce variations in drug administration and BPH between one patient and another.

The next step is to determine the total amount of overhead costs by adding direct and indirect overhead costs. then divided by the total number of Hemodialysis patients in 2023, as shown in the table below:

Table 4. Total *Overhead Cost*

Description	Hemodialisa	
	Direct	Indirect
Total	Rp 2.411.026.018	Rp 162.800.997
Number of hemodialysis services 5012	Rp 481.051	Rp 32.482
Total Overhead	Rp5 13.533	

From table 4, shown that the amount of direct and indirect costs in Haemodialysis services in 2023, amounted to Rp2,573,827.01 so that if it is charged to 5012 Haemodialysis patients, each patient is charged Rp. 513,533.

The last step in calculating the unit cost using the Activity-Based Costing method, according to Baker (1998), is to determine the total costs that arise, including direct costs of Hemodialysis services, direct resource overhead costs, and indirect resource overhead costs.

From the calculations in Table 5, the unit cost for Hemodialysis services using the Activity-based Costing method is Rp 1,396,739. This unit cost value can still be lower if there is efficiency in some variable costs and standardization in performing services or clinical pathways that are the basis for hemodialysis actions for patients with and without complications.

Table 5. Calculation of Hemodialysis Unit Cost

No Jenis Biaya	Single Use (Rp)	Persen (%)
Direct cost of hemodialysis	Rp883.206	63.23%
Direct cost resources overhead	Rp481.051	34.44%
Indirect cost resources overhead	Rp32.482	2.33%
Total	Rp1.396.739	100.0

Comparing the cost of Hemodialysis using the activity cost approach (ABC) with hospital costs and the amount of the INA CBGS package.

After the amount of the Hemodialysis unit cost is known, a comparison is then made with the Hemodialysis action rate that applies at RSUD I.A Moeis Samarinda with the INA CBGs Tariff, as shown in the following table :

Table 6. Comparison of Unit Costs of the ABC Method with Hospital Tariffs and INACBGs

Comparative Value	Value	%
Unit *Cost* Hemodialysis with ABC	Rp. 1,396,739	
Hospitals Rate	Rp. 1,200,000	86%
INA CBGS Rate	Rp. 856,200	61%

Based on Table 6, it can be explained that the amount of the Hemodialysis unit cost, after being calculated using the activity cost approach (ABC) 86% is fulfilled by hospital costs, or in other words, hospital costs are still lower than unit costs. This is also the case with the comparison between the Hemodialysis unit cost and the amount of the INA CBGS package. The value of the INA CBGS package for Hemodialysis at RSUD I.A Moeis Samarinda is in accordance with class C in Regional IV Kalimantan, with code N 3-15-0 (dialysis procedure) of Rp . 852,600. The amount of the Hemodialysis unit cost that has been calculated using the Activity-Based Costing method is 61% fulfilled by the INA CBGS tariff, or in other words, the INA CBGS package is lower than the calculated cost per unit.

This condition, if left unaddressed, affects the hospital's cash flow, disrupts the operations of the hospital, and impacts the quality of services provided. The difference in the results of the cost calculation per unit using the activity-based costing approach (ABC), the INA-CBGs package, and hospital costs is due to differences in the calculation methods. In the ABC approach, service activities to patients serve as the basis for classifying costs used in setting service rates. The INA CBGs package is a package amount that includes all components used in Hemodialysis services, such as drugs and BPH, as well as

supporting examinations and services provided by doctors and nurses. Likewise, the cost of Hemodialysis services at RSUD I.A Moeis Samarinda is determined using conventional calculation methods that are adjusted to the cost of Haemodialysis services in surrounding hospitals.

Calculating the cost recovery rate for Haemodialysis services.

After the cost per Hemodialysis unit was set at Rp1,364,257, the next step was to calculate the cost recovery rate (CRR) as shown in the following table :

Table. 7 Nilai Cost Recovery Rate

	Hemodialysis rate with ABC	Quantity	Total Cost
Cost Recovery Rate	Rp1.364.257	5012	Rp7,000,457,64 3
		97,67%	

Based on Table 7, it can be explained that cost recovery is a percentage that describes how well the hospital is able to cover costs with revenue received from patient fees, with a standard value above 100%. It is known that the total cost is Rp7,000,457,643, which is obtained from the sum of direct costs, direct resource overhead costs, and indirect resource overhead costs, with the number of Hemodialysis treatments during 2023 as many as 5012. The calculation results in a CRR of 97.67%, indicating that the revenue earned is insufficient to cover all incurred expenses and does not generate a profit.

DISCUSSION

Unit Cost Analysis and Hemodialysis Tariff Determination Using the Activity-Based Costing (ABC) Method

The initial step in calculating unit costs involves the classification of costs into three main categories: fixed, semi-variable, and variable costs. Fixed cost components consist of the Annualized Investment Cost (AIC) of physical infrastructure, medical equipment, and non-medical equipment. Among these, medical equipment accounts for the highest AIC, followed by buildings and non-medical equipment. The magnitude of medical equipment AIC is significantly influenced by the initial acquisition cost and the volume of equipment procured. These findings are consistent with several prior studies (7, 8, 9, 10), which similarly report that medical equipment represents the largest proportion of total capital investment, followed by buildings and non-medical equipment.

While this cost analysis provides essential insights into the financial structure of healthcare facilities, it is equally important to evaluate whether the determined unit costs benefit the hospital and its users. Accurately calculating unit costs not only ensures financial sustainability but also supports decision-making in resource allocation, which can enhance the quality of services and patient care. Properly managed, these unit cost calculations can lead to improved operational efficiency, better budgeting for

future investments, and optimized use of resources, ultimately benefiting both the hospital and its patients (22, 23)

Further analysis indicates that semi-variable costs make a significant contribution to the overall expenditure in the Hemodialysis Unit. These primarily include staff salaries and travel expenses. In 2023, salary expenses in the Hemodialysis Unit constituted 4.41% of the total personnel costs at RSUD IA Moeis. This observation aligns with findings from other studies (3,11), which also highlight staff salaries as the predominant component of semi-variable costs. Despite comparable structures, RSUD IA Moeis demonstrates relatively more efficient travel-related expenditures, not due to a lack of staff development programs, but because training costs are predominantly covered by external stakeholders.

Among variable costs, the largest expenditures are attributed to consumables and medications, reflecting variability in treatment regimens among hemodialysis patients. Besides dialysis procedures, patients often require additional medications to manage chronic comorbidities. This pattern is corroborated by previous research (4, 12, 13), which identifies medications and consumables as the most substantial variable costs. A key factor is the incomplete implementation of clinical pathways in managing these patients. Therefore, to enhance efficiency, a comprehensive evaluation of variable costs in the Hemodialysis Unit is warranted.

The identified variable costs may be further categorized into direct and indirect resource overheads. Within the direct overhead category, equipment-related costs are predominant. Enhancing efficiency in this area necessitates optimizing the utilization of existing infrastructure, such as by expanding operational hours to a three-shift system. With the current capacity of 14 dialysis machines, the Hemodialysis Unit has the potential to provide up to 7,518 dialysis procedures annually, assuming 312 working days.

Several studies (14,15,12) have similarly observed underutilization of dialysis units, which typically operate on a single shift per day—except for Mondays, Tuesdays, Thursdays, and Fridays, when two shifts are implemented. This scheduling limitation restricts the number of procedures performed. A distinct operational feature of RSUD IA Moeis is that dialysis machine maintenance is outsourced to a third party, unlike most hospitals, where such responsibility lies with internal maintenance teams.

The application of Activity-Based Costing (ABC) allows RSUD IA Moeis to more accurately and consistently establish hemodialysis service tariffs for both BPJS-covered and out-of-pocket patients. This methodology not only improves the precision of tariff setting but also minimizes the discrepancy between the hospital's internal tariff and the INA-CBGs reimbursement, thereby enhancing financial efficiency and strengthening hospital cash flow.

Comparison of Hemodialysis Costs Using ABC, Hospital Tariffs, and INA-CBGs Packages

The unit cost of a single hemodialysis session at RSUD IA Moeis, as calculated using the ABC approach, amounts to IDR 1,396,739. In comparison, the hospital's currently implemented tariff is IDR 1,200,000—equating to only 86% of the actual cost being recovered. Meanwhile, the INA-CBGs reimbursement package for the same service stands at IDR 852,600, covering merely 61% of the

calculated unit cost. Prolonged cost recovery deficits of this magnitude may negatively impact the hospital's financial performance. Therefore, a reassessment is necessary, particularly for hemodialysis services involving comorbidities and complications.

A review of the hospital billing system revealed variations in drug administration across hemodialysis patients, including medications such as Amlodipine, Candesartan, and Metformin for chronic illnesses. Ideally, these medications should be administered separately during outpatient visits to relevant specialty clinics, rather than during dialysis sessions. By doing so, the costs of chronic disease medications can be billed independently via the pharmacy system. Effective coordination among the clinical service unit, claims department, and BPJS is essential—reinforced through the issuance of a Director's Decree formalizing Standard Operating Procedures (SOPs) or Clinical Practice Guidelines (CPGs) for the management of hemodialysis patients with comorbidities and complications. This approach has already been successfully implemented at Muhammadiyah Hospital in Cilacap, Central Java, contributing to increased revenue from its Hemodialysis Unit.

These findings corroborate previous research, which indicates that cost variations are driven by differences in treatment protocols and laboratory examinations. Thus, the rationalization of necessary diagnostic tests and implementation of screening protocols are critical to prevent unnecessary expenditures (16,17,10,9,18).

The observed differences between costs derived using ABC, hospital tariffs, and INA-CBGs packages are primarily due to distinct costing methodologies. The ABC method allocates costs based on patient-centered activities to determine more accurate service tariffs. In contrast, INA-CBGs reimbursements are bundled payments that encompass a full spectrum of services—medications, consumables, diagnostic examinations, and clinical staff involvement. Traditional hospital tariffs are often calculated using conventional costing approaches and benchmarked against comparable facilities. This issue was also documented in a study by Lakoan M. at Dr. Soehadi Prijonegoro Hospital in Sragen, where conventional cost calculations resulted in actual unit costs exceeding existing tariff structures (19,20).

Implementing the ABC approach enables RSUD IA Moeis to differentiate tariffs for hemodialysis patients with and without complications, facilitating the creation of standardized bundled pricing packages. The resulting unit cost analysis can also inform the development of clinical pathways and support improvements in resource utilization efficiency.

Calculation of Hemodialysis Cost Recovery Rate

Based on the findings of this study, the unit cost of a hemodialysis session in 2023 at RSUD IA Moeis, calculated using the ABC method, is IDR 1,396,739. The total annual cost incurred was IDR 7,000,457,643, resulting in a Cost Recovery Rate (CRR) of 97.87%. This figure indicates that the revenue collected remains below the break-even point of 100%. A previous study by Rusli (2019) reported CRRs of 74% for BPJS patients and 93% for self-paying patients in 2018, suggesting a persistent service deficit that warranted internal cross-subsidization. Similarly, Verdika (2020) found a

CRR of 95.97% for BPJS patients at RSU Puri Asih Karawang, further reflecting a shortfall in cost recovery.

The CRR results for RSUD IA Moeis indicate that BPJS reimbursement can still be optimized. With 100% as the ideal benchmark, the current rate of 97.8% presents opportunities for improvement. This gap can potentially be narrowed by optimizing clinical pathways and differentiating therapeutic approaches between patients with and without complications (25,26)

To ensure financial sustainability, hospitals may pursue strategies such as adjusting service tariffs, optimizing resource utilization, and implementing cost-efficiency measures (21). RSUD IA Moeis is well-positioned to adopt these strategies by extending operational hours to three shifts, recruiting additional qualified nursing personnel, and expanding the hemodialysis facility to fulfill its agreement with a third-party provider (PT. Menjangan) to install 30 dialysis machines. Furthermore, optimizing unit utilization requires proactive support from the hospital's marketing division to disseminate service information and promote collaboration with healthcare facilities across Samarinda and the broader East Kalimantan region.

Efficiency enhancement at RSUD IA Moeis also entails standardizing care delivery for hemodialysis patients, whether or not complications are present. The development of a formal clinical pathway for hemodialysis is essential to minimize variation in medication use, consumables, and diagnostic testing. In addition, efforts should be made to conserve utilities such as electricity and water by turning off equipment when not in use and preventing water wastage through improved supervision.

CONCLUSION AND RECOMMENDATION

Based on an Activity-Based Costing (ABC) analysis, the unit cost of hemodialysis at RSUD IA Moeis Samarinda is IDR 1,396,739. This figure significantly exceeds both the INA-CBGs reimbursement rate of IDR 856,200 and the hospital's own tariff of IDR 1,200,000. The INA-CBGs rate covers only 61% of the actual cost, a shortfall that, along with a cost recovery rate (CRR) of 97.67%, indicates the hospital is not fully recovering its expenditures. This financial gap highlights the need for a reevaluation of tariff-setting policies and underscores the importance of using accurate costing methodologies, like the ABC approach, to ensure the long-term financial sustainability of healthcare services. To tackle the financial gap in hemodialysis services at RSUD IA Moeis Samarinda, a multi-pronged strategy is essential. This includes advocating for policy adjustments engaging policymakers to increase INA-CBG reimbursement rates for high-cost services like hemodialysis, ensuring they accurately reflect the actual cost of provision, enhancing internal efficiency utilizing the activity-based costing (abc) method to identify and implement operational improvements that can lower the unit cost without compromising quality of care, strategic tariff review the hospital should strategically revise its internal tariffs to align more closely with actual costs, potentially through gradual adjustments to mitigate sudden financial burden on patients, leveraging abc for future planning: continuously

employing the abc approach will be crucial for transparent cost analysis, informed decision-making, and substantiating future requests for equitable reimbursement (24, 25,26)

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