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Research Article

Analysis of Single-Use Hemodialysis Tariff Determination Based on INA-CBG: A Case Study at Siaga Medika Banyumas General Hospital

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Abstract. The increasing prevalence of Chronic Kidney Disease (CKD) has led to a rising demand for hemodialysis services, most of which are financed by the Indonesian National Health Insurance (BPJS Kesehatan) through the INA-CBG tariff system. However, the discrepancy between INA-CBG tariffs and the actual service costs—particularly due to the use of single-use dialyzers—poses financial challenges for private hospitals. This study aims to analyze the operational costs, tariff differences, and financial feasibility of single-use hemodialysis services at Siaga Medika Banyumas General Hospital. A qualitative descriptive-exploratory approach was employed through in-depth interviews, observations, and document analysis involving five key informants. The results indicate that the largest cost component comes from medical consumables, especially dialyzers. A comparison revealed that the actual service cost was IDR 660,138, which is lower than the INA-CBG tariff of IDR 875,000 and the hospital's own tariff of IDR 1,877,536. The cost recovery rate (CRR) analysis yielded 132.54% for BPJS patients and 284.4% for general (non-BPJS) patients, indicating profitability. The hospital's strategies include logistics efficiency, adjustments in non-BPJS tariffs, and resource optimization. The study concludes that the single-use hemodialysis service at Siaga Medika Banyumas General Hospital is financially viable, although it requires strict cost management and more accurate tariff policy support to ensure service sustainability.

Keywords: Cost Recovery Rate, Hemodialysis, Hospital Tariffs, INA-CBG, Operational Costs

1. Introduction

Chronic Kidney Disease (CKD) is a degenerative condition that poses a growing global health challenge due to its high prevalence and long-term impact. According to the 2010 Global Burden of Disease report, CKD ranked 18th as a leading cause of death worldwide (Rosmila, Yaya, & Pribadi, 2020). In Indonesia, the prevalence of CKD has reached 0.38%, equivalent to 3.8 per 1,000 people, with approximately 60% of these patients requiring dialysis treatment. This highlights that CKD is not only a medical issue but also a burden on healthcare financing systems.

Hemodialysis is the most widely adopted renal replacement therapy for CKD patients in Indonesia. This procedure uses a machine and a dialyzer to filter a patient's blood. Dialyzers are classified into two types: reuse (multiple-use) and single-use. Data from the 2020 Indonesian Renal Registry (IRR) revealed that 99% of CKD patients undergo hemodialysis therapy. The number of hemodialysis units has also risen significantly, from 382 in 2015 to 973 units in 2020, with private facilities accounting for 59% of the total.

From a financial standpoint, the National Health Insurance (JKN) program has become the main source of funding for hemodialysis services since 2015. About 86% of these services are financed by BPJS Kesehatan through the INA-CBG (Indonesian Case Based Groups) scheme, and this proportion rose to 91% by 2018. INA-CBG offers a fixed bundled payment based on diagnosis, procedure, and hospital classification. However, hemodialysis services constitute one of the highest expenditure categories for BPJS Kesehatan. In 2015 alone, it ranked second in overall reimbursement value, totaling IDR 2.78 trillion (Soetedja et al., 2022).

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National guidelines allow CKD patients to undergo dialysis two to three times per week, which imposes significant and ongoing financial obligations on hospitals. These institutions must maintain service quality while operating efficiently. Many hospitals report a misalignment between the INA-CBG reimbursement and actual service costs, especially in components like medical personnel fees, consumable medical supplies, and medications.

As a Referral Health Facility (FKRTL), hospitals are obligated to deliver cost-effective services. To ensure both efficiency and sustainability, hospitals must conduct comprehensive cost analysis, including unit cost calculations. Such evaluations enable hospitals to monitor service performance at all levels—clinical units, departments, or diagnostic services—while also guiding strategic decisions, such as pricing policies. Unit cost calculation is essential for enhancing competitiveness and ensuring long-term financial health (Asmadi et al., 2023; Sumiati et al., 2019).

Siaga Medika Banyumas General Hospital, a private type C hospital located in Banyumas Regency, Central Java, has been partnering with BPJS Kesehatan. Its hemodialysis services began in 2015 with four machines using the reuse method. Over time, as demand increased, the hospital expanded its hemodialysis unit to 36 machines and partnered with two vendors for equipment. Since February 2023, the hospital has implemented a single-use dialyzer system. With a daily average of 70 dialysis procedures, the hospital recorded BPJS claims amounting to IDR 1.1 billion in just the first half of 2024.

Despite this high service volume and the transition to single-use dialyzers, the hospital has not yet performed a complete unit cost calculation. Current cost assessments are limited to direct components such as consumables, medical services, and drugs. Indirect costs, including overheads, are still not fully accounted for. Considering that 99% of the hemodialysis unit's revenue comes from INA-CBG reimbursements, cost control is essential to prevent financial losses. A proper evaluation of actual costs against fixed tariffs will help the hospital assess efficiency and develop more appropriate pricing strategies.

Previous studies have reported significant gaps between INA-CBG rates and actual unit costs. For instance, research by Fibionisa et al. (2023) showed that the hemodialysis unit cost calculated using the Activity-Based Costing (ABC) method was higher than the INA-CBG rate in a government type B hospital. Similarly, Rosiana et al. (2019) found the same pattern in a private type B hospital. Conversely, Rosmila et al. (2020) discovered that unit costs were lower than INA-CBG rates in a private type C hospital. These variations emphasize the need for hospitals to base cost calculations on real operational data, as each institution has a unique cost structure and level of efficiency.

As a healthcare provider, Siaga Medika Banyumas General Hospital is expected to maintain high service quality while ensuring operational sustainability. One way to achieve this is by evaluating its hemodialysis tariffs based on actual costs and comparing them with the INA-CBG rates. This analysis is critical to assess whether current reimbursement levels adequately cover the true costs of providing single-use hemodialysis services. Moreover, such data will serve as a foundation for financial and operational policy decisions.

Given this context, the present study is timely and relevant. It aims to analyze the pricing of single-use hemodialysis services at Siaga Medika Banyumas General Hospital based on INA-CBG reimbursement rates, evaluate the financial feasibility of the service, and identify factors contributing to the gap between actual service costs and fixed tariffs. The results are expected to support strategic management decisions and inform policy-making for both hospital administrators and the national health insurance system, particularly in managing hemodialysis services in private type C hospitals.

2. Preliminaries Or Related Work Or Literature Review

This section presents the theoretical foundations underpinning the study entitled *"Analysis of Single-Use Hemodialysis Tariff Determination Based on INA-CBG: A Case Study at Siaga Medika Banyumas General Hospital."* It elaborates on relevant theories that support the research focus and critically reviews prior empirical studies related to the topic. These references provide both conceptual grounding and methodological direction for the present study.

Hemodialysis Concept

Hemodialysis is a medical procedure used to filter blood outside the body using a dialysis machine and an artificial filter called a dialyzer, functioning as an artificial kidney. The machine prepares a dialysis solution that facilitates the removal of excess fluids and toxins from the blood. The primary goal of hemodialysis is to effectively eliminate uremic toxins and

excess fluid due to impaired kidney function (Fibionisa, Ramadhan, & Nugroho, 2023; Margina & Prena, 2024).

The dialysis system mainly consists of the dialyzer, dialysis machine, extracorporeal blood circuit, and water purification system. The basic principle of hemodialysis is to circulate blood through tiny vessels separated by a thin membrane to allow diffusion and remove unwanted substances from the blood (Fibionisa, Ramadhan, & Nugroho, 2023; Margina & Prena, 2024).

Hospital Tariffs

According to Keputusan Menteri Kesehatan Republik Indonesia Tahun 2023 Nomor HK.01.07/ MENKES/ 1634/ 2023 Tentang Pedoman Nasional Pelayanan Kedokteran Tata Laksana Penyakit Ginjal Kronik, there are absolute and relative contraindications for hemodialysis. Absolute contraindication is the absence of vascular access. Relative contraindications include patients with severe vascular access problems, heart failure, coagulopathies, hemodynamic instability, advanced malignancy, late-stage AIDS, and other organ failure-related conditions such as dementia or advanced cirrhosis with encephalopathy. To achieve adequate dialysis, hemodialysis is typically performed two to three times per week. In Indonesia, the standard practice is twice a week. The targeted adequacy for dialysis is spKt/V of 1.2 for twice-weekly and 1.8 for thrice-weekly sessions.

Hospital tariffs are compensation received by hospitals for service and non-service activities provided to users. In private hospitals, tariffs are set by the hospital director with approval from the hospital owner. Tariff setting must adhere to the principles of mutual aid and fairness, prioritizing low-income communities, without aiming solely for profit.

Tariff setting should be based on the National Tariff Pattern and maximum ceiling prices. The National Tariff Pattern is determined based on unit cost components, considering the hospital's context. Unit costs are calculated with attention to service sustainability, development, purchasing power, fairness, and healthy competition. These costs are derived from the total expenses incurred for each hospital activity (Menteri Kesehatan Republik Indonesia, Perarutan Menteri Kesehatan Republik Indonesia Nomor 85 Tahun 2015 Tentang Pola Tarif Nasional Rumah Sakit, 2015).

In the context of hemodialysis, hospital tariffs are calculated by summing up the costs of consumable materials, medical and paramedical staff, medications, and laboratory tests. Several factors influence hemodialysis tariffs, including service activities, patient conditions, type of dialyzer, and infrastructure resources (Swandayana, Menap, Sismulyanto, & Putra, 2023).

Indonesia Case-Based Groups (INA-CBG) Tariff

The BPJS Kesehatan (Indonesian National Health Insurance Agency) began operation on January 1, 2014, under Presidential Regulation No. 111/2013 (amending Regulation No. 12/2013), implementing the Indonesia Case-Based Groups (INA-CBG) system for healthcare claims at secondary care levels (Soetedja, Nurwahyuni, & Intan, 2022). The INA-CBG tariff is the reimbursement paid by BPJS Kesehatan to secondary health facilities based on grouped diagnosis and procedures. This includes all medical and non-medical resources used in the service.

The INA-CBG system provides standardized package rates, ensuring greater certainty and encouraging efficient, high-quality care. Hemodialysis services under INA-CBG are reimbursed as a bundled payment encompassing all service components. Tariffs are calculated using hospital cost data (costing) and coding data. Costing data includes both operational and investment costs, sourced from selected hospitals representing various classes and ownership types. Coding data is based on JKN claims and follows ICD-10 (diagnosis) and ICD-9-CM (procedures) coding systems from 2010 (Verdika, Nurdin, & Kusnadi, 2022).

Under Peraturan Menteri Kesehatan Republik Indonesia Nomor 3 Tahun 2023 tentang Standar Tarif Pelayanan Kesehatan dalam Penyelenggaraan Program Jaminan Kesehatan, single-use dialyzers are the standard, and if reused, reimbursement is only 85% of the applicable tariff. For a Class C private outpatient hospital, the single-use hemodialysis tariff is set at IDR 875,000.

Relevant Studies

The financial sustainability of hemodialysis services has become a critical issue in the context of Indonesia's National Health Insurance (JKN) system. Many hospitals are required to operate within the reimbursement limits set by INA-CBGs, which often do not reflect the actual cost of delivering high-quality hemodialysis care. Several researchers have attempted to

analyze and compare these cost structures in different settings to identify financial gaps and propose more realistic service tariffs.

Rosiana, Sarnianto, and Anggriani (2019) conducted a quantitative descriptive study titled Comparative Cost Analysis of Hemodialysis in Patients with Chronic Kidney Disease at Bogor District Hospital. The research compared the real cost, hospital tariff, and ideal cost of hemodialysis with the INA-CBGs reimbursement rate. Their findings revealed that both the hospital tariff and ideal cost exceeded the INA-CBGs rate. Interestingly, although the INA-CBGs rate appeared 5% higher than the real unit cost, it failed to account for indirect and fixed costs, thereby indicating a financial shortfall. The study was conducted in a type B hospital and involved an analysis that included additional unbilled patient needs as part of the ideal cost.

Soetedja, Nurwahyuni, and Intan (2022) approached the topic from a broader perspective by conducting a systematic literature review titled Hemodialysis Services for Chronic Kidney Disease Patients in the JKN Era. Using the PRISMA framework, they reviewed literature from the past seven years and selected eight relevant articles. Their objective was to compare the unit cost of hemodialysis services with INA-CBGs tariffs. The study confirmed a significant disparity between the two, particularly in outpatient hemodialysis settings, emphasizing the inadequacy of INA-CBGs in covering actual service costs.

A more technical approach was used by Fibionisa, Ramadhan, and Nugroho (2023) in their study Comparison Analysis of Rates by Unit Cost and INA-CBGs Rates in Hemodialysis Services at Hospital X. They adopted a quantitative, descriptive-analytic, and comparative design. Utilizing the Activity-Based Costing (ABC) method, they found that the calculated unit cost was higher than the INA-CBGs rate. The study identified several contributing factors: the cost calculation method itself, staff salaries, physician service fees, consumable use, medication, supporting diagnostic services, and dialyzer reuse policies. Conducted in a type B government hospital, this study highlights the complexity and variability of cost determinants.

In a similar vein, Verdika, Nurdin, and Kusnadi (2022) examined unit cost and cost recovery in their study Comparative Analysis of Unit Cost of Hemodialysis Services Using the Activity-Based Costing (ABC) Method Against Hospital Tariffs and INA-CBG Rates as well as Cost Recovery Rate (CRR). Using a qualitative, cross-sectional approach at RSU Puri Asih, they compared ABC-based unit costs with hospital tariffs and INA-CBGs rates. The findings revealed that the ABC-based unit cost was higher than the INA-CBGs rate but lower than the official hospital tariff. Furthermore, the calculated CRR was below 100%, indicating that the hospital had not fully recovered its operational expenses, thus affecting financial performance.

Another study by Rosmila, Yaya, and Pribadi (2020), titled The Comparison of the Unit Cost of Hemodialysis with INA-CBG Rates in Muhammadiyah Siti Aminah Hospital, applied a qualitative case study method. The researchers explored whether any non-value-added activities existed in the hemodialysis process and compared unit costs with INA-CBG rates. The study found a positive cost difference, with unit costs exceeding INA-CBGs reimbursement. Although no non-value-added activities were found, the hospital had not yet implemented standard supporting examinations, potentially impacting service quality.

From the reviewed literature, it is evident that a consistent gap exists between the actual unit cost of hemodialysis services and the rates reimbursed by INA-CBGs. This discrepancy is influenced by various factors, including costing methodologies, hospital classifications, input cost components, and policy variations in dialyzer use. However, most studies focus on public or type B hospitals and often do not analyze cost feasibility from the perspective of private hospitals using single-use dialyzers. This study addresses that gap by providing a financial feasibility analysis of single-use hemodialysis services in a private hospital setting. It emphasizes not only the cost comparison with INA-CBGs rates but also a deeper understanding of fixed and variable cost structures and their implications on service sustainability under the JKN system.

3. Proposed Method

Location and Time

The study was conducted at Siaga Medika Banyumas General Hospital, which provides single-use hemodialysis services. The research took place from October to June 2025.

Design and Type

A descriptive-exploratory qualitative study was used to comprehensively explore the tariff determination process for single-use hemodialysis services.

Informants

The sampling technique applied is purposive sampling, with five respondents selected based on their comprehensive knowledge of the hemodialysis services at the Dialysis Unit of Siaga Medika Banyumas General Hospital. Five key informants: the Head of Finance, Service Manager, Medical Support Manager, Head of Hemodialysis Unit, and Head Nurse of the Hemodialysis Room. Inclusion criteria: holding a structural or functional position directly related to dialysis services or tariff policy, working at the hospital for at least one year, willingness to participate, and access to relevant data. Exclusion criteria: unwilling to be interviewed, lack of knowledge or involvement in tariff setting, or long-term leave during data collection.

Data Collection and Analysis

Data were collected through observation, in-depth interviews, and document analysis. Data were analyzed using reduction, presentation, and conclusion drawing. Triangulation was conducted to ensure credibility.

4. Results And Discussion

Hemodialysis Service Profile

The hospital operates 38 dialysis machines and performs about 70 sessions daily, mostly for BPJS patients. Single-use dialyzers are used exclusively. Staff includes one nephrology consultant, three general practitioners, 27 trained dialysis nurses, four certified technicians, a dietitian, administrative personnel, and support staff.

Operational Costs of Single-Use Hemodialysis

The impact of operational costs on single-use hemodialysis services at Siaga Medika Banyumas General Hospital is a critical factor in maintaining service quality and sustainability. The largest portion of the cost is attributed to medical consumables, particularly dialyzers (Table 1). The mandatory use of new and sterile dialyzers for each hemodialysis procedure increases expenditures but simultaneously enhances quality, safety, and infection prevention.

Table 1. Breakdown of BMHP Costs per Hemodialysis Procedure at Siaga Medika Banyumas General Hospital

Item	Quantity	Unit Price (IDR)	Total (IDR)
10cc Syringe	1	1.132,22	1.132,22
1cc Syringe	1	1.119,76	1.119,76
Bicnat Dialysate Fluid	1	77.700	77.700
Acid Dialysate Fluid	1	77.709,82	77.709,82
0.9% NaCl Infusion	1	4.968,18	4.968,18
Dialyzer	1	152.070	152.070
Heparin	0,2	43.900,78	8.780,16
Bloodline	1	85.980,15	85.980,15
AV Fistula 16G x 1	2	13.389,53	26.779,06
Mersibion Injection	1	3.208,43	3.208,43
Total			**439.447,78**

Source: Hospital Management Information System, Siaga Medika Banyumas General Hospital

This condition aligns with the theory proposed by Fibionisa et al. (2023), which emphasizes that the use of single-use dialyzers results in a unit cost of hemodialysis that often exceeds the INA-CBG estimates, thereby increasing the financial management challenges faced by hospitals. Dependence on a single vendor, price fluctuations of medical devices, and indirect costs (overhead) present additional challenges.

In the context of cost efficiency, the study reveals that efforts such as logistics optimization, human resource efficiency, and equipment maintenance are key strategies in reducing the operational costs of single-use hemodialysis services. Logistics optimization is carried out through systematic inventory management of medical consumables based on actual needs. In terms of human resources, efficiency is achieved by assigning staff according to their competencies and providing continuous training. Meanwhile, preventive maintenance of equipment helps avoid sudden failures that could disrupt services and escalate costs.

These findings are consistent with Kondoallo & Mulyadi (2019), who stated that operational cost efficiency influences the quality of hemodialysis services. Putri et al. (2025)

emphasized that efficiency is imperative amid the limited reimbursement rates provided by BPJS.

Single-use hemodialysis services require sterile equipment and procedures, making the selection of efficient vascular access crucial. The study highlights that arteriovenous (AV) shunt is the most cost-effective option and significantly reduces the risk of complications compared to central double-lumen (CDL) or femoral access. Clinically, AV shunts have been proven to extend access longevity, reduce infection rates, and minimize the costs associated with complication management. Observations at Siaga Medika Banyumas General Hospital confirmed that the use of AV shunts reduces both financial burden and complication rates compared to other vascular access methods.

Table 2. Comparison of Medical Consumables (BMHP) Costs by Vascular Access Type per Hemodialysis Procedure at Siaga Medika Banyumas General Hospital

Type of Vascular Access	Total BMHP Cost (IDR)	Difference from Highest Cost (IDR)
AV Shunt	439.447,78	13.564,44
CDL	453.012,22	0 (highest cost)
Femoral	442.120,39	10.891,83

The data table presents a comparison of BMHP (Medical Consumables) costs for three types of vascular access used in hemodialysis procedures: AV Shunt, Central Double Lumen (CDL), and Femoral access. Among these, CDL incurs the highest total cost at IDR 453,012.22, while the lowest cost is associated with AV Shunt, at IDR 439,447.78. This cost disparity in managing hemodialysis services warrants attention, particularly when the volume of procedures is substantial, as the accumulated differences can have a significant impact on budgetary efficiency. Therefore, shifting the preference toward AV Shunt access can be considered a strategy for sustainable and evidence-based optimization of hemodialysis services.

Cost Discrepancy Between INA-CBG and Hospital Rates

There is a discrepancy between hospital rates as listed on patient billing and the INA-CBG tariff. The cost per procedure reaches IDR 1,877,536, which is significantly higher than the INA-CBG tariff of IDR 875,000, with a detailed breakdown provided in Table 3.

Table 3. Total Hospital Tariff per Hemodialysis Procedure at Siaga Medika Banyumas General Hospital

Component	Cost (IDR)
Medical Consumables (BMHP)	747.314,27
Medications	84.057,62
Facility Charges	750.000
Service Fees	150.000
Routine Laboratory Examinations	21.164,50
Specialist Doctor Consultation	125.000
Total	**1.877.536,39**
	1.877.536

Source: Hospital Management Information System, Siaga Medika Banyumas General Hospital

First, the mismatch between hospital tariffs and INA-CBG is due to outdated internal tariff policies that fail to reflect actual cost developments. This occurs when hospitals continue to apply legacy pricing structures that are static and not based on updated unit cost calculations, potentially leading to financial imbalance and a decline in service quality. These findings are supported by Rosiana et al. (2019), Verdika et al. (2022), and Haslinur et al. (2020), who emphasized that obsolete internal tariff policies are a major factor contributing to the gap between hospital rates and INA-CBG-based payments.

Furthermore, limited regulations and the lack of government subsidies—particularly for private hospitals—widen the disparity between INA-CBG tariffs and the actual hospital rates. Private hospitals such as Siaga Medika Banyumas General Hospital, which do not receive operational subsidies, must absorb a significant cost difference. Rosmila et al. (2020), Soetedja et al. (2022), and Rosiana et al. (2019) noted that unequal access to subsidies is a key determinant of this rate disparity. Azzahra & Supadmi (2024) stressed that such imbalances could result in financial deficits for private hospitals if not addressed through cross-subsidization or optimal managerial efficiency.

In addition, rising prices of Medical Consumables (BMHP), particularly single-use dialyzers, exert cost pressures that are not matched by the flat INA-CBG tariff. Cost components such as dialyzers are influenced by external factors like exchange rates, import dependency, and global medical device market dynamics. However, the INA-CBG tariff system does not adjust for these fluctuations, forcing hospitals to bear increased costs while receiving fixed reimbursement. Research by Verdika et al. (2022) confirmed the low cost recovery rate (CRR) due to flat INA-CBG tariffs amidst rising actual costs, particularly for BMHP such as dialyzers. Fibionisa et al. (2023) also noted that the INA-CBG system does not account for market price variability and changes in input costs, further burdening hospital finances.

Moreover, the limited scope of items claimable under INA-CBG—such as medications and consumables—leads hospitals to absorb unrecouped costs not covered by the tariff. The fixed package tariff system lacks the flexibility to accommodate clinical variations in patient needs. As a result, hospitals must bear additional costs to maintain service quality. Soetedja et al. (2022), Rosmila et al. (2020), and Putri et al. (2025) agree that these claim limitations exacerbate the mismatch between actual costs and INA-CBG tariffs. Azzahra & Supadmi (2024) also observed significant disparities caused by variations in laboratory services and differing medication policies, many of which are not fully reimbursed. These findings, in the long run, may threaten the financial sustainability of hospitals.

Financial Feasibility

The study findings indicate that the single-use hemodialysis service at Siaga Medika Banyumas General Hospital is financially feasible. This is demonstrated by a positive margin between the INA-CBG tariff of IDR 875,000 and the actual cost of service, amounting to IDR 660,138 per procedure, as shown in Table 4.

Table 4. Comparison of Single-Use Hemodialysis Tariffs at Siaga Medika Banyumas General Hospital

Comparison Type	Tariff A (IDR)	Tariff B (IDR)	Difference (IDR)
INA-CBG vs Actual Cost	875.000	660.138	214.862
Hospital Tariff (Patient Billing) vs Actual Cost	1.877.536	660.138	1.217.398

This profit margin was derived from a cost-benefit analysis comparing revenue from INA-CBG tariffs to actual procedure costs. The resulting surplus not only supports the long term operational sustainability but also reflects efficient resource management and strategic service planning, particularly in implementing the single-use system.

Based on the calculations, the single-use hemodialysis service at Siaga Medika Banyumas General Hospital achieved a favorable Cost Revenue Ratio (CRR). For BPJS patients, with a claim value of IDR 875,000 and an actual cost of IDR 660,138 per procedure, the resulting CRR is 132.54%. This means that for every IDR 100 of cost incurred, the hospital receives IDR 132.54 in revenue. This suggests that the single-use hemodialysis service is financially viable and profitable, especially within the National Health Insurance (JKN) payment scheme.

For general (non-BPJS) patients, the hospital charges IDR 1,877,536 per procedure, yielding a CRR of 284.4%, which means that every IDR 100 of cost generates IDR 284.40 in revenue. The high CRR reflects a markup strategy applied to general patients to compensate for the relatively low INA-CBG tariff and serves as a major source of hospital profit. Although the CRR demonstrates the profitability of the single-use hemodialysis service, this calculation does not yet account for all fixed cost components, such as equipment depreciation, machine maintenance, managerial expenses, and other overhead costs.

These findings support the theory that CRR is a key indicator of hospital service efficiency and sustainability (Verdika, Nurdin, & Kusnadi, 2022). Putri et al. (2025) emphasize that a surplus over actual costs indicates efficiency and profitability. Meanwhile, Sunariyanti et al. (2025) report that only about 38.8% of hemodialysis services generate a positive margin, highlighting that the gap between INA-CBG tariffs and actual costs is not uniform across hospitals. Thus, the consistent achievement of a positive margin at Siaga Medika Banyumas General Hospital should be viewed as a strategic accomplishment, demonstrating the effectiveness of national tariffs in supporting the sustainability of services in mid-tier private hospitals.

Furthermore, the hemodialysis unit has proven to be a primary revenue source sustaining the hospital's financial viability. The high demand for hemodialysis among chronic kidney disease patients positions the unit as a high-utilization provider with a stable cash flow. Siaga Medika Banyumas General Hospital recorded BPJS revenues exceeding one billion rupiah in the first semester alone, confirming that hemodialysis is not only clinically essential but also financially vital to the hospital's revenue structure. This supports hospital management theory, which identifies the hemodialysis unit as a strategic profit center (Perkumpulan Nefrologi Indonesia, *13th Report of Indonesian Renal Registry*, 2020).

One financial strategy implemented by Siaga Medika Banyumas General Hospital is applying tariff markups to general patients as compensation for the low INA-CBG rates. The hospital sets higher prices for non-BPJS patients to cover the gap between INA-CBG tariffs and actual service costs. This is done through cost structure analysis to maintain a balance between efficiency and service quality. The markup strategy functions as a cross-subsidy, where the surplus from general patients offsets deficits from JKN patients. Wardani et al. (2024) describe this approach as a vital financial adaptation for hospitals, supported by Rosiana et al. (2019) and Holly et al. (2019), who argue that markup strategies are effective in maintaining the sustainability of hemodialysis services.

In addition to tariff management, the hospital also relies on efficient resource management and adaptive managerial policies to achieve profitability. Optimization efforts are carried out in various aspects, including medical equipment distribution, logistics procurement, operational time management, and scheduling of medical personnel. The goal is not only to reduce costs but also to ensure consistent service quality. According to cost management and value-based healthcare theory, efficiency is achieved when all resources are utilized to produce maximum output with minimal costs (Margina & Prena, 2024). Their study emphasizes the importance of equipment procurement efficiency and logistics control to minimize cost disparities between single-use and reuse systems.

Nevertheless, the narrow margin between tariffs and actual costs can pose significant economic risks if not managed efficiently. Azzahra & Supadmi (2024) warn that this gap may become a major financial burden, particularly for high-cost services like hemodialysis. Sunariyanti et al. (2025) assert that efficient clinical pathways and proper implementation of standard operating procedures (SOPs) are crucial to prevent losses resulting from inaccurate tariff compensation.

In conclusion, the integration of efficient management strategies, optimal resource utilization, and adaptive tariff policies constitutes the main pillars in ensuring the profitability and sustainability of single-use hemodialysis services. These strategies are key to addressing the limitations of the current healthcare financing system such as JKN, while also ensuring that services remain high quality, cost effective, and sustainable for both hospitals and patients.

5. Conclusion

The conclusion drawn based on the research findings and discussion is as follows:

- The major operational cost of single-use hemodialysis is medical consumables, especially dialyzers, contributing over 35% of the total tariff.
- Tariff discrepancies are due to internal hospital policy, rising costs of medical materials, and INA-CBG's limited cost coverage.
- Financial feasibility is achievable through cost-efficiency, logistics optimization, and adjusting general patient tariffs.
- Cost control strategies and periodic tariff evaluations are critical for service sustainability in type C private hospitals like Siaga Medika Banyumas General Hospital.

6. Recommendations

Based on the conclusions outlined above, the following recommendations can be made:

- Hospitals should regularly calculate comprehensive unit costs, including both direct and indirect expenses, as a basis for internal tariff setting.
- Negotiation strategies should be developed for general patient tariffs to optimize cross-subsidization.
- The government and BPJS Kesehatan should revise INA-CBG tariffs based on evidence-based costing, involving private hospitals in the process.

- Future research should include hospitals with varied types and locations and integrate patient clinical data for broader cost-effectiveness analysis

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