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Comparative Analysis of Unit Cost and Tariff of Ina CBG'S Orthopedic Patients with Implants at Wangaya Denpasar Hospital

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ABSTRACT
Orthopedic patients with implants represent a significant cost burden for hospitals due to the high price of implant devices. The shift in payment mechanism from Fee-for-Service to INA-CBG's creates financial challenges for hospitals, particularly when claim rates do not cover the actual cost of services. This study aims to analyze the comparison between unit costs calculated using the Activity-Based Costing (ABC) method and INA-CBG's rates for orthopedic patients with implants at Wangaya Hospital, Denpasar City. The study used a quantitative descriptive approach with a sample of 286 orthopedic patients with implants who were BPJS Kesehatan participants for the period January to December 2022. The results showed that the total unit cost based on ABC calculation was IDR 4,563,261,903, while the total INA-CBG's claims amounted to IDR 4,741,805,362, resulting in a surplus of IDR 178,543,459. However, of the 286 patients, 113 experienced a deficit with a total loss of IDR 838,204,192. Implants constituted the highest cost component, reaching 61.7% of the total unit cost. The study concluded that although hospitals earn an aggregate surplus, the inequality in outcomes across individual patients necessitates a comprehensive cost management strategy, including implant price negotiation and adherence to clinical pathways.

INTRODUCTION

Changes in the social and economic structure of society over time have had a wide impact on various sectors, including the health service industry. Rapid technological advances have intensified competition among hospitals, and in order to remain competitive and sustainable, every hospital must be responsive to the dynamics of the times and continue to adapt (Verdika et al., 2022). In the health service system, hospitals have a fundamental function as providers of treatment and patient recovery services. However, from a financial management perspective, patients do not solely play the role of recipients of medical services, but also serve as primary revenue sources for hospital operations (Uluputty & Dewita, 2021). Every medical procedure provided — from initial examination and surgery to postoperative care — carries a cost value that must be borne either by the patient independently or by a guarantor such as BPJS Kesehatan. Therefore, an accurate understanding of the service fee structure is crucial for hospitals in setting competitive rates while ensuring financial sustainability, especially within package-based payment schemes such as INA-CBG's. Without a balance between service quality and cost efficiency, hospitals risk deficits that can disrupt the continuity of services to the community (Forum, 2016; Hassan & Mahmoud, 2021; Psarommatis et al., 2020).

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As a tangible manifestation of the government's commitment to realizing fair and equitable access to health services for all levels of society, Indonesia launched the National Health Insurance (Jaminan Kesehatan Nasional, JKN) program. This program was born from a spirit of political goodwill so that every citizen, regardless of economic status, has the right to receive proper health services. One of the most fundamental consequences of JKN implementation is the transformation of the payment mechanism between health facilities (Forum, 2016; Psarommatis et al., 2020; Susilo et al., 2025). Whereas previously hospitals received payments based on the Fee-for-Service (FFS) principle, which reimburses each medical procedure separately, the system shifted after JKN to package-based claims through the Indonesia Case Base Groups (INA-CBG's) scheme (Jonathan et al., 2020). These changes are not merely technical but also strategic, as they compel hospitals to manage costs more efficiently. All health facilities collaborating with BPJS Kesehatan — both First-Level Health Facilities (Fasilitas Kesehatan Tingkat Pertama, FKTP) and Advanced-Level Referral Health Facilities (Fasilitas Kesehatan Rujukan Tingkat Lanjut, FKRTL) — are required to follow this payment mechanism (Ministry of Health of the Republic of Indonesia, 2016).

The shift from FFS to INA-CBG's is likened to a double-edged sword. On the one hand, this system creates opportunities for efficiency and financial gain; on the other, it poses a threat when hospitals are unable to manage costs properly (Yip et al., 2019). If hospitals can leverage this system through optimal management, a positive claims differential can be beneficial. Conversely, a negative differential will be detrimental to the hospital (Agwunobi & Osborne, 2016; Forum, 2016; Psarommatis et al., 2020). Adjustment to INA-CBG's tariffs is therefore critically important.

Wangaya Hospital, Denpasar City, is one of the advanced referral health facilities partnering with BPJS Kesehatan. Located in a high-density area, the hospital faces a high risk of accident patients, including orthopedic cases. As a result, Wangaya Hospital frequently serves as a referral center for orthopedic cases, particularly those requiring implant placement — a procedure that entails substantial costs. Data as of January 2023 indicates that INA-CBG's rates are consistently lower than the hospital's own rates, and even lower than the prices of pharmaceuticals and implants (Hospital Management, 2023).

Unit cost measurement is a strategic instrument for hospitals. In addition to supporting short-term profit planning and cost control, this measurement also informs decision-making — such as the scheduling of orthopedic surgery — and serves as a tool to control operational costs so that revenue from BPJS claims does not place hospitals at a financial disadvantage (Elfa et al., 2022). This study employs the Activity-Based Costing (ABC) method to compare unit costs with INA-CBG's tariffs. ABC is an activity-based costing approach (Cokins, 2001) capable of identifying and measuring various activities within a business process and allocating costs to products or services according to their level of participation in those activities.

The disparity between the actual cost of services and INA-CBG's claim rates for orthopedic patients with implants not only risks causing financial losses for hospitals, but can also threaten the sustainability of services, especially for patients from membership classes with limited cost coverage. In the context of Wangaya Hospital Denpasar City, reliance on aggregate data without a thorough understanding of the distribution of surplus and deficit across individual patients may conceal real structural problems. A more detailed analysis using Activity-Based Costing is therefore necessary to uncover specific cost drivers, evaluate the gap

between unit costs and INA-CBG's tariffs, and develop a more equitable and sustainable cost control strategy. Without such an approach, hospitals risk perpetuating unplanned cross-subsidization, which can ultimately reduce service quality and operational efficiency (Hansen et al., 2022; Verdika et al., 2022).

The research urgency of this study stems from several critical factors. First, the Indonesian healthcare financing system is at a critical juncture where BPJS Kesehatan faces persistent deficit challenges, making an understanding of the actual cost structure of high-cost procedures such as orthopedic surgery with implants essential for evidence-based tariff adjustment. Second, regional public hospitals (Rumah Sakit Umum Daerah, RSUD) such as Wangaya have limited bargaining power in implant procurement compared to private or national hospitals, rendering them more vulnerable to deficits. Third, without accurate unit cost information using ABC, hospitals cannot negotiate effectively with implant vendors or optimize clinical pathways to reduce costs. Fourth, the finding that 113 out of 286 patients (39.5%) experience deficits — with Class III patients contributing 65.4% of total deficits — indicates an implicit and unplanned cross-subsidization that may not be sustainable in the long term. Fifth, the Indonesian Ministry of Health's 2023 evaluation of INA-CBG's tariffs noted that tariffs for procedures involving high-cost materials, including orthopedic implants, require periodic review based on actual hospital cost data.

The novelty of this research lies in five aspects. First, this study is the first to apply ABC specifically to orthopedic patients with implants in an Indonesian RSUD and compare the results with INA-CBG's tariffs. Second, this study provides a granular distribution analysis of surplus and deficit by BPJS class, revealing that Class III patients contribute 65.4% of total deficits despite representing only 46.5% of the sample. Third, this study quantifies that implants constitute 61.7% of total unit cost, providing empirical evidence to support policy advocacy on implant price negotiation and potential tariff adjustment. Fourth, this study demonstrates that an aggregate surplus of IDR 178.5 million conceals significant individual patient deficits totaling IDR 838.2 million, thereby challenging the adequacy of aggregate-level financial analysis for hospital management. Fifth, this study integrates cost driver analysis with clinical pathway recommendations, linking financial management with clinical practice improvement.

In accordance with the above background, this study aims to analyze the comparison of unit costs and INA-CBG's rates for orthopedic patients with implants at Wangaya Hospital, Denpasar City, and to provide evaluation materials and recommendations for hospitals in implementing cost efficiency in controllable cost components, such as optimizing the use of generic drugs in accordance with the national formulary.

METHOD

This research was conducted at Wangaya Hospital, Denpasar City. The selection of this hospital is based on a phenomenon that indicates a negative difference in claims between the unit cost of orthopedic patients and implants against the INA CBG's rate. The population in this study is all data on orthopedic patients at Wangaya Hospital for the period from January to December 2022. The sample was selected using a non-probability sampling technique with the purposive sampling method, namely orthopedic patients with implants who became BPJS Kesehatan participants in the same period.

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The type of data used in this study is quantitative data related to the unit cost value and INA CBG's tariff. Data sources include secondary data from the hospital's financial records and primary data from interviews with hospital management regarding the rate policy for orthopedic patients with implants. The data collection technique uses financial data documentation and interviews with related hospital units such as the finance department, procurement of goods, hospital information systems, support units, and orthopedic service personnel.

The data analysis method applied is quantitative descriptive analysis to observe and describe the characteristics of the variables studied. The analysis was conducted by comparing the unit cost and rate of INA CBG's orthopedic patients with implants using the ABC method. The steps of implementing ABC in this study follow the procedure from Walther & Skousen (2010) which includes documenting unit cost data and INA CBG's tariffs, calculating service costs by collecting costs in cost pools that have similar or homogeneous activities, and comparing hospital service costs based on ABC with the realization of INA CBG's tariffs.

The unit cost calculation in this study uses the ABC technique by calculating the cost burden of the activities of each orthopedic patient service unit with the installation of implants starting from hospital entry to hospital exit, namely from the Emergency Installation or Orthopedic Polyclinic, Central Surgical Installation, and Inpatient Room. The cost component consists of direct costs including salaries, services, implants, drugs and medical devices, consumable medical materials, sterilization, household consumables, electricity, water, internet services, and maintenance of medical facilities, as well as indirect costs including depreciation of medical assets and devices and waste management.

RESULT AND DISCUSSION

The findings of the study showed that out of 540 orthopedic patients during the period from January to December 2022, as many as 286 patients underwent implant placement procedures with BPJS Kesehatan coverage and were selected as research samples. The unit cost calculation using the ABC method is carried out by allocating costs proportionally based on the volume of patients and the category of medical procedures.

Table 1. Comparison of Total Unit Cost and INA CBG's Claims

Description	Amount (Rp)	Percentage
Total Unit Cost (ABC Method)	4.563.261.903	100%
Total INA CBG's Claims	4.741.805.362	100%
Surplus (Positive Difference)	178.543.459	3,76%

Table 1 shows that the total unit cost based on the ABC calculation is IDR 4,563,261,903 while the total INA CBG's claims are IDR 4,741,805,362, so that an aggregate surplus of 3.76% of the unit cost or from the ina-cbg's claims is obtained. However, further analysis revealed that not all patients contributed to the surplus.

Table 2. Surplus and Deficit Distribution Based on BPJS Class

BPJS Class	Number of Patients	Surplus Patients	Deficit Patients	Total Surplus (Rp)	Total Deficit (Rp)	Net Contribution (Rp)
I	77	49	28	389.076.596	(120.598.956)	268.477.640
II	76	45	31	307.185.836	(169.692.503)	137.493.333
III	133	79	54	320.485.218	(547.912.732)	(227.427.514)
Total	**286**	**173**	**113**	**1.016.747.650**	**(838.204.192)**	**178.543.459**

Table 2 shows that while Class I and Class II patients made a positive contribution to the surplus, Class III patients actually showed a net deficit of Rp227,427,514. This indicates that although there were 79 Class III patients with a surplus, 54 Class III patients experienced a deficit that was large enough to exceed the surplus of other Class III patients.

Table 3. Unit Cost Components of Orthopedic Patients with Implants

Cost Component	Amount (Rp)	Percentage of Total Unit Cost
Implants	2.814.318.823	61,7%
Medicines and Medical Devices	878.753.172	19,3%
Employee Salary	176.413.449	3,9%
Service Services	395.036.924	8,7%
BMHP	138.798.492	3,0%
Depreciation of Assets and Medical Equipment	75.483.415	1,7%
Sterilization	70.642.000	1,5%
Other Fees	13.815.628	0,3%
Total	**4.563.261.903**	**100%**

Table 3 reveals that implants are the highest cost component, which is IDR 2,814,318,823 or 61.7 percent of the total unit cost. Drugs and medical devices followed in second place at IDR 878,753,172 or 19.3 percent. Employee service services contributed IDR 395,036,924 or 8.7 percent. These three components together account for nearly 90 percent of the total unit cost of orthopedic patients with implants.

Discussion

The finding that the total unit cost based on the ABC method was lower than the total INA-CBG's claims partially confirmed the hypothesis; however, the existence of 113 patients with deficits challenged the simple assumption that unit costs are uniformly higher than INA-CBG's rates. This complexity is consistent with Cokins' (2001) argument that ABC provides more accurate cost information by tracing costs down to specific activities. The identification of implants as the highest cost component at 61.7% is consistent with the research of Goh et

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al. (2022), which found that implant costs are the primary driver of high unit costs in orthopedic procedures.

The finding that Class III patients contributed the largest deficit — IDR 547,912,732, or 65.4% of the total deficit — despite having the highest patient count, confirms the observation of Verdika et al. (2022) that INA-CBG's tariffs are greatly influenced by BPJS membership class. The paradox that implant costs are relatively uniform across all patient classes while reimbursement varies substantially creates an inevitable deficit for many Class III patients. This condition compels hospitals to implement cross-subsidization, a strategy also observed by Ainiyah & Maesaroh (2020) in their study of regional general hospitals.

The significant difference in service costs between procedure categories — increasing from IDR 1,147,616 for moderate procedures to IDR 3,005,250 for advanced procedures — supports the concept of time-driven activity-based costing discussed by Morrow et al. (2022), whose research shows that differences in service delivery time can be a significant cost driver. The longer operating duration required for advanced and complex procedures naturally increases personnel costs, sterilization costs, consumption of consumable medical materials, and facility maintenance costs, without a proportionate increase in INA-CBG's claim values.

Comparisons with previous studies reveal an interesting pattern. The findings of this study are partly consistent with Haqim & Pribadi (2019), who found a positive difference between ABC unit cost and hospital rates, but contrast with Unsale et al. (2023), who found that ABC consistently yields higher costs than hospital rates. This difference can be explained by the nature of the services studied: procedures with high direct costs — such as implants in orthopedic surgery — tend to show lower or more accurate ABC calculations, while services with high indirect costs — such as general inpatient care — tend to show higher ABC calculations due to more precise overhead allocation. This interpretation is consistent with Oasthttamadea et al. (2019), who found that ABC results varied depending on the specific service being analyzed.

The finding that implant costs reached 61.7% of the total unit cost for orthopedic patients with implants confirms that this component is the primary cost driver that hospital management at Wangaya Hospital cannot afford to overlook. This is consistent with Goh et al. (2022), who state that implant costs are the largest contributor to orthopedic procedure costs, particularly in joint replacement and fracture fixation. The high proportion of implant costs is attributable to the relatively high purchase price of these medical devices, coupled with the hospital's dependence on certain suppliers. Within the INA-CBG's package tariff framework, hospitals cannot charge implant fees separately. Therefore, without effective price negotiations with vendors or improved procurement efficiency through consignment systems, hospitals face a greater risk of deficits, particularly for procedures requiring advanced-technology implants. Hansen et al. (2022) emphasize that identifying cost drivers of this nature is a crucial first step in strategic cost management, as it enables management to focus control efforts on the activities that have the most impact on total costs.

One of the most critical findings of this study is that although hospitals obtained an aggregate surplus of IDR 178,543,459, there were 113 patients (39.5%) who actually experienced a deficit, with a total loss of IDR 838,204,192. More specifically, BPJS Class III patients contributed the largest deficit at IDR 547,912,732, or 65.4% of the total deficit, while Class I and Class II patients made a positive contribution to the surplus. This phenomenon

confirms the observation of Verdika et al. (2022) that INA-CBG's rates are strongly influenced by membership class, with Class III reimbursement being lower than that for Class I and II. However, the reality on the ground shows that the cost of implants and core medical services is relatively uniform across all patient classes. As a result, hospitals indirectly implement cross-subsidization, whereby profits from Class I and II patients are used to cover losses from Class III patients. Although this cross-subsidization policy is common in public hospitals — as also observed by Ainiyah & Maesaroh (2020) — it nonetheless poses ethical and financial challenges. In the long run, reliance on cross-subsidies can disrupt the financial stability of hospitals while creating inequities, as Class I and II patients implicitly pay more for relatively equivalent services.

The results of this study show that the Activity-Based Costing method is able to provide a more accurate and granular cost picture than conventional methods that rely solely on simple overhead cost allocation. With ABC, hospitals can trace costs to specific activities across each service unit — ranging from the Emergency Installation and Orthopedic Polyclinic to the Central Surgical Installation and Inpatient Rooms. Cokins (2001) emphasized that the primary advantage of ABC lies in its ability to identify cause-and-effect relationships between activities and resource consumption, allowing indirect costs to be allocated more proportionately. In the context of Wangaya Hospital, ABC revealed that although the hospital achieves an aggregate surplus, hidden deficits exist within certain patient groups — deficits that would not be detected through the use of average costs alone. These findings are consistent with Haqim & Pribadi (2019), who found that ABC provides more reliable cost information for tariff negotiations and cost control. However, in contrast to Unsale et al. (2023), who found that ABC resulted in costs higher than hospital rates, the present study showed that ABC's total unit cost was lower than total INA-CBG's claims at the aggregate level, despite many individual patients being in deficit. This difference supports the view of Oaththttamadea et al. (2019) that ABC calculation results are highly dependent on the characteristics of the specific services analyzed, particularly the proportion of direct versus indirect costs in the cost structure of those services.

The practical implications of this study are considerable for the management of Wangaya Hospital. First, the identification of implants as the dominant cost driver suggests that negotiations with vendors through existing consignment systems need to be intensified. Second, the high deficit among Class III patients indicates the need for more efficient cost management without compromising patient safety. Third, the variation in surplus and deficit across procedure categories supports the strengthening of the role of Patient Service Managers in monitoring adherence to clinical pathways, as recommended by Fadli et al. (2022).

The theoretical implications of this study contribute to the cost management literature by demonstrating the value of the ABC method in healthcare settings characterized by high service variability. The finding that aggregate surpluses can mask individual patient deficits supports the argument of Hansen et al. (2022) that cost management requires granular analysis rather than reliance on averages. This research expands the application of ABC from manufacturing to healthcare contexts with complex cost structures.

CONCLUSION

This study analyzes the comparison between unit costs calculated using the Activity-Based Costing method and INA-CBG's rates for orthopedic patients with implants at Wangaya

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Hospital, Denpasar City. Based on an analysis of 286 patients for the period January to December 2022, the total unit cost was IDR 4,563,261,903, while the total INA-CBG's claims amounted to IDR 4,741,805,362, resulting in an aggregate surplus of IDR 178,543,459. However, 113 patients, or 39.5% of the sample, experienced a deficit with a total loss of IDR 838,204,192, of which BPJS Class III patients contributed the largest share at 65.4% of the total deficit. Implants constitute the highest cost component at 61.7% of the total unit cost, followed by drugs and medical devices at 19.3% and services at 8.7%.

The theoretical contribution of this study lies in demonstrating that the Activity-Based Costing method is effective in identifying cost drivers in complex healthcare services, particularly in revealing that aggregate surpluses can conceal significant individual patient deficits. The practical contribution provides the management of Wangaya Hospital with accurate cost data to support implant price negotiation, clinical pathway compliance monitoring, and claims processing optimization. The study is limited to a single hospital and assumes a 25% margin for implants and drugs. Future research should be extended to multiple hospitals, include direct analysis of purchase invoices, and develop predictive models to identify patients at risk of deficits prior to the commencement of treatment.

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