RESEARCH ARTICLE

Editorial Process: Submission:07/23/2025 Acceptance:02/25/2026 Published:03/05/2026

Cost Disparities Between Hospital Expenditures and Reimbursement Schemes in Indonesia: A Study on Chemotherapy for Breast Cancer

Muh. Deni Kurniawan[1], Erfan Abdissalam[1]*, M. Wahyu Ariawan[1], Abdul Rahem[2], Yulistiani Yulistiani[2], Ariska Wigatiningtyas[3]

Abstract

Objective: Significant gaps exist between hospital-incurred medical costs and national health insurance reimbursement rates, challenging the sustainability and equity of breast cancer care in Indonesia. Fixed tariffs often fail to capture the complexities and financial burdens associated with chemotherapy. This study compares hospital-incurred medical costs with both INA-CBG and non-INA-CBG reimbursement rates for breast cancer chemotherapy, identifies the key cost components, and evaluates the appropriateness of current tariffs under the National Health Insurance (JKN) scheme. **Methods:** A retrospective cross-sectional study was conducted at a tertiary hospital in Surabaya, Indonesia, using data from breast cancer patients who underwent chemotherapy in 2021. Clinical and cost data were obtained from hospital billing records, electronic medical records, and BPJS Kesehatan claims. The Wilcoxon signed-rank test was used to compare hospital-incurred medical costs with reimbursement rates. Subgroup analyses by INA-CBG code and chemotherapy regimen were performed to assess variability in coverage. **Results:** A total of 80 patients were included, predominantly female (97.5%) and diagnosed with stage IV disease (64.1%). Most were categorized under INA-CBG code C-3-13-0 (93.75%). Overall, the median hospital-incurred medical costs significantly exceeded reimbursement rates: IDR 3,657,290 vs. IDR 1,161,000 for C-3-13-0 ($p < 0.001$) and IDR 3,964,189 vs. IDR 2,151,900 for C-4-13-I ($p = 0.031$). Key cost drivers were chemotherapy administration (57.93%), nursing care (14.04%), and handling of cytotoxic drugs (7.88%). Specific regimens, such as vinorelbine, showed significantly higher costs that were not adequately reimbursed. **Conclusion:** JKN tariffs for breast cancer chemotherapy substantially underestimate actual treatment costs. To improve financial sustainability and access, periodic tariff adjustments, adoption of activity-based costing, and consideration of hybrid payment models should be implemented to ensure equitable financing of oncology care in Indonesia.

Keywords: JKN- breast cancer- chemotherapy- reimbursement- healthcare costs

Asian Pac J Cancer Prev, **27 (3)**, 999-1005

Introduction

Cancer financing plays a crucial role in mitigating the health and economic burdens faced by patients and their families. The substantial costs of treatment, combined with indirect expenditures such as transportation and caregiving, contribute significantly to financial distress, particularly among low-income households [1, 2]. Strengthening financial protection mechanisms for cancer care is therefore critical to ensuring equitable access [3].

Indonesia has implemented comprehensive payment reforms through the Indonesia Case-Based Groups (INA-CBG) system under the National Health Insurance (JKN), managed by BPJS Kesehatan. This prospective payment mechanism replaces the traditional fee-for-service model by linking reimbursement to specific diagnoses [4, 5]. While intended to improve administrative efficiency and cost control, the system has also created challenges due to mismatches between fixed INA-CBG tariffs and actual hospital-incurred medical costs [6, 7]. Such discrepancies can result in financial deficits, particularly in the management of complex or chronic conditions [6, 8]. Evidence from childbirth, hypertension, and hemodialysis further shows that real hospital costs frequently exceed INA-CBG claims [4, 5, 8]. Nevertheless, diagnosis-related group (DRG) systems like INA-CBG have demonstrated benefits internationally, including greater cost-efficiency, transparency, and shorter hospital stays [9, 10].

Previous studies in Indonesia have reported significant discrepancies between hospital-incurred medical costs and

*[1]Faculty of Pharmacy, Universitas Mulawarman, Samarinda, Indonesia. [2]Department of Pharmacy Practice, Faculty of Pharmacy, Universitas Airlangga, Surabaya, Indonesia. [3]Sekolah Tinggi Ilmu Kesehatan Samarinda, Samarinda, Indonesia. *For Correspondence: erfan.abdissalam@ff.unmul.ac.id*

INA-CBG reimbursement rates for cancer care. Analyses of breast, cervical, and lung cancer patients show that chemotherapy, pharmaceutical services, and medical devices are the primary cost drivers [11]. In lymphoma, the chemotherapy burden alone may reach nearly one-sixth of the national GDP per capita per hospital visit [12]. These financing gaps undermine the quality and sustainability of oncology services, particularly in hospitals that depend heavily on BPJS reimbursement, and risk limiting patient access [11, 12]. Moreover, the financial toxicity of cancer treatment is exacerbated by sociodemographic factors, including low household income and high dependency ratios [13].

Although previous studies have explored the financial burden of cancer care in Indonesia, systematic investigations comparing hospital-incurred medical costs with reimbursement rates remain limited in the Indonesian context. This gap is particularly evident in analyses of INA-CBG and non-INA-CBG claims for breast cancer chemotherapy. The present study, therefore, aims to compare hospital-incurred medical costs with reimbursement values under the JKN scheme. We hypothesized that the costs of breast cancer chemotherapy substantially exceed standardized reimbursement amounts. The findings are expected to provide empirical evidence to guide policy reforms and strengthen the financial sustainability of oncology services within the JKN framework.

Materials and Methods

Study Design and Objective

A retrospective observational cross-sectional study was conducted at a state hospital in Surabaya, Indonesia, to examine the cost discrepancies between hospital-incurred medical costs and the reimbursement claims submitted to BPJS Kesehatan for breast cancer patients receiving chemotherapy in either inpatient or outpatient settings. This study analyzed secondary data collected from January through December 2021, within the framework of Indonesia's National Health Insurance (JKN) program.

Setting

The study was conducted at a government-affiliated tertiary hospital that provides comprehensive oncology services and participates in the JKN reimbursement scheme managed by BPJS Kesehatan.

Participants

Eligible participants in this study were adult patients, aged 18 years and older, who had been diagnosed with breast cancer (ICD-10 code: C50) and who received at least one complete cycle of chemotherapy during the specified study period. The inclusion criteria were as follows: (1) a histopathologically confirmed diagnosis of breast cancer, (2) comprehensive clinical and financial documentation, (3) a clearly documented chemotherapy regimen, and (4) treatment reimbursed through BPJS Kesehatan, either via the INA-CBG or non-INA-CBG pathways. Patients were excluded if their records were incomplete or if their reimbursement was processed outside of the BPJS Kesehatan system. The majority of included patients presented with advanced disease (stage IV), which may influence the cost profile compared with early-stage patients.

Study Size

The final sample consisted of 80 patients. No formal sample size calculation was performed, as all eligible patients during the study period were included. This total sampling approach reduced selection bias.

Data Sources and Measurement

Clinical and financial data were retrieved from three primary sources: (1) hospital billing systems, (2) electronic medical records (EMRs), and (3) BPJS Kesehatan claim documentation. Two reimbursement schemes were assessed: (a) INA-CBG claims, using bundled payments by diagnosis grouping, and (b) non-INA-CBG claims, reimbursed through itemized billing outside the INA-CBG structure.

All costs were recorded from the healthcare provider's perspective in Indonesian Rupiah (IDR). For reference, the average exchange rate in 2021 was IDR 14,300 per USD.

The analysis is limited to direct medical costs as the cost perspective is used, which comprised: (1) pharmaceutical supplies, (2) medical devices and disposable supplies, (3) clinical pharmacy services, (4) handling of cytotoxic medications, (5) chemotherapy administration, (6) nursing care, (7) oncologist services, and (8) inpatient room charges. Indirect costs (e.g., transportation, productivity loss, caregiver expenses) and diagnostic investigations beyond chemotherapy were excluded to ensure consistency and comparability across patients. Within the INA-CBG scheme, diagnostic examinations are reimbursed separately from the chemotherapy service package, leading to their exclusion from this study's calculations, despite being part of direct medical costs. These excluded components may substantially contribute to the overall financial burden and should be considered in future burden-of-illness or cost-effectiveness analyses.

Variables

The primary outcome was the cost gap per treatment episode, defined as the difference between hospital-incurred medical costs and the corresponding JKN reimbursement amount. Independent variables included INA-CBG case code, chemotherapy regimen, reimbursement type (INA-CBG and non-INA-CBG), treatment setting (inpatient vs outpatient), and length of stay (for inpatients).

Bias Control

To reduce selection bias, all patients who met the eligibility criteria and had complete records during the study period were included. Information bias was minimized by cross-validating data across billing systems, EMRs, and BPJS claim documentation. No data imputation was performed; cases with missing critical information were excluded.

Statistical Methods

Descriptive statistics were used to summarize patient

and cost characteristics. Categorical variables are presented as frequencies and percentages. Continuous variables were assessed for normality using the Shapiro–Wilk test and were found to be non-normally distributed ($p < 0.05$); therefore, medians and interquartile ranges (IQRs) are reported. Paired comparisons between hospital-incurred medical costs and reimbursement values were conducted using the Wilcoxon signed-rank test (two-tailed, $\alpha = 0.05$). Prespecified subgroup analyses were performed by INA-CBG code and chemotherapy regimen. Analyses were conducted using SPSS Statistics version 27 (IBM Corp., Armonk, NY, USA). No adjustment for multiple comparisons was applied.

Ethical Considerations

The study adhered to the principles of the Declaration of Helsinki and was approved by the Research Ethics Committee of Universitas Airlangga Hospital (No. 086/KEP/2022). All patient data were anonymized prior to analysis, and the requirement for informed consent was waived due to the retrospective design.

Results

Participant Characteristics

A total of 80 breast cancer patients who received chemotherapy between January and December 2021 were included using a total sampling approach. The majority were female (97.5%), with only two male patients (2.5%). Most participants were aged 30–50 years (71.25%), and a substantial proportion (64.1%) were diagnosed with stage IV disease. In terms of INA-CBG coding, 93.75% were classified under C-3-13-0, while 6.25% were assigned to C-4-13-I. No missing data were recorded. Baseline characteristics are summarized in Table 1.

Direct Medical Costs (Excluding Chemotherapy Drugs)

The distribution of direct medical costs, excluding chemotherapy drug costs, showed that chemotherapy administration accounted for the largest share (57.93%), followed by nursing care (14.04%) and handling of cytotoxic drugs (7.88%). The mean total direct medical cost per treatment episode, excluding chemotherapy drugs, was IDR 3,665,080. A detailed breakdown is presented in Table 2.

Normality Tests of Cost Variables by INA-CBG Code

The Shapiro–Wilk test demonstrated that all continuous variables, including hospital-incurred medical costs and BPJS reimbursement values, significantly deviated from a normal distribution ($p < 0.05$). Reimbursement values for the C-3-13-0 group were identical across all cases. Results are presented in Table 3.

Comparison of Hospital-Incurred Medical Costs and INA-CBG Reimbursements

Wilcoxon signed-rank tests confirmed that hospital-incurred medical costs consistently exceeded INA-CBG reimbursement values. For C-3-13-0, the median cost was IDR 3,657,290 (IQR 854,633) compared with a fixed reimbursement of IDR 1,161,000 (IQR 0), resulting in a significant median shortfall ($p < 0.001$). For C-4-13-I,

Table 1. Patient Characteristics

Variable	Number of Patients	Percentage (%)	n
Age (years)			80 (100%)
30-40	31	38.75%	
41-50	26	32.50%	
51-60	15	18.75%	
>60	8	10.00%	
Sex			
Male	2	2.50%	
Female	78	97.50%	
Cancer Stage			
0	5	6.41%	
I	0	0.00%	
II	5	6.41%	
III	13	16.67%	
IV	50	64.10%	
Unspecified	5	6.41%	
INA-CBG Code			
C-3-13-0	75	93.75%	
C-4-13-I	5	6.25%	

Table 2. Distribution of Direct Medical Costs Excluding Chemotherapy Medications

Direct Medical Costs	Total Cost (IDR)	Percentage	Mean ± SD
Pharmaceutical Supplies	8160016	2.78%	103291 ± 94654
Medical Devices and Disposable Medical Supplies	14919482	5.09%	186494 ± 90452
Clinical Pharmacy Services	2260000	0.77%	28250 ± 5687
Cytotoxic Drug Handling	23100000	7.88%	355385 ± 123150
Oncologist Services	13375000	4.56%	169304 ± 76998
Chemotherapy Administration	170000000	57.93%	2151899 ± 533220
Nursing Care	41166930	14.04%	527781 ± 96362
Inpatient Room Charges	20300000	6.92%	414286 ± 110397
Total Cost (IDR)	293281428	100%	3665080 ± 799467

Note: Costs are presented in IDR. Average exchange rate during the study period: IDR 14,300 per USD. Mean ± SD values represent the average cost per patient across the study cohort (n=80). Since each patient underwent multiple chemotherapy cycles, the per-patient costs may appear high but reflect cumulative expenses during the study period.

Table 3. Descriptive Statistics and Shapiro–Wilk Normality Test for INA-CBG Groups C-4-13-I and C-3-13-0

INA-CBG Groups	Variables	n	Mean ± SD (IDR)	Median (IQR) (IDR)	Range (IDR)	Shapiro-Wilk (p)	Decision
C-4-13-I	Actual Cost	5	4420236 ± 1099618	3964189 (1615882)	2627405	0.024*	Not normally distributed
	JKN Reimbursement	5	2496180 ± 471425	2151900 (860700)	860700	0.006*	Not normally distributed
C-3-13-0	Actual Cost	75	3.630.737 ± 759928	3657290 (854633)	3765805	<0.001*	Not normally distributed
	JKN Reimbursement	75	1161000 ± 0	1161000 (0)	0	-	Constant

Note: $p < 0.05$ indicates a significant deviation from normality; IQR, Interquartile Range (Q3–Q1); Constant data, all values are identical (SD = 0, IQR = 0).

Table 4. Comparison of Actual Costs and Reimbursement Values under INA-CBG Codes within the JKN Scheme

INA-CBG Code	Mean ± SD Actual Cost (IDR)	Median (IQR) (IDR)	Mean ± SD JKN Reimbursement (IDR)	Median (IQR) (IDR)	Mean Cost Difference (IDR)	p-value
C-3-13-0	3630737 ± 759928	3657290 (854633)	1161000 ± 0	1161000 (0)	2469737 ± 759928	<0.001
C-4-13-I	4420236 ± 1099618	3964189 (1615881.5)	2496180 ± 471425	2151900 (860700)	1924056 ± 896859	0.031

Note: Statistical significance based on Wilcoxon signed-rank test; $p < 0.05$ indicates a significant difference between actual costs and reimbursement values. For INA-CBG reimbursement values, the standard deviation is zero because tariffs are fixed and uniform across patients within the same INA-CBG code.

the median cost was IDR 3,964,189 (IQR 1,615,882) compared with a median reimbursement of IDR 2,151,900 (IQR 860,700), resulting in a median shortfall of IDR 1,812,289 ($p = 0.031$). Reimbursement values for the C-3-13-0 group were identical across all cases (SD = 0), reflecting the fixed tariff system in place. These findings are summarized in Table 4.

Normality Tests of Cost Variables by Chemotherapy Regimen

Normality testing of cost variables across chemotherapy regimens indicated that most distributions were non-normal, supporting the use of non-parametric methods. Details are provided in Table 5.

Cost Differences by Chemotherapy Regimen

Analysis of individual chemotherapy regimens using Wilcoxon signed-rank tests identified specific drugs with significant under-reimbursement. Statistically significant differences were found between hospital-incurred costs and JKN reimbursement for Brexel® 20 mg ($p < 0.001$), cyclophosphamide 1g ($p = 0.002$), vinorelbine 10mg ($p = 0.039$), and Vinorkal® 10mg/ml ($p = 0.002$).

Conversely, although a numerical cost difference was observed for cyclophosphamide (Endoxan® 1000 mg) with a median shortfall of IDR 55,822, this difference was not statistically significant ($p = 0.180$). Similarly, several other widely used regimens, including paclitaxel, epirubicin, and goserelin (Zoladex®), showed no significant cost differences. These findings highlight that reimbursement gaps are regimen-specific and more pronounced for certain drugs. Furthermore, a combined analysis of all drug regimens did not reveal a significant overall cost difference ($p = 0.870$). A detailed comparison of drug levels is available in Table 6.

Discussion

This study reveals a substantial cost disparity between the actual expenditures incurred by hospitals and the reimbursement values provided under the JKN scheme for breast cancer patients receiving chemotherapy. Consistent with the initial hypothesis, both the INA-CBG package scheme and the non-INA-CBG scheme fail to cover the true clinical costs. The median cost shortfall was IDR 2,496,290 for cases classified as C-3-13-0 and IDR 1,812,289 for C-4-13-I, with both differences being statistically significant. These results align with previous research findings suggesting that INA-CBG rates are inadequate to meet the actual expenses associated with cancer chemotherapy [14–16].

The majority of patients are classified as stage IV (64.1%), and nearly all fall under the INA-CBG code C-3-13-0 (93.75%) (Table 1). This predominance of advanced-stage cases highlights the referral patterns to tertiary hospitals, as well as potential delays in the detection and access to early diagnosis at the primary care level. Previous studies have indicated that referral delays, along with geographic and socioeconomic barriers, continue to influence the timing of breast cancer presentations

Table 5. Descriptive Statistics and Normality Test of Actual Costs and JKN Reimbursement by Chemotherapy Regimen

Variable	n	Mean ± SD (IDR)	Median (IQR) (IDR)	Range (IDR)	Shapiro-Wilk (p)	Decision
Actual Cost	20	700493.20 ± 1348307.625	341476.00 (453865)	6164835	0.001*	Not normally distributed
JKN Reimbursement	20	693692.95 ± 1355692.991	336472.50 (418686)	6190045	0.001*	Not normally distributed

Note: Shapiro–Wilk test was used to assess data normality. p-values < 0.05 indicate non-normal distribution

Table 6. Comparison of Actual Costs and JKN Reimbursement by Chemotherapy Regimen

Chemotherapy Drug Name and Strength	Unit	n	Actual Cost (IDR)		JKN Reimbursement (IDR)		Cost Differences (IDR)		p-value	Interpretation
			Total	Mean	Total	Mean	Total	Mean		
Bonevell® 6mg/6ml	vial	1	586905	586905	550000	550000	36905	36905	-	Not applicable (NA)
Brexel® 20 mg	vial	82	14182795	172965	13854772	168962	328023	4003	<0.001	significant difference
Brexel® 80 mg	vial	40	27926351	698159	27670900	691773	255451	6386	0.579	No significant difference
Carboplatin 150mg	vial	6	762420	127070	762420	127070	0	0	1	No significant difference
Carboplatin 450mg	vial	18	5185620	288090	5185620	288090	0	0	1	No significant difference
Cyclophosphamide 1g	vial	28	5540920	197890	5597020	199894	-56100	-2004	0.002	significant difference
Cyclophosphamide 500mg	vial	2	190960	95480	227306	113653	-36346	-18173	-	Not applicable (NA)
Doxorubicin 10mg/5ml	vial	4	172660	43165	172660	43165	0	0	1	No significant difference
Doxorubicin 50mg/25ml	vial	3	669438	223146	662607	220869	6831	2277	0.317	No significant difference
Endoxan® 1000 mg	vial	4	828179	207045	604890	151223	223289	55822	0.18	No significant difference
Epirubicin 10mg/5ml	vial	10	834200	83420	834200	83420	0	0	1	No significant difference
Epirubicin 50mg/25 ml	vial	10	4122500	412250	4122500	412250	0	0	1	No significant difference
Herzemab® 440mg	vial	31	1,92E+08	6209613	1,93E+08	6233210	-781502	-25210	0.063	No significant difference
Ibandronic Acid 1mg/ml	vial	1	550000	550000	550000	550000	0	0	-	Not applicable (NA)
Paclitaxel 100mg	vial	4	576180	144045	576180	144045	0	0	1	No significant difference
Paclitaxel 30mg	vial	3	341781	113927	341781	113927	0	0	1	No significant difference
Vinorelbine 10mg	vial	32	18559920	579998	15920368	497512	2639552	82486	0.039	significant difference
Vinorkal® 10mg/ml	vial	44	20983141	476890	20983160	476890	-19	0	0.002	significant difference
Zoladex® 3.6mg	syringe	1	988260	988260	988259	988259	1	1	-	Not applicable (NA)
Zometa® 4mg/100ml	vial	13	20686400	1592492	20848800	1607654	-162400	-12492	0.157	No significant difference
Overall (all drug combined)	-	-	-	-	-	-	-	-	0.87	No significant difference

Note: Statistical significance based on Wilcoxon signed-rank test

in Indonesia and other middle-income countries [17, 18]. This finding emphasizes that diagnosis-based rate estimates that do not take into account the clinical burden of advanced stages are at risk of resulting in inadequate funding for high-referral hospitals [14, 19].

The analysis of cost components indicates that chemotherapy administration services comprise over half of the total direct non-drug medical costs, accounting for 57.93%. This is followed by nursing services at 14.04% and cytostatic handling at 7.88% (see Table 2). These figures underscore the substantial demand for human resources and logistical support required for cancer treatment, particularly during complex chemotherapy procedures. Within package tariff systems like INA-CBG, the workload and non-drug operational expenses of this nature are often insufficiently represented, leading to a potential discrepancy between the tariffs and the actual service requirements [11, 15, 20]. Therefore, the adjustment of diagnosis-based tariffs needs to consider the cost components of non-drug services in greater detail to ensure the continuity of quality oncology services in JKN facilities.

Comparisons between treatment regimens reveal that several chemotherapeutic agents, particularly Vinorelbine, impose significant cost burdens that are not addressed by non-INA-CBG claim rates. Furthermore, targeted therapies, such as Trastuzumab (Herzemab®), showed a strong trend towards higher costs, although this difference did not reach statistical significance ($p = 0.063$). This variation among regimens supports findings that the bundled tariff structure does not adequately account for the high prices of cytotoxic drugs, particularly in the case of targeted therapies [15, 21]. The discrepancy between tariffs and actual costs can disrupt the sustainability of tertiary hospitals that manage advanced cases. Hospitals may avoid the use of expensive medications or implement informal balance billing mechanisms, which risks exacerbating access inequalities.

Studies from various financing arrangements indicate that under-reimbursement may lead to a decrease in the volume of services and quality [14, 15, 22]. Countries with more advanced DRG systems have implemented outlier payment mechanisms and carve-outs to avoid under-reimbursement for innovative and high-cost therapies [23, 24]

This research was carried out at a tertiary referral hospital. Due to the potential variability in costs resulting from the characteristics of the facilities and patient caseloads, these findings should be interpreted with caution before being generalized to a national level. Additionally, indirect costs, such as transportation and family time, were not included, which means that the overall estimate of the economic burden is likely to underestimate the actual value. The subgroup sizes for several treatment regimens and INA-CBG codes are relatively small, resulting in limitations regarding the precision of the estimates. Furthermore, the retrospective design of the study relies heavily on the completeness of documented billing and claims. Although efforts were made to triangulate data from various internal sources, an unavoidable risk of information bias remains. It is also important to note that this study did not assess clinical outcomes, such as therapy response or side effects, which could significantly influence resource utilization patterns.

Regular revisions of INA-CBG tariffs should be prioritized, especially for patients with advanced-stage cancer. Implementing a mixed payment model that permits carve-outs for high-cost medications or service-oriented logistics could improve the accuracy of compensation. Additionally, incorporating activity-based costing at the hospital level can yield precise data for national tariff adjustment inputs [15, 20] Khoirunnisa et al., 2024).

In conclusion, this study demonstrates a substantial disparity between hospital-incurred medical costs and JKN reimbursement tariffs for breast cancer chemotherapy in Indonesia. Such under-reimbursement threatens the financial sustainability of oncology services and may compromise equitable patient access. To ensure fair compensation and service quality, the JKN payment system should adopt periodic tariff revisions based on activity-based costing and incorporate hybrid or carve-out payment models for high-cost therapies. Broader, multicenter cost analyses integrating clinical outcomes are recommended to guide evidence-based policy reforms and strengthen the long-term sustainability of cancer financing in Indonesia.

Author Contribution Statement

MDK: data analysis and manuscript preparation; EA: principal investigator and data collection; MWA: supervision of research activities; AR and Y: expert consultation in research design and data analysis; AW: data analysis and manuscript writing.

Acknowledgements

General

The authors would like to extend their heartfelt gratitude to the Faculty of Pharmacy at Universitas Airlangga, the Faculty of Pharmacy at Universitas Mulawarman, and the Samarinda College of Health Sciences for their invaluable academic and institutional support.

Ethical Declaration

The study protocol was reviewed and approved by the Research Ethics Committee of Universitas Airlangga Hospital (No. 086/KEP/2022).

Data Availability

Research data is confidential in the hands of researchers.

Conflict of Interest

The authors declare that there are no conflicts of interest related to this study.

References

1. Danhauer SC, Canzona M, Tucker-Seeley RD, Reeve BB, Nightingale CL, Howard DS, et al. Stakeholder-informed

conceptual framework for financial burden among adolescents and young adults with cancer. Psychooncology. 2022;31(4):597-605. https://doi.org/10.1002/pon.5843.
2. Sheikh N, Sarker AR, Sultana M, Mahumud RA, Ahmed S, Islam MT, et al. Disease-specific distress healthcare financing and catastrophic out-of-pocket expenditure for hospitalization in bangladesh. Int J Equity Health. 2022;21(1):114. https://doi.org/10.1186/s12939-022-01712-6.
3. Deribe L, Addissie A, Girma E, Abraha A, Adam H, Berbyuk Lindström N. Stress and coping strategies among parents of children with cancer at tikur anbessa specialized hospital paediatric oncology unit, ethiopia: A phenomenological study. BMJ Open. 2023;13(1):e065090. https://doi.org/10.1136/bmjopen-2022-065090.
4. Febri Nilansari A, Yasin N, Puspandari D. Cost analysis of inpatient hypertension patients at panembahan senopati hospital, bantul, yogyakarta, indonesia: Comparison between ina-cbgs rates and hospitalized actual rate. J Public Heal Dev. 2023;21:153-67. https://doi.org/10.55131/jphd/2023/210312.
5. Wardhana MP, Gumilar KE, Rahmadhany P, Rosita Dewi E, Laksana MAC. Ina-cbgs claim versus total hospital cost: A vaginal delivery investigation at airlangga university academic hospital, indonesia. J Public Health Res. 2020;9(4):1999. https://doi.org/10.4081/jphr.2020.1999.
6. Negara SB, Octavia DR, Utami PR. IAI CONFERENCE: The comparison of the actual cost to case-mix of type 2 diabetes mellitus inpatient in Pandan Arang Boyolali hospital. Pharmacy Education. 2021;21(2):269-74.
7. Wirantari NP, Gunawijaya E, Kartika Yantie NPV. Cost analysis of congenital heart disease patients who underwent diagnostic catheterization. Paediatr indones. 2020;60(5):244–52. https://doi.org/10.14238/pi60.5.2020.244-52.
8. gigin bian r, Rizal Y, Firman P. The comparison of the unit cost of hemodialysis with ina cbg rates in muhammadiyah siti aminah hospital. Arch Bus Res. 2020;8(5):80-95. https://doi.org/10.14738/abr.85.8210.
9. Mehmood A, Ahmed Z, Ghailan K, Dohare S, Varghese J, Azeez FK. Implementation of healthcare financing based on diagnosis-related group in three who regions; western pacific, south east asia and eastern mediterranean: A systematic review. J Health Manag. 2023;25(3):404-13. https://doi.org/10.1177/09720634231168250.
10. Mihailovic N, Kocic S, Jakovljevic M. Review of diagnosis-related group-based financing of hospital care. Health Serv Res Manag Epidemiol. 2016;3:2333392816647892. https://doi.org/10.1177/2333392816647892.
11. Yuliastuti F, Andayani TM, Endarti D, Kristina SA. Breast, cervical, and lung cancer: A comparison of real healthcare costs and ina-cbgs rates in the era of national health insurance. Pharm Pract (Granada). 2023;21(1):2768. https://doi.org/10.18549/PharmPract.2023.1.2768.
12. Samirah, Suharjono, Rafii A, Adityara RA, Romadhon PZ, Ratri DMN. Measuring the national tariff and patient economic burden of chemotherapy treatment for lymphoma cancer. Pharm Educ. 2024;24(3):p. 381-7. https://doi.org/10.46542/pe.2024.243.381387.
13. Susilowati M, Afiyanti Y. The socio-demographic factors correlated with financial toxicity among patients with breast cancer in indonesia. J Public Health Res. 2021;10(s1). https://doi.org/10.4081/jphr.2021.2403.
14. Santoso A, Sulistyaningrum IH, Rosyid A, Cahyono EB, Wirastuti K, Riyanto B. Comparative Of Real Cost Against The Price Of Ina-Cbg's Breast Cancer And Its Affecting Factors In JKN Program Era. JFSP. 2020;6(1):2579–4558. https://doi.org/10.31603/pharmacy.v6i1.2963
15. Satibi S, Andayani TM, Endarti D, Suwantara IPT, Agustini NPD. Comparison of real cost versus the indonesian case base groups (ina-cbgs) tariff rates among patients of high-incidence cancers under the national health insurance scheme. Asian Pac J Cancer Prev. 2019;20(1):117-22. https://doi.org/10.31557/apjcp.2019.20.1.117.
16. Suryanegara FDA, Iskandar D, Ekaputra E, Kuntjoro E, Setiawan D, Postma MJ, et al. Costs analysis of radiotherapy for breast cancer in indonesia: A comparison between reimbursement tariffs and actual costs. BMC Health Serv Res. 2025;25(1):766. https://doi.org/10.1186/s12913-025-12849-9.
17. Gondhowiardjo S, Hartanto S, Wirawan S, Jayalie Vf, Astiti Iap, Panigoro SS, et al. Treatment delay of cancer patients in indonesia: A reflection from a national referral hospital. Med j indones. 2021;30(2):129–37. Https://doi.Org/10.13181/mji.Oa.204296.
18. Hutajulu SH, Prabandari YS, Bintoro BS, Wiranata JA, Widiastuti M, Suryani ND, et al. Delays in the presentation and diagnosis of women with breast cancer in yogyakarta, indonesia: A retrospective observational study. PLoS One. 2022;17(1):e0262468. https://doi.org/10.1371/journal.pone.0262468.
19. Barouni M, Ahmadian L, Anari HS, Mohsenbeigi E. Challenges and adverse outcomes of implementing reimbursement mechanisms based on the diagnosis-related group classification system: A systematic review. Sultan Qaboos Univ Med J. 2020;20(3):e260-e70. https://doi.org/10.18295/squmj.2020.20.03.004.
20. Saptaningsih AB, Nikmah US, Aryandono T, Dwiprahasto I, At Thobari J. Cost-effectiveness analysis of two chemotherapy regiments fac vs. Taxane for operable breast cancer patients in indonesia. Asian Pac J Cancer Prev. 2022;23(4):1147-54. https://doi.org/10.31557/apjcp.2022.23.4.1147.
21. Yulistiani Y, Abdissalam E, Rahem A, Hamidi NF, Utomo FN. Cost burden of chemotherapy for indonesian healthcare insurance and social security/jaminan kesehatan nasional (jkn) patients with non-hodgkin lymphoma. J Oncol Pharm Pract. 2024;30(6):1096-100. https://doi.org/10.1177/10781552241261250.
22. Li D, Lei HK, Shu XL, Zhang X, Tu HL, Wang F, et al. Association of public health insurance with cancer-specific mortality risk among patients with nasopharyngeal carcinoma: A prospective cohort study in china. Front Public Health. 2023;11:1020828. https://doi.org/10.3389/fpubh.2023.1020828.
23. Omelyanovskiy V, Zheleznyakova I, Bezdenezhnykh T, Lazareva M, Fedyaev D. The review of the foreign experience on the financing of innovative medical technologies. Farmakoekonomika. 2020;13:316-23. https://doi.org/10.17749/2070-4909/farmakoekonomika.2020.055.
24. Quentin W, Stephani V, Berenson RA, Bilde L, Grasic K, Sikkut R, et al. How denmark, england, estonia, france, germany, and the USA pay for variable, specialized and low volume care: A cross-country comparison of in-patient payment systems. Int J Health Policy Manag. 2022;11(12):2940-50. https://doi.org/10.34172/ijhpm.2022.6536.