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Evaluation of ICU Bed Allocation Policy Implementation in Reducing Surgery Cancellation and Inpatient Care Indicators: A Qualitative Study

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Abstrak. *Rumah Sakit Ibu dan Anak Harapan Kita Jakarta (RSABHK) menerima rujukan dari pasien di berbagai daerah setiap hari. RSABHK melakukan setidaknya 50 operasi dan prosedur yang memerlukan anestesi setiap hari. Sekitar 10% dari prosedur ini memerlukan tempat tidur ICU untuk manajemen pasca operasi. ICU RSABHK mengkategorikan tempat tidur pasien menjadi dua kategori: bedah dan medis. Penelitian ini bertujuan untuk mengevaluasi kebijakan distribusi tempat tidur berdasarkan kondisi bedah dan medis mengenai jumlah pembatalan bedah dan indikator rumah sakit di ICU. Metode penelitian adalah studi retrospektif observasional kualitatif dari indikator untuk BOR, LOS, TOI, BTO, tingkat pembatalan bedah (SCR) dan risiko keuangan rumah sakit 20 bulan sebelum implementasi kebijakan dibandingkan dengan 20 bulan setelah implementasi kebijakan. Hasil penelitian menunjukkan bahwa setelah kebijakan diimplementasikan, ada penurunan 54,45% dalam jumlah SCR, peningkatan BOR 9,7%, penurunan LOS 10,97%, penurunan TOI 56,16%, dan peningkatan BTO 24,54%. Lebih dari 30 juta rupiah mengurangi risiko kerugian finansial rumah sakit. Kesimpulannya, kebijakan ini efektif dalam mengurangi tingkat stagnasi, tingkat pembatalan operasi, dan risiko kerugian finansial bagi rumah sakit.*

Kata kunci: *Alokasi Tempat Tidur ICU; ICU Bedah-Medis; Indikator Rawat Inap; Tingkat Pembatalan Operasi (SCR); Risiko Kerugian Finansial Rumah Sakit.*

Abstract. *Harapan Kita Women and Children Hospital Jakarta (RSABHK) receives referrals from patients in various regions every day. RSABHK performs at least 50 surgeries and procedures that require anesthesia daily. Approximately 10% of these procedures require ICU beds for post-operative management. RSABHK ICU categorizes patient beds into two categories: surgical and medical. This study aims to evaluate bed distribution policies based on surgical and medical conditions regarding the number of surgical cancellations and hospital indicators in the ICU. The research method is a qualitative observational retrospective study of indicators for BOR, LOS, TOI, BTO, surgical cancellation rates (SCR) and hospital financial risks 20 months preceding the policy implementation compared to 20 months following the policy implementation. The results showed that after the policy was implemented, there was a 54.45% reduction in the number of SCR, a 9.7% increase in BOR, 10.97% decrease in LOS, 56.16% decrease in TOI, and 24.54% increase in BTO. More than 30 million rupiahs reduced hospital risk of financial loss. The conclusion is that the policy is effective in reducing the rate of stagnation, the rate of surgery cancellations, and the risk of monetary loss for the hospital.*

Keywords: *ICU Beds Allocation; Surgical-Medical ICU; Inpatient Indicators; Surgery Cancellation Rate (SCR); Hospital Financial Loss Risks.*

Introduction

The Intensive Care Unit (ICU) at Harapan Kita Women and Children Hospital (RSABHK) provides critical care for maternal and pediatric patients. Its services include both surgical and non-surgical (medical) cases, with patient proportions fluctuating over time. In practice, medical patients often occupy most ICU beds, limiting access for postoperative patients who urgently require intensive monitoring and specialized care. The Central Surgical Installation (CSI) at RSABHK performs 40–50 anesthesia-based surgical or diagnostic procedures daily. Approximately 10% of these cases require postoperative admission to the ICU. When no ICU beds are available, scheduled procedures must be postponed or cancelled. Cancellations attributable to ICU bed shortages account for more than 2% of all surgical cancellations, while additional causes include administrative constraints, patient-related conditions, operator availability, and limited neonatal intensive care capacity for caesarean deliveries. Such interruptions disrupt clinical workflow, compromise patient outcomes, and reduce hospital efficiency and staff performance (Bosque-Mercader & Siciliani, 2022).

In mid-2022, a bed management initiative was introduced to classify ICU patients into two primary categories: surgical and medical. Surgical cases included patients admitted before or after surgery, or following anesthesia, while medical cases comprised non-surgical patients across age groups. This policy was intended to improve ICU bed utilization and reduce surgical cancellations. Its implementation required evaluation to determine its effect on patient flow and hospital efficiency. Delays in elective surgery stem from a range of factors medical, patient-related, logistical, and administrative. A study at a government hospital in Semarang reported that 38.9% of surgical delays exceeded five days, most commonly due to medical reasons (48.1%), followed by logistical and administrative factors (27.8%) and patient-related causes (14.8%) (Amurwani & Rofi'i, 2018). The majority of patients in government hospitals, including RSABHK, are insured by Badan Penyelenggara Jaminan Sosial (BPJS) Kesehatan. Under the Indonesia Case-Based Groups (INA-CBGs) payment scheme, hospitals risk financial loss when care extends beyond the clinical pathway for a given diagnosis. Each additional inpatient day generates expenses not reimbursed by BPJS. For instance, the daily inpatient cost for a BPJS class III patient in a type A hospital is approximately IDR 2,480,000. Thus, even a one-day surgical delay due to ICU bed unavailability may impose substantial financial strain on the institution. Efficient ICU management is therefore essential to prevent prolonged occupancy and minimize unnecessary costs. Previous studies demonstrate that medical ICU patients have an average length of stay (LOS) of 10.2 days, compared with 3.6 days for surgical ICU patients (Toptas et al., 2018; Fowler et al., 2019). Guided by this evidence, the ICU at RSABHK restructured its bed allocation to reserve specific slots for surgical patients. Because medical patients typically require longer treatment durations, full occupancy by this group can cause stagnation and disrupt elective surgery schedules. Prolonged ICU occupancy also affects patient flow from other hospital units. Patients from wards, emergency departments, or external referrals frequently face extended waiting times before gaining admission to the ICU. Data collected from 2020 to 2022 reveal consistent increases in inpatient indicators such as Bed Occupancy Rate (BOR), Length of Stay (LOS), and Bed Turnover (BTO), confirming that ICU capacity during this period was consistently overextended (Table 1).

Table 1. ICU Inpatient Indicators 2020-2022

Indicators	2020	2021	2022
Bed Occupancy Rate (BOR)	86.42%	89.06%	94.46%
Length of Stay (LOS)	5.99 days	6.33 days	6.52 days
Bed Turnover (BTO)	51.7 times	52.3 times	55.06 times
Turnover Interval (TOI)	1.88 days	0.84 days	0.39 days

This study employs hospital inpatient indicators to evaluate the effectiveness of ICU bed utilization. The key parameters include the Bed Occupancy Rate (BOR), Length of Stay (LOS), Turnover Interval (TOI), Bed Turnover (BTO), and Surgery Cancellation Rate (SCR). Each serves as a quantitative measure of service efficiency and bed productivity. Bed Occupancy Rate (BOR) represents the percentage of utilized beds within a defined period. It provides an overview of ICU workload and space efficiency. An optimal BOR for general hospitals ranges between 60% and 85%, while for ICUs, the ideal range is narrower, between 75% and 85% (de Oliveira et al., 2019). Sustained BOR levels above this range may indicate overcapacity, which can increase operational strain and infection risk. Length of Stay (LOS) refers to the total number of calendar days a patient receives inpatient treatment, from admission until discharge. Economically, longer stays correspond to higher costs, either directly borne by patients or indirectly by hospitals under bundled payment systems such as BPJS Kesehatan. According to the Barber Johnson international standard, the acceptable LOS range is 3–12 days. Achieving a reduction in LOS depends on factors such as hospital infrastructure, workforce capability, leadership, and care coordination (Tipton et al., 2021). At RSABHK, the average LOS in the ICU is 6.52 days—well within the acceptable range but indicative of moderate bed stagnation.

Extended hospitalization can increase the likelihood of complications, healthcare costs, and patient dissatisfaction. Studies associate prolonged LOS with delays in clinical decision-making, inefficient discharge planning, and systemic bottlenecks within care pathways. Efforts to reduce LOS vary in approach and scope. Some interventions enhance clinical pathways and early mobilization, while others emphasize discharge planning, case management, medication oversight, and multidisciplinary teamwork. While these strategies can improve turnover and reduce costs, they also introduce potential risks most notably premature discharge and readmission due to incomplete recovery. Therefore, LOS management must be tailored to patient characteristics and clinical conditions rather than applied uniformly. Patients with complex or chronic illnesses, those from socioeconomically disadvantaged backgrounds, or those lacking access to adequate follow-up care often face delayed discharge. In such cases, LOS reduction must balance efficiency with patient safety and equitable access to care. Institutional readiness particularly in leadership, staffing, and infrastructure plays a decisive role in determining outcomes. Turnover Interval (TOI) measures the average number of days a bed remains vacant between two consecutive admissions. Longer TOI values indicate inefficient utilization, as idle beds generate no clinical or financial output. Conversely, shorter TOI reflects high turnover and faster patient flow, which is desirable from a management perspective. However, a TOI approaching zero can pose hygiene and safety risks. Beds reused without adequate cleaning increase the potential for nosocomial infections and staff fatigue. The optimal TOI value for hospitals is between 1 and 3 days (Isnaini et al., 2024). Bed Turnover (BTO) indicates how many times a bed is occupied by different patients within a specific period, reflecting overall bed productivity. Higher BTO values generally imply efficient use of hospital resources. However, excessively high turnover can compromise service quality if cleaning and sterilization processes are shortened.

According to Barber Johnson's international benchmark, the ideal BTO range for hospitals is 40–50 patients per bed annually (Sudra, 2010). Surgery Cancellation Rate (SCR) in this study specifically refers to elective surgeries postponed due to unavailable ICU beds. This indicator is routinely recorded by the Central Surgical Installation (CSI) as part of hospital quality metrics. The national benchmark limits the total surgical cancellation rate to a maximum of 3% (Perjanjuan Kinerja Tahun 2023, 2023). Reducing cancellations caused by ICU capacity constraints directly improves both clinical outcomes and hospital efficiency. Elective surgery cancellations prolong hospital stays and create financial inefficiencies, particularly within the BPJS Kesehatan system, which applies a fixed reimbursement per case (INA-CBGs). Each additional inpatient day

represents a potential uncompensated cost. Based on BPJS data, the average daily inpatient cost is approximately IDR 3,298,500 for class I, IDR 2,889,300 for class II, and IDR 2,480,100 for class III (see Table 2). Minimizing surgical delays therefore directly reduces the risk of financial loss for hospitals operating under this payment model.

Table 2. Daily Inpatient Claim from HFIS (Health Facilities Information System) BPJS Kesehatan, Categorized

Inpatient Class	Group Code	Daily Cost (IDR)
First-class ward	Z-4 – 12-I	3,298,500
Second-class ward	Z-4 – 12-I	2,889,300
Third-class ward	Z-4 – 12-I	2,480,100

The Intensive Care Unit (ICU) is a specialized hospital ward equipped with advanced medical technology, trained personnel, and standardized protocols to manage patients in critical condition. In some health systems, it is also referred to as the Critical Care Unit (CCU) or Intensive Therapy Unit (ITU). The primary function of the ICU is to provide continuous monitoring and intervention for patients with life-threatening illnesses or those recovering from major surgical procedures. Admission criteria typically include cases involving airway obstruction or impending obstruction, respiratory failure, cardiac arrest, bradycardia, severe neurological events such as recurrent seizures, and multiple organ dysfunction (Begum & Smith, n.d.). At Harapan Kita Women and Children Hospital (RSABHK), the ICU operates as a distinct department under the Medical and Nursing Directorate. The unit is led by an ICU Head, supported by officers responsible for administration, human resources, and service coordination.

The ICU's mandate encompasses both clinical management of critical patients and the achievement of key performance indicators set by the hospital board and the Ministry of Health. The multidisciplinary care team includes physicians-in-charge (DPJP) from various specialties pediatricians, anesthesiologists, emergency and intensive care consultants (ERIA), as well as subspecialists in anesthesia and intensive care (SpAn-TI, Subsp. IC). These physicians collaborate with a team of dedicated intensive care nurses led by a ward head and supervised daily by a Clinical Instructor (CI). The unit operates continuously, 24 hours a day throughout the year, which makes ICU services among the most complex and resource-intensive hospital operations. Given this constant operational demand, ICU work presents substantial risks of fatigue, burnout, and occupational stress among healthcare workers. The safety of both patients and staff depends on the maintenance of adequate staffing ratios, shift regulation, and systematic support from non-clinical personnel. Competent administrative, housekeeping, and maintenance staff are indispensable to ensure continuous service readiness, even outside regular working hours. In Indonesia, the concept of a dedicated Surgical Intensive Care Unit (SICU) remains relatively uncommon. Most hospitals maintain integrated ICUs that accommodate both medical and surgical patients. Whether separation is feasible depends on hospital capacity, infrastructure, and financial resources. In contrast, many international institutions have long adopted distinct ICU divisions to enhance patient flow and care specialization.

The London Health Science Centre, for example, operates a Medical–Surgical Intensive Care Unit (MSICU) (About the Medical–Surgical Intensive Care Unit (MSICU), n.d.), while Dr. Sardjito General Hospital in Yogyakarta is among the few Indonesian hospitals applying a similar separation between Medical ICU (MICU) and Surgical ICU (SICU) (Rawat Khusus RS Sardjito, n.d.). Hospitals that differentiate ICU services by case type typically do so to improve efficiency, resource allocation, and quality of care. According to Rohrig et al. (2019), surgical ICUs tend to focus on a narrower patient population, allowing intensivists to manage the continuum of care

from pre-operative preparation through post-operative stabilization and transition to general wards. Key characteristics of the surgical ICU model include:

1) Intensivists coordinate patient management across the surgical continuum, ensuring smooth transitions from the operating room to the ICU and subsequently to inpatient wards.
2) ICU bed availability is actively regulated by intensivists to accommodate surgical caseload fluctuations.
3) Advanced life-support technologies, such as mechanical ventilation, extracorporeal membrane oxygenation (ECMO), and continuous veno-venous hemofiltration (CVVH), are central to care delivery.
4) The demand for ventilator use in surgical ICUs is typically lower than in medical ICUs due to the nature of post-operative recovery.
5) Care delivery is more technically specialized and focused.

However, studies also indicate that surgical ICU patients have a higher risk of adverse events compared with those in medical ICUs. Park et al. (2018) found that patients experiencing complications in surgical ICUs exhibit a 3.8-fold increase in mortality compared with those without adverse events. These findings highlight that while specialization enhances focus and efficiency, it also demands stringent clinical governance and multidisciplinary coordination to ensure patient safety.

Research Methodology

This study was designed to evaluate the implementation of an ICU bed allocation policy that divides available beds into two categories—medical and surgical slots. The ICU at RSAB Harapan Kita consists of 16 beds, of which 13 were assigned to medical patients and 3 reserved for surgical patients. This internal policy was introduced in mid-2022 and has been continuously applied for more than three years. The evaluation aims to determine whether the policy improved ICU utilization efficiency and reduced the rate of elective surgery cancellations. A qualitative observational approach was employed, utilizing documentary data from hospital records. The study analyzed five key inpatient indicators Bed Occupancy Rate (BOR), Length of Stay (LOS), Turnover Interval (TOI), Bed Turnover (BTO), and Surgery Cancellation Rate (SCR) collected from ICU reports covering the period November 2020 to February 2024. The data were retrieved from the hospital's monthly, quarterly, and annual performance reports.

The analysis compared two datasets:

1) Dataset I: 20-month period before the implementation of the bed allocation policy.
2) Dataset II: 20-month period following policy implementation.

For each indicator, the corresponding values from Dataset I and Dataset II were analyzed and compared. BOR was expressed as a percentage, LOS and TOI in days, and BTO as the number of bed uses per month. SCR was presented as a percentage of elective surgeries cancelled due to ICU bed unavailability. Changes in each indicator were calculated in percentage terms to determine improvement or decline following the policy. Additionally, data on daily inpatient claims were obtained from the hospital's BPJS Kesehatan insurance department.

These figures were used to estimate the hospital's financial risk of loss associated with delayed or cancelled surgeries. The calculation was performed by multiplying the number of cancelled elective surgeries in each dataset by the average daily inpatient cost (based on BPJS Class I tariff, as the majority of RSABHK patients fall under this class). The estimated potential loss assumes that each cancelled or delayed surgery corresponds to at least one additional inpatient day. Therefore, if one patient experiences a one-day delay due to ICU bed unavailability, the financial risk to the hospital is equivalent to the daily reimbursement rate for that patient's care under the BPJS payment scheme. This estimation provides a monetary perspective on how ICU bed management impacts hospital efficiency and financial sustainability.

Results and Discussion

Results

This section outlines the findings derived from the analysis of inpatient indicators collected from the ICU. The data are presented in two main datasets representing conditions before and after the implementation of the bed allocation policy. The comparison highlights the policy's impact on ICU efficiency, patient flow, and hospital financial performance.

Table 3. Dataset I and II

Dataset I	BOR I (%)	LOS I (days)	TOI I (days)	BTO I (times)	SCR I (%)
November 2020	94.76	4.91	0.27	5.79	0.28
December 2020	91.71	5.69	0.51	5.00	1.51
January 2021	81.45	7.35	1.67	3.44	1.31
February 2021	82.59	8.04	1.70	2.88	0.71
March 2021	89.72	6.27	0.72	4.44	0.84
April 2021	83.33	6.06	1.21	4.13	1.17
May 2021	80.44	5.96	1.45	4.19	3.03
June 2021	100	6.40	0	4.69	1.14
July 2021	96.37	6.83	0.26	4.38	1.27
August 2021	98.19	5.73	0.11	5.31	1.51
September 2021	86.67	5.33	0.82	4.88	0.74
October 2021	90.93	5.24	0.52	5.38	0.78
November 2021	81.87	6.78	1.50	3.63	0.99
December 2021	97.17	6.03	0.18	5.00	1.08
January 2022	9012	6.30	0.69	4.44	0
February 2022	89.51	6.68	0.78	3.75	1.03
March 2022	83.27	5.43	1.09	4.75	0.71
April 2022	96.46	6.91	0.25	4.19	0.52
May 2022	104.44	8.09	0.34	4.00	0.83
June 2022	92.41	7.56	0.62	3.67	0.89
Mean	90.35	6.38	0.73	4.39	1.01
Dataset II	BOR II (%)	LOS II (days)	TOI II (days)	BTO II (times)	SCR II (%)
July 2022	89.07	7.10	0.87	3.89	0
August 2022	96.42	6.56	0.24	4.56	0.21
September 2022	96.25	6.08	0.24	4.75	0.45
October 2022	101.61	5.54	0.09	5.69	1.40
November 2022	97.71	5.65	0.13	5.19	0.70
December 2022	96.37	6.37	0.24	4.69	0.20
January 2023	94.56	7.56	0.44	3.88	0.45
February 2023	97.10	6.69	0.20	4.06	0.40
March 2023	100	6.89	0.00	4.50	0.59
April 2023	97.71	6.01	0.14	4.88	1.23
May 2023	97.98	5.23	0.11	5.81	0
June 2023	95.42	5.45	0.26	5.25	0.83
July 2023	91.94	4.18	0.37	6.81	0.77
August 2023	120.56	6.10	1.04	5.25	0.51
September 2023	103.96	4.84	0.18	6.81	0.53
October 2023	126.81	5.62	1.19	6.13	0,52
November 2023	107.29	4.29	0.29	6.44	0.68
December 2023	101.21	5.12	0.29	7.00	0.19
January 2024	101.21	4.18	0.05	7.50	0.89

February 2024	103.23	4.17	0.13	6.13	0.56
Mean	99.12	5.68	0.32	5.46	0.55

A summary of the analyzed data from Table 3 is presented in Table 4. The table compares the mean values of all ICU performance indicators across the two observation periods, illustrating variations before and after the implementation of the bed allocation policy.

Table 4. Datasets Summary

Indicators (Unit)	Dataset I	Dataset II	Change Direction	Percentage Difference (%)
Bed Occupancy Rate (BOR) (%)	90.35	99.12	Increased	9.70
Length of Stay (LOS) (days)	6.80	5.68	Decreased	10.97
Turnover Interval (TOI) (days)	0.73	0.32	Decreased	56.16
Bed Turnover (BTO) (times)	4.39	5.46	Increased	24.54
Surgery Cancellation Rate (SCR) (%)	1.01	0.55	Decreased	54.45

After the implementation of the ICU bed allocation policy, notable changes were observed across all performance indicators. The Bed Occupancy Rate (BOR) increased by 9.7%, from 90.35% before implementation to 99.12% afterward, indicating a higher level of bed utilization within the ICU. Meanwhile, the Length of Stay (LOS) decreased from 6.38 days to 5.68 days, reflecting a reduction of approximately 10.97%. This suggests that patient turnover became more efficient and that the average duration of ICU care was shortened following the policy. The Bed Turnover (BTO) rate also showed improvement, rising from 4.39 to 5.46 times per month, which demonstrates that each bed was utilized by a greater number of patients within the same time frame. Correspondingly, the Turnover Interval (TOI) decreased significantly from 0.73 days to 0.32 days, a reduction of 56.16%. In practical terms, this means that an ICU bed, which previously remained vacant for approximately 17 hours between patients, is now idle for only around 7 hours before being reoccupied. In addition, the Surgery Cancellation Rate (SCR) due to ICU bed unavailability dropped markedly from 1.01% to 0.55%, representing a 54.45% decrease compared to the period prior to policy implementation. This decline indicates that the new bed allocation system—distinguishing surgical from medical patients—contributed substantially to improving surgical scheduling stability and reducing elective procedure cancellations.

Table 5. Surgery Cancellation Rate and Hospital Financial Loss Risk

Dataset	Surgery Cancellations (Patients)	Estimated Financial Loss (IDR)
Dataset I (Before Implementation)	69	227,596,500
Dataset II (After Implementation)	58	191,313,000
Difference	11	36,283,500

The potential financial loss avoided through the implementation of this policy was estimated by multiplying the daily inpatient care cost by the difference in the number of surgery cancellations between the two datasets. The comparison of the Surgery Cancellation Rate (SCR) and the corresponding financial impact is summarized in Table 5. Since the majority of patients treated at RSABHK are covered by BPJS Class I, the calculation was based on the

daily inpatient reimbursement rate for this category. The analysis revealed a difference of IDR 36,283,500 between the pre- and post-implementation periods. This figure represents the minimum potential financial savings for cases where surgery is delayed by only one day. Should a delay extend beyond one day, the hospital's potential loss would increase proportionally, emphasizing the economic significance of an efficient ICU bed allocation system in minimizing financial risk and ensuring optimal resource utilization.

Discussion

This study aimed to evaluate the implementation of an ICU bed allocation policy that distinguishes between medical and surgical cases by analyzing several performance indicators: Bed Occupancy Rate (BOR), Length of Stay (LOS), Turnover Interval (TOI), Bed Turnover (BTO), Surgery Cancellation Rate (SCR), and the estimated risk of hospital financial loss. The findings provide empirical evidence for the development of more efficient ICU bed management models and a framework for determining optimal ICU capacity based on hospital characteristics. As shown in Table 4, the BOR remained relatively high, ranging between 80% and 90%. After the policy implementation, BOR increased by approximately 8.77%, which contrasts with the initial hypothesis that the figure would decline. This persistent elevation can be explained by two primary factors. First, RSAB Harapan Kita functions as a Ministry of Health referral hospital that continuously receives critically ill patients from various regions, naturally sustaining high bed occupancy. Second, the flexible nature of the bed allocation policy allows temporary adjustments between surgical and medical slots. When surgical demand is low, surgical beds are temporarily assigned to medical patients, ensuring near-full utilization of available capacity. Consequently, the BOR reflects a fully occupied ICU, even though turnover processes are ongoing. High BOR values are often associated with increased workload and potential burnout among ICU staff, especially nurses. Previous studies have shown that excessive bed occupancy may elevate the risk of nosocomial infections and staff fatigue (Cunningham et al., 2006; Kaier et al., 2012), although some research has found no direct correlation (Volpe et al., 2013). Given the nurse-to-patient ratio of 1:2, continuous full occupancy intensifies physical and cognitive demands. To address this, the ICU management implemented a balanced assignment strategy, combining patients on mechanical ventilation and those breathing spontaneously under the supervision of the same nurse. The LOS decreased by 10.97%, from 6.38 to 5.68 days. This aligns with the expectation that designating surgical beds would shorten the overall ICU stay, as surgical patients typically require shorter intensive care compared to medical patients (Fowler et al., 2019). Reduced LOS suggests greater service efficiency and contributes to financial sustainability, particularly under the BPJS Kesehatan reimbursement scheme, which penalizes prolonged hospitalization outside clinical pathways. Simultaneously, the TOI decreased from 0.73 to 0.32 days, indicating that the idle time between patient discharges and subsequent admissions was reduced from approximately 17.5 hours to 7.6 hours.

This improvement reflects more efficient bed turnover, allowing a greater number of patients to receive critical care within a fixed period. Correspondingly, the BTO increased from 4.39 to 5.46, confirming enhanced utilization and productivity per bed. The reduction in the Surgery Cancellation Rate (SCR) from 1.01% to 0.55% represents a 54.45% decline following policy implementation. Allocating specific ICU slots for surgical patients ensured improved scheduling reliability and reduced elective procedure cancellations. This also enhanced the predictability of surgical workflows and patient satisfaction while lowering administrative and clinical disruptions. Financially, the policy demonstrated measurable benefits. As shown in Table 5, the hospital avoided a potential loss of approximately IDR 36,283,500, based on BPJS Class I reimbursement rates. This figure represents the minimum savings for surgeries delayed by only one day, implying that longer delays would amplify financial risk proportionally. Under Indonesia's universal healthcare financing structure, hospitals must operate with high operational efficiency to maintain fiscal balance. Avoiding unnecessary

delays and cancellations directly supports cost containment and quality assurance. Thus, this study reinforces the importance of structured ICU bed allocation as a mechanism for optimizing resource use, sustaining performance indicators, and mitigating financial exposure.

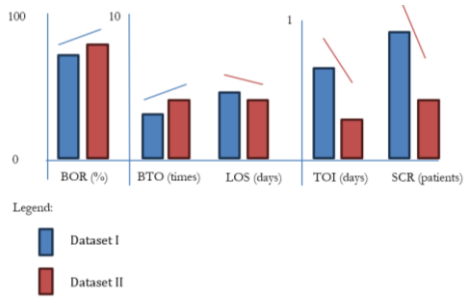

Figure 1. Comparison Chart of Datasets I and II

Conclusion

The implementation of the ICU bed allocation policy distinguishing between surgical and medical patients has proven to be an effective managerial decision. This approach offers tangible improvements within the ICU, allowing more patients to be accommodated simultaneously while enhancing scheduling transparency for physicians and ensuring greater certainty for patients awaiting surgery. The hospital also benefits economically, as the policy significantly reduces the risk of financial losses associated with surgery cancellations and inefficient bed use. The findings indicate that the policy did not lead to a reduction in the Bed Occupancy Rate (BOR), which remained relatively high due to the hospital's status as a national referral center. However, the policy successfully shortened the Length of Stay (LOS), increased Bed Turnover (BTO), and reduced the Turnover Interval (TOI). These improvements demonstrate enhanced efficiency in patient flow and resource utilization. Furthermore, the policy substantially lowered the Surgery Cancellation Rate (SCR), resulting in measurable financial savings and improved operational continuity. Overall, this initiative represents a practical model for ICU bed management that aligns with efficiency, quality, and patient safety objectives.

This policy is particularly relevant for tertiary hospitals with high patient volumes and complex case mixes. Nevertheless, its applicability in smaller hospitals with limited ICU capacity may differ, as separating beds by medical and surgical categories could reduce flexibility. Despite this, the underlying principle of structured allocation remains valuable as a strategic framework for optimizing critical care resources. This study faced certain limitations that should be acknowledged. The available dataset covered only twenty months before and after the policy's implementation. Earlier data could not be included because it coincided with the COVID-19 pandemic, during which ICU operations were disrupted by staff shortages and emergency reconfigurations. These circumstances led to atypical fluctuations in ICU indicators, making them unsuitable for comparison. Another limitation concerns the estimation of financial risk. The analysis relied on projected losses derived from the INA-CBGs reimbursement model of BPJS Kesehatan, which operates as a bundled payment system. Consequently, precise calculations of profit or loss were not feasible, as the actual cost of care depends on multiple variables such as disease type, treatment complexity, and hospitalization duration. To maintain consistency, the estimation used the average daily inpatient reimbursement rate for BPJS Class I—the most common category among RSAB Harapan Kita patients. Despite these constraints, the findings provide a credible and practical insight into how structured ICU bed management can improve hospital efficiency and financial stability.

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