QANUN MEDIKA
Jurnal Kedokteran
Fakultas Kedokteran FKUM Surabaya
http://journal.um-surabaya.ac.id/index.php/qanunmedika

Research Article

Efficiency of Inpatient Care Services at Surabaya Islamic Hospital in 2022-2023 Using the Barber-Johnson Approach

Frea Astrilia Tamarina[1*], Heru Suswojo[2], Sholihul Absor[2]

1) Master student of Hospital Administration Study Program, Faculty of Medicine, Universitas Muhammadiyah Surabaya, Surabaya, East Java, 60113, Indonesia
2) Master of Hospital Administration Study Program, Universitas Muhammadiyah Surabaya, Surabaya, East Java, 60113, Indonesia

ARTICLE INFO

Submitted : 15th July 2025
Accepted : 2nd January 2026
Published : 25th January 2026

Keywords:
Barber Johnson; Bed Occupancy Rate; Bed Turn Over; Turn Over Interval; Average Length of Stay.

Correspondence:
dr.frea@gmail.com

ABSTRACT

Efficiency is used as an indicator of hospital performance, including the overall performance of hospital health services. The effectiveness of services related to hospital bed management is assessed using the metrics Bed Occupancy Rate (BOR), Average Length of Stay (ALOS), Turnover Interval (TOI), and Bed Turnover (BTO) on the Barachman-Johnson graph. The construction of a new building resulted in an increase in the number of patients and beds from 2022 to 2023, according to medical record data from the Islamic Hospital (RSI) Surabaya inpatient ward. The availability of community services may be affected by changes in bed availability. This study aimed to evaluate the efficiency of inpatient services at RSI Surabaya in 2022–2023 using bed utilization indicators (BOR, ALOS, TOI, and BTO) and the Barber–Johnson graphical approach. This study used an observational analytical design with a quantitative approach. Descriptive and comparative analyses were conducted to evaluate inpatient bed management indicators (BOR, ALOS, TOI, and BTO) at RSI Surabaya in 2022–2023 using the Barber–Johnson method, based on aggregate secondary hospital data. The RSI Surabaya inpatient ward's Barber Johnson graph for 2022 and 2023 shows that the BOR value has decreased, the ALOS is low, the TOI has reached an optimal value, and the BTO is high. The Barber Johnson efficiency area is not where the four parameter points are located. In conclusion, inpatient bed utilization at RSI Surabaya in 2022 and 2023 did not achieve optimal performance.

QANUN MEDIKA
Jurnal Kedokteran
Fakultas Kedokteran FKUM Surabaya
http://journal.um-surabaya.ac.id/index.php/qanunmedika

INTRODUCTION

According to Government Regulation Number 17 of 2023 concerning Health, health efforts are all activities carried out continuously and in an integrated manner to maintain and improve the community's health status. Health services are an important component of these efforts. These services include promotive, preventive, curative, rehabilitative, and palliative services (Undang-Undang Republik Indonesia, 2023). Hospitals, as health care facilities, also provide inpatient, outpatient, and emergency services. In the era of globalization, hospitals are required to continuously improve the quality of their services in order to satisfy patients (Peraturan Menteri Kesehatan Republik Indonesia, 2020). Hospital service indicators provide an overview of the level of utilization, quality, and efficiency of services, including the effective use of beds (Herawati et al., 2025). Because they demonstrate the hospital's capacity to provide comprehensive care to patients who require supervision, inpatient services are a crucial component of hospital operations. As the primary patient care facility, beds need to be properly managed to maximize their use (Kemenkes RI, 2013), with the aim of improving public health.

Efficiency is one measure of hospital performance that reflects the performance of all health services within the hospital. The assessment of inpatient service efficiency is conducted using inpatient indicators that describe the unit's activities. Bed management statistics can be used to assess service efficiency through four Barber-Johnson parameters. The Barber-Johnson approach uses the parameters Bed Occupancy Rate (BOR), Average Length of Stay (ALOS), Turnover Interval (TOI), and Bed Turnover (BTO) to calculate efficiency levels. In addition, Barber-Johnson charts can assist hospital management in improving the quality of patient care (Fitriani, Susanti, and Hardiana 2024). BOR is the percentage of bed utilization by inpatients, while ALOS is the average length of stay. TOI is defined as the bed turnover interval, which is the average number of days a bed is unoccupied from the time it is vacated until it is reoccupied. BTO describes the frequency of bed utilization by patients within a given period (Trianto & Abidin, 2025). According to Barber Johnson's approach, the value of the BOR indicator that meets the ideal standard is 75%-85%; the ideal ALOS standard is 3-12 days; the TOI is 1-3 days; and the ideal BTO standard is 30 times. Information on the value of BOR, ALOS, TOI, and BTO for each period can be used to estimate the targets that must be achieved by the hospital (Fitriani, Z., *et al.*, 2024). The four Barber Johnson parameters will statistically converge at a cut-off point. The hospital can be said to be efficient if the point is in the Barber Johnson efficient region

Islamic Hospital (RSI) Surabaya, one of the largest hospitals in Surabaya, likewise makes every effort to provide the best services to meet the community's demand for comprehensive, high-quality care, including inpatient ward services. The target number of inpatients was 15.552 and 24.174, according to the RSI Surabaya's Annual Work Plan and Budget for 2022 and 2023. However, the actual number of patients in 2022 was 11.200, and in 2023, it was 14.616; therefore, the inpatient ward rate in 2022 was 72%, and in 2023, it was 62,8%. The data indicate that while the number of patients has increased over the past year, the hospital's goal has not yet been met. One factor that may have contributed to the inpatient ward's lack of achievement in 2022 is the closure of several inpatient rooms due to the construction of the new RSI Surabaya Tower building, reducing the ward's capacity from 167 to 132 beds. Construction of the Tower Building was completed in 2023, with the number of beds increasing to 238 due to the addition of

QANUN MEDIKA
Jurnal Kedokteran
Fakultas Kedokteran FKUM Surabaya
http://journal.um-surabaya.ac.id/index.php/qanunmedika

new inpatient rooms. However, this additional bed has not increased the inpatient ward's achievement in 2023 because the number of targets has also increased. This research is motivated by changes in bed availability, which have the potential to affect service availability for the community.

This study shows that research on the effectiveness of inpatient services using the Barber–Johnson approach has been conducted in several hospitals, but most studies have focused solely on evaluating indicators without accounting for the dynamics of significant changes in bed capacity. In addition, these studies generally observe stable hospital operational conditions in terms of bed availability, so they do not describe the context of hospitals that experience drastic changes in capacity over a relatively short period. To date, no studies have been found that specifically examine how changes in bed availability resulting from renovations or new construction affect the efficiency of inpatient services using Barber-Johnson graphs. Previous research in Surabaya, namely at the 05.08.05 Mother and Child Hospital in 2022, showed that the ALOS value met the Barber-Johnson ideal standard, but the BOR, TOI, and BTO indicators in the first and second quarters did not meet the ideal standard. This indicates that there are research gaps that have not yet been filled and warrant further exploration.

The findings of this study, particularly those related to the effectiveness of inpatient services, are expected to be used to assess the level of service efficiency at RSI Surabaya, as well as to evaluate the efficiency of RSI Surabaya's inpatient services in 2022-2023 based on bed utilization indicators (BOR, ALOS, TOI, and BTO) using the Barber-Johnson graphical approach. Thus, this study is expected to provide empirical evidence regarding the effectiveness of bed utilization at RSI Surabaya during that period and support the development of strategies to improve the quality of inpatient services in the following period.

METHODS

The design of this study is an observational-analytic, quantitative approach. Data analysis was performed descriptively to describe bed management indicators (BOR, ALOS, TOI, and BTO) at RSI Surabaya in 2022 and 2023, and to evaluate the effectiveness of inpatient services using the Barber Johnson approach at RSI Surabaya in 2022 and 2023.

The research was conducted from February to October 2025 using aggregate secondary data from hospitals, including the number of visits, total beds, number of days of treatment, and total days of treatment in inpatient wards in 2022 and 2023. The sample in this study was the total population data in 2022 and 2023.

The univariate analysis in this study was presented as frequency distributions. Then, bivariate analysis was performed descriptively and comparatively to examine the association between indicator values and inpatient service efficiency (BOR, ALOS, TOI, and BTO) between 2022 and 2023. Meanwhile, multivariate analysis was conducted conceptually using the Barber-Johnson graphical approach, considering the simultaneous relationships among BOR, ALOS, TOI, and BTO to assess bed utilization efficiency.

All data used have obtained ethical approval from the Islamic Hospital (RSI) Surabaya, No. 177.EC.KEP.RSIAY.02.25. Data access was granted with the approval of the Surabaya RSI administration, and all data information will be kept confidential. The analysis was performed using Microsoft Excel software. The analysis results are presented as calculations and graphs of BOR, ALOS, TOI, and BTO using the Barber-Johnson approach.

QANUN MEDIKA
Jurnal Kedokteran
Fakultas Kedokteran FKUM Surabaya
http://journal.um-surabaya.ac.id/index.php/qanunmedika

RESULTS

Indicators of a hospital's services can be seen from BOR, ALOS, TOI, and BTO. BOR is an indicator used to measure hospital bed utilization over a given period. ALOS is an indicator that shows the average length of patient care days in a hospital during a given period. TOI is an indicator that shows the average number of empty bed days in a certain period, and BTO is an indicator that shows the frequency of hospital bed usage in a certain period (Rosy, Agustin, and Pujilestari 2024). Based on this, it is clear that hospital service indicators (BOR, ALOS, TOI, BTO) are closely related to bed availability.

Based on medical records from RSI Surabaya in 2022-2023, the total number of patients and the values of indicators for hospital inpatient ward services, including BOR, ALOS, TOI, and BTO, were obtained (Table 1).

Based on Table 1 above, the number of inpatients at RSI Surabaya in 2023 increased by 3,416 patients compared to 2022. This study presents only comparative data for 2022 and 2023 because 2021 was still affected by COVID-19, which could have introduced bias.

The Bed Occupancy Rate (BOR) for each year is calculated using the following formula: BOR = (number of days of care in a year / (number of beds × number of days in a period)) × 100%. Based on the above information, the BOR value decreased by 11.26% from 2022 to 51.13% in 2023. This condition indicates that the bed utilization rate is lower than the previous year, suggesting that many beds remain underutilized. Using the formula ALOS = total days of care/number of discharges (alive + dead), the ALOS value for each year is calculated by adding up all of the treatment days of all inpatients during a given year and dividing that total by the number of patients discharged (alive or dead) during that same year. According to the table above, the ALOS decreased by 0,06 days to 2,45 days between 2022 and 2023, indicating that the average patient stay was shorter than in 2022. This might suggest that patients are released earlier.

TOI per year is obtained based on the formula: TOI = ((number of beds x number of days in a period) - number of days of treatment) / number of patients discharged (alive + dead). In TOI, the waiting time increased from 1,11 to 2,6 days, indicating that the waiting time for an empty bed in 2023 is longer than in 2022. The BTO value for each year is obtained by dividing the number of discharged patients (both living and dead) by the number of available beds, then multiplying by the number of days in a year. BTO formula = (number of discharges (alive + dead) / number of beds available) x number of days in one year. The number of days in a

Table 1. Number of Patients and Values of BOR, ALOS, TOI, and BTO at the RSI Surabaya Inpatient Ward in 2022 and 2023

Year	Total Beds	Number of Patients	Number of Treatment Days	Total Days of Care	BOR	ALOS	TOI	BTO
2022	132	11.200	30177	30258	62.39%	2.51	1.49	91.4
2023	238	14.616	38075	38029	51.13%	2.45	2.6	72.3

Source: RSI Surabaya Aggregate Secondary Data Recap

QANUN MEDIKA
Jurnal Kedokteran
Fakultas Kedokteran FKUM Surabaya
http://journal.um-surabaya.ac.id/index.php/qanunmedika

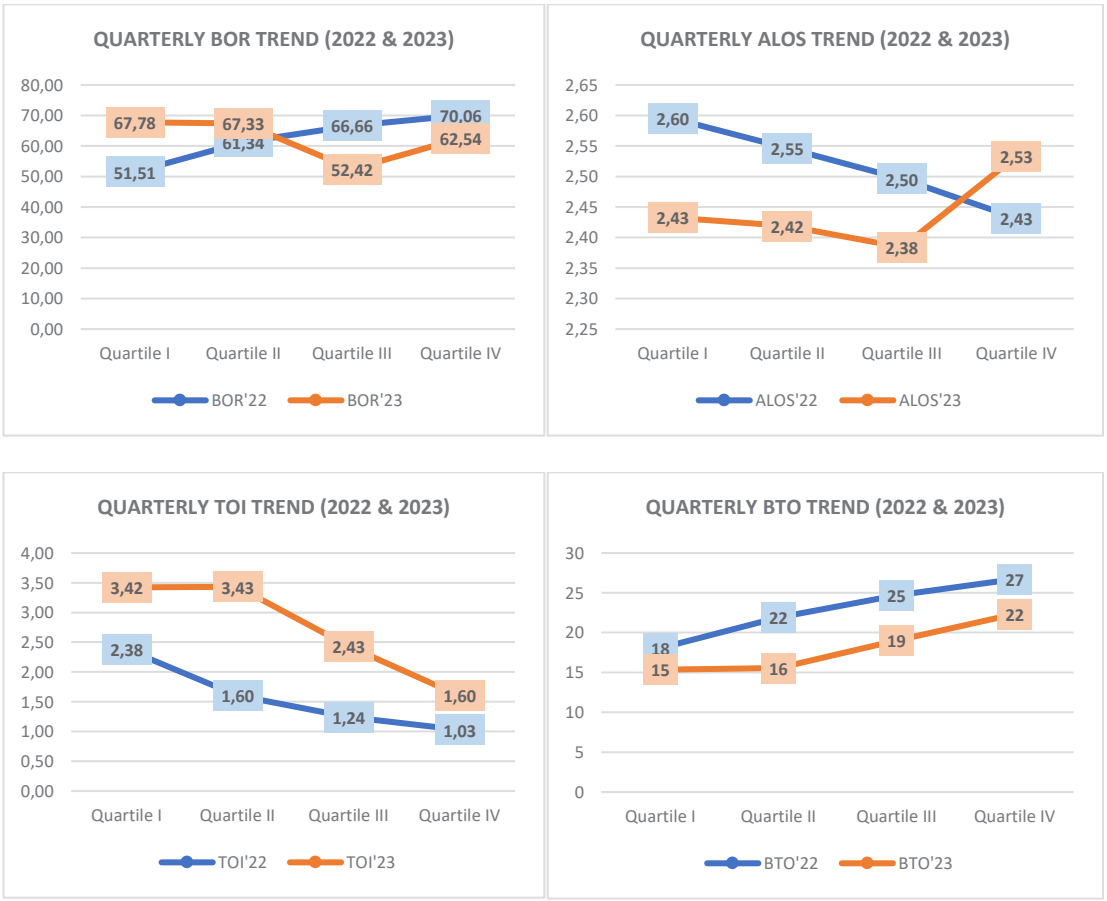

Figure 1. Quarterly Trends for BOR, ALOS, TOI, and BTO in 2022 and 2023

one-year period is 365. The table above shows a decrease in BTO from 2022 to 2023, from 91,4 times to 72,3 times. This indicates that the number of patients using beds in 2023 was lower than in 2022, which could be due to an increase in bed capacity.

In 2022, inpatient service indicators showed consistent improvements in efficiency. ALOS declined from the first to the fourth quarters; TOI continued to decline; BTO increased gradually; and BOR continued to rise. This pattern reflects more optimal bed utilization with shorter hospital stays and faster bed turnover. In contrast, in 2023, the indicator pattern was more volatile. ALOS was relatively stable in the first three quarters but increased in the fourth quarter, suggesting a possible rise in case complexity at year-end. Higher TOI at the beginning of the year, then declined sharply until the fourth quarter, indicating an increase in bed utilization efficiency in the second half of the year. BTO continued to increase throughout the year, though lower than in 2022, while BOR fluctuated, with a significant decline in the third quarter before increasing again. These conditions indicate that the efficiency and consistency of inpatient services in 2023 were not as optimal as in 2022.

These indicators can be presented using the Barber Johnson graph to determine the level of service efficiency in the hospital. The following is a Barber Johnson graph of the indicators

QANUN MEDIKA
Jurnal Kedokteran
Fakultas Kedokteran FKUM Surabaya
http://journal.um-surabaya.ac.id/index.php/qanunmedika

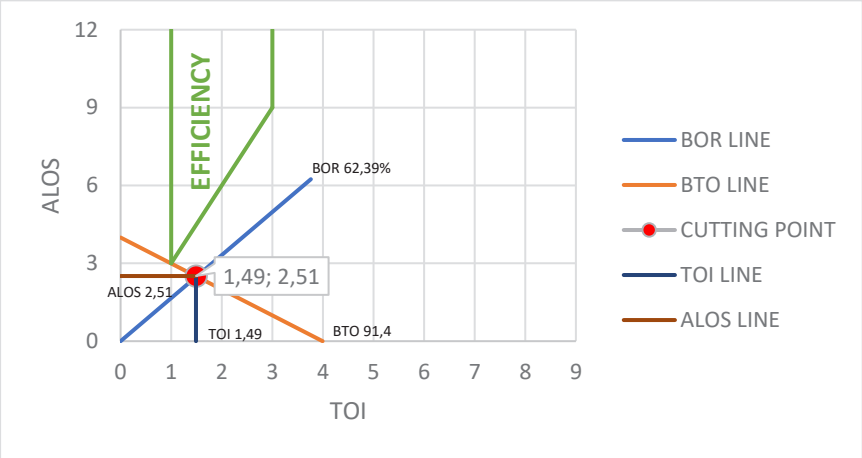

Figure 2. Barber Johnson Graph of RSI Surabaya Inpatient Ward Services Year 2022

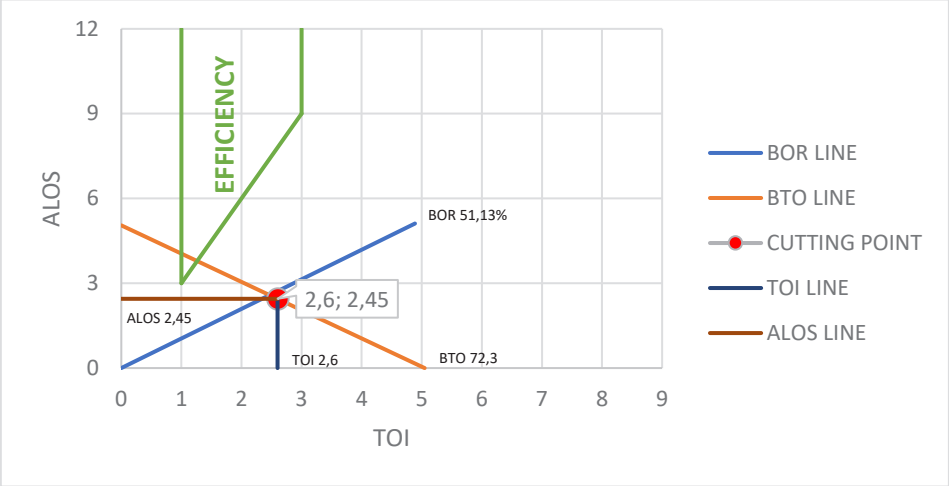

Figure 3. Barber Johnson Graph of Inpatient Ward Services RSI Surabaya Year 2023

BOR, ALOS, BTO, and TOI in 2022 (Figure 1) and 2023 (Figure 2) at the RSI Surabaya inpatient ward.

The 2022 RSI Surabaya inpatient ward service's Barber Johnson graph displays a BOR value of 62,39%, indicating that the hospital's bed capacity is 62,39%. With an ALOS of 2,51 days, patients typically stay in the hospital for 2 to 3 days. The BTO value is 91,4 times, meaning that each bed is used on average 91–92 times in a year, and the TOI value is 1,49 days, meaning that the average waiting time for an empty bed before it is used by the next patient is 1-2 days. Additionally, the graph demonstrates that the four indicators converge at a single intersection point located at coordinates 1,49 and 2,51. The cut-off point is outside the Barber Johnson efficiency area, indicating that RSI Surabaya's bed utilization efficiency was not yet optimal in 2022.

Barber Johnson claims that although the TOI reached the ideal value of 1-3 days and a very high BTO value (>30 times) was obtained, the BOR value on the graph was below ideal (<75%) and the ALOS value was low (<3 days). Even though bed utilization rates are typically

QANUN MEDIKA
Jurnal Kedokteran
Fakultas Kedokteran FKUM Surabaya
http://journal.um-surabaya.ac.id/index.php/qanunmedika

low, a short TOI shows that beds are always refilled promptly. Beds are rapidly emptied and can be used more frequently (high BTO) when the ALOS is short

The 2023 RSI Surabaya inpatient ward service's Barber Johnson graph displays a BOR value of 51,13%, indicating that the hospital's bed capacity is 51,13%. With an ALOS of 2,45 days, patients typically stay in the hospital for 2 to 3 days. The BTO value is 72,3 times, meaning that each bed is used on average 72-73 times in a year, and the TOI value is 2.6 days, meaning that the average waiting time for an empty bed before it is used by the next patient is 2-3 days. The cut-off point value of the four indicators is (2,6; 2,45), and they nearly meet (approach) at a single intersection. The position of this cut-off point is outside the Barber Johnson efficiency area, indicating that RSI Surabaya's bed utilization efficiency was not yet optimal in 2023, as in the previous year. Based on Barber Johnson, the BOR value on the graph is less than ideal (<75%), the ALOS value is low (<3 days), the TOI value has met the ideal range (1-3 days), and the BTO value is very high (>30 times).

The 2023 RSI Surabaya inpatient ward service's Barber Johnson graph displays a BOR value of 51,13%, indicating that the hospital's bed capacity is 51,13%. With an ALOS of 2,45 days, patients typically stay in the hospital for 2 to 3 days. The BTO value is 72,3 times, meaning that each bed is used on average 72-73 times in a year, and the TOI value is 2.6 days, meaning that the average waiting time for an empty bed before it is used by the next patient is 2-3 days. The cut-off point value of the four indicators is (2,6; 2,45), and they nearly meet (approach) at a single intersection. The position of this cut-off point is outside the Barber Johnson efficiency area, indicating that RSI Surabaya's bed utilization efficiency was not yet optimal in 2023, as in the previous year. Based on Barber Johnson, the BOR value on the graph is less than ideal (<75%), the ALOS value is low (<3 days), the TOI value has met the ideal range (1-3 days), and the BTO value is very high (>30 times),

DISCUSSION

Service efficiency in hospitals is a crucial aspect of healthcare that helps ensure optimal use of resources and facilities without compromising the quality of patient care. Barber Johnson graph is one of the methods used to analyze the efficiency of bed management, using four parameters. This efficiency level calculation uses the parameters of BOR, ALOS, TOI, and BTO (Simanjuntak, E. & Angelia, C., 2019), which is statistically described by a cut-off point. A hospital that has a cut-off point in the Barber Johnson efficiency region means that it has optimal bed utilization without causing overcrowding or long waiting times for patients, while a hospital that has a cut-off point outside the efficiency region indicates an imbalance in the inpatient management system, such as too low occupancy rate or too long duration of hospitalization, which may affect the effectiveness of health services (Rizaldy, M., et al, 2021).

Based on the results of statistical calculations using the Barber Johnson graph for inpatient rooms at RSI Surabaya in 2022 and 2023, it can be seen that the BOR value has not reached the ideal value, with a result of <75%. The BOR value on the graph also shows a decrease from 62.39% in 2022 to 51.13% in 2023, even though the number of inpatients increased from 11,200 in 2022 to 14,616 in 2023, but the number of beds increased from 132 beds in 2022 to 238 beds in 2023 as a result of construction activities. The higher the BOR value, the higher the bed utilization rate. Conversely, if the BOR value is low, the hospital's bed utilization rate is also low, which

QANUN MEDIKA
Jurnal Kedokteran
Fakultas Kedokteran FKUM Surabaya
http://journal.um-surabaya.ac.id/index.php/qanunmedika

can lead to a decrease in economic income (Wirajaya, M. & Tunas, I., 2023). A low BOR indicates underutilization of hospital facilities, while a high BOR indicates high utilization (Widiyanto & Wijayanti, R., 2020). It shows that ALOS is still not ideal because it has a value of <3 days. The ALOS on the graph also shows a decrease from 2022 of 2,51 days to 2,45 days in 2023. This decrease in ALOS indicates that patients spend less time at RSI Surabaya. A decrease in ALOS can indicate an increase in the efficiency of inpatient services, patients can recover faster or get a more effective treatment process, or a policy regarding the maximum number of days for inpatient care provided by the National Health Insurance and BPJS (Reppond, Flavin, and Albaum 2024). It shows that the TOI value is ideal, falling between 1 and 3 days. There is a change in the TOI value from 2022 (1,49 days) to 2023 (2,6 days), which means that the time bed is not filled becomes longer, so that there is a decrease in the use of the bed in one year, even though it is still within the ideal value. It shows that the BTO rate in the inpatient ward of RSI Surabaya in 2022 and 2023 was excessively high and not yet ideal (>30 times). The BTO value of 91,4 times in 2022 and 72,3 times in 2023 still reflects an excessively high rate, despite a decline over the year. The high BTO rate at RSI Surabaya indicates that hospital beds are being rapidly cycled, possibly due to a short ALOS, which quickly fills beds.

Analysis of inefficiency factors on the Barber Johnson chart using 6M and Environment (Barber et al. 2022)of data from the Surabaya RSI perspective, as follows:

1. Man

From a human resources perspective, the decrease in ALOS indicates that medical and paramedical personnel at RSI Surabaya are relatively capable of providing effective services, enabling patients to undergo shorter hospital stays. This contrasts with doctor visit timeliness, which was only 63.2% in 2022 and 68.4% in 2023. Effective communication and good teamwork among healthcare staff that reflect the competence and coordination between healthcare personnel contribute to better teamwork, which in turn can improve the overall efficiency of patient services (Meneses-la-riva et al. 2025)

2. Money

Financing refers to the availability, management, and sustainability of hospital funding sources used to support operations and investments in the construction and development of hospital facilities. It is also related to efficiency in increasing bed utilization (Afrila and Simarmata 2025). The construction of a new building at RSI Surabaya significantly increased the number of beds by 80.3% from 132 to 238. The decline in BOR over 1 year may be due to the addition of bed capacity, which increased faster than the increase in patient visits, which was only 30.5% from 11,200 to 14,616 in the RSI Surabaya inpatient ward.

3. Material

In terms of materials, the facilities at RSI Surabaya are quite complete and function well, thereby having a positive impact on patient satisfaction. The construction of a new building at RSI Surabaya has also significantly increased the number of beds. Adequate facilities and supporting infrastructure are important components in providing smooth and optimal inpatient services without operational obstacles (Rande et al., 2023). However, because the completeness of the facilities, especially the addition of beds, has not been accompanied by a comparable increase in the number of inpatients, this has resulted in a low BOR, which may be caused by an increase in TOI (Resmiani, Wirajaya, & Putu Ika F, 2022).

QANUN MEDIKA
Jurnal Kedokteran
Fakultas Kedokteran FKUM Surabaya
http://journal.um-surabaya.ac.id/index.php/qanunmedika

4. Machine

From a technical perspective, the inpatient service support system is not yet optimal in supporting bed management. This is evident in the system's limited performance in providing real-time bed availability data, resulting in less effective monitoring, planning, and decision-making processes related to bed utilization. In addition, the hospital management information system (SIMRS) continues to undergo frequent maintenance, which impacts access and the smooth operation of inpatient services. On the other hand, problems also occur with unstable internet connections. Frequent network disruptions, mainly due to unfavorable weather conditions, disrupt access to SIMRS and other support systems. This condition can reduce service efficiency. The use of SIMRS in the implementation of bed management should improve the efficiency and accuracy of inpatient bed management (Tallupadang and Veranita 2024).

5. Method

From a methodological perspective, health service policies and the implementation of care standards, especially for JKN and BPJS patients, contribute to low ALOS values. Most inpatients at RSI Surabaya use the BPJS national health insurance service, according to observations (90.4% in 2022 and 92% in 2023), which may be related to shorter hospital stays. This is in line with previous research findings that JKN services that comply with ALOS standards for inpatient care have lower ALOS values (Efisiensi et al. 2021). Implementing inpatient care standards improves service efficiency but indirectly affects other indicators, such as BOR and BTO. The combination of high BTO with a decrease in BOR and ALOS may indicate an imbalance in bed utilization (Aloh et al. 2020). This imbalance may indicate an oversupply of beds or suboptimal utilization, where beds are not being used optimally (Athirah et al. 2024).

6. Market

In terms of marketing, the hospital has a dedicated team that handles marketing activities and runs various promotional programs, including room rate promotions (Masithoh, Setianto, and Dhamanti 2022). However, these efforts are considered insufficient to significantly increase the number of general patients, resulting in a disparity between the number of BPJS patients and executive patients. This situation affects the bed occupancy rate (BOR).

7. Environmental

From an environmental perspective, RSI Surabaya is located in a relatively small radius surrounded by several competing hospitals, including ST. Vincentius a Paulo-RKZ Surabaya Catholic General Hospital (type B), William Booth Hospital (still type C), and RSAL (type A), which is located across the street. All hospitals around RSI Surabaya are also known to serve general patients and BPJS patients.

Overall, the Barber Johnson indicator analysis shows that the efficiency of inpatient services at RSI Surabaya in 2022–2023 is not yet fully optimal. The decline in BOR and ALOS, accompanied by an increase in the number of beds and inpatients, indicates an imbalance in bed utilization. Although the TOI value remains within the ideal range, the upward trend indicates that beds are remaining vacant for longer periods. In addition, the BTO value remains too high, reflecting the high patient turnover due to relatively short hospital stays. This condition confirms the need to evaluate and improve bed management and inpatient capacity planning to make the utilization of hospital resources more effective and balanced.

The limitations of this analysis are descriptive and use the Barber Johnson method, so this study does not consider service quality or the workload of health workers. The Barber

QANUN MEDIKA
Jurnal Kedokteran
Fakultas Kedokteran FKUM Surabaya
http://journal.um-surabaya.ac.id/index.php/qanunmedika

Johnson method focuses on the operational efficiency of bed utilization, so it does not evaluate clinical outcomes and service quality, such as patient satisfaction levels (Nisak and Cholifah, 2020). In addition, indicator calculations are highly dependent on data accuracy, so recording errors can bias the interpretation of results. Therefore, additional supporting data is needed to complement the findings of this study, including nosocomial infection rates, service quality indicators, patient satisfaction levels, and healthcare worker workload, so that the assessment of hospital service efficiency can be carried out more comprehensively and in greater depth.

CONCLUSION

Based on data and analysis results in the Surabaya RSI inpatient ward in 2022 and 2023, it is known that the BOR value tends to be low (<75%), ALOS is relatively short (<3 days), TOI is within the ideal range (1–3 days), and BTO is relatively high (>30 times). These conditions indicate that the BOR, ALOS, and BTO indicators have not met the ideal standards according to the Barber Johnson criteria. The points plotted on the Barber Johnson graph are outside the efficiency zone, indicating that bed utilization in 2022 and 2023 remains suboptimal.

Therefore, planned and continuous improvement efforts are needed and can be considered by hospital management to improve the efficiency and quality of inpatient services. The following efforts can be made by optimizing referral flows and adjusting bed distribution between inpatient rooms to increase inpatient capacity utilization, evaluating clinical pathways and patient discharge policies to ensure that the length of stay is in line with clinical needs and reduces the risk of readmission, strengthening existing bed management and patient admission coordination to keep bed waiting times under control, and redesigning inpatient capacity and service patterns.

REFERENCES

Afrila, Febria.R, and Simarmata.M. 2025. "Perencanaan Pembiayaan Kesehatan di Rumah Sakit" Desentralisasi: Jurnal Hukum, Kebijakan Publik, dan Pemerintahan,Vol. 2 No. 3 Agustus 2025. https://doi.org/10.62383/desentralisasi.v2i3.9

Aloh, Henry E., Obinna E. Onwujekwe, Obianuju G. Aloh, and Chijioke J. Nweke. 2020. "Is Bed Turnover Rate a Good Metric for Hospital Scale Efficiency ? A Measure of Resource Utilization Rate for Hospitals in Southeast Nigeria." *Cost Effectiveness and Resource Allocation* 1–8. doi: 10.1186/s12962-020-00216-w.

Anon. 2020. "Bahwa Peraturan Menteri Kesehatan Nomor 30 Tahun 2019 Tentang Klasifikasi dan Perizinan Rumah Sakit Perlu Disesuaikan dengan Perkembangan Dan Kebutuhan Hukum;" (3):1–80.

Athirah, Zahra, Ulil Kholili, Nur Maimun, Wen Via Trisna, and Siti Hasanah. 2024. "Berdasarkan Grafik Barber Jhonson di Rumah Sakit Umum Daerah Petala Bumi Provinsi Riau Tahun 2018 – 2020." 03:30–45.

Barber, Grafik, Johnson Di, Rumah Sakit, and Asy-syifa Sambi Pada Tahun. 2022. "Journal Health Information Management Indonesian (JHIMI) Journal Health Information Management Indonesian (JHIMI)." 01(02).

Dian Fitriani. 2022. "Efisiensi Pelayanan Ruang Isolasi Covid-19 Berdasarkan Teori Barber Johnson." 13:77–82. DOI: Http://Dx.Doi.Org/10.33846/Sf13114

QANUN MEDIKA
Jurnal Kedokteran
Fakultas Kedokteran FKUM Surabaya
http://journal.um-surabaya.ac.id/index.php/qanunmedika

Fitriani, Zulva, Fitria Aryani Susanti, and Hedy Hardiana. 2024. "Efisiensi Pengelolaan Tempat Tidur Instalasi Rawat Inap Menggunakan Grafik Barber Johnson di Rumah Sakit X Tahun 2023." 7(1):10–17.

Resmiani.M.K.P., Wirajaya.M.K.M., Farmani. P.I., 2021. "Analisis Efisiensi Rawat Inap di Bali Royal Hospital dengan Pendekatan Barber Johnson", Universitas Bali Internasional.136-50.

Rosy, Neng, Agustin J, et al., 2024. "Analisis Efisiensi Penggunaan Tempat Tidur Pada Unit Pelayanan Rawat Inap Gedung a Berdasarkan Grafik." 5(September):7138–51.

Issue, S., Santi Rande, Kus Indarto, and Aji Ratna Kusuma. 2023. "Jurnal Aisyah : Jurnal Ilmu Kesehatan The Quality of Health Services and Hospital Facilities to the Satisfaction of the Community in the Hospital." 8:375–80. doi: 10.30604/jika.v8iS1.2315.

Kemenkes RI. 2013. "Peraturan Menteri Kesehatan RI Nomor 82 Tentang Sistem Informasi Manajemen Rumah Sakit." *Peraturan Menteri Kesehatan* (87):1–36.

Made.K. et al., 2022. "Efficiency of Beds Use in Covid-19 Isolation Inpatient Room at Udayana University" Hospital Program Studi Manajemen Informasi Kesehatan, Universitas Bali Internasional, 1–16.

Masithoh, Annisa Alfinur, Budhi Setianto, and Inge Dhamanti. 2022. "Strategi Pemasaran Di RSI Surabaya Ahmad Yani Berdasarkan Pendekatan New Wave Marketing Marketing Strategy at RSI Surabaya Ahmad Yani Based on New Wave Marketing Approach." 1–12.

Meneses-la-riva, Monica Elisa, Víctor Hugo Fernández-bedoya, Josefina Amanda Suyo-vega, Hitler Giovanni Ocupa-cabrera, Rosario Violeta Grijalva-salazar, and Giovanni Deus Ocupa-meneses. 2025. "Enhancing Healthcare Efficiency : The Relationship Between Effective Communication and Teamwork Among Nurses in Peru."

Menteri Kesehatan RI. 2020. "Peraturan Menteri Kesehatan Nomor 30 Tahun 2019 Tentang Klasifikasi dan Perizinan Rumah Sakit Perlu Disesuaikan dengan Perkembangan dan Kebutuhan Hukum;" (3):1–80.

Press and Umsida, 2020. Universitas Muhammadiyah Sidoarjo. n.d. *Buku Ajar Statistik Di Fasilitas Pelayanan*.

Reppond, Alexander M., Nicholas Flavin, and Michael N. Albaum. 2024. "Process Improvement Initiative to Reduce Average Length of Stay in a Community Hospital – A Preliminary Report." 6(2). doi: 10.46804/2641-2225.1197.Process.

Resmiani.M.K.P., Wirajaya.M.K.M., Farmani. P.I., 2021. "Analisis Efisiensi Rawat Inap di Bali Royal Hospital dengan Pendekatan Barber Johnson", Universitas Bali Internasional.136-50.

Rizaldy, Mohammad Naufal Ikhsan, Ramdan Maulana, and Leni Herfiyanti. 2021. "Implementasi Grafik Barber Johnson Pada Aplikasi Microsoft Excel Di Rsud Cililin." *Jurnal Kesehatan Tambusai* 2(3):50–56. doi: 10.31004/jkt.v2i3.1947.

Rosy, Neng, Agustin J, et al., 2024. "Analisis Efisiensi Penggunaan Tempat Tidur Pada Unit Pelayanan Rawat Inap Gedung a Berdasarkan Grafik." 5(September):7138–51.

Simanjuntak, Esraida, and Clara Angelia S. 2019. "Analisa Indikator Rawat Inap Periode Tahun 2017-2018 Di Rumah Sakit Sinar Husni Medan." *Jurnal Ilmiah*

QANUN MEDIKA
Jurnal Kedokteran
Fakultas Kedokteran FKUM Surabaya
http://journal.um-surabaya.ac.id/index.php/qanunmedika

Perekam Dan Informasi Kesehatan Imelda (JIPIKI) 4(2):614–19. doi: 10.52943/jipiki.v4i2.84.

Tallupadang, Deivita Patintingan, and Mira Veranita. 2024. "Efektivitas Penerapan Sistem Informasi Manajemen Rumah Sakit Dalam Implementasi Bed Management Rawat Inap Di Rumah Sakit X." 4.

Tk, Bhayangkara, I. I. Sartika, and Asih Bandung. 2025. "Meningkatkan Mutu Pelayanan Di Rumah Sakit." 19(2):2022–25.

Widiyanto, Widiyanto, and Rossalina Adi Wijayanti. 2020. "Analisis Faktor Penyebab Rendahnya Bed Occupancy Rate (BOR) Di Rumah Sakit Mitra Medika Kabupaten Bondowoso." *J-REMI : Jurnal Rekam Medik Dan Informasi Kesehatan* 1(4):529–36. doi: 10.25047/j-remi.v1i4.2060.

Wirajaya, Karma Maha. 2023. "Analisis Efisiensi Rawat Inap Di Bali Royal Hospital Dengan Pendekatan Barber Johnson." *Jurnal Manajemen Kesehatan Yayasan RS.Dr. Soetomo* 9(1):136. doi: 10.29241/jmk.v9i1.1412.

Zulva Fitriani, Fitria Aryani Susanti, and Hedy Hardiana. 2024. "Efisiensi Pengelolaan Tempat Tidur Instalasi Rawat Inap Menggunakan Grafik Barber Johnson Di Rumah Sakit X Tahun 2023." *Jurnal Manajemen Informasi Dan Administrasi Kesehatan (JMIAK)* 7(1):10–17. doi: 10.32585/jmiak.v7i1.5058.