

Analysis of Bed Utilization Efficiency in Neurological Inpatient Rooms Based on Barber Johnson Charts at the Baubau City Regional General Hospital

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A B S T R A C T

The Barber Johnson Graph (BJG) is an analytical method used to assess the efficiency level of hospital management, particularly in relation to inpatient bed utilization. This study was conducted at BLUD RSUD Kota Baubau in 2025, focusing on the neurology inpatient ward. The objective was to evaluate the efficiency of bed use by comparing the BJG indicators between the first and second quarters. A quantitative research method with a descriptive approach was applied, while data collection techniques included interviews, observations, and document reviews. The instruments used consisted of interview guidelines, observation sheets, and documentation forms. The analysis was carried out using four main indicators: Bed Occupancy Ratio (BOR), Average Length of Stay (AvLOS), Turn Over Interval (TOI), and Bed Turn Over (BTO). The findings revealed an increase in BOR from 49.5% in the first quarter to 67.0% in the second quarter. AvLOS remained stable at 2 days across both periods. TOI decreased from 2 days to 1 day, while BTO showed a significant increase from 21.81 times to 33.45 times. Overall, the results indicate an improvement in bed utilization efficiency in the neurology inpatient ward, although some indicators have yet to reach the optimal standard and therefore require further improvement in subsequent periods.

INTRODUCTION

Efficient inpatient services are an important benchmark in efforts to improve the quality of hospital services, with bed utilization being a key aspect as it has a direct impact on resource management and the smooth flow of services. The number of beds used reflects a hospital's capacity management capabilities; therefore, measuring bed utilization efficiency must be done systematically to support planning and managerial decision-making.(Valentina, 2019). A hospital is a healthcare institution that is built, equipped, and run by healthcare professionals to detect, treat, and cure diseases and injuries in patients, including the provision of emergency care and inpatient care. (Kemenkes RI, 2020). Medical records are systematic records of a patient's health history, including diagnoses, medical procedures, laboratory test results, treatments, and medications, which serve as the basis for patient management, service quality evaluation, and legal evidence (Permenkes RI No 24, 2022).

One instrument for assessing the efficiency of bed utilization is the Barber Johnson Chart (BJC), which integrates four key indicators, namely Bed Occupancy Ratio (BOR), Average Length of Stay (AvLOS), Turn Over Interval (TOI), and Bed Turn Over (BTO). According to (Agustriyani and Rohman, 2020), Measuring these indicators can provide a comprehensive picture of the effectiveness of bed management in inpatient services. Medical records are an important source of data in calculating efficiency indicators.. (Fitriani, 2024) mentioning that proper recording and management of inpatient data enables hospital management to conduct evidence-based evaluation and planning. This is in line with (Lubis and Astuti, 2018) which emphasizes that the quality of daily inpatient census data has a direct impact on the accuracy of hospital statistical information. Health service statistics also form the basis for measuring the efficiency of bed utilization.. (Agustriyani and Rohman, 2020) explains that BOR, AvLOS, TOI, and BTO data are highly relevant as capacity planning indicators, especially in hospitals with fluctuating patient visits. Meanwhile, research by (Lubis and Astuti, 2018) showing

Hospitals that routinely analyze these indicators tend to be better able to maintain a balance between service quality and operational sustainability.

The use of Barber Johnson charts has proven effective in illustrating the efficiency of inpatient care in various hospitals. Research results (Wirajaya, 2023) revealed that the use of GBJ helps management to visually see the achievement of efficiency indicators. In line with that, (Ferdianto, 2023) adding that this graph can also be used as a basis for decision-making in assessing the success of hospital policies. Several previous studies have shown that the use of hospital beds in Indonesia is still efficient. A study by (Sari and Susanti, 2021) at Anna Medika Madura Hospital found that BOR and AvLOS did not meet national standards, although BTO was quite good. Research by (Susanti, 2022) at Cililin Hospital also found that most GBJ indicators were outside the efficient zone. Similarly, research (Pratama, 2018) at Prof. Dr. M. Ildrem Hospital in Medan showed low BOR and high TOI, thereby reducing efficiency levels. This indicates that bed efficiency issues remain a problem in various hospitals.

Based on initial observations in the neurology inpatient ward of the Baubau City Regional General Hospital BLUD from January to June 2025, the four indicators (BOR, AvLOS, TOI, and BTO) did not show efficiency in accordance with the standards on the Barber–Johnson Chart. This condition indicates problems in bed management and patient service flow that could potentially affect service quality, patient satisfaction, and hospital operational effectiveness. Therefore, a more in-depth analysis of the factors causing the low achievement of these indicators is needed in order to formulate appropriate interventions to improve bed utilization efficiency in the neurology inpatient ward.

METHODS

This study applied a quantitative method with a descriptive design and a time series approach. The population studied included all officers who took care of the daily inpatient census in the neurology ward and medical record officers, while the sample consisted of Daily Inpatient Census (SHRI) reports from January to June 2025. The research was conducted at the Baubau City Regional General Hospital BLUD from April to July 2025. The variables studied included bed utilization, Barber Johnson Graph, and indicators of BOR, AvLOS, TOI, and BTO. Data collection techniques were carried out through observation, interviews, and documentation studies using instruments such as observation sheets, interview guidelines, and census documents. The data were processed descriptively to assess the level of efficiency in bed utilization based on the Barber Johnson.

RESULTS & DISCUSSION

Analyzing and Interpreting Bed Occupancy Ratio (BOR) Based on Barber Johnson's Graphical Indicators.

Based on the analysis results, the BOR of the Neurology ward in the first quarter of 2025 was 49%, which is still below the efficiency standard (60–85%). Meanwhile, in the second quarter, it increased to 67%, a rise of almost 20%. Interview results indicate that the low BOR in the first quarter was influenced by fluctuations in the low number of patient visits, limited medical personnel, resulting in some patients being transferred to other wards, and many patients being referred more quickly to other facilities, resulting in an average length of stay of only 5.4 days. On the other hand, the increase in BOR in the second quarter was triggered by an increase in the number of patients, the presence of more severe cases that required a longer average length of stay (7.4 days), more complete medical personnel, and a decrease in referrals. This shows that variations in patient visits, availability of medical personnel, and length of stay are the main factors that affect BOR efficiency during this period.

This finding is consistent with the results of the study. (Ferdianto, 2023) di RSUD Anna Medika Madura, yang menyatakan bahwa penggunaan tempat tidur dinilai belum efisien apabila BOR berada di bawah standar nasional. Dalam penelitiannya, nilai BOR pada Triwulan I hingga III tidak pernah melebihi 30%, dan baru pada Triwulan IV mencapai 53,99%, yang masih belum ideal. Oleh karena itu, BOR sebesar 68,0% pada Triwulan II sudah tergolong baik dan menunjukkan efisiensi yang lebih tinggi dibandingkan dengan kondisi di RSUD Anna Medika.

Furthermore, this improvement is also in line with (FERNIAWAN, 2021) At Dr. Soeroto Ngawi Regional General Hospital, which reported that the BOR value for three consecutive years never

exceeded 64%, namely 57.8% (2018), 63.2% (2019), and 55.1% (2020). The study noted that the low BOR value has resulted in the inefficiency of inpatient services and suggested increasing promotion and improving services as solutions. Thus, the BOR value of 68.0% achieved in Triwulan II dapat dianggap has shown better efficiency when compared to conditions in the hospitals that were the subject of the study.

Thus, the increase in BOR from the first quarter to the second quarter shows a positive trend in the efficiency of bed utilization. If this trend is maintained or improved, hospital services will become more optimal, both in terms of service quality and operational income.

Analyzing and Interpreting Average Length of Stay (ALOS) Based on Barber Johnson's Graphical Indicators.

Based on the analysis results, the average Length of Stay (AvLOS) in the first quarter (January–March) was 2 days, which did not meet the Barber Johnson standard (4–6 days) and indicated that inpatient services were quite efficient. However, in the second quarter (April–June), the average was also 2 days, which was still below the standard and therefore considered inefficient. Interviews revealed that patient distribution in the neurology ward was managed in accordance with the policy of the neurology specialist, whereby a decrease in the number of patients meant that there were no neurological cases requiring treatment, while during busy periods when beds were full, patients were transferred to other wards that still had beds available but continued to be treated by the specialist according to the patient's condition. This indicates that variations in patient numbers and strict distribution policies affect the length of stay, thereby impacting the AvLOS value.

Meanwhile, in the second quarter (April–June), there was an increase in inpatient service efficiency, with total days of care increasing to 681 days and the number of patients discharged reaching 170. Based on this data, the AvLOS value increased to 2.04 days. Although this figure still falls short of the ideal standard, the increase from the first quarter reflects improvements in patient management. Patients were treated for longer periods of time in accordance with clinical needs, indicating an improvement in service quality, case management, or an increase in the complexity of the conditions being treated.

This is in line with research (Ferdianto, 2023) which suggests that AvLOS that is well below the standard (below 3 days) indicates that inpatient service efficiency is not yet optimal. At Anna Medika Madura General Hospital, the AvLOS from the first to fourth quarters ranged from 3.4 to 3.78 days, which is still within the range of efficiency, although it has not reached the 4–6 days standard of the Barber Johnson graph. Thus, the AvLOS of 2.04 days in the second quarter of this study still needs to be improved, but it already shows a positive trend.

In addition, according to (Ferniawan, 2021) An AvLOS that is too short may reflect high pressure to discharge patients immediately, which can interfere with service quality. In his study at Dr. Soeroto Ngawi Regional General Hospital, the AvLOS values for 2019 and 2020 were 3.5 days and 3.6 days, respectively, which are within a more ideal range of efficiency compared to this study. Therefore, the duration of 2.04 days found in the second quarter still needs to be improved to ensure optimal quality of care.

Thus, although the AvLOS in the second quarter has not yet reached the ideal standard, efforts to improve service quality and regular case management evaluations are necessary to ensure that bed utilization efficiency is balanced with optimal medical care quality.

Menganalisis Dan Menginterpretasi *Turn Over Internal* (TOI) Berdasarkan Indikator Grafik Barber Johnson.

Based on the calculations, the Turn Over Interval (TOI) value in the first quarter was recorded at 2 days, which is still within the ideal standard (1–3 days). However, this shows that beds are on average empty for more than 2 days before they can be used again, so their utilization efficiency is not yet optimal. This condition is likely influenced by the time lag in accepting new patients or the low number of visits. Interviews with neurology ward staff revealed that patient distribution fully follows the policies of the neurology specialist DPJP; if there is a decrease in patients, this indicates that there are no cases requiring neurology-related hospitalization. Meanwhile, when beds are full, patients are usually transferred to other care units that still have vacant beds, but remain under the supervision of the DPJP according to the patient's condition. In the second quarter, the TOI value decreased to 1 day, which

is in line with the ideal standard and reflects an increase in efficiency in bed utilization. This decrease was influenced by an increase in the number of patients admitted, proses pelayanan yang lebih cepat, serta pengelolaan distribusi tempat tidur yang lebih baik oleh DPJP dan tim pelayanan.

This is in line with the findings (Ferdianto, 2023), which in his research stated that the TOI value at Anna Medika Madura General Hospital during the first three quarters of 2021 was above the ideal standard ($TOI > 8$ days), and only reached efficiency in the fourth quarter with a TOI value of 2.97 days. This indicates that excessively high TOI values can hinder efficiency, while the decrease in TOI that occurred in the second quarter of this study shows an improvement in bed management.

In the study (Ferniawan, 2021) At Dr. Soeroto Ngawi Regional General Hospital, the TOI value also shows a close relationship with service efficiency. In 2018, the TOI was recorded at 5.5 days (inefficient), but in 2019 it dropped to 2 days and was considered efficient. The study concluded that the decrease in TOI indicates a more effective referral system and bed management. Therefore, the achievement of a TOI of 1.6 days in the second quarter of this study is an indication of the success of inpatient service management.

Thus, the decrease in TOI from 2.04 days to 1.6 days between the first and second quarters shows a significant improvement in bed utilization efficiency. This reflects that the hospital has been able to optimize patient rotation and minimize bed vacancy time, which ultimately contributes to improved service quality and productivity.

Analyzing and Interpreting Bed Turn Over (BTO) Based on the Barber Johnson Graph Indicator

Based on the results, the Bed Turn Over rate in the first quarter was 21.81 times, which exceeded the minimum quarterly standard (around 10 times), indicating excellent bed utilization efficiency. However, in the second quarter, the BTO rate increased to 33.45 times. Information from interviews with neurology ward staff indicated that patient distribution was carried out in accordance with the policy of the specialist neurologist, whereby if patient visits were high and beds were full, patients could be placed in other rooms that still had empty beds but would still be treated by the specialist neurologist according to the patient's condition.

This is in line with research conducted by (Ferdianto, 2023), which states that BTO is one of the important indicators in assessing bed efficiency. In his research, the BTO value for the first to third quarters at Anna Medika Madura General Hospital was below 7 times and only reached 14.42 times in the fourth quarter. This value is still far below the achievements in this study. Thus, a BTO of 33.4 times in the second quarter reflects a very high level of productivity in the utilization of inpatient beds.

In a study conducted by (Ferniawan, 2021) At Dr. Soeroto Ngawi Regional General Hospital, the highest BTO value achieved was only 67 times per year (or around 16–17 times per quarter) in 2019. The researchers concluded that an increase in BTO is directly proportional to patient rotation efficiency, as long as service quality and infection control are maintained. Therefore, the BTO value of 33.4 times achieved in the second quarter of this study exceeded the national and regional averages, indicating excellent service efficiency and productivity.

Thus, the increase in BTO from 21.81 to 33.45 times from the first to the second quarter indicates a significant improvement in inpatient management. Beds are being used more intensively and efficiently, reflecting high service capacity and rapid patient flow. However, it is important to maintain a balance between efficiency and service quality so that increased productivity does not compromise the quality of care provided

CLOSING

The conclusions of this study are based on the results of an analysis of bed utilization efficiency using Barber Johnson Graph (BJG) indicators, namely BOR, AvLOS, TOI, and BTO. In general, there was an increase in bed utilization from the first quarter to the second quarter. This is indicated by the BOR value, which increased from 49.5% to 67.0%, thereby meeting the national efficiency standard. The AvLOS value remained at 2 days in both quarters, although still below the ideal standard, it reflects inpatient management that is sufficiently in line with patient needs. The TOI indicator is within the efficient range (1–3 days). with a decrease from 2 days to 1 day, indicating faster patient turnover. Meanwhile, BTO increased sharply from 21.81 times to 33.45 times, indicating that bed utilization is becoming more optimal. Thus, this study concludes that the efficiency of bed utilization in the neurology

inpatient ward of the Baubau City Regional General Hospital BLUD improved in the second quarter, although some indicators, such as AvLOS, still need improvement to meet ideal standards.

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