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Efficiency Analysis of Bed Occupancy Rate (BOR), Length of Stay (LOS), Turn Over Interval (TOI), and Bed Turn Over (BTO) of Marwa Ward, PKU Muhammadiyah Hospital, Temanggung, Central Java, February 2025

Ahmad Dhanial Prayoga[1], Herman Wahyu Dwi Maelana[2]
Akademi Manajemen Administrasi Yogyakarta[1,2]
dhaniallpray@gmail.com[1], herman@amayogyakarta.ac.id[2]

Abstract

Inpatient care is a service for patients admitted to the hospital using a bed for observation, diagnosis, therapy, medical rehabilitation and other medical support purposes. Inpatients at PKU Muhammadiyah Temanggung Hospital, Central Java are always numerous, so that it can make the percentage of inpatient indicators inefficient. In connection with this, the use of beds can be ascertained to be high. The purpose of this study was to analyze the efficiency of Bed Occupancy Rate (BOR), Length of Stay (LOS), Turn Over Interval (TOI), and Bed Turn Over (BTO) of Marwa Ward, PKU Muhammadiyah Temanggung Hospital, Central Java in February 2025. The population in this study was the recapitulation of the daily census of inpatients in Marwa Ward, and the sample used was a saturated sample, namely the recapitulation of the daily census of inpatients in Marwa Ward during February 2025. The research method used was a quantitative method with a descriptive approach. Data collection used interview techniques, documentation and literature study. The data were analyzed using the calculation formula from the 2011 SIRS Technical Guidelines. The results of this study indicate that the inpatient Bed Occupancy Rate (BOR) indicator demonstrated an efficient percentage (79.04%). Meanwhile, the inpatient Length of Stay (LOS) indicator showed an inefficient rate of 3.3 days. The Turnover Interval (TOI) showed an inefficient rate of 0.78 days, and the Bed Turnover (BTO) indicator showed an inefficient rate of 7.46 times.

Keywords: *efficiency, inpatient indicators, use of bed*

Abstrak

Rawat inap adalah pelayanan terhadap pasien yang masuk ke rumah sakit dengan menggunakan tempat tidur untuk keperluan observasi, diagnosis, terapi, rehabilitasi medik dan penunjang medik lainnya. Pasien rawat inap di Rumah Sakit PKU Muhammadiyah Temanggung, Jawa Tengah selalu banyak, sehingga dapat menjadikan persentase indikator rawat inap tidak efisien. Sehubungan dengan hal tersebut, penggunaan tempat tidurnya dapat dipastikan tinggi. Tujuan dilaksanakannya penelitian ini adalah untuk menganalisis efisiensi *Bed Occupancy Rate* (BOR), *Length Of Stay* (LOS), *Turn Over Interval* (TOI), dan *Bed Turn Over* (BTO) Bangsal Marwa

Rumah Sakit PKU Muhammadiyah Temanggung, Jawa Tengah Bulan Februari Tahun 2025. Populasi dalam penelitian ini yaitu rekapitulasi sensus harian rawat inap Bangsal Marwa, dan sampel yang digunakan adalah sampel jenuh yaitu rekapitulasi sensus harian rawat inap Bangsal Marwa selama bulan Februari tahun 2025. Metode penelitian yang digunakan adalah metode kuantitatif dengan pendekatan deskriptif. Pengumpulan data menggunakan teknik wawancara, dokumentasi dan studi pustaka. Data dianalisis dengan rumus perhitungan dari Juknis SIRS 2011. Hasil penelitian ini menunjukkan indikator rawat inap *Bed Occupancy Rate* (BOR) menunjukkan persentase yang efisien (79,04%). Sedangkan indikator rawat inap *Length Of Stay* (LOS) menunjukkan angka yang tidak efisien sebesar 3,3 hari. *Turn Over Interval* (TOI) menunjukkan angka yang tidak efisien sebesar 0,78 hari, dan *Bed Turn Over* (BTO) menunjukkan persentase yang tidak efisien sebesar 7,46 kali.

Kata kunci *: efisiensi, indikator rawat inap, penggunaan tempat tidur*

Introduction

According to Minister of Health Regulation Number 3 of 2020 concerning Hospital Classification and Licensing, a hospital is a health service institution that provides comprehensive individual health services, including inpatient, outpatient, and emergency care. Improving the quality of health services is a primary focus in maintaining the operational success of hospitals. Bed Occupancy Rate (BOR), Length of Stay (LOS), Turnover Interval (TOI), and Bed Turnover (BTO) are indicators of the efficiency of inpatient facility utilization (Sangkot, Ogitalia, Suryandari, & Wijaya, 2024).

Inpatient care indicators are indicators that aim to determine the level of utilization, quality, and efficiency of inpatient care services, as well as the efficiency of bed use in hospitals. Therefore, to measure this, inpatient care indicators are needed, consisting of BOR (Bed Occupancy Rate), ALOS (Average Length of Stay), TOI (Turn Over Interval), and BTO (Bed Turn Over). The ideal values for inpatient care indicators, according to the Indonesian Ministry of Health, are BOR between 60% and 85%, ALOS between 6 and 9 days, TOI between 1 and 3 days, and BTO between 40 and 50 times (Simanjuntak & Angelia, 2019).

Efficiency is a crucial aspect in the provision of healthcare services in general. Without efficiency, healthcare services can be hampered because hospitals do not optimize their resources. Efficiency is defined as the consistency of the method used to carry out a business or work, in carrying out something without wasting significant energy, time, and costs. Efficiency is also defined as usefulness, appropriateness, and accuracy. Efficiency is also the ability of a person to carry out their duties well and appropriately, namely without wasting energy, time, and costs (Sangkot, Ogitalia, Suryandari, & Wijaya, 2024).

PKU Muhammadiyah Hospital in Temanggung, Central Java is a charitable enterprise owned by the Muhammadiyah Regional Leadership in the health sector, and the position of the General Health Advisory Council (MPKU) is an extension of the Muhammadiyah Regional Leadership as the owner of PKU Muhammadiyah Hospital in Temanggung, Central Java, in carrying out the tasks of managing PKU Muhammadiyah Hospital in Temanggung, Central Java.

Services at PKU Muhammadiyah Hospital in Temanggung, Central Java include outpatient care, inpatient care, laboratory care, radiology, medical rehabilitation, and others. PKU Muhammadiyah Hospital in Temanggung, Central Java is a busy hospital in its daily health services, including inpatient health services.

Theoritical Review

According to the Minister of Health Regulation Number 3 of 2020 concerning Hospital Classification and Licensing, a hospital is defined as a health service institution that provides comprehensive individual health services that provide inpatient, outpatient, and emergency services (Daud, Naue, & Mooduto, 2023).

The provision of inpatient services is a service for patients admitted to hospital for observation, diagnosis, treatment, rehabilitation and/or other health services with an overnight stay in the hospital (RSUD, 2025).

Hospital days are the number of patients present at the time of the census, plus patients admitted and discharged on the same day the census was taken. This equates to bed occupancy with in a 24-hour period. (Rachman & Winarsih, 2021).

Horton and Ifhima explains that available beds are health facility beds available for inpatient care, whether occupied or vacant at any given time. These beds do not include beds in examination rooms, emergency rooms, physical therapy rooms, delivery rooms, and recovery rooms (Hosizah & Maryati, 2018).

The number of patients discharged is the number of patients who left the hospital because they recovered, were referred to another health facility, or died (Ferniawan, p. 2021).

The Indonesian Ministry of Health (2005) explains that the daily inpatient census is the daily recording or counting of inpatients in an inpatient ward. The daily census records the movement of patients in and out of the hospital for 24 hours, from 12:00 AM to 12:00 PM. The goal is to identify and obtain information on all patients admitted and discharged from the hospital during a 24-hour period .

1. *Bed Occupancy Rate* (BOR)

   The Indonesian Ministry of Health (2005) defines the Bed Occupancy Rate (BOR) as the percentage of bed occupancy in a given time period.

This indicator provides an overview of the level of hospital bed utilization. The ideal BOR parameter value is between 60-85%.

2. *Length Of Stay* (LOS)
   The Indonesian Ministry of Health (2005) defines Length of Stay (LOS) as the average length of a patient's stay. This indicator, in addition to providing an indication of efficiency, can also provide a picture of service quality. When applied to specific diagnoses, it can be used as a basis for further observation. In general, the ideal Length of Stay (LOS) is between 6-9 days.
3. *Turn Over Interval* (TOI)
   The Indonesian Ministry of Health (2005) defines Turn Over Interval (TOI) as the average number of days a bed is unoccupied, that is, the time from when a bed is empty after a patient is discharged until it is refilled by a new patient. The ideal standard for Turn Over Interval (TOI) is between 1 and 3 days, where the higher the Turn Over Interval (TOI) number, the longer the bed is unused, which means it is less economically productive for the hospital.
4. *Bed Turn Over* (BTO)
   The Indonesian Ministry of Health (2005) defines Bed Turn Over (BTO) as the frequency of bed use in a period, measured by the number of times the bed is used by the patient. The ideal standard for Bed Turn Over (BTO) is between 40 to 50 times per year, which reflects optimal bed use.

Research Method

This type of research uses a quantitative research method with a descriptive statistical analysis approach. Sugiyono states that quantitative research methods can be defined as research methods based on the philosophy of positivism, used to research specific populations or samples, data collection using research instruments, and quantitative/statistical data analysis, with the aim of testing predetermined hypotheses (Suwarsa & Hasibuan, 2021).

Sugiyono explained that descriptive statistical analysis is statistics used to obtain an overview of the conditions, processes, procedures, and so on of a phenomenon being studied. Descriptive research does not aim to test hypotheses or make generalizations, but only to provide information about the phenomenon being studied (Seubelan & Galathea, 2024).

Ismael Nurdin and Sri Hartati define a hypothesis as a temporary conclusion that is not yet final; a temporary answer; a temporary assumption; which is a researcher's construct regarding a research problem, which states between two or more variables. Gulo explains that a hypothesis is formed from the initial intention of the research, namely to find out something that exists at a certain level is believed to be true by formulating the research problem in the form of a question, then answered with initial thoughts and proven through empirical research (Mulyani, 2021).

The hypotheses in this study are:

1. The efficiency value of the inpatient Bed Occupancy Rate (BOR) indicator in the Marwa Ward, PKU Muhammadiyah Hospital, Temanggung, Central Java, in February 2025 is expected to show an efficient percentage in accordance with the 2011 SIRS Guidelines.
2. The efficiency value of the inpatient Length of Stay (LOS) indicator in the Marwa Ward, PKU Muhammadiyah Hospital, Temanggung, Central Java, in February 2025 is expected to show an efficient percentage in accordance with the 2011 SIRS Guidelines.
3. The efficiency value of the inpatient Turnover Interval (TOI) indicator in the Marwa Ward, PKU Muhammadiyah Hospital, Temanggung, Central Java, in February 2025 is expected to show an efficient percentage in accordance with the 2011 SIRS Guidelines.
4. The efficiency value of the inpatient Bed Turnover (BTO) indicator in the Marwa Ward, PKU Muhammadiyah Hospital, Temanggung, Central Java, in February 2025 is expected to show an efficient percentage in accordance with the 2011 SIRS Guidelines. 2011 SIRS GUIDELINES.

Researchers used all daily inpatient census documents in the Marwa ward during February 2025 as the population used for research.
The sample used in this study was a saturated sample. Sugiyono explained that a saturated sample is one whose number, if increased, would not increase representation and thus would not affect the value of the information obtained (Tristiyanto, Disurya, & Kristina, 2023). The saturated sample used in this study was the number of daily inpatient censuses in the Marwa ward during February 2025.

This research was conducted at PKU Muhammadiyah Hospital, Temanggung, Central Java, specifically in the Marwa ward. The researchers conducted data collection during February 2025.

Research data collection techniques are methods or ways used to collect the information needed in a study or research (Iba & Wardhana, 2023). Several data collection techniques that researchers use to obtain the information or data that researchers need during research, namely interviews, documentation and literature studies.

In conducting the interview, the researcher interviewed Mr. Ahmad Rizky Mubarok as source 1 with the position of medical records officer and Mrs. Dwi Anita Kurniawaty as source 2 with the position of medical records officer from the PKU Muhammadiyah Hospital Temanggung, Central Java.

The data analysis method used in this study was descriptive statistical analysis. Quantitative descriptive is a statistical analysis used to describe, summarize, and analyze quantitative data. Quantitative data is data that can be measured using numbers, such as age, weight, height, and so on (Sudirman, et al., 2023).

Results And Discussion

The following is the recapitulation of the Daily Inpatient Census of the Marwa Ward, PKU Muhammadiyah Hospital, Temanggung, Central Java, for February 2025.

Table 1 Recapitulation Data of SHRI Bangsal Marwa

No	Data	Amount
1	Length of treatment	741
2	Number of days of treatment	664
3	Number of patients discharged (alive + dead)	224
4	Patient died <48 hours	3
5	Patient died >48 hours	1
6	Number of beds	30
7	Number of periods (days)	28

(Source: Secondary Data Processed 2025)

The results of the recapitulation of the Daily Inpatient Census were explained by a source person 1 in the medical records section that is the data obtained from SHRI is then processed by nurses into a daily census recapitulation, which we will obtain, such as the initial number of patients each day. Patients are admitted by class: Class I, II, III. Patients are admitted from the ward. There are many discharges, including those who are discharged alive, those who die within 48 hours, or those who die within 48 hours, and then referred. Then, patients who escape. This data will then be able to calculate the number of days of treatment, the length of stay, and the number of remaining patients in the ward, ultimately resulting in treatment days.

Calculation using the 2011 SIRS JUKNIS formula as follows :

$$BOR = \frac{Number\ of\ Treatment\ Days}{number\ of\ beds\ x\ Number\ of\ Days\ in\ One\ Period}\ x\ 100\%$$

$$BOR = \frac{664}{30\ x\ 28}\ x\ 100\%$$

$$BOR = \frac{664}{840}\ x\ 100\%$$

$$BOR = 79{,}05\%$$

Based on the tabulation above, the percentage of the Bed Occupancy Rate (BOR) indicator shows a percentage of 79.05%, where this percentage shows efficient results in accordance with the 2011 SIRS Technical Guidelines regulations.

$$LOS = \frac{\text{Length of treatment}}{\text{Number of patients discharged (alive + dead)}}$$

$$LOS = \frac{741}{224}$$

$$LOS = 3{,}3\ days$$

Based on the tabulation above, the percentage of the Length Of Stay (LOS) indicator shows a figure of 3.3 days, where this figure shows inefficient results when compared with the 2011 SIRS Technical Guidelines regulations (6 - 9 days).

$$TOI = \frac{(Number\ of\ beds\ x\ Period) - Number\ of\ Treatment\ Days}{\text{Number of patients discharged (alive + dead)}}$$

$$TOI = \frac{(30\ x\ 28) - 664}{224}$$

$$TOI = \frac{840 - 664}{224}$$

$$TOI = \frac{176}{224}$$

$$TOI = 0{,}78\ days$$

Based on the tabulation above, the percentage of the Turn Over Interval (TOI) indicator shows a percentage of 0.78 days, where this figure shows inefficient results when compared with the 2011 SIRS Technical Guidelines regulations (1-3 days).

$$BTO = \frac{\text{Number of patients discharged (alive + dead)}}{number\ of\ beds}$$

$$BTO = \frac{224}{30}$$

$$BTO = 7{,}46 \text{ times}$$

Based on the tabulation above, the percentage of the Bed Turn Over (BTO) indicator shows a percentage of 7.46 times, where this figure shows inefficient results when compared with the 2011 SIRS Technical Guidelines regulations (40-50 times).

The following table shows the calculation results of the inpatient indicators Bed Occupancy Rate (BOR), Length Of Stay (LOS), Turn Over Interval (TOI), and Bed Turn Over (BTO) for the Marwa Ward, PKU Muhammadiyah Hospital, Temanggung, Central Java, in February 2025.

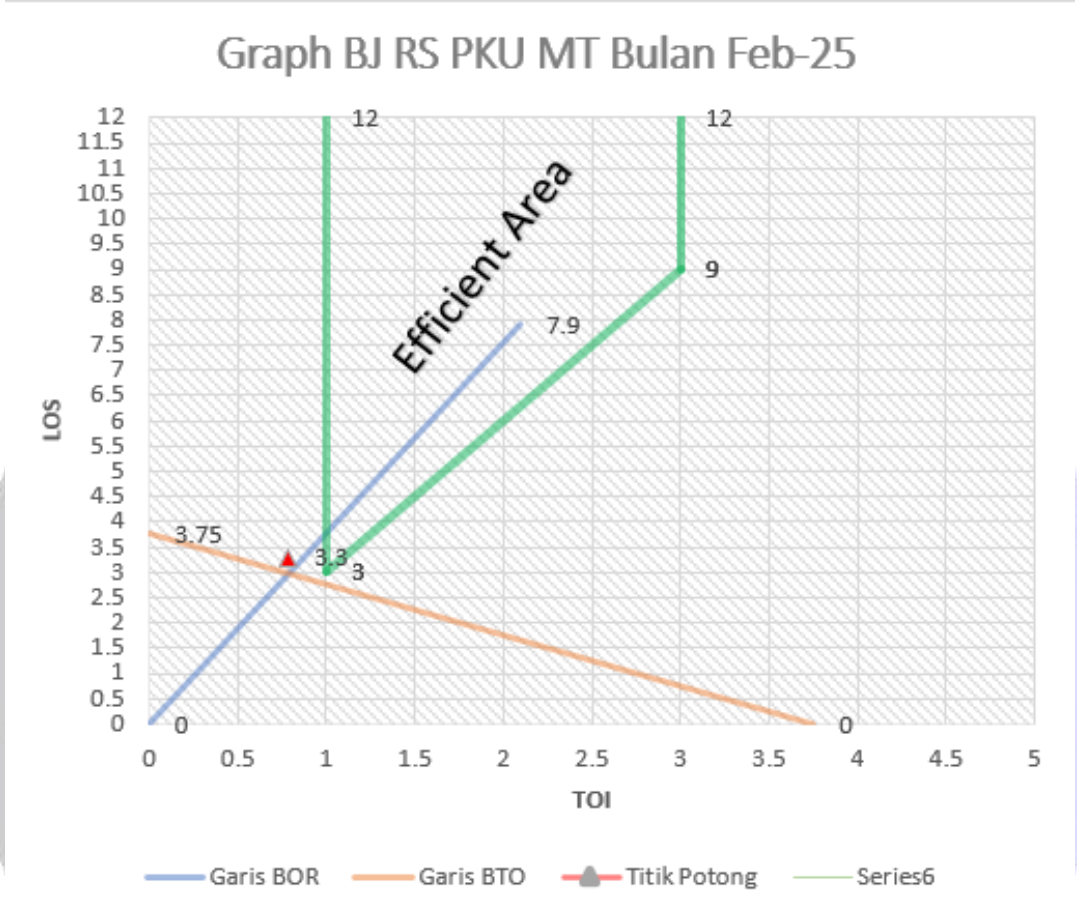
Table 2 Data for Calculation of Inpatient Indicators

No	Indicator	Percentage	Unit	SIRS 2011 Technical Guidelines Standards	Information
1	*Bed Occupancy Rate* (BOR)	79,04	% (percentage)	60-85%	Efficient
2	*Length Of Stay* (LOS)	3,30	Day	6-9 days	Not Efficient
3	*Turn Over Interval* (TOI)	0,78	Day	1-3 days	Not Efficient
4	*Bed Turn Over* (BTO)	7,46	time	40-50 times (in one year)	Not Efficient

(Source: Secondary Data Processed 2025)

Explanation regarding the calculation results of the inpatient indicators Bed Occupancy Rate (BOR), Length Of Stay (LOS), Turn Over Interval (TOI), and Bed Turn Over (BTO) of the Marwa Ward, PKU Muhammadiyah Hospital, Temanggung, Central Java, in February 2025, explained by a resource person 1 and 2 in the medical records section as follows: Sourch person 1 said the process is for the recapitulation to be seen in Excel from the daily census to the recapitulation using Excel. We have entered the formula in Excel here, later for BOR LOS TOI there is already an Excel formula there, then we just need to recap the daily data from SHRI into the monthly recapitulation of the daily census creation, the results will be automatically input, because we have patented the formula in the Excel application. And sourch person 2 said we just need to input the manual form into Excel, so it's automatic because there's already a formula, so we just input the data from the manual.

The following are the results of the calculation of Bed Occupancy Rate (BOR), Length Of Stay (LOS), Turn Over Interval (TOI), and Bed Turn Over (BTO) for the Marwa Ward, PKU Muhammadiyah Hospital, Temanggung, Central Java, in February 2025, presented in the form of a Barber Johnson Graph.



(Source: Secondary Data Processed 2025)

Figure 1 Barber Johnson Marwa Ward Graph

Based on the Barber Johnson Graph above, the meeting point of the inpatient indicators Bed Occupancy Rate (BOR), Length Of Stay (LOS), Turn Over Interval (TOI), and Bed Turn Over (BTO) is obtained, namely meeting at the intersection point coordinates of 0.78, 3.3 where the intersection point indicates the intersection point meeting outside the efficient area.

If the calculation results of each inpatient indicator show efficient results according to the 2011 SIRS Technical Guidelines regulations, then it means that each inpatient indicator shows good performance. If the intersection point in the Barber Johnson graph shows outside the efficient area, then it indicates an imbalance between inpatient indicators. Although the calculation results of the inpatient indicators Bed Occupancy Rate (BOR), Length Of Stay (LOS), Turn Over Interval (TOI), and Bed Turn Over

(BTO) show efficient results, but when presented in the form of a Barber Johnson graph the intersection point is outside the efficient area, then it can be interpreted that the calculation results of the inpatient indicators do not show mutually supportive results that indicate an optimal hospital service system.

The following is an explanation regarding the results of the calculation of the inpatient indicators for the Marwa ward at PKU Muhammadiyah Hospital, Temanggung, Central Java, in February 2025 according to sources from the medical records department, that is sourch person 1 said it depends, so not every month all wards make it efficient. Because efficiency is between 60-80%, perhaps the Ministry of Health varies, but there are wards that are indeed inefficient. If this is what you're looking for in February, thank God, Marwa is mostly efficient at around 70-80%. But other wards, such as the isolation ward and the ICU, are wards that are likely inefficient because their BOR is probably low, not between 60-80% or 70-80%. And the sourch person 2 said that results of inpatient care indicator calculations is not always, the results are not always efficient.

Conclusion

1. The Bed Occupancy Rate (BOR) inpatient indicator shows an efficient percentage of 79.04% in accordance with the 2011 JUKNIS SIRS regulations (60-85%).
2. The Length of Stay (LOS) inpatient indicator shows an inefficient figure of 3.3 days in accordance with the 2011 JUKNIS SIRS regulations (6-9 days).
3. The Turn Over Interval (TOI) inpatient care indicator shows an inefficient figure of 0.78 days in accordance with the 2011 JUKNIS SIRS regulations (1-3 days).
4. The Bed Turn Over (BTO) inpatient indicator shows an inefficient figure of 7.46 times (in one month) in accordance with the 2011 JUKNIS SIRS regulations (40-50 times in one year, 3.33 - 4.16 times in one month).

Recommendation

This study only used one month's data, whereas it should have used a full year's data. The hope and suggestion for future researchers, if they want to conduct research like this, is to use a full year's data.

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