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# **Original Research Article**

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# Analysis of statistic health care as indicators of efficiency service in Semen Padang Hospital through Barber Johnson graph

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## **ABSTRACT**

**Background:** The efficiency of service delivery is very important for hospitals. One measurement of service indicators that can be used is the Barber Johnson graph (GBJ). GBJ is needed to see and measure the level of service efficiency in hospitals. The indicators used are bed occupancy rate (BOR), bed turnover rate (BTR), turnover interval (TI), and length of stay (LOS). This graph can also be used to compare or view hospital developments at different times, and to increase the likelihood of changes in one variable by changing other variables. This research was conducted at Semen Padang Hospital (SPH), Padang, West Sumatera, Indonesia.

**Methods:** The purpose of this study was to determine the statistical value of hospital and hospital service efficiency levels by using the Barber Johnson graphic. This research method is descriptive by direct observation of the medical record file of inpatients since the January to December 2017 period.

**Results:** Statistical data obtained from SPH in 2018 showed the value of service days 30132, and the Number of beds 144 units. From the data processing results obtained a total bed occupancy rate 60.83%, bed turnover rate 6.86 times, turnover interval 2 days and average length of stay 3 days.

**Conclusions:** Statistical data obtained from SPH in 2018 shows the value of BOR, TI is in an efficient, while BTR and LOS are inefficient.

Keywords: Graphic Barber Johnson, Hospital, Medical record, Statistics of efficiency bed usage

### **INTRODUCTION**

The hospital is an information center that organizes health services whose existence is needed by the community. One of the services provided by the hospital is inpatient care. The inpatient data can be used to calculate the efficiency of hospital services. Efficiency is one of the parameters/performance indicators that technically underlies the entire performance of a hospital. Without monitoring efficiency, problems can arise from the management side which leads to deviant actions. <sup>1</sup>

The medical record is an important hospital document, where the data contained in the medical record can be used as a benchmark for the efficiency of hospital services and as a basis for making decisions. Assessment of service efficiency is related to the use of available beds in hospitals. To assess hospital efficiency, Barber Johnson graph can be used by analyzing the area of efficiency. This graph is one of the prerequisites of evaluation by the hospital accreditation team using four parameters namely bed occupancy rate (BOR), bed turnover rate (BTR), turnover interval (TI), average length of stay (ALoS).<sup>2</sup>

In recent decades, the efforts for reducing bed numbers and increasing the usage by patients along with reducing the length of stay and improving the admission process can have an impact on improving hospital performance, which result in lower cost for hospital by rising hospital bed occupancy rate, although that can lead to ascending hospital efficiency and tighter control of cost, but also to complications.<sup>3</sup>

This Barber Johnson graph (GBJ) can be used to compare between several hospitals in an area or several units in the hospital itself in the same period, compare or see the development of hospitals at different times, and to increase the likelihood of changes in a variable by changing other variables. Jhonson Barber area is an area bounded by four indicators/parameters. If all four indicators are combined the result is one point. A hospital can be said to be efficient if that point is in the efficient area of Barber Jhonson. Barber Jhonson's efficient efficiency areas are BOR >75%, TI: 1-3, ALoS >3, and BTR <80.4

Hospital indicators that are not following established standards cause the need for an assessment of the area of efficiency in the hospital. Previous researchers on the efficiency of inpatient services have been carried out by Mardian (2016) in Balung Regional Hospital and found that all inpatient rooms in Balung Regional Hospital are still not efficient in terms of inpatient services. In this study, none of the inpatient rooms had a BOR value that reached Barber Johnson's standards.<sup>1</sup>

At the present, only a view research in hospital efficiency assessments in West Sumatra. Based on this, researcher is interested in conducting the research on statistical calculations and analyzing it with the Barber Jhonson graphic at Semen Padang Hospital (SPH). This hospital has been chosen because it is one of the private hospitals that received a complete level of accreditation in 2017. The purpose of this study was to determine the statistical value of hospital and hospital service efficiency levels by using the Barber Johnson graphic.

#### **METHODS**

This research was conducted during June until August 2019 at Semen Padang Hospital and Apikes Iris Padang. This research using quantitative descriptive method. The data has been taken in three days from abstraction data of inpatient medical records from January to December 2018 obtained from the hospital medical record. Then, the writer continued with statistical analysis of health care as an indicator of service efficiency through Barber Johnson graphic. The calculation and statistical analysis were carried out at Apikes Iris Padang.

The data collection technique used in this study was by direct observation of inpatient medical records in the January-December 2018 period at SPH.

# **Efficiency**

In this study, efficiency measures used GBJ. Method of GBJ uses four indicators (BTO, BOR, LOS and TI). In this graphic there is an area called an area efficient. The efficient area is used for help the reader determine whether with the values of these four parameters, the use of a bed in a hospital already efficient or not. GBJ has efficiency indicators same with indicator that has been determined by the Indonesian Ministry of Health.<sup>5</sup>

#### **RESULTS**

From the data collection, 9772 patients were discharged from January 01 to December 31, 2018, with 144 units of beds. The inpatient census of 29999 patients is obtained with an average census of 87.21 patients. Service days obtained 30132 patients with an average service day of 87.59 patients Table 1. Present the inpatient BOR in 2018 is 60,83 %. The BTR is 67.86 x, the interpretation is that, on average, each hospital bed had 67 occupants during 2018. The ALoS is calculated from the total length of stay. Base on the data, ALoS value is 3 days. The TI is 2 days.

1											
Months	Count of day	Discharge	Sensus		Service of day		BOR	BTR	TLOS	ALoS	TI
			Total	Average	Total	Average			-		
January	31	823	2728	88	2736	88.26	61.29	5.72	2547	3.09	2.10
February	28	782	2198	78.5	2215	79.11	54.94	5.43	2356	3.01	2.32
March	31	882	2585	83.39	2600	83.87	58.24	6.13	2582	2.93	2.11
April	30	856	2668	88.93	2681	89.37	62.06	5.94	2701	3.16	1.91
May	31	914	2873	92.68	2887	93.13	64.67	6.35	2811	3.08	1.73
June	30	825	2615	87.17	2626	87.53	60.79	5.73	2659	3.22	2.05
July	31	981	3069	99.00	3081	99.39	69.02	6.81	3065	3.12	1.41
August	31	898	2659	85.77	2672	86.19	59.86	6.24	2711	3.02	2.00
September	30	1015	2940	98.00	2952	98.40	68.33	7.05	2918	2.87	1.35
October	31	1037	3190	102.90	3202	103.29	71.73	7.20	3176	3.06	1.22
November	30	742	2454	81.80	2460	82.00	56.94	5.15	2536	3.42	2.51
December	31	654	2124	75.8	2114	72.30	46.75	5.40	2634	2.94	2.06
Grand total	365	9772	29999	87.21	30132	87.59	60.83%	67.86	30267	3.10	1.99

Table 1: Health care statistics of SPH inpatients.

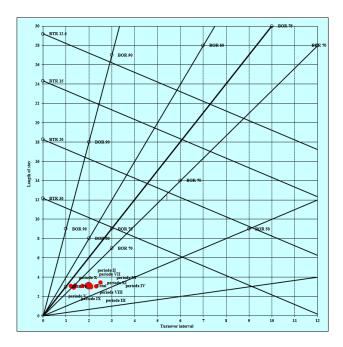


Figure 1: The GBJ at SPH 2017, in "X" axis is turnover interval and "Y" axis is average length of stay.

Figure 1 illustrates the GBJ at SPH 2017. In "X" axis is turnover interval and "Y" axis is average length of stay.

#### **DISCUSSION**

From Table 1 it can be seen that the statistical value of inpatients at SPH based on BOR or percentage of bed use is 60.83%. BOR is a number that shows the percentage of bed use at a certain time in the Inpatient Unit. The benefit of using a BOR is to find out the rate of use of a hospital bed. BOR values contained in SPH can be categorized as inefficient. The low BOR rate is the lack of use of hospital care facilities by the community. According to Sudra, the lower BOR value means that fewer beds are used to treat patients compared to the beds that have been provided. In other words, a small number of patients can cause economic income difficulties for the hospital.

Patient censuses are counted per period or month. Inpatient census means directly counting the number of inpatients means directly counting the number of patients served in the inpatient unit. Census is generally held around midnight (before 00 o'clock). The census can be carried out at any time as long as the census hours are chosen must be fixed or consistent and uniform in all census implementing units.

Frequency of use of the bed which means how many times in a given unit of time in the SPH inpatient room. The period used is 1 year (2018) with a standard value of 67.86 times. Based on its efficiency, the BTR value is not efficient. The efficiency of the BTR value is 40-50 times. 67 times the value that exceeds the capacity for using the bed. According to Sudra, BTR is the average number of

patients who uses every bed in a certain period.<sup>7</sup> Logically, the higher the BTO number means each the available bed is used by many patients take turns.

The ALoS is calculated from the total length of stay. Base on the data, ALoS value is 3 days. Statistical models of LOS are important aspects of healthcare planning and resource allocation. Healthcare providers, health authorities and insurance providers rely in parts of their analyses on assumptions about the durations of hospital stays and their distributions over time.<sup>8</sup>

The IT value obtained was 1.99 days or 2 days. This means that the bed interval is left or empty until it is refilled only waiting two days. This value is included in the category of efficient. Turn over an interval is the average number of days a bed is not occupied for patient care. This "empty" day occurs between when the bed is abandoned by one patient until it is used again by the next patient. The default value of turn over intervals is 1-3 days.

From the analysis of GBJ above, it can be seen that hospital indicators which consist of 60.83% BOR which are included in the standard of the Ministry of Health of the Republic of Indonesia are 60-85%. ALOS 3 days which is still below the standard of the Ministry of Health of the Republic of Indonesia is 6 to 9 days. TI 2 days which is following the standards of the Ministry of Health of Indonesia that is 1 to 3 days and BTR 67 times which exceeds the standard of the Ministry of Health of Indonesia which is 40 to 50 days.

Barry Barber, Finst P. and David Johnson in 1973 attempted to formulate and integrate four parameters to monitor and assess the efficiency of the use of beds for patient care wards. The four parameters combined are BOR, ALoS, TI, BTR. The combination of the four parameters is then realized in the form of a graph which is finally known as the Barber Johnson graphic.<sup>5</sup> According to Rustiyanto, Barber Johnson's chart is used to monitor and assess the level of efficiency of hospitalization and to know the level of efficiency of hospital services. If the Barber Johnson point is outside the efficient area then the health service has not been efficient.<sup>9</sup>

#### **CONCLUSION**

Statistical data obtained from SPH in 2018 shows the value of BOR, TI is in an efficient level, while BTO and ALoS are inefficient. The writer hopes Semen Padang Hospital can optimasize all the inpatient care with a good standard.

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