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Performance Indicators of Affiliated Hospitals to Yasuj University of Medical Sciences, Iran (2011-2018): Pabon Lasso Model

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ABSTRACT

Aims Hospital indicators are one of the most important criteria of hospital efficiency. The aim of this study was to determine the performance indicators of affiliated hospitals of Yasuj University of Medical Sciences in 2011-2018.

Instruments & Methods This cross-sectional descriptive study was conducted on 5 hospitals, including Shahid Beheshti, Shahid Rajaei, and Emam-Sajjad Yasuj hospitals, and Shahid Rajaei Hospital in Gachsaran and Emam-Khomeini Hospital in Dehdasht affiliated to Yasuj University of Medical Sciences in 2011-2018. Bed Occupancy Rate (BOR), Bed Turnover (BTR) and Average Length of Stay (ALS) were collected through hospital information system and analyzed according to Pabon Lasso model and compared with the standard levels.

Findings The mean BTR (98.76 times per year), ALS (2.12 days) and BOR (70.9%) in hospitals in 2011-2018 were favorable. ALS was 15.24 days in Shahid Rajaei hospital in Yasuj. Shahid Beheshti hospital was in zone 3 in all years. Emam-Sajjad hospital was in zone 3 in all years except 2014. Shahid Rajaei hospital of Yasuj was in zone 4 in 2011-2018. Emam-Khomeini hospital was in zone 1 in 2015-2016, zone 3 in 2011-2012, 2014, 2017-2018, and zone 4 in 2013. Shahid Rajaei hospital of Gachsaran was in zone 3 only in 2012, zone 1 in 2016-2019 and zone 2 in 2011 and 2013-2015.

Conclusion The performance indicators of affiliated hospitals of Yasuj University of Medical Sciences are at the favorable and moderate level, and in total, in 2011-2018, most of the hospitals have been in zone 3, which indicates good performance.

Keywords Hospital; Quality Indicators; Economic Evaluation; Iran

CITATION LINKS

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Introduction

Hospitals, as the most important, largest and most costly health service providers, have a very heavy responsibility in providing comprehensive prevention services, early detection, timely treatment and rehabilitation of patients [1, 2] and are responsible for a major part of health care costs in most countries [3].

According to World Bank studies in developing countries, hospitals account for 50 to 80% of health resources, while their efficiency is less than 50% of their capacity [3-9]. However, in developed countries, the share of hospital costs in the health sector does not exceed 40% [9]. On the other hand, given that 5 to 10% of Gross Domestic Product (GDP) in developing countries, including Iran, is spent on health care services, all health care providers, including hospitals, will face budget problems in the future [10]. According to the budget organization, each hospital bed costs an average of 25158 $ in 2002 to reach the use stage, and about 377358490 $ of budget is lost annually for inactive hospital beds [3, 11, 12]. Studies conducted in this field have estimated the efficiency of the country's hospitals between 58 and 99% [2]. Therefore, due to the fact that hospitals have a huge capital, it is necessary to pay attention to the proper efficiency of hospital beds [6].

Efficiency is the most important and common mechanism for evaluating and measuring the performance of an enterprise, including a hospital, Therefore, this issue has been considered by decision makers and policy makers in this sector. One of the criteria for determining the efficiency and effectiveness of hospitals is to calculate performance indicators and compare them with standards. Some of the most important hospital performance indicators include the Bed Occupancy Rate (BOR), Average Length of Stay (ALS), and the Bed Turnover Rate (BTR), which should be checked regularly and periodically [1, 4-6, 8, 13-21].

Pabon Lasso model is a technique used to interpret and compare hospital efficiency utilizing three hospital indicators BOR, BTR and ALS simultaneously [16].

BOR is calculated as occupied days in a given time period × 100. ALS for patients is obtained from the total occupied bed days in a given time and the number of discharged or dead patients in the same period. Patient stay length reflects medical decisions about patient stay duration in the hospital. Social problems of patients, inappropriate professional services, lack of facilities and damage to the device can increase the patient's stay duration. BTR is the number of discharged and deceased persons in the same year to the average of standby beds. This indicates the number of occupied and empty beds in a certain period and shows the average number of patients that use the specified beds in a time span [10].

In the study of Naderimanesh *et al*., which examined the status of performance indicators in selected teaching and non-teaching hospitals of Tehran province, ALS in teaching and non-teaching hospitals were 5.81 and 2.91 days, respectively. This indicator was favorable in 7.15% of teaching hospitals and 77.77% of non-teaching hospitals. BOR and BTR in teaching hospitals were 76.35% and 45.97 per year, respectively, both of which were at a favorable level in 92.85%. BOR and BTR in non-teaching hospitals were 62.7% and 65.44 per year, respectively, and these indicators were 11.11% and 100%, respectively, at the favorable level [19]. In Jannati *et al*.'s study in East Azarbaijan province, BTO, ALS and BTR were 64.55%, 2.34 days and 104.4 per year, respectively [2]. In the study conducted by Ghorbani *et al*. in Bam city, BTO and ALS were 80.4% and 2.24 days, respectively [14].

Given that hospital indicators are one of the most important criteria of hospital efficiency, and the last study was done in 2006 in Kohgiluyeh and Boyer-Ahmad province, this study was conducted to determine the status of hospital indicators in covered hospitals by Yasuj University of Medical and compare it with the standards of the Ministry of Health and Medical Education from 2011 to 2018.

Instruments and Methods

This cross-sectional descriptive study was conducted on 5 hospitals, including Shahid Beheshti, Shahid Rajaei, and Emam-Sajjad Yasuj hospitals (teaching hospitals), and Shahid Rajaei Hospital in Gachsaran and Emam-Khomeini Hospital in Dehdasht (non-teaching hospitals) affiliated to Yasuj University of Medical Sciences, Yasuj, Iran, from 2011 to 2018. These hospitals, with the exception of Shahid Rajaei Psychiatric Hospital (Yasuj), provide general medical services to the patients of Kohgiluyeh and Boyer-Ahmad province.

Computerized data were collected through Hospital Information System (HIS), including number of active beds, number of active bed days, number of occupied bed days, number of discharges, and performance data consisting of Bed Occupancy Rate (BOR), Bed Turnover (BTO) and Average Length of Stay (ALS).

The collected data were analyzed using Excel 2007 software according to the Pabon Lasso model to provide relevant graphs and compared with the standard levels of hospital performance indicators of the Ministry of Health and Medical Education of Iran (Table 1) [3].

Table 1) Standard levels of hospital performance indicators of the Ministry of Health and Medical Education of Iran

Indicator	Favorable	Moderate	Unfavorable
Bed Occupancy Rate (BOR), %	>70	60-70	<60
Average Length of Stay (ALS), days	<3.5	3.5-4	>4
Bed Turnover Rate (BTR), per year	>24	17-24	<17

Pabon Lasso model is a technique used to interpret and compare hospital efficiency using three hospital indicators BOR, BTR and ALS simultaneously. In its graphical model, BOR is placed on the X-axis and BTR is placed on the Y-axis. According to the mathematical correlation between these three indicators, a line starting at zero and passing through any point on the graph represents ALS, which increases consistently from left to right and top to bottom. This graph is divided into four zones by two perpendicular lines; one is drawn from the average BOR point on X-axis and the other from the average BTR on Y-axis. Either the standard (minimum acceptable) value of the indicators in a given region/country or the average of the indicators related to all hospitals can be considered as the basis for the graph subdivisions. Cautions should be yet made while using the mean as a basis for division, as Lasso argues, because outliers such as single-specialty hospitals e.g., psychiatric or gynecologic hospitals, with overly long and short ALS and BOR might distort and skew the divisions [16]. Figure 1 illustrates the 4 zones of Pabon Lasso model.

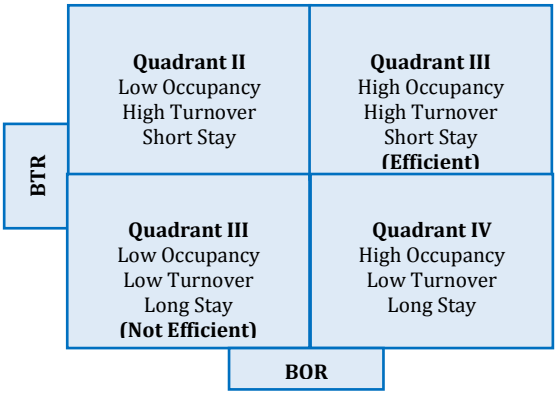


Figure 1) Pabon-Lasso diagram

Findings

The indices of five hospitals affiliated to Yasuj University of Medical Sciences from 2011 to 2018 are shown in Table 2.

Table2) The indices of all hospitals from 2011 to 2018

Hospital	BTR (times per year)	ALS (days)	BOR (%)
H1	143.79	2.00	77.52
H2	128.81	2.10	74.53
H3	13.97	15.24	67.40
H4	112.9	2.11	72.95
H5	94.36	2.28	62.14

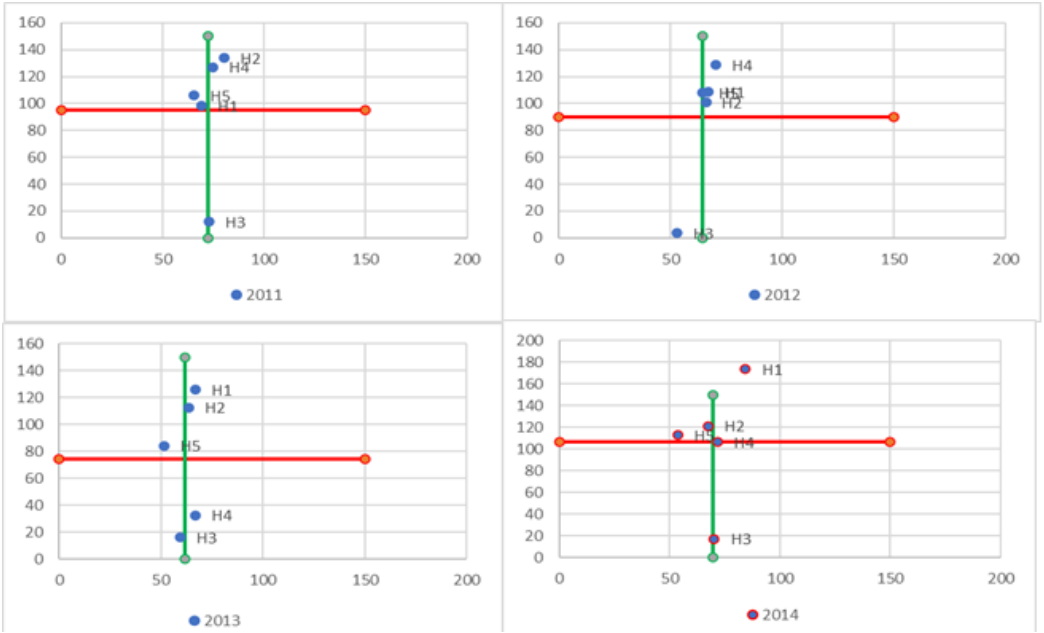
H1: Shahid Beheshti Hospital, H2: Emam Sajjad Hospital, H3: Shahid Rajaei Hospital in Yasuj, H4: Emam Khomeini Hospital in Dehdasht, H5: Shahid Rajaei Hospital in Gachsaran

The performance status of affiliated hospitals to Yasuj University of Medical Sciences from 2011 to 2018 is illustrated in Table 3.

Table 3) The performance status of affiliated hospitals to Yasuj University of Medical Sciences from 2011 to 2018

Years	BTR (times per year)	ALS (days)	BOR (%)
2011	95.41	2.26	72.43
2012	89.90	2.19	64.11
2013	74.36	2.00	61.56
2014	106.31	1.97	69.5
2015	111.56	2.12	76.13
2016	106.09	2.21	76.54
2017	103.31	2.24	75.05
2018	103.19	2.00	71.94
Total mean	98.76	2.12	70.90

Pabon Lasso Graphs of the affiliated hospitals to Yasuj University of Medical Sciences from 2011to 2018 are shown in Figure 2 that illustrates the location of each hospital.



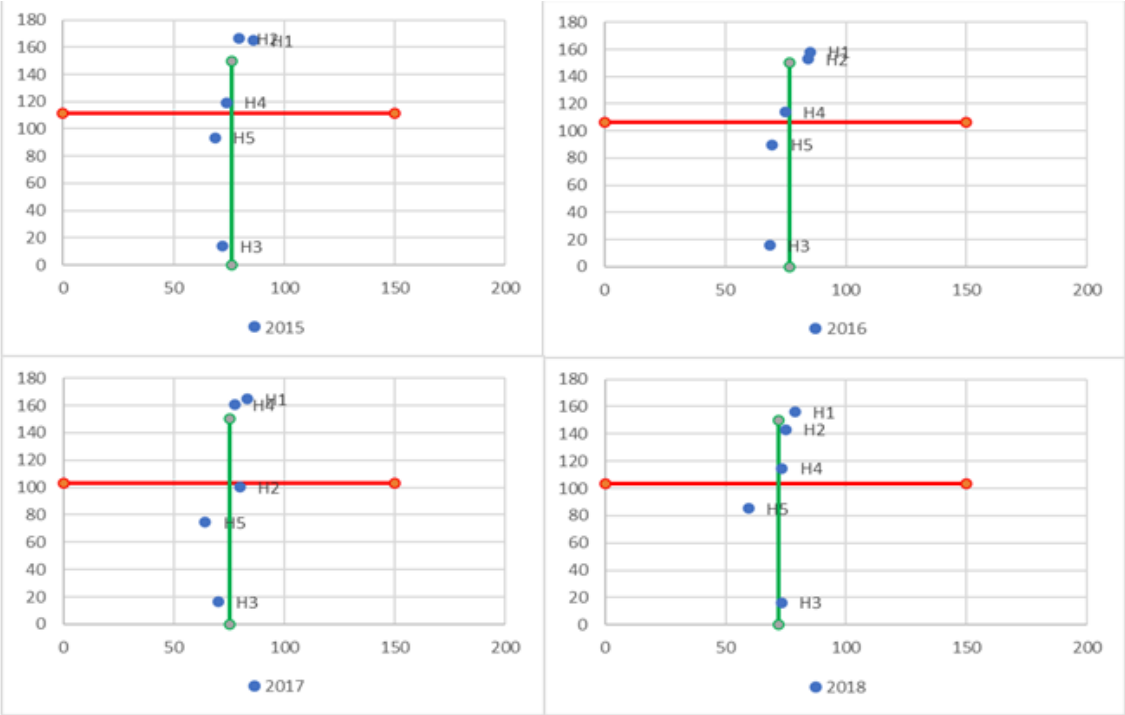


Figure 2) Pabon Lasso Graphs of the affiliated hospitals to Yasuj University of Medical Sciences from 2011to 2018

Discussion

This study was conducted to evaluate the hospitals' performance of Yasuj University of Medical Sciences, because this issue is one of the most important concerns of policy makers and health care managers.

From 2011 to 2018, Shahid Beheshti and Emam Sajjad hospitals (except for 2017) were placed in the third part of Pabon Lasso graph, which shows the efficiency and optimal level of productivity. It should be noted that 41 beds of emergency ward reduced in 2017.

In 2011-2012, 2014 and 2018, Shahid Rajaei hospital was located in zone 4. Considering that this is a psychiatric hospital (Prolonged stay of patients and the predominance of chronic diseases), it seems logical. But since 2013, 2015-2017, it was located in zone 1, indicating a surplus of hospital beds relative to the existing demand, low and limited use of hospital capacity, low demand for inpatient services, non-admission of patients or referral to other centers, lack of motivation in staff, especially physicians, people's preference to choose other hospitals, poor efficiency, lack of proper management and low need to develop a hospital or build a new hospital on site.

Emam Khomeini Dehdasht Hospital was located in zone 3 from 2011 to 2018 and in zones 4 and 2 in 2015 and 2016, respectively. It should be noted that 19 hospital beds including 10 postpartum beds and 9 neurosurgery beds were added between 2015 and 2016.

From 2011 to 2018, Shahid Rajaei Hospital of Gachsaran was located in zone 1 and 2, except 2012 that was in zone 3, which indicates the large number of hospital beds and empty beds. Hence, there is little need to develop a hospital or build a new hospital on site; meanwhile, there is a hospital affiliated with the oil company in this city, and a new hospital was opened in 2017. In the study by Ghoshtasebi *et al*. in 2006 in hospitals of Kohgiluyeh and Boyer-Ahmad province, Shahid Beheshti Hospital (Yasuj), Shahid Rajaei Hospital (Gachsaran), Emam Sajjad Hospital (Yasuj), Emam Khomeini Hospital (Dehdasht) and Shahid Rajaei Hospital (Yasuj) fell in zones 1, 2, 3, and 4, respectively [6].

The results of a study in Mali showed that 19% of hospitals are located in zone 1, 3% in zone 2, 11% in zone 3, and 7% in zone 4 [7]. In the study of Mehrolhasani *et al*. in 2010, 27.2% of hospitals were located in zone 1, 22.8% in zone 2, 41% in zone 3 and 9% in zone 4 [8]. Also, in the study of kavosi *et al*. in 2010, 28.57% of hospitals were located in zone 1, 21.24% in zone 2, 35.71% in zone 3 and 14.28% in zone 4 [9]. In the study of Forootan *et al*. in 2011, 28.5%, 14.3%, 14.3% and 42.8% of hospitals were located in zones 1, 2, 3 and 4, respectively [7]. In Nekoei-Moghadam *et al*.'s study in 2007, 25%, 50% and 25% of hospitals were located in zones 2, 3, and 4, respectively [4]. Overall, from 2011 to 2018, as shown in Figure 2, 40-80% of hospitals were in zone 3, followed by 20-40% in zone 1 and 0-20% in zones 2 and 4, which is consistent with other studies and refers to the efficient use of resources.

The present findings showed that since 2011 to 2018, the total average of BTR in the studied hospitals was favorable (98.76 times per year), which is higher than the standard of Deputy of

Health and Medical Education of Iran and Iran's national average (57.8 times per year) [11]. Since these years, BTR was also favorable in all hospitals except Shahid Rajaei Hospital of Yasuj (Psychiatric Hospital). In the study of Ghoshtasebi *et al*., BTR was favorable in all hospitals of Kohgiluyeh and Boyer-Ahmad province except Shahid Rajaei Hospital of Yasuj [6]. Also, BTR in the other studies by Mohammadi *et al*. [10], Forootn *et al*. [7], kavosi *et al*. [9], Mehrolhasani *et al*. [8], Jannati *et al*. [2], Naderimanesh *et al*. [19], Tarsaki [3], Mehrtak *et al*. [16], and Lotfi *et al*. [11], were 82.38, 82.3, 95.54, 60.6, 70.27, 45.97, 76, 76.4 and 66 times per year, respectively. In the study of Nekui-Moghadam *et al*., BTR was favorable in all teaching hospitals in Shiraz (except Ebensina, which is a psychiatric hospital) and Kerman [4]. In the present study, BTR was higher compared to other studies. This difference seems to be related to the fact that trauma and poisoning referral centers are located in Yasuj, and on the other hand, Dehdehat and Gachsaran districts have only one hospital to provide medical services to patients.

From 2011 to 2018, total mean of BOR was favorable (nearly 71%), but it was moderate (60-70%) in Shahid Rajaei (Yasuj) and Emam Khomeini (Dehdasht) hospitals. In the study of Ghoshtasebi *et al*., BOR was moderate in Kohgiluyeh and Boyer-Ahmad province in 2006. It was favorable in Emam Sajad (Yasuj) and Emam Khomeini (Dehdasht) hospitals, moderate in Shahid Rajaei (Yasuj) hospital and unfavorable in Shahid Beheshti (Yasuj) hospital [6]. The average of BOR in the studies by Mohammadi *et al*. [10], Forootan *et al*. [7], Kavosi *et al*. [9], Mehrolhasani *et al*. [8], Ghorbani *et al*. [14], Jannati *et al*. [2], Naderimanesh *et al*. [19], Reisi-Nafchy *et al*. [12], Tarsaki [3], Mehrtak *et al*. [16], Nekoei-Moghadam *et al*. [4], Jonaidi *et al*. [13], and Lotfi *et al*. [11], was in the range of 51% to 85% (51.4%, 77.7%, 53.07%, 63%, 80.4%, 64.55%, 76.35%, 60.7%, 71.2%, 51.5%, 84.83%, 75% and 65.91%, respectively). Although BOR is higher compared to some studies, given that, it is in the lower limit of favorable range, it must be noted that due to proximity to Shiraz, some patients prefer to refer to Shiraz hospitals, especially for elective surgeries, and some patients need to be transferred to Shiraz hospitals due to the lack of some required equipment and facilities.

From 2011 to 2018, total mean of ALS was favorable (2.12 days) exclusively for Shahid Rajaei hospital (Yasuj). In the study by Ghoshtasebi *et al*. in 2006 in Kohgiluyeh and Boyer-Ahmad province, ALS was favorable (3 days) exclusively for Shahid Rajaei hospital (Yasuj), but it was moderate in Shahid Beheshti hospital (Yasuj) [6]. The average of ALS in the studies by Mohammadi *et al*. [10], Forootan *et al*. [7], Kavosi *et al*. [9], Mehrolhasani *et al*. [8], Ghorbani *et al*. [14], Jannati *et al*. [2], Naderimanesh *et al*. [19], Reisi-Nafchy et al. [12], Tarsaki [3], Mehrtak et al. [16], Nekoei-Moghadam et al. [4], Joneidi et al. [13] and Lotfi et al. [11], was 2.45, 4, 3.21, 2.5, 2.24, 2.34, 2.91, 2.4, 2.5, 2.5, 3.18, 5.19 and 13.6 days, respectively. Although ALS is favorable (less than 3.5 days) in the most studies, ALS in our study was lower than others. This reveals that the process of admission, treatment and discharge of the patient is suitable.

We could not enroll Bibi Hakimeh hospital of Gachsaran and Shahid Jalil hospital of Yasuj in the study, because these hospitals are newly established. Also, the data of the hospital affiliated to the oil company was not recorded due to lack of access to the data.

Considering that the evaluation of hospitals includes all important performance dimensions such as technical efficiency, resource allocation, quality and equity, periodic evaluations are necessary to obtain an exact idea of the overall performance of the hospital system. On the other hand, due to the 15-fold increase in the dollar price over the past 20 years in Iran, the cost of each hospital bed to reach the stage of use and reducing the annual budget for inactive hospital beds has increased dramatically. Therefore, executive managers should have an appropriate plan to maintain and increase the use of hospital beds.

The researchers recommend conducting a study to evaluate the performance indicators of all hospitals in Kohgiluyeh and Boyer-Ahmad province.

Conclusion

The performance indicators of affiliated hospitals of Yasuj University of Medical Sciences are at the favorable and moderate level, and in total, from 2011 to 2018, most of the hospitals have been in zone 3, which indicates good performance.

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Ethical Permissions: The study was approved by Ethics Committee of Yasuj University of Medical Sciences (IR.YUMS.REC.1398.090)

Conflicts of Interests: The authors declared no conflict of interest.

Authors' Contribution: Mousavizadeh A. (First author), Introduction author/ Methodologist/ Original researcher/ Statistical analyst/ Discussion author (35%); Manzouri L. (Second author), Introduction author/ Methodologist/ Original researcher / Statistical analyst/ Discussion author (35%); Karimi Baseri A. (Third author), Introduction author/ Original researcher/ Discussion author (30%)

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