

## Comparison of performance indicators in one of hospitals of Tehran with national standards

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### Abstract

**Aims:** Evaluation of performance and effectiveness in hospitals is one of the essential issues. Many indicators are expressed as known performance indicators and hospital situation can be evaluated by calculation and comparison of these indicators with standards. This study aimed to investigate and evaluate the performance indicators of one of hospitals of Tehran and compare the favorable performance to existing conditions in order to provide a picture of the actual performance of the mentioned hospital.

**Methods:** In this cross-sectional descriptive study some performance indicators of a selective hospital was compared to results from the years before and also to the available standard in year 2007. Performance indicators used in Iran were extracted from electronic and library resources. The standard questionnaire of Ministry of Health was used for collecting data. Data were analyzed using Chi-square statistical method by SPSS 17 software.

**Results:** Most of studied indicators including active/fixed bed ratio, bed occupancy rate and rate of admissions per bed had a favorable condition compared to other studies and existing standards, but turnover rate and average length of stay were in unfavorable condition.

**Conclusion:** Turnover rate and average length of stay which are in direct relationship have an unfavorable condition and essential measures should be taken for their improvement. Other indicators are in favorable condition and some are even in higher than expected situation.

**Keywords:** Hospital, Performance Indicators, Standard

### Introduction

Every country has standards or criteria for providing health services. These criteria differ from a country to the other and even according to the region. Healthcare system (whether with public or private sector's participation), should have clear and comprehensive standards to evaluate health-treatment services. Without standards, evaluating health-treatment cares is not possible. Thus, for an efficient control, the preparation and using appropriate indices are required. In this regard, both qualitative and quantitative indicators are important. Having information on the need for health-treatment cares may be a standard tool for planning in this area and may help to determine goals and to provide services. But the short-term programming services is of more significance in order to determine the exact goals and also recognize available resources for effective planning that include decision making about the area of monitoring the indicators' selection (quantitative and qualitative monitoring criteria).

In Iran, some hospital indicators are not satisfactory and in some cases differ with their desirable level, meaning a huge loss to national capital. According to

the budget organization estimation at the current situation, each hospital bed costs, averagely, 250 million rials before reaching the application stage and annually about 300 million dollars of budget are wasted with inactive hospital beds. This is occurring when many patients cannot be hospitalized due to the lack of access to hospital bed or several other reasons. Having access to the accurate, exact and up to date information, managers of organizations can evaluate the path and rate of the organization's progress to meet its objectives and work effectively to improve the strategy, to take logical decisions and to improve the organization's efficiency [1]. The first aim of the health information system is to provide complete, valid, appropriate, adequate and timely information for different health managers. Today, promoting the treatment quality and reaching to the highest care standard is considered as one of the most important goals of an organization and achieving this goal is possible only with organizing and utilizing the information [2].

Hospital indicators show the hospital performance in the various fields. Therefore paying multidirectional attention to these markers is essential [3]. Some of these indicators, not only show the hospital

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performance, but also clarify the status under its coverage. In hospital, qualitative indicators have special significance. These indices should be exclusively designed for each activity. Moreover, hospital indices should be studied and compared regularly at the certain periods of time as the most important factors showing hospital performance, and their situation in the provinces, different regions and various organizations (public, private, social security, etc.) have to be specified [4, 5].

Different sources have suggested different definitions for the index or indicator term. As defined by the World Health Organization, indices or indicators are variables that directly or indirectly help measuring changes, in such a way that, they set a specific mode and therefore, can be used to measuring the changes. Basically, indicator is a variable which evaluates the situation and circumstance, and makes it possible to measure the changes over time [6, 7].

Ministry of Health has announced the hospitals' performance indicators as shown in table 1 [8]. In a research conducted by Amerioun and Delavari titled "Comparative analysis of the crisis programs in border hospitals" in 2008, the bed occupancy ratio performance indicator has been studied as a factor affecting crisis management programs [9]. In a research by Karami et al. titled "studying the relationship between the hospitals' degree with performance indices in the teaching hospitals in Kashan University of medical sciences in 2006 to 2007, six teaching hospitals' performance indicators have been investigated [10]. Mohammed Rafiee et al. have examined the beds occupancy rate (BOR) in the Shiraz hospitals as a performance indicator [11].

BOR and bed's rotation are always inversely related, and if the opposite is observed in the hospital chart and statistics, one can hesitate about the authenticity of information. But no logical relationship was found between these indices and length of patient's stay. The length of stay index and BOR have a direct relationship and the interesting point about bed occupancy and bed rotation is that if the length of stay is fixed in a period of time, even if bed rotation increases, BOR will be reduced which is, in its turn, very noteworthy. BOR and bed rotation rate indices were inversely correlated in most cases and only when BOR is over 75%, these two find a direct relationship [1].

The purpose of this study was to investigate, evaluate and analyze the hospital performance indicators of hospitals as one of the medical centers across the country and to compare the hospitals' desirable performance with the current situation, in order to provide a picture of their actual performance.

## Methods

This is a descriptive study with practical results and cross-sectional method. The population of the study was a selected hospital in Tehran and its performance indicators during 2007.

First, the necessary coordination regarding data collection was performed and patients' stay record was studied after referring to the hospital medical documents. The tool for collecting data and information was a standard questionnaire used by Ministry of Health to collect the data. The required indices, which had been already prepared as a questionnaire, and also performance information were completed for all cases and after recording them in the computer, they were finally analyzed in the Excel 2007 environment. Then, referring to the available information regarding this hospital's performance, the results of this study were compared with similar studies and state standards. The main hospital performance indices, including the hospital BOR, the average patients stay duration, mortality ratio, ratio of admission per bed, and finally the number of discharged separated by different wards in 2006 and 2007, were compared. Electronic and library resources were used to extract performance indices used in Iran. After the extraction of the given data, in order to have access to the studies conducted in Iran, the search in virtual environment (Internet) was done.

**Table 1-** Hospitals' performance indicators according to Health Ministry announcement

Index Type	Optimal	Moderate	Undesirable
The ratio of active bed to the fixed bed (%)	75-80	60-74	Less than 60
Bed occupancy (%)	More than 70	60-70	Less than 60
The ratio of bed performance	More than 24	17-24	Less than 17
Distance of bed turning (days)	Less than 2	2-3	More than 3
The ratio of acceptance per each bed	More than 24	17-24	Less than 17
The average patient's stay (days)	Less than 3.5	3.5-4	More than 4
The ratio of surgery operations to the surgery room (surgery per day)	4	2-4	Less than 2
The ratio of dead to the hospitalized patients (%)	Less than 2	2-3	More than 3

**Table 2-** Comparison of the percentage of bed occupancy ratio in the various wards of hospital in years 2006 and 2007

Ward name	Occupancy ratio (%)		Results
	2006	2007	
OH (Heart operation room)	49	54	Increased
CCU1	89	88	Decreased
CCU2	88	87	Decreased
ICU 1	0	43	Increased
ICU2	93	91	Decreased
ICU3	98	99	Increased
3B (Women)	62	63	Increased
3A (Women)	70	59	Decreased
4B (Heart)	59	54	Decreased
4A (Heart)	65	62	Decreased
5C (Women surgery)	75	79	Increased
5B (Men surgery)	67	73	Increased
5A (Men surgery)	74	73	Decreased
6D (Men internal medicine)	88	90	Increased
6C (Women Orthopedics)	60	70	Increased
6B (Men Urology)	72	77	Increased
6A (Men orthopedics)	66	65	Decreased
7C (Men physical medicine)	85	86	Increased
7B (Children)	73	75	Increased
7A (Children)	62	76	Increased
8D (Neurology internal medicine)	85	85	No change
8C (Women physical medicine)	76	81	Increased
8B (Women psychiatry)	74	74	No change
8A (Men psychiatry)	86	87	Increased
9D (Women internal medicine)	85	90	Increased
9B (women specialized surgery)	55	55	No change
9A (Men specialized surgery)	65	65	No change
10D (Men internal medicine)	84	92	Increased
10C (Graft)	89	82	Decreased
10B (Heart)	71	54	Decreased
(VIP) 10A	69	71	Increased
NICU (Newborns ICU)	69	77	Increased

## Results

The highest bed occupancy ratio (BOR) was associated to the ICU3 section in years 2006 and 2007. In 2007, at most parts of the hospital, there was an increase in bed occupancy ratio compared to 2006 (Table 2).

Also according to the data of Table 3, the highest mortality in the years 2006 and 2007 was related to ICU3 section. The most stay duration in both years

belonged to the psychiatry ward (Table 4).

**Table 3-** Comparison of the number of deaths in the various wards of hospital in years 2006 and 2007

Ward name	Number of dead per thousand patients		Results
	2006	2007	
OH (Heart operation room)	28	10	Decreased
CCU1	25	20	Decreased
CCU2	13	16	Increased
ICU 1	0	14	Increased
ICU2	88	70	Decreased
ICU3	358	373	Increased
3B (Women)	0	0	No change
3A (Women)	0	0	No change
4B (Heart)	2	0	Decreased
4A (Heart)	1	1	No change
5C (Women surgery)	0	1	Increased
5B (Men surgery)	3	4	Increased
5A (Men surgery)	3	0	Decreased
6D (Men internal medicine)	30	41	Increased
6C (Women Orthopedics)	0	0	No change
6B (Men Urology)	2	0	Decreased
6A (Men orthopedics)	1	1	No change
7C (Men physical medicine)	20	7	Decreased
7B (Children)	0	0	No change
7A (Children)	2	2	No change
8D (Neurology internal medicine)	24	19	Decreased
8C (Women physical medicine)	8	5	Decreased
8B (Women psychiatry)	0	0	No change
8A (Men psychiatry)	0	0	No change
9D (Women internal medicine)	13	22	Increased
9B (women specialized surgery)	0	0	No change
9A (Men specialized surgery)	0	0	No change
10D (Men internal medicine)	29	31	Increased
10C (Graft)	4	3	Decreased
10B (Heart)	9	0	Decreased
(VIP) 10A	16	16	No change
NICU (Newborns ICU)	179	232	Increased

The highest admission in 2006 was related to the operating room department and the lowest admission was related to ICU1 ward and the most admission in 2007 was related to the ICU1 ward and the lowest admission was related to ICU3 and 8A (Table 5).

**Table 4-** Comparison of the patients' stay in the various wards of hospital in years 2006 and 2007

Ward name	Mean stay (day)		Results
	2006	2007	
OH (Heart operation room)	2	2	No change
CCU1	3	2	Decreased
CCU2	3	3	No change
ICU 1	0	3	Increased
ICU2	6	6	No change
ICU3	11.5	14	Increased
3B (Women)	3	3	No change
3A (Women)	2	1	Decreased
4B (Heart)	3	3	No change
4A (Heart)	3	3	No change
5C (Women surgery)	12	5	Decreased
5B (Men surgery)	5	5	No change
5A (Men surgery)	4	4	No change
6D (Men internal medicine)	8	9	Increased
6C (Women Orthopedics)	4	4	No change
6B (Men Urology)	4	4	No change
6A (Men orthopedics)	5	4	Decreased
7C (Men physical medicine)	10	8	Decreased
7B (Children)	4	4	No change
7A (Children)	4	4	No change
8D (Neurology internal medicine)	8	7	Decreased
8C (Women physical medicine)	9	8	Decreased
8B (Women psychiatry)	14	11	Decreased
8A (Men psychiatry)	11	12	Increased
9D (Women internal medicine)	9	11	Increased
9B (women specialized surgery)	2	2	No change
9A (Men specialized surgery)	4	3	Decreased
10D (Men internal medicine)	7	11	Increased
10C (Graft)	10	9	Decreased
10B (Heart)	5	3	Decreased
(VIP) 10A	5	5	No change
NICU (Newborns ICU)	6	7	Increased

**Table 5-** Comparison of the ratio of admission per hospital bed in the various wards of hospital in years 2006 and 2007

Ward name	Ratio of admission per hospital bed		Results
	2006	2007	
OH (Heart operation room)	119	9	Decreased
CCU1	10	12	Increased
CCU2	9	9	No change
ICU 1	0	6	Increased
ICU2	6	22	Increased
ICU3	3	2	Decreased
3B (Women)	7	8	Increased
3A (Women)	11	12	Increased
4B (Heart)	6	6	No change
4A (Heart)	7	7	No change
5C (Women surgery)	6	6	No change
5B (Men surgery)	5	6	Increased
5A (Men surgery)	6	6	Increased
6D (Men internal medicine)	4	3	Decreased
6C (Women Orthopedics)	5	6	Increased
6B (Men Urology)	6	6	No change
6A (Men orthopedics)	5	5	No change
7C (Men physical medicine)	3	3	No change
7B (Children)	6	6	No change
7A (Children)	5	6	Increased
8D (Neurology internal medicine)	4	3	Decreased
8C (Women physical medicine)	3	3	No change
8B (Women psychiatry)	2	4	Increased
8A (Men psychiatry)	2	2	No change
9D (Women internal medicine)	3	3	No change
9B (women specialized surgery)	7	7	No change
9A (Men specialized surgery)	8	9	Increased
10D (Men internal medicine)	3	3	No change
10C (Graft)	3	3	No change
10B (Heart)	6	5	Decreased
(VIP) 10A	4	4	No change
NICU (Newborns ICU)	3	3	No change

**Table 6-** Comparing the performance indicators of the selected hospitals in three consecutive years 2006, 2007 and 2008

Hospital index	2006	2007	2008	Results
The ratio of active bed to the fixed bed (%)	84	84.78	86	Desirable
Bed occupancy (%)	74	74	77	Desirable
The ratio of bed performance	50.04	51.74	57.83	Desirable
Interval of bed turning (days)	5.33	5.24	4.94	Desirable
The ratio of acceptance per each bed	42.03	43.85	50.27	Desirable
The average patient's stay (days)	5.35	5.26	4.96	Undesirable
The average patient's stay (days)	3.32	3.43	4.07	Desirable
The ratio of dead to the hospitalized patients (%)	2	2	1	Desirable
Number of active beds	573	578	581	-

The performance indices of the active bed compared to the fixed bed, BOR, bed's performance ratio, the rate of admission per bed, the ratio of surgical operations to the operating room, and the ratio of dead patients to admitted patients were at desirable level. But the interval between the bed's rotation and the mean patient stay was undesirable in comparison with the standards (Table 6).

## Discussion

Comparing the results of the performance indicators in the hospital under study, with those of hospitals which are affiliated with the Tehran university of Medical science and the provincial averages and state standards [12], provides the following results:

The index of active beds to the fixed beds ratio in the hospital in 2008 shows an increase compared to the years of 2007 and 2006 and is in a good condition. The average of this index is more than the studied hospitals affiliated with Tehran University of Medical Sciences (60.17%) and is also higher than provincial (63%) and state (76%) averages and is also in a better condition compared with the results of Tehran hospitals (averagely 62%). Although in this relationship, some factors such as of area's cultural structure and treatment facilities also should be considered.

BOR Index is in a good condition and has increased by 3% in 2008 compared to the years 2006 and 2007. This index is in the situation beyond the optimal level compared with the existing standard, while the average of this index in the hospitals of Tehran University of Medical Sciences is 70%, provincial 58.4% and state is 65.35%. The bed performance index is at a desirable level. Moreover, the mentioned index has had an increasing trend during the three years of the study. Likewise, the rate has increased in 2007 about 1.7 units (equal to 57.83) and in 2008 about 6.2 units (equal to 57.83). While the mean of this index is higher than its mean in the hospitals of Tehran University of Medical Sciences (24.3), and provincial (12.53) and state (16.7) hospitals.

The index of the interval of bed turning is in a poor condition. However, it should be noted that its trend is improving. According to global standards, more than three days is considered as undesirable situation, while this hospital in 2008 (with an upgrading trend) has reached to 4.94 days. The ratio of this index is more than its average in the hospitals affiliated with Tehran University of Medical Sciences (2.3 days) and is also higher than provincial (2.2 days) and state (1.85 days) averages. Therefore, managers should assist to improve this index further and to achieve the desirable level regarding this index.

The index of the ratio of acceptance per each bed has increased compared with the year 2006 and 2007 has a significant increase (about 6.42) compared with the years 2007 and 2008. While the ideal situation is more than 24%, this hospital is in a highly desirable condition and has a distance equal to 26.27 units with the desirable condition. The average of this index in

the Tehran University of Medical Sciences is 24.16, in provincial hospitals is 33.60 and in state hospitals is 24.90.

Obviously, all medical staff working on reducing patient length of stay and the less time of patients' stay is more desirable. According to the standard, the index of the average patient stay should not on average be more than four days. In 2006, in this hospital, this index had been 5.35 and with an improving trend has reached 5.26 days in 2007 and 4.96 days in 2008. The average of this index is more than its mean in Tehran University of Medical Sciences (5.4 days), provincial hospitals (4.9 days) and state hospitals (3.5 days). This index is at the undesirable condition based on the results presented.

The standard announced about the index of the ratio of surgical operation to the surgery room is 4 surgeries per day. In the years 2006 and 2007, the studied hospital was in the moderate condition in terms of this index, but with a growing trend and by productivity increase in 2008, reached 4.07 surgeries per day which is in a good and beyond the optimum condition. The average of this index is more than its average in Tehran University of Medical Sciences (1.34 surgeries per day), provincial hospitals (a surgery per day) and state hospitals (1.72 surgeries per day). The ratio of dead patients to the admitted ones 2006 and 2007 was 2% indicating the moderate condition and reached 1% by an improving trend in 2008 which is in a good condition. It is noteworthy that a value of less than 2% is considered as a desirable condition. The average of this index is equal to its mean in of Tehran University of Medical Sciences (1%), lower than the provincial average (2%) and in a desirable condition compared with the announced standard (maximum 3%). It is suggested that in the future, several research works are conducted regarding the hospital indicators and their comparison with developed countries in order to achieve national standards in this field. Moreover, the factors affecting the changes of each of the hospital indices must be examined in different types of hospitals, including public, private, educational, non-educational, specialized, and general hospitals and those affiliated with Social Security.

## Conclusion

Indicators of bed turning interval and the average patient stay, that have a direct relationship with each other, are in an undesirable condition and each year great efforts are undertaken to promote them. All other indicators are in optimal condition or even some of them are highly beyond the desirable level.

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