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Health System Reform Plan and Performance of Hospitals: an Iranian Case Study

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ABSTRACT

Background: Health system reform is essential to make desired Changes. In Iran, first phase of Health Reform Plan (HRP) was implemented in hospitals affiliated with Ministry of Health and Medical Education (MHME) in 2014. **Aim:** The present study was carried out to evaluate the performance of hospitals affiliated with Urmia University of Medical Sciences at the time of the implementation of HRP. **Methods**: This cross-sectional study carried out in two stages, before (2012- 2013) and during (2014- 2015) implementation of the HRP in district and teaching hospitals. Data collection and evaluation of performance of hospitals was performed using indices issued by MHME using graphical and statistical analysis. **Results:** Average bed occupancy rate and bed turnover rate increased and the average length of stay decreased in the majority of hospitals during the study period. The highest and lowest bed occupancy rate was observed in district hospitals. All hospitals were shifted toward the third zone in Pabon Lasso (PL) diagram. **Conclusion:** This study confirmed that the implementation of the defined package of HRP in hospitals affiliated with UUMS resulted in increased admissions and hospitalization and improved performance.

Keywords: Evaluation, Hospital, Performance, Health System Reform, Urmia.

1. INTRODUCTION

Health system reform is a continuous and purposeful process aimed at increasing the efficiency and effectiveness of the healthcare sector (1). Since the 1979 Islamic Revolution, Iranian health system has experienced numerous reforms. The latest round of such reforms, consisted of several phases (2) and hospitals affiliated with the Ministry of Health and Medical Education (MHME) were subject to the first phase of the Health Reform Plan (HRP), which began in 2014 (3).

Health reform plans mainly focus on improvements in areas, such as prioritization, system planning, financing, resource allocation, and quality management, in system and organizational levels (4). Providing the necessary resources of hospitals such as beds, operating and nursing departments are of utmost importance from the perspective of the policymakers and even the public, and is, therefore, a widely discussed issue (5).

At the same time, providing health care services, as the prerequisite of Universal Health Coverage, depends on certain factors such as the availability of hospital beds to meet the demand (6). Although, for most patients, primary healthcare is believed to be the main and first contact point in health system, hospitals have become the center of attention for authorities and academic centers due to their required facilities and resources. Therefore, hospitals are of great importance for managers, health economists, public management, and even politicians (7).

In most developing countries, the resources of health sector and hospitals receive special attention because they account for over 5% of GDP and 5%-10% of public funds (8). Healthcare costs have increased from 4% to 7% in recent years in Iran (9). According to a report by the Statistical Center of Iran, government spending on hospital care is 40% of total health expenditures (10).

In health systems, the performance of hospitals is regularly and systematically measured and reported (11). Among the indices used to evaluate the performance of hospitals, three are more important: Bed Occupancy Rate (BOR), Bed Turnover Rate (BTR), and Average Length of Stay (ALS) (12, 13).

There are several factors that influence hospitals' performance indices. These include payment

systems, the number of beds and the level of service delivery (14). According to some studies, the optimal number of beds is defined to be 200-400 for acute care hospitals (15). ALS increases and BTR decreases with the complexity of diagnosis and treatment processes, showing an inverse relationship (16) (Table 1).

Evaluations based on one of the above three indices might be misleading and incomplete. However, simultaneous consideration of these indices would provide a more complete picture of the situation. The indices' descriptive and analytical powers would increase when combined due to their mathematical relationships (17). Therefore, despite the benefits of independent assessments, combined and simultaneous analysis of these three indices is very helpful. In this regard, the (Pabon Lasso Model) PLM is a useful tool as it combines all three indices (18).

A review of the previous studies showed that the PLM is one of the most widely-used tools for assessing the performance of hospitals. Researchers have used the PLM to investigate the performance and efficiency of hospitals in numerous studies. The detailed interpretation of the model's four zones has also been mentioned in previous studies (13, 17-28).

Aim: Implementation of HRP in the hospital affiliated with MHME might have increased the number of admissions and hospitalization rates and have influenced the performance of hospitals. Therefore, this study was aimed at investigating the performance of hospitals before and after HRP.

2. MATERIALS AND METHODS

This longitudinal study was carried out with retrospective approach in hospitals affiliated with Urmia University of Medical Sciences (UUMS), West Azerbaijan Province, Iran, in 2015. Census sampling was employed to select the units of the study and the statistical population consisted of 19 district hospitals and four teaching centers (N=23). The only Psychiatric teaching hospital was excluded from the study due to its distinct nature.

The data were collected in a four-year period including two two-yearly time frames: before implementation of HRP (2012 and 2013) and after implementation of HRP (2014 and 2015). The selected performance indices included BOR, BTR, and ALS. Data were collected using monthly activity forms approved by MHME.

A comparison was made between 2012-2013 period (before HRP) and 2014- 2015 period (After HRP) in order to determine the performance of hospitals. PLM graphic diagram and statistical analyses applied in the study.

The PLM diagram was compartmentalized to four zones according to the ordered pair of means of BOR and BTR in the four-year study period. Then the locations of the hospitals were determined according to the three performance indices from 2012 to 2015 year by year.

The data were analyzed in SPSS (version 16). The difference based on years determined using paired t-test (BTR) or Freidman's test (ALS and BOR) regarding normality of data. The difference between district hospitals and teaching hospitals was investigated using independent t-test (BTR) or Mann-Whitney U test (ALS and BOR). The significance level determined at P=0.05.

3. RESULTS

In this study, four teaching and 19 district hospitals affiliated with UUMS were investigated. Large hospitals were located in the capital city of the province. The total number of active beds had been reported 3031 in 2012 which have been increased to 3320 in 2015. The results showed that means of BOR and BTR ascended in the teaching hospitals during the study period and increased by 75.06% and 102.13 times in 2015, respectively. ALS declined from 2.98 days in 2012 to 2.86 in 2015. The highest ALS was reported in the teaching hospitals. On the other hand, the highest BTR were related to the district hospitals. The highest and lowest BOR were also reported in district hospitals.

Hospital type	Average length of stay	Turnover rate
1st referral	Lower	Higher
2nd referral	Middle	Middle
Tertiary	Higher	Lower

Table 1. Optimal pattern of hospital utilization

During four-year study period, teaching hospital No. 1 accounted for the highest BOR and teaching hospital No. 2 did for the highest BTR. Both BOR and BTR means experienced an increase in 2015 compared to 2014. Average ALS declined after the implementation of HRP (Table 2).

The PLM diagram was compartmentalized to four zones according to the ordered pair of means of BOR (68%) and BTR (87 times per year) and the location of the studied hospitals were determined. The status of all hospitals had been changed during study period.

In 2012 and 2013, only six district hospitals (26%) were located in zone III. In 2014, the number of hospitals increased to nine including eight district hospitals and one teaching hospital in zone III. In general, gradient of all units were toward zone III so that, in 2015, the number of hospitals in this zone increased to 13 (56% of hospitals).

In comparison between teaching hospitals and district hospitals, also was found that all of teaching hospitals were in zone IV in 2012. While except for one case, the rest of the teaching hospitals were located in zone III in 2015 (Diagram 1).

Statistical analysis was also used to investigate and compare the indices. Normality of data was examined with Shapiro-Wilk Test. Data about ALS and BOR were not normal.

The results of paired t-test showed that means of BTR was significant between the year prior to the implementation of HRP (2013) and the initial year of implementation of HRP (2014) (p= .001).

On the other hand, a significant difference in BTR was between the first year and the second year of implementation (2014 and 2015) (p= .005). BTR ascended from 2013 to 2015 (87.5 to 102).

The results of independent t-test showed that deference of means of BTR was significant between teaching hospitals and district hospitals (p=.00). BTR in district hospitals (99.5±28.3) were higher than teaching hospitals (66.5±12.4).

Friedman's test showed significant mean difference of ALS among hospitals in four year period (p= .023). Wilcoxon test showed mean difference of ALS were significant between hospitals in 2013 and 2014 (p= .019). Wilcoxon test showed mean difference of ALS were significant between hospitals in 2013

Index Hospital		ALS (day)				BTR (times in year)				BOR (%)			
		2012	2013	2014	2015	2012	2013	2014	2015	2012	2013	2014	2015
1	TH*	5.38	5.24	5.04	4.87	60.32	58.93	62.96	64.79	88.75	84.58	87.18	86.58
2	TH	3.23	3.18	3.29	3.37	82.51	86.29	89.22	88.39	72.7	75.37	81.11	81.63
3	TH	4.82	4.66	4.68	4.74	60.61	55.61	62.68	63.25	80.77	72.25	79.82	81.86
4	TH	5.26	5.16	4.87	5.23	55.09	55.67	59.83	57.94	78.91	78.15	79.78	83.13
5	DH**	2.61	2.44	2.21	2.51	93.35	93.82	98.51	101.5	66.65	63.27	61.03	69.69
6	DH	2.54	2.44	2.44	2.52	113.57	115.8	116.5	128.3	80.86	76.71	77.77	88.81
7	DH	3.82	4.09	4.19	4.13	73.95	62.36	65.31	74.5	77.11	70.48	75.1	84.85
8	DH	1.81	2.09	1.89	1.98	91.41	72.55	117.8	134.4	45.39	40.25	60.93	73.03
9	DH	2.07	1.85	1.84	2.14	66.65	46.03	55.35	69.27	37.78	23.25	28.04	40.67
10	DH	2.31	2.2	1.5	1.41	43.24	69.92	83.32	117.6	27.32	41.66	34.36	45.45
11	DH	5.03	3.13	2.45	1.92	30.71	32.95	51.67	70.86	27.21	22.52	34.77	38.21
12	DH	1.86	2.21	2.03	2.06	140.06	119.2	121.7	138.8	70.93	72.26	67.87	78.17
13	DH	2.58	2.98	2.85	2.85	105.85	88.03	101.8	115.3	74.54	71.92	79.89	90.6
14	DH	1.59	1.45	1.43	1.56	137.9	142.6	159.1	149.1	58.57	58.17	62.54	63.85
15	DH	3.32	3.25	3.2	3.36	83.53	85.2	86.52	89.87	75.78	75.71	75.55	82.78
16	DH	2.87	2.73	2.72	2.71	85.98	86.57	87.94	96.97	67.48	64.85	65.61	71.89
17	DH	3.11	2.85	2.76	3.1	95.16	87.91	88.63	92.28	80.64	67.14	66.91	78.19
18	DH	2.68	2.71	2.62	2.66	96.06	87.86	100.4	119.1	70.48	65.44	74.54	87.29
19	DH	2.61	2.54	2.5	2.66	85.98	99.85	109.3	105	61.89	69.3	76.41	75.47
20	DH	2.51	2.38	2.42	2.61	131.42	143.9	145.2	153.1	89.99	93.84	96.51	109.7
21	DH	2.83	2.88	2.71	2.78	92.21	84.33	94.39	92.76	71.41	66.49	70	69.56
22	DH	1.87	2.05	2.11	2.43	127.92	121.4	124.3	130.1	65.22	68.24	72.11	86.72
23	DH	1.85	1.88	2.05	2.21	125.39	15.31	109.1	95.98	64.35	59.47	61.62	58.2
Mean		2.98	2.89	2.77	2.86	90.38	83.13	95.29	102.1	66.73	64.40	68.24	75.06

Table 2. Studied performance indices in teaching and district hospitals. *Teaching Hospital **District Hospital

and 2014 (p= .016). The highest (2.98 days) and the least (2.77 days) ALS were in 2012 and 2014, respectively.

Friedman's test showed mean difference of BOR were significant among hospitals in four year period (p= .000). Wilcoxon test showed difference in mean of BOR were significant between hospitals in 2013 and 2014 (p= .003). Wilcoxon test showed that difference in means of BOR were significant between hospitals in 2013 and 2015 (p= .000) and 2014 and 2015 (p= .000). The highest (75%) and the least (64.4%) BOR in hospitals were in 2013 and 2015, respectively.

4. DISCUSSION

This study was aimed at investigating the performance of hospitals in UUMS using PLM diagram as well as statistical analysis of performance indices. The overall results showed performance improvement after the implementation of HRP.

It seems necessary to remark two preliminary points before discussion about the results: first; Along with improvement of studied indices in selected hospitals, 290 beds were added to available beds in the study period. The increase in the number of beds can prevent the BOR increase; however, the simultaneous increase in the number of beds and BOR can be a reason for further improvement of performance, so the results of the study confirmed it.

Second; prior to the implementation of HRP, the indices were higher than the optimum values defined by the MHME (13) and even close to the ideals. In some units, some extra beds were used and the real number of beds was higher than the approved nominal capacity, meaning that, there was not more room for improvement.

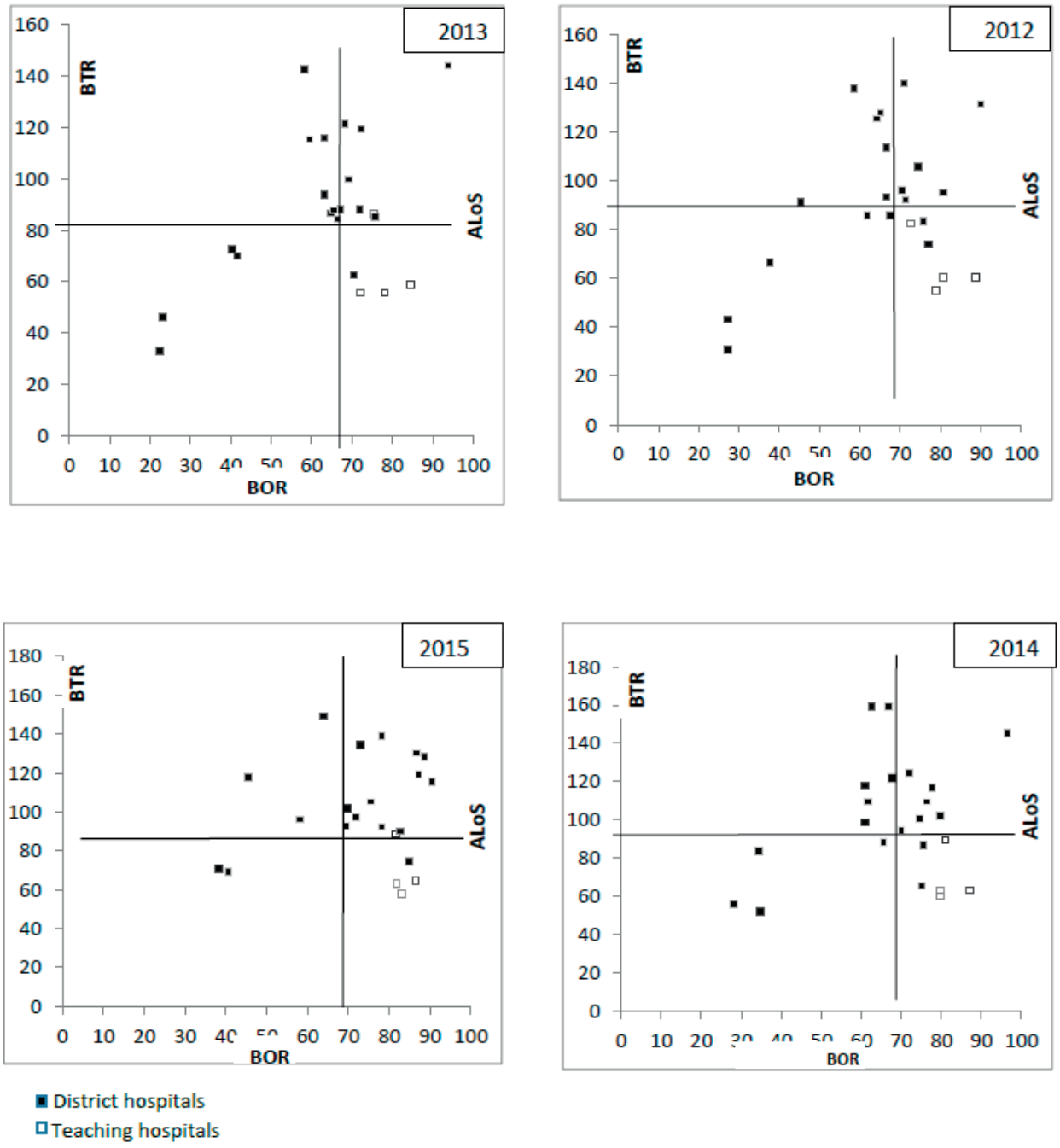

Figure 1. Location of teaching and district hospitals in four- year study period

Although the increase in efficiency or improvement of performance was not directly mentioned in the HRP (3), the decrease in out of pocket payments in the hospitals affiliated with the MHME was subject to the HRP (1). Decreased out of pocket payments could affect the increase in admissions and hospitalization (2).

Comparison of selected indices individually showed a significant improvement in 2014 and 2015 relative to 2013. The results of the study by Rezaei in Iran showed a significant improvement after implementing the HRP, which is consistent with the present research's findings (29). Faridfar also reported improvement of indices after implementation of the HRP (30).

Service quality improvement and improved access can increase the number of admissions and, accordingly, hospitalization and bed turnover rates. Kheiri reported the retention of doctors in deprived areas, service quality improvement, supply of medicine by hospital, and free natural childbirth after the implementation of the HRP (31). The study by Sorkhanlou showed the reduced hospital payment in 2014 compared to 2013, which was contributed to the increased hospitalization (32).

According to the findings, mean of ALS was higher in teaching hospitals than district hospitals. This finding was consistent with the study of Duma (16) and standards provided by the MHME (13). Due to the more suitable facilities and equipment in teaching hospitals, patients with critical situation requiring specialized services, were referred to teaching hospitals located in the capital of the province. The results of the studies of Kasiri (33) and Hashemian (34) were consistent

with present study. It should be noted that increased number of patients requiring hospitalization and shortage of beds can contribute to early discharge from hospital. This can create other complications associated with reduced quality of services, due to the fact that the indices in the two years prior to the implementation of the HRP showed high number of admissions and hospitalization in studied hospitals.

As for the teaching hospitals, differences among inpatient wards could change the indices. Teaching center number 2 had the lowest ALS among all teaching hospitals. The gynecology ward with relatively short ALS was located in this hospital and short stay could be the result of greater BTR compared to other hospitals. Free natural childbirth has been included in the program (3), could justify greater number of admissions and hospitalization.

The comparison of studied units in PLM diagram indicated the improvement in the years after HRP implementation, so that the units moved from zone I, II, and IV toward zone III. Zone III indicates better performance and efficiency (18). Teaching hospitals in Urmia, which were in zone IV, moved toward zone III after the implementation of the HRP. ALS is longer in teaching hospitals compared to the district hospitals, which is consistent with the results of the previous studies (16) and standards approved by the MHME (13).

The results of present study along those of Bahadori (20) seem more logical due to the same sample of study. Both studies covered the hospitals affiliated with UUMS in a 5-year period with a two-year time interval. The means of indices used in the PLM diagram showed similarities and the results of two studies showed relative consistency. However, Performance improvement was impressive in the present study.

Although improved BOR is an indicative of technical efficiency, it is also considerable from the perspective of management because that induced demand is expected in fee-for-service payment systems like Iran (14). A study by Nabilou showed that reduced number of unnecessary days of stay contributed to the appropriate use of beds, increased hospital productivity, and reduced waiting times and costs (35).

Due to numerous factors affecting the increase or decrease in the indices and the importance of logical utilization of hospital beds, further studies are proposed in terms of the medical necessity of hospitalization, service quality promotion, and responsiveness in order to improve efficiency and minimize possible adverse effects.

5. CONCLUSIONS

The investigation of the indices in a four-year time frame showed improvements in the first year of implementation of HRP. The improvement continued in the second year, too. This situation was not highlighted in the years before implementation of HRP or was slower. The overall aim of reforms in health systems is to increase efficiency and improving performance. This study proved that the HRP increased the number of admissions, hospitalization rates, and the efficiency of hospitals affiliated with UUMS. Proper utilization of resources and better performance is not less important than the creation of resources. Accordingly, the maintenance of service quality, medical appropriateness of admissions, and timely discharge are of great importance.

- **Conflict of Interest:** The authors declare that they have no conflict of interest.
- Author Statement: Contribution to conception and design: BN, HY and PSS. Substantial contribution to acquisition of data: BN, HY and PSS. Substantial contribution to analysis and interpretation of data: BN and HY. Drafting the article: BN and PSS. Revising the article for important intellectual content: BN and HY. Final approval of the version to be published: BN and HY.

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