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The Effect of Health System Reformation Plan on the Performance Indexes in Public Hospitals in Iran

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Abstract

Background and Objectives: The Health System Reformation Plan (HSRP) was developed to improve quality and accessibility of health care services and reduce the costs to protect people from catastrophic out of pocket payments. The aim of current study is to investigate the effect of HSRP on performance indexes of governmental hospitals affiliated to Iran University of Medical Sciences in Iran.

Methods: This was a descriptive analytic study with retrospective approach based on extracted data from 16 hospitals of Iran University of Medical Sciences in Iran. Specific indices comprising income and expenses, paraclinical evaluations, bed performance indices and reform instructional indices were collected in 5 categories before (April 2013) and after (May 2014 to March 2016) implementation of HSRP. Data were analyzed through SPSS software version 22, using paired *t* test and Pearson correlation coefficient.

Findings: After implementation of HSRP, indexes of bed turnover rate, bed occupancy percentage, average active bed, number of emergency patients, the average length of stay of the patient, percentage of normal delivery, cash income, cost of consumables and equipment, percentage of armed forces insurance deductibles and percentage of social security insurance deductibles increased.

Conclusions: The HSRP imposed high economic burden on insurance companies due to increased tariffs with no plan to control them; however, it has improved utilization and accessibility of services. It is necessary to supply consistent financial resources and apply effective supervising on continuous performance of project to meet the objectives.

Keywords: Health System Reformation Plan (HSRP), Health System, Performance Indicators, Public Hospitals

Background and Objectives

Health systems are changed to improve health status and indicators of community and meet the people health needs. High cost of health services is one of the critical concerns of health system managers around the world. Ageing of population, increasing the occurrence and prevalence of non-communicable chronic diseases, progressive trend of technologies and modern health equipment are the main reasons of high costs of health care services.[1]

Similar to other many countries, health system in Iran, faces challenge of dramatic increasing of health services costs. The costs of medical care and treatment have been increased up to 107 times over the last 20 years, which pushed 3.5 million people below the poverty line each year.[2] Health system in Iran is affected by this burden.

In the last years, Iran has been 112th out of 190 countries in people's participation in health care payment.[3] Then the reform seemed to be necessary. Health system reforms are not limited to Iran. Many countries like China, Turkey, Australia and the United States, have experienced these reforms to increase accessibility and optimize quality and costs of health services.[4] Iranian health policy makers have put the plan on the agenda to improve health care actions.[5]

Though, the Health System Reformation Plan (HSRP) was developed to face the mentioned challenges in health care services. Eight steps were considered in hospitals affiliated to universities of Ministry of Health and Medical

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Education through 8 packages: 1. Reducing patients' out of pocket payments, 2. Supporting medical doctors to stay in deprived area, 3. Specialist's residential programs, 4. Health services quality improvement, 5. Hoteling quality improvement, 6. Financial protection of patients with specific conditions or hard to cure diseases, 7. Propagation of normal child delivery, and 8. Supervising on project plan performance. Therefore, the book on Relative Value of Health Services was published as second stage of the plan and legal tariffs were defined for more than 1700 medical services.[6]

Given the high governmental budget spent to run this program, it is needed to evaluate the plan performance in health setting.[7] If the resources are applied in right way, the performance indexes must be measured before and after the implementation of the plan.[8] Main performance indexes comprised bed occupancy rate, bed turnover and patient's average length of stay.[8]

Some domestic and abroad studies (i.e. 9,10,11) have investigated the impact of HSRP on health sector indicators. Dadgar et al investigated the effect of the HSRP on performance indicators of hospitals affiliated to Lorestan University of Medical Sciences. According to their results, after HSRP, bed occupancy rate, the ratio of active to constant beds, and the rate of surgeries had increased significantly, while a significant decrease was found in bed turnover interval rate and the ratio of caesarean section to total natural deliveries.[9] Van Der Wees et al[10] concluded that health care reforms in Massachusetts have been associated with health status promotion and greater service utility, especially by low socioeconomic groups of people. Yasar[11] demonstrated that the reform plan of health system has led to more hospital bed occupation and increasing the bed occupancy rate in Turkey.

These studies have only evaluated a limited number of indicators. We found no comprehensive research evaluating the income and expenditure or HSRP guideline indicators, before and after the plan.

Methods

As the first step, we achieved the permission letter from research deputy of Iran University of Medical Sciences. Then started to collect information in deputies of treatment, resources management and drug department.

This was a analytic descriptive study with retrospective approach based on data extracted from all 16 hospitals of Iran University of Medical Sciences in Iran (6 general and 10 specialized hospitals), from the year of 2013 to 2016 through the data collection forms developed by the researchers. No sampling method was applied; because all university hospitals were studied.

Data about selected indicators were categorized in five main groups: 1. Income and expenditure (comprising: cash income, costs of consumables and equipment and), 2. human resources (the ratio of nursing force to active bed), 3. Paraclinical (including the number of CT scan admission, the number of MRI admission, the number of angiography admission, the number of exercise test admission, the number of nuclear medicine admission, the number of bone density measurement admission, and the number of angioplasty admission), 4. bed functional indicators (average number of active bed, bed occupancy rate, number of emergency patients, average length of stay, and the bed turnover rate), and 5. HSRP Guidelines (e.g. Percentage of vaginal delivery). The time duration from 2013 to 2014 was set as the period before HSRP and 2014 to 2016 as after HSRP.

Data were analyzed through SPSS software version 22, using paired *t* test and Pearson correlation coefficient as needed.

Results

In the first year after the implementation of plan, indices of number of emergency room patients ($P=0.019$), the bed occupancy rate ($P=0.001$), the bed turnover rate ($P=0.006$), the percentage of vaginal delivery ($P=0.004$), the percentage of the armed forces insurance deductibles ($P=0.042$), and cost of consumables and equipments ($P=0.015$) increased significantly while the angioplasty admission index decreased significantly ($P=0.01$). However, there was no significant change in other indices (Table 1).

In the second year after the implementation of the plan, the number of emergency patients ($P=0.009$), the percentage of bed occupancy ($P=0.005$), the bed turnover rate ($P=0.0001$), the percentage of vaginal delivery ($P=0.005$), the percentage of armed forces insurance deductibles ($P=0.01$), and the percentage of social security insurance deductibles ($P=0.0001$) increased significantly, while the ratio of nursing staff to active beds ($P=0.025$) and the cost of consumables and equipments ($P=0.015$) decreased significantly (Table 2).

In the third year after the implementation of the plan, the number of emergency patients ($P=0.009$), the percentage of bed occupancy ($P=0.005$), the bed turnover rate ($P=0.0001$), the percentage of vaginal delivery ($P=0.005$), the percentage of armed forces insurance deductibles ($P=0.01$), and the percentage of social security insurance deductibles ($P=0.0001$) increased significantly, while the indicators of the ratio of nursing staff to active beds ($P=0.025$) and the cost of consumables and equipments ($P= 0.015$) decreased significantly (Table 3).

Table 1. Indices Means Changes From the Year of 2013 to 2014

Aspects	Index Title	Mean in 2013	Mean in 2014	Changes in Mean	Changes in Standard Deviation	*P* Value
Bed functional inexes	Average active bed (number)	180.62	178.50	-2.12	11.55	0.47
	Number of emergency room patients	56602.38	63360.81	6758.43	10326.53	0.019
	Average Length of stay (day)	5.7494	5.8400	0.09	0.45	0.43
	Bed occupancy percentage	73.1519	78.1725	5.02	5.14	0.001
	Bed turnover rate (number)	64.63	70.13	5.5	6.82	0.006
Guidelines for vaginal delivery promotion	Percentage of vaginal delivery	54.9125	48.7875	6.12	4.06	0.004
Income and expenses	Percentage of armed forces insurance deductibles	2.369	4.950	2.58	4.64	0.042
	Percentage of social security insurance deductibles	3.813	4.394	0.58	2.53	0.37
	Percentage of Salamat insurance deductibles	6.519	7.244	0.72	7.25	0.69
	Cost of consumables and equipments ($)	29237411	29441868	1124515	1640215	0.015
	Cash income ($)	18971657	15002211	3500627	10534150	0.20
Human labour	Ratio of nursing force to active bed (number)	1.126	1.128	-0.003	0.14	0.94
Paraclinical	Number of CT scan admissions	8452.80	10761.00	-2308.2	2190.4	0.07
	Number of MRI admissions	1497.00	1354.00	143	383.45	0.51
	Number of angiography admissions	2301.00	2375.00	-74	333.75	0.80
	Number of angioplasty admissions	693.00	1073.00	-380	8.48	0.01
	Number of exercise test admissions	65.00	50.67	11	18.66	0.20
	Number of nuclear medicine admissions	545.00	1113.75	-568.75	681.75	0.19
	Number of bone density assessment admissions	269.50	249.50	20	162.63	0.89

Table 2. Indexes Mean Differences Between 2013 and 2015

Aspects	Index Title	Mean in 2013	Mean in 2015	Changes in Mean	Changes in Standard Deviation	*P* Value
Bed functional	Average active bed (number)	180.63	184.44	3.81	19.40	0.44
	Number of emergency room patients	56602.38	72083.38	15481	20730.32	0.009
	Average length of stay (day)	5.7494	5.6125	-0.13	0.53	0.32
	Bed occupancy percentage	73.1519	80.2844	7.13	8.65	0.005
	Bed turnover rate (number)	64.63	73.63	9	7.58	0.0001
Guidelines for vaginal delivery promotion	Percentage of vaginal delivery	54.9125	49.1000	5.81	4.05	0.005
Income and expenses	Percentage of armed forces insurance deductibles	2.369	5.000	2.63	3.67	0.01
	Percentage of social security insurance deductibles	3.813	10.244	6.43	3.19	0.0001
	Percentage of Salamat insurance deductibles	6.519	7.481	0.96	8.49	0.65
	Cost of consumables and equipments ($)	29237411	21167356	6542637	9543073	0.015
	Cash income ($)	18971657	16934995	948581	18221930	0.83
Human labour	Ratio of nursing force to active bed (number)	1.126	1.250	-0.12	0.18	0.025
Paraclinical	Number of CT scan admissions	8452.80	10057.60	-1604.8	1531.1	0.07
	Number of MRI admissions	1497.00	2494.25	-997.2	957.1	0.12
	Number of angiography admissions	2301.00	3324.50	-1023.5	358.5	0.15
	Number of angioplasty admissions	693.00	1595.50	-902.5	297.6	0.14
	Number of exercise test admissions	65.00	71.50	50.68	72.75	0.14
	Number of nuclear medicine admissions	545.00	1426.50	-881.5	804.1	0.11
	Number of bone density assessment admissions	269.50	312.50	-43	260.2	0.85

Table 3. Indexes Mean Differences Between 2013 and 2016

Aspects	Index Title	Mean in 2013	Mean in 2016	Changes in Mean	Changes in Standard Deviation	*P* Value
Bed functional	Average active bed (number)	180.63	189.13	8.5	20.9	0.12
	Number of emergency room patients	56602.38	74184.38	17582	25810.08	0.01
	Average Length of stay (day)	5.7494	5.6050	-0.14	0.62	0.37
	Bed occupancy percentage	73.1519	81.1313	7.97	7.53	0.001
	Bed turnover rate (number)	64.63	72.44	7.81	7.2	0.001
Guidelines for vaginal delivery promotion	Percentage of vaginal delivery	54.9125	50.3875	4.52	6.89	0.10
Income and expenses	Percentage of armed forces insurance deductibles	2.369	6.731	4.36	5.55	0.007
	Percentage of social security insurance deductibles	3.813	4.050	0.23	2.79	0.73
	Percentage of Salamat insurance deductibles	6.519	4.894	-1.62	7.42	0.39
	Cost of consumables and equipments ($)	29237411	25200247	1531099	3021020	0.06
	Cash income ($)	18971657	17902225	556709	13270739	0.86
Human labour	Ratio of nursing force to active bed (number)	1.126	1.154	-0.02	0.24	0.65
Paraclinical	Number of CT scan admissions	8452.80	10620.80	-2168	1708.7	0.04
	Number of MRI admissions	1497.00	3810.75	-2313.7	2701.6	0.18
	Number of angiography admissions	2301.00	3060.00	-759	1097.42	0.50
	Number of angioplasty admissions	693.00	1428.00	-735	452.54	0.26
	Number of exercise test admissions	65.00	66.50	33.68	99.31	0.44
	Number of nuclear medicine admissions	545.00	1223.00	-678	692.33	0.14
	Number of bone density assessment admissions	269.50	309.50	-40	130.1	0.73

Table 4 shows the comparison between performance indicators before the plan (2013) and the means of indexes in whole three years of 2014, 2015 and 2016, as the period after the plan. As seen in the table, a significant increase occurred in the bed turnover rate ($P=0.0001$), bed occupancy rate ($P=0.0001$), average active bed ($P=0.0001$), the number of emergency patients ($P=0.001$), average length of stay ($P=0.001$), the percentage of vaginal delivery ($P=0.0001$), the cost of supplies and equipment ($P=0.017$), cash income ($P= 0.0001$), the percentage of armed forces insurance deductibles ($P=0.004$), and the percentage of social security insurance deductibles ($P=0.001$).

The mean values of functional indicators are provided to test significant changes in the first year after the implementation of HSRP. As its shown above, the indices of number of emergency attendants, the bed occupancy rate, the bed turnover rate, the percentage of vaginal delivery, the percentage of the armed forces insurance deductibles, and the cost of consumables and supplies had shown a significant increase, while the angioplasty admission index had decreased significantly ($P<0.05$).

Discussion

According to current study, the percentage of bed occupancy has increased significantly since the implementation of HSRP. Rezaei has confirmed the increase in bed occupancy coefficient index (12). Also, Yaser's study showed that after the implementation of HSRP in Turkey, the hospital beds were fully occupied, so the bed occupancy rate had increased.[11]

Dadgar et al[9] in 2016 concluded that the average patient's stay time has slightly increased after the HSRP, though not significant, it is consistent with the results of this study in the first year after the implementation of HSRP. Reducing the patient's stay in the years after the implementation of HSRP could be due to increased rate of referrals to teaching hospitals and, on the other hand, speeding up the discharge of patients. Ebrahimipour et al[13] in Imam Reza hospital in Mashhad claimed that the

Table 4. Differences of Indices Mean in the Year of 2013(Before HSRP) and Indexes Mean in 2014 to 2016 (After HSRP) *

Aspects	Index Title	Changes in Mean	Changes in Standard Deviation	P Value
Bed functional	Average active bed (number)	-245.35417	193.03477	0.0001
	number of emergency patients	-103569.93750	94193.88917	0.001
	Average length of stay (day)	-7.57146	7.72306	0.001
	Percentage of bed occupancy	-112.34875	18.45485	0.0001
	Bed turnover rate (number)	-103.27	44.20428	0.0001
Guidelines for vaginal delivery promotion	Percentage of vaginal delivery	-59.77083	22.41844	0.0001
Income and expenses	Percentage of armed forces insurance deductibles	-3.19167	3.76106	0.004
	Percentage of social security insurance deductibles	-2.41667	2.25099	0.001
	Percentage of Salamat insurance deductibles	-0.02083	7.39448	0.991
	Cost of consumables and equipments ($)	47056927	70014408	0.017
	Cash income ($)	20078480	15861186	0.0001
Human labour	Ratio of nursing force to active bed (number)	-0.05733	0.17417	0.223
Paraclinical	Number of CT Scan admissions	-15906.06667	13823.88313	0.062
	Number of MRI admissions	-3621.50000	3302.04734	0.116
	Number of angiography admissions	-4418.50000	2383.18555	0.232
	Number of angioplasty admissions	-2451.50000	625.31810	0.114
	Number of exercise test admissions	-79.33333	95.10112	0.096
	Number of nuclear medicine measurement admissions	-2402.91667	1556.96791	0.054
	Number of bone density measurement admissions	-395.66667	550.12908	0.495

*This is the mean of indexes through whole period of three years after HSRP

average length of hospital stay after the implementation of HSRP has reduced, which is consistent with results of this study, in the second and third year after the implementation of HSRP. The length of hospital stay in Chinese hospitals dropped from 12.1 days in 2006 (before the reform plan) to 9.1 days in 2010 (after the reform plan). In other words, it had decreased by an average of 25%, which is not similar to our results.[15] Dadgar et al[9] also showed that the changes in the coefficient of bed occupancy and the ratio of active to constant bed had a significant increase. Concerning the bed occupancy rate, their results are consistent with results of this study. But, according to the results of our study, the average active bed rate has not changed significantly.

Aghili Dehkordi et al[21] in 2016 showed that publication of the book named "Relative Values" has significantly increased the indicators of bed occupancy, daily bed occupancy, the average patient's stay duration, and the number of deaths, while it has significantly decreased the indexes of bed turnover interval, the bed turnover occupancy, and the C-section rate. The percentage of bed occupancy in the studied hospitals has increased by 5.02%, 7.13%, and 7.97% in the first, second, and third year after the implementation of the HSRP, respectively. It could be attributed to the goals of the HSRP, including the reduction of patients' out of packet payment, improving the quality of hoteling and physicians visits.

The current study showed that the rate of normal vaginal delivery has significantly increased in the first year after the implementation of the HSRP. The results revealed that HSRP objectives were not achieved a 10% reduction in the rate of cesarean delivery until the end of 2014, 2015, and 2016. In a large hospital in Tehran, Zarei et al[14] concluded that the percentage of C-section has decreased about 3% to 7%; thus, the natural vaginal delivery program has failed to achieve the target of a 10% reduction in cesarean rates at the end of 2014. Fouladi et al[17] indicated that the goal of reducing C-section rate up to 10% has not been fully gained in hospitals affiliated to Qom University of Medical Sciences. The results of Ebrahimipour et al[13] suggested a decreasing rate of 2.3% of C-sections in Imam Reza hospital, Mashhad.

According to the findings of Dadgar et al,[9] in 2016, the ratio of C-section to normal deliveries decreased

significantly, which is consistent with the results of the present study. Goudarzi et al[18] demonstrated that the free of charge vaginal delivery in teaching hospitals has not led to a significant increase in its rate. Hence, further planning should be made by the Ministry of Health in this area. In 2014, Yarmohammadian et al[16] realized that after HSRP, total number of vaginal deliveries were increased in comparison with the same period last year, in Isfahan teaching hospitals. Rezaei[12] showed that the ratio of C-section to vaginal delivery after the implementation of the HSRP significantly decreased, which is consistent with the results of our study. Seidali and Namazi[19] in Khuzestan province found a significant reduction as 49.56% to 32.1% in C-section rate after HSRP compared to the time before the plan.

Zandian et al[20] concluded the HSRP had a positive effect on reduction of C-section and the ratio of C/S to normal vaginal delivery (NVD) had decrease 0.79 times.

In general, the improvement of C/S to NVD ratio was not noticeable in all studied hospitals in comparison with other studies in Iran or worldwide. It could be due to cultural background or medical aspects or special services provided by some hospitals. Then, it is required to teach women and culture-making in communities in order to increase healthy behavior. Naturally, this needs further attention by the authorities and policymakers in the health sector.

The results of this study showed that the ratio of nursing staff to active beds in the first, second and third years after the implementation of HSRP has reduced, while the decrease has been only significant in 2015. Shaham et al[22] concluded that the HSRP has been significantly effective in fixing manpower shortage. This was not seen only in the paramedics, but also the staff of operating room, laboratory, and radiology departments of hospitals, which is consistent with our study. According to the current study results, the ratio of nursing in 2013 (before HSRP) and 2014, 2015, and 2016 (after HSRP) were lower than the standard levels.

Faridfar et al[23] showed that the paraclinical admissions during 2014 have been much higher than 2013, which is inconsistent with the present study.

Of study limitations were problem in data accessibility in some hospitals due to inappropriate way of data gathering and saving and no integrated collecting of precise performance indicators.

Further studies are recommended to obtain expert opinions and all stakeholders idea to investigate positive and negative impacts of HSRP. Also, monitoring of HSRP implementation align with guidelines and evaluation of goals achievement is required.

Conclusions

The HSRP has led to high economic burden for government and insurance companies because of increasing in tariffs and no controlling plan, however, it has improved utilization and accessibility of services. It is necessary to supply consistent financial resources and apply effective supervising on project implementation to meet the plan objectives.

Abbreviations

HSRP: Health System Reformation Plan; IUMS: Iran University of Medical Sciences; C/S: Cesarean Section; NVD: normal vaginal delivery.

Competing Interests

The authors declared no competing interests.

Authors' Contributions

The authors made equal contributions to the present study.

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