The Impact of the Health Transformation Plan on Hospital Performance Indicators: A Meta-analysis Study in an EMRO Region Country

Abstract

To adapt to the changing conditions and respond to the needs of society, health systems need continuous changes and reforms in their structure and performance, and subsequently, they need to evaluate their indicators. Therefore, this study aimed to investigate the impact of the health system transformation plan (HTP) on the functional indicators and efficiency of hospitals in a country in the Middle East region (Iran). A systematic literature review was conducted according to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines using the online databases Medline, EMBASE, Scopus, Pubmed, SID, Magiran, and Medlib from 2013 to 2022 using a combination of medical subject heading terms ('health system transformation plan [Mesh] OR 'health reform [Mesh] OR implementation of the health transformation plan [Mesh] ''AND ('performance indicators' [Mesh]) ''AND ('Iran' [Mesh]). STATA version 11 were used for data analysis. A total of 20 reports (cross-sectional, cohort, and case-control) were identified for this study. The results showed that after the HTP, the indices of bed occupancy rate and bed turnover rate have increased and the index of bed turnover distance has decreased. On the other hand, after the implementation of this plan in hospitals, the average of patients' length of stay has increased. The implementation of HTP has improved most of the performance indicators of hospitals and has generally led to an increase in the productivity of hospitals compared to that before the implementation of the plan. However, efforts to strengthen weak performance indicators and identify effective indicators along with adopting correct policies to increase the overall efficiency of hospitals can be effective in improving HTP.

Keywords: *EMRO, health system transformation plan, Iran, performance indicator*

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Introduction

Health is the center of sustainable social, economic, political, and cultural development. In this regard, hospitals, as the largest units of the health system, use a large part of financial and human resources and are very important in the health economy, especially in developing countries.[1,2] Therefore, the evaluation of the hospital's performance is very useful, and it shows how the activities and the use of resources are carried out in each hospital.[3] On the other hand, paying consideration to the effective and efficient use of resources will help to create economically justified hospitals, which will play a very effective role in achieving the goals of the health sector.[4] Considering the great role of hospitals in providing health care, improving the performance of hospitals is one of the goals of every health system. According to the opinion of many authors, the improvement of performance requires the correct definition and evaluation of performance and identification of performance weaknesses and their elimination. Performance evaluation also requires continuous identification and monitoring of performance indicators.[5]

Performance indicators, as a tool to compare the level of service, to evaluate services, to compare services with standards and similar centers, or for comparison over time, are the most important factors that show the hospital's performance.[1,6] Indicators such as bed occupancy rate (BOR), average length of patient stay (ALS), bed rotation distance (BRD), and bed turnover rate (BTR) are among the most important performance indicators that should be reviewed and evaluated at regular intervals and in different programs.[7-9]

Health systems play an important role in maintaining and promoting people's health

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through policy making, intra-sectoral governance, and leadership. Governments consider the process of reforming the health sector as one of the most strategic issues of the country.[10] The main mission of health systems is to improve the level of health and respond to the needs of people and society.[11] Health systems need reforms because of provision of needs of community, rapid pace of technological change, increased expectations of individuals to use the most recent and best technologies, increased service costs, resource shortages, dominance of the market economy over service-providing organizations, and the unpleasant effects on the health market as well as issues such as poverty and transition of diseases.[11-13]

Two important features of health systems make the reforms inevitable in this sector. First, health is one of the individuals' basic needs and rights, and the second is the rapid pace of changes and transformations. The transformations in the appearance of diseases, evolution of health concepts, and the advancement of technology in terms of diagnosis, treatment, and provision of services indicate the fast speed of changes in health.[11,12] In Iran, the achievements and challenges of the health system led governments to implement reforms in this area.[10]

In this regard, one of the most recent reforms in the health system of Islamic Republic of Iran is called "Health Transformation Plan (HTP)".[14] In accordance with its general duties, missions, and upstream documents, especially the 20 Year National Vision document, health legislation in the 5th development plan and the 11th government program, the Ministry of Health and Medical Education (MoHME), as the main custodian of the country's health system, initiated the HTP, in May 2014, with three approaches to financial protection of individuals, access to health services, and improved quality of services.[11,15,16]

Faridfar *et al*.[17] examined the effect of the HTP on different types of clinical, para-clinical, surgical, and patient satisfaction indicators in Tehran and found an increase in the frequency of admissions in clinics and para-clinics as well as in patient satisfaction. Hashemian *et al*.,[18] in their study, reported improving the performance indicators of the hospital. Also, in the study of Dadgar *et al*.,[19] after the implementation of the transformation plan, all the examined indicators were in a better condition than before. Mousavi Rigi *et al*.,[5] by examining the hospitals of Bushehr, showed that in most of the hospitals, the investigated indicators had a better status than before. In a similar study, Kasiri *et al*.[20] acknowledged that after the HTP, the percentage of bed occupancy and bed turnover increased. According to the OECD report, reforms in Japan have led to a reduction in hospitalization rates for the elderly and an increase in home care under the name of long-term care insurance.[21] Yasar *et al*.'s[22] study showed that after the transformation plan of the health system in Turkey, the longevity of

healthcare workers in low-income areas and the proportion of full-time specialist doctors increased.

Many studies have investigated performance indicators in different regions of Iran after the HTP. As far as we know, there is no comprehensive study on performance indicators after the transformation plan of the health system in Iran. As a result, this meta-analysis was carried out in order to systematically review, analyze, and synthesize the indicators of hospital malpractice after health reforms in Iran.

Method

A systematic review and meta-analysis were conducted in 2022. Relevant studies were identified from PUBMED, EMBASE, SCOPUS, and WEB OF SCIENCES as international databases and Magiran, SID, and Medlib as Persian databases from 2013 to 2022. The search terms ("health system transformation plan [mesh] or "health reform [mesh] or implementation of the health transformation plan [mesh]" and ("performance indicators" [mesh]) were used, as well as the references of scan identification documents, and if their titles match the subject, they were inserted.

Searches were conducted from March 2022 to February 2023. Eligible observational studies were reviewed in both English and Persian languages. The inclusion criteria were 1) observational studies that examined performance indicators in hospitals after the transformation plan, 2) cross-sectional, cohort, and case-control studies, and 3) studies with clear and accurate data. Likewise, case reports, case series, editorials, letters to the editor, commentaries, reviews, and clinical trials, as well as studies that did not measure performance indicators, were excluded. Abstracts of all articles were entered into Endnote version 7 software and duplicates were removed. The authors then read the full text and retained it for final review if it met the inclusion criteria. In addition, review articles and editorials were excluded.

The checklist includes items that are essential for a clear report of a systematic review. In this document, the meaning and logic of each item in the checklist were explained. For each case, an example of a good report was included and, where possible, references were made to relevant empirical studies and methodological literature.

In the next stage, we checked the results of the articles. If they reported performance indicators, they were retained as final eligible articles for analysis.

Data extraction

Data extraction in data sheets was created in the Excel software, and the data of interest variables were imported. The extracted data were as follows: title, year of the study, setting, number of hospitals, BRD rate, BOR rate, ALS rate, BTR rate, normal and cesarean delivery rate, cesarean to normal delivery, active to fixed bed ratio, number of surgeries, number of hospitalized patients, and number of outpatients before and after HTP.

This search produced a total of 588 records, of which 161 articles were duplicates and were removed from the study process; then the title and abstract of 242 articles were reviewed. At this stage, 198 articles were excluded from the study process. The most basic reasons for exclusion were studies conducted outside of Iran, the type of publication, and studies that did not report the rate of the investigated variables. After the final review of the remaining studies, 18 articles were included in the meta-analysis and the data were extracted. Additional information can be found in the 2009 flow chart on Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [Figure 1]. Also, to assess the risk of bias, we used ROBVIS as a web application designed to visualize the risk of bias.

Results

Quality assessment of studies

The quality assessment of the studies was appraised by the CASP checklist. As shown in Figure 2, eight studies entered the meta-analysis phase. The studies are shown in Table 1.

As shown in Table 1, the average of BOR, BTR, and BRD has increased after HTP and the average ALOS of the patient has also decreased. According to the findings, the rate of cesarean delivery has decreased, followed by the increase in natural delivery. In general, the performance indicators of hospitals have improved after the HTP.

According to the collected studies, the number of elective and emergency operations has increased after HTP (elective operations: 221.2 ± 258.6 before HTP and 263.6 ± 231.9 after HTP. Emergency operations: 135.9 ± 293.8 before HTP and 179.1 ± 333.1 after HTP) (11). The voluntary discharge emergency has decreased (12.2 before HTP and 9.5 after HTP) (26) and the number of emergency patients has also increased after the HTP (52403 ± 30289 before HTP and 60151 ± 31746 after HTP).[6] These indicators are not reported in Table 1 because they were only in one article.

Discussion

Since performance indicators reflect the efficiency and effectiveness of organizational units, they create an environment for controlling and evaluating activities.[8] It is necessary to evaluate the performance of hospitals in order to measure the continuous efficiency and effectiveness of programs and executive processes.[10] In this study, the performance indicators of Iranian hospitals were compared and discussed before and after HTP to provide a scientific basis to managers to increase the exploitation of resources and facilities in hospitals.
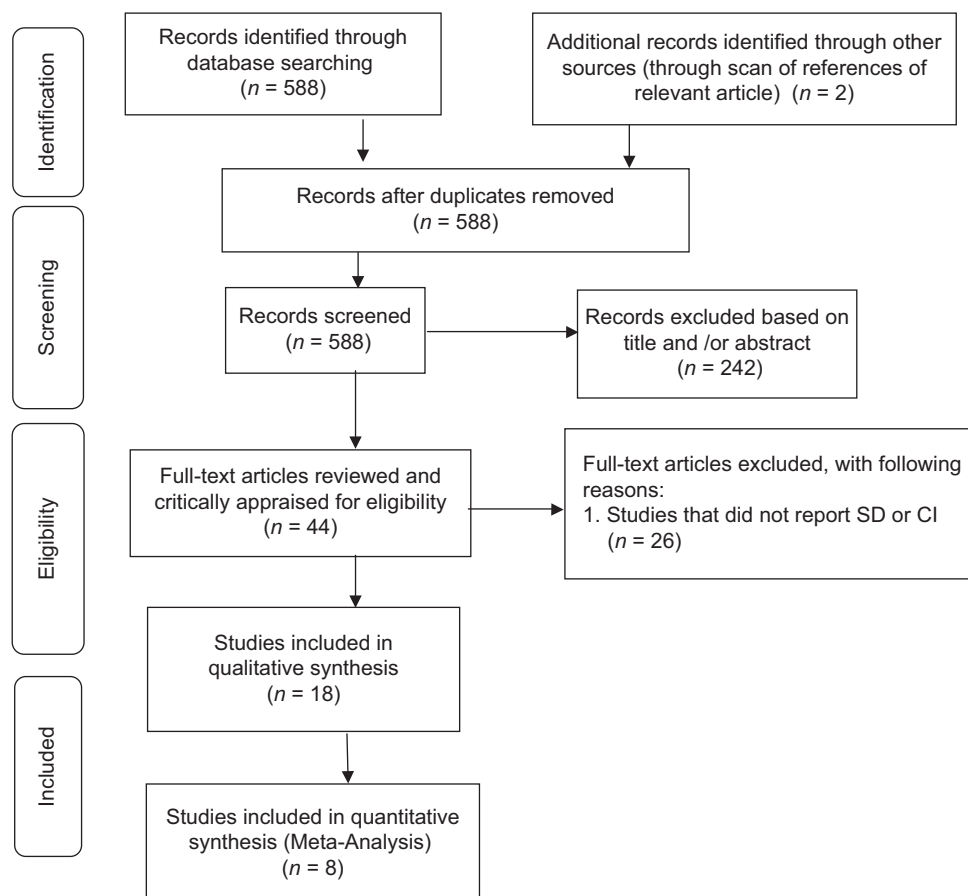

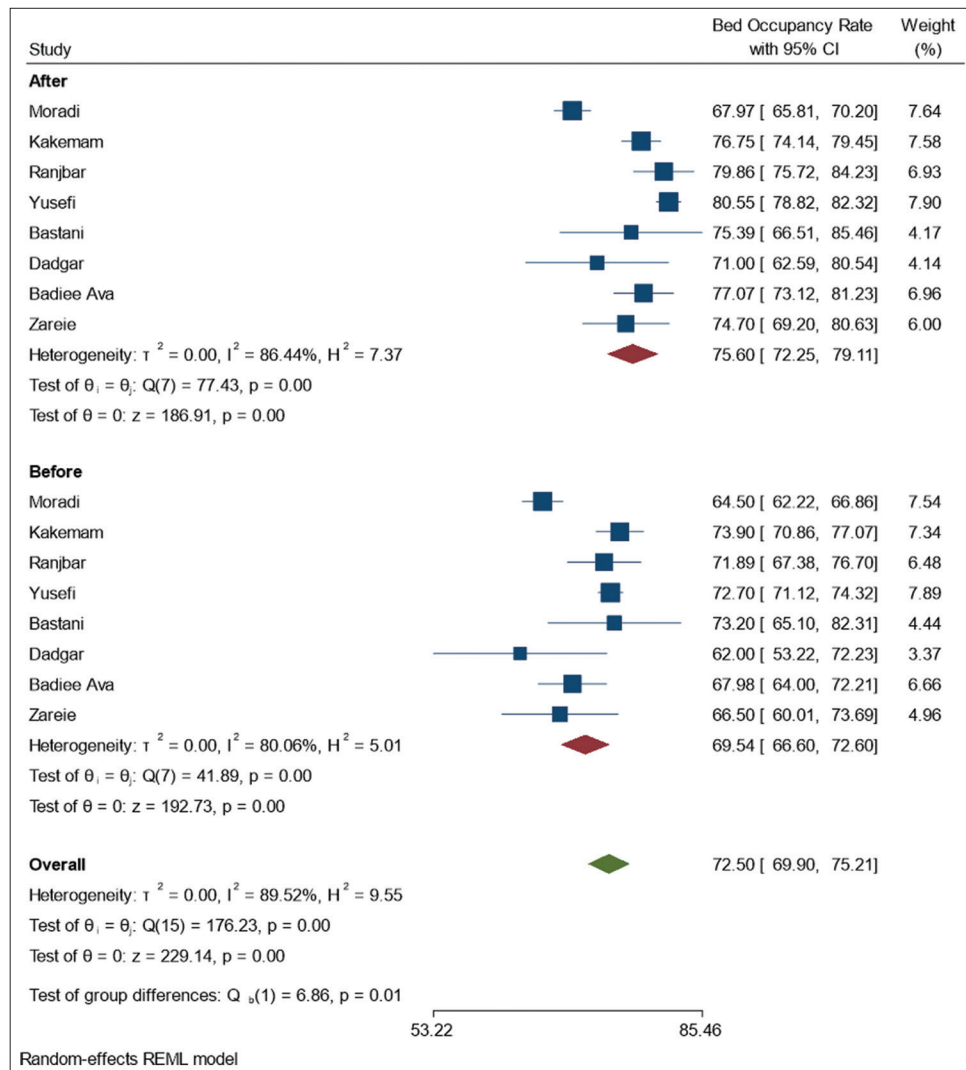Figure 1: Flowchart of documents selection process

Figure 2: The Forest plot of bed occupancy rate

The results of the current research show that the HTP in Iran's hospitals has had positive effects and has created changes in most of its performance indicators that are in line with the pre-determined goals. This finding is consistent with the results of other studies conducted in this field.[8,9,24] The results of Khammarnia *et al*.'s study showed that the implementation of accreditation after HTP is an important and influential factor on the performance indicators of the hospital. In fact, accreditation can be a management tool to identify the hospital's strengths and areas that can be improved, and the data collected in the accreditation process as a valuable source of information can lead to efficient and effective decisions.[26]

According to the obtained results, the use of hospital beds has increased after the HTP. In other words, the transformation plan of the health system has increased the percentage of bed occupancy in the studied hospitals. This increase can be due to various reasons, including the decrease in the share of payments received from

patients, the presence of a resident specialist doctor in the hospital, and the efforts of hospital management to increase productivity and service delivery.[8] This finding is consistent with the studies of Rezaei *et al*. and Zarei *et al*.[6,11]

According to the findings, the bed turnover rate (BTR) has also increased after the transformation plan. BTR is the number of times patients use a hospital bed in a given period of time. This rate shows the number of occupied and empty beds in a certain period of time and indicates the average number of patients who leave the hospital and use a certain bed in a certain period of time.[2,5] The bed turning distance index shows the return rate of the patient to the hospital and indicates how the performance of the hospital was in treatment and the quality of the services provided. The ideal figure of this index is between 1 and 2 days, and if the performance interval is equal to 1 day, the bed occupancy rate is 80%, and if this figure is more than 2 days, it is considered high and indicates the lack of

Table 1: Features of existing primary studies of performance indicators before and after HTP in meta-analysis

Author	Year	Setting	Number of Hospitals	Before HTP mean±SD (95%CI)	After HTP mean±SD (95%CI)
BOR (Bed occupancy rate)					
Rezaei *et al*.[11]	2016	Hamedan	15	55±23 (0.4-0.6)	60±27 (0.4-0.7)
Bastani *et al*.[7]	2016	Shiraz	14	73.2±16.3 (65-82)	75.4±17.9 (66-85)
Mousavi Rigi *et al*.[5]	2016	Booshehr	4	56.5	58.5
Moradi *et al*.[23]	2017	Kurdestan	11	65.4 (63-68)	69.9 (68-72)
Yusefzadeh *et al*.[24]	2017	Azarbayjan gharbi	23	64.4	75.0
Hashemian *et al*[18]	2017	Isfahan	43	67.0	75.2
Dadgar *et al*.[19]	2017	Lorestan	14	62±18 (53-71)	71±17 (62-80)
Zarei *et al*.[6]	2017	Tehran	15	66.5±13.5 (60-73)	74.7±11.2 (69-80)
Kakemam and Dargah[25]	2018	Tehran	42	73.9±10.1 (71-77)	76.7±8.7 (74-79)
Yusefi *et al*.[12]	2018	Shiraz	10	72.7±2.6 (71-74)	80.5±2.9 (79-82)
Dargahi *et al*.[8]	2018	Tehran	8	80.1	86.0
Ghazizadeh *et al*.[9]	2018	Azarbayjan sharghi	15	37±17 (0.2-0.4)	41±28 (0.2-0.5)
Khammarnia *et al*.[26]	2019	Zahedan	2	69.2	89.6
Jahangiri *et al*.[10]	2019	Tehran	1	43.8	48.7
Badiee Aval *et al*.[1]	2019	Mashhad	28	67.9±11.0 (64-72)	77.0±10.9 (73-81)
Ranjbar *et al*.[4]	2021	Yazd	10	71.9±7.5 (67-77)	79.8±6.8 (76-74)
Goudarzi *et al*.[2]	2021	Kerman	24	53.0	58.0
BTR (Bed turnover interval)					
Mousavi Rigi *et al*.[5]	2016	Booshehr	4	92.7	91.8
Moradi *et al*.[23]	2017	Kurdestan	11	86.2	90.9
Zarei *et al*.[6]	2017	Tehran	15	68.6±25.4 (56-82)	76.9±28.4 (63-91)
Yusefzadeh *et al*.[24]	2017	Azarbayjan gharbi	23	83.1	102.1
Hashemian *et al*.[18]	2017	Isfahan	43	71.2	76.4
Dargahi *et al*.[8]	2018	Tehran	8	54.4	63.0
Badiee Aval *et al*.[1]	2019	Mashhad	28	93.1±36.8 (79-107)	108.4±45.3 (92-125)
BRD (Bed rotation distance)					
Bastani *et al*.[7]	2016	Shiraz	14	5.7±3.8 (4-8)	6.0±4.0 (4-8)
Rezaei *et al*.[11]	2016	Hamedan	15	5.4±2.2 (4-7)	6.0±2.6 (5-7)
Dadgar *et al*.[19]	2017	Lorestan	14	2.6±3.2 (0.9-4)	1.7±2.4 (0.4-3)
Ghazizadeh *et al*.[9]	2018	Azarbayjan sharghi	15	5.4±2.2 (4-7)	5.9±2.7 (5-7)
Yusefi *et al*.[12]	2018	Shiraz	10	1.2±0.3 (1-1)	1.0±0.2 (0.9-1)
Khammarnia *et al*.[26]	2019	Zahedan	2	1.8	2.9
Jahangiri *et al*.[10]	2019	Tehran	1	3.5	48.8
Ranjbar *et al*.[4]	2021	Yazd	10	1.5±0.6 (1-2)	0.8±0.4 (0.6-1)
ALOS (Average Length of Stay)					
Bastani *et al*.[7]	2016	Shiraz	14	10.4±19.9 (0-21)	9.4±16.2 (0.9-18)
Rezaei *et al*.[11]	2016	Hamedan	15	3.0±1.1 (2-4)	2.0±1.2 (1-3)
Mousavi Rigi *et al*.[5]	2016	Booshehr	4	2.3	2.3
Moradi *et al*.[23]	2017	Kurdestan	11	2.7±1.8 (2-4)	2.8±1.8 (2-4)
Yusefzadeh *et al*.[24]	2017	Azarbayjan gharbi	23	2.9	2.8
Hashemian *et al*.[18]	2017	Isfahan	43	3.4	3.6
Zarei *et al*.[6]	2017	Tehran	15	4.3±2.1 (3-5)	4.1±1.9 (3-5)
Dadgar *et al*.[19]	2017	Lorestan	14	4.1±5.3 (1-7)	4.2±6.1 (1-7)
Kakemam and Dargah[25]	2018	Tehran	42	7.3±1.7 (7-8)	7.0±1.6 (7-7.4)
Dargahi *et al*.[8]	2018	Tehran	8	4.5	4.2
Yusefi *et al*.[12]	2018	Shiraz	10	4.2±0.1 (4-4)	5.4±0.2 (5-6)
Ghazizadeh *et al*.[9]	2018	Azarbayjan sharghi	15	2.1±1.2 (1-3)	2.0±1.2 (1-3)
Khammarnia *et al*.[26]	2019	Zahedan	2	3.9	4.0
Jahangiri *et al*.[10]	2019	Tehran	1	7.4	6.6
Badiee Aval *et al*.[1]	2019	Mashhad	28	4.5±8.0 (2-7)	4.5±7.7 (2-7)
Ranjbar *et al*.[4]	2021	Yazd	10	3.8±0.3 (4-4)	3.4±0.4 (3-4)

Contd...

Table 1: Contd...

Author	Year	Setting	Number of Hospitals	Before HTP mean±SD (95%CI)	After HTP mean±SD (95%CI)
Cesarean Delivery					
Seydali *et al.*[27]	2015	Shosh	1	49.5	32.1
Piroozi *et al.*[28]	2016	Kurdestan	12	39.0	33.5
Rezaei *et al.*[29]	2017	Jahrom	1	47.5	38.7
Jamshidi *et al.*[30]	2018	Fasa	1	51.6	49.0
Khammarnia *et al.*[26]	2019	Zahedan	2	38.6	29.3
Khazaei *et al.*[31]	2019	Qom	-	55.5	49.8
Bahmaei *et al.*[32]	2019	Abadan	3	45.0	34.0
Mosadeghrad *et al.*[33]	2020	Iran	-	56.1	49.9
Lotfi *et al.*[34]	2021	Shiraz	-	53.9	47.0
Normal Delivery					
Rezaei *et al.*[29]	2017	Jahrom	1	52.4	61.3
Zaboli *et al.*[35]	2017	Kerman	7	51.9	56.7
Jamshidi *et al.*[30]	2018	Fasa	1	48.3	50.9
Yusefi *et al.*[12]	2018	Shiraz	10	25.4±74.5 (0-72)	29.5±19.5 (17-42)
Khazaei *et al.*[31]	2019	Qom	-	44.5	50.2
Mosadeghrad *et al.*[33]	2020	Iran	-	43.9	50.1
Raoufi *et al.*[36]	2020	Tehran	1	14.2±5.5 (3-25)	26.8±12.9 (1-52)
Lotfi *et al.*[34]	2021	Shiraz	-	46.1	52.9
Cesarean to Normal Delivery					
Rezaei *et al.*[29]	2016	Hamedan	15	0.3±0.1 (0.2-0.4)	0.3±0.1 (0.2-0.3)
Dadgar *et al.*[19]	2017	Lorestan	14	0.4±0.1 (0.3-0.4)	0.3±0.1 (0.3-0.4)
Active to Fixed Bed Ratio					
Rezaei *et al.*[11]	2016	Hamedan	15	0.9±0.6 (0.6-1)	1±0.7 (0.6-1)
Dadgar *et al.*[29]	2017	Lorestan	14	0.8±0.3 (0.6-1)	1±0.5 (0.7-1)
Number of Surgeries					
Dadgar *et al.*[29]	2017	Lorestan	14	425.7±646.4 (87-865)	450.7±658.2 (106-796)
Zarei *et al.*[6]	2017	Tehran	15	5460±3452 (3710-7210)	6673±4205 (4540-8800)
Dargahi *et al.*[8]	2018	Tehran	8	15262	19229
Number of Hospitalized Patients					
Zarei *et al.*[6]	2017	Tehran	15	1113±7621 (275-659)	13072±8364 (8840-17300)
Ghazizadeh *et al.*[9]	2018	Azarbayjan sharghi	15	467±380 (0-4970)	517±419 (305-729)
Number of Outpatients					
Zarei *et al.*[6]	2017	Tehran	15	69286±48946 (44500-94100)	86994±56128 (58600-115000)
Ghazizadeh *et al.*[9]	2018	Azarbayjan sharghi	15	4013±2944 (2520-5500)	4512±3842 (2570-6450)
Dargahi *et al.*[8]	2018	Tehran	8	236399	27418

demand and the bed remains empty. It is out of standard, or there may be a defect in the procedure of accepting the patient.[5] Confirming the results of other studies, the findings showed that the bed rotation distance decreased after the HTP and its amount is proportional to the percentage of bed occupancy.[9,16]

On the other hand, the duration of hospitalization of patients has increased after the implementation of the plan. Increasing the duration of hospitalization makes the situation of this index unfavorable. This finding is consistent with the results obtained from the studies of Badiee Aval *et al.* and Mousavi Rigi *et al.*, that is, increasing the length of a patient's stay in hospitals leads to problems such as the lack of beds and ultimately the false use of beds by patients.[1,5]

The social problem of the patient, the undesiredness of specialized services, the lack of facilities, the malfunctioning of diagnostic devices, and the doctor's decision-making can be the main reasons for increasing the patient's stay in in-patient departments and providing more services to patients.[23] An increase in the duration of hospitalization causes an increase in the costs of the treatment center and the patient's family; therefore, formulation and implementation of policies to accelerate the process of admission and discharge and pay more attention to out-patient services and leveling of services can reduce the duration of hospitalization and impose a lower percentage of costs on medical centers.[7]

One of the main and direct goals of the health system transformation plan has been to reduce the rate of cesarean

section and increase natural childbirth in the hospital. According to the obtained results, the rate of natural childbirth has increased after the implementation of the HTP. The results of Khayeri *et al*.'s study showed that 90% of the country's hospitals have reached the goal of free natural childbirth after the implementation of the transformation plan.[37] The reason for this can be free of charge and the desire of more mothers to have a natural birth. According to the results, the ratio of cesarean section to total natural births has decreased; this finding is in line with the study of Rezaei *et al*.[11]

The index of the ratio of active beds to fixed beds has increased after the implementation of the transformation plan [Table 2]. This finding is consistent with the studies of Dadgar *et al*.[19]

According to the results of the present study, the amount of surgery has increased after the implementation of the transformation plan. In the study by Rezaei *et al*.,[11] the reason for this is the implementation of the book of relative values and the significant increase in tariffs and, as a result, the formation of a kind of induced demand from the providers. In line with this finding, in Zarei *et al*.'s[6] study, the decrease in patients' out-of-pocket payments is also mentioned as one of the reasons for the increase in this index. According to the official report of the Ministry of Health, people's share of hospitalization expenses has reached 4.5% from 37%, and this reduction in payments can increase the access of people, especially the low-income groups, to hospital services.[6]

The number of hospitalized patients and out-patients has increased in hospitals after the reform of the health system. Considering the programs of "reducing the payment number of hospitalized patients", "improving the quality of visit services", and "special clinic development programs", the increasing rate of these indicators was not unexpected.[9] This can lead to problems such as overcrowding in big hospitals, ignoring the referral system, increasing waiting lines, and lack of human resources.[6]

Among the limitations of this study, we can mention the small number of investigated indicators.

Conclusion

Based on the results of the present study, the implementation of HTP by changing the tariffs of health care services has resulted in increasing the financial access of patients to medical services. This has led to an increase in the patient's desire to be admitted to government centers as well as more acceptance of the patient by the health care provider. As a result, with the increase in the number of active beds, the bed occupancy rate and the average length of stay have increased. Considering the decrease in the efficiency of hospitals, it is suggested that factors such as managing the length of stay of patients by experts, performing economic evaluations and applying more effective clinical interventions, emphasizing the patient referral system, hiring manpower based on the needs of the hospital, and optimal allocation of beds should be taken into consideration.

Journalism ethics considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

Conflicts of interest

There are no conflicts of interest.

Table 2: Sub-group analysis of performance indicators before and after HTP in Iranian hospitals from 2000 to 2022

Variable	No. of reports	Pooled estimate of variables Before HTP Mean (95% CI)	
		Before HTP	**After HTP**
BOR	8	64.5 (66.3-72.8)	75.7 (72.3-79.2)
BTR	2	80.3 (59.6-108.4)	91.7 (65.5-128.5)
BRD	6	3 (1.6-5.9)	2.6 (1.1-6.3)
ALOS	10	3.8 (2.9-5)	4.1 (3.2-5.2)
Normal Delivery	2	14.7 (5.5-39.1)	29.3 (19.2-44.8)
Cesarean to Normal Delivery	2	40 (0.3-0.4)	30 (0.3-0.4)
Active to Fixed Bed Ratio	2	0.9 (0.8-1.1)	1 (0.8-1.2)
Number of Surgeries	2	1621.8 (133-20000)	1811.8 (129-25000)
Number of Hospitalized patients	2	468.8 (303-725)	2607.7 (110-62000)
Number of Outpatients	2	17000 (1035.4-280000)	20000 (1094.1-360000)

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