

The impact of health transformation plan on hospitalization rates in Iran: An interrupted time series

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Summary

Objective: The study aims to assess the impact of health transformation plan (HTP) as a major health system reform on hospitalization rate in Iran. Health transformation plan adopted different measures to increase the coverage of basic health insurance, increase the quality of outpatient visit care, improve and expand the family physician program, expand health services to suburban areas, reduce out-of-pocket (OOP) payments for inpatient services, and update tariffs to more realistic ones.

Methods: We selected Kurdistan province, a province that was not a patient referral hub, for the collection of monthly hospitalization data over a period of 50 months. Interrupted time series (ITS) analysis was carried out, and segmented regression analysis was employed to assess the abrupt (or short-term) and gradual (or long-term) effects of HTP on hospitalization rate.

Results: Although before the intervention, there was no significant increase or decline in hospitalization rate in the Kurdistan province, after the implementation of HTP, a significant increase in the intercept and slope of hospitalization rate was observed ($P < 0.001$).

Conclusion: Health transformation plan has improved the utilization of hospitalization care services in a province

that historically had been suffering from underutilized hospital services.

KEYWORDS

health system reform, hospitalization, inpatient, utilization, Iran, interrupted time series

1 | INTRODUCTION

Access is the first necessary condition to utilize care services.¹ Nowadays, only a limited number of people in the world, especially in poor and developing countries, have timely access to health services; thus, to universalize the services, it is necessary to alter health system financing methods and move them toward payment methods such as social health insurance.² It is a solution that has been adopted by most countries with an almost universal coverage.^{3,4}

Health insurance coverage and the amount of out-of-pocket payments for health services are the factors affecting health services utilization and access.⁵ The emphasis on direct payment of health costs, either legal or illegal, deprives millions of people from receiving health care at a due time. Elimination of financial obstacles in direct payment increases people's, especially poor people's, access to health services.⁶⁻⁸

Access to health services, particularly inpatient care, is very difficult for people who are not under health insurance coverage or any kind of financial protection plan. When a protection plan does not cover sufficient services or is deficient, households may not have access to necessary health care services and encounter catastrophic expenditures.^{9,10}

If care is delivered with a delay, it also causes hospitalizations while it could have been prevented by timely treatment.^{11,12} Underutilization and inadequate access to health care services are issues that can be solved by developing social protection programs through adopting measures such as social insurance or publicly funded health care.^{9,13}

From a theoretical point of view, expansion of social protection schemes and development of primary health care (PHC) have diverse effect on the utilization of hospitalization services. On one hand, timely access to PHC and outpatient cares can lead to a reduction in avoidable hospitalization that is termed "efficiency effect". On the other hand, better access to secondary care services in time of need, through improving referral process and reducing patient's out-of-pocket payment, can increase "referral-sensitive" hospitalization or decrease unavoidable hospitalization that is termed "access effect." Ambulatory care sensitive conditions hospitalization is a type of hospitalizations that can be avoided, or its probability can be reduced by providing appropriate primary and outpatient care services.^{14,15}

In recent years, Iranians have underutilized inpatient services; thus, despite low ratio of hospital beds to population, the average hospital bed occupancy rate in the country is much lower than the desirable and standard rate recommended by the Ministry of Health (occupancy rate > 70%). According to health experts, the main reason for people's low access to hospitalization services is the high costs of hospitalization services.¹⁶ In Iran, since May 2014, some reforms have been implemented in health system, known as health transformation plan (HTP), with three main goals: providing financial protection for people, improving equity in access to health services, and improving the quality of services.⁶

1.1 | Health transformation plan

Health transformation plan includes different interventions and various packages. Three phases have been carried out so far. The *first phase* started in May 2014 and included the following items:

1. Providing basic and free health insurance for all Iranians who do not have any kind of health insurance coverage by Iran Health Insurance Organization and covering some services that were not covered by the service

packages of basic insurance systems in the past: As reported by the National Institute of Health Researches in Iran in 2010, 17% of Iranian households were not covered by any kind of health insurance. After implementing this package of HTP, over 10 million people were covered by health insurance organization.

2. Reducing out-of-pocket payments for inpatient services in hospitals affiliated to Ministry of Health and Medical Education (MOHME): As stated in the national health accounts report of Iran in 2008, the shares of health care insurance organization, social security, and armed forces, as the three main insurer organizations, out-of-total health care costs were 6.6%, 10.9%, and 1.5%, respectively, which indicates the ineffectiveness of insurances in height and depth of the coverage of services, as most the health care costs were imposed on households. In the mentioned report, the share of out-of-pocket payment, of the total health care costs, was more than 50%. One of the objectives of HTP package was reducing direct out-of-pocket payment by hospitalized patients in the hospitals affiliated to MOHME to 8% of total hospitalization costs for city residents and to 5% for villagers and resident of cities with a population of less than 20 000 people. After implementing the third phase of HTP, due to increased medical fees, it reduced to 6% for urban population and to 3% for villagers and resident of cities with a population of less than 20 000 people. Another objective of this package was to avoid the referral of patients or their companions to out-of-the supply chain in hospitals affiliated to MOHME, in order to buy medicine, consumables, and medical equipment and to receive diagnostic medical services. In recent years, almost all patients were referred to out-of-the hospital for buying equipment and consumables; because such costs are not registered in patient's records, they are not covered by basic insurance agencies, and these costs are imposed on patients and their families. It is one of the reasons for increasing the share of out-of-pocket payment in health expenditures.
3. Supporting physicians retention in underserved areas: This package was written with the aim of increasing public access to services and health care services in the second and third level, enhancing the recruitment and retention of specialists in such areas
4. Improving hoteling quality in hospitals affiliated to MOHME: This package was used to improve the quality of hoteling services in all hospitals affiliated to MOHME, reach minimum standard rate (three stars), respond to patient's expectations, and increase patients' and their companions' satisfaction with services.
5. Improving the quality of outpatient visit services in hospitals affiliated to MOHME: This package was implemented to standardize and improve the quality of outpatient visit services, increase doctors' incentive for retention in public sector, maintain full-time geographic faculty members to increase patients' satisfaction, change doctors' behavior, and reduce the hospitalizations and unnecessary surgeries by increasing doctors' income via increasing the number of outpatient visits, especially for various surgical specialists.
6. Increasing the presence of resident physicians in hospitals affiliated to MOHME: In order to increase 24/7 response in hospitals affiliated to MOHME and guaranty the delivery of appropriate health care services in 24/7 in all parts of the country, and improve the quality of health care services, universities of medical science were obliged to use specialist or subspecialists/fellowship as resident doctors in hospitals. Resident doctor is required to be physically active during the time of residency in university hospitals and carry out all actions required for patients that are related to their field of specialty.
7. Providing free services for natural childbirth with the aim of promoting natural delivery in hospitals affiliated to MOHME.^{6,7}

The *second phase* with a focus on PHC began on May 22, 2014; this phase included the following:

1. Improving health care services in rural regions and small towns with a population of less than 20 000 people through recruiting doctors, midwives, and other human resources needed to provide services in rural health centers in underprivileged regions, and adding new drugs to previous list of drugs.

2. Providing PHC services for a population of over 8.5 to 10 million people who live in suburban areas: In the past, this population had no access to PHC. In suburban areas, there should be a physician per 8000 to 15 000 people, a dietitian per 30 000 to 50 000 people, and a psychologist and experts in laboratory sciences.
3. Continuing family physician pilot program in two provinces, namely, Fars and Mazandaran.
4. Extending family physician program to cities with a population of 20 000 to 50 000 people.
5. Implementing a national plan for promoting and developing self-care.
6. Strengthening and institutionalizing intersectoral cooperation in the field of health at the national, provincial, and city level.^{6,7}

The *third phase*, which included updated tariffs of health services was implemented from October 2014 to eliminate the informal payments and create equity in wages of various medical specialties. The third phase included the following:

- 1- Increasing tariff for medical services: Because of implementing the third phase, there was a significant rise in tariff of most medical services. In years before implementing the HTP, informal payments, although illegal, were observed in country's health care system. According to a study in 2011, 11.3% of doctors had received informal payments from hospitalized patients. According to doctors, low tariffs were the main reason for informal payments.
- 2- Enhancing supervision over the implementation of medical services tariffs: With the implementation of the third phase, supervision over medical services tariffs was increased by universities of medical sciences to prevent receiving any extra money from patients. Also, a telephone system (1690) and a website (www.1690.ir) were set up to receive reports on medical violations. They enabled people to report their complaints and track them.⁶

Because HTP is one of the most important social programs implemented by the government, monitoring and evaluation of the program can provide many lessons for health system policy makers. Timely monitoring and evaluation of reforms can provide evidence required for (re)directing the reforms. Nowadays, after 2 years of implementing the HTP, it is necessary to assess the impact of this plan on utilization of hospital services. Hence, the aim of this study was to evaluate the immediate (or short-term) and long-term effects of HTP on utilization of hospital services.

2 | METHODS

We conducted an interrupted time series (ITS) study and analyzed monthly hospitalization rate to assess abrupt drops (or short-term) and gradual (or long-term) effects of HTP on hospitalization rate. An ITS study does not require a concurrent "control group" to establish a causal link between an intervention and an outcome.¹⁷

We hypothesized that the intervention would affect hospitalization rate more strongly in areas where households were poor. We also needed to select a province that was not a patient referral hub for other provinces. Kurdistan, a province in the western part of Iran, met this criterion. This province has eight counties and has 14 hospitals and is one of the economically poor provinces in the country (Table 1).¹⁶

TABLE 1 Characteristic of Kurdistan province and Iran, 2014

Variable	Kurdistan Province	Iran
Population	1 524 000 ⁽¹⁶⁾	77 337 000 ⁽¹⁶⁾
Hospital beds per 1000 population	1.17 ⁽¹⁶⁾	1.70 ⁽¹⁶⁾

TABLE 2 Structure of data for analysis of the impact of health transformation plan on hospitalization rate in Kurdistan province

Observation	Hospitalization Rates ^a	Time, mo	Intervention	Time After Intervention
1	7.894	1	0	0
2	8.567	2	0	0
3	8.645	3	0	0
4	8.963	4	0	0
5	8.142	5	0	0
6	8.485	6	0	0
7	8.181	7	0	0
8	8.287	8	0	0
9	8.577	9	0	0
10	8.946	10	0	0
11	9.519	11	0	0
12	8.836	12	0	0
13	7.674	13	0	0
14	8.993	14	0	0
15	8.602	15	0	0
16	9.090	16	0	0
17	8.557	17	0	0
18	8.651	18	0	0
19	8.127	19	0	0
20	8.466	20	0	0
21	9.317	21	0	0
22	9.030	22	0	0
23	9.055	23	0	0
24	8.482	24	0	0
25	7.873	25	0	0
26	9.177	26	1	1
27	9.519	27	1	2
28	9.636	28	1	3
29	9.226	29	1	4
30	9.896	30	1	5
31	9.018	31	1	6
32	9.388	32	1	7
33	9.860	33	1	8
34	9.943	34	1	9
35	10.615	35	1	10
36	9.942	36	1	11
37	9.050	37	1	12
38	10.214	38	1	13
39	10.240	39	1	14
40	10.020	40	1	15
41	10.392	41	1	16
42	10.205	42	1	17

(Continues)

TABLE 2 (Continued)

Observation	Hospitalization Rates ^a	Time, mo	Intervention	Time After Intervention
43	10.165	43	1	18
44	10.187	44	1	19
45	10.577	45	1	20
46	11.085	46	1	21
47	11.102	47	1	22
48	10.788	48	1	23
49	9.959	49	1	24
50	10.728	50	1	25

^aHospitalization per 1000 inhabitants.

We obtained data on all hospitals in Kurdistan province from the hospitals information system and we also collected population data from the Statistical Centre of Iran. We modeled data using segmented regressions to assess causal links between the intervention and the outcome of interest. This model required at the least 48 observations to check seasonality in the data.¹⁸ Our sample included 50 observations (ie, one per month)—starting 25 months before (March 2012 to April 2014) and ended 24 months after (June 2014–May 2016) HTP (Table 2). Interrupted time series analysis was performed using two ordinary least squares (OLSs) regression-based approaches, viz, Newey-West and Prais. We used Newey-West approach in our estimation.^{18,19} Newey estimates the coefficients by OLS regression but produces Newey-West standard errors to handle autocorrelation in addition to possible heteroskedasticity. The model was estimated using Newey. Moreover, to ensure that we estimated a model that accounted for the correct autocorrelation structure, we used Actest and considered lag 12 in the ITS models to correct autocorrelation.¹⁸ We conducted several diagnostic assessments. The results of Dickey-Fuller statistic suggested the stationary residuals. The results suggested a normal residual distribution. To eliminate the effects of population growth, we defined each observation as the number of hospitalizations per month divided by the population in a year. Analyses were carried out using STATA statistical software version 13.

3 | RESULTS

As shown in the regression table (Table 3), the preintervention rate remained stable and no significant increase or decline in the hospitalization rate was observed. The starting level of hospitalization rate was estimated to be 8.469. However, we observed significant changes in the intercept (representing short-term effect) and slope

TABLE 3 Estimated coefficients of segmented regression model for hospitalization rate in Kurdistan province

Regression with Newey-West Standard Errors Maximum Lag: 12 $F_{3,46} = 262.90$ Prob > F = 0.0000					
Parameter	Coefficients	Number of Observations = 50			
		Newey-West Standard Errors	P Value	Confidence Interval (95%)	
Intercept	8.469	0.098	0.000	8.271	8.667
Preintervention slope	0.010	0.007	0.178	-0.005	0.025
Change in intercept	0.568	0.129	0.000	0.309	0.827
Change in slope	0.051	0.008	0.000	0.035	0.069
Post intervention linear trend	0.062	0.004	0.000	0.053	0.070

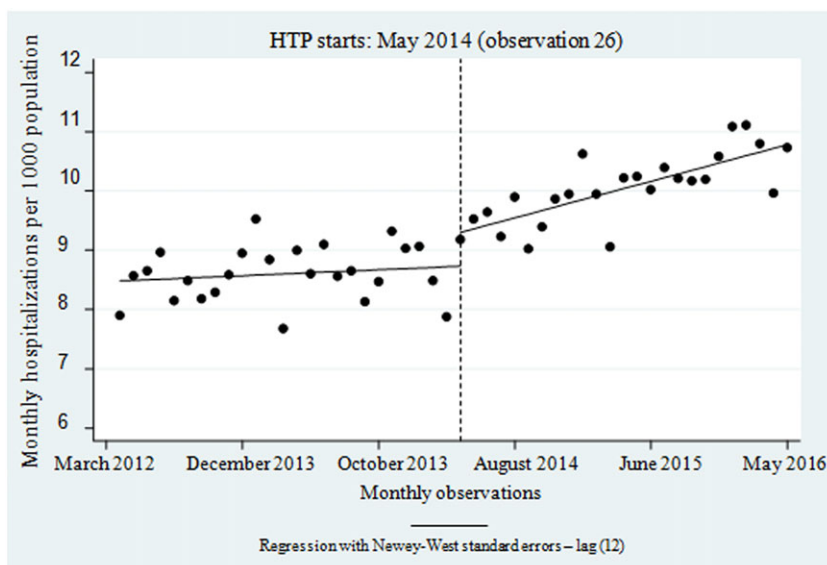


FIGURE 1 Segmented regression model of hospitalization rate in Kurdistan province with Newey-West standard errors

(representing long-term effect) in the hospitalization rate ($P < 0.001$). This finding suggests that HTP increased the likelihood of the utilization of hospital services after the implementation of HTP. As shown in Table 3, the hospitalization rate in Kurdistan increased, on average, by about 5.1 hospitalizations per 100 000 people per month.

The regression model for hospitalization rate is shown in Equation (1):

$$Y_t = 8.469 + 0.010 \text{ time } t + 0.568 \text{ intervention } t + 0.051 \text{ time after intervention } t. \quad (1)$$

In Equation (1), Y_t is the hospitalization rate in month t ; time indicates time in months at time t from the start of the observation period; intervention is a dummy (indicator) variable representing the intervention (pre-HTP periods 0, otherwise 1), which was implemented in the 26th month in the series, and time after intervention is the number of months after the HTP at time t ; 8.469 represents the intercept, or starting level of the hospitalization rate; 0.010 is the slope of the hospitalization rate until the implementation of the HTP; 0.568 indicates the change in the level of the hospitalization rate in the period immediately following the implementation of HTP (compared with the counterfactual); 0.051 represents the difference between pre- and post-HTP slopes of the hospitalization rate.

Figure 1 provides a visual display of the results.

4 | DISCUSSION AND CONCLUSION

In our study, we evaluated the effects of HTP in Iran on hospitalization rate, and the results showed a statistically significant increase in the hospitalization rate. Health transformation plan increased the utilization of hospital beds in a population that formerly underutilized hospital services. Our results show that the “access effect” of HTP outweighed its potential “efficiency effect.” Our results are different from the results of other studies that claim an increase in PHC and outpatient cares access and an increase in health insurance coverage through a reduction in ambulatory care sensitive conditions hospitalization that led to a reduction in total hospitalization rate.^{14,20-22} In a study in the United States, Friedman and Basu observed that improving people's access to primary and outpatient care services and expanding health insurance coverage resulted in a reduction in all hospitalizations among children.²²

Epstein studied the impact of public clinics on avoidable hospitalization rate in the elderly and low-income communities in Virginia; the results of the study showed that the availability of free clinics had a significant relationship with a reduction in avoidable hospitalization rate. They finally concluded that availability of free clinics resulted in a better access of low-income and at-risk groups to primary care.²³

Our finding is consistent with the results of other studies. Rashidian et al hypothesized that improving people's access to primary care—family physician program and a social protection scheme in rural areas in Iran—would result in a reduction in hospitalization rate. However, they observed that primary health care program instituted as part of the health system reform process increased people's access to hospital care services. In their study, the hospitalization rate among rural population increased, on average, by about 4.6 hospitalizations per 100 000 insured people per month.⁵

The study of Saha et al in the United States showed that improving people's access to primary care—by expanding the Medicaid program in the state of Oregon to cover low-income families—resulted in an increase in the hospitalization rate. In their study, avoidable hospitalization rate increased in the population covered by Medicaid insurance plus the population uninsured after expansion of Medicaid program in 1994 (in contrary to their hypothesis) and increased from 46.1 to 54.9 people per 10 000. They concluded that avoidable hospitalization may not have a reverse relationship with primary care.²⁴

Dafny and Gruber studied the development and increasing impacts of people covered by Medicaid and its relationship with hospitalization rate and found that every 10% increase in the number of people covered by Medicaid insurance led to 8.4% increase in hospitalization rate. They concluded that the increase in unavoidable hospitalization is far more than the increase in avoidable hospitalization.¹⁴

One of the strengths of our study was its methodology ITS analysis is arguably the strongest quasi-experimental research design. Interrupted time series is particularly useful when a randomized trial is infeasible or unethical. Furthermore, ITS study does not require a concurrent “control group” to establish a causality link.^{5,17}

According to the results of our study, plans that focus on increasing health insurance coverage, increasing people's access to primary and outpatient care services, and raising the quality of health care do not necessarily lead to a decrease in hospitalization, especially in a society where people's real needs for hospitalization services had not been met in the past.

4.1 | Limitations

The study also had important limitations. It was conducted in only one province, whereas ideally it should have been conducted in a nationally representative sample. Also, we did not have access to data on hospitalization length and causes of admission. Further, studies are required in future to study the long-term effects of HTP on the utilization of hospital services. According to the results of our study, after 2 years of the implementation of HTP, the utilization of hospital services is still increasing.

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CONFLICT OF INTEREST

The authors have no competing interests.

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ETHICAL APPROVAL

The study was approved by the Ethics Committee of Kurdistan University of Medical Sciences in August 3, 2016.

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