The Relationship Between Distribution of Human Resources Distribution and Performance Indicators of Hospitals Before and After Implementation of Health System Evolution Plan in Iran

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Received: 02 Feb. 2019; Accepted: 12 Jul. 2019

Abstract- The implementation of the Health System Evolution Plan has resulted in an increase in the rate of patient's referral to hospitals of medical universities, and thus, hospitals' performance indicators. The aim of the present study is to investigate the changes in hospital indicators after the implementation of the Health System Evolution Plan and the relationship between this plan and distribution of human resources in hospitals of Tehran University of Medical Sciences. This was a descriptive-analytical and cross-sectional study. The research population consisted of information about human resources and performance indicators before and after the implementation of the Health System Evolution Plan in the hospitals. The research tool was a data collection form. The collected data were analyzed in SPSS software, and analytical results were obtained using the Pearson correlation test and Two Sample t-test. The results showed that there was a significant relationship between hospitals performance indicators and the distribution of human resources after the implementation of the Health System Evolution Plan. In fact, this plan has increased the deficit of nursing and paraclinical staff. In addition, the results showed as hospitals' performance indicators have increased, more human resources has been recruited in these hospitals. The success of Implementation of Health System Evolution Plan and development of general hospitals indicators need comprehensive. Planning for retainment of all groups of health workers and paying attention to appropriate distribution of physicians, nurses, and paraclinical staff in public hospitals and finally a comprehensive review of human resources standards by the Iranian Ministry of Health.

Acta Med Iran 2019;57(8):510-517.

Keywords: Health system evolution plan; Distribution of human resources; Hospital performance indicators; Tehran university of medical sciences

Introduction

Human resources management has defined the process of development and improvement of skills and qualifications of the organization's staff as the center of healthcare manpower (1). Health care workers are the most valuable resources of health care organizations (2). These organizations provide services in a challenging environment, making the introduction of health human resources initiatives, especially critical for safe patients (3).

The most important skill required for healthcare workforce to deliver high-quality care to patients is the human resources developments (4). Desirable human resources management and having an advanced system to support and development manpower of health care organizations should be the first priority in these organizations for their managers (5).

Human resources should be considered an organizational asset, but the expert human resources is not easy to find. This is why human resources demands much more attention (6). Sufficient human resources for the health care system are essential and improve the quality and equity of care (7). Although the health care system in all countries with a critical shortage of human resources (8). WHO estimated a global shortage of health care systems to raise 12.9 million by 2035 (9).

Therefore, shortage and surplus of human resources

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reduce the quality of effective services. In fact, a proper combination of physicians, nurses, and other medical and non-medical staff provides quality hospital services (10). Arab *et al.,* (2009) showed that the reception department in a pediatrics hospital in Tehran, Iran faced with a shortage of manpower. For compensation of this shortage, they suggested to enhance hospital technology, increase human resources, and pay the staff according to workload as the solution (11).

Matsumoto *et al.,* (2010) showed that there was a disproportion of human resources to health care facilities in Japan in comparison with Great Britain through the calculation of the GINI coefficient. Implementation of an equality-oriented insurance system and government interferences to develop the right strategies for proper distribution of human resources was proposed as a solution (12).

Sadeghifar *et al.,* (2011) showed that only seven hospital departments of the Ilam province in Iran were distributed in compliance with the Iranian Ministry of Health standards. Also, seven departments were above the standards, while 48 departments were below the standards of human resources distribution (13).

Ghazi Mirsaeid *et al.,* (2013) reported all hospitals affiliated with Tehran University of Medical Sciences were faced with a lack of sufficient human resources. In addition, most departments of studied hospitals had not appropriate human resources distribution (14).

Bahadori *et al.,* (2013) reported that in hospitals of Ilam and Ahvaz, Provinces in South and Southwest of Iran, the number of nurses was below the standard in 42 departments (15).

According to Sadeghifar *et al.,* (2013) reporting in hospitals of Ahvaz in Khuzestan province of Iran, most of the departments faced with lack of sufficient nursing staff that was not compatible with human resources standards in these hospitals (16).

Misada *et al.,* found that globally, there was an acute shortage of human resources for the health care system, and the greatest burden is borne by low-income countries, especially in Africa and some parts of Asia. They declared an overall huge gap across 46 countries, including physicians and nurses. The use of technology, the development of policies and legal frameworks and humanized skill by guidelines were the only ways for the decrease in this gap (17).

Also, Sheffler and Tuleuko reported there were important differences by country income group in case of human resources shortage. Although health workers shortage occurs in all countries, low income and middle-income countries have a much larger and growing shortage, and inversely upper-middle and high-income countries tend to decrease the shortages to 2030 (18).

In a study in Malaysia, Elarabi and Johari (2014) stated that human resources management in health care centers had a significant effect on the quality of health care services and staff performance (19).

On the other hand, hospital performance, including bed turnover rate (BTO), bed occupancy rate (BOR), number of patients, and number of surgical operations indicators, are the most important criterias and should be checked regularly within specific time intervals. Hospital performance indicators include improving public health in each country to attain organizational goals (20,21).

Hospitals play a vital role in delivering the best health care services, which are essential to improving resource allocation (22). Moreover, one of the performance measurement is the comparison of Inputs and outputs in order to estimate the efficiency of hospitals (23).

The establishment of specific researched criterias to evaluate hospital performance indicators is very important. Therefore, it is necessary to design to evaluate human resources dedicated to hospitals to discover the potential inefficiencies (24).

In this regard, the Health System Evolution Plan was established to all public hospitals in Iran on May 5, 2014. Therefore, hospital performance indicators were changed due to this plan. To deal with these changes, directors, and administrators of the public hospitals included in this plan should identify their human resources requirements and try to fulfill them. So, the aim of this study is to determine changes in hospital performance indicators before and after the implementation of the Health System Evolution Plan, and the relationship between these changes and distribution of human resources in hospitals affiliated with Tehran University of Medical Sciences. For this purpose, this study tries to identify number and distribution of human resources in three groups of practitioners including physicians, nurses, and paraclinical staffs as independent variables, and assess the relationship between these variables and hospital performance indicators, as dependent variables before and after the implementation of Health System Evolution Plan.

Materials and Methods

This was a descriptive-analytical and cross-sectional study. The research population consisted of data resources requested from the health information technology departments by checklist forms from two general hospitals, including Shariati and Imam Khomeini,

and two specialized hospitals, Farabi Eye and Razi Skin Hospitals affiliated with Tehran University of Medical Sciences. These hospitals were selected purposefully based personal judgment and proportional, and their previous cooperation for data collection. Whereas the Health System Evolution Plan was implemented in 2014, the data obtained from 2013, one year before and 2015, one year after implementation of this plan. Data collection tools were three information collection forms, including a form for collecting data from managers of clinical, nursing, and paraclinical departments, a form for collecting data from health information technology departments, and a form for collecting information from heads of administrative affairs departments. After data collection was completed, the required number of human resources, staff shortage and surplus, and distribution of human resources were determined according to the staff standards and proportions set by the Iranian Ministry of Health for each hospital and job title. The validity of data collection forms was confirmed by expert panel considering the number of beds, physicians, nurses, and paraclinical staff in each department, bed occupancy rate (BOR), bed turnover rate (BTO), number of hospitalized patients, and surgical operations in each hospital. In addition, shortage and surplus and distribution of human resources in each department of selected hospitals were determined according to regulations and standards of the Iranian Ministry of Health. The data were determined specifically for each job title and studied hospitals independently. Hospital Performance indicators were extracted for each department and used after expert panel confirmation. The data was analyzed by SPSS software and analytical results were studied using Pearson correlation and Sample T-test.

Results

The results showed that a deficit of nursing human resources, and also the deficit of operation rooms, anesthesiology, medical laboratory, and radiology department's staff were compensated by 2, 6, 31, and 23 after implementation of Health System Evolution Plan. However, the results showed that Razi hospital had seven physicians more than the standard level, which had been kept constant after the implementation of this plan. Farabi Eye Hospital had 46 surplus physicians before the plan, which had been increased to 58 after the plan. In fact, the surplus human resources in this group were actually increased after the implementation of the Health System Evolution Plan in these two hospitals. In Shariati hospital, the number of physicians had been reduced by 36, while in Imam Khomeini hospital, this number had been increased by 47.

The results of the Pearson correlation test showed a negative significant correlation between the deficit of nursing staff and bed occupancy rate, the number of patients, and bed turnover rate indicators and the number of surgical operations after the implementation of the Health System Evolution Plan in Shariati and Imam Khomeini Hospitals. In general, as the deficit of nursing staff had increased, these indicators had been decreased (Table 1).

Table 1. The relationship between studied hospitals performance indicators and the distribution of nursing staff

Name of Hospital	Bed occupancy rate		Bed turnover rate		Number of patients		Number of surgical operations	
	Correlation coefficient	Significance level	Correlation coefficient	Significance level	Correlation coefficient	Significance level	Correlation coefficient	Significance level
Razi	-0.324	0.068	0.108	0.18	0.320	0.09	-0.166	0.12
Farabi	-0.278	0.316	-0.423	0.131	-0.254	0.081	-0.230	0.08
Shariati	-0.674	0.003	-0.368	0.02	-0.620	0.01	-0.505	0.04
Imam Khomeini	-0.779	0.001	-0.520	0.03	0.603	0.04	-0.473	0.06
Total	-0.512	0.03	0.670	0.01	-0.482	0.04	-0.301	0.04

The relationship between the hospitals' performance indicators and the deficit of paraclinical staff after the implementation of the Health System Evolution Plan showed that, as the deficit of paraclinical staff increased, these indicators decreased significantly (P<0.05) by Pearson correlation test (Table 2).

Table 2. The relationship between studied hospitals performance indicators and the distribution of paraclinical staffs

Name of Hospital	Bed occupancy rate		Bed turnover rate		Number of patients		Number of surgical operations	
	Correlation coefficient	Significance level	Correlation coefficient	Significance level	Correlation coefficient	Significance level	Correlation coefficient	Significance level
Razi	-0.68	0.000	-0.348	0.001	-0.748	0.001	-0.727	0.001
Farabi	-0.59	0.000	-0.311	0.001	-0.400	0.001	-0.583	0.001
Shariati	-0.64	0.000	-0.084	0.17	-0.300	0.001	-0.191	0.04
Imam Khomeini	-0.55	0.000	-0.267	0.02	-0.044	0.48	-0.815	0.001
Total	-0.59	0.000	-0.402	0.001	-0.450	0.001	-0.702	0.001

The results of Table 3 showed there was the relationship between the hospitals' performance indicators and distribution of physicians after the implementation of the Health System Evolution Plan, i.e., an increased number of physicians resulted in improved hospital performance indicators (Table 3).

Table 3. The relationship between studied hospitals performance indicators and the distribution of physicians

Hospital	Bed occupancy rate		Bed turnover rate		Number of patients		Number of surgical operations	
	Correlation coefficient	Significance level	Correlation coefficient	Significance level	Correlation coefficient	Significance level	Correlation coefficient	Significance level
Razi	0.877	0.02	0.263	0.05	0.320	0.1	0.456	0.03
Farabi	0.487	0.04	0.359	0.04	0.682	0.01	0.688	0.01
Shariati	0.762	0.03	0.600	0.03	0.701	0.02	0.271	0.07
Imam Khomeini	0.796	0.01	0.921	0.01	0.825	0.01	0.560	0.01
Total	0.635	0.02	0.640	0.02	0.632	0.01	0.489	0.03

The results of the Two-Sample T-test showed that the Health System Evolution Plan had a significant effect on reducing the deficit of human resources in studied hospitals. In fact, this plan led to an increase in the number of physicians, while no such effect was observed in the paraclinical and nursing job groups (Table 4).

Table 4. The effect of healthcare system overhaul plan on the lack of hospital staff

Medical staffs	Name of Hospital	Before the overhaul plan	After the overhaul plan	t	*P*
Nursing staff	Razi	17	5	8.15	0.02
	Farabi	129	124		
	Shariati	242	166		
	Imam Khomeini	803	646		
Paraclinical staff	Razi	69	60	3.69	0.13
	Farabi	120	133		
	Shariati	-42	-9		
	Imam Khomeini	85	65		
Physicians	Razi	-7	-7	12.14	0.002
	Farabi	-74	-107		
	Shariati	-62	-46		
	Imam Khomeini	-91	-138		

(-): Negative numbers represent the surplus of force in that group

Discussion

Human resources for health (HRH) are the most important input of the health care system. HRH reductions are forced by economic circumstances, but policy-markers pursue human resources goals and policies such as incasing the frontline workforce while reducing support staff and protection of some groups (25). The critical shortage of health workers is a huge problem in low and middle-income countries, and so many strategies to increase and equitably distribute are recommended for goal development (26).

The results of the current study showed the studied hospitals were still faced with a deficit of paraclinical and nursing staff, even after the implementation of the Health System Evolution Plan. On the other hand, there were surplus physicians in these hospitals. These results were in line with those of Sadeghifar *et al*., that showed several job groups were compatible with human resources standards of Iranian Ministry of Health; however the other had surplus staffs and the remaining were below the standards of human resource in Ilam province of Iran (13). The results of the current study also comply with those of Momeni *et al.,* who showed that most of the public hospitals' departments were below standard, while a few of them had surplus staffs in public hospitals in Lorestan province of Iran (27).

Ghazi Mirsaeid *et al.,* found that there was a deficiency of human resources among all studied hospitals. Also, the distribution of human resources among most of the hospitals' departments was not coordinated with the Iranian Ministry of health before the implementation of the Health System Evolution Plan in Tehran university of Medical Sciences (14) that is similar to the current study.

Regarding the deficit of nursing staffs in clinical and emergency departments in current study, this is compatible with Rahmani *et al.,* who should emergency departments of Tehran University of Medical Sciences (28), and Jahani *et al.,* the deficit of nursing staffs in Mazandaran province of Iran (29) before implementation of Health System Evolution Plan in Iran.

Buarhaus *et al.,* declared there was considerable concern about the U.S. nurse shortage and substantial proportions of respondent's perceived negative impact on care processes, patient safety, and early detection of patient complications (30).

But, Haddad *et al.,* reported according to the American Nurses Association (ANA) there would be more registered nurse jobs available through 2022 than any other profession in the United States are needed to avoid a further shortage and grow than all other occupations from 2016 through 2026 (31).

Khalajinia and Gaeeni and Bahmani and Farhanian reported the main challenge of Health System Evolution Plan in Iran is the deficit of human resources especially physicians in public hospitals (32,33) that is not similar to current study results because of the surplus of physicians in Tehran University of Medical Sciences after implementation of this plan.

The findings of the current study showed the deficit of paraclinical staff both before and after implantation of the Health System Evolution Plan in studied hospitals. These results are in line with the results of Bardsiri *et al.,* and Farvardin *et al.,* in Tehran, Iran (34,35). Although, Datta *et al.,* revealed that an increase of paraclinical staff, especially radiotherapy requirement, is expected for the patient over the next years in Switzerland (36).

The findings of the present study indicated the Health System Evolution Plan in Iran had a significant effect on reducing the deficit of human resources, and there was a positive significant relationship between the increase in the number of surplus physicians and studied hospital performance indicators.

Shahabi *et al.,* showed there was a significant relationship between the number of physicians and active inpatient beds in hospitals. This finding is in line with that of the present study, especially after the implementation of the Health System Evolution Plan.

In a study in West Azarbaijan province in Iran, Jafari Sirizi *et al.,* (2017) showed that, by implementation the full-time attending physicians program, the Health System Evolution Plan could improve hospitals performance indicators in the Emergency departments (37) is in line with findings of the current study. Mousavi Rigi *et al.,* in Busher, Iran (38), Rezaei *et al.,* in Hamedan province of Iran (39) and finally Faridfar *et al.,* in Tehran, Iran (40) reported there to negative correlation between hospitals performance indicators and the shortage of physicians especially after implementation of Health System Evolution Plan in Iran. Buerhaus *et al.,* claimed there was a negative impact of the shortage of physicians and use processes and hospital capacity that could be important barriers to resolving the current physician shortage and improving hospital performance (41,42). We found a negative significant correlation between the deficit of nursing staff and studied hospitals' performance indicators. Azari *et al.,* revealed the nursing staff of Tehran University of Medical Sciences were at levels below the standards and this shortage showed meaningful relationships with the hospitals' performance (43) that confirm the findings of current research after implementation of the Health System Evolution Plan. Also, Ever hart *et al.,* and Clark *et al.,* stated negative relationships existed between nursing staff shortage and hospital performance and patient satisfaction (44,45).

Abedi *et al.,* and Yosefinezhadi *et al*., declared a lack of sufficient human resources management including paraclinical, and nursing staff, and physicians influence the hospitals' performance and accreditation (46,47).

The limitation of this study is cross-sectional research regarding a year before and one year after implementation of the health system evolution plan in public hospitals in Iran that may be changed the findings in another time.

Second, this study was induced only at Tehran University of Medical Sciences hospitals that might not be generalizable to all hospitals in Iran.

According to the results, the nursing staff had the highest level of shortage of human resources before and after the implementation of the Health System Evolution Plan in Iran. Therefore, it seems compensation for the nursing staff shortage is a main human resource factor for the development of this plan in Iran. Moreover, the success of this national plan needs a comprehensive retainment of all groups of health workers in hospitals in Iran.

In general, it can be claimed that the Health System Evolution Plan has affected the distribution situation of human resources in all public hospitals, i.e., with an increase in the number of patients' referrals, to the hospitals, the workload of medical staff increase. Therefore, for the development of hospital performance indicators, paying attention to the appropriate distribution of physicians, nurses, and paraclinical staff is necessary-by health care policy-makers. Also, the latest version of staff standards was provided by the Office of Human Resources of the Ministry of Health in 2005, needs a comprehensive review based on the implementation of the Health System Evolution Plan.

Acknowledgments

This study is part of a research plan in Tehran University of Medical Sciences under the code 95-01-157-31830 and ethical code IR.TUMS.VCR.REC. 1395.1256. The authors would like to hereby express their gratitude towards managers of the selected hospitals and colleagues who collaborated with the authors in collecting research data.

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