Prioritization of Hospital Information System's Executive Barriers to Patient Payment Reduction and Visitation Quality Improvement Packages of Health System Reform Plan from the Perspectives of Users and Experts in Hospitals of Yazd

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Abstract

Background: Healthcare facilities are dependent on hospital information systems due to the high volume and variation of information in different fields. These systems are a prerequisite for effective and high-quality healthcare provision in hospitals.

Objectives: The present study intended to prioritize the executive barriers to these systems in patient payment reduction and visitation quality improvement packages of the health system reform plan (HSRP) from the perspectives of users and experts in selected university hospitals of Yazd, Iran, in 2019.

Methods: The population of this descriptive-analytical study included 110 participants, including experts of information technology (IT) unit, hospital managers, and personnel of the administrative and medical units dealing with the hospital information system. The data collection tool was a researcher-made questionnaire based on similar studies, the validity of which was evaluated by a committee of experts. Also, the reliability of the questionnaire was investigated and confirmed before the study using the Cronbach's alpha method and a sample of 30 participants. Data analysis was performed using SPSS software version 21.

Results: Among the six barrier dimensions, the highest mean score belonged to the professional factors (3.46 ± 1.03), followed by human barriers (3.44 ± 0.83). Among professional barriers, the lack of motivation of the personnel in IT learning and get training on the IT-related skills had the highest mean score of 3.67.

Conclusions: According to the results, outsourcing such services and special budget allocation for hardware and software update and support, holding conferences, and provision of practical training in this field are suitable strategies for better implementation of such systems.

Keywords: Health System Reform Plan; Hospital Information System; Hospital

1. Background

Nowadays, technological advances, customer expectation growth, increased demand, resource shortage, and concerns regarding health system errors have increased the complexity of health systems, highlighting the need for investigating the performance of healthcare organizations (1). Performance is an important characteristic of any organization and is evaluated through information collection and determining the consistency of the work with the related goals and assumptions (2). Statistics and indicators can measure the success of a given organization and determine the extent of goal achievement (3). Therefore, it is essential to prepare and use appropriate indicators for effective surveillance. Information regarding the need for healthcare may be a standard tool for planning in this field and help set the goals and provide services (4).

In practice, the accurate measurement of hospital indicators to assess the performance is undeniably important. The growth and development of healthcare environments and their increasing complexity have made

healthcare managers seek higher and more accurate information to maintain the effectiveness and survival of their organizations in the healthcare market (5). The hospital information system (HIS) is needed to improve the performance indicators because such systems can provide the managers with accurate and correct values of available indicators in the shortest time possible (6). In 2006, the World Health Organization (WHO) states that the reason to establish HIS is to develop a mechanized patient information service that will effectively promote the information for the purposes of patient care, statistics, education, and research.

HIS can improve medical and healthcare-related decision-making by providing hospital policymakers with accurate information. Many managers believe that they have to use such systems to revolutionize the hospitals (7). Given that hospitals are highly dependent on information, managers of these organizations need to understand that they can integrate the capabilities of information systems into their business strategies only through the powerful area of information management (8). This is due to the fact that systematic evaluation of the HIS supports the clinical, financial, and management healthcare measures and can modify and develop hospital information software for the needs of users (9).

The health system is the most important infrastructure to create changes in this area. If this area is appropriately addressed, we will not face increasing problems. The economy is the pulse of hospital management, and economic prosperity depends on accurate data records. If data is not recorded properly, the related costs are not received. According to a 2016 report by the fourth national conference on the health information management promotion, more than 30% of the costs related to services provided in public hospitals are not received due to defects in the information system. In the meantime, the first step for developing an information system is the proper and accurate implementation of the programs based on the needs of each organization and adaptation of the organizations with such programs. Health system reform plan (HSRP) is one of the national programs highly dependent on the hospital information system.

The HSRP was run in May 2014 in all public hospitals throughout Iran. From the beginning of the plan, the involved hospitals were obliged to provide all diagnostic and therapeutic services, medications, equipment, and medical supplies to all patients who were hospitalized at the same hospital or were in the service supply chain. This program is currently being implemented in the form of eight packages, including patient payment reduction, emergency service improvement, natural childbirth promotion, visitation quality improvement, the presence of resident specialists in hospitals, health service pricings, stay of physicians in underserved areas, and hoteling quality improvement. Although the HSRP implementation increased the satisfaction of the patients and a group of healthcare personnel, its persistence is facing serious challenges. A major bug of this plan is its dependence on the HIS, although it is incompatible with the HIS currently used in the hospitals, especially the previous systems. The two packages of patient payment reduction for hospitalization and visitation quality improvement are highly dependent on the HIS. Therefore, it is necessary to prioritize the barriers to the integrated HIS and find suitable solutions.

2. Methods

The present study was a descriptive-analytical study conducted in 2019. The study was performed at three university hospitals in Yazd, including Shahid Rahnemoun, Shahid Sadoughi, and Afshar hospitals. The study population included all the hospital staff in information technology (IT) units, those in charge of entering the data and extracting the information related to payment reduction and visitation quality improvement packages, and the hospital managers (n = 110). The census method was used for enrolling participants, so the sample size and study population were the same.

The study tool included a researcher-made questionnaire that investigated the priority of executive barriers to the HIS in implementing the payment reduction and visitation quality improvement packages of the HSRP. The questionnaire was designed based on the available models and questionnaires and included two parts. While the first part included demographic and occupational information of the participants, such as age, gender, academic degree, and work experience, the second part included questions on the barriers to the HIS, which inhibited its proper adaptation with HSRP. The barriers were investigated in six dimensions, including human, financial, legal, organizational, technical, and professional barriers. The validity of the questionnaire was confirmed by hospital management professors and IT experts, while the reliability was calculated using the Cronbach's alpha method on 10% of the sample size. The questionnaire was scored on a 5-point Likert scale (very high importance = 5, high importance = 4, intermediate importance = 3, low importance = 2, and slight importance = 1). For data collection, after the approval of proposal by the Yazd University of Medical Sciences, the researchers referred to the mentioned hospitals and distributed the validated and reliable questionnaire among the participants. When the questionnaires were filled, the recorded data were entered into the statistical analysis software and analyzed.

3. Results

According to our findings, 44% of the participants were male, and 38% were single. Moreover, 24% of the

participants worked in the medical records unit, 9% in the IT unit, 23% in the discharge unit, 17% in the admission unit, 8% in the financial unit, and 19% in the insurance and income unit. Regarding education level, 68% of the participants had a bachelor's degree, 15% had an associate degree, and 27% had a master's degree. In terms of work experience, 70% of the participants had less than 10 years of experience, 29% had 11 - 20 years of experience, and 11% had more than 21 years of experience (Table 1).

Table 1. Frequency and Percentage of Staff by Different Variables

Variables	Frequency	Percentage
Gender		
Male	48	44
Female	62	56
Marital status		
Single	42	38
Married	68	62
Workplace		
Medical records	26	24
Insurance and income	21	19
Financial	9	8
IT	10	9
Admission	19	17
Discharge	25	23
Employment status		
Permanent and temporary-to-permanent	31	28
Contractual	42	38
Corporate	37	34
Education level		
Associate degree	14	15
Bachelor's degree	62	68
Master's degree	25	27
Age group		
20 - 30	46	51
31 - 40	44	48
41 - 50	10	11
Work experience		
1 - 10	64	70
11 - 20	26	29
21 - 30	10	11
Total	110	100

Among human barriers, the two factors of "lack of specific criteria on training the related staff, updating and promoting their knowledge, and evaluating their performance" and "high level of human errors in recording the information required by the desired packages" had the highest score with the mean score of 3.67. Given the financial barriers, the highest score was 3.50 for two factors of "lack of funding to establish up-to-date programs, including SEPAS (Iranian electronic health record)" and "lack of funding to employ and train expert staff in this unit". In terms of legal and organizational barriers, the highest scores were 3.75 and 3.67 for the factors "lack of any law requiring the healthcare facilities to share the healthcare information between each other" and "lack of support from the IT unit by senior managers", respectively. Also, the factors "poor intranet access and lack of internet access" and "lack of motivation of the personnel in IT learning and get training on the IT-related skills" were the technical and professional barriers with the highest scores of 3.50 and 3.67, respectively (Table 2).

Table 2. Mean and Standard Deviation of Barrier Scores

Dimension/Barrier	Mean	Standard Deviation
Human barriers		
Insufficient experience of healthcare programmers	3.08	1.00
Lack of laws for medical IT expert recruitment	3.50	0.80
Lack of specific criteria on training the related staff, updating and promoting their knowledge, and evaluating their performance	3.67	0.89
No utilization of the scientific potential and technical and credit facilities of national and international associations, institutions, and assemblies	3.25	0.87
Lack of instructing the workers on the inputs of the desired packages	3.50	0.67
High level of human errors in recording the information required by the desired packages	3.67	0.78
Financial barriers		
Lack of funding to establish up-to-date programs, including SEPAS	3.50	0.90
Lack of funding to equip departments with the information systems	3.42	0.90
Lack of funding to update healthcare information websites and databases	3.42	0.79
Lack of funding to employ and train expert staff in this unit	3.50	1.00
Lack of funding to train other healthcare personnel on IT-related systems and programs	3.17	0.83
Legal barriers		
Lack of executive policies and guidelines provided by the related university for this unit	3.08	1.24
Lack of policies and executive policies provided by the IT unit of the organization	3.00	0.95
Presence of some restrictive rules (data confidentiality, etc.)	3.17	1.27
Lack of any law requiring the healthcare facilities to share the healthcare information with each other	2.75	0.97
No mechanism to report the bugs suggested by users to backup companies	3.08	1.00
Organizational barriers		
Lack of support from the IT unit by senior managers	3.67	1.07
Insufficient occupational and organizational commitment of the HIS users and workers responsible for these systems	3.50	1.17
Lack of planning for this unit by senior managers	3.33	1.15
Lack of proper cross-sectoral coordination on the use of IT in the organization	3.25	0.75
The negative attitude of hospital staff toward using IT to facilitate the work process	3.08	1.24
Lack of estimation of training needs (attitude, knowledge, and skills) at the employment time and during the work	3.33	0.78
Technical barriers		
Network errors disturbing recording and sending information	3.25	0.97
The poor capability of computers depending on the type of user activity	3.42	0.90
Lack of hardware and software support for IT equipment	3.17	1.11
Poor intranet access and lack of internet access	3.50	0.90
Lack of hardware and software capabilities' development	3.25	1.14
Professional barriers		
Lack of workers expert in IT	3.42	1.08
Insufficient skills of the workers on how to work with related equipment, software, and hardware	3.33	0.98
Insufficient knowledge of the staff on how to work with related equipment, software, and hardware	3.42	0.79
lack of motivation of the personnel in IT learning and get training on the IT-related skills	3.67	1.30

Among these six barrier dimensions, the professional (3.46 ± 1.03) and human barriers (3.44 ± 0.83) had the high-

est scores (Table 3).

Table 3. Mean and Standard Deviation of Barrier Dimension Scores

Barrier Dimension	Mean	Standard Deviation
Human Barriers	3.44	0.83
Financial Barriers	3.4	0.88
Legal Barriers	3.02	1.08
Organizational Barriers	3.36	1.02
Technical Barriers	3.31	1
Professional Barriers	3.46	1.03

4. Discussion

Nowadays, the application of information systems has affected the performance of organizations. Therefore, some organizations are using specific programs for information system development and utilization. The first step in preparing an information development plan is to identify the barriers to using this technology. Information systems can be effective in improving the productivity and efficacy of organizations. However, there are some obstacles in the way. Therefore, the present study investigated these barriers in the form of six dimensions, including human, financial, legal, organizational, technical, and professional ones.

Different studies have evaluated and reported different classifications for barriers to information system utilization. For example, Amirkhani and Sabet (2010) investigated the barriers in four groups of structural, behavioral, environmental, and intrinsic barriers in the form of 12 items (10). Atashak and Mahzadeh (2011) classified the barriers as infrastructural-technical, individual, cultural-educational, and economic barriers (11). Moreover, Kazemi (2008) classified these barriers into six groups, including management, human, cultural, organizational, technological, and environmental dimensions (12). Also, Omidi and Hosseini (2008) investigated the organizational, social, human, legal, financial, and technical challenges (13). Moreover, Sarrafizadeh and Alipour (2011) investigated the technical, operational, cultural, and legal feasibilities as the requirement groups (14).

Therefore, many obstacles and items can affect the requirements for information system implementations in all the organizations evaluated in the above studies. Given the role of HSRP in the better implementation of these systems, the necessity to investigate these barriers is further highlighted. In the following, each of these barriers is discussed separately.

4.1. Human Barriers

Among human barriers, the two factors of "lack of specific criteria on training the related staff, updating and promoting their knowledge, and evaluating their performance" and "high level of human errors in recording

the information required by the desired packages" had the highest score with the mean score of 3.67. Yuen and Ma (2004) reported that the experience of the staff and their positive attitude towards IT implementation was an important requirement for its utilization (15). Moreover, Atashak and Mahzadeh (2011) reported that "having the necessary knowledge to use IT" had the highest score among the individual requirements for IT utilization (11).

There have been several studies on human and individual barriers affecting the acceptance of information systems, and different aspects of these individual barriers have been investigated. In the study by Robertson (1997), general knowledge was one of the individual barriers to the utilization of an information system (16). If the levels of general knowledge and modern technology utilization skills are satisfactory in a given country, these factors can move the whole society towards using technological advances. In third-world countries, this general knowledge is relatively insufficient due to the low level of general culture, rural life, low literacy level, inadequacies, and economic, political, and social poverty. Therefore, these are considerable obstacles to the development of new communication networks.

In general, it can be said that human barriers are the most important barriers to modern technology development and implementation. Therefore, the countries willing to make progress in this field should invest in public knowledge promotion, expert and efficient worker training, professional knowledge improvement of the information system operators, and general and professional knowledge improvement of the modern service providers and staff of the relevant organizations in modern communication technologies (16). To facilitate this, it is recommended to design and establish in-service training courses about HIS and the seven mentioned skills because these courses can increase the knowledge and improve the attitudes about information systems, and subsequently reduce the resistance to its utilization. It is also suggested to use incentive policies to increase health system utilization by the staff.

4.2. Financial Barriers

Given the financial barriers, two factors of "lack of fund-

ing to establish up-to-date programs, including Sepas" and "lack of funding to employ and train expert staff in this unit" had the highest mean score. Smith et al. (2000) reported that financial factors were basic requirements for HIS implementation (17). In a comprehensive evaluation model by Kazanjian and Green (2002), they identified economic factors as one of the main barrier dimensions and introduced the criteria of measurement, cost-effectiveness analysis, and opportunity-cost analysis (18). In a study by Garrido et al. (2004), the authors evaluated the investment in information systems in a healthcare provision facility (19).

4.3. Legal Barriers

Among the legal barriers, "lack of any law requiring the healthcare facilities to share the healthcare information between each other" had the highest score. Omidi and Hosseini (2011) also evaluated the legal challenges in their study (13). Also, Gupta et al. (2013) reported that security and privacy were effective factors in IT utilization by small and medium-sized companies (20).

Nowadays, the issue of information security management faces much controversy due to its high complexity. These problems are about providing the suitable framework, methods, and technologies to improve information security in organizations.

Effective implementation of information security requires an integrated approach. In the current situation, information security has a managerial nature and needs training and attention by the organization managers. In 2005, this led to the development of one of the most comprehensive standards of information security management systems called ISO 27001: 2005. This national standard is intended to determine the requirements for the establishment, implementation, utilization, monitoring, evaluation, maintenance, upgrading, and improvement of a documented information security management system. Therefore, it is recommended to follow these standards for HIS to extend the implementation of these systems to all medical organizations in order to maintain information confidentiality.

4.4. Organizational Barriers

Among the organizational barriers, "lack of support from the IT unit by senior managers" had the highest mean score. Our findings were compatible with those of Toprakci (2006) (21), Drent & Meelissen (2008) (22), and Whittaker (1999) (23), who reported the effect of management factors on technology utilization. They all found that lack of cooperation, support, and commitment of managers and their resistance to changing the related laws can disturb the technology utilization. This lack of continuous support by the senior managers was also emphasized by Kwok & Longley (1999) (24) and Bellone

(2008) (25). According to Siponen & Willison (2009) (26), insufficient knowledge and awareness about the information system can cause problems for the organizations in implementing these standards. Therefore, it is recommended to employ expert and experienced managers with sufficient expertise in resource management and equipment utilization.

4.5. Technical Barriers

Among the technical barriers, "poor intranet access and lack of internet access" had the highest score. The study by Sanaye et al. (2014) reported that "adequate internet speed", "knowledge on the utilization of IT", "expert employees", and "ability of the information system to be installed on different computers" were the most important technical requirements for information system utilization in the offices of the Ministry of Sports and Youth in Fars province in Iran (27).

Atashak et al. (2011) reported that "high internet speed" and "presence of necessary facilities" had the highest scores among technical barriers (11). Moreover, Omidi and Hosseini (2011) stated that technical requirements, especially appropriate bandwidth, hardware, and software, were the most important factors in IT utilization in the organization studied (13). The findings by Murphy and Terry (1998) (28), Mungania (2004) (29), Berge & Leary (2006) (30), and Cantoni et al. (2004) (31) were also compatible with the above results. Internet and intranet access require support from internet service providers. These providers connect to large parent stations to provide internet access for their clients with sufficient telephone lines (32). In Iran, the number of internet service providers is lower than the applicants for these services due to legal, political, and cultural barriers and restrictions. Accordingly, this low number of service providers limits internet access for the general population. Therefore, it is necessary to clarify the benefits of extended bandwidth for medical and healthcare organizations and consider making the infrastructure for implementation and utilization of special network services for hospitals. Given the improvement in technical aspects after HSRP implementation, it is necessary for the authorities to provide maximum bandwidth capacity for healthcare facilities and organizations, upgrade the related equipment, and remove current restrictions to increase internet speed and quality in order to benefit from HIS implementation.

In order to improve the HIS performance, it is recommended to take some measures, including internet speed improvement, provision and production of up-to-date software and hardware, and provision of backup systems. Also, hospitals can use the power and experience of private and international service companies to provide the necessary infrastructure for the establishment of intelligent information networks.

4.6. Professional Barriers

Among the professional barriers, "lack of motivation of the personnel in IT learning and get training on the IT-related skills" had the highest mean score. Atashak et al. (2011) reported that "promoting the culture of the information system use" and "adequate informing on the culture of the information system use" had the highest scores (11). Moreover, Chang et al. (2007) showed that government policies could affect the hospitals' efforts for modern information system technology utilization (33).

Since cultural contextualization is a basic foundation for any change, especially in the utilization of modern information systems in hospitals, the promotion of HIS use is not possible without considering the culture and related infrastructure in the related organization. Therefore, by identifying effective cultural elements and formulating the appropriate programs, we can pave the way for these changes. Hence, professional barriers are a limitation to information system development in healthcare organizations, especially in developing countries.

4.7. Conclusion

According to our results, there were some obstacles in all dimensions. The results showed that implementing the HSRP protocols in accordance with other HIS-related programs and partial HSRP implementation can help resolve the problems. For better HSRP implementation, we can take additional measures, including allocation of a special budget for HIS hardware and software update and support, training the staff on the HIS utilization and development, and holding HSRP-related conferences to present the latest achievements of the program and practical training of the related staff.

Given that health information systems are one of the main pillars of providing services to patients in hospitals, awareness of the barriers of the hospital information system can be effective for policy makers and hospital managers to reduce disruption in service delivery. Health managers can use these results to improve the quality of hardware and software support for HIS, maximize the potential of health information, and plan to anticipate potential problems. In addition, the results of the present study can help IT engineers and hospital information system staff to design evaluation checklists and identify executive deficiencies.

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