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Review Article

Challenges of Information Systems in Healthcare Organizations

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Abstract

Introduction: Information systems enable the managers to access the proper information needed to make decisions. Management decision making based on real information leads to increased efficiency and effectiveness. Problems related to information system will lead to incorrect information and consequently incorrect decisions. Therefore, this study was conducted to investigate and identify the challenges of ISs in healthcare organizations.

Methods: This study is a systematic review. PubMed/Medline, Scopus, PMC and Iranian databases such as Magiran and SID were searched from 2013 to 2018. English and Persian studies were searched using keywords including IS, Hospital Information System, Health Information Technology, Health Information System, Medical Information Reporting System, Electronic Medical Record, Electronic Health Record, Medical Informatics, Health Informatics, Nursing Information System, Nursing Informatics, hospital Management Information System, Nursing Clinical Information System, Pharmacy Information System, and Electronic Medical Record System.

In the initial search, 300 studies were identified. After screening the studies using the exclusion criteria, 101 of them were selected. Then, through complete reviews of full texts of the studies, 54 of them were excluded from the study. The rest of the articles were coded by Esterberg method and 6 themes of challenges were extracted.

Results: The results showed that the challenges of IS in the health system included structural, manpower, financial/support, security, process, and organizational challenges.

Conclusion: To achieve the success and effectiveness of IS and make the right decisions based on the proper information, it is necessary to eliminate the issues that lead to problems in these systems.

Keywords: Health Information System, Medical Informatics, Electronic Health Records, Hospital Information System, Nursing Informatics, Challenge.

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Introduction

Today, information is one of the most important sources of power in the world. Information is the basis of decision making and planning (1). With the huge advances in information exchange systems, information systems have undergone major changes over the years, from a library tab to web databases (2); following this cultural-information revolution, health and medical environments need to equip themselves with tools for the rapid and accurate exchange of medical and paramedical information to improve the health of their clients (3). Management information systems help the managers monitor and follow the current work of the organization and predict the future situation (4).

Information systems increase accurate reporting and reduce the reporting errors (5), and the most appropriate way to monitor a wide range of health indicators (6). Information systems are used in organizations as an opportunity to achieve competitive advantage (7). These systems collect, process, store, distribute, and share relevant information which is responsible for creating information communication, increasing productivity, making decision, and supporting strategic and tactical decisions (8, 9). Making accurate decisions at the right time is especially important in health systems. On the other hand, information systems face challenges that influence making decisions.

As Cottle and Hoover stated, the volume of data related to healthcare organizations has grown dramatically in the past years and it is expected to increase in the coming years due to the use of innovative technologies (10). The health system has also benefited from information systems due to the large amount and variety of information (11). Real

and accurate information is needed to implement treatment, care, management, and other activities in the health system (12). Information systems in healthcare organizations reduce medical errors, improve efficiency and quality of care, support the health care delivery, achieve cost savings and increase cost effectiveness, and increase the patient involvement in healthcare decision making (13, 14).

The success of an information system depends on a clear strategy, proper design, and implementation of the system, and for this purpose, the health system, in addition to having a technological structure and hardware and software support, must meet the needs and expectations of the users of the system (12, 15, 16). Successful implementation of ISs leads to efficient and effective organizational processes and work procedures at the individual level, which, according to DeLone and McLean, depends on several factors such as system and information quality, use of IS, user satisfaction, and individual and organizational impact (17).

Most studies report that the performance of ISs has not been favorable (18), and the most common and important challenges in university hospitals are related to environmental factors, especially the negative attitude of the society towards the use of ISs and in non-university hospitals, related to human factors, especially the lack of motivation to use these systems (19). Human factors, including computer skills, understanding the usefulness, and ease of use of ISs, are effective in its successful adoption and implementation (20). One of the issues to which managers are faced is evaluation (21). Continuous evaluation is necessary to ensure the efficient implementation of ISs and their positive impact on the provision of health services (22). Post-implementation evaluation is a process, the purpose of which is to improve and develop the system (21). Because problems related to ISs lead to incorrect information and consequently incorrect decisions, this study was conducted to investigate and identify the challenges of ISs in healthcare organizations.

Methods

This study was a systematic review of articles published between 2013- 2018 about the challenges of ISs in the health system. At the first stage, authors searched Persian and English articles from 2013 up to 2018 in PubMed/Medline, Scopus, PMC and Iranian databases such as Magiran and SID.

The keywords searched included Information System, Health Information System, Medical Informatics, Electronic Health Records, Hospital Information System, and Nursing Informatics and challenge.

Inclusion criteria were original or review studies on Information System's challenges in the health sector that were published in the English or Persian languages from 2013 up to 2018.

Exclusion criteria were studies on Information System's challenges in other organizations and those that were not from the intended time period.

All of the early studies that emphasized the ISs in the health system and those in other organizations and industries were excluded. Also, authors extracted the information about the year of the studies and ISs problems in the health area. Finally, information was entered into the forms designed for the purpose of the study.

In the initial search, 300 studies were identified. After screening the studies using the exclusion criteria, 101 of them were selected. Then, through complete reviews of full texts of the studies, 54 of them were excluded from the study; finally, we selected and assessed the results of 47 studies that were coded by Esterberg method and 6 themes related to the challenges of ISs were extracted (Figure 1).

Data Analysis

The selected studies were fully reviewed, and the required data were extracted and categorized (Tables 1-6). To organize the studies, we used Endnote X8 software.
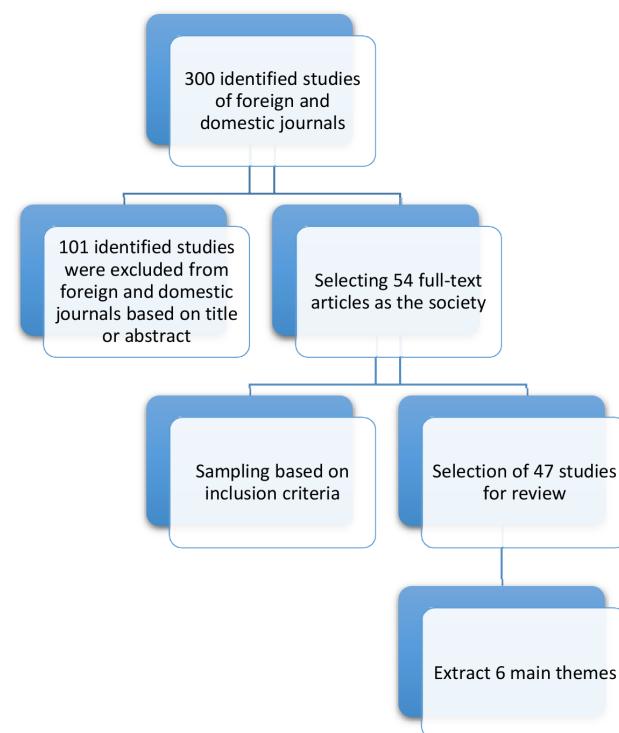

Figure 1: Diagram of Research Stages

Table 1: Themes of Structural challenges of ISs

	Subthemes	Concepts
Structural challenges	Software	- Possibility of information loss (11) - Adjustment of software response speed to user speed (23) - Old or new version (24) - Limitations due to quality aspects of the system (25) -Repetitive and time consuming documentation (26) - Usability problems (27)
	Hardware	- Old and elementary systems (11) - Lack of computers in hospitals (19) - Technical problems of systems (19), Insufficient professional IT technical support (28), technical resource constraints (29) - System hanging (23)

Table 2: Themes of manpower challenges of ISs

	Subthemes	Concepts
Manpower challenges	Individual	- Lack of incentive to use system (19, 30) - User's expectations and satisfaction (15, 25, 31-35) - Skills (20) - Understanding the Usefulness (20) - Understanding the ease of use (20) - Acceptance factors of system such as perceived usefulness, ease of use and behavioral control (36) - Unsuitability for individualization (37, 38) - Need to longer time for new user to become accustomed to the system (39) - Inattention to the users' needs (34) - Lack of technicians (28) - Documentation errors (40)
	Interpersonal	- Communication (41) - Poor dissemination of knowledge (42)
	Managerial	- Lack of equipment of hospital departments with computer Systems and IS program (11) - Training the new personnel by unspecialized staff (11), limitation of access to training (42) - Employing staff without the basic computer skills (11) - Project management (20) - Lack of significant approach to risk management, lack of significant approach to risk identification (43) - Undesirability in utilization of information in decision making (44)
	Cultural	- Don't having the culture of using of system (11)

Table 3: Themes of Financial/Support challenges of ISs

	Subthemes
Financial/Support challenges	- Lack of resources and harmonized tools as barriers to information access (45) - Cost (20) - Increased workload (30) - Vulnerable structure (46) - Decrease of financial efficiency (31) - Quality of care (31) - Doesn't deliver quality data (47), threats to data quality (48)

Table 4: Themes of security challenges of ISs

	Subthemes
Security challenges	- Inadequate IT-security for the protection of data (16), Security of system (49) - Legal challenges, privacy concerns (16) - Safeguards of information security (50) - Don't pay attention to the patient safety aspect (51) - Discrepant intentions toward privacy protection and support (52) - Accuracy of data (42)

Table 5: Themes of organizational challenges of ISs

	Subthemes
Organizational challenges	- Inadequate training about system (16, 19, 20) - Lack of user participation in the design of system before Installation (19) - Cost (20) - Structural challenges includes system management structure and information process (53) - Infrastructures of computerized reports (54) - Lack of interoperability between different Systems (55)

Table 6: Themes of process challenges of ISs

		Subthemes	Concepts
Process challenges	Implementation	Human Factors	- Resistance to the application of new technologies (16) - Lack of acceptance (56)
		Managerial Factors	- Lack of recovery plan and disaster management (16) - Instability of leadership (20)
		Organizational Factors	- Lack of a perfect implementation plan and well-defined strategy (16) - Organizational culture (57)
		Technological Factors	- Lack of sufficient guides in the system (23) - Instability of programming in all parts of the software (23) - lack of functionality and usability (23, 27) - Message exchanges between systems (58) - Existence network equipment (59) - Existence Hardware equipment (59) - Unsuitable flexibility (49)
	Development		- Users participation (60)
	Evaluation		- Usability principles relating to "Consistency and standards" (27, 61)

Figure 2: Themes of Information System's Challenges

Results

According to Figure 2, challenges of ISs are categorized into 6 themes consisting of structural, manpower, financial/support, security, process, and organizational challenges.

Structural challenges were related to software and hardware problems (Table 1). The type of the system version, system quality, technical problems, insufficient technical support usability of system, lack of computer, possibility of data loss, and documentation were the problems related to structural challenges.

Individual, interpersonal, managerial, and cultural issues were categorized into manpower challenges (Table 2). Expectations, incentive, satisfaction, acceptance and needs of the users, system usage skills, users' understanding of the usefulness of the system, documentation errors, longer time for new users, and lack of skillful and specialized users were related to individual challenges.

Weak communication and interactions and reluctance to share knowledge were among the interpersonal challenges.

Recruited employees who did not have the skills to work with the system and needed training, and poor planning for training new users including training by unskilled staff, undesirability in utilization of information in decision making and lack of proper approach to risk management and project management were among the subcategories of human challenges that fall into the category of managerial challenges.

The culture of using the system is also related to the cultural challenges that are part of the subcategories of human challenges of IS.

Subcategories of financial/support challenges are shown in Table 3.

Lack of resources, unsuitable support structure, lack of filtering tools to access information, and threats to deliver quality data were categories of financial/support challenges.

In general, lack of protecting data and information, issues related to data accuracy and lack of attention to the patient safety aspect were related to security challenges of ISs in the health field (Table 4).

Issues such as inadequate training of the system users, reluctance of users to participate in the system design, organization costs, and poor system management structure and information process were categorized in as the organizational challenges of ISs (Table 5).

In the category of process challenges, issues related to the implementation, development, and evaluation of ISs were included. Factors involved in the implementation of ISs included human, managerial, organizational, and technological factors (Table 6). Lack of user's acceptance and resistance to application of new technology were related to human factors that affect the implementation of ISs. Insufficient strategy and organizational culture were organizational factors affecting the implementation of ISs.

Lack of recovery plan and disaster management were the subcategories of managerial factors affecting the implementation of ISs. Subcategories of technological factors affecting implementation of ISs included insufficient guides, information exchanges between the systems, problems related to existence of equipment and hardware equipment, functional problems, and inflexibility of the system.

Discussion and Conclusion

This study aimed at identifying the challenges of ISs in healthcare organizations. These challenges, including the organizational, manpower, process, financial/support, structural and security factors, are challenges of ISs. Improving the quality, efficiency, and effectiveness of health services depends on using ISs (62).

Implementation of ISs should be considered as a process of organizational transformation and development and should be done by a group of computer experts, future users of the system, and management of the organization (63). The "human element" is critical to health IT implementation. Specific data on the aspects of electronic health records and other tools that users find most difficult to use, the training and support needed before implementation begins, and the unintended consequences of technology adoption could be fed into product development and technical assistance programs for providers (64). Improper use of electronic software at hospitals and health centers could lead to reduced productivity of the system documents and inefficient use of information in health records (11). System quality and information quality are significant factors influencing the perceived ease of use of ISs, while information quality and service quality are the key factors affecting perceived usefulness of ISs (65).

Continuous evaluation is considered as one of the main stages in the creation of ISs and its main purpose is to pay attention to the effective issues in the health system (66). "Evaluating ISs leads to increase in the reliability coefficient of these systems' efficiency" (33).

Accordingly, and based on the results of this study, the following recommendations are proposed to enhance the success of ISs:

1. Before launching an ISs, the feasibility of the system implementation should be considered in development of a specific plan and strategy for implementation, and then system/organization should be equipped with appropriate hardware and software facilities.

2. Whereas any change is accompanied by resistance of a number of people in the organization, it is necessary to promote the culture of proper use of the system; also, to reduce the resistance of users to use new technologies, appropriate measures should

be taken.

3. The needs, expectations and satisfaction of the system users should be considered and their participation should be used in the system design.

4. To eliminate the shortcomings and deficiencies of the system, continuous evaluation is performed, and the development of the system is also considered. Management of the health system should provides training conditions for the system users by specialized staff.

5. For improving the knowledge and skills of users in the proper use of ISs, the possibility of their interpersonal interactions should be provided and the culture of knowledge sharing and use of the system should be spread in the organization. Maintaining the confidentiality and protection of data and information, patient safety aspect and system security are other important factors in the success of ISs that must be supported through technological security infrastructure and use harmonized tools to enable specific people to access accurate information at the proper time and place.

In summary, given the nature of health care organizations and the high volume of information in these organizations, it is necessary to organize the information through ISs in order to access the proper information at the right time by people who need this information, so identifying the problems and challenges of ISs in such organizations will effectively help the system users to use the system effectively through resolving these challenges.

Ethical Considerations

In this research, ethical principles, such as fidelity in quoting scientific texts and prevention of plagiarism, have been considered and observed.

Conflict of Interest: None declared.

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