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Original Article

Assessment of the Readiness of the Hospitals Affiliated to Shiraz University of Medical Sciences for Implementation of Electronic Health Record Based on the California Academy of Family Physicians Tool: A case study in Iran

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Abstract

Introduction: A correct understanding of the level of readiness is the key to success in implementing an electronic health record. The aim of this study was to assess the readiness of the hospitals affiliated to Shiraz University of Medical Sciences for implementing electronic health records based on the tools of the California Academy of Family Physicians tool.

Methods: This descriptive-applied study was performed in 2021 in six hospitals of Shiraz University of Medical Sciences equipped with hospital information system in Iran. Data were collected through interviews with managers, information technology experts, and hospital information system experts through checklists in 5 areas of management, finance and budget, operational, technology, and organizational alignment.

Results: The results showed that in the assessment of general readiness, Nemazi hospital with 38% and Amir hospital with 37% readiness were more suitable and moderately prepared than other hospitals in moving towards the implementation of electronic health records, and the rest of the hospitals did not have the necessary readiness. In management, finance and budget, and operational capacity, most hospitals were in a weak position between 10% -30% and were not ready at all.

Conclusion: According to the results, it is recommended that measures such as leadership measures, participation and support of managers, recruitment of information technology specialists, budget allocation, justification of return investment, continuing education programs, user participation, and process support should be taken to increase the mentioned capabilities and readiness of hospitals in the implementation of electronic health records.

Keywords: Readiness, Assessment, Implementation, Electronic health record

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Introduction

During the past years, great advances have been made in information technology and in the field of healthcare. Electronic health record is a new technology that is considered as a standard for medical practice in the United States in the 21st century (1-4). Indeed, Electronic Health Record (EHR) is an electronic repository of health information and health care information that has been registered and approved by health care providers (5-9).

The main purpose of EHRs is to improve the quality of services by sharing information between health care providers, improving patient care documentation and saving costs (5, 7, 10). EHRs also reduce the costs, increase productivity and coordination among care providers, improve and enhance decisions by providing timely alerts (5, 11, 12), and offers a safer way to care for patients (13).

EHRs are widely accepted in the United States and health care organizations (14, 15). Many governments

are pursuing incentive policies to implement EHRs. This issue has also been emphasized in Iran (16). EHR is an opportunity to implement fundamental improvements in the public health sector (17). It is necessary for delivery of quality care and access to patient information (18); it is cost-effective and customer-oriented and provides timely access to complete and accurate information (19).

The process of creating and using EHRs, despite the potential benefits, is not easy and requires technical and organizational infrastructure and training of human resources (1, 7). Another study has stated that to assess the readiness to implement the EHR system, we should consider the four areas of organizational culture, management and leadership, operational readiness, and technical readiness (12).

The EHR implementation plan includes 6 stages of evaluation, planning, selection, implementation, assessment, and promotion. The first and most important step in implementing health systems is to assess readiness. Assessment of readiness is the first important step in implementing an EHR (1, 6). Readiness assessment is part of pre-implementation evaluation and a basic necessity that takes precedence in implementation. Readiness assessment is a method that examines various aspects of an organization and measures the readiness of each component of the organization. Using this evaluation leads to the right decision (1, 20).

Readiness assessment provides a list of tasks to be performed, and, based on this assessment, more accurate planning can be done on costs and time. In this regard, it is necessary for organizations to evaluate the readiness of the organization before implementing the EHR, so that the implementation is based on the available facts. For using the results of this evaluation, it is possible to identify the shortcomings in the field of accepting EHRs and to plan and take action to eliminate them (1, 21).

Some studies have considered the readiness of human resources to accept EHRs as more important among the stages of assessing the readiness to implement EHRs and state that users play a key role in designing, setting up, and using these systems (6), some others have mentioned 4 main areas related to the assessment of readiness to implement EHRs, including organizational culture, management and leadership, operational readiness, and technical readiness (1).

Given that currently one of the important policies of the Ministry of Health and Medical Education of Iran is the implementation of EHRs at the national level (22, 23), the purpose of this study was to assess the readiness of hospitals before implementation of the EHR, because with a background in hospitals' readiness to implement EHRs, we can better plan and find resources that meet specific needs.

Methods

This descriptive-applied study was conducted in Iran in October 1400. The study population included six hospitals: Nemazi, Shahid Faghihi, Shahid Rajaee, Shahid Chamran, Hafez, and Amir affiliated to Shiraz University of Medical Sciences, which were equipped with the hospital information system at the time of data collection. Due to the limited research community, sampling was not performed.

Hospital readiness assessment in this study was based on the tools of the California Academy of Family Physicians, which is designed to facilitate the move toward EHR acceptance, thereby increasing the quality of care and workflow efficiency. This tool helps us to be aware of the increasing capacity to accept the success of EHR. The main data collection checklist was in English and was obtained from the California Institute of Family Physicians. The validity of the tool was checked through content validity and obtaining the opinions of several relevant experts. Evaluation based on this tool focuses on five capacities including managerial capabilities (4 components), finance and budget capacity (4 components), operational capacity (4 components), technology capability (9 components), and organizational alignment capacity (8 components).

Each capacity is divided into levels that indicate different steps of readiness shown by scores from 0 to 5 (higher score indicates higher levels of readiness). The raw scores of the items related to each capacity are added together and then the percentage is taken and the readiness percentage of that power is obtained. For the percentage of total readiness, the total score column of all the powers is added together and then the percentage is taken.

The researcher first provided the checklist to the managers of the studied hospitals. After determining the time specified for completing the checklist, the researcher went to the study centers and received some information from hospital managers and another part from hospital information technology experts and hospital information system experts through interviews. Received. Then, all the information collected from the checklist was analyzed by SPSS.v.25 statistical software.

Results

The evaluation results showed that in finance and budgetary capacity, Amir hospital (40%) had the

highest level of readiness and Shahid Chamran, Shahid Faghihi and Shahid Rajaee (10%) hospitals had the lowest level of readiness (Figure 1).

In managerial capacity, Nemazi hospital (40%) had the highest level of readiness and Shahid Chamran, Shahid Faghihi and Shahid Rajaee (10%) hospitals had the lowest level of readiness (Figure 1).

In operational capacity, Nemazi and Amir hospitals (30%) had the highest level of readiness and Shahid Faghihi hospital (10%) had the lowest level of readiness (Figure 2).

In technology capacity, Nemazi hospital (40%) had the highest level of readiness and Shahid Faqihi hospital (26%) had the lowest level of readiness (Figure 2).

In organizational alignment, Nemazi hospital (52%) had the highest level of readiness and Shahid Chamran hospital (10%) had the lowest level of readiness (Figure 3).

In the assessment of general readiness, Nemazi hospital (38%) had the highest level of readiness and shahid Chamran hospital (14%) had the lowest level of readiness (Figure 4).

Discussion

In this study, five capacities of EHRs including management, finance and budget, operational, technology, and organizational alignment were examined. The results obtained as to the readiness assessment showed that in management capacity, Nemazi hospital was moderately prepared and the rest of the studied hospitals were not ready; the management capacity of these hospitals was weak and they were not ready to implement EHRs yet.

In Ajami study, the assessment of readiness for acceptance of health information systems has been

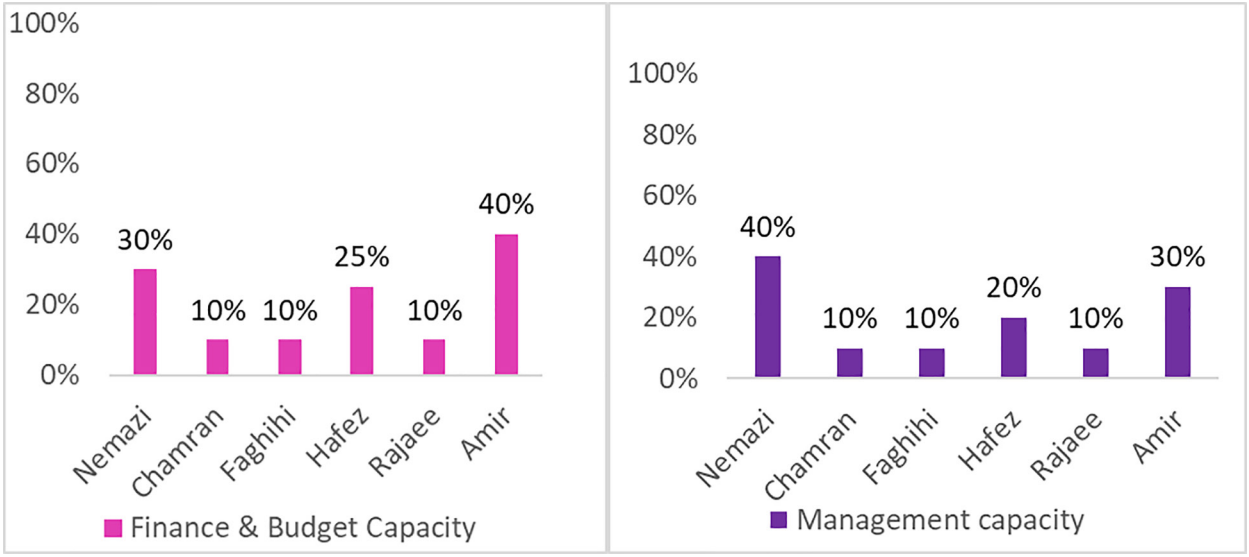

Figure 1: Determining the percentage of readiness of Shiraz University of Medical Sciences hospitals to implement Electronic Health Record in finance and budgetary capacity and management capacity, based on the tools of the California Academy of Family Physician

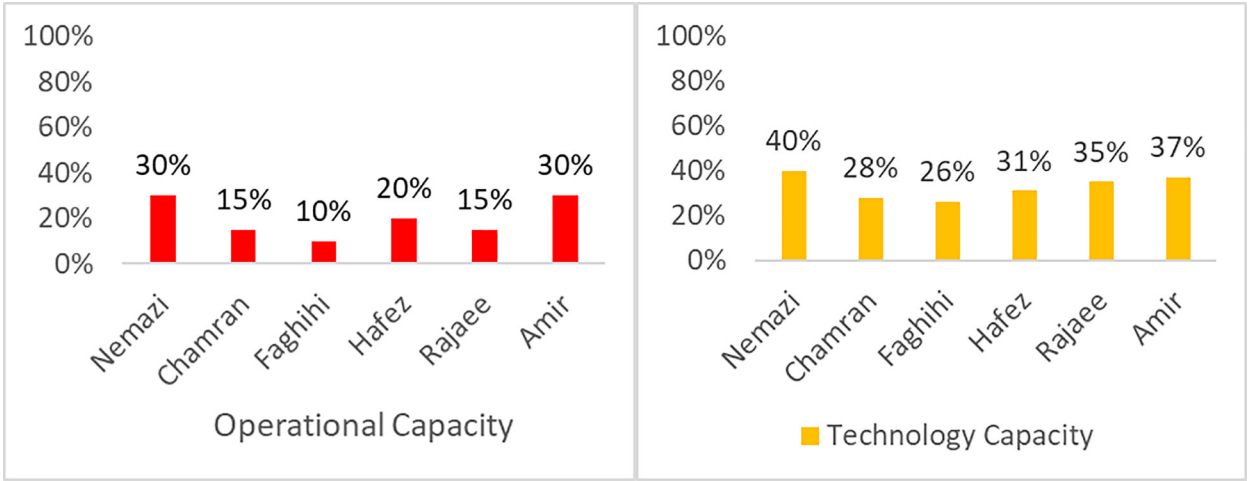

Figure 2: The percentage of readiness of Shiraz University of Medical Sciences hospitals to implement Electronic Health Record in operational capacity and technology capacity, based on the tools of the California Academy of Family Physician

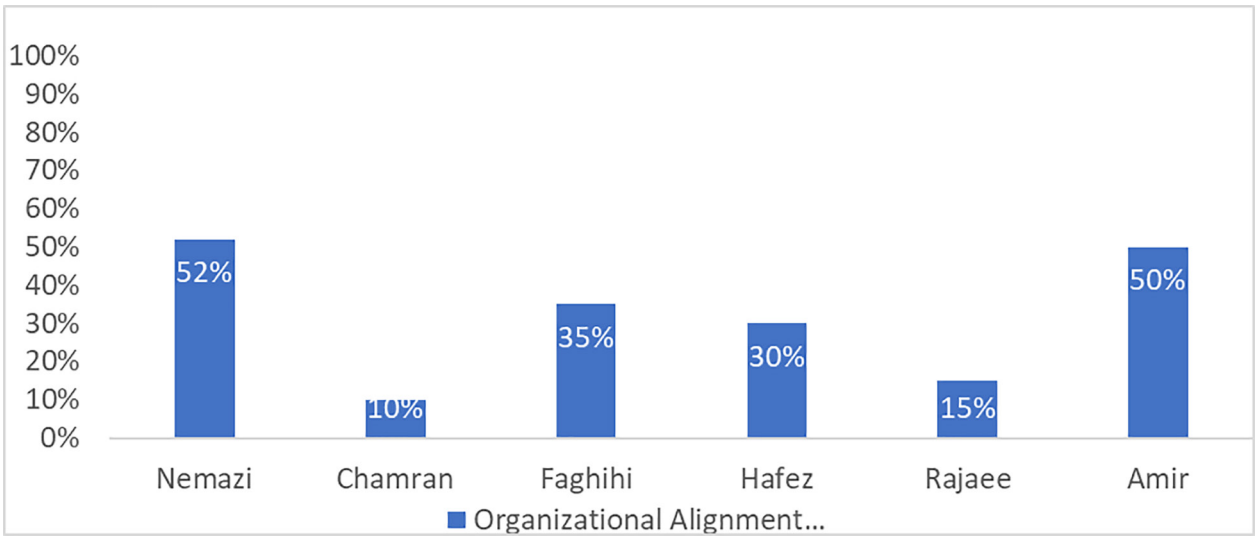

Figure 3: The percentage of readiness of Shiraz University of Medical Sciences hospitals to implement Electronic Health Record in organizational alignment capacity, based on the tools of the California Academy of Family Physicians

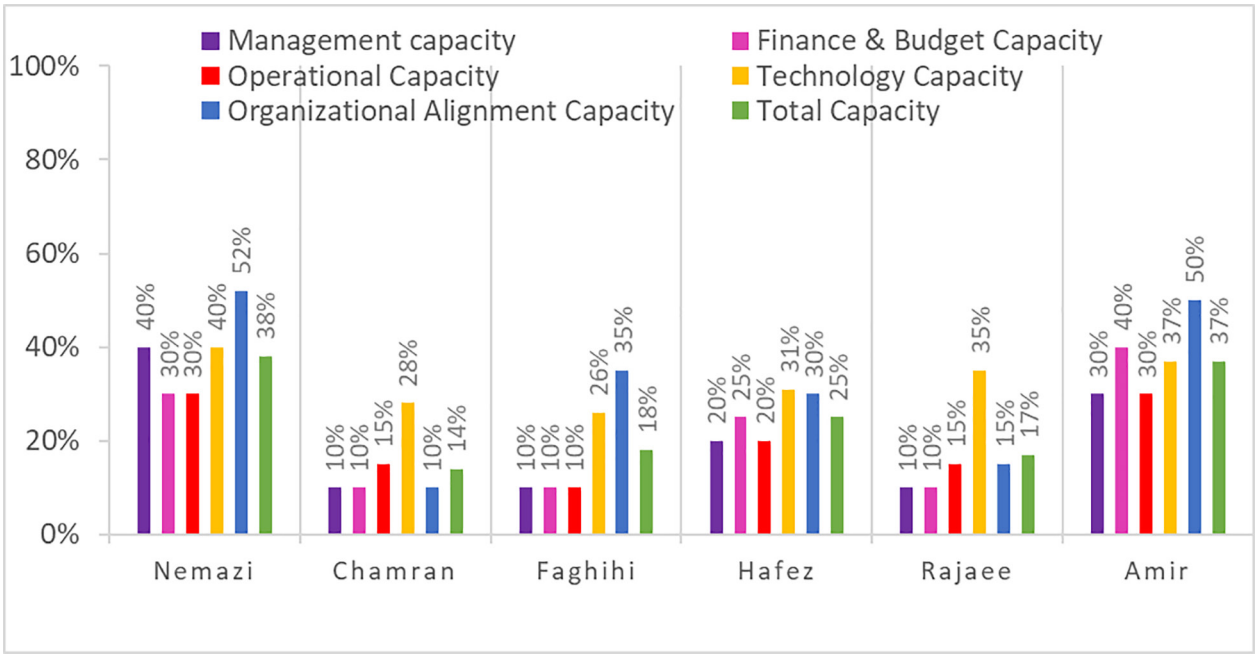

Figure 4: The percentage of overall readiness of Shiraz University of Medical Sciences hospitals for the implementation of Electronic Health Record based on the tools of the California Academy of Family Physician

mentioned as the first and most important factor for the implementation of these systems (1). A study of the successful implementation of EHRs in small ambulatory practice settings in the United States showed that the implementation of EHRs depended on a variety of factors, including technology, education, leadership, change management, and the unique characteristics of the outpatient environment (24). As to assessment of the readiness to implement technologies, several efforts have been made to develop a comprehensive tool. Some efforts emphasized staff readiness and patient readiness, while others considered organizational readiness to be the key to success or failure (25). Ghazisaeidi considered the e-health readiness assessment model to include 5 dimensions of culture, leadership and management, technical infrastructure, governance, and operational (26).

Management capacity according to the California Academy of Family Physician tools includes champion, staff, and dedicated staff to manage the project and define roles and responsibilities. The importance and role of management in health care centers have always been significant and hospital managers are one of the most basic resources of the organization and play a major role in improving the efficiency and effectiveness of activities (27-29). Hospital managers make decisions in planning,

organizing resources, directing and leading staff, and controlling performance (30). In Mirani's study, insufficient support of senior managers is stated as the most important factor in implementing EHRs (31). In Lorenzi's study, champion is an absolute necessity in the successful implementation of the EHRs (24). Maryati and Mirani cite the support of high-level managers as an effective factor in the organization's readiness to implement information technologies (31, 32).

Due to the fact that the management capacity to implement EHRs in most of the studied hospitals was weak, before any action to implement EHRs, strengthening the management capacity, especially in the centers that are weaker in this regard is of particular importance. Low management capacity in the studied hospitals can be due to the nascent hospital information systems, lack of sufficient opportunities for managers and their rapid change; lack of complete knowledge about EHRs and the benefits of its implementation; and lack of a written program to implement EHRs and shortcomings in integrated management.

The results obtained in relation to the readiness assessment showed that in finance and budgetary capacity, Amir hospital was moderately prepared and the rest of the studied hospitals were not ready and the finance and budget capacity of these hospitals was weak and not ready to implement EHRs yet. The finance and budget capacity in the California Academy of Family Physician includes the costs and benefits of implementing an EHR and return on investment analysis.

In the Lorenzi's study, many physicians expressed concern about the lack of finance support for start-up and training costs and the technical infrastructure for implementing EHRs (24). Mirani has stated that financial issues have always been one of the main concerns of creating and using EHRs (31). In Kabukye's study, it was stated that 50-75% of EHR implementations failed because they exceeded the budget and execution time and did not provide end user satisfaction (21). Jebraeily's study also emphasizes the lack of budget and insufficient investment and lack of strategic information technology planning for implementing EHRs (33).

In Thakkar and Olawuyi's study, the most important obstacle to using EHRs is the lack of coordination of costs and benefits and financial reimbursement (18, 34). Given that the finance and budget capacity to implement EHRs in most of the studied hospitals was not satisfactory, the low finance and budget capacity might be due to the fact that hospitals are fully aware of the benefits and advantages of implementing EHRs.

The results obtained in relation to the readiness assessment showed that in the operational capacity, Nemazi and Amir hospitals were in a better position compared to other hospitals; however, in this capacity, all the studied hospitals were not ready to implement EHRs yet.

In the present study, operational capacity included formal training plan for staff and clinical and administrative processes, which is consistent with Mirani (31) and Ajami's (1) studies. Studies have emphasized the importance of staff training and learning in the implementation of information systems and have stated that in the implementation of any software, user awareness and understanding of the software are the first of seven essential keys for successful software implementation (35, 36). Gesulga stated that most important barriers to implementing EHRs included unskilled staff, user resistance, concern of return on investment, and lack of executive support (37). Olawuyi also emphasize on lack of well-trained clinician informatics workforce to lead the process (18).

Jebraeily has stated that educating health care providers and familiarizing them with EHRs are vital factors in increasing the readiness to implement EHRs (6). The low operational capacity in implementing EHRs in the studied centers can be due to the lack of policies, measures, and laws to implement EHRs at the national level, and lack of programs to train the staff and health care providers.

The results obtained in relation to the assessment of readiness indicated that in terms of technology capacity, Nemazi, Amir, Hafez and Shahid Rajaee hospitals were moderately prepared and Shahid Chamran and Shahid Faqihi hospitals were not ready yet and needed more work.

Readiness assessment is the first of 6 steps to implement e-health and should include infrastructure readiness, technical readiness, and process readiness (25). Among the most important factors affecting the use of EHRs are the appropriate hardware and network infrastructure and information systems. Therefore, it is necessary to evaluate the technical infrastructure, equipment, and standards before using the EHR (31). In the present study, technology capacity includes information management, patient involvement, IT management and support, and information technology infrastructure, which is consistent with the Ajami's study (1). Ghazisaeidi categorized the readiness of technical infrastructure, including a network equipped with appropriate security bandwidth, communication infrastructure, databases, hardware with adequate capacity for

storing and processing information and security considerations (26). In another study, the lack of IT specialist staff, lack of staff awareness in the field of information technology, lack of training programs, and lack of motivation have been cited as the most important challenges in using information technology (38). John reported that major barriers to EHR adoption were the initial cost of IT (39).

According to the researcher, low technology capacity in the studied hospitals can be due to lack of hardware needs assessment, non-participation, and dissatisfaction of patients with referral information technology systems, insufficient number of IT staff in hospitals, and weakness in designing information systems based on standards.

The results obtained as to the readiness assessment showed that in the organizational alignment, Nemazi, Shahid Faghihi, Hafez, and Amir hospitals were in a better condition compared to other hospitals and the readiness of these centers was at an average. The findings also showed that there was no sufficient and strong understanding of the value of EHRs in Shahid Rajaees and Shahid Chamran hospitals, and in this capacity, these two centers were not yet ready to implement EHRs.

Mirani has categorized management and leadership as one of the main areas in assessing the readiness to implement EHRs (31), while in the present study, leadership is classified in the area of organizational alignment capacity and management is a separate area. Maryati's study states that most IT projects have failed for a variety of reasons, including organizational issues and leaders who have not adequately assessed organizational readiness for change (32).

Organizational culture is in fact the perception of physicians, employees, and patients of the EHR (1). Mirani states that before creating and using an EHR, organizational culture must be examined and organizational readiness to change is a key factor in success or failure. If the individual readiness of employees is not assessed before the implementation of the system, it may be considered as the most important obstacle in the implementation of that system (21, 31). Haji Pour Talebi states that successful implementation of health system needs consideration of organizational and managerial factors (40).

In Jebraeily and Lorenzi's study, the most important obstacles to the implementation of EHRs, attitudes and behavioral limitations of individuals and organizational changes have been expressed (24, 33). Perhaps the low level of organizational alignment capacity in the studied centers is due to lack of sufficient and strong understanding of the value and impact of EHRs on the clinical goals of the hospital, lack of full knowledge and appropriate attitude of EHRs, low participation of physicians in planning and decision making, lack of EHR support group, and lack of strategic information technology plan.

The results obtained in relation to the assessment of overall readiness indicate that Nemazi and Amir hospitals have shown a better capacity than other hospitals in moving towards the implementation of EHRs and are strong in some areas and weak in others; therefore, they are moderately prepared. The findings also showed that Hafez, Shahid Faghihi, Shahid Rajaee and Shahid Chamran hospitals are not ready to implement EHRs.

Implementation of EHR systems has been proposed as one of the common solutions to improve health services and overcome challenges, as the core of any e-health system (25, 26), and can provide medical reminders and warnings (31).

Conclusion

Assessment of readiness is a part of pre-implementation preparation and a basic need and provides a good picture of the current situation. Lack of preparedness reveals the weakness of the organization during the implementation of the EHR. Therefore, knowing the level of readiness, its areas and requirements can facilitate the implementation of any information system. According to the results of the research, it is recommended that measures should be taken to strengthen the management, finance and budget, operational, technology, and organizational alignment capacity, to better prepare hospitals in the implementation of EHRs. In this regard, leadership measures, participation and support of managers, formulation of strategic plans, recruitment of IT specialists, having a dedicated budget, justification of return investment, continuous in-service training programs, creation of hardware infrastructure and network, implementation applied culture, user participation, and process support are some of the effective factors in increasing hospital readiness.

One of the limitations of this study was the lack of proper cooperation and quick response from some personnel. Since this study was performed simultaneously with the corona virus epidemic in 6 teaching hospitals of Shiraz University of Medical Sciences, this limitation was removed with repeated follow-ups by the researcher.

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