

Readiness of Shiraz teaching hospitals to implement Electronic Medical Record (EMR)

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ABSTRACT

Introduction: Due to the importance of Electronic Medical Record (EMR) in the quality of health care services, checking the readiness of hospitals to implement it is a vital step to define success or failure of the Electronic Medical Record in the first place. The aim of this study was to evaluate the readiness of Shiraz teaching hospitals to implement Electronic Medical Record.

Method: This study was a cross-sectional descriptive study done in 2015. The study population included Health Information Management (HIM) staff of Shiraz teaching hospitals. Five hospitals from a total of 14 hospitals were selected as Single-stage cluster sampling with a population of 79 health information management staff. Data collection was performed by using a validated questionnaire. The questionnaire consisted of three main dimensions including technical, organizational and legal requirements. For data analysis, SPSS software version 16 and one way Analysis of Variance (ANOVA) for comparisons between five hospitals were used.

Results: The results showed that Shiraz teaching hospitals have high readiness (3.66 out of 5) to implement Electronic Medical Record. Shiraz teaching hospitals are better prepared in terms of legal requirements. Also, a significant difference was not observed among the hospitals in any of the technical, organizational and legal aspects ($P > 0.05$).

Conclusion: Due to the importance of the technical, organizational and legal aspects in the implementation of Electronic Medical Record, it is recommended that the authorities consider these aspects in implementation of Electronic Medical Record. Also, according to the high readiness of Shiraz teaching hospitals to implement Electronic Medical Record, it is recommended that authorities should take necessary measures, including financial support in order to run it.

Keywords: Implementation, Electronic Medical Records (EMR), Hospital, Health Information Management

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Introduction

Patient record is the main source of information related to the patient's health care as well as a source of dynamism for the health service provider organizations.

Physicians, nurses and other care providers, patients, health policy makers, legal and research authorities need these records (1). Therefore, the use of information technology in various sectors of health care, particularly in hospitals, provide a great potential to improve the quality of provided services and the efficiency and effectiveness of staff and also reduce some of organizational costs. Ministry of Health and Welfare of Japan published Strategy 21 health care information in 1994 that this report shows that health information system is a key to improve the quality and efficiency of health care and is one of the elements important in achieving the new

system of healthcare electronic medical records (2). This system is a computerized health information system that consists of details of reference information such as demographic information, summary of referrals, medical history, allergies, disabilities, and history of test results; some of these systems may consist of the record of orders, the results management and support the decision and even some of them may be integrated with software that can consist of schedule appointments, financial affairs, and public reports (3).

According to Wager, to achieve the most ideal patients' medical records state that is the Electronic Health Record (EHR), the elementary and middle levels of the patient's medical file should be evolved before that. As Wager states, the most basic level is the Automated Medical Record (AMR) which is actually a combination of paper medical records and computerized scan of paper patient's medical

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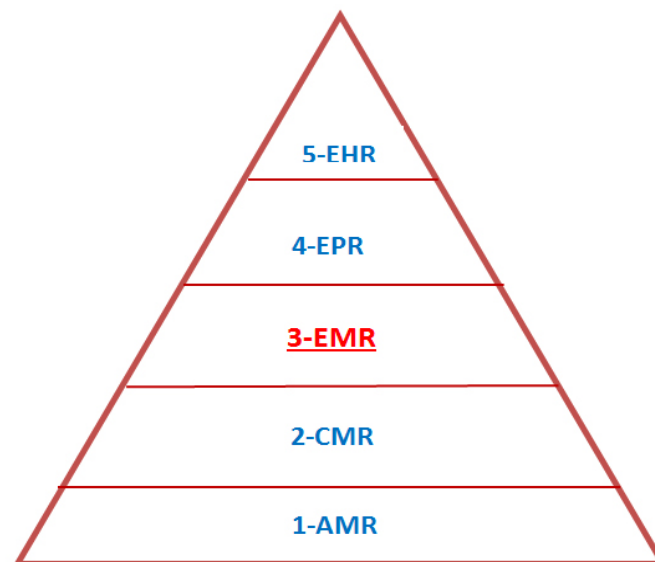
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records. The second level is the Computerized Medical Record (CMR) which is in fact the computerized scan of all paper patients' medical records. According to him, the first and second levels are static levels, because they don't have any of the capabilities of intelligent information systems. The third level is the Electronic Medical Record (EMR) which is dynamically unlike the first and second levels because it has capabilities of intelligent systems. The first three levels in terms of extent are used in the context of a health care center such as hospitals. Electronic Medical Record has a lot of information interaction with Hospital Information System (HIS). The fourth level is the Electronic Patient Record (EPR) which is similar to the third level except that the patient information is shared across several health-care centers. The fifth level is the most ideal type and has the same capabilities similar to the third and fourth levels, except that people's health information is shared on a much broader level (Figure 1) (4).

Figure 1. Levels achieved by Electronic Health Records (4)



Electronic Medical Record are tools that have played an effective role in the quality of care relying on the Clinical Decision Support Systems (CDSS) as an alert reminder or interpreter and predictive and diagnostic proposer and also the system of Computerized Physician Orders Entry (CPOE) (5).

This is a computerized health information system that consists of details of reference information such as demographic information, a summary of referrals, medical history, allergies, disabilities and history of test results, and some of these systems may consist of records of the orders, results management and support the decision and even some of them may be integrated with a software that can consist of schedule appointments, financial affairs, and public reports (6, 7). There is a widespread belief in the majority of articles that Electronic Medical Record and Electronic Health Record can reduce health care costs significantly, improve the quality of health care services, and ultimately improve population health state. Implementation of EMR system in developing countries is

also possible and can be expanded to manage hundreds of thousands of patients (8).

Achievement of all the benefits depends on the accurate and correct implementation of this technology. Despite the importance of medical informatics systems, these systems are slow to be accepted by health care providers (9). Our country, as a developing country, needs to implement new information technologies, particularly in the healthcare industry to achieve a sustainable development.

But always the implementation of clinical systems has failed for many reasons, such as financial, technical, organizational problems (9). Predictable medical team reasons to accept or reject the new information system will allow an organization to actively implement reforms for increasing acceptance (8-11).

With the growing need for digital information in health care, EMR has become an essential element of Health Information Technology (HIT) and with the growing demand for EMR evaluation, possibility of using it is a

vital step in the first place to define success or lead to failure of the electronic medical record (8). So, evaluating the use of establishment and implementation of electronic medical records will be crucial in the treatment settings (12).

Today, in many countries of the world, including our country, the necessity of implementation of EHR has been shown and strategic plans of the country health system indicate a serious decision to move towards the implementation of the Electronic Health Record. Now, all teaching hospitals of Shiraz are on the second level (Computerized Medical Record-CMR) in order to achieve the Electronic Health Record (EHR); there is no way to pass from this stage except for implementation of electronic medical records (third level). Due to the experiences of developed countries that have taken the necessary benefits from this system and also the importance of the view of health information management unit staff as professionals of Hospital health information, we decided to study the health information management unit staff

of Shiraz teaching hospitals. Successful implementation of electronic medical records as other information technologies in the health system depends on many aspects; in this study, three technical, organizational and legal aspects that are very important in the establishment of electronic medical records were studied. The aim of this study was to evaluate the readiness of Shiraz teaching hospitals to implement electronic medical records based on technical, organizational and legal aspects.

Methods

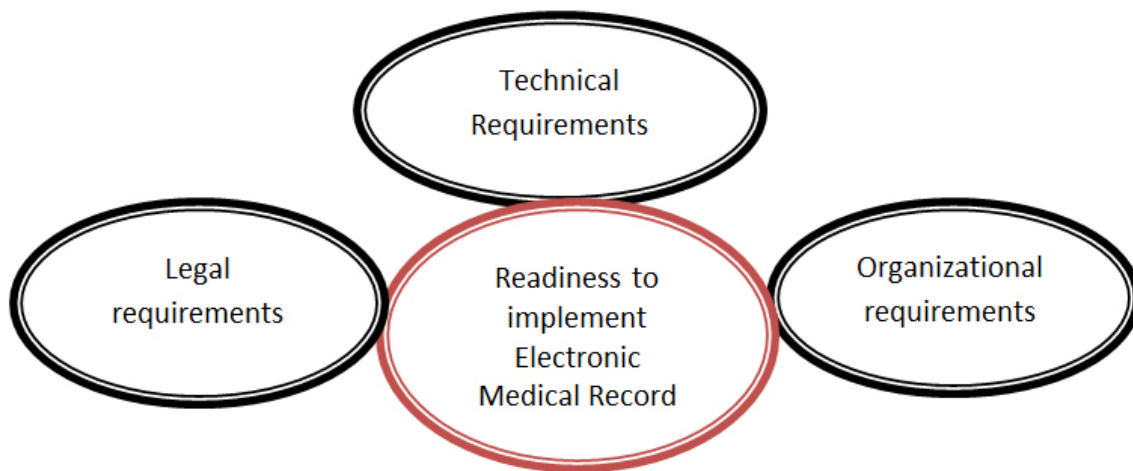
This is a cross-sectional descriptive-analytic study carried out in selected teaching hospitals of Shiraz University of Medical Sciences in 2015. The study population included 79 health information management staff of Shiraz teaching hospitals. Single-stage cluster sampling was used for selection of samples. Five hospitals were selected among 14 teaching hospitals. Due to ethical considerations, the names of the hospitals are not mentioned, and the participants in the study were assured that they will remain anonymous. From the 79 questionnaires distributed, 57 were fully completed; the proportion of the returned questionnaires and the response coefficient to the questionnaires was 72%.

To collect the data, a questionnaire was used, the validity and reliability of which have already been confirmed. Five-point Likert scale was used to determine the relevant requirements.

The first 13 questions were related to familiarity with electronic medical records; the questions were designed based on range of five-point Likert scale and the maximum and minimum average points of each aspect of awareness were range from very high to very low. Another 22 questions related to the technical requirements (including 7 questions), organizational (including 10 questions), and legal (including 5 questions) in hospitals were defined according to a range of five items (very high, high, medium, low, and very low) based on the current status requirements. Figure 1 displays the model of readiness to implement electronic medical records.

A sample of 20 out of the main sample was selected to determine the reliability and verification of the questionnaire; then, the questionnaires were distributed among them, and after a week they were filled out again by the same group. By using Cronbach’s alpha test, its reliability was measured to be 84%, which indicates high reliability of the questionnaire. The rates were also assessed separately for each of the factors. From 79 questionnaires distributed among the medical records staff of 5 selected hospitals, 57 were collected, so the ratio of completed questionnaire and the questionnaire response coefficient was 74 percent. Data were analyzed using SPSS software version 16 and descriptive statistics for analysis of demographic data and statistical Analysis of Variance (ANOVA) for comparing the hospitals in terms of technical, organizational and legal requirements

Figure 2. The thematic model of readiness to implement electronic medical records



Its reliability (Tables 1 and 2) and validity were evaluated again. The content validity of the questionnaire was tested by the use of the opinions of professors and experts (including 3 professors from School of Management and Information affiliated to SUMS and 2 professors from School of Management and Information affiliated to IUMS). The questionnaire included three parts to determine the level of knowledge and assess the requirements related to the required technical, organizational and legal standards to implement electronic medical records. The first part of the questionnaire also included questions about demographic characteristics (sex, age, work experience and education). The second part included 35 questions.

were performed. Also, to determine the level of readiness to implementation of EMR in hospitals, the scores were divided into three parts: 0-1.66 as the low readiness level, 1.66-3.32 as the medium, and 3.33- 5 as the high level of readiness.

One of the most important limitations of the study was Lack of cooperation to complete the questionnaires because the participants were busy, but to solve this problem we referred when the workload was lower .

Results

Among the 57 completed questionnaires, 51 percent (29) of the patients were female. The average age of the staff was

36 years (sd= 6.5) and average work experience was 13 years (sd= 3.2) among them. 73 percent of the respondents had a bachelor's degree, 9 percent had an associate degree, 11 percent had a master's degree, and the others also had diploma.

Questions 1 to 13 of the research related to the knowledge of Health Information Management staff about electronic medical records showed that the knowledge of Health Information Management department staff about electronic medical records is at a high level (average knowledge level of staff 66.3 (sd= 5.13)). The results of the knowledge of Health Information Management department staff about electronic medical records are shown in Table 1.

Table 1. The knowledge of Health Information Management Department staff about EMR

	Questions	Average score	Cronbach's alpha
1	Your proficiency in computer use	4.15	0.78
2	Your familiarity with the concept of Electronic Medical Record	3.9	
3	Your familiarity to the benefits of Electronic Medical Record	3.89	
4	Your familiarity with tools and technologies needed for Electronic Medical Record	3.81	
5	Your familiarity with Electronic Medical Record of the other countries	3.55	
6	The effect of education on increasing the knowledge of hospital staff to work with electronic medical records	3.53	
7	The effect of Electronic Medical Record on increasing the quality of health care services and patient safety.	3.69	
8	The effect of Electronic Medical Record on increasing the speed of deal with patients.	3.63	
9	The effect of Electronic Medical Record on reducing the patients and hospital costs	3.73	
10	The effect of Electronic Medical Record on public access to healthcare services	3.62	
11	The effect of Electronic Medical Record on increasing patients' satisfaction	3.58	
12	The effect of Electronic Medical Record on preserving the patients' privacy	3.58	
13	The effect of Electronic Medical Record on preserving the confidentiality and security of patient information.	2.96	
	Average	3.66	

According to Table 1, the knowledge of Health Information Management Department staff as to working at the computer with 4.15 and the effect of EMR on preserving the confidentiality and security of patient information with 2.96 respectively had the highest and lowest scores.

The technical, organizational and legal requirements related to the establishment of EMR are shown in Table 2. The first part of Table 2 which is about the technical requirements of the establishment of EMR, quick and easy access to the internet was more than other cases and available software and applications for implementation of EMR was less than the others.

The second part of Table 2 shows the availability of the organizational requirements needed to implement EMR; the readiness of the organization to deal with challenges and obstacles was more than other mentioned requirements. Also, the policies and procedures for the establishment of EMR were less than other available organizational requirements.

The third part of Table 2 displays the legal requirements for establishing EMR which has been designed based on the existing policies. As shown, data security policy existed more than any other policy in the studied hospitals. According to Table 2, legal requirements are observed

more than the other requirements in Shiraz teaching hospitals; also based on the findings in Table 2, it can be concluded that the organizational requirements were found less than the technical and legal requirements in other studied hospitals.

According to Table 3, using one-way ANOVA (Analysis of Variance) to evaluate the differences between the studied hospitals in terms of requirements (technical, organizational and legal), it was found that among the studied hospitals in terms of technical requirements ($P=0.333$), organizational requirements ($P=0.700$) and legal requirements ($P=0.834$), there was no significant difference ($P> 0.05$).

Discussion

The review of the studies revealed that the implementation of Electronic Medical Record plays an important role in the management of patient information, such as reduction of the health care costs, improvement of the delivery of health care, successful implementation of Electronic Health Record, information integration, and reduction of medical errors (13-16). On the other hand, EMR technology, in particular, requires financial investment and physicians initially should not seek to evaluate the returning of the cost of consumption, and therefore may be afraid to implement it. Rising costs, concerns about the confidentiality of patient records, reduction of the meeting time of physician and patient, changes in work flow, heavy design EMR for users, reduction of physician independence, and the difficulty learning the use of EMR are the most important reasons for the slow implementation of Electronic Medical Records. The establishment of this system in hospitals needs scientific and accurate studies to be conducted.

From the findings of this study, it can be concluded that familiarity of the staff of Health Information Management of Shiraz teaching hospitals with EMR is at a high level.

Table 2. Technical, organizational and legal requirements related to the establishment of electronic medical records from the viewpoint of Health Information Management department staff

	Technical Requirements	Average score	Cronbach's alpha
14	Effective Hospital Information System	3.17	0.69
15	Equipment and hardware needed	3.27	
16	Software and applications required	3.08	
17	Quick and easy access to the Internet	4.19	
18	Policies to promote infrastructure and technology	3.76	
19	Hospital's ability to allocate dedicated website Electronic Medical Record	3.14	
20	Appropriate infrastructure to Electronic Medical Record system with other information systems and available software	3.87	
	Average	3.69	
Organizational requirements			
21	strategic plan in the Hospital (main purpose, special, determine priorities based on objective, mission, vision SWOT)	4.01	0.76
22	Strategic plan in the Hospital (main purpose, special, determine priorities based on objective, mission, vision SWOT) and to establish Electronic Medical Record	3.37	
23	Policies and procedures for the establishment of Electronic Medical Record in hospitals	2.95	
24	Certain programs to determine the conversion of paper records to Electronic Medical Record	4.03	
25	Forming executive teams and related working groups to establish Electronic Medical Record	3.39	
26	Teaching courses for acquiring skills needed to work with Electronic Medical Record	3.15	
27	Organizational readiness to deal with the challenges and obstacles	4.07	
28	Restructuring and re-engineering the process of providing clinical services	3.98	
29	Senior managers support from the establishment of electronic medical records	3.65	
30	Tangibility of early benefits of Electronic Health Records for senior executives	3.55	
	Average	3.61	
Legal requirements			
31	Policies of monitoring the preservation and security of electronic records.	3.98	0.70
32	Privacy policies	3.41	
33	Confidentiality policies	3.60	
34	Access to clinical information policies	3.65	
35	Data security policies	4.11	
	Average	3.75	

Table 3. One-way ANOVA test for comparing the status of the five studied hospitals to establish Electronic Medical Record

Variable	Group					Statistic (F)	P value
	Hos1 (n=16)	Hos2 (n=9)	Hos3 (n=15)	Hos4 (n=9)	Hos5 (n=8)		
Technical requirements	3.28±0.51	3.72±0.21	3.71±0.22	3.83±0.71	3.81±0.19	1.178	0.230
Organizational requirements	3.21±0.61	3.70±0.48	3.72±0.17	3.91±0.25	3.73±0.52	0.665	0.700
Legal requirements	3.41±0.44	4.01±0.62	3.70±0.19	3.85±0.79	3.91±0.17	0.494	0.834

Langarizade et al. (2013) concluded that staff awareness of Health Information Management department with EMR is at a high level (17); this is consistent with the results of this study. Najafi (2010) in her study concluded that familiarity with technology is effective on intention to use the EMR (18); also, Jebraeily (19) in his study reached a similar conclusion. As a result, it can be said that the high level of knowledge of the staff with EMR is so important in establishment of this system.

The survey of hospitals revealed that all teaching hospitals

of Shiraz are located on the second level of the sequence five-level implementation of Electronic Health Record (20); it means the system of Computerized Medical Records (scanning information into the computer system). This level is before the level of EMR and can be said that the level of knowledge and preparedness to some extent depends on the logical sequence. The study findings revealed that teaching hospitals of Shiraz University of Medical Sciences are in a moderate to high level in terms of technical, organizational and legal requirements to

establish the EMR. Also, between the studied hospitals in terms of the mentioned requirements there was no significant difference. The results of this study are consistent with those of Langarizade et al.'s study that concluded there was no significant difference between Urmia hospitals of University of Medical Sciences in terms of technical, organizational and legal requirements (17). It seems that we can observe successful implementation of this system with detailed planning due to the high level of readiness of hospitals and the level of readiness at hospitals are in the same level.

From surveying the other findings of the study revealed that studied hospitals have more readiness in terms of legal requirement to establish electronic medical record. It seems there are existing policies that will play an important role in hospitals to implement EMR; actually, the existing policies and their implementation lead to an increase in this readiness.

Also, the readiness of Shiraz University of Medical Sciences hospitals in terms of the organizational requirements is above the average. Hostgaard and Nohr in their study concluded that organizational culture plays an important role in the implementation of EHR (21). Organizational requirements and procedures, programs, infrastructures and appropriate supports play important roles in the implementation of any system and Health Information Management staff of hospitals acknowledge the importance of organizational requirements.

Technical requirements are lower than the other requirements. The results of this study are consistent with those of Amatayakul et al.'s study (22, 23) that concluded peoples' technical limitations in the implementation of health information technologies are more important than the other limitations. Also, Langarizade et al. in their study indicated that only 60 percent of hospitals in terms of technical requirements are ready to EMR implement (17).

Conclusion

The implementation and the use of EMR, especially in developing countries, have become inevitable. But the implementation of this system requires accurate studies to be conducted and without accurate studies in its establishment, we will fail to run it.

Due to the importance of the implementation of EMR in various aspects of health system, the need to implement it is felt more than ever; on the other hand, the readiness of hospitals is at a proper level, so it seems that we can establish the EMR at the level of Shiraz University of Medical Sciences teaching hospitals with proper planning. Also, considering the importance of technical, organizational and legal requirements in the establishment of EMR, comprehensive attention to them is very important. On the other hand, according to the results of this study, organizational requirements in comparison with technical and legal requirements in hospitals are in a lower level. Therefore, more attention to organizational requirements and efforts to increase it in hospitals will play an important role in the establishment of the EMR in Shiraz teaching hospitals.

It is recommended that before implementing EMR, the policies for information confidentiality should be developed and physicians and Health Information Management staff should be informed about these policies. Also, it is suggested that a strategic plan for implementing electronic medical record should be designed more studies should be conducted in this field.

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Competing Interest

None declared.

References

1. Chaulagai CN, Moyo CM, Koot J, Moyo HB, Sambakunsi TC, Khunga FM, et al. Design and implementation of a health management information system in Malawi: issues, innovations and results. *Health Policy Plan.* 2005;20(6):375-84.
2. Toyoda K. Standardization and security for the EMR. *Int J Med Inform.* 1998;48(1-3):57-60.
3. Ludwick DA, Doucette J. Adopting electronic medical records in primary care: lessons learned from health information systems implementation experience in seven countries. *International journal of medical informatics.* 2009;78(1):22-31.
4. Wager KA, Lee FW, Glaser JP, Burns Glaser J, Managing J. *Health information systems: a practical approach for health care executives.* Jossey-Bass; 2005.
5. Carter Jerome H. *Electronic medical records: a Guide for clinicians & administrators.* Translated by Langarizadeh M, Mahmoodzadeh B & Khezri R Tehran: Institute of Dibagaran. 2005:185-201.
6. Hillestad R, Bigelow J, Bower A, Girosi F, Meili R, Scoville R, et al. Can electronic medical record systems transform health care? Potential health benefits, savings, and costs. *Health Aff (Millwood).* 2005;24(5):1103-17.
7. Mills TR, Vavroch J, Bahensky JA, Ward MM. Electronic medical record systems in critical access hospitals: leadership perspectives on anticipated and realized benefits. *Perspect Health Inf Manag.* 2010;7:1c.
8. Wills MJ, El-Gayar O, Bennett D. Examining healthcare professionals' acceptance of electronic medical records using UTAUT. *Issues in Information Systems.* 2008;9(2):396-401.
9. Ahmadi Dehghobodini M. [Structure combination between Davies information acceptances Model. *New plans in educational sciences.* 2010;5(2):56-8.
10. Follen M, Castaneda R, Mikelson M, Johnson D, Wilson A, Higuchi K. Implementing health information technology to improve the process of health care delivery: a case study. *Dis Manag.* 2007;10(4):208-15.
11. Valdes I, Kibbe DC, Tolleson G, Kunik ME, Petersen LA. Barriers to proliferation of electronic medical records. *Inform Prim Care.* 2004;12(1):3-9.
12. Gans D, Krzewski J, Hammons T, Dowd B. Medical groups' adoption of electronic health records and information systems. *Health Aff (Millwood).* 2005;24(5):1323-33.
13. Garavand A, editor. Nematollahi M, Monem H. The role of electronic medical records (EMR) in reducing Hospital costs. *International Conference on Sustainable Reform in Health Systems;* 2015.
14. Gozali E, Langarizadeh M, Sadoughi F. A SURVEY OF THE POSSIBILITY OF ELECTRONIC MEDICAL RECORDS IMPLEMENTATION IN TEACHING HOSPITALS AFFILIATED TO URMIA UNIVERSITY OF MEDICAL SCIENCES. *Journal of Urmia Nursing And Midwifery Faculty.* 2013;11(5):0-.

15. Holroyd-Leduc JM, Lorenzetti D, Straus SE, Sykes L, Quan H. The impact of the electronic medical record on structure, process, and outcomes within primary care: a systematic review of the evidence. *Journal of the American Medical Informatics Association*. 2011;18(6):732-7.
16. Price A. A study of factors influencing physician adoption of electronic medical records technology. *Grenoble Ecole de Management*. 2010.
17. Langarizade M, Gozali M, Sadoghi F. [Comparative evaluation Hospitals preparation for deployment Electronic Medical Records in Urmia]. *Journal of Faculty of Tehran University of Medical Sciences (Pyavrd salamat)*. 2013;7:312-24.
18. Najafi N. [Effective factors for adoption of Electronic patient record between physician usingn the unified theory of acceptance and use of technology (UTAUT)]: Shiraz: Shiraz Payame Noor University; 2010.
19. Jebraeily M, Ahmadi M, Hajavi A, Gohari M, Sedghi Jahromi M, Zareh Z. Electronic Health Records: Personnel Readiness Assessment. *Journal of Health Administration*. 2010;13(39):17-24.
20. Torabi M, Safdari R. [Electronic Health Record]. tehran: jafari publication; 2009.
21. Hostgaard AM, Nohr C. Dealing with organizational change when implementing EHR systems. *Stud Health Technol Inform*. 2004;107(Pt 1):631-4.
22. Amatayakul M. EHR? Assess readiness first: there's no denying interest in electronic health records is increasing. *Healthcare Financial Management*. 2005;59(5):112-4.
23. Miller RH, Sim I. Physicians' use of electronic medical records: barriers and solutions. *Health Aff (Millwood)*. 2004;23(2):116-26.