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Evaluation of health care professionals' readiness for accepting Electronic Health Records in Western Iran

A Study of E-Health Care in a Developing Country

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ABSTRACT (MAX. 200 WORDS):
The rapid development of information and communication technology (ICT) has affected all aspects of business, including health care. One of the most important contributions of ICT to healthcare system effectiveness is the creation of electronic health records (EHRs). EHRs are considered as the critical source of providing information in a healthcare system. The purpose of this study is to evaluate the health care professionals' readiness level within EHRs implementation in five teaching hospitals at Hamedan city in Western Iran. We used a descriptive cross sectional survey design in the form of a standard questionnaire for gathering quantitative data from a sample of 137 healthcare professionals randomly. The data were reported as mean and proportion. This study has evaluated three components of the readiness to accept EHR including computer skills, knowledge, and attitude. The differences in these components by sociodemographic characteristics were assessed using t-test and one-way analysis of variance (ANOVA) and correlation between them was measured using Spearman correlation coefficient. Results of this study showed a small positive correlation between

knowledge and attitude while the correlations between computer skill and knowledge and attitude were negative. There were small differences in readiness level by sociodemographic characteristics including education attainment and occupation.

Acknowledgement

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Naghmeh Yazdani

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1 Introduction

This chapter will describe the underlying issues that lay ground for the study by explaining the background and the motivation behind the research. It includes: background, research problems, research question, research purpose, and delimitation.

1.1 Background

The rapid growth of information and communication technology (ICT) has influenced the ways people communicate, work, transact business and across all sectors. One of the important aspects that ICT has influenced is health sector. Indeed, there has been substantial advances in ICT-based healthcare, especially over the recent two decades. E-health application is an emerging ICT in health care system that focuses on improved quality of healthcare delivery, increase patient safety, and reduce healthcare costs (Ami-Narh & Williams, 2012).

In addition to the advancement in IT, advances in the healthcare sector, as well as increasing patients' awareness and expectations, have transformed health care providers into customer-oriented and competitive environments (Poon, Wright, Simon, Jenter, Kaushal, Volk, Cleary, Singer, Tumolo & Bates, 2010). Therefore, in order to develop and continue their activities, these organizations are thinking about improving the quality of services along with their cost-effectiveness, and this will not be possible but through timely access to quality information (Franczak, Klein, Raslau, Bergholte, Mark & Ulmer, 2014; Safdari, Ghazisaeidi & Jebraeily, 2015). In fact, such quality information is required not only by physicians and other care providers, but also patients themselves as well as health policy makers, legal and research authorities need them. However, paper-based patient information system, particularly in developing countries, is unable to provide access to such information (Ayatollahi, Mirani & Haghani, 2014; Ozair, Jamshed, Sharma & Aggarwal, 2015). They suffer from many limitations including spatial constraints, limitations in providing communication between providers, limitations in readability and organizing data and so on (Safdari, Ghazisaeidi & Jebraeily, 2015). In response, there has been a move toward adaptation of electronic/computerized information systems in the form of electronic health records (EHRs) (Berg, 2001). An EHR is an electronic lifelong collection of information that is recorded or approved by health care providers and shared at various locations (Ayatollahi, Mirani & Haghani, 2014). It is a systematic collection of a patient's medical details (e.g. medical history, medication orders, vital signs, laboratory results) in digital format (Saleem, Russ, Justice, Hagg, Ebright, Woodbridge & Doebbeling, 2009; Ozair et al., 2015). Compared with paper recorders, EHR is associated with improved access to health care and the quality of care as well as reduction in expenses (Ozair et al., 2015).

It is argued that EHR provides a single, coherent, integrated and complete source of health information including treatment, prescription, test results, diagnostic effects and important environmental information and health care information (Ayatollahi, Mirani & Haghani, 2014). The main purpose of EHR is to improve the quality of services by reducing medical errors, providing effective methods of communication and information sharing between health care providers and better management of medical records for educational and research purposes

(Wager, Lee & Glaser, 2017; McGinn, Grenier, Duplantie, Shaw, Sicotte, Mathieu, Leduc, Légaré & Gagnon, 2011). The benefits of EHR can be divided into three main groups: i) quality, outcomes and safety; ii) efficiency and cost saving; and iii) patient's and provider's satisfaction. Albeit it should be noted that the negative outcomes associated with EHR implementation have also been reported (Wager, Lee & Glaser, 2017). For example, a previous study found that the implementation of EHR in pediatric intensive care unit of a children's hospital was associated with increased mortality due to a decline in quality created by several implementation factors such as no creation of order sets for critical care (Wager, Lee & Glaser, 2017; Han, Carcillo, Venkataraman, Clark, Watson, Nguyen, Bayir & Orr, 2005). Interestingly, a second children's hospital that implemented the same EHR system, did not observe such an increase in their mortality (Wager, Lee & Glaser, 2017; Del Beccaro, Jeffries, Eisenberg & Harry, 2006).

The benefits created by EHR can be especially attractive for developing countries with low levels of economic growth and inadequate technical and social infrastructures Indeed, traditional health care management is a major challenge for many of these countries and they consider EHR as a solution that can reduce health care costs and improve population health (Hassibian, 2013). Iran is among these developing countries with a health system that is facing several major challenges including high demands and pressure to reduce prices, provision of community health services, and improvement in efficiency, justice, accessibility, and quality of health care (Hassibian, 2013; Mehrdad, 2009). To address these challenges, the Iranian Ministry of Health has been instructed to design and develop a platform for storing and retrieving citizens' health information through EHRs (Mehrdad, 2009).

However, successful implementation of EHR is not a readily achievable task and there are persistent resistance and challenges with EHR implementation and use. A lack of user participation and readiness is among major challenges and barriers in acceptance of EHR (Habibi-Koolaee, Safdari & Bouraghi, 2015). To shed light on this, the current study aims to investigate the extent and determinants of health care professionals' readiness in EHR acceptance in teaching hospitals in Western Iran.

1.2 Problem

While EHRs is a cost-effective option improving health care quality, its implementation faces significant implementation constraints (Boonstra, Versluis & Vos, 2014). The most important bottlenecks are cost, technical, standardization, individual-behavioural, and organisational constraints. In fact, a lack of the unwillingness and participation of users in EHRs acceptance is considered as a major cause of its failure (Habibi-Koolaee, Safdari & Bouraghi, 2015; Hassibian, 2013; Dornan, Pinyopornpanish, Jiraporncharoen, Hashmi, Dejkriengkraikul & Angkurawaranon, 2019; Li, Land, Ray & Chattopadhyaya, 2010; Castillo, Martínez-García & Pulido, 2010; McGinn et al., 2011). A previous study in Denmark reported that low investment in the readiness of users to accept EHRs was a main barrier in its implementation (Hostgaard & Nohr, 2004). Therefore, it is necessary for health care organizations to evaluate the technical infrastructure and equipment, work processes and organizational instructions, organizational culture and manpower readiness including their computer skills, knowledge and attitudes prior to any decision to implement EHRs (Amatayakul & Lazarus, 2005). This is even more vital in developing countries where health care systems are under higher financial pressure and health care professionals, especially physicians, have significant power in the

health care delivery system (Hassibian, 2013). Given this and growing interest in implementation of EHRs in Iranian health care systems, the current study will provide useful insights on readiness of health care professionals in implementing EHRs which can aid to reduce the resistance in EHRs implementation and lead to more informed policy-making.

Much research has been done on EHRs in Iran, but only one study has investigated nurses' readiness for implementing EHRs in hospitals in Tehran (capital of Iran) (Habibi-Koolaee, Safdari & Bouraghi, 2015). In this study, I expand these previous studies by including a range of health care professionals in addition to nurses including physician, medical record officers, laboratory technicians, and radiology staff of five teaching hospitals located outside Tehran at Hamedan city in Western Iran.

1.3 Purpose and Research Question

The main purpose of the research:

The overall purpose of this study is to investigate the level of readiness of health care professionals for EHR acceptance and to identify its determinants.

Research Questions:

What is readiness level of health care professionals in accepting EHRs in Iran (a developing country)?

Which characteristics influence the readiness of health care professionals for EHR acceptance?

1.4 Importance of the Study

Many researches on EHRs have emphasized the importance of EHRs implementation. While the success of EHRs depend entirely on the acceptance and readiness of health care professionals, few studies have been done on the readiness of health care professionals as the main consumers (users) of EHRs. EHRs implementation is also very expensive. Therefore, the findings of this study might help to find cost-effective strategies to improve the readiness and acceptance of EHRs among health care professionals. In particular, the benefits of this study is possibly more profound in a developing country such as Iran facing many financial problems which make a successful implementation of EHRs even more vital. Moreover, this research can help researchers working in the technical field of EHRs to have a better view of their consumers and make designs appropriate to their level of readiness and attitude. This study is also a guide for health care systems that want to implement EHRs to design appropriate training courses for their health care professionals so that they can take full advantage of EHRs in their system.

Therefore, the need for this study and studies that help to understand the obstacles and problems of EHRs implementation can be very useful in reducing the cost of EHRs implementation. In particular, with the spread of Covid-19 disease the need to implement EHRs has become much more apparent than ever, especially in Iran which has problems in

tracking patients and their medical history. Indeed, lack of EHRs has led to poor statistic on COVID-19 cases and also poor coordination in the patient's care, which can lead to medical errors and thereby patient dissatisfaction.

1.5 Delimitation & limitation

This study has several limitations. First, the study covers only five teaching hospitals in one city in Iran. Some aspects of these hospitals including their management and the behaviour of the health care professionals working at these teaching hospitals may be different from other hospitals. Moreover, Hamedan is a city in the west of Iran with its specific cultural and organizational characteristics which might be different from other cities in the country. Furthermore, Iran is a developing country with its own health system and epidemiology profile which is different from other developing countries. All these aspects can limit the generalizability of the findings to other type of hospitals and other locations including other developing countries. Second, due to difficulty in access to all health care professionals and also time constraints for conducting this research, only five categories of health care professionals were included in this study which might not be representative of all health care professionals. Third, the study has a descriptive nature and hence no causality can be interpreted from the findings. Fourth, the data were obtained using self-report questionnaire and therefore possibilities for miss-reporting should not be overlooked.

1.6 Definitions

E-health care:

Theoretical definition: E-health care is a growing field of the intersection of medical informatics, public health and commerce that is evolving through the Internet and related technologies. In fact, it is not only a technical advancement, but also a new way of thinking, attitude and commitment that is intended to improve health care (Eysenbach, 2001).

Practical definition: In this study, the practical definition corresponds to the theoretical definition.

Electronic health records (EHRs):

Theoretical definition: EHRs are the collection of the whole medical history of an individual that is recorded by health care providers and shared in various places (Ajami & Arab-Chadegani, 2013). Information about medical history of an individual includes progress notes, problems, medications, vital signs, past medical history, immunizations, laboratory data, radiology reports, and etc. (Hassibian, 2013). The main purpose of EHR is to improve the quality of services by reducing medical errors, providing effective methods of communication and information sharing. In addition, it aims to promote the management of medical records for educational and research purposes (Ayatollahi, Mirani & Haghani, 2014; Castillo, Martínez-García & Pulido, 2010).

*Practical definitio*n: In this research, the practical definition corresponds to the theoretical definition.

Health care professional:

Theoretical definition: Health care professional interact with patients and provide care services to them (Sadatsafavi, Walewski & Shepley, 2013; Courtenay, Lim, Castro-Sanchez, Deslandes, Hodson, Morris, Reeves, Weiss, Ashiru-Oredope, Bain, Black, Bosanquet, Cockburn, Duggan, Fitzpatrick, Gallagher, Grant, McEwen, Reid, Sneddon, Stewart, Tonna & White, 2018). Health care professional include all nursing departments, physicians, midwives, technicians, associates and experts in laboratory science, radiology and emergency medicine (Sadatsafavi, Walewski & Shepley, 2013; Courtenay et al., 2018).

Practical definition: Health care professionals in this study refer to physicians, nurses, medical records staff, laboratory technicians, radiologists experts who work in five teaching hospitals at Hamedan city in Western Iran.

Readiness level:

Theoretical definition: Readiness is the state of mind about the need for innovation (knowledge), the ability to undertake technology transfer (skills) as well as minimizing resistance and support for the effort (positive attitude) in the successful implementation of new technology (Jansen, 2000). Creating readiness for change depends on the capacity of the organization and people's perception of change, which includes the belief and attitude of individuals and the aims and culture of the organization (Jansen, 2000).

Practical definition: In this study, readiness is defined as a function of the computer skills, knowledge about EHR and attitudes towards EHR.

Implementation:

Theoretical definition: Implementation is the set of operations required for putting to use or integrating changes and innovations within an environment (Moullin, Sabater-Hernandez, Fernandez-Llimos & Benrimoj, 2015). In fact, implementation is the beginning of using a plan or system (Moullin et al., 2015).

Practical definition: In this study, the practical definition corresponds to the theoretical definition.

Acceptance:

Theoretical definition: According to the definition given by Ausserer and Risser acceptance is "a phenomenon that reflects, to what extent potential users are willing to use a certain system" (Ausserer & Risser, 2005, p.3).

Practical definition: In this study, the practical definition corresponds to the theoretical definition.

Developing countries:

Theoretical definition: Developing countries are countries that have low economic indicators, and their technical infrastructure is not advanced, which has led to lower living standards (Hassibian, 2013).

Practical definition: In this study, the practical definition corresponds to the theoretical definition.

Skill:

Theoretical definition: The ability or expertise to do a better job through training and experience (Adams, 2015).

Practical definition: The meaning of skill in this research is the ability to work with the superior skills of ICDL.

Knowledge:

Theoretical definition: Understanding through experience, study or investigation (Adams, 2015).

Practical definition: In this study, knowledge entails familiarity with the general concepts of EHR and understanding its main goals and benefits.

Attitude:

Theoretical definition: According to the definition given by Sezgin and Yildirim attitude is "Individual's positive or negative feeling about performing the target behaviour. "(Sezgina & Yıldırım, 2014, p.1325).

Practical definition: In this study, attitude is defined as the views of health care professionals on the impact of EHR implementation on service quality, information quality, their own jobs and the resulting problems.

2 Theoretical Background

E-health is defined as the use of ICT to support health. E-health technology includes several applications such as "Hospital Information Systems (HIS), Electronic Medical Records (EMR) system, internet-based telemedicine, and m-health are essential tools of information technology" (Zayyad & Toycan, 2018, p.2). E-health acceptance by health care professionals has been low in some developed countries and also many developing countries. Due to common resource constraint (e.g. insufficient E-Health infrastructure), the e-health acceptance by health care professionals was not successful in developing countries. Thus, assessing the readiness level to accept e-health has become an essential requirement for the successful implementation and use of e-health (Li et al., 2010).

2.1 E-Health Care in Developing Countries

The last two decades have seen substantial growth in the field of e-health care technology worldwide (Zayyad & Toycan, 2018; Luna, Almerares, Mayan, Bernaldo & Otero, 2014). According to the definition given by the World Health Organization (WHO) e-health is "a cost-effective and secure use of Information and Communications Technologies (ICT) in support of health and health-related fields, including healthcare services, health surveillance, health literature, and health education, knowledge and research" (Zayyad & Toycan, 2018, p.2 ; Blaya, Fraser & Holt, 2010). The approaches of e-health care technology include Hospital Information Systems (HIS), EHR, internet-based telemedicine, and mobile-health (Zayyad & Toycan, 2018; Shekelle, Morton & Keeler, 2006).

All of these approaches have increased the quality of health services and reduced medical errors and health care expenses. In addition, e-health care technology provides updated information on electronic prescriptions and patient information and health problems for health service providers (Zayyad & Toycan, 2018). In fact, routine share of information between different departments can lead to an improved administrative system and better clinical decision support system (Zayyad & Toycan, 2018; Ludwick & Doucette, 2009; Meier, Fitzgerald & Smith, 2013).

Given the advantages of e-health care, developing countries are increasingly applying it to reduce many of their health care challenges (Alsharo, Alnsour & Alabdallah, 2020). For instance, among countries in sub-Saharan Africa, the application of ICT tools in conducting tasks such as patient identification, structured reporting, and financial management has led to significant improvements in efficiency and effectiveness of health services in hospitals (Zayyad & Toycan, 2018). In addition, the implementation of these e-health care services was associated with reduced waiting time (Zayyad & Toycan, 2018).

Although the benefits of e-health care technology for health care systems are evident, its implementation in developing countries faces many challenges (Alsharo, Alnsour & Alabdallah, 2020). A comparative analysis of five developing countries (Turkey, Saudi Arabia, Egypt, United Arab Emirates, and Iran) have explored a number of challenges that these countries face in using e-health technology and identified "ICT infrastructure, policy regulations, clinical adaptation of users, healthcare financing, and supply chain management" (Zayyad & Toycan, 2018, p.2) as the major challenges faced by health care professionals in

these countries (Zayyad & Toycan, 2018). Another study conducted in Africa reported that 39% of e-health care challenges are associated with socioeconomic restrictions, 22% with poor ICT infrastructure and 39% with a lack of skills and human resources (Figure 1) (YUSIF & SOAR, 2014). Another study conducted in Pakistan identified the limited access to the Internet, the lack of expertise and the lack of hard-ware and software in the local language as the main barriers of e-health care implementation (Qureshi, Shah, Najeebullah., Kundi, Nawaz, Miankhel, Chishti & Qureshi, 2013). Moreover, another study carried out in Kenya recognized the "lack of computer equipment, lack of computer skills, cost of computer equipment and internet connection" (Ouma & Herselman, 2008, p.307) as the major barriers in rural areas (Ouma & Herselman, 2008). Finally, study conducted in Iran expressed that the main barriers to creating e-health are the lack of a specific strategy, changing health managers quickly, inability to attract specialized IT technicians in e-health field, lack of financial management to provide health funding and a lack of technical standards and proper implementation method (Nasiripour, Rahmani, Radfar & Najafbeigi, 2012).

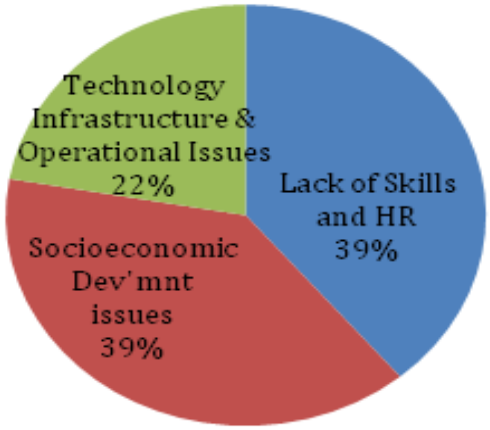

Figure 1 Challenge of E-Health in Africa (YUSIF& SOAR, 2014, p.1).

2.2 E-Health Records (in Developing Countries)

As mentioned earlier, there is a rising interest in developing countries to implement EHRs in their health care system. There are several reasons for this growing interest. First, every year all countries devote a large budget to their health systems and given that these countries are facing financial difficulties, they have found the EHRs as a suitable solution to reduce their costs. Second, EHRs can improve health care problems. For example, implementing an EHR can reduce medical error and thus improve patient safety, thereby increasing patient satisfaction. Given the tendency of developing countries to implement EHRs, they should keep in mind that implementing EHRs is very costly. In addition, the implementation of EHRs faces serious problems and obstacles (Hassibian, 2013; Li et al., 2010; Zayyad & Toycan, 2018; YUSIF & SOAR, 2014).

A comparative analysis of some developing countries (sub-Saharan Africa) has explored a number of these serious problems and obstacles that these countries face in implementing EHRs. In this review of 21 studies on the use of EHRs in 15 sub-Saharan African countries,

three major challenges in the use EHRs were found. The first challenge is that most EHRs are funded through international partnerships and therefore the host institutions are not confident enough about the sustainability of this system. Second challenge is related to poor infrastructure in developing countries, such as power outages and network breakdowns. Finally, the costs of setting up and maintaining EHRs systems are enormous (Akanbi, Ocheke, Agaba, Daniyam, Agaba, Okeke & Ukoli, 2012).

Another study conducted in Asia reviewed 32 papers from 15 countries documented the use of EHRs in Asia, identified five major challenges to implementing EHRs. Similar to findings for African countries, one of these challenges is poor infrastructure (e.g., reliable electricity). Another challenge is organizational culture and "the need for well-trained technological support in healthcare settings" (Dornan et al., 2019, p.5). A third challenge is resistance of physicians and health professionals in accepting the EHRs system. Another important challenge is ethical concerns, such as patient confidentiality, patient privacy, informed satisfaction, and data security. Finally, a lack of quality data, lack of hospital IS management, and low usage of health information were other major challenges in EHR implementation (Dornan et al., 2019).

According to a study conducted in Iran, the major challenges that exist in EHR implementation are "a lack of efficient planning, a lack of skilled manpower, and limitations in information technology training for healthcare professionals" (Dornan et al., 2019, p.5).

2.3 E-health Care Professionals readiness level

E-health care is commonly used to describe the application of information and communication technology in the health sector and to increase the efficiency of the health system. Furthermore, e-health care takes various forms and covers a wide range of objectives of the health care system from administrative objectives to the provision of health service. Although application of e-health care is growing and its effectiveness is obvious, its acceptance by health professionals still causes many challenges (Toure, Poissant & Swaine, 2012). Indeed, 70% of e-health care implementation projects have failed implying that the implementation of these projects must be planned carefully, and all influential factors must be identified (Toure, Poissant & Swaine, 2012). To reduce the rate of failure and risk, it will be useful to assess the organization's readiness for potential changes induced by implementing e-health care (Toure, Poissant & Swaine, 2012). Organizational readiness for change refers to "the extent to which organizational members are psychologically and behaviourally prepared to implement organizational change." (Toure, Poissant & Swaine, 2012, p.168 ; Weiner, Amick & Lee, 2008). Actually, organizational readiness is one of the most important prerequisites in accepting an innovation (Toure, Poissant & Swaine, 2012). Many studies have shown that the main reason for the failure of ICT implementation is human and organizational factors (Gagnon, Desmartis, Labrecque, Car, Pagliari, Pluye, Fremont, Gagnon, Tremblay & Legare, 2012) and promoting the understanding of the potential users has been suggested as a solution to successful implementation of e-health technologies (Liu Sheng , Jen-Hwa Hu , Wei , Higa & Au, 1998). Therefore, prior to introducing e-health technology in an organization, it is necessary to know the specifications and readiness of the users (Liu Sheng et al., 1998). A previous study conducted in Pakistan suggested that for a successful implementation of e-health care, physicians must be involved in the information system development process in order to incorporate their needs into the content of the information

system. In addition, this study also suggested that providing appropriate tools and training at regular intervals can help health professionals to accept e-health technologies (Qureshi et al., 2013).

In regard to EHR, a previous study conducted among health professionals in teaching hospitals in Tehran, Iran, found that factors related to project management and human factors were more important than organizational and technical factors in the success of EHR implementation (Safdari, Ghazisaeidi & Jebraeily, 2015). Another study conducted in Iran, reported a moderate level of readiness (2.9 out of 5) among nurses toward EHR implementation. Surprisingly, this study reported a small negative correlation between EHR knowledge and attitude toward EHR (Hassibian, 2013).

2.4 Readiness level frameworks

In this part, I will introduce the theories of this study's framework.

2.4.1 User's Informational-Based Readiness (UIBR)

In this study, I assess the readiness of health care professional to accept EHR.

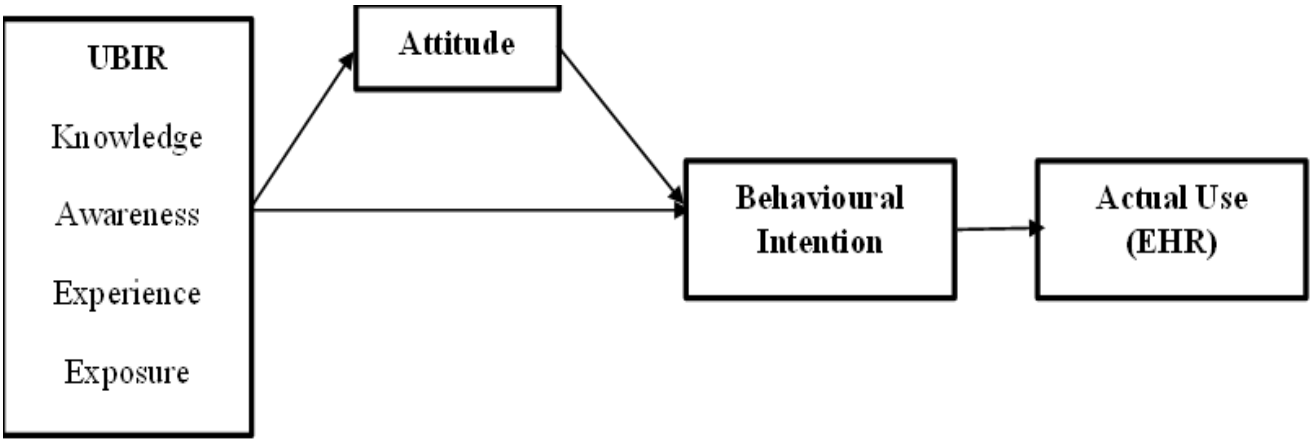

Figure 2 User's Informational-Based Readiness Framework (Zolait, Mattila & Sulaiman, 2009, p.84)

I am relying on the User's Informational-Based Readiness (UIBR) framework to explain health professionals' readiness to use EHR. Informational-based readiness refers to "peoples' tendency to adopt and use an innovation once it has been introduced to them" (Zolait, Mattila & Sulaiman, 2009, p.77). UIBR includes four main elements: previous exposure, awareness, knowledge and experience (Zolait, Mattila & Sulaiman, 2009). Knowledge includes "both knowing how and knowing about" something (Zolait, Mattila & Sulaiman, 2009, p.78). In fact, according to the theory of "Diffusion of Innovation" (Zolait, Mattila & Sulaiman, 2009, p.78), the knowledge of an innovation is crucial in its acceptance (Zolait, Mattila & Sulaiman, 2009). According to Rogers (1995 p.165), knowledge refers to the "information necessary to

use an innovation properly" (Rogers, 1995; Zolait, Mattila & Sulaiman, 2009, p.78). Awareness refers to the potential users' awareness of the existence of a technology (Rogers, 1995; Zolait, Mattila & Sulaiman, 2009). It begins when a user is exposed to a technology and starts to understand how it works (Zolait, Mattila & Sulaiman, 2009). In this study these two concepts are measured together using the questions in the knowledge subsection of the questionnaire.

Experiences that gained over years of educational learning systems help to understand at least some innovation attributes (Zolait, Mattila & Sulaiman, 2009). Sarel and Marmorstein pointed out that "prior experience with computers and technology seems to be a key correlate of early adoption." (Sarel & Marmorstein, 2003; Zolait, Mattila & Sulaiman, 2009, p.81). In addition, a study conducted in Finland found that "attitude and actual behaviour are both influenced by an individual's experience of computers and technology." (Karjaluoto, Mattila & Pento, 2002; Zolait, Mattila & Sulaiman, 2009, p.82).

Finally, exposure to an innovation can raise the probability of its acceptance. "Lim et al. (2002) postulated that low levels of exposure may lead to the absence of attitudinal effects, as the lack of knowledge and experience may prevent the formation of attitudes." (Lim, Gan & Chang, 2002; Zolait, Mattila & Sulaiman, 2009, p.82). However, this last element hasn't been evaluated in the questionnaire used for the study and hence we dropped it from our framework (Figure 3).

Within this framework, I argue that the user's experience in using EHR, prior knowledge of EHR, and computer skills are determinant factors in predicting behavioural intention towards EHR use and acceptance (Figure 2) (Zolait, Mattila & Sulaiman, 2009).

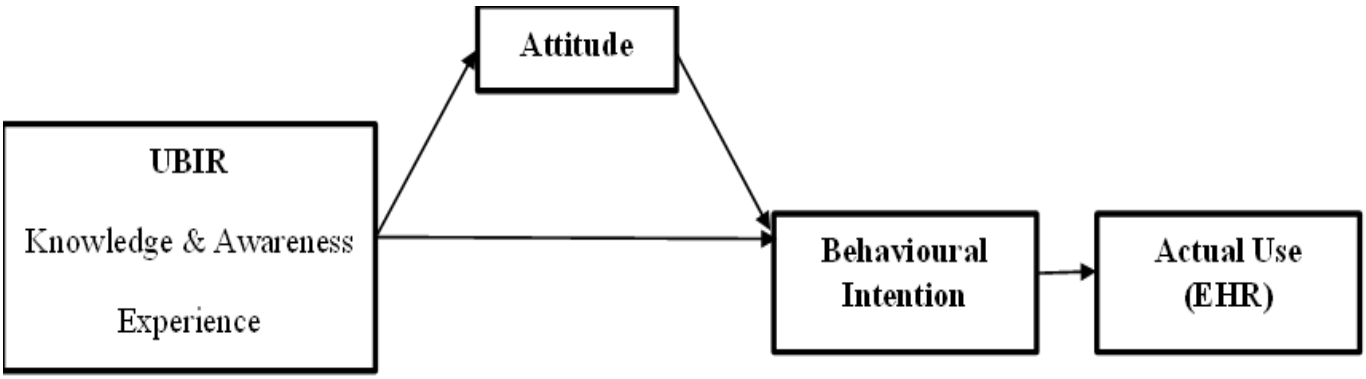

Figure 3 This Study Framework for health care professionals' readiness level

2.4.2 Experience

Many studies have shown that one of the main reasons for accepting e-health implementation is experience. A previous study conducted in Kenya suggested that the lack of computer skill and experience is a main barrier to implement ICT in the rural hospitals (Ouma & Herselman, 2008). Another study conducted in Nigeria reported a low level of e-health technology

acceptance in this country partially due to low experience of IT among staff (Zayyad & Toycan, 2018).

Another study conducted in US also found that the lack experience and skill in using technology among nurses were important barriers in accepting EHR (Adams, 2015). Different frameworks have shown that experience is an influential element in e-health user readiness to accept it. In these frameworks, e-health is an emerging information technology in the healthcare system. One of these frameworks is unified theory of acceptance and use of technology (UTAUT) (Ami-Narh & Williams, 2012). UTAUT presents "an integrated view of user acceptance and usage of new technology." (Ami-Narh & Williams, 2012, p.1386) UTAUT includes theory of reasoned action (TRA), theory of planned behaviour (TPB), innovation diffusion theory (IDT), technology acceptance model (TAM), motivational model, model of PC utilization (MPCU) and social cognitive theory (SCT). UTAUT integrates "four core determinants of intention and usage with up to four moderators of key relationships" (Figure 4) (Ami-Narh & Williams, 2012, p.1386). The four key constructs influencing the intention to use are: performance expectancy, effort expectancy, social influence, and facilitating conditions. "The key moderators in the model are gender, age, voluntariness and experience" (Ami-Narh & Williams, 2012, p.1386). Therefore, according to UTAUT, experience is on factor which should be measured in evaluating user behaviour to accept EHR (Ami-Narh & Williams, 2012).

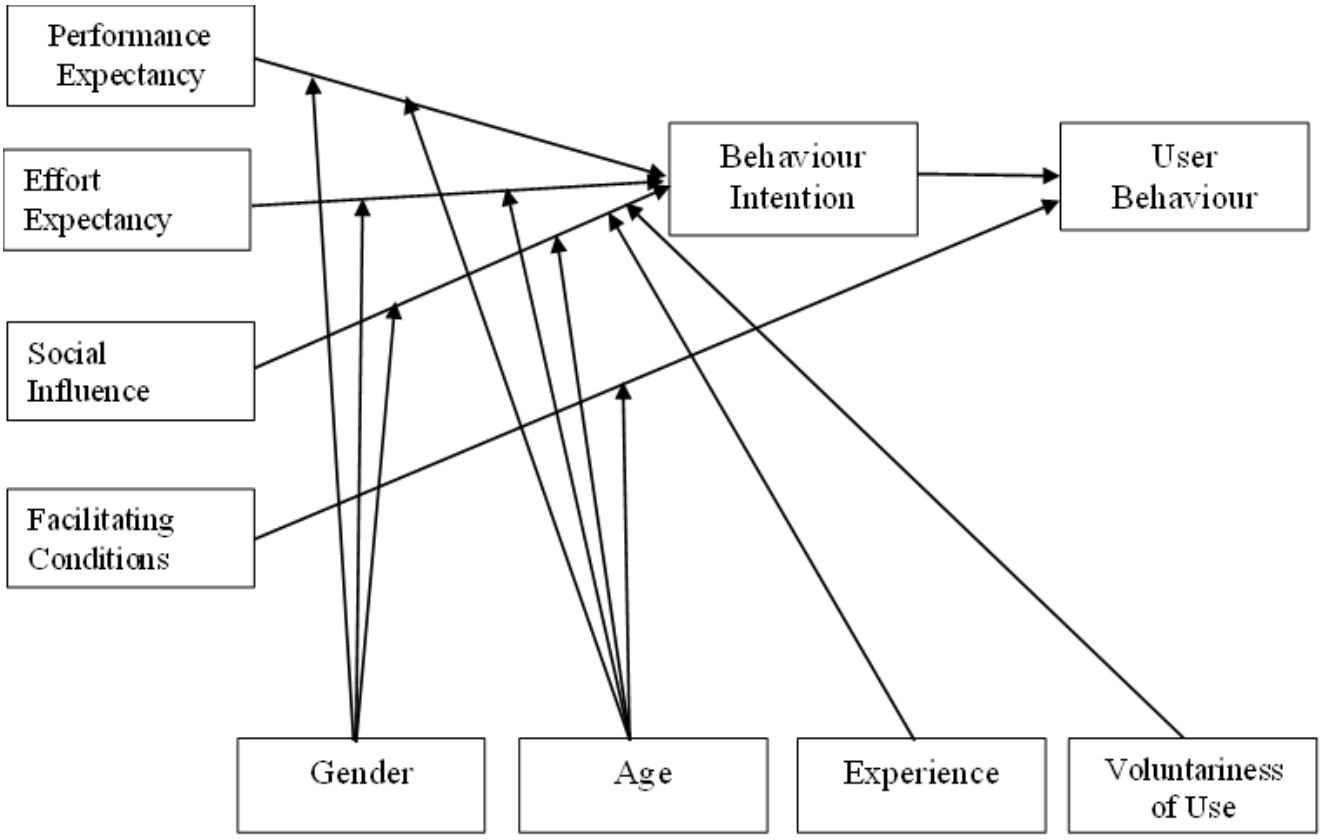

Figure 4 The "unified theory of acceptance and use of technology" framework (Ami-Narh & Wiliams, 2012, p.1387)

Another framework that emphasizes experience concerned with e-health is E-Health Readiness Assessment Framework (EHRAF) developed by Li et al. EHRAF includes four main elements: core readiness, engagement readiness, technological readiness, and societal readiness. In this framework, experience is concerned with healthcare providers' and organisational readiness (Figure 5) (Li et al., 2010).

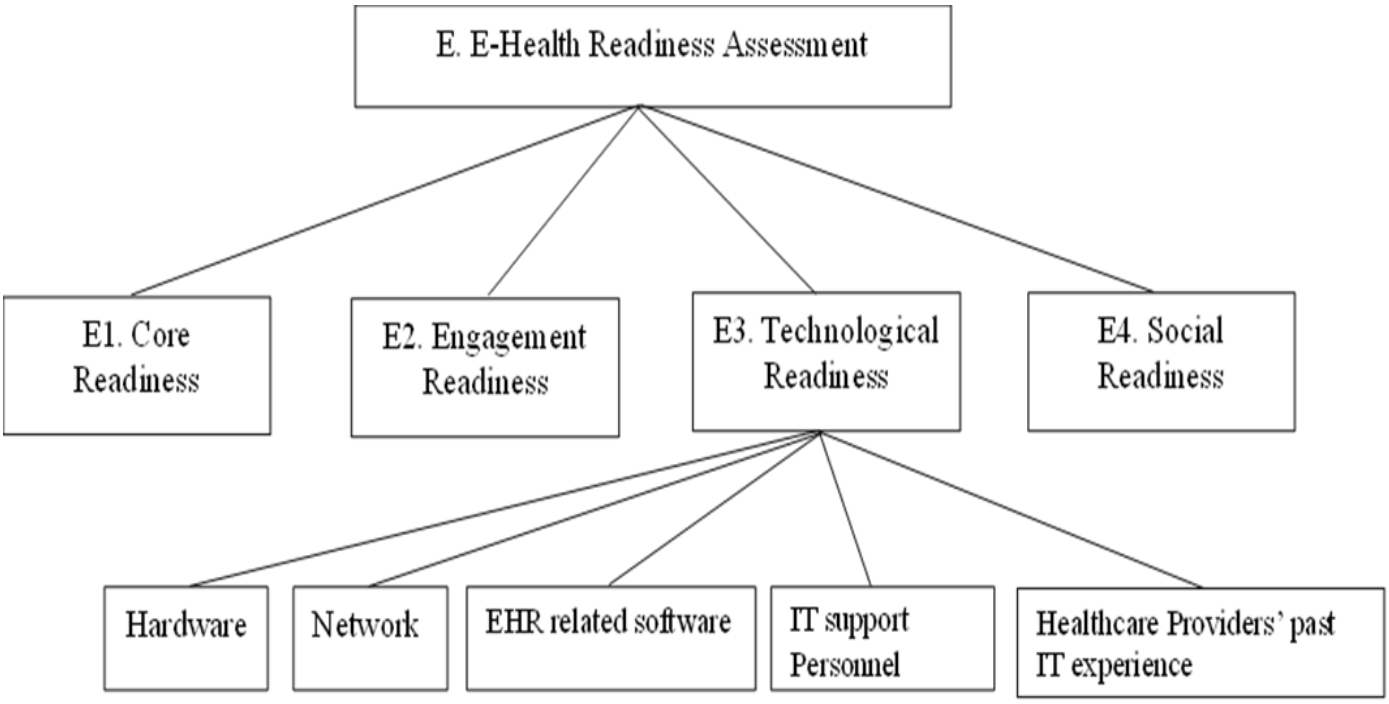

Figure 5 The "E-Health Readiness Assessment Framework" (Li et al., 2010)

The technological readiness included in this framework covers hardware required for EHR applications, network, EHR-related software, IT-support personnel, and healthcare providers' past IT experience. The healthcare providers' past IT experience is an aspect covered in this study and it includes elements such as frequency of using PC, frequency of using e-media, using computer for e-health, and training or direct experience in using EHR (Li et al., 2010).

2.4.3 Knowledge & Awareness

As mentioned above, knowledge and awareness are important determinant of technology acceptance. Another framework that emphasizes their importance is the STOPE framework measuring readiness level using 5 domains: Strategy, Technology, Organization, People, and Environment. In this framework, awareness is a sub-domain of the People domain and knowledge is a sub-domain of the Environment domain (Figure 6) (Retnani, A.P & Prasetyo, 2019).

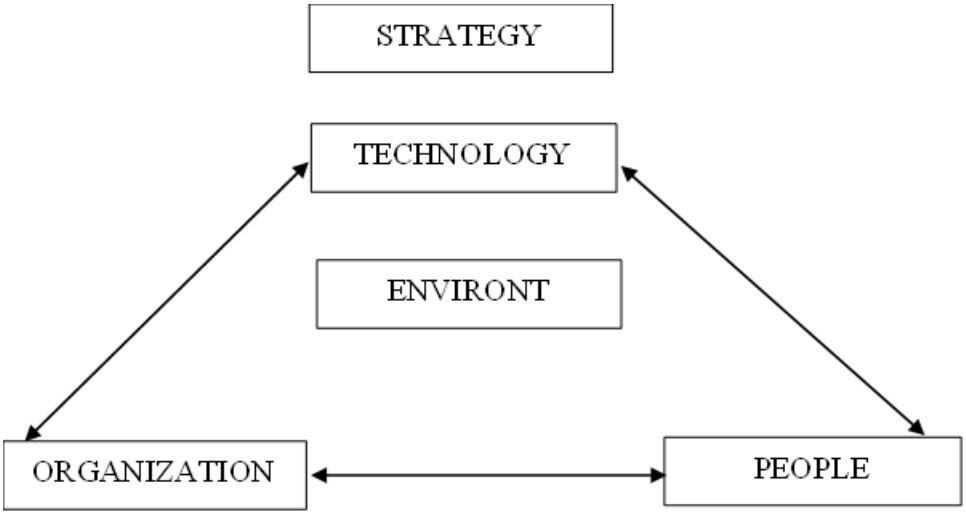

Figure 6 STOPE Framework (Retnani, A.P & Prasetyo, 2019, p.271).

A study conducted in the US assessing the acceptance of EHR by nurses reported that improving the skill, knowledge and attitude toward EHR can affect its' successful acceptance (Adams, 2015). Moreover, many studies conducted in developing countries reported knowledge as a main determinant of accepting e-health implementation. A study conducted in Bangladesh found that the knowledge level of health care professionals can influence successful implementation of the e-health system (Parvin & Shahjahan, 2016). In another study implemented in Nigeria, knowledge was an influencing factor of e-health acceptance (Zayyad & Toycan, 2018). Gregory and Tembo studied the factors influencing the success and failure of e-health implementation in Zambia and found that successful e-health implementation depends on health professionals' knowledge (Gregory & Temb, 2017).

2.4.4 Attitude

Attitude is another influential factor in the acceptance of a technology. This fact has been emphasized in a framework known as "technology acceptance model (TAM)" (Ami-Narh & Williams, 2012). TAM framework posits that" an individual's attitude toward the use of a technology is determined by two factors: perception of usefulness and ease of use of that technology. Attitude influences users' intention to use the technology" (Figure 7) (Ami-Narh & Williams, 2012, p.1386). In addition, according to Yarbrough and Smith, TAM can be used

to understand the factors affecting acceptance and use of new technology by healthcare professionals (Yarbrough & Smith, 2007).

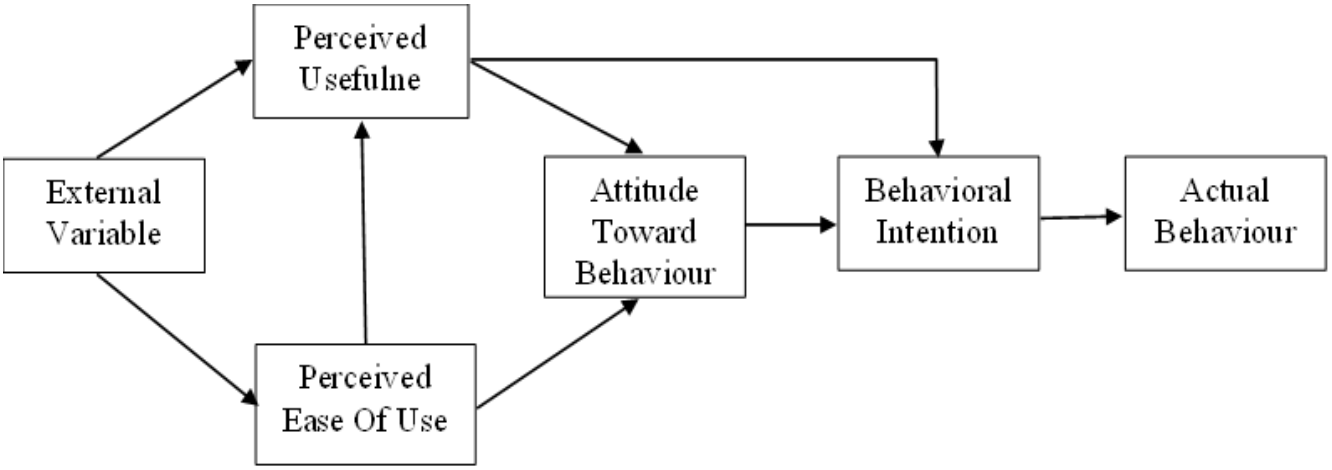

Figure 7 Technology acceptance model (TAM) framework (Ami-Narh, Williams, 2012, p.1386)

Moreover, Hossain et al. proposed a framework to explain the factors affecting individuals' acceptance of new technologies and *attitude toward the system* (ATS) is a main component of this framework. Indeed, their study showed that among the users in rural areas, a positive attitude towards e-health care is associated with 4.5 times higher probability of e-health acceptance compared with a negative attitude towards e-health. Therefore, these authors advised e-health service providers to focus more on" generating social reference or positive word-of-mouth" in order to increase the probability of a successful implementation of e-health projects in rural areas of developing countries (Hossain, Yokota, Sultana & Ahmed, 2019).

Another study in UK also found that health professionals' attitudes influence the use of technology and concluded that Currie et al. described "if patients and health professionals are not receptive to an e-health initiative, there is a risk of less or un-successful deployment of that initiative." (Currie, Philip & Roberts, 2015, p.3).
Another study conducted in northern Uganda highlighted the important role of healthcare professionals in healthcare practices and the barriers in their e-health acceptance. This study found that positive attitude of healthcare professionals toward e-health can significantly influence not only the acceptance of e-health, but also its effective use (Olok, Yagos & Ovuga, 2015). Another study conducted in Bangladesh found that health professionals' positive attitude toward e-health can lead to suitable implementation, use, and sustainability of e-health services (Parvin & Shahjahan, 2016).

Table 7 Description of previous studies on the components of EHR readiness level.

Concepts	Description	References
experience	The impact of experience on the acceptance of one innovation	Zolait, Mattila & Sulaiman, 2009; Sarel & Marmorstein, 2003; Karjaluoto, Mattila & Pento, 2002; Ouma & Herselman, 2008; Adams, 2015; Ami-Narh & Williams, 2012; Zayyad & Toycan, 2018; Li et al., 2010.
Knowledge and Awareness	The impact of knowledge on the acceptance of one innovation	Zolait, Mattila & Sulaiman, 2009; Retnani, A.P & Prasetyo, 2019; Adams, 2015; Parvin & Shahjahan, 2016; Zayyad & Toycan, 2018; Gregory & Temb, 2017.
Attitude	The impact of attitude on the acceptance of one innovation	Zolait, Mattila & Sulaiman, 2009; Ami-Narh & Williams, 2012; Yarbrough & Smith, 2007; Hossain, Yokota, Sultana & Ahmed, 2019; Currie, Philip & Roberts, 2015; Olok, Yagos & Ovuga, 2015 Parvin & Shahjahan, 2016.

3 Methods

3.1 Research Strategy

In order to reach an answer to our research question, a quantitative method was applied in this study since we aim to study the large number of research population.

Hamedan is a city in the west of Iran with a population of 783,300 in 2019. It has twenty-seven hospitals of which 5 teaching hospitals affiliated to Hamedan University of Medical Sciences were included in this study (Shahid Beheshti, Besat, Ekbatan, Fatemie, Farshchian). The number of beds and health care professionals of these hospitals is as follows: Shahid Beheshti have 247 beds and 794 health care professionals, Besat have 581 beds and 1170 health care professionals, Ekbatan have 123 beds and 419 health care professionals, Fatemie have 126 beds and 460 health care professionals, and Farshchian have 324 beds and 987 health care professionals.

"Quantitative methods describe a set of techniques to answer research questions with an emphasis on quantitative data" (Recker, 2013, p.66). The quantitative research provides knowledge through the collection of numerical data and the observation of samples and then the presentation of this data to numerical analysis (Recker, 2013). Quantitative research is rooted in the assumption that the effects of the social environment are constructed by individuals as interpretations (Recker, 2013).

This study is a cross-sectional survey-based research conducted in 5 teaching hospitals affiliated to Hamedan University of Medical Sciences, Western Iran. The study's population consisted of all physicians, nurses, medical records staff, laboratory technicians, and radiologists working in teaching hospitals. When the study population is very large and it is not possible to prepare a list of all members of the community, it is difficult to select a sample from a practical point of view, the cluster sampling method is used (Nongkynrih, 2012; Woodard, 2001). Cluster sampling is based on the division of the research community into distinct units and includes randomly selecting multiple clusters and choosing certain subjects randomly within each cluster to form the final sample (Nongkynrih, 2012; Woodard, 2001). We used multi-stage cluster sampling method in this study. At the first stage, we randomly selected 5 teaching hospitals among hospitals affiliated to Hamedan University of Medical Sciences (Shahid Beheshti, Besat, Ekbatan, Fatemie, Farshchian). These formed our clusters and in second stage a random number of respondents from different categories of health professionals (physician, nursing, medical records, laboratory sciences, radiology) within hospitals were selected.

EHR has not been implemented in these five hospitals, but its implementation project is under review, and this study is part of this project. The results of this study can help executives' managers to have better insights about the readiness level of health care professionals to accept EHR before its implementation. In addition, this study also examines the factors affecting health care professionals' readiness which can help managers in planning to reduce health care professionals' resistance to change and accept the EHR.

3.2 Data Collection

The data on participants' readiness including their knowledge and attitude toward EHRs implementation was collected through a reliable and valid questionnaire (Habibi-Koolaee, Safdari & Bouraghi, 2015). We distributed 180 questionnaires among our target groups and 137 ones were answered. At the beginning of the questionnaire, the importance of the study and its objectives are mentioned. The questionnaire has 5 subsections. The first subsection includes sociodemographic characteristics of the respondents including sex, age, level of education, occupation, work experience and medical training center. The second subsection assess the respondent's computer skills including frequency of using computer at home and work, time spent on internet, and the level of International Computer Driving License (ICDL) skills. Through the Likert criterion the answers were considered as 5 choice types (very limited = 1, limited = 2, moderate = 3, high = 4 and very high = 5). The third subsection of the questionnaire evaluates the respondents' knowledge about the goals, benefits and general concepts of EHR. The fourth subsection of the questionnaire examine the respondent's attitude toward EHR implementation contains questions on the impact of EHR on quality of health care services and quality of health information as well as complications created by EHR. The responses to this subsection are in forms of strongly agree, agree, no opinion, disagree and strongly disagree. In the final subsection, the respondent's opinion on factors influencing the awareness of clinical staff are identified with five-choice (very high, high, medium, low, very low) options.

3.3 Data Analysis

The steps of data analysis are as follows:

Step 1:

The mean computer skill was calculated as the average scores on the responses to the related questions which had a score between 1 and 5.

Step 2:

Each question in knowledge subsection has a score of 0 (wrong answer) and 1 (correct answer) which was added to obtain a total score between 0 and 14 for the knowledge score. This score was transformed to a score between 0 and 5 using the following formula:

$$\text{Mean knowledge score} = (5 * \text{total knowledge score})/14$$

Step 3:

The mean attitude score was calculated as the average of responses to the questions in this subsection (each question has a score of 1 to 5). We coded the responses in a way that a higher score reflects a more positive attitude toward EHR.

Step 4:

Respondents' readiness is computed as the mean of computer skills, knowledge and attitude scores.

Step 5:

I will present descriptive data as mean ± standard deviation and proportions.

Step 6:

I will use t-test to compare the mean scores between two independent groups (e.g. men and women) and one-way analysis of variance (ANOVA) for several independent groups (e.g. health care professionals).

Step 7:

Spearman correlation coefficient is used to determine the correlation between different subsections. Significance level in all tests will be 0.05. Statistical analyses were conducted in SPSS statistical software.

3.4 Validity and Reliability

Nowadays, many health care studies are performed through tools such as questionnaires, checklists and interviews to quantify people's behaviour (Kimberlin & Winterstein, 2008). To get reliable and accurate information from these sources, it is crucial to assess their validity and reliability (Kimberlin & Winterstein, 2008; Recker, 2013). Adequate knowledge and understanding of the validity and reliability are essential in designing of studies and the application of various measurements (Kimberlin & Winterstein, 2008; Recker, 2013).

The reliability of a questionnaire reflects its measurement accuracy (Recker, 2013). This means that if the study is repeated under the same conditions, the score or value of the questionnaire will not change. It should be noted that in reliability, accuracy (or correct amount) is not measured for the questionnaire, but it depends on the narrative part of the questionnaire (Recker, 2013; Kimberlin & Winterstein, 2008; Heale & Twycross, 2015). Most of reliability 's problems stem from a reliance on subjective observations and data collections. Imprecise or ambiguous questions are other sources of threats for reliability (Recker, 2013). Since even the most accurate questionnaires are not necessarily reliable, the reliability of the questionnaire should be assessed (Recker, 2013; Kimberlin & Winterstein, 2008; Heale & Twycross, 2015). Reliability has different aspects including stability, internal consistency and interrater reliability (Kimberlin & Winterstein, 2008; Heale & Twycross, 2015).
Stability of measurement, or test–retest reliability is assessed by providing a questionnaire to the same group of respondents at several different times. Then, the responses at two or more time periods are compared and the differences are measured (Kimberlin & Winterstein, 2008; Heale & Twycross, 2015). A strong correlation between the responses or the scores obtained from the questionnaire across time indicates that the questionnaire has good reliability with high accuracy and low variance or dispersion (Kimberlin & Winterstein, 2008; Heale & Twycross, 2015). A drawback of this test-retest approach is that, depends on their memory ability, people might think that they should answer questions in the same way as they answered earlier to make researcher (s) happy. A way to reduce the effects of memory is to increase the time between the first test and retest(s) (Kimberlin & Winterstein, 2008; Heale & Twycross, 2015).

Interrater reliability is a measure of reliability which is assessed by one instrument (questionnaire) on a single set of subjects and by two or more observers, is tested to check the degree of agreement of the observers on the instrument (Kimberlin & Winterstein, 2008; Heale & Twycross, 2015). (1) Interrater reliability is used to assess the agreement of two or more observers in measuring a quantitative variable. (2) Cronbach's alpha is a measure of internal consistency and is "a function of the average intercorrelations of items and the number of items in the scale" (Kimberlin & Winterstein, 2008, p.2277).

For this study, the reliability of the questionnaire was evaluated using the test- retest method and Cronbach's alpha. In the test–retest reliability method, a total of 10 health care professionals in a teaching hospital filled the questionnaire at a baseline date and ten days later. Based on the results, the vague and suspicious items of the questionnaire were removed. Furthermore, the internal consistency of the questionnaire was assessed in a previous study by obtaining a Cronbach α of 0.82 (Habibi-Koolaee, Safdari & Bouraghi, 2015).

Validity means the extent to which the method or tool used in research can accurately measure the desired property (Kimberlin & Winterstein, 2008; Heale & Twycross, 2015). Validity refer to whether the instrument selected for the measurement has the characteristics of the instrument for which it was designed. Validity has different aspects including construct validity, content validity, criterion-related (Kimberlin & Winterstein, 2008; Heale & Twycross, 2015).
The content validity of the questionnaire used in this study was determined using a review of the scientific literature and also collecting experts' opinion (Habibi-Koolaee, Safdari & Bouraghi, 2015).

3.5 Ethics

Ethical principles are important elements of research, and they must be considered already at the start of the research process, to avoid possibility of data manipulation (Recker, 2013; Bhattacherjee, 2012). Walsham emphasizes that three ethical issues must be considered in research: confidentiality and anonymity; working with the organization; and reporting in the literature (Walsham, 2006). Bhattacherjee (2012) defines ethics according to how well people adjust to specific standards within a field (Bhattacherjee, 2012).

We conducted our research within the university's framework, therefore our research process was such that we first got acquainted with the instructions provided by the university and we considered these instructions in our research process. Furthermore, we followed several generally accepted ethical principles which were regarded to be important to practice, namely: voluntary participation and harmlessness, anonymity and confidentiality, disclosure, as well as analysis and reporting (Bhattacherjee, 2012). We committed ourselves to adhere with these principles. At first, we informed the participants that participation in this survey were not mandatory and that they were free to answer the questionnaire. Participants were also assured that if they wish to drop out of the study, there were no consequences or harm to their work in any way.

Since we do not examine participants' subjective responses, the disclosure of the study will most likely not affect the data (Recker, 2013; Bhattacherjee, 2012). Hence, we ensured to inform the subjects prior to the data collection about our study aim(s), its importance and how

it was carried out, to give them the opportunity to make a conscious choice of whether they were willing to participate in the study or not.

Since the data were collected through questionnaire, it was possible to provide the subjects with anonymity while participating in the study (Bhattacherjee, 2012). Therefore, we guaranteed confidentiality by informing the subjects that their own and their organization identities were not disclosed in the paper or any forum. It should be noted that confidentiality is of high importance to our study because we believe that the lack of confidentiality can negatively influence our study's reliability since it will influence how the subjects will collaborate and answer the questions.

To comply with the "analysis and reporting" principle, we made sure to document the approaches used for data analysis and report all findings in the paper (Bhattacherjee, 2012; Walsham, 2006).

4 Findings

4.1 Respondents' characteristics

To get an oversight over the quality and distribution of respondents and therefor the generalizability, the descriptive statistics was used. Out of 180 distributed questionnaires, 137 ones (76.1%) were returned. The distribution of respondents from the five teaching hospitals are shown in Figure 8.

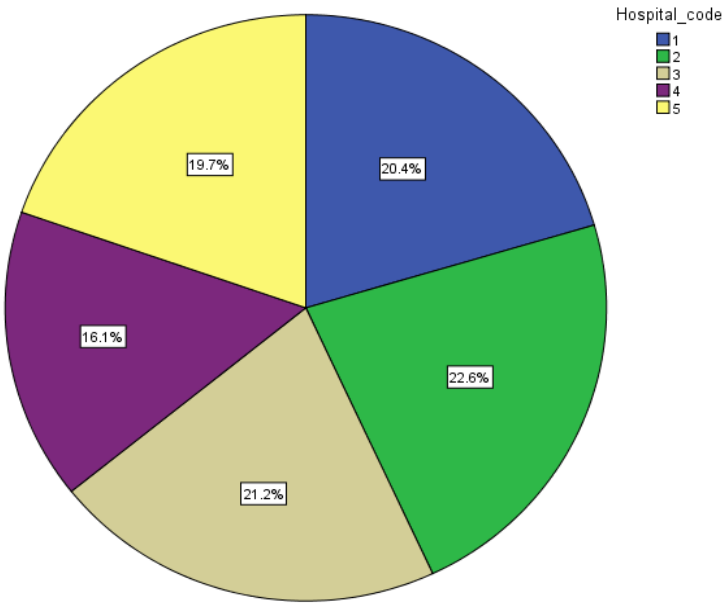

Figure 8 Distribution of the sample taken from different hospitals

The majority (76.6%) of the respondents were female (Figure 9) and the respondents mean age was 35.61 ranging from 21 to 61 years (Figure 10).

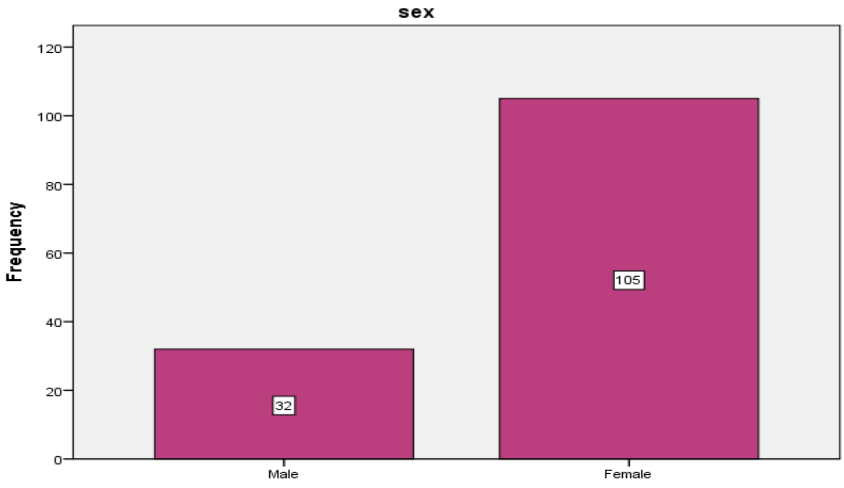

Figure 9 Sex distribution

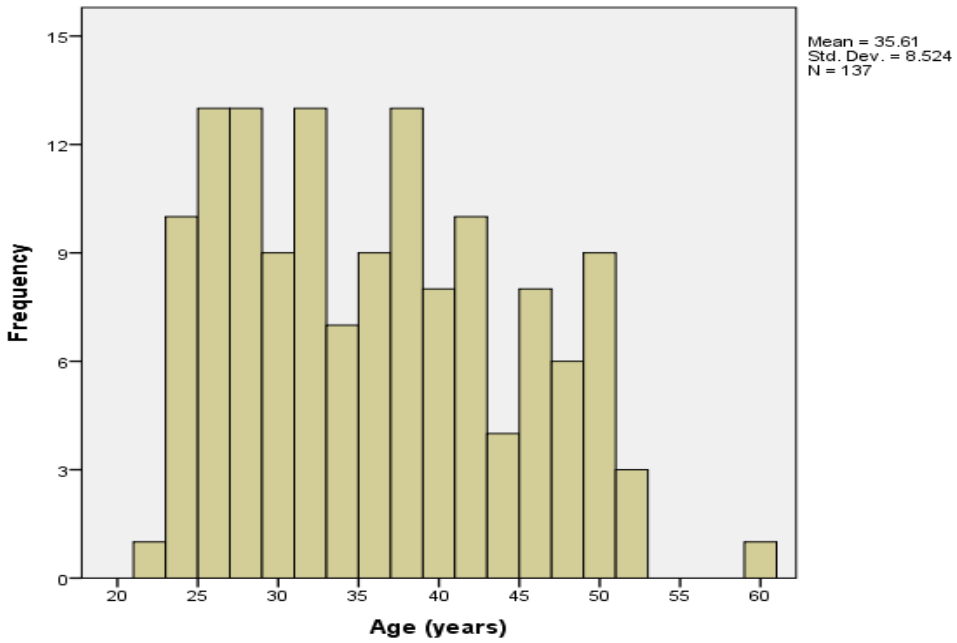

Figure 10 Age distribution

In terms of the highest educational attainment, most respondents (74.5%) had a bachelor degree with only 1.5% having a PHD degree and 1.5% having a high school diploma. Among the remaining, 11.7% had a master degree and 10.9% had a vocational degree (Figure 11).

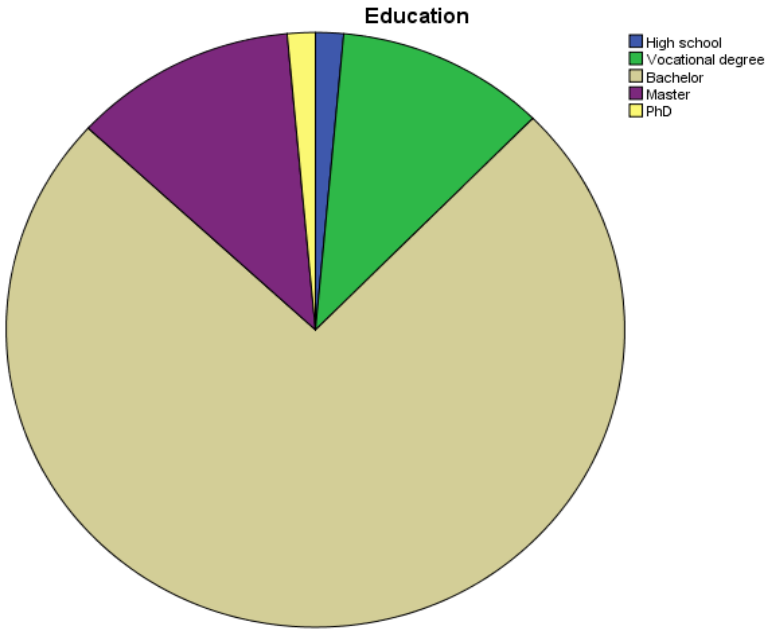

Figure 11 Education distribution

The mean years of work experience was 11.1 years with around 37.6% having ≤5 years of work experience (Figure 12).

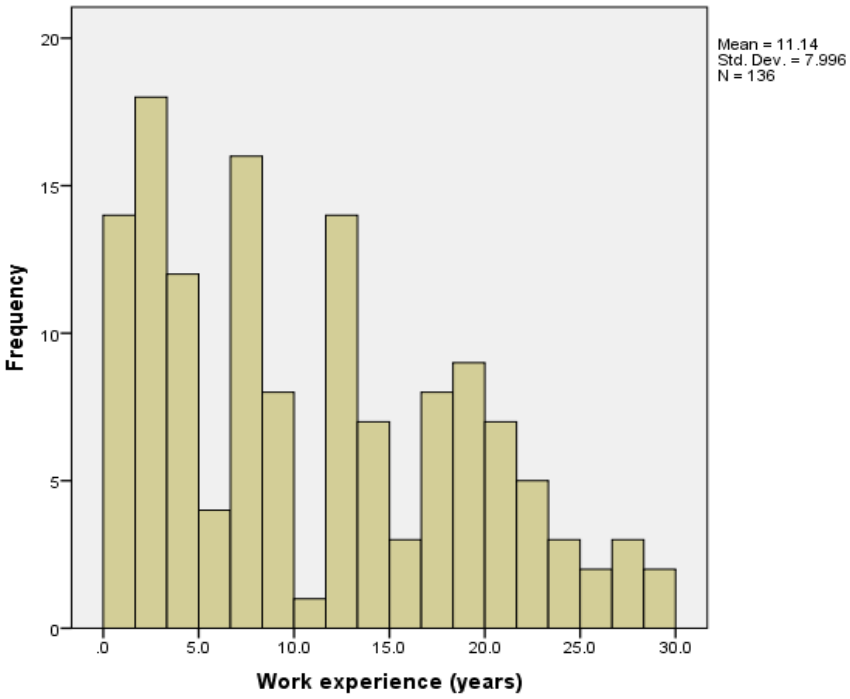

Figure 12 Work experience in years

Regarding the respondents' profession, majority (62.0 %) were nurses followed by medical record officers (11.7%) (Figure 13).

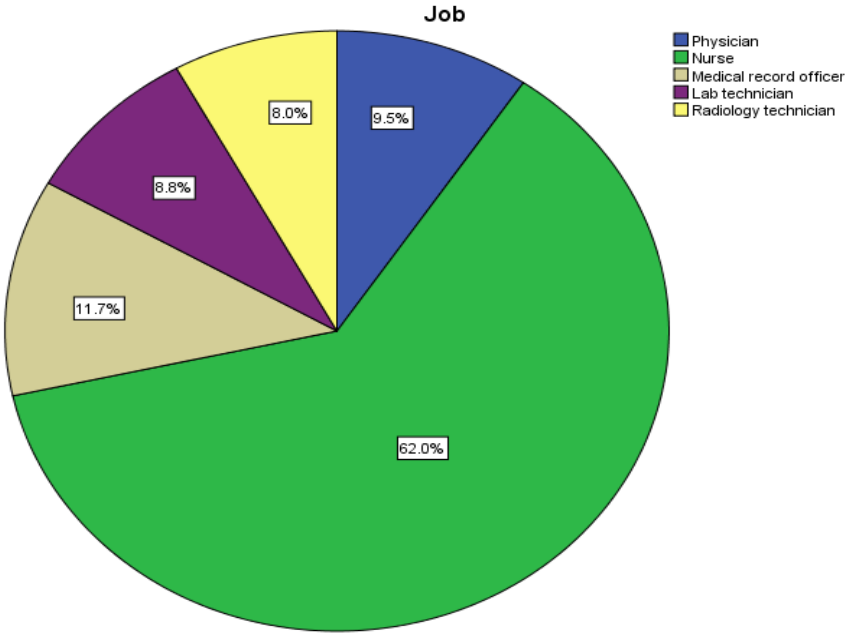

Figure 13 Profession distribution

The majority of the respondents have access to a computer either at home or/and at work (Figure 14).

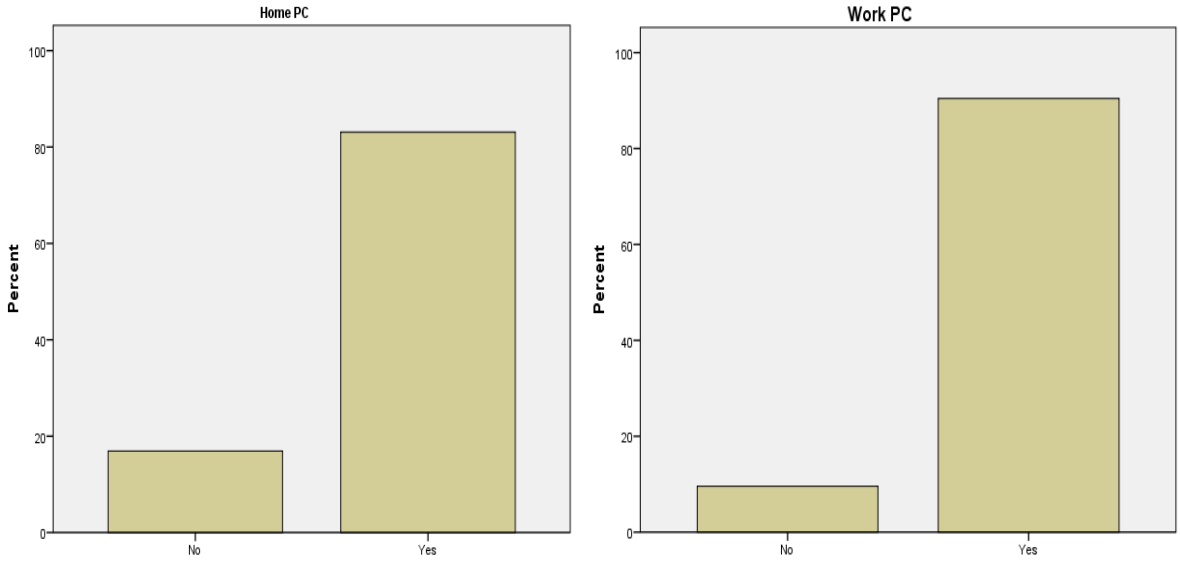

Figure 14 Distribution of access to computer at home and workplace

4.2 The readiness levels

The top four ICDL components with at least moderate level of skills were the Microsoft Office Word (73.5%), basic computer concepts (70.5%), Windows (64.7%), and using email/internet (55.1%) (Figure 15).

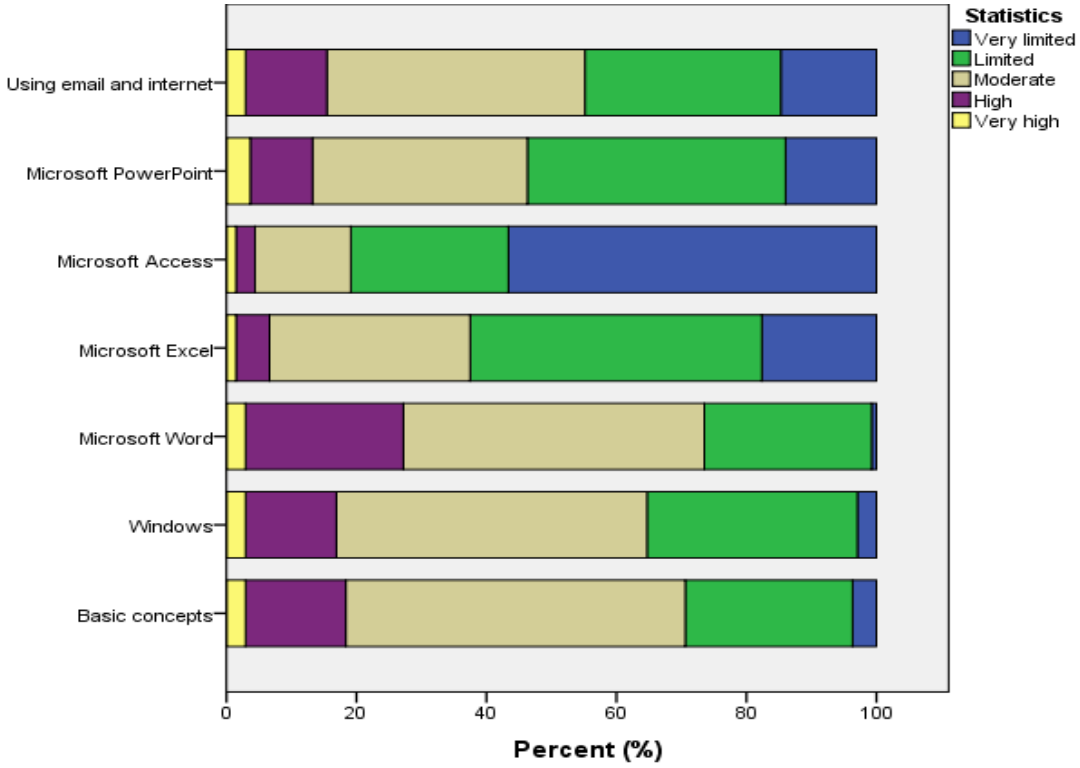

Figure 15 Distribution of the responses to the seven ICDL skills

The mean (standard deviation) ICDL score was 2.54 (0.64) showing a moderate level of computer skills in the sample (Figure 16). Around 27% had an ICDL score≤2 while only 4% had a score of 4 or higher.

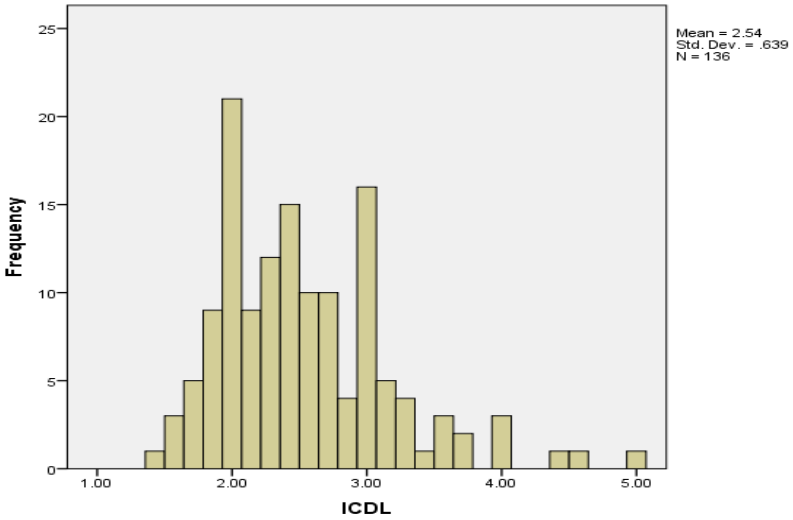

Figure 16 Distribution of ICDL score

Figure 17 display the distribution of responses to the knowledge questions.

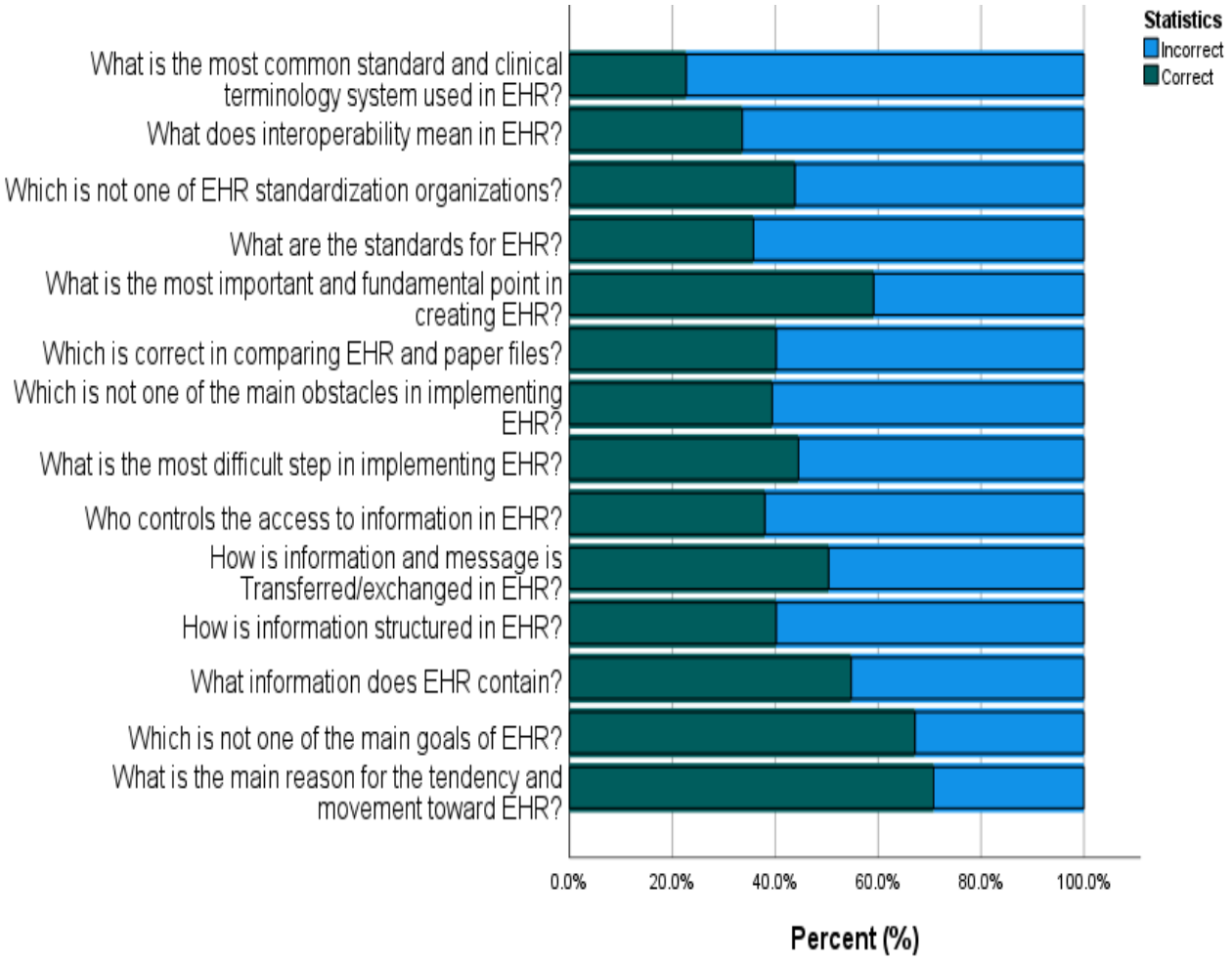

Figure 17 Distribution of responses to knowledge questions

The top five knowledge questions with the highest proportions of correct answers were: "What is the main reason for the tendency and movement toward EHR?" (70.8%), "Which is not one of the main goals of EHR?" (67.1%), "What is the most important and fundamental point in creating EHR? (59.1%)", "What is not one of the main goals of EHR?" (54.8%), and "How is information and message is transferred/exchanged in EHR?" (50.4%). On the other hand, the top five knowledge questions with least correct answers were: "What is the most common standard and clinical terminology system used in EHR?" (22.6%), "What does interoperability mean in EHR?" (33.6%), and "What are the standards for EHR?" (35.8%), "Who controls the access to information in EHR?" (38.0%), and "Which is not one of the main obstacles in implementing EHR" (39.4%) (Figure 17).

As shown in Figure 18, the top five positive attitude toward EHR was related to:

- "The security and confidentiality of information in EHR is more than paper files." (55.5% strongly agree/agree).
- ""EHR threats the confidentiality and security of information." (53.3% strongly disagree/disagree).
- "EHR improves performing tasks." (46.0% strongly agree/agree).
- "EHR speeds up service delivery." (45.3% strongly agree/agree).
- "EHR promotes the quality of care." (45.3% strongly agree/agree).

On the other hand, the top five negative attitude toward EHR was related to:

- "EHR creates new responsibilities and raises expectations." (65.0% strongly agree/agree).
- "EHR imposes a lot of work discipline and leads to strict control." (62.8% strongly agree/agree).
- "The flexibility and ability to modify information in EHR is lower than paper files." (61.3% strongly agree/agree).
- "EHR reveals the weaknesses and incompetency of employees in acquiring new skills." (59.1% strongly agree/agree).
- "EHR incurs high costs on the organization." (58.4% strongly agree/agree).

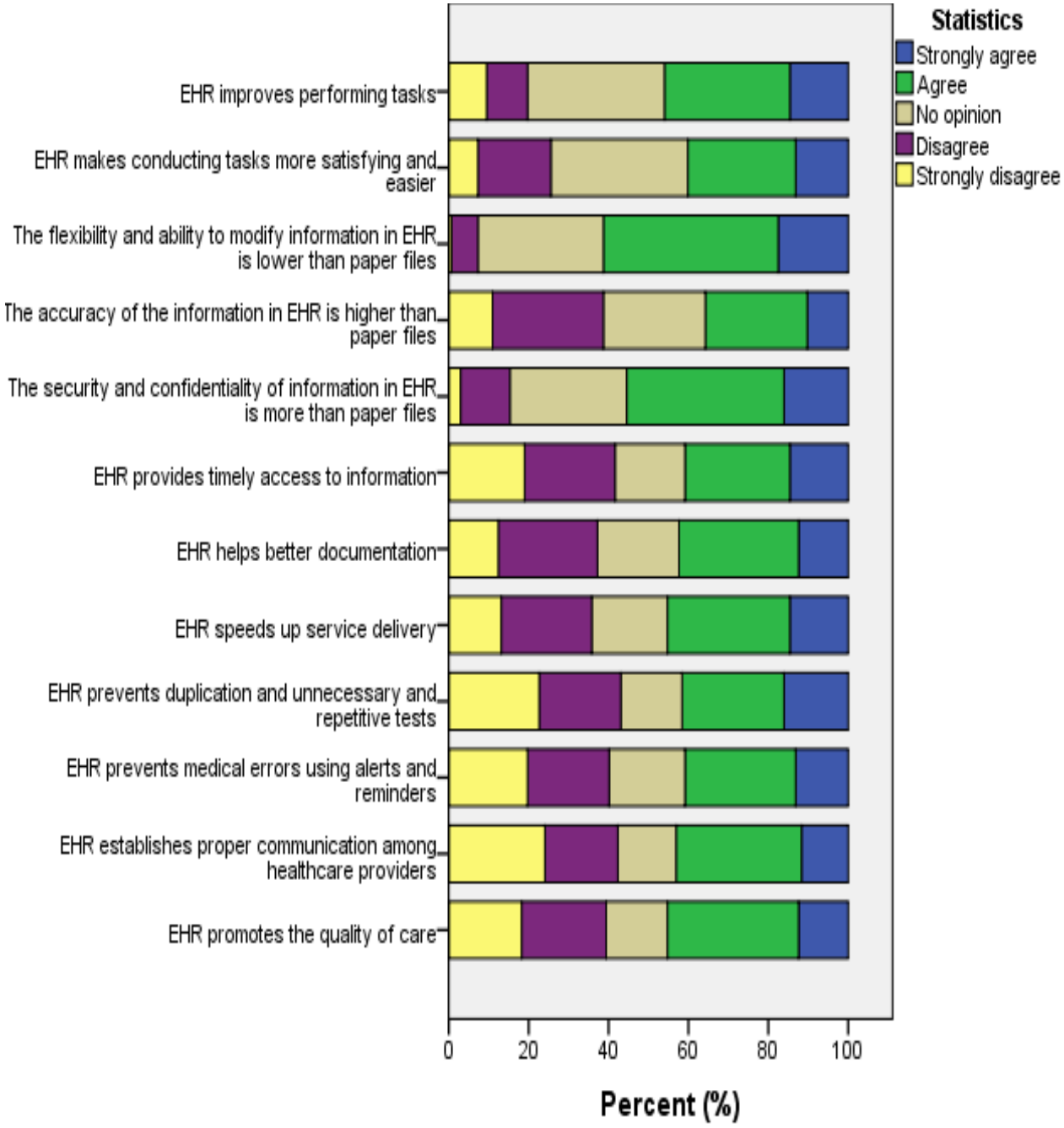

Figure 18 Distribution of responses to attitude questions

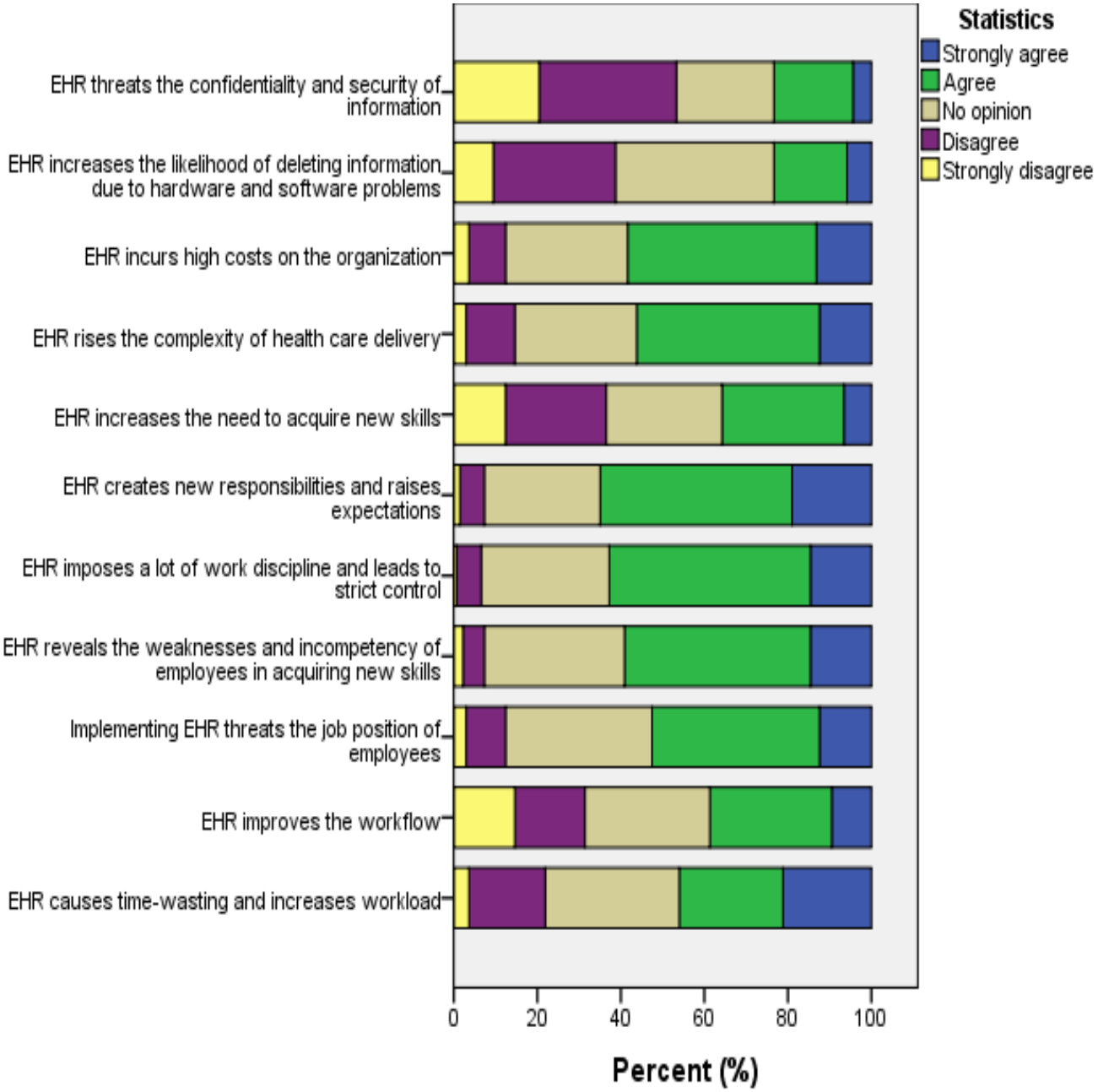

Figure 18 Con. Distribution of responses to attitude questions

As it can be seen in Figure 19, among "other factors improving the readiness level of healthcare professionals to accept EHR to a high/very high extent.", the respondent reported the following as the most important factors: "Training the knowledge and skills necessary to work with EHR." (30.4%), "Ensure the security and confidentiality of information in EHR." (28.6%), and "High speed and ease of using EHR." (27.7%). On the other hand, majority (54.8%) of respondents believed that "Motivate through encouragement and rewards." had low/very low influence on rising their readiness level in accepting EHR. More importantly, for all these other factors, majority of respondents believed that they had low/very low influence of rising the readiness level.

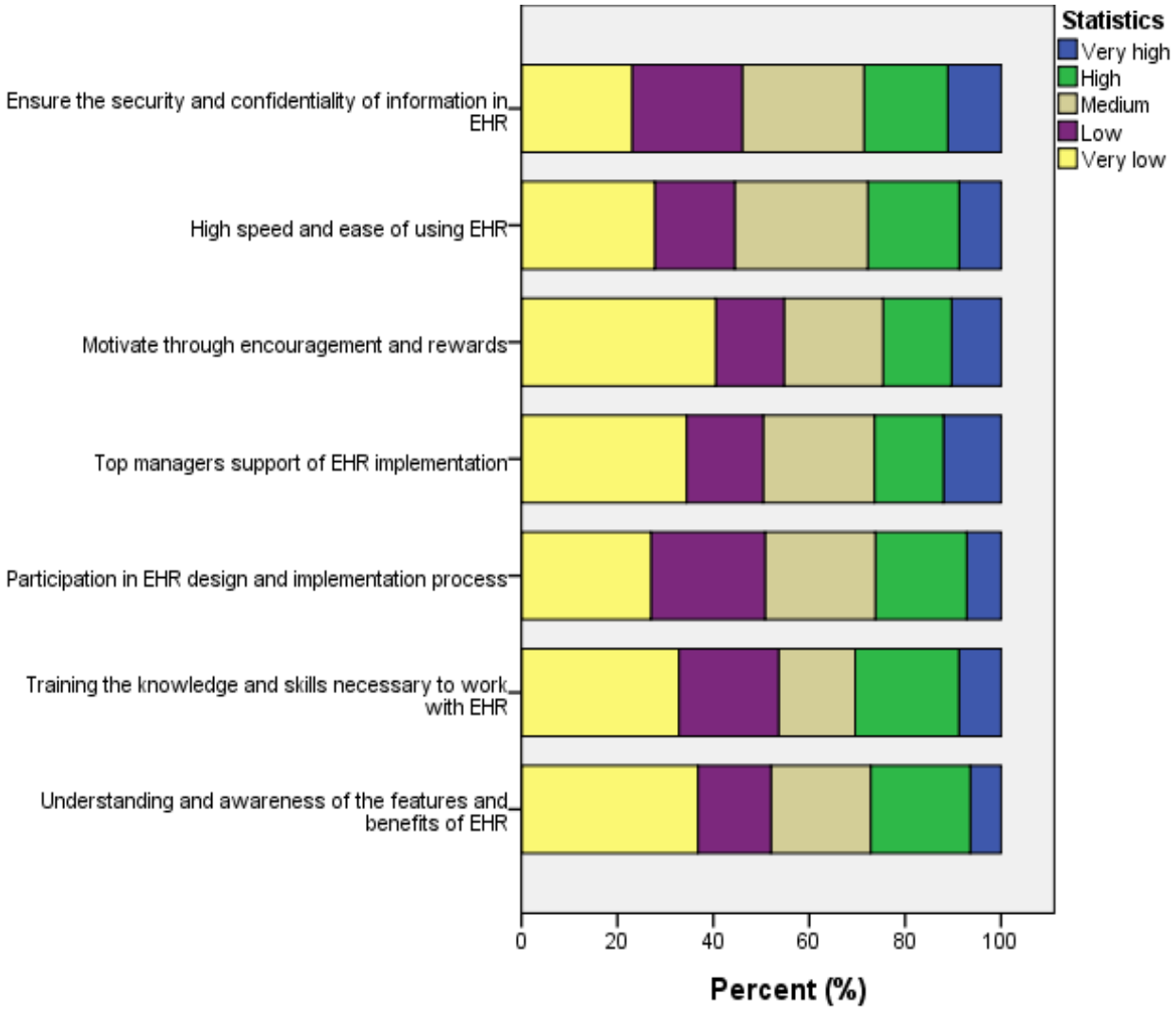

Figure 19 Other factors enhancing readiness to accept EHR

There were small and moderate negative correlations between the ICDL scores with knowledge and attitude scores, respectively, suggesting that those with lower ICDL scores had higher knowledge and more positive attitude toward EHR (Table 2). On the other hand, I

observed a small positive correlation between knowledge and attitude scores suggesting those with higher knowledge on EHR tends to have a more positive attitude toward it.

Table 8 Spearman correlation among computer skills, knowledge, and attitude

	Computer skills	Knowledge	Attitude
Computer skills	1.00	-0.177	-0.505
Knowledge	-0.177	1.00	0.280
Attitude	-0.505	0.280	1.00

4.3 Determinant factors

There is a statistically significant difference in ICLD scores (p-value <0.05) by the level of education and by occupation categories (Table 3). Respondents with a Master/PhD degree and physician had, on average, higher scores than other education/occupation groups. There were no statistically significant relationships between other characteristics and respondents' ICDL scores. Surprisingly, there were small and statistically non-significant difference in ICDL scores among those who took the ICDL course and who didn't, possibly suggesting low effectiveness of such courses. Across occupations, medical record officers and radiologists had close computer skill scores (2.8) to physicians (3.0). Moreover, the scores for people with up to vocational degree and those with bachelor degree were comparable. In overall, the highest computer skills belonged to physician men with Master/PhD degree who did ICDL-tutorial training and had access to computer. On the other hand, the lowest computer skill was seen among nurses women with a Bachelor degree who didn't take up ICDL-tutorial and didn't have access to computer.

Table 9 Mean ICDL score by respondents' characteristics

	Mean (95% CI)	Median	Max, Min	Mean difference (95% CI)	P-value
Sex				0.07 (-0.19, 0.33) [a]	0.33[a]
Men	2.6 (2.4, 2.8)	2.4	1.9, 4.0		
Women	2.5 (2.4, 2.7)	2.4	1.4, 5.0		
Occupation					0.002[b]
Physician	3.0 (2.6, 3.5)	3.0	2.0, 4.0		
Nurse	2.4 (2.3, 2.5)	2.3	1.4, 4.6		
Medical record officer	2.8 (2.4, 3.2)	2.7	1.7, 5.0		
Lab technician	2.5 (2.2, 2.7)	2.4	1.9, 3.1		
Radiologist	2.8 (2.4, 3.1)	2.7	2.1, 3.7		
Education					<0.001[b]
Up to vocational degree	2.6 (2.3, 2.8)	2.7	1.6, 3.4		
Bachelor	2.4 (2.3, 2.5)	2.3	1.4, 3.7		
Master and higher	3.4 (2.9, 3.8)	3.1	2.0, 5.0		
Taking up ICDL-tutorial				0.15 (-0.09, 0.39) [a]	0.21[a]
Yes	2.6 (2.5, 2.7)	2.4	1.4, 5.0		
No	2.4 (2.2, 2.6)	2.2	1.6, 4.0		
Access to computer at home				0.24 (-0.05, 0.52) [a]	0.11 [a]
Yes	2.6 (2.5, 2.7)	2.4	1.4, 5.0		
No	2.3 (2.1, 2.5)	2.3	1.6, 3.1		
Access to computer at work					
Yes	2.6 (2.4, 2.7)	2.4	1.4, 5.0	0.09 (-0.24, 0.43) [a]	0.58 [a]
No	2.5 (2.1, 2.8)	2.1	1.6, 4.0		

CI: confidence interval
[a] Obtained from independent student t-test.
[b] Obtained from one-way analysis of variance (ANOVA)

I didn't find any statistically significant relationships between the respondents' characteristics and their knowledge about EHR (p >0.05, Table 4). Moreover, the knowledge results showed that the medical record officer had the highest level of knowledge about EHR (2.5) (Table 4). In overall, the highest knowledge belonged to medical record officer with a Bachelor degree who didn't had access to computer. On the other hand, the lowest knowledge was seen among radiologist with a Master/PhD degree who had access to computer.

Table 10 Mean Knowledge score by respondents' characteristics

	Mean (95% CI)	Median	Max, Min	Mean difference (95% CI)	P-value
Sex				0.03 (-0.26, 0.32) [a]	0.14[a]
Men	2.3 (2.0, 2.6)	2.5	3.6, 0.0		
Women	2.3 (2.1, 2.4)	2.5	3.9, 0.7		
Occupation					0.12[b]
Physician	2.1 (1.6, 2.5)	2.1	1.1, 3.2		
Nurse	2.3 (2.2, 2.5)	2.3	0.0, 3.9		
Medical record officer	2.5 (2.2, 2.9)	2.9	1.4, 3.6		
Lab technician	2.2 (1.8, 2.5)	2.3	1.1, 2.9		
Radiologist	1.9 (1.6, 2.2)	1.8	1.1, 2.5		
Education					0.094[b]
Up to vocational degree	2.2 (1.9, 2.5)	2.1	1.1, 3.2		
Bachelor	2.4 (2.2, 2.5)	2.5	0.0, 3.9		
Master and higher	1.9 (1.5, 2.3)	1.8	0.7, 3.2		
Taking up ICDL-tutorial				0.06 (-0.33, 0.2) [a]	0.64[a]
Yes	2.3 (2.1, 2.4)	2.5	0.7, 3.9		
No	2.3 (2.1, 2.6)	2.5	1.1, 3.6		
Access to computer at home				-0.09 (-0.23, 0.41) [a]	0.59 [a]
Yes	2.3 (2.1, 2.4)	2.5	0.7, 3.9		
No	2.4 (2.1, 2.7)	2.5	1.1, 3.2		
Access to computer at work					
Yes	2.3 (2.2, 2.4)	2.5	0.7, 3.9	-0.07 (-0.3, 0.45) [a]	0.71 [a]
No	2.4 (2.0, 2.7)	2.5	1.4, 3.6		

CI: confidence interval
[a] Obtained from independent student t-test.
[b] Obtained from one-way analysis of variance (ANOVA)

There were statistically significant differences in attitude toward EHR and the level of education, occupation category, and access to computer at home ($p < 0.05$, Table 5). People with a bachelor degree, nurses and those without access to computer had, on average, higher scores than the comparison groups (Table 5). Among educational groups, those with a bachelor degree had, on average, a more positive attitude toward EHR. Across occupation categories, nurses (2.9) followed by medical record officers (2.7) had the most positive attitude toward EHR. In overall, the most positive attitude toward EHR belonged to nurses with a Bachelor degree who had NO access to computer. On the other hand, the least positive attitude toward EHR was seen among radiologist with a Master/PhD degree who had access to computer.

Table 11 Mean Attitude score by the respondents' characteristics

	Mean (95% CI)	Median	Max, Min	Mean difference (95% CI)	P-value
Sex				0.0 (-0.22, 0.21) [a]	0.98[a]
Men	2.8 (2.6, 2.9)	2.8	2.0, 3.5		
Women	2.8 (2.7, 2.9)	3.0	1.0, 3.6		
Occupation					0.007[b]
Physician	2.5 (2.2, 2.8)	2.5	1.8, 3.3		
Nurse	2.9 (2.8, 3.0)	3.1	1.0, 3.5		
Medical record officer	2.7 (2.4, 3.0)	2.6	1.6, 3.5		
Lab technician	2.6 (2.2, 3.0)	2.4	2.0, 3.6		
Radiologist	2.4 (2.2, 2.6)	2.4	2.0, 2.8		
Education					0.000[b]
Up to vocational degree	2.6 (2.3, 2.8)	2.5	1.6, 3.6		
Bachelor	2.9 (2.8, 3.0)	3.0	1.0, 3.5		
Master and higher	2.4 (2.1, 2.6)	2.3	1.5, 3.3		
Taking up ICDL-tutorial				0.02 (-0.19, 0.2) [a]	0.87[a]
Yes	2.8 (2.7, 2.9)	3.0	1.5, 3.6		
No	2.8 (2.6, 3.0)	3.0	1.0, 3.5		
Access to computer at home				-0.29 (0.04, 0.53) [a]	0.02[a]
Yes	2.7 (2.6, 2.8)	2.8	1.0, 3.6		
No	3.0 (2.8, 3.2)	3.2	2.1, 3.5		
Access to computer at work					
Yes	2.8 (2.6, 2.9)	3.0	1.0, 3.6	-0.21 (-0.07, 0.5) [a]	0.14 [a]
No	3.0 (2.7, 3.2)	3.1	2.1, 3.5		

CI: confidence interval

[a] Obtained from independent student t-test.

[b] Obtained from one-way analysis of variance (ANOVA)

There was a statistically significant difference between the respondents' occupation and their readiness score ($p < 0.05$, Table 6). Medical record officer had, on average, higher scores than other occupations. There were no statistically significant differences in respondents' readiness level by other characteristics (Table 6). In overall, the highest readiness level score belonged to medical record officer with Master/PhD degree who didn't have access to computer. On the other hand, the lowest computer skill was seen among radiologist with up to vocational degree who had access to computer.

Table 12 Mean Readiness level score by sociodemographic

	Mean (95% CI)	Median	Max, Min	Mean difference (95% CI)	P-value
Sex				0.05 (-0.07, 0.18) [a]	0.4[a]
Men	2.6 (2.5, 2.7)	2.6	1.8, 3.1		
Women	2.5 (2.5, 2.6)	2.5	1.7, 3.1		
Occupation					0.04[b]
Physician	2.5 (2.3, 2.8)	2.6	1.8, 3.1		
Nurse	2.5 (2.5, 2.7)	2.6	1.7, 3.1		
Medical record officer	2.7 (2.5, 2.8)	2.8	2.0, 2.9		
Lab technician	2.4 (2.3, 2.6)	2.4	2.1, 2.9		
Radiologist	2.3 (2.2, 2.5)	2.4	2.0, 2.7		
Education					0.38[b]
Up to vocational degree	2.4 (2.3, 2.4)	2.4	1.8, 2.9		
Bachelor	2.5 (2.5, 2.6)	2.6	1.7, 3.1		
Master and higher	2.5 (2.4, 2.7)	2.6	1.8, 3.1		
Taking up ICDL-tutorial				0.03 (-0.08, 0.15) [a]	0.55[a]
Yes	2.5 (2.5, 2.6)	2.5	1.8, 3.1		
No	2.5 (2.4, 2.6)	2.6	1.7, 3.1		
Access to computer at home				0.05 (-0.09, 0.19) [a]	0.52[a]
Yes	2.5 (2.5, 2.6)	2.5	1.7, 3.1		
No	2.6 (2.4, 2.7)	2.6	1.8, 3.1		
Access to computer at work					
Yes	2.5 (2.5, 2.6)	2.5	1.7, 3.1	0.64 (-0.1, 0.23) [a]	0.45 [a]
No	2.6 (2.6, 2.8)	2.6	1.8, 3.1		

CI: confidence interval
[a] Obtained from independent student t-test.
[b] Obtained from one-way analysis of variance (ANOVA)

5 Discussion

In this study, I evaluated the readiness level of health care professionals to accept EHR in five teaching hospitals at Hamedan city in Western Iran. The readiness level of health care professionals in this study was measured using three components: computer skills, knowledge about EHR, and attitude toward EHR. The level of computer skill was assessed based on ICDL training. I also explored the associations between these readiness components and the respondents' sociodemographic characteristics. I draw the following implications based upon findings and the existing literature on EHR acceptance:

5.1 Computer skills (Experience)

The findings of this study showed that computer skills, measured as ICDL score, had association with the respondents' level of education and occupation. People with a Master or PhD degree and physician had, on average, higher scores than other education/occupation groups. However, I didn't observe any significant associations between respondents' ICDL skills and other characteristics. The mean ICDL score in our study was 2.5 out of 5 suggesting a moderate level of compute skill among the respondents. This level of ICDL skill, however, was greater than the one (mean ICDL score of 2.2) reported in a previous study in Tehran (Habibi-Koolaee, Safdari & Bouraghi, 2015). Surprisingly, the proportion of persons with an ICDL training certificate in our study (71.5) was lower than this previous study conducted in Tehran (86.3%). Given this and also no association between ICDL certificate and ICDL score in our study, it seems that revision in ICDL training courses are urgently needed., access to computer/internet among the respondents in our study was greater than those observed in a previous study conducted in northern Uganda (Olok, Yagos & Ovuga, 2015), possibly reflecting better socioeconomic status among the respondents in our study.

5.2 Knowledge (Knowledge & awareness)

There was a moderate level of knowledge about EHR (2.3 out of 5) among the respondents in this study. This is slightly smaller than the value (2.6) reported in a previous study conducted in Tehran, Iran (Habibi-Koolaee, Safdari & Bouraghi, 2015). In addition to these small differences in mean knowledge scores, there were significant differences in the distribution of the responses to single questions. For instance, 66% and 75% of the respondents in Tehran study (Habibi-Koolaee, Safdari & Bouraghi, 2015) correctly answered the questions "what information does EHR contain?" and "Which is not one of the main goals of EHR?", respectively, while these were 54.7% and 67.1% in the current study. In this study, there were no statistically significant differences in knowledge scores by sociodemographic characteristics. This is in contrast with a previous study conducted among physicians in Bangladesh where males reported more knowledge about e-health care than females (Parvin & Shahjahan, 2016). This difference might be due to differences in measured outcome (EHR vs. e-health care) and study sample (five healthcare professions vs. only physicians). Our results highlight need to improvement in healthcare professionals' knowledge about EHR regardless of their sociodemographic characteristics. In other words, no specific subgroup

should be prioritized in designing strategies toward promoting EHR knowledge among health care professionals.

5.3 Attitude

There was a moderate positive attitude toward EHR among the participants in the current study (2.8 out of 5). This is smaller than the score (3.3 out of 5) reported among the nurses in a previous study conducted in Tehran (Habibi-Koolaee, Safdari & Bouraghi, 2015). While difference in healthcare professionals might be seen as a possible explanation of this difference, but the mean attitude score among nurses in this study was 2.9 which is still lower than this previous study. As described earlier, the level of knowledge about EHR was slightly greater in the study conducted in Tehran and considering the positive correlation between knowledge and attitude, this might explain the lower positive attitude in the current study. In addition, potential differences in respondents' sociodemographic characteristics might also contribute to the observed difference with the previous study.

In the current study, the most positive attitude toward EHR was related to promotion of confidentially while the most negative attitude was associated with increased work burden and responsibilities. This is somewhat different with the study conducted in Tehran in which the most positive attitude was about the EHR capacity in establishing proper communication and the most negative attitude was about the increased complexity of service delivery (Habibi-Koolaee, Safdari & Bouraghi, 2015). In addition, there were substantial differences in the distribution of responses to the specific question between this study and previous study conducted in Tehran. For instance, 45.3% and 43.1% of the respondents in this study strongly agree/agree with the following statements, respectively: "EHR promotes the quality of care" and "EHR establishes proper communication among healthcare providers". In comparison, 81.4% and 87.2% of the respondents in the study conducted in Tehran (Habibi-Koolaee, Safdari & Bouraghi, 2015) stated that they are strongly agree/agree with these statements. While cultural and sociodemographic differences might partially explain the observed differences, further research is needed to explain the differences in the findings between Hamedan and Tehran.

Another study conducted among 112 physicians in Bangladesh reported that a large proportion of the respondents (77.6%) had strongly agree/agree beliefs about the statement "E-health can improve the productivity of the workplace" (Parvin & Shahjahan, 2016, p.4). In contrast, a much lower proportion of respondents in this study had the similar view toward EHR, that is only 38.7% had strongly agree/agree beliefs about a similar statement "EHR improve the workflow". Furthermore, while 70.5% of the respondents in Bangladesh stated that they "strongly agree/agree" with the statement "E-health saves my time when I use it" (Parvin & Shahjahan, 2016, p.5), only 21.9% of the respondents in the current study showed disagreement with the statement "EHR causes time-wasting and increases workload".

Furthermore, our findings showed a small positive correlation between EHR knowledge and a positive attitude toward it. While this is in line with a systematic review that reported a positive correlation between healthcare providers' knowledge and attitude towards the use of computer (Hobbs, 2002), this is in contrast with the findings of the study conducted in Tehran where a small negative correlation was reported (Habibi-Koolaee, Safdari & Bouraghi, 2015). To explain their findings, Habibi-Koolaeel et al. speculated that more knowledge about EHR

implies more knowledge about its advantages and disadvantages and hence if their respondents were more concerned with the disadvantages of EHR, then the higher knowledge would lead to a more negative attitude toward EHR (Habibi-Koolaee, Safdari & Bouraghi, 2015). In this line, our results might reflect that the respondents in our study were less concerned about the disadvantages of EHR. Furthermore, while the magnitude of the Spearman correlation between ICDL skills and knowledge (0.02) and attitude (-0.06) was almost non-existent in the study conducted in Tehran (Habibi-Koolaee, Safdari & Bouraghi, 2015), the magnitudes of Spearman correlations were substantially larger in this study (-.18 with knowledge and -0.51 with attitude). The negative correlations between ICDL skills and knowledge about EHR possibly call for changes in ICDL training courses or developing training courses oriented toward improving health care professionals' knowledge about EHR in Iran.

5.4 Behaviour intention and Actual use

Within UIBR framework, the health care professional's acceptance is derived from their willingness to use EHR as a new technology according to their experience and knowledge and attitude and intention of the actual behaviour. According to our study result, the positive correlation between knowledge and attitude in this study can potentially lead to behaviour intention and actual use of EHR.

6 Conclusion

This study aimed to investigate the level of readiness of health care professionals for EHR acceptance and to identify its determinants. Our literature review identified that an important contribution of technology applications in the field of healthcare is the creation of EHR, which contains all information created by health care providers about patients and their registration in the form of computer records. Integrated access to all patient information and their integrated display is one of the primary goals of EHR, which is very important in improving clinical care and reducing medical errors.

Healthcare organizations all over the globe continue to implement EHR in an attempt to improve operations and the quality of patient care. In fact, implementing the EHR can improve services by reducing medical errors, providing communication methods, and sharing information between providing health services and better management of medical records for education. However, despite the potential benefits of EHR, its implementation faces constraints and barriers, the most important of which include cost, technical, individual-behavioral, and organizational constraints.

Research shows that attitudes-behavioral limitations or resistance to change play a greater role than other limitations. Therefore, it is crucial to assess the readiness of health care professionals to accept EHR before its implementation, which led us to the following research question:

Which characteristics influence the readiness of health care professionals for EHR acceptance?

What is readiness level of health care professionals in accepting EHRs in Iran (a developing country)?

To answer these questions, we made a small change to the UIBR framework and considered it as our study framework that matched our standard questionnaire. We studied three components of the readiness level of health care professionals for EHR acceptance: computer skills, knowledge about EHR, and attitude toward EHR. We then collected information through a standardized questionnaire in a random sample of health care professionals in Hamedan, western Iran. Our findings revealed that the level of all three components were moderate in our sample. Moreover, there were negative correlations between computer skills and knowledge and attitude, while a positive correlation between knowledge and attitude was observed. These findings highlight the need for revising ICLD training courses or designing new EHR-oriented training courses in order to promote EHR knowledge and in turn create a positive attitude toward its acceptance. In particular, our results showed that health care professionals think that EHR implementation would increase their workload and responsibilities. Such beliefs are not indeed in line with the reality and hence should be incorporated in any training courses intended to improve EHR acceptance. In addition, there were small differences in computer skills and attitude by education and occupation which might need to be considered in implementation of strategies toward improving health care professionals' readiness to accept EHR.

As mentioned in the delimitation, as this thesis focused on teaching hospitals at Hamedan University of Medical Sciences in Western Iran, its findings might not be generalized to all

hospitals in Iran. We, therefore, propose that future studies explore this subject in other hospitals in other cities in Iran. Furthermore, this thesis is a descriptive quantitative study based on data collected using a standard questionnaire. Conducting qualitative research can shed more lights on explaining the findings of this study and also other aspect of EHR readiness among health professionals.

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Appendix I

Part One: Demographic and Socioeconomic

1. Sex: Male ☐ Female ☐
2. Age: .....
3. Education level:

High School degree ☐ Vocational School ☐ Bachelor degree ☐ Master degree ☐ Doctorate degree ☐

4. Job: Physician ☐ Nurse ☐ Medical records ☐ Laboratory Sciences ☐ Radiology ☐
5. Work Experience (years): .....
6. Workplace Medical Training Center: .....

Part Two: Computer Skills

1. Do you have a personal computer? Yes ☐ No ☐
2. How often do you use the computer at **home**?

   Very seldom ☐ Seldom ☐ sometimes ☐ often ☐ Very often ☐
3. Do you have a computer at **work**? Yes ☐ No ☐
4. How often do you use the computer at **work**?

   Very seldom ☐ Seldom ☐ Sometimes ☐ Often ☐ Very often ☐
5. Do you use the **internet and email**? Yes ☐ No ☐
6. How often do you use the **internet and email**?

   Very seldom ☐ Seldom ☐ Sometimes ☐ Often ☐ Very often ☐
7. Have you done the seven skills of ICDL tutorials? Yes ☐ No ☐ Other ☐
8. What is your computer skills according to the seven skills of ICDL?

Seven skills of ICDL	Very limited	Limited	Moderate	High	Very high
First skill : Basic concepts					
Second skill : Windows					
Third skill : Microsoft Word					
Fourth skill : Microsoft Excel					
Fifth skill : Microsoft Access					
Sixth skill : Microsoft PowerPoint					
Seventh skill : Using Email and the Internet					

Part three: Knowledge level

- Please select the complete answer after carefully studying any of the following questions about electronic health records (EHRs).

1. What is the main reason for the tendency and movement towards EHR?
   a) Advances occurred in medical sciences and information technology
   b) Overcoming the inherent limitation of paper files
   c) Vital need to health information
   d) All options above

2. Which **is not** one of the main goals of EHR?
   a) Improving the quality of health care and its cost effectiveness
   b) Timely access to complete and accurate information
   c) Reduce the need for manpower
   d) Increase information security and confidentiality

3. What information does EHR contain?
   a) Information on services provided in hospitals
   b) Patient health information from birth to death
   c) Information about patient's medical history including delivered procedures and tests
   d) Financial and accounting information

4. How is information structured in EHR?
   a) Based on patient problems
   b) Based on the date and time of the events
   c) Based on the source of information
   d) Based on computer processing

5. How is information and message is transferred/exchanged in EHR?
   a) Only within different wards of a hospital
   b) Between the hospitals of a city
   c) Within hospitals with similar computer system
   d) Without any time and place constrains from any place around the world

6. Who controls the access to information in EHR?
   a) The patient herself/himself and her/his consent
   b) Physicians and health care providers
   c) Technicians of health information management
   d) Access is easy and there is no control

7. What is the most difficult step in implementing EHR?
   a) Designing
   b) implementation
   c) Evaluation
   d) Maintenance and improvement

8. Which **is not** one of the main obstacles in implementing EHR?
   a) Technical limitations (lack of necessary hardware and software)
   b) Investment constraints (high cost and late profitability)
   c) Lack of expert manpower
   d) Limitation of changes (user resistance and organizational culture)

9. Which is correct in comparing EHR and paper files?
   a) Documenting in EHR is more difficult than in paper files
   b) Paper files are more effective in helping the decision-making than EHR
   c) Timely access to information by providers is only possible in EHR
   d) Replacing EHR by paper files is in the best interest of service providers rather than customers

10. What is the most important and fundamental point in creating EHR?
    a) Standardization of health care data
    b) To have advanced hardware equipment
    c) To implement extensive changes in service delivery
    d) To have useful software

11. What are the standards for EHR?
    a) Hardware, software, telecommunications equipment
    b) Dictionary, classification system, computer programming
    c) Structural models, levels of access to information
    d) Structure and content, message exchange, confidentiality

12. Which **is not** one of EHR standardization organizations?
    a) HL7
    b) JCAHO
    c) CEN / TC
    d) ASTM

13. What does interoperability mean in EHR?
    a) Ability to operate between different information systems.
    b) Interpretation and aggregation of integrated data.
    c) Electronic transfer of information across information systems
    d) "a" and "b"

14. What is the most common standard and clinical terminology system used in EHR?
    a) ASTM and Read codes
    b) ASTM and UMLS
    c) HL7 and SNOMED CT
    d) HL7 and UML

Part four: Attitude

Please read each of the following and state whether you agree or disagree with them, if you think otherwise.

Questions	Strongly agree	Agree	No Opinion	Disagree	Strongly disagree
1. EHR promotes the quality of care					
2. EHR establishes proper communication among healthcare providers					
3. EHR prevents medical errors using alerts and reminders					
4. EHR prevents duplication and unnecessary and repetitive tests					
5. EHR speeds up service delivery					
6. EHR helps better documentation					
7. EHR provides timely access to information					
8. The security and confidentiality of information in EHR is more than paper files					
9. The accuracy of the information in EHR is higher than paper files					
10. The flexibility and ability to modify information in EHR is lower than paper files					
11. EHR makes conducting tasks more satisfying and easier					
12. EHR improves performing tasks					
13. EHR causes time-wasting and increases workload					
14. EHR improves the workflow					
15. Implementing EHR threats the job position of employees					
16. EHR reveals the weaknesses and incompetency of employees in acquiring new skills					
17. EHR imposes a lot of work discipline and leads to strict control					
18. EHR creates new responsibilities and raises expectations					
19. EHR increases the need to acquire new skills					
20. EHR rises the complexity of health care delivery					
21. EHR incurs high costs on the organization					
22. EHR increases the likelihood of deleting information due to hardware and software problems					
23. EHR threats the confidentiality and security of information					
24. Other cases					

Part five: Factors

Please specify the effect of any of the following factors in enhancing your readiness to run HER.
Please state any other factors that you have in mind.

Factors enhancing the level of readiness	Very high	High	Medium	Low	Very low
Understanding and awareness of the features and benefits of EHR					
Training the knowledge and skills necessary to work with EHR					
Participation in EHR design and implementation process					
Top managers support of EHR implementation					
Motivate through encouragement and rewards					
High speed and ease of using EHR					
Ensure the security and confidentiality of information in EHR					
Other factors (please state below)					

Appendix II: Questionnaire in Persian

بخش اول : مشخصات فردی- اجتماعی

۱- جنسیت: مرد □ زن □

۲- سن: .....

۳- میزان تحصیلات: دیپلم□ کاردانی □ کارشناسی□ کارشناسی ارشد و دکتری حرفه ای□ دکتری و بالاتر□

۴- شغل: پزشک □ پرستار□ مدارک پزشکی□ علوم آزمایشگاهی□ رادیولوژی □

۵- سابقه کاری: .....

۶- مرکز آموزشی درمانی محل خدمت: .....

بخش دوم : مهارت کامپیوتری

۱-آیا شما کامپیوترشخصی دارید؟ بلی□ خیر□
۲- میزان استفاده شما از کامپیوتر در منزل در چه حدی است؟
خیلی کم□ کم□ متوسط□ زیاد□ خیلی زیاد□

۳- آیا در محیط کاری، کامپیوتر دارید؟ بلی□ خیر□
۴- میزان استفاده شما از کامپیوتر در محیط کاری در چه حدی است؟
خیلی کم□ کم□ متوسط□ زیاد□ خیلی زیاد□

۵-آیا از اینترنت و ایمیل استفاده می کنید؟ بلی□ خیر□
۶- میزان استفاده شما از اینترنت وایمیل در چه حدی است؟
خیلی کم□ کم□ متوسط□ زیاد□ خیلی زیاد□

۷- آموزشهای دوره ای مرتبط با مهارتهای ۷گانه ICDL را گذرنده اید؟ بلی □ خیر □ سایر موارد □
۸- میزان مهارت کامپیوتری شما با توجه به مهارتهای ۷گانه ICDL در چه حدی است ؟

مهارتهای ۷گانه ICDL	خیلی کم	کم	متوسط	زیاد	خیلی زیاد
مهارت اول: مفاهیم اولیه					
مهارت دوم: Windows					
مهارت سوم: Word					
مهارت چهارم: Excel					
مهارت پنجم: Access					
مهارت ششم: PowerPoint					
مهارت هفتم: آموزش اینترنت و شبکه					

بخش سوم : میزان آگاهی

لطفا پس از مطالعه دقیق هر یک از سوالات ذیل که در مورد پرونده الکترونیک سلامت (EHR) می باشد پاسخ کامل را انتخاب فرمائید.

۱- علت اصلی گرایش و حرکت به سوی EHR کدام می باشد؟

الف) پیشرفتهای صورت گرفته در عرصه علوم پزشکی و فناوری اطلاعات

ب) غلبه بر محدودیت های ذاتی پرونده کاغذی

ج) نیاز حیاتی به اطلاعات سلامت

د) همه گزینه ها

۲- کدامیک جزئ اهداف اصلی EHR نمی باشد؟

الف) ارتقای کیفیت خدمات سلامت و هزینه اثربخشی آن

ب) دسترسی بموقع به اطلاعات کامل و صحیح

ج) کاهش نیاز به نیروی انسانی

د) بالا بردن امنیت و محرمانگی اطلاعات

۳- EHR حاوی چه نوع اطلاعاتی است؟

الف) اطلاعات مربوط به خدمات ارائه شده در بیمارستانها

ب) تمام اطلاعات سلامت فرد از قبل از تولد تا پس از مرگ

ج) اطلاعات مربوط به تشخیص، تاریخچه بیمار واقدامات انجام گرفته

د) اطلاعات مالی و حسابداری

۴- سازماندهی اطلاعات در EHR چگونه می باشد؟

الف) براساس مشکلات بیمار ب) براساس تاریخ و زمان وقایع

ج) بر اساس منبع اطلاعات د) بر اساس پردازش کامپیوتر

۵- انتقال اطلاعات و تبادل پیام در EHR چگونه انجام می گیرد؟

الف) فقط در داخل بخشهای یک بیمارستان

ب) بین بیمارستانهای یک شهر

ج) در بیمارستانهای که سیستم کامپیوتری مشابه دارند

د) بدون هیچ محدودیت زمانی و مکانی در همه نقاط دنیا

۶- کنترل دسترسی به اطلاعات درEHR بعهده چه کسی است؟

الف) خود بیمار و رضایت وی

ب) پزشک و ارائه کنندگان خدمات سلامت

ج) متخصصان مدیریت اطلاعات سلامت

د) دسترسی براحتی صورت می گیرد و هیچ کنترلی وجود ندارد

۷ - مشکل ترین مرحله در پیاده سازی EHR کدام است؟

الف) طراحی ب) اجرا

ج) ارزیابی د) نگهداری وبهبود

۸– کدام یک جزئ موانع اصلی در پیاده سازی EHR محسوب نمی شود؟
الف) محدودیت فنی (کمبود سخت افزار و نرم افزار لازم)
ب) محدودیت سرمایه گذاری (هزینه بالا و سوددهی دیر)
ج) کمبود نیروی متخصص
د) محدودیت تغییرات (مقاومت کاربران و فرهنگ سازمانی)

۹- کدام مورد در مقایسه EHR با پرونده کاغذی صحیح می باشد؟
الف) مستندسازی در EHR نسبت به پرونده کاغذی مشکل تر است
ب) کارایی پرونده کاغذی در کمک به تصمیم گیری بیشتر از EHR است
ج) دسترسی بموقع و همزمان ارائه کنندگان به اطلاعات فقط در EHR ممکن است
د) جایگزین شدن EHR با پرونده کاغذی به نفع ارائه کنندگان خدمات است تا مشتریان

۱۰- مهم ترین و اساسی ترین نکته در ایجاد EHR کدام گزینه می باشد؟
الف) استاندارد سازی داده های مراقبت بهداشتی
ب) داشتن تجهیزات سخت افزاری پیشرفته
ج) اجرای تغییرات وسیع در ارائه خدمات
د) داشتن نرم افزار های کاربردی

۱۱- استانداردهای مربوط به EHR شامل چه مواردی است؟
الف) سخت افزار- نرم افزار- تجهیزات مخابراتی
ب) واژه نامه- سیستم طبقه بندی- برنامه نویسی کامپیوتری
ج) مدلهای ساختاری- سطوح دسترسی به اطلاعات
د) ساختار و محتوا- تبادل پیام- محرمانگی

۱۲- کدامیک جز سازمانهای استاندارد سازی EHR نمی باشد؟
الف) HL7 ب) JCAHO ج) CEN/TC د) ASTM

۱۳- مفهوم استاندارد تبادل پیام (Interoperability) در EHR چیست؟
الف) قابلیت عملکرد بین سیستم های اطلاعاتی مختلف
ب) تفسیر و تجمع داده های ادغام شده
ج) انتقال اکترونیکی اطلاعات از سیستم های اطلاعاتی به یکدیگر
د) گزینه الف و ب

۱۴- رایج ترین استاندارد و سیستم اصطلاح شناسی بالینی که در EHR استفاده می شود؟
الف) ASTM and Read codes ب) ASTM and UMLS
ج) HL7 and SNOMED CT د) HL7 and UML

بخش چهارم : نگرش

لطفا هریک از موارد ذیل را با دقت خوانده و موافقت یاعدم موافقت خود را نسبت به آنها بیان کنیددرصورتیکه موارد دیگـر بـه نظرتـان رسید ذکر فرمائید.

سوالات	کـــــاملا موافق	موافق	بدون نظر	مخالف	کـــــاملا مخالف
۱- EHR موجب ارتقای کیفیت خدمات سلامت می شود					
۲ – EHR ارتباط مناسب بین ارئه کنندگان خدمات برقرار می کند					
۳ – یاداوریها وهشدارهای موجود درEHR موجب پیشگیری از خطاهای پزشکی می شود					
۴ – EHR از دوباره کاریها و انجام تستهای غیر ضروری و تکراری جلوگیری می کند					
۵ – EHR سرعت ارائه خدمات را افزایش می دهد					
۶ – EHR به بهبود مستند سازی کمک می کند					
۷- EHR موجب دسترسی بموقع به اطلاعات می شود					
۸- امنیت و محرمانگی اطلاعات در EHR بیشتر از پرونده کاغذی است					
۹- صحت و دقت اطلاعات در EHR بیشتر می شود					
۱۰- انعطاف پذیری و قابلیت اصلاح اطلاعات در EHR نسبت به پرونده کاغذی کمتر است					
۱۱- EHR انجام کار را رضایت بخش تر و آسان تر می کند					
۱۲- EHR موجب بهتر شدن انجام کار می شود					
۱۳- EHR موجب اتلاف وقت و افزایش حجم کاری می شود					
۱۴-EHR موجب بهتر شدن جریان کاری می شود					
۱۵- پیاده سازی EHR موقعیت شغلی کارکنان را به مخاطره می اندازد					
۱۶- EHR موجب آشکار شدن نقاط ضعف و بی کفایتی کارکنان در کسب مهارتهای جدید می شود					
۱۷-EHR انظباط کاری زیادی را تحمیل می کند و موجب کنترل شدید می شود					
۱۸-EHR با عث ایجاد مسئولیتهای جدید و افزایش انتظارات می شود					
۱۹-EHR نیاز به کسب مهارتهای جدید را افزایش می دهد					
۲۰- EHR موجب پیچیدگی ارائه خدمات سلامت می شود					
۲۱- EHR هزینه زیادی بر سازمان ایجاد می کند					
۲۲- امکان حذف و عدم پشتیبانی دائمـی از اطلاعـات در اثـر مـشکلات ناشـی از سـخت افزاری و نرم افزاری در EHR بیشتر است					
۲۳- محرمانگی و امنیت اطلاعات در EHR به خطر می افتد					
سایر موارد					

بخش پنجم : عوامل موثر

لطفا تاثیر هریک از عوامل ذیل را در افزایش میزان آمادگی شما برای اجرای EHR مشخص کنید درصورتیکه موارد دیگر به نظرتان رسید ذکر فرمائید.

عوامل موثر بر افزایش میزان آمادگی	خیلی زیاد	زیاد	متوسط	کم	خیلی کم
درک و اگاهی از ویژگی ها و مزایای EHR					
آموزش دانش و مهارت لازم برای کار با EHR					
مشارکت افراد در فرآیند طراحی و پیاده سازی EHR					
حمایت مدیران رده بالا از پیاده سازی EHR					
ایجاد انگیزه از طریق تشویق و پاداش					
سرعت بالا و سهولت استفاده از EHR					
اطمینان از امنیت و محرمانگی اطلاعات درEHR					
سایر موارد					