Evaluation of Physicians' Information Technology Readiness

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Original Research / Orijinal Araştırma

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ABSTRACT

Aim: In this study, the information technology and health informatics knowledge readiness of Turkish physicians were evaluated.

Methods: In the evaluation of the Information Technology Dimension, basic computer usage, health informatics concepts and privacy in health informatics were evaluated by a questionnaire.

Results: When the science education dimension and survey data were evaluated, it was observed that the male participants' information technology readiness was higher than the female participants' information technology readiness. The average score of physicians was 3.5 in our study and it needs a personal effort to have a better information technology skills level. Another observation is that the informatics education dimension changes according to the age group, and it is determined that the participants at the early ages have more qualifications in terms of education.

Conclusion: Likewise, it is one of the results obtained in the evaluation of the data that young physicians have higher information technology skills. When the data were evaluated in terms of academic title, it was observed that informatics education was affected according to the academic title and basic computer usage skills were not affected by the title, but the information about health informatics was affected by the academic title.

Keywords: information technology, readiness, health informatics

Hekimlerin Bilgi Teknolojisi Hazırbulunuşluğunun Değerlendirilmesi

ÖZ

Amaç: Bu çalışmada, Türk Hekimlerinin bilgi teknolojisi ve tıbbi bilişim bilgisi konusundaki hazırbulunuşluğu değerlendirilmiştir.

Yöntem: Bilgi teknolojisi boyutunun değerlendirilmesinde üç alt boyut oluşturulmuştur (temel bilgisayar kullanımı; sağlık bilişimi kavramları; sağlık bilişiminde gizlilik, güvenlik). Çalışmayı yürütmek için bir anket çalışması yapılmıştır.

Bulgular: Bilim eğitimi boyutu ve anket verileri değerlendirildiğinde, erkek katılımcıların bilgi teknolojileri konusunda hazırbulunuşluk durumlarının kadın katılımcıların bilgi teknolojileri konusunda hazırbulunuşluk durumlarından daha yüksek olduğu görülmüştür. Çalışmamızda hekimlerin ortalama puanı 3,50 idi. Daha iyi bilgi teknolojileri beceri seviyesine sahip olmak için kişisel çaba sarf edilmesi gerekmektedir. Aynı zamanda bilişim eğitim boyutunun yaş grubuna göre değiştiği ve erken yaştaki katılımcıların eğitim açısından daha fazla niteliğe sahip oldukları belirlenmiştir.

Sonuç: Genç hekimlerin daha yüksek bilgi teknolojisi becerilerine sahip olduğu verilerin değerlendirilmesinde elde edilen sonuçlardan biridir. Veriler akademik unvan açısından değerlendiril-diğinde, bilişim eğitiminin akademik unvana göre etkilendiği ve temel bilgisayar kullanım becerilerinin unvandan etkilenmediği, sağlık bilişimi ile ilgili bilginin akademik unvandan etkilendiği gözlenmiştir.

Anahtar kelimeler: bilgi teknolojisi, hazırbulunuşluk, sağlık bilişimi

Introduction

Internet has found its place in every field of life with the development of technology. Uninterrupted access to information technologies is possible with the mobile devices. It is inevitable that this situation will have reflections in all sectors. With the development of health information systems, new models have emerged in the provision of health care services, which have led to changes and reassessment of clinical processes. All these developments have led to the increasing the use of information technologies in health care services. New processes have required healthcare workers' information technology skills to be above a certain level. As physicians are at the center of this information production process, it is important for physicians to use health information systems effectively and to have sufficient skills in information technologies in general (1). In this context, the main purpose of the research was: "It was necessary to evaluate the information technology readiness of physicians in the provision of health informatics services". For this purpose, the following sub-objectives will be answered:

• What is the relationship between physicians' demographic characteristics and technological skills?

• How is the readiness of physicians for health information technologies?

Health Information Systems and Physicians

Today, as in all fields, information and communication technologies are widely used in the provision of health services. The use of information technologies in health has led to the emergence of the concept of health informatics. It is possible to talk about the following stages in the development of health information systems (2):

• Transition from paper based recording systems to computer aided recording systems.

• Transition from departmental registration systems to information systems on health institution information systems.

• Patients and people other than health institution users are users.

• The use of health data is not only for treatment or administrative purposes, but also for planning and clinical research.

• Ability to process images and molecular data.

• Using sensors to collect big data in health information systems.

The development of health information systems has changed the processes in which patient records are used only for archival purposes and has made health data an integral part of the diagnosis-treatment processes. Together with these processes, the data became an indispensable source for the decision support (3).

In the researches conducted on the use of information technologies in the field of health, the positive effects of health information systems in providing quality treatment services and increasing the operational efficiency of health institutions have been revealed (4). The most important finding revealed in these studies is that doctors should use health information systems effectively in order to have the positive effects in their works. The aims of physicians to use information systems can be listed as follows:

• Scheduling: Scheduling patient appointments, planning interviews and calls with the patient.

• Access to Health Records: Record of diagnostic treatment information related to the patient, access to historical data, use for the purpose of recording prescriptions, reports etc.

• Patient Monitoring: Monitoring of the patient whose treatment is planned, monitoring data related to chronic diseases.

• Decision Support: Performing diagnosis and diagnosis of patients with the help of clinical decision support systems, monitoring of outcome information from laboratory, imaging systems, planning treatment.

• Communication and Consultation: pPysicians use information technology tools such as video conferencing, voicemail, e-mail for consultation and communication.

• Training and Research: Physicians use information technologies extensively to access the information they need in their areas of expertise.

The physicians lack of information technologies knowledge may prevent them from performing their works efficiently. Physicians who have the most

important role in the treatment of patients should be up-to-date on information technologies and their computer literacy should be high. The high level of susceptibility of physicians to information technologies and the effective use of health information systems increases the quality of health care services produced, as well as the successful implementation of health information systems (5).

It is clear that health information systems have many positive effects on the provision of health services. However, there are many studies that show the problems may arise in health information systems may have unexpected adverse effects on health services (3). Leaving aside the technical problems in health information systems, it is a fact that ethical problems are the most important problems that will arise from use. Considering the possibility that the patient's medical data may be shared with others against his or her will may cause the patient to store some information and mislead the treatment process. It would be correct to address the following ethical problems (6):

Confidentiality and Privacy: Health-related organizations are designed to share patient information at specific stages of the treatment or payment process. For example, to pay the patient's treatment fees, some information needs to be communicated to the insurance authorities. Ensuring that these data shared among institutions is accessible only by authorized personnel is an important issue for the confidentiality of patient data. The user entering this data is also expected to take due care of data entry, taking into account that the data may be misused. This data sharing, which may cause serious problems for the patient, should not be performed without the consent of the patient. Confidentiality and privacy issues do not arise solely from sharing patient data between institutions or access by unauthorized persons. The fact that established health information systems are vulnerable to cyber attacks, which is one of the most important problems of the information age, which we frequently encounter today, may also lead to the use of malicious data leaked out of the environment. For this reason, the establishment of security infrastructures

should be considered.

Accuracy and Data Inconsistency: The accuracy and consistency of data stored in health information systems is one of the issues that are as important as the privacy and confidentiality of patient data. It is clear that any erroneous changes or errors in the patient data will adversely affect the treatment process and may even lead to negative consequences such as referring the patient to the wrong treatment. Such inconsistent data may arise from the design problems of health information systems, as well as the inability of the personnel entering the data to use the software correctly and effectively.

Readiness

Readiness includes the individual needs to demonstrate certain behavioral competences; to what extent individuals are ready, prepared or equipped to participate in organizational development activities, mentally, psychologically or physically. Institutional changes take place in the organization development activities. The effectiveness and success of these changes depend on many factors. The readiness of organizations and employees to change is one of the most important of these factors (7).

The concept of Information Technology (IT) readiness generally focuses on individuals learning technological infrastructure. The extent to which individuals are intertwined with technology in their daily lives, technological readiness should be achieved as quickly as possible (8). Information technology readiness depends on the ability of individuals to work with high efficiency in business life and to benefit from these technological tools. At this point, employees' readiness to the tools related to their duties is important. Individuals with a high level of information technology readiness for the task can adapt more easily to the job they are working in and can work here for a long time with high efficiency.

Holt and Vardaman (9) stated that readiness for change is conceptually composed of both individual differences and structural elements. Readiness reflects the level of acceptance and adoption by an organization and its members for a change plan to change a given status quo. Let's think of an

organization full of enthusiastic and energetic individuals for a new initiative, but inadequately equipped. It is argued that individual and structural differences should be taken into consideration when they are ready. The readiness for change is a factor that has a significant impact on the attitude of employees towards the implementation of change, and hence the success of this initiative. A study on nurses reveals that nurses have positive attitudes towards the use of computers in health care. Accordingly, individual characteristics of nurses are also effective in computer use degrees (10).

Methods

The population of the research is the physicians who work in different positions and branches in public or private hospitals. Since the research aimed to evaluate the information technology readiness of physicians in general, random sample selection method was applied. The sample was studied with Turkish Ministry of Health hospitals. A total of 120 questionnaires were distributed and 100 questionnaires were answered by physicians. The response rate of the survey was 83%.

Descriptive statistics were expressed as frequency (n), percentage (%), average, standard deviation, median, interquartile width, minimum and maximum values. Shapiro Wilk test was used to check the general mean values of the responses to the normal distribution. Pearson chi-square test was used for categorical variables between the dimensions evaluated. Nonparametric Spearman Rho correlation coefficient test was used to compare the non-normally distributed numerical data in correlation analysis. Statistical significance was evaluated at $p<0.001$ and $p<0.05$.

The questionnaire was compiled by eclectic method. Part 1 of the Questionnaire, Part 2 and 3 of the questionnaire were used to measure the health informatics skills and knowledge levels of the participants. Likert type questions were answered as **"I strongly agree, I agree, I am undecided, I disagree, I strongly disagree"** for 29 questions**. The questions in the second part of the questionnaire are used to measure the ICT competency of the participants, while

the questions in the third part of the questionnaire measure the competence of the participants in terms of basic computer use and health informatics, and the degree of participation in security informatics in health informatics. Firstly, the consistency study was conducted for the scales, followed by descriptive data analysis and inferential scale analysis. According to Cronbach Alpha analysis, it is seen that the value obtained >0.88 and has a high level of reliability.

Results

In the selected sample, 44 female physicians and 56 male physicians answered the questionnaire. In terms of participants' sex, it was observed that the skills of male participants were higher than the female participants in the basic computer use sub-dimension and it did not affect health informatics concepts and health informatics within the scope of security and privacy sub-dimensions.

In terms of age, it was observed that the informatics education dimension changes according to the age, and the informatics qualifications of the participants between the ages of 36-40 are higher than the participants in the 41-45 age range. This shows that young physicians have higher information technology readiness. Similarly, as a result of the evaluation of the age status in terms of sub-dimensions of information technologies, it was observed that the basic computer readiness of the participants in the 26-30 age group was higher than the physicians in the other age groups.

When the educational status of the participants examined it was seen that there is a significant difference between and the mean scores of ICT readiness and its sub-dimensions as shown in Table 1.

Table 1. Distribution of participants' ICT average scores by education level

Education Status	ICT Values		
	Mean±SD	Median	Min - Max
License	2.44±0.54	2.25 (0.17)	2.00 – 3.50
Master	2.28±0.69	2.00 (0.33)	1.33 - 4.00
Doctorate in Science	2.45±0.48	2.33 (0.83)	1.67 – 3.33

• Informatics technologies readiness of participants with a PhD degree in science is higher than informatics readiness of participants with a master's degree.

• Information technologies readiness of participants with a bachelor's degree is higher than information technologies readiness of participants with a doctorate of science.

• The readiness of the undergraduate graduates to the concepts of health informatics is higher than the readiness of the students with a doctorate of science to the concepts of health informatics.

• It was determined that the level of education does not affect the security and privacy readiness of the participants in health informatics.

When it is examined whether there is a significant difference between the academic title status of the participants and the mean scores of ICT readiness and its sub-dimensions;

• Informatics training readiness of practitioner-physician participants is higher than informatics readiness of associate professor participants.

• ICT training readiness of the participants with the title of Specialist Doctor is higher than the ICT training readiness of the associate professors.

• Information technology readiness of the participants with the title of specialist doctor is higher than the information technology readiness of the associate professors.

• The attendance of specialist physician participants on health informatics concepts is higher than that of associate professor participants on health informatics concepts.

• It was determined that the academic title does not affect the security and privacy readiness of the participants in health informatics.

The average value obtained as a result of the application of 6-item information education dimension and 23-item information technologies dimension were used in the survey to the participants, Shapiro Wilk normality test was performed. Descriptive statistical information about scales and sub-dimensions is given in Table 2.

Table 2. Descriptive statistical of dimensions

Dimension	Avarage
ICT Education Dimension	2,38±0,59
Information Technologies Dimension	3,63±0,66
Basic Computer Use	3,86±0,74
Health Informatics Concepts	2,77±1,09
Security and Privacy in Health Informatics	4,46±0,51

Since the mean value data of the questionnaire and information technology dimensions used in the questionnaire were not distributed normally, the relationships between the independent variables were examined with the non-parametric Spearman Rho correlation coefficient test and the statistical significance $p<0.001$ and $p<0.05$ levels were evaluated. As a result of the tests:

When the relationship between mean readiness of basic computer use and health informatics concepts, which are sub-dimensions of IT, is examined, it is seen that there is a positive medium-level relationship between the pairs. $(rs(100)=0.404, p<0.001)$ was found to be statistically significant.

When the relationship between the average scores of basic computer use and security and privacy in health informatics, which are the sub-dimensions of IT, is observed, there is a positive low level relationship between the pairs, and as the participants' basic computer use readiness increases, security and privacy readiness of participants increases in health informatics. The relationship $(rs(100)=0.249, p=0.012)$ was found to be statistically significant.

When the readiness of health informatics concepts, which are sub-dimensions of IT, and the relationship between mean scores of security and privacy in health informatics are considered, there is a positive medium-level relationship between the pairs, as the participants' readiness of health informatics concepts increases, the security and privacy readiness of the participants is increased. This linear relationship $(rs(100)0.619, p<0.001)$ was found to be statistically significant.

Questionnaires related to the dimensions of the

questionnaire were 5-point Likert type. When the evaluation of the participants with a score of 3.40 and above was considered to be at the level of expected readiness, Aydın and Taşçı (11) considered that the average score of 3.50 in our study was significant.

Discussion

There is not much research in the literature to measure the readiness of physicians' information technologies. In addition to having the ability to use information technologies effectively, it also requires information literacy, including actions such as identifying the need for information, finding and making the necessary resources for access to information, passing the information through known knowledge production processes. In this study, in terms of the general evaluation of the survey and its dimensions, it was observed that the age and academic titles of the physicians generally affected the information technology skills, that the training they received on information technology increased in a positive way as expected, but that this education increased the health informatics and health information, it was observed that did not affect.

Conclusion

However, with the increase in information technology skills; physicians regardless of age group and academic title, health informatics concepts and health informatics security and privacy issues also increased. The average score of physicians was 3.50 in our study needs a personal effort to have a better ICT skill level.

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