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Original article

Investigating the Factors Related to the Usage Behavior of Employees towards Electronic Health Records Considering the Role of Behavioral Intention

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Abstract

Introduction: The improving electronic health record becomes one of the essential goals of social security medical centers. The present study aims to investigate the factors related to the usage behavior of employees towards electronic health records considering the role of behavioral intention in Social Security Medical centers of Khorasan Razavi Province, Iran.

Methods: The present correlational research is conducted in 2020. The statistical population was the staff of the social security medical centers (N=180) using the counting method. The data collection tool in this study was a standard questionnaire that its validity and reliability had been verified in the previous studies. The data were analyzed by SPSS and SMART PLS software.

Results: Hope for effort (path coefficient: 0.240 and t-statistic: 2.984), social impact (path coefficient: 0.194 and t-statistic: 2.453), facilitation of conditions (path coefficient: 0.150 and t-statistic: 2.005), and personal innovation in information technology (path coefficient: 0.225 and t-statistic: 3.005), positively and significantly affected behavioral intention. Also, behavioral intention (path coefficient: 0.462 and t-statistic: 7.495) positively and significantly affected staff's usage behavior in e-health record acceptance. This is while the expected performance (path coefficient: 0.048 and t-statistic: 0.548) and resistance to change (path coefficient: 0.106 and t-statistic: 1.690) did not significantly affect behavioral intention.

Conclusion: Considering the positive effect of hope for effort and social impact and facilitation of conditions and personal innovation in information technology, and behavioral intentions on the behavior in e-health record acceptance, it is recommended that Social Security Medical centers of Khorasan Razavi to train and strengthen the above-mentioned factors.

Introduction

One of the essential applications of technology in the healthcare area is creating electronic health records (EHR), which includes all the data created by healthcare providers registered in the form of computer records (1). Integrated access to all patient data and their integrated display is one of the primary goals of the EHR, which is crucial in improving clinical care and reducing medical errors (2). EHR can raise awareness or knowledge about health care among patients, as well as health care professionals to improve cooperation between different government agencies, and increase the health care quality (3). One of the main goals of EHR is to create systems with interoperability. Obviously, systems that follow different standards are not able to exchange communication and coordination with each other and cannot improve the patient care process (4). The standard for EHR can improve data transmission power, security, safety, quality, reliability, efficiency and effectiveness of data (5). In addition, health information systems use and comply with internationally

valid standards and global standards of technology and medical sciences (2). Undoubtedly, the EHR is one of the key technologies in the field of health care and can meet most of the vast and complex needs of the health area. The electronic health record contains the health care information of the individual, which is stored electronically and stored and transmitted with complete security. Accordingly, its primary purpose is to support integrated, continuous, and quality care of patients, and includes information about the past, present, and future of the individual (6).

Designing an EHR requires the following conditions:

- Coordination of users and health information management experts
- Digital communication infrastructure
- Health Information Technology Standards
- National data source system
- Health information systems software
- Health insurance laws and regulations and health insurance systems
- Functional capabilities and electronic compatibility between departments and electronic security systems of health services
- Promoting the culture of using modern technology with the mutual cooperation of the employees of the health system and information technology. (7)

In general, administrative barriers to the implementing EHR include technical constraints, standardization, organizational change, attitude and behavior of individuals and cost constraints (4). In other studies in this field, the attitude-behavior limitations of individuals or resistance to change have been more important than other implementation constraints. The growing capacity of information technology in the fields of collecting, storing and transmitting large volumes of information has caused patients to worry about the widespread access of other people to their EHR. Undoubtedly, by creating a safe framework in this area, the issue of collecting, controlling, and maintaining the patient's confidential information can be safely guaranteed (3). An EHR is an electronic patient medical record accessible through a network of computers to provide health care (8). The EHR includes information about laboratory tests, treatments, medications prescribed, patient identity information, legal permits, and allergies. This information is stored in certain forms such as databases, structured documents and free text structures by a large number of information systems available in the market (9). Different definitions of EHR such as electronic patient record, patient computer record, electronic medical record, integrated health record, shareable health record, integrated electronic health care records are given. This organization considers these terms as synonymous namesand sees their differences in the conditions of the sectors and countries that use them (10).

Consistency in the use of health information system by those involved in the production and registration of patient data and also their lack of knowledge of the EHR can be one of the crucial obstacles in the complete and micro-implementation of the EHR (6). EHR information can be associated with factors such as reducing hospital errors by increasing the accuracy of the treatment process and thus improving the quality of treatment. Using patients' information and records to improve the quality of treatment, speeding up treatment by eliminating parallel tasks, financial transparency, reducing costs paid by patients, increasing the security of patients' information by using standards of information storage and retrieval, and information exchange, staffs' satisfaction with treatment process, and ultimately provide appropriate solutions to achieve these goals (4). Due to the importance of medical records and the need for physicians and nurses to provide information to patients in order to accurately diagnose and identify patients, by forming these files, accurate identification of factors affecting this process can be done. Accordingly, positive and related factors can be strengthened and negative and mitigating factors can be controlled or eliminated. As a result, identifying and controlling these factors can be essential and important for these electronic files that can be responsive to the medical community at any time. Behavioral intentions are defined by most researchers as the desire to visit or redeem and the desire to recommend to others. In this regard, the basis of a person's behavioral intentions can be estimated by two indicators: the purpose of redemption and providing positive advice (11). Factors related to the behavioral intentions and usage behavior of employees of the EHR include expected performance, hope for effort, social impact, facilitation of conditions, personal innovation in information technology, and resistance to change. Theoretical and operational definitions of each are as follows:

Expected performance refers to the extent to which an individual believes that using a system will improve his or her performance (12). According to researchers, performance expectancy theory is equal to the perceived usefulness of the technology acceptance model (13). Hope for effort refers to the degree of ease and convenience of using a system, which is derived from the concepts of perceptual ease of the technology acceptance model (14). According to some researchers, the acceptance of a new technology or system in an organization will be successful when they believe that learning how to use that technology and system is easy (15). Other researchers also explained that when there are fewer barriers for consumers to use the new technology, the system will be user-friendly (16). In this regard, ease of use will be a vital factor in strengthening consumers' behavioral intentions. Social impact refers to the degree to which a person understands that others believe he or she should use a new system. This concept can facilitate understanding of behavioral intentions regarding IT adoption (15). In another definition, researchers described social influence as a person's desire to influence the way others think about doing a particular action (17). Facilitation of conditions is the degree to which a person believes that there is a technical and organizational infrastructure to support the use of the system. Personal innovation in information technology is a person's desire (satisfaction) to try any new technology (15). Employees' resistance reaction to change in organizations is normal and expected and is considered a natural response to change because change is a movement from the known to the unknown (18). Some researchers define resistance as any behavior that helps maintain the status quo (19).

In order to explain the research background, a number of domestic and foreign researchers have conducted the following research:

Abbasi et al. in a study showed a high rate of accurate and timely information entry in hospital information systems. The results also identified some sources of inaccurate and delayed data entry that can be attributed to user negligence (20). In a study, Rajaeian et al. concluded that computer knowledge and the importance of standardization significantly affect the perceived simplicity, as well as the importance of standardization and perceived simplicity on perceived usefulness. However, the

effect of the importance of information security on perceived usefulness was not confirmed (21). Hossain et al. indicated that policymakers should expedite the approval of the e-health system by the government. Development of social strategies to encourage physicians to motivate each other to use the EHR system and to ensure their technical adequacy and training to facilitate the use of this system (3).

Today, the applications of data and communication technology is considered as an essential factor in the development of all organizations, including health system organizations (5). Considering the importance of the above issue, these organizations have made certain changes and transformations to transcend the systems they are using, one of which is the creation of EHR (7). Therefore, according to the above explanations, the necessity of this research is to identify the factors related to the behavioral intentions and usage behavior of employees of the EHR in social security medical centers of Khorasan Razavi province, Mashhad, Iran. Hence, by controlling the negative factors and strengthening the positive factors on this process, more benefit can be gained from this process, and access to patients' information can be done quickly. Therefore, the present study aimed to investigate the factors related to behavioral intention and usage behavior of employees, including expected performance, hope for effort, social impact, facilitation of conditions, resistance to change, personal innovation in information technology and evaluating the effectiveness of these factors. Notably, the conceptual model of the present study is adapted from the study of Hossain et al. The difference is that in Hossain's model, the effect of the "facilitation of conditions" factor on the behavior of using it twice (once directly and once due to the effect on behavioral intention) has been assessed. However, according to researchers, there is no need to double-check this factor, and logically, once the impact of this factor on behavioral intent is measured, according to the logic of the model, there is no need to re-examine its effect on behavior, and this is considered obscure. Finally, the conceptual model of the present study is given in Figure 1 as follows:

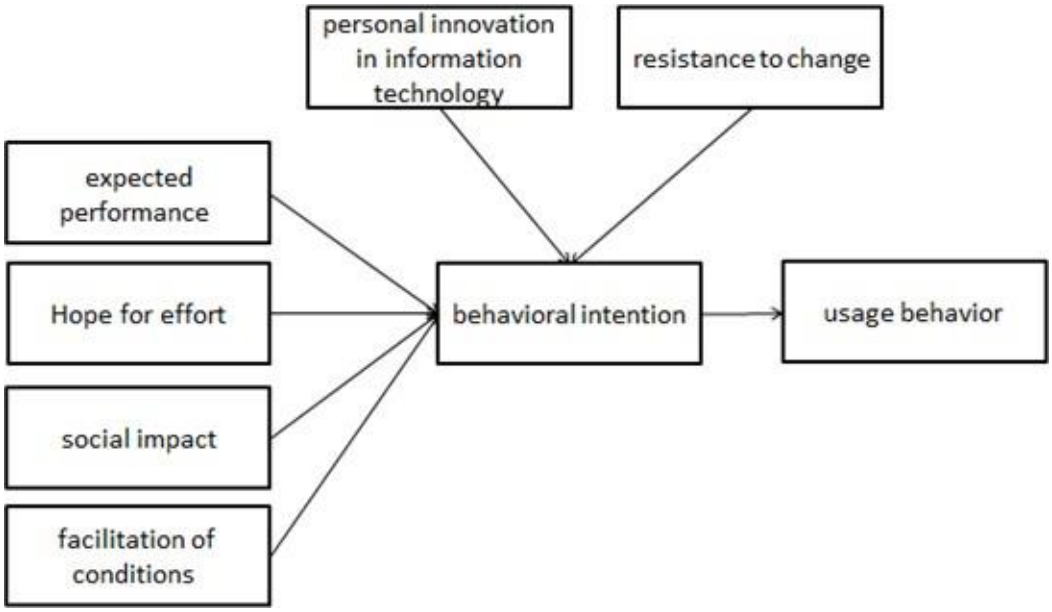

Figure 1. Conceptual model of research based on the Hossain et al.'s study. (3)

Methods

The present study is descriptive-correlation. The statistical population consisted of all administrative staff of the medical department of the Social Security Organization in Khorasan Razavi province, which numbered 180 people. Due to the limited statistical population, the sampling method was not used, and the census method was used. The questionnaire was then completed by all statistical population. A questionnaire was used to collect data. The first part of the questionnaire was related to the demographic questions of the study population, which included age, education, and work experience. In the second part, the questions were related to research variables, which were adapted from the research of Hossein et al. (3). The validity of the present questionnaire was also measured using the content validity ratio index. To evaluate the content validity from the experts' point of view, the content coordination of the measurement tool and the purpose of the research were used. For this purpose, two qualitative and quantitative methods were considered. In a qualitative review of the content, the researcher asked the experts to provide the necessary feedback on the tool, based on which the modifications were made. Content validity ratio index was used to ensure that the most important and correct content (author's necessity) was selected (22). The questionnaire was based on the 5-point Likert scale. After collecting the data, Cronbach's alpha for the research variables was calculated

using SPSS software. The reliability of the questionnaire was approximately 0.9. Therefore, the questionnaire had a good and acceptable reliability. In this regard, the hypotheses of the present study examined the impact of expected performance, hope for effort, social impact, facilitation of conditions, personal innovation in information technology, and resistance to change in behavioral intentions in accepting EHR. Finally, the effect of behavioral intentions on the usage behavior of employees of the EHR was also examined. Also, structural equation modeling was used to test the hypotheses. Finally, the data were analyzed using SPSS and SMART PLS software (23).

Normality test (Kolmogorov-Smirnov)

When checking the normality of data, the null hypothesis based on that the data distribution is normal is tested at a 5% error level. Therefore, if the larger test statistic equals 0.05, then there will be no reason to reject the null hypothesis that the data is normal, in other words, the data distribution will be normal. Therefore, according to the test results of the normality of the research variables and considering that the significance level of some variables is less than 5% (abnormal) and others more than 5% (normal), then you should use the Smart PLS software for the analysis, because it is not sensitive to the normality or abnormality of the variables.

Reliability and validity of research variables

Cronbach's alpha coefficient and combined reliability were used to confirm the reliability of the research variables. If Cronbach's alpha and combined reliability are greater than 0.7, the variables have good reliability. Also, the average variance extracted (AVE) was used to evaluate the validity of the research variables, which values above 0.5 indicate appropriate validity. In this regard, Cronbach's alpha values were obtained between 0.734 and 0.894. Also, composite reliability values between 0.848 and 0.934 have been obtained, which means good reliability of structures. Eventually, the average value of variance extracted for the research variables is between 0.616 and 0.825, which is more than the minimum value of 0.5, which indicates the appropriate validity of the research variables.

Results

In order to test the hypotheses of this study and meet the main purpose, first the demographic characteristics of the research community, which includes 180 administrative staff of the medical department of the Social Security Organization in Khorasan Razavi province, are identified, which is presented in Table 1.

Table 1. Descriptive statistics of research demographic variables

Demographic variables	Demographic profile	Number	Percentage
Gender	Man	104	57.77
	Female	76	42.23
Age	Less than 30 years	40	22.22
	Between 31 and 40 years	47	26.11
	Between 41 and 50 years	62	34.44
	More than 50 years	31	17.23
Education	Above diploma and less	26	14.44
	Bachelor	38	21.11
	Bachelor's degree	48	26.66
	PhD	68	37.79
Years of service	0 to 5 years	63	35.00
	5 to 10 years	67	37.22
	10 to 15 years	44	24.44
	More than 15 years	6	3.34

Investigating the status of variables

Table 2 shows that the highest score obtained among the research variables with 3.125 is dedicated to resistance to change, followed by expected performance and personal innovation in information technology with scores of 2.777 and 2.753, respectively, are in the next ranks.

Testing research hypotheses

In this section, the method of analysis in this research, namely structural equation modeling, which has been done using Smart PLS software, was explained, and then the research hypotheses were tested using this method. Figures 2 and 3 show the structural equation modeling of the research hypotheses in the form of standard and significance coefficients, respectively. If in the case of significant coefficients, the t-statistic is outside the range of +1.96 and -1.96, the hypothesis is confirmed.

Table 2. Status of research variables

Variables	Very few	Few	Medium	Very	Very much	Average
Expected performance	37 (21%)	36 (20%)	53 (29%)	37 (21%)	17 (9%)	2.777
Hope for effort	43 (24%)	55 (31%)	47 (26%)	24 (13%)	11 (6%)	2.473
Social impact	47 (26%)	48 (27%)	45 (25%)	26 (15%)	14 (7%)	2.483
Facilitation of conditions	44 (24%)	48 (27%)	54 (30%)	22 (12%)	12 (7%)	2.487
Personal innovation in information technology	36 (20%)	42 (23%)	52 (29%)	33 (19%)	17 (9%)	2.753
Resistance to change	26 (14%)	32 (18%)	48 (27%)	47 (26%)	27 (15%)	3.125
Behavioral intention	48 (27%)	34 (19%)	51 (28%)	33 (19%)	14 (7%)	2.603
Usage behavior	70 (39%)	45 (25%)	33 (19%)	26 (14%)	6 (3%)	2.196

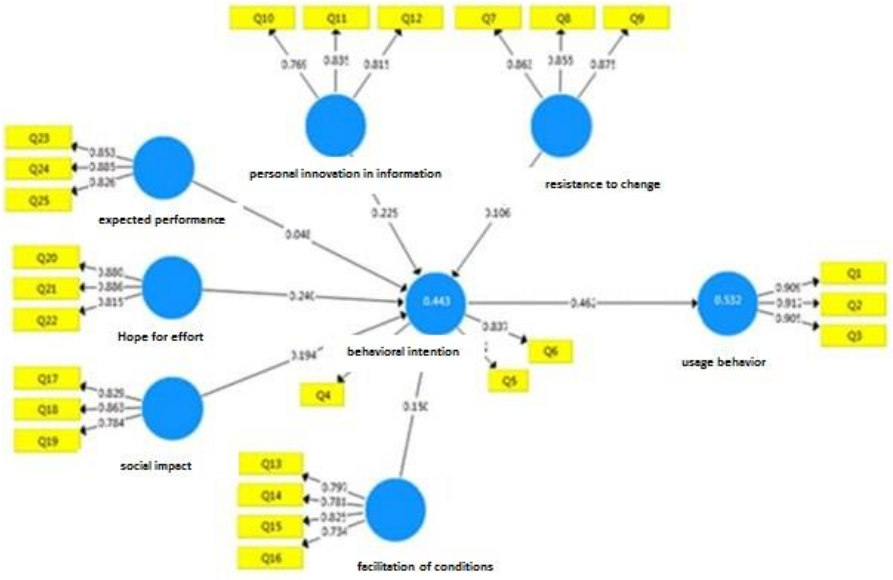

Figure 2. Model for measuring hypotheses in standard mode

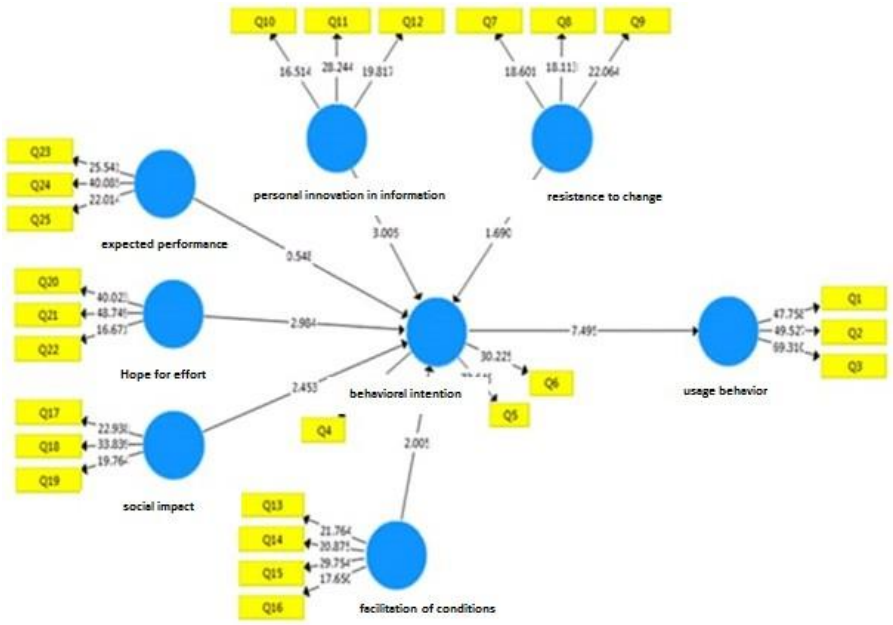

Figure 3. Model for measuring significance state hypotheses

The GOF index is used to evaluate the overall value of the model in Smart PLS software. The results of fitting the general part of the model are presented in Table 3.

$$GOF = \sqrt{\overline{communalities}} \times \overline{R^2}$$

According to Table 3, the result of the model value index test is equal to 0.591. Since the minimum acceptable value for this index is 0.36, it can be claimed that the research model has a high fit.

Table 3. The results of fitting the general part of the model

Variables	Communality	R Square	GOF
Expected performance	0.731	-	
Hope for effort	0.741	-	
Social impact	0.683	-	
Facilitation of conditions	0.616	-	
Personal innovation in information technology	0.651	-	0.591
Resistance to change	0.748	-	
Behavioral intention	0.763	0.443	
Usage behavior	0.825	0.532	
Average	0.719	0.487	

Then, in order to test the first hypothesis of the research, first, the effect of expected performance on behavioral intentions in accepting EHR in Social Security Medical centers was investigated. Then, to test the second, third, fourth, fifth, and sixth hypotheses of the research, respectively, the hope for effort, social impact, facilitation of conditions, personal innovation in information technology, and resistance to change in behavioral intentions in accepting EHR in Social Security Medical centers were analyzed. In this regard, according to Table 4, statistical analysis showed that five hypotheses were confirmed and two were rejected. This means that expected performance and resistance to change do not positively affect behavioral intentions. While other variables examined on behavioral intentions and behavioral intentions also affect the usage behavior of employees of the EHR.

Table 4. Results of correlation coefficients and t-statistics to test hypotheses

Hypothesis	Path	Path coefficients	T-value	Result
1	Expected performance → behavioral intention	0.048	0.548	Not approved
2	Hope for effort → behavioral intention	0.240	2.984	Confirmation
3	Social impact → behavioral intention	0.194	2.453	Confirmation
4	Facilitation of conditions → behavioral intention	0.150	2.005	Confirmation
5	Personal innovation in information technology → behavioral intention	0.225	3.005	Confirmation
6	Resistance to change → behavioral intention	0.106	1.690	Not approved
7	Behavioral intention → usage behavior	0.462	7.495	Confirmation

Discussion

The first hypothesis was rejected due to the amount of t-statistic in Figure 3; therefore, the expected performance does not affect the behavioral intentions in the selected community. Also, Hossain et al.'s findings confirmed the absence of a relationship between expected performance and behavioral intentions (3). The result of this hypothesis is in line with the findings of Hossain et al. Also, the result of this hypothesis is in contradiction with Biruk and Mehari's findings. According to their research findings, expected performance positively affect use intention and use attitude (24).

Therefore, it can be argued that the expected performance of employees from the facilities that are available to them, such

as the EHR can overshadow their behavioral intentions in using this system. This is because some resistance to computer systems among employees stems from a lack of awareness and knowledge about improving their performance in the future through the use of these systems.

The second hypothesis was accepted according to the amount of t-statistic in Figure 3; therefore, hope for effort positively and significantly affect intentions in the selected population. This result is consistent with the findings of Biruk and Mehari. According to their findings, hope for effort positively affect the intention to use and attitude of use (24).

However, this result contradicts the research findings of Hossain et al. (3). Davarpsand also stated in his research that hope for effort greatly affect person's attitude in performing behavior and directly affects a person's behavioral intentions in using Internet banking services (25). Therefore, it can be argued that the more tangible the hope for effort and ease of using the EHR for employees, the greater their behavioral intentions in using this system. Because always the fear of difficulty and inability to do some work using new and modern systems can affect the behavioral intentions and usage behavior of employees.

In the third hypothesis, according to the amount of t-statistic in Figure 3 was accepted. Therefore, the social impact on behavioral intentions in the selected population has a positive and significant effect. Accordingly, the result of this hypothesis is consistent with the findings of Hossain et al. and Birouk and Mehari (3, 24). Therefore, it can be argued that if a person's colleagues and peers in the organization use the EHR, she/he will be persuaded to use it and her/his behavioral intentions will be affected by comparing the abilities and capabilities of others with their own abilities and capabilities.

The fourth hypothesis was accepted according to the t-statistic in Figure 3. Therefore, facilitation of conditions has a positive and significant effect on the behavioral intentions in the selected society. This result is in line withthe findings of Birouk and Mehari and Hossain et al. (24,3). Harle et al. and Kowitlawakul et al. also introduced ease of use as one of the factors influencing the attitude of medical students in using EHR (26, 27). Therefore, it can be argued that if the organization provides the opportunity for employees to learn and train the use of this system, it willsee a different result from employees, and this is a kind of facilitation of conditions and mental readiness of employees to accept a new technology.

The fifth hypothesis was accepted according to the amount of t-statistic in Figure 3. Therefore, personal innovation in information technology positively and significantly affect behavioral intentions in the selected society. The results of this hypothesis is consistent with the findings of Hossain et al. (3). Agarwal and Prasad also stated that personal innovation positively affect users' intention to use new e-health services (28). Therefore, it can be argued that if the organization provides the necessary infrastructure to implement this system and demands the creation of such a system from employees in in-service training sessions and allows employees to demand such a system, it will certainly seek their support.

The sixth hypothesis was rejected due to the amount of t-statistic in Figure 3. Therefore, resistance to change has no significant effect on behavioral intentions in the selected population. The results of this hypothesis contradicts the findings of Hossain et al. (3). Guo et al.'s findings also showed that resistance to change reduces users' willingness to use e-health services, and that older people also have a greater tendency to resist change (29). Therefore, it can be argued that perhaps the reason for rejecting this hypothesis in the study population is the familiarity of employees with the benefits of implementing this system or perhaps they have seen the experience of implementing these systems in other countries, in which case not only they do not have resistance, but they will be welcomed.

The seventh hypothesis was accepted according to the amount of t-statistic in Figure 3. Therefore, behavioral intentions have a positive and significant effect on the usage behavior of employees of e-health records in the selected community. The result of this hypothesis is consistent with the findings of Hossain et al. and Birouk and Mehari (3, 24). Therefore, it can be argued that the intentions of behavior are considered good predictors of actual behavior. Humans think for even a few seconds before doing something, and this is their behavioral intention in doing or not doing something. This hypothesis also proves that the behavioral intentions of usage behavior of employees from the EHR with respect to other factors of expected performance, hope for effort to their actual use of this system has been effective.

Conclusion

The present study aims to investigate the factors related to the usage behavior of employees from electronic health records considering the role of behavioral intention in Social Security Medical centers of Khorasan Razavi Province. Considering the positive effect of hope for effort and social impact and facilitation of conditions and personal innovation in information technology, and behavioral intentions on the behavior in e-health record acceptance. Therefore, it is recommended that Social Security Medical centers of Khorasan Razavi to train and strengthen the above-mentioned factors.

Declarations

Acknowledgement

The authors of this study would like to express their gratitude to the administrative staff of the medical department of the Social Security Organization in Khorasan Razavi Province for their sincere cooperation in conducting this research.

Conflicts of Interests

The authors declare no conflict of interest.

Ethical statement

Participants were reassured that the research data and the identities of the individuals were confidential and would not be shared with others. In addition, participants were allowed to leave the study at any time.

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None.

Authors' contributions

Methodology: Amir Ghafourian Shagerdi, Research idea: Omid Behboodi, Data collection and data analysis: Reza Vazifehshenas, and Writing manuscript: Mohammad Sajjad Ghafourian Shagerdi.

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