

Data Requirements and the Basis for Designing Health Information Kiosks

Mina Afzali¹, Maryam Ahmadi²,
Zahra Mahmoudvand³

¹Department of Health Information Management, School of Allied Medical Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran

²Department of Health Information Management, School of Health Management and Information Sciences, Iran University of Medical Sciences, Tehran, Iran

³Department of Health Information Management, School of Allied Medical Sciences, Tehran University of Medical Sciences, Tehran, Iran.

Corresponding author: Zahra Mahmoudvand.
Department of Health Information Management,
School of Allied Medical Sciences, Tehran
University of Medical Sciences, Tehran, Iran. E-mail:
zahramahmoudvand@yahoo.com

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ABSTRACT

Introduction: Health kiosks are an innovative and cost-effective solution that organizations can easily implement to help educate people. **Aim:** To determine the data requirements and basis for designing health information kiosks as a new technology to maintain the health of society. **Methods:** By reviewing the literature, a list of information requirements was provided in 4 sections (demographic information, general information, diagnostic information and medical history), and questions related to the objectives, data elements, stakeholders, requirements, infrastructures and the applications of health information kiosks were provided. In order to determine the content validity of the designed set, the opinions of 2 physicians and 2 specialists in medical informatics were obtained. The test-retest method was used to measure its reliability. Data were analyzed using SPSS software. **Results:** In the proposed model for Iran, 170 data elements in 6 sections were presented for experts' opinion, which ultimately, on 106 elements, a collective agreement was reached. **Conclusion:** To provide a model of health information kiosk, creating a standard data set is a critical point. According to a survey conducted on the various literature review studies related to the health information kiosk, the most important components of a health information kiosk include six categories; information needs, data elements, applications, stakeholders, requirements and infrastructure of health information kiosks that need to be considered when designing a health information kiosk.

Keywords: kiosk Information requirements, health information kiosk, health system.

1. INTRODUCTION

Access to accurate information at the right time is a fundamental principle in today's health care (1). Obviously, recording the information of individuals and society has played an important role in the success and prosperity of medical science. With the advances in science and the emergence of technology, solving the health problems of communities has become much easier, and it is safe to say that, medical science owes its success to electrical and computer applications to a great extent. One of the important applications of these technologies is in the field of medical information kiosks (2). Information kiosks are one of the best ways to distribute information. Kiosk is a computer-based terminal that is used to provide health information to patients (3, 4). Many people are unaware of their current health status and health risks. Today, knowing about key health indicators is vital, because people can change their behavior with the in-

formation they obtain to prevent or manage their illness. Health kiosks are an innovative and cost-effective solution that organizations can easily create to help people maintain their health (5-8). With the advent of new technologies, health information can be accessed through public health kiosks (9).

Among the general features of health kiosks are; viewing information about the physical condition, receiving exercise programs based on physical condition and goals, receiving a diet program based on the information provided, viewing exercise activities, automatic measuring of biometric indicators (height, weight, body mass index, body fat index, pulse, blood oxygen levels, blood pressure, etc.). This system can be used in one of three ways; face detection, fingerprint recognition and identification card (10).

Hospitals justify the implementation of kiosks primarily as a measure to improve patient service, and not merely as a costly measure. The experience of

Research community		Specialized physician		General practitioner		Informatics expert		Patient		Total	
Age	Demographic information	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Sex	Female	8	40	7	41.18	1	25	23	56.10	39	47.5
	Male	12	60	10	58.82	3	75	18	43.90	43	52.5
Age	15-25	0	0	1	5.88	0	0	9	21.95	10	12.20
	25-35	5	25	2	11.76	4	100	13	31.71	24	29.27
	35-45	6	30	6	35.30	0	0	8	19.51	20	24.40
	45-55	7	35	5	29.41	0	0	7	17.07	19	23.17
	55-65	2	10	3	17.65	0	0	4	9.76	9	10.96

Table 1. Frequency distribution and percentage of age and sex in the research community

leading organizations has shown that, kiosks can increase patient satisfaction by reducing waiting times, providing better service, and maintaining more privacy. Many organizations also gain significant operational benefits from it, including increasing patient capacity and improving the accuracy of patients' demographic information (11, 12).

2. AIM

Considering the comprehensive and efficient use of health information kiosks in developed countries, the purpose of this study was to determine the data requirements and basis for designing health information kiosks as a new technology to maintain the health of society.

3. METHODS

This descriptive survey study was conducted in 2015 in Namazi Hospital in Shiraz. The research population consisted of specialized physicians (N=120), general practitioners (N=59), informatics experts (N=4) and patients of Namazi Hospital in Shiraz. For informatics experts, the community-based sampling was done and for physicians (N=20), general practitioners (N=17) and patients (N=41), purposive sampling method was used.

In this study, a researcher-made questionnaire was used to collect the data. By searching among all types of data sets regarding data requirements of health information kiosks, a researcher-made questionnaire containing all the information elements was developed. The questionnaire included a list of information requirements in 4 sections (demographic data, general information, diagnostic information and medical history), and questions related to data elements, stakeholders, infrastructure, applications, and security, general and technical requirements of information kiosks in Namazai Hospital, Shiraz. The research community was asked to rate the information requirements and applications of health information kiosks from the scale 1 to 10 according to the degree of importance, so that, the most important score was 10 and the least important score was 1. Furthermore, the questions related to the data elements, stakeholders, infrastructure and the requirements of the health information kiosk were designed based on the 5-item Likert scale, so that, the most important item scored 5, and least important scored 1. The questions related to the objectives of the minimum set of data, data elements, stakeholders, and the applications of health information kiosks at Namazai Hospital in Shiraz were answered by general practitioners, specialist physicians and patients. Questions related to infrastructure, (security, general and technical) requirements, stakeholders, and the applications of health information kiosks were answered by infor-

matics experts.

The content validity method was used to assess the validity of the questionnaire, and the opinions of two specialized physicians and two medical informatics experts were obtained, and to test its reliability, a test-retest method was used, so that, seven subjects were selected from the peer group outside the research community, and they were asked to complete the questionnaire, which was done twice in ten days interval, and finally the correlation coefficient of 87% was determined, thus, the reliability of the questionnaire was confirmed. The completed questionnaires were analyzed by SPSS statistical software version 21 using descriptive statistics techniques. In the questionnaire, in order to determine the information requirements and applications of health information kiosks, information elements with minimum mean of 7 and above were selected. In regard to data elements, stakeholders and infrastructure of health information kiosk, the items that had the mean of less than 3 were eliminated, and items with a minimum mean of 3 or more were accepted in the model.

4. RESULTS

The results of this study are presented in three parts. The first part of the study includes the demographic data of the research community. The second part contains the results of information requirements of health information kiosks, and the third part includes the results of the data collection process, stakeholders, application, (security, general and technical) requirements, and infrastructure of health information kiosks.

4.1. Demographic data of the research community

Table 1 shows the demographic data of the research community, including frequency distribution and percentage of sex and age in the research community.

According to Table 1, in the frequency distribution, gender and age sections, 43 participants were males (52.5%) and 39 were females (47.5%). Also, those aged 25-35 years had the highest frequency (29.27%) and individuals aged 55-65 years had the lowest frequency (10.96%).

4.2. Statistical results of information needs for health information kiosks (Table 2)

In the section of proposed information requirements in Table 2, in the demographic information section of users, the highest mean score was related to the full name (93.9) and the lowest mean score was related to height (7.31). In the section of users' general information in health information kiosks, congenital anomalies had the highest mean score (8.66) and the lowest mean score was related to the number of attendance (7.52). In the users' diagnostic information section in health information kiosks, the results of tests had the highest mean (8.60), and the diagnostic process had the lowest mean

Information requirements	Sub-categories
Demographic information	Full name, date of birth, height, weight, education, employment, marital status, religion, age, race, home address, landline phone number, post code
General information	Blood group, BMI, congenital anomalies, work and living conditions, lifestyle, associated illness, number of attendance, date of attendance
Diagnostic information	Medical tests, results of tests, results of radiology, diagnosis process, clinical symptoms
Medical history	History of surgery, type of surgery, date of surgery, history of transplantation, number of transplantations, history of diabetes, time of diabetes diagnosis, history of high blood pressure, time of high blood pressure diagnosis, cardiovascular problems, pulmonary problems, medication history, family medical history, history of smoking, history of alcohol consumption

Table 2. Information needs of health information kiosks. Abbreviations: BMI, Body Mass Index

(7.07), and also in the patient information section in the health information kiosks, history of surgery, history of transplantation, history of diabetes, history of blood pressure, cardiovascular problems, pulmonary problems, and history of heart disease were the most important items (9.44) and history of smoking and history of alcohol use were the least important items (8.13).

4.3. Statistical results of the section of data elements' collection, stakeholders, applications, requirements (security, general and technical), and infrastructures of health information kiosks (Table 3)

In the kiosk data element section, pregnancy health education, sexual health education, cardiac disease education, and education on coping with contagious diseases through health information kiosks had the highest mean score (4.25) and the level of familiarity with health information kiosks had the lowest mean score (3.2). In the section of kiosk application, increasing the users' level of awareness had the highest mean score (9.36) and the lowest mean score was related to the users' support (7.02) from the prospective of the participants. In the section of the importance of health information kiosks, the overall importance of the kiosk was (3.9) from the perspective of specialist physicians, (3.94) from the perspective of general practitioners, (3.5) from the perspective of informatics experts, and (3.58) from the perspective of patients. In the section of the importance of requirements (security, general and technical) of health information kiosks, the encryption of confidential information when storing information based on the encryption standard, disabling the data transfer on any external device including CD drive and USB, the application of powerful encryption and secure systems to prevent password cracking, authentication and access permissions, and use the Help facility had the highest score (5) and policies to protect facilities from unauthorized physical access, tampering and theft and account deactivation after three login attempts had the lowest score (4.25). In the section of health information kiosk infrastructure, the use of the printer alongside the kiosk, the use of a touch screen, the use of video ads in the kiosk's software, the use of image in the kiosk's software, the easy use of device for users, the concordance of hardware components of the device with ergonomic standards, hardware and software reliability, management control (including policies, standards and instructions defined for all information kiosks), logical control (use of software and data to monitor and control access to information and

Group	Sub group
Data elements of health information kiosk	Familiarity with health information kiosks, pregnancy health education, sexual health education, smoking and drug abuse education, education on how to use medication, mental illness education, heart disease education, traditional and herbal medicine education, first aid education, education on the prevention of contagious diseases, grouping of specific educational films for specific age groups, education on nutrition and nutrition pyramid, education on neonatal health, occupational health education
Application of health information kiosk	Increasing users' medical knowledge, creating user-friendly environment, protecting users, reducing the need for physicians, creating motivation in users, reducing costs, saving users time, increasing users' awareness, maintaining confidentiality of information
Stockholders of health information kiosk	The importance of health information kiosks from the perspective of expert physicians, general practitioners, experts of informatics and patients
Security, general and technical requirements of health information kiosk	Periodic update of security, control of login attempts and reporting inconsistencies, password management, policies to protect facilities from unauthorized physical access, manipulation and theft, policies to allow access to electronic health information, physical protection of devices to restrict unauthorized user access, audit control in the device, informing users about the audit function of the device, encryption of confidential information when storing information based on the encryption standard, providing a warning of confidentiality of information on all devices containing information, account deactivation of user after three login attempts, designing programs by software company to automatically alert abusive or abnormal activities, disabling the transfer of data on any external device including CD drive, USB, the use of powerful encryption and secure system to prevent password cracking, authentication and access permissions, denial of access to personal e-mail as the data may be sent by email, using the "Help" facility.
Infrastructure of health information kiosk	Using the printer alongside the kiosk of health information, using the keyboard and mouse, using the touch screen, using the video ad in the software, using the image in the software, using the flash file in the software, use of HTML file in the software, use of glucometer machine in the kiosk, the use of accessories such as smartphones and headphones, easy use of the device for users, the concordance of the hardware components of the device with ergonomic standards, hardware and software reliability, flexibility of the device as the ability to improve hardware and software versions of the device, strength and durability of the device, portability of the device, physical control (having locks or individuals for the protection of information, controlling and monitoring the work environment and computer facilities), management control (including policies, standards and instructions for all information kiosks), logical control (using software and data to monitor and control access to information and computer systems for example; user authentication and password), access control (a valid method for verifying access based on the role or function of the organization)

Table 3. Statistical results of the section of data elements' collection, stakeholders, applications, requirements (security, general and technical), and infrastructures of health information kiosks

computer systems for example; user authentication and password), and access control (a valid method to confirm individual access based on the role or function of the organization) had the highest score from the perspective of the informatics experts, and the use of keyboard and mouse had the lowest score (3.5).

5. DISCUSSION

Health information kiosks in Iran were created by a number of private companies under the name of the Health Testing Station with the objectives of investing and creating jobs in crowded centers such as airports, railways, travel terminals, shopping centers and etc in the large cities of Iran. These devices in Iran have been used for less than 10 years,

and are used to measure height, weight, blood pressure, blood glucose and heart rate (13). According to a survey conducted on various studies related to the health information kiosk, the most important components of a health information kiosk include six categories of information requirements, data elements, applications, stakeholders, requirements and infrastructure of health information kiosks that need to be considered when design a health information kiosk. According to a study of Charles (2009), among the items that should be considered in the design of a triage-based health kiosk system are; 1) a user's display screen for entering and displaying demographic information, diagnosis and patient records, 2) input tools such as keyboards, 3) the use of a printer alongside the health information kiosk and 4) the use of password. These findings are consistent with the results of current study (14). Another research was conducted by Jones to determine the applications of health information kiosks. The findings of Jones' study are not in line with the current study, as in Jones' study, improving children' health, improving the use of antibiotics for respiratory infections, encouraging screening for breast cancer, addressing the needs of religious minorities, managing various types of low back pain, education on skin cancer were among the applications of the health information kiosk. However, these items have not been considered in the present study as the essential applications(9) . In another study conducted by Goldschmidt et al., the most important information in the health kiosks include the teaching of patients about various illnesses such as; counseling patients on various medical procedures, displaying films to help eliminate misunderstandings between the doctor and the patient, providing post-operative instructions for patients, and improving patient compliance and clinical outcomes (15). Our study is not consistent with the Goldschmidt et al., research as their study includes counseling and educational films. However, in their study, postoperative instructions have been considered as an essential part, which has not been considered necessary in the current study. In another study, Coulston et al., stated that, the infrastructure of health information kiosks include computers, monitors, handsets, USB, printer, Internet connection and Window XP software (16). The results of their study are consistent with the findings of current research, because in the current research, the most important infrastructure for health information kiosks include the use of printers alongside health information kiosks, the use of accessories such as headphones and touch screen, the use of video ads in software used in the kiosk, and other items with a score of 5. In another study, Lowe et al., referred to the saving of users' time as one of the applications of health information kiosks (11), which is consistent with the findings of current research. Benjamin et al., conducted a study to assess the effects of health information kiosks on the knowledge of HIV patients. The results showed that, the use of kiosk could lead to purposive training, and it also increases the knowledge of patients about HIV (17). These results are consistent with the findings of current study. In the healthcare sector, the use of efficient information systems to realize the efficiency, effectiveness and quality of services as well as satisfaction of clients is an indispensable necessity. There is no doubt that, in order to meet the goals of healthcare system in the country, we need a comprehensive information network at

all levels; from a rural health homes to the third level referral system (meaning the specialized health centers) and the ministry (18). Therefore, it is obvious that, health care is heavily based on information, but on the other hand, the dispersion of information causes undesirable effects on current and future patient care and imposes more costs on the system (19).

6. CONCLUSION

Health information kiosks are a cost-effective way to obtain information and an appropriate management tool for the patient to know about their health status. Since there are no standards in Iran to determine the information items, infrastructure, and technical, general and security requirements that should be in the health information kiosks, and also considering the role of health information kiosks in raising public health and medical awareness as well as reducing disease, it is essential to create a standard template for Iran's health information kiosks. According to a survey conducted on various studies regarding the health information kiosk, the most important components of a health information kiosk include six categories; "information requirements, data elements, applications, stakeholders, requirements, and infrastructure of health information kiosks that need to be considered when design a health information kiosk.

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- **Authors' contributions:** Mina A contributed to the conceptualization and study design, data collection and interpretation, manuscript drafting and its editing. Zahra M's major role was conceptualization and study design, help in interpretation of the data and critically revising several drafts of the article for improvement of its intellectual content. Maryam A helped greatly in conceptualization and design of the study, data analysis and interpretation and also preparation of the final draft of the article. All authors have read and approved the submitted and revised final version of the manuscript and confirm that no part of this paper is copied from other sources.

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