E-Readiness Assessment of Teaching Hospitals Affiliated to Hormozgan University of Medical Sciences for E-Learning Implementation for Nurses' In-Service Training

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Original Article

Abstract

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Introduction: To get updated, nurses need to attend in-service training courses. E-learning is a promising solution for providing courses to busy nurses in teaching hospitals. This study aims to evaluate the readiness of teaching hospitals for e-learning implementation specialized for nurses' in-service trainings.

Methods: This descriptive-analytical survey was carried out in Bandar Abbas (Iran) teaching hospitals affiliated to Hormozgan University of Medical Sciences (HUMS) from March to June 2016. It included nursing staff, trainers, and related hospital and HUMS authorities. Questionnaires and checklists adopted from earlier studies and customized for this study were used for data collection. Appropriate descriptive and inferential statistical formulas were applied using SPSS version 19.

Results: Data showed that HUMS; in general, was in an optimum situation for e-learning implementation regarding manpower, financial support, technical equipment, strategic plan, content authoring and access to the internet. However, access to information resources and digital library was not good. Hospital authorities stated that they had lack of manpower and required infrastructure. Some of them doubted the appropriateness of e-learning for clinical trainings. Apart from knowledge dimension, nurses reported significantly higher than the average on other study dimensions.

Conclusion: To implement e-learning for nurses' in-service trainings, HUMS must hire experts for authoring and producing content; and technical staff for maintenance the infrastructure. Moreover, e-learning knowledge and skills of people involved in e-learning needs to be improved.

Key words: E-Readiness, Nurses, In-Service Training

Introduction:

Institutions are increasingly persuaded to incorporate e-learning solutions into their educational programs mainly due to the advantages it provides for learning such as making learning contents available anywhere anytime: while saving both cost and time (1). However, not being fully acquainted with the pros and cons of e-learning and strategies required for implementation of the solution, institutions may not make the right decision to incorporate e-learning in their educational infrastructure (2). Not meeting the pre-requisites of institutionalization of e-learning, initiatives adopted to improve the quality of learning may result in failure (3,4).

To minimize the risk of failure in the process of e-learning implementation, researchers have proposed models for carefully investigating the e-Readiness of institutions (5,6). The models determine how ready an organization is for the upcoming technological challenges. They carefully study a wide range of parameters likely to affect the success of the project such as IT-infrastructure, IT-skills of stakeholders, educational program and etc. In short, the models specify how mature an organization (infrastructure, authorities, learners, educational system, learners and trainers) is to institutionalize e-learning (7-9).

E-learning is also considered as a promising solution to be adopted by healthcare sectors whose staff are subject to be regularly and objectively updated about fast-changing biomedical knowledge as well as about professional developments in order to adapt themselves with constantly changing environment of healthcare (10-12). Since e-learning projects take high investment costs, healthcare providers must be well prepared in advance to avoid project failure as well as challenges arising from mal-implementation (13). Although there are several models (9,14) for studying e-readiness, a model suggested by Schreurs et al in 2008 seems to be ideal for studying the e-readiness of hospitals (5).

Hormozgan University of Medical Sciences (HUMS), established in 1986 in Bandar Abbas-Iran, manages healthcare services as well as medical education in Hormozgan province in south of Iran. There are more than 600 nursing staff at HUMS who provide both clinical nursing services for patients and clinical trainings for nursing students.

To keep the HUMS nursing staff scientifically and professionally updated, the in-service department of HUMS collaborating with nursing departments and nursing educational offices at hospitals organizes various traditional in-service programs through inviting subject-related professors and trainers. However, busy nurses either cannot attend the scheduled courses regularly or do not have enough time to focus on the subjects instructed because of duties at the hospital and/or home. This; unfortunately, leads to lower level of services a nurse can provide. A promising solution for such a situation is "e-Learning". In this study, we are to assess the e-readiness of HUMS for implementation of e-learning – specialized for in-service training of nursing staff – at its teaching hospitals based on Schreurs et al model.

Methods:

This descriptive-analytical survey which studied the e-readiness of teaching hospitals affiliated to HUMS for implementation of e-learning based on the model developed by Schreurs et al from March to June 2016 (5).

E-Learning Readiness Assessment Instrument

The model consists of two main criteria: 1) enabling or delivery and 2) results.

The enabling criteria addresses the creation of the environment where e-learning is supposed to be implemented. It dealt with preparation of the learners as well as the management of learning in the organization. The enabling criteria are divided into two main dimensions. The first one is "enabling the employees/learners to participate in an e-learning course" which consists of a) assessment of learners competence, b) assessment of preferred learning style, c) motivating employees, d) organizing and managing procedures and processes to share knowledge and experience in learning, and e) optimizing the learning process and the role of e-learning in it. The second section is "training activity in the organization as a management issue" which includes a) how training is valued in practice, b) time allocated to training, c)

learning culture, and d) evaluation of the impact of training (5).

The result criteria includes the level of preparedness to implement e-learning in the target organization. In other words, it deals with the learners' characteristics, the availability of technological facilities, the investments done by management and the quality of the e-learning solutions and processes themselves. There are four dimensions in the result criteria. The first dimension is "learner characteristics" including ICT skills of the learners, Internet experience of the learners, Motivation for use of e-learning of the trainees, and preferred learning style (audio, video, online….).

The second one is "availability of qualitative technological facilities for e-learning such as user ICT infrastructure, internet connectivity, flexible learning management system to handle web-based materials, a system to connect learners together and tracking the learning activity. The third dimension is "organization and management of e-learning" which addresses "investments in physical environment, good user systems and in e-learning infrastructure", "learning time during working hours?" and "preparatory training in usage computers and internet". The last dimension is "E-learning process and solutions/courses" which consists of organization of the e-learning activity, training in using e-learning system, support of the e-learning activity, information about available e-learning courses, user friendly system functions facilitating learning activities, e-learning course content and presentation, level of personalization of learning, matching of course with learning style and matching of course with job requirements (5).

E-readiness assessment tools customized for HUMS

To customize the model for HUMS teaching hospitals, we first observed the current status of in-service training programs in the target hospitals and also tried to get some general information about HUMS plans for e-learning. Then we made required changes to the dimensions of the model according to the target hospitals and the people involved in the implementation process such as 1) HUMS authorities including HUMS vice-chancellor for Education, Administrator for Education and Graduate Studies, Administrator of

Medical Education Development Center and the Administrator of Statistic, Information and Communication Technologies (SICT) who manages all the IT affairs at HUMS, 2) hospital authorities including hospital managers and IT officers, 3) nursing staff and 4) trainers. To collect required data we developed a checklist for HUMS and hospital authorities, and two questionnaires for trainers and nurses.

1) Checklist – HUMS authorities and hospital authorities

Since the development of IT-related activities at teaching hospitals is considerably influenced by the top management of HUMS, a checklist was developed – based on the criteria specified in the model – to collect required data from the top management involved in making decision on adopting e-learning solution as well as hospital authorities. The checklist included 8 sections: 1) personnel (5 Yes/No questions), 2) Financial support (9 Yes/No questions), 3) Technical support (6 Yes/No questions), 4) Strategic plan (6 Yes/No questions), 5) Content (5 Yes/No questions), 6) References (4 Yes/No questions), 7) Organizational chart (6 Yes/No questions), and 8) Access (3 Yes/No questions). There was a "comment" column for the Yes/No questions in the checklist so that interviewees could comment on each question. The validity of the checklist was confirmed by the faculty members of Health Information Technology Department at HUMS. It was used as a tool when interviewing the related authorities.

2) Questionnaire – Nursing staff and Trainers

To assess the e-readiness of nurses and trainers, we developed two questionnaires based on the criteria of the model. After being validated by the faculty members of Hearth Information Technology Department at HUMS, the reliability of the questionnaires were calculated after distributing between nurses and trainers. Chronbach's alpha was 0.85 and 0.95 for nurses and trainers, respectively.

The nursing staff questionnaire included 18 items classified into 4 sections: 1) access to hardware, software and internet for e-learning, 2) computer and internet skills, 3) Knowledge about e-learning, and 4) motivation for participating in e-learning courses.

The trainers' questionnaire included 21 items classified into 4 sections: 1) access to hardware, software and internet for e-learning, 2) computer and internet skills, 3) Knowledge about e-learning, and 4) motivation for participating in e-learning courses.

The items of the questionnaires were all five-point Likert scale from "very low" with value of "1" to "very high" with value of "5". The average level of the items was considered "2.5".

HUMS structure and teaching hospitals

Medical universities provide health services as well as medical education in their related geographical regions in Iran. Hence, HUMS as a medical university in Hormozgan province, provides health services through seven vice-chancellors and three management offices in Hormozgan province located in south of Iran. There were also four teaching hospitals (Table 1) affiliated to HUMS at the time of the study: 1) Shahid Mohammadi (General), 2) Koodakan (Children), 3) Shariati (Women) and 4) Ebn-e-Sina (Psychiatry). To develop their activities in education and information technology, hospitals rely on vice-chancellor for education and management for Statistic, Information and Communication of HUMS, respectively.

Ethics

In this study, the respondents of questionnaires and checklists were briefed about the objectives of the study. They provided informed consent prior to completing the questionnaire or taking part in the interviews. The identity of the respondents remained confidential.

Sampling and data analysis

To collect required data for e-readiness analysis, the researchers first interviewed all the authorities in HUMS using the checklist after making appointments and in their official offices. After introducing the study, its objectives and advising that the interview was recorded, the interviewees were asked as per the items listed in the checklist. The interviewee had a copy of the checklist during the interview. The researchers recorded all the interviews and took notes at the time of interview. Then answers of the interviewees to the checklist items were transcribed, and then were organized.

Since there were just 26 trainers, the questionnaires were delivered to all the trainers. There were totally 602 nurses in the hospitals at the time of data collection. The minimum sample size was estimated 215 nurses using Cochrane Formula with 50% ratio and 95% Confidence Interval. The sample size of the hospitals were 130, 54, 24 and 7 nurses in Shahid Mohammadi, Koodakan, Shariati and Ebn-e-Sina, respectively. They all were randomly selected.

Table 1. Teaching hospitals affiliated to HUMS

Hospital	Field	Beds	Total Nursing Staff	Total trainers of nursing in service courses
Shahid Mohammadi	General-Specialty & Sub specialty	450	400	16
Koodakan	Children: Specialty & Sub specialty	130	120	10
Shariati	Women: Specialty & Sub specialty	100	61	0
Ebn-e-Sina	Psychatry: Specialty	74	21	0
Total		774	602	26

* it is the number of nurses who were subject to participate in the training!

The collected data were imported to SPSS version 19 for analysis. Descriptive and single-test tests, Kruskal Wallis and Mann–Whitney U test and Kolmogorov Smirnov were used based on the score obtained from the collected data.

Results:

The results of the study are presented in 5 sections:

HUMS Authorities

The results showed that HUMS authorities unanimously stated that HUMS was in a suitable status for implementation of e-learning (at university level) regarding manpower, financial support, technical support, strategic plan, content production, and access to the internet. However, they believed that there were difficulties regarding access to information resources and access to digital library.

Hospital Authorities

To assess the infrastructure available at the teaching hospitals for implementation of e-learning, both the hospital managers as well as hospital IT officers were simultaneously interviewed using the checklist customized for hospitals in three domains of Manpower, Technical Support and Access to the Internet. The results are as below:

Shahid Mohammadi Hospital

The interviewees believed that although there was a lack of technical manpower, the hospital was in a good situation from the viewpoints of technical, logistics as well as access to the internet.

The hospital manager and IT officer had different ideas for e-learning implementation. The then manager believed that it is unlikely to implement e-learning solution in hospitals effectively mainly due to the nature of clinical teaching in nursing, medical and allied health sciences. However, the IT officer had a completely different idea. He was quite positive.

Koodakan Hospital

The interviewees believed that there were enough IT personnel. They received consultancy support from HUMS management of SICT. They stated that the hospital was in a good position regarding technical infrastructure and internet access for e-learning. The interviewees mentioned e-learning is helpful but not a complete solution for nursing in-service trainings because of the necessities of clinical education.

Shariati Hospital

Shariati hospital was the oldest HUMS hospital. Due to construction repairs, HUMS had decided to transfer the healthcare services of the hospital to another hospital affiliated to Social Security Organization (Iran) called Khalij Fars at the time of this research. However, we interviewed the hospital authorities. They didn't have enough IT staff, but they received consultancy services from SICT management. The authorities believed the hospital was in a good condition for hardware and software as well as access to internet with high bandwidth for implementation of e-learning.

Ebn-e-Sina Hospital

Although IT affairs of this hospital was managed by Shahid Mohammadi hospital, the hospital was in a good condition for implementation of e-learning (IT infrastructure and software). The manager of the hospital had a positive idea about e-learning implementation in hospitals.

Nurses' in-service training programs

Table 2 shows the frequency of in-service trainings performed in the hospitals in one year before the research.

Table 2. The frequency on in-service trainings performed in hospitals

Hospital	In-service training
Shahid Mohammadi	16
Koodakan	10
Shariati	0
Ebn-e-Sina	0
Total	**26**

* All the trainings were suspended for construction repairs
** Trainings are managed by Shahid Mohammadi Hospital

Trainers

The contact details of the trainers were collected from the hospitals. The questionnaires were delivered to the trainers. Only 12 questionnaires were completed and were collected. The analysis of the results showed that mean of dimensions for "access to hardware, software and internet", "IT skills", "knowledge" and "motivation" were 2.38±1.25, 3.54±1.56, 2.00±1.59 and 3.20±1.51, respectively (Table 3)

Table 3. Frequency (percentage) and mean score of trainers for the studied dimensions

		Access to hardware, software and internet		P-value	IT skills		P-value	Knowledge		P-value	Motivation		P-value
		Mean	SD		Mean	SD		Mean	SD		Mean	SD	
Total score		12 (100)	2.38	1.25	0.633†	3.54	1.56	0.026*†	2.00	1.59	0.827†	3.20	1.51
													0.076‡
Hospital	**Koodakan**	7 (58.3)	1.86	1.14		3.24	1.77		2.03	1.54		2.86	1.75
	Shahid Mohammadi	5 (41.7)	3.10	1.08	0.059×	4.05	1.16	0.505×	1.95	1.91	0.829×	3.81	0.83	0.443×
Sex	**Female**	8 (66.7)	2.31	1.03	0.931×	3.76	1.03	0.704×	1.26	0.95	0.038*×	3.39	1.00	0.848×
	Male	4 (33.3)	2.50	1.78		3.15	2.39		3.73	1.50		2.88	2.31	
Certificate	**BSC.**	11 (91.7)	2.18	1.10	0.107×	3.48	1.64	1.000×	2.00	1.69	0.724×	3.23	1.59	0.521×
	MSc.	1 (8.3)	4.50	0		4.10	0		2.00	0		3.00	0	
Work Experience (year)	**6-10**	3 (25.0)	3.17	1.44		4.87	0.23		4.00	1.04		4.58	0.29	
	11-15	5 (41.7)	2.20	1.57	0.627‡	3.38	1.96	0.061‡	1.00	0.94	0.049*‡	2.60	1.84	0.075‡
	16-25	4 (33.3)	2.00	0.41		2.47	0.12		1.33	0.98		2.83	0.72	

†. Single-test test, ‡. Kruskal Wallis Test, × Mann–Whitney Test, Level of significance less than 0.05

Table 3. Frequency (percentage) and mean score of trainers for the studied dimensions

		Access to hardware, software and internet		P-value	IT skills		P-value	Knowledge		P-value	Motivation		P-value
		Mean	SD		Mean	SD		Mean	SD		Mean	SD	
Total Score		215 (100)	2.66	1.31	0.039*†	2.77	1.07	<0.001*†	1.98	1.22	1.000†	2.90	1.39	<0.001*†
Hospital	**Shariati**	24 (112)	3.04	1.13		2.47	0.78		1.83	1.16		2.79	1.42	
	Koodakan	54 (25.1)	2.66	1.35		2.98	1.03		2.22	1.21		3.04	1.38	
	Shahid Mohammadi	130 (60.5)	2.59	1.35	0.502‡	2.73	1.13	0.206‡	1.93	1.22	0.202‡	2.85	1.39	0.913‡
	Ebn-e-Sina	7 (3.3)	2.57	0.89		2.82	095		1.52	1.56		3.00	1.61	
Sex	**Female**	195 (90.7)	2.69	1.31	0.252×	2.77	1.06	0.862×	1.99	1.22	0.888×	2.93	1.39	0.372×
	Male	20 (9.3)	2.32	1.34		2.73	1.15		1.88	1.26		2.65	1.41	
Educational Degree	**Associate agree**	31 (14.5)	2.48	1.20		2.51	0.99		2.11	1.16		3.21	1.46	
	Bachelor of Science	158 (73.8)	2.70	1.27	0.688‡	2.80	1.09	0.263‡	2.00	1.25	0.575‡	2.81	1.35	0.250‡
	Master of Science	25 (11.7)	2.72	1.65		2.95	1.00		1.70	1.09		3.17	1.67	
Work Experience (year)	**1-5**	72 (33.5)	2.69	1.37		2.83	0.99		1.82	1.16		2.53	1.25	
	6-10	45 (20.9)	2.63	1.22	0.916‡	2.75	1.77	0.924‡	2.07	1.22	0.688‡	2.83	1.58	0.020*‡
	11-15	51 (23.7)	2.72	1.30		2.67	1.13		20.9	1.31		3.20	1.32	
	16-25	47 (21.9)	2.56	1.36		2.79	1.05		2.03	1.25		3.18	1.38	

†. Single-test test, ‡. Kruskal Wallis Test, × Mann–Whitney Test, Level of significance less than 0.05

As it can be seen, the trainers reported their IT skills higher than average level (P=0.026).

Results showed that there was no significant difference between hospitals, sex, educational degree and work experience when comparing the studied dimensions. However, in the Knowledge dimension, there was significant difference between trainers with different work experience (P=0.038) and between females and males (P=0.49).

Nurses

As it can be seen (Table 4), nurses significantly reported the dimensions above the average (P<0.05). They just showed that they were significantly lower than average in the Knowledge dimension.

Results showed that there was no significant difference between hospitals, sex, educational degree and work experience when comparing the studied dimensions. In the motivation dimension, there was significant difference between nurses with different work experience (P= 0.02). Nurses with work experience of more than 11 years reported higher motivation.

Conclusion:

Studies show that e-learning not only improves clinician behavior and patient outcomes (15,16) but also nursing educational programs(17,18). E-learning is said to be an ideal solution for offering educational and training programs for organizations with rapid knowledge progress and organizations which need to reduce costs of the programs. Taking high initial investment costs, e-learning solutions must be carefully initiated. To clarify the e-readiness of HUMS teaching hospitals for implementation of e-learning, we focused on the feasibility of the implementation based on a model already tested for hospitals (5).

Nurses are one of the most influential elements for providing healthcare services to patients in hospitals. To empower the nursing staff, Iranian medical universities offer in-service training programs. E-learning in recent years has been proposed to be the solution for providing in-service training programs (10,18). Hence, adoption of e-learning in medical education is one of the most important issues in the development of information technology in current situation and as a challenge in future (3). Considering the trend of new changes for adoption of e-learning, medical universities must adapt themselves to benefit from the advantages of ICT in learning (1).

According to our results HUMS is in a relatively suitable status for implementation of e-learning from the view point ICT infrastructure in general. Authorities of HUMS believe the university possesses required manpower, financial

support, and access to hardware and software for implementation of e-learning, access to the internet, strategic plan, authoring and content production.

However, the authorities stated HUMS was not in a good condition regarding digital library. Digital libraries are of high importance for e-learning solutions. They have a support role in e-learning. Digital libraries can help learners with educational resources (19). Although HUMS did not have a dedicated digital library for e-learning system, the deputy for research (at the Iranian Ministry of Health and Medical Education) had been providing access to a wide range of digital resources from international publishers through a consortium for the medical universities in Iran. Students, faculties and employees of the medical universities can easily use the material through their websites (20).

Although the teaching hospitals were in a good condition for implementation of e-learning regarding ICT infrastructure, maintenance and access to the internet, they all have some concerns regarding manpower.

According to our results, trainers reported dimensions of "access to hardware, software and the internet", "knowledge" and "motivation" lower than average. Since trainers have a critical role in the implementation of e-learning, HUMS has to have a serious plan for empowerment of the trainers.

Since nurses with 11-15 years of work experience had significant motivation for e-learning, it might be implied that this group of nurses were aware of the issues of traditional in-service trainings and also the benefits of e-learning. However, nursing staff with more work experience reported lower motivation rate. It might be due to being accustomed to traditional trainings as well as not having enough IT skills and limited time to their retirement.

Although hospital managers had positive ideas regarding implementation of e-learning, they had concerns about providing clinical nursing skills to nurses. This idea is not supported in other studies (18).

It can be concluded that although HUMS had a suitable ICT infrastructure for implementation of e-learning (in-service training of nurses), it requires professional personnel for authoring and content production. It is recommended to improve the

awareness of nurses, trainers and hospital managers before implementation of e-learning solutions.

There are two main limitations in this study. The first one is that there was no specific e-learning solution at the time of the study to be assessed based on the results obtained from the study. Secondly, more than fifty percent of the trainers of the programs did not returned the questionnaires. The reason for such a feedback should be addressed in the future studies.

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Confilict of Interest:

The authors declare no conflict of interest.

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