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Electronic Medical Education Effect on Learner Application of Health Care Knowledge in Iran

Shima Tabatabai^{1*}

¹School of Medical Education, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

Author's contribution

The sole author designed, analyzed, interpreted and prepared the manuscript.

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ABSTRACT

Background: Like most of countries, medical education in Iran consists of undergraduate, postgraduate, and continuing medical education (CME). The use of Internet technologies, have been integrated into all three level of medical education. The effect of Electronic medical education on application of health care knowledge in compare with traditional medical education could show the effectiveness of program.

Aims: The aim of this study is to examine the effect of E-Learning on application level of knowledge & clinical reasoning issues as compared to lecture-based learning in a medical education program.

Study Design and Methodology: This randomized controlled trial was conducted in scientific meetings for 68 Physicians. Knowledge assessment tests were performed before and immediately after E-Learning and lecture-based educational session.

Results: A significant improvement at the application level of knowledge & clinical reasoning was found in both groups ($P < 0.01$). There was no significant difference between the E-Learning & traditional educational approaches. Course completers had significant improvements in application level of health care knowledge.

Conclusion: The effect of E-Learning in medical education and on learner basic knowledge, application of health care knowledge in response to clinical vignettes is comparable to a lecture-

*Corresponding author: E-mail: shtabatabai@yahoo.com;

based approach. Therefore, E-Learning can be effective in all levels of Medical Education, and it will enable Physicians to have a self-directed learning with choosing the place and time of their lifelong learning process.

Keywords: Medical education; e-learning; clinical vignettes; knowledge; application; clinical reasoning; health care knowledge.

1. INTRODUCTION

The world of medical education is more complex than ever and there seems to be no end in knowledge. Updated knowledge becomes adaptive responses of physicians to continuously evolving circumstances [1]. Changing concepts of education have led many medical schools to design educational programs to enhance learning as traditional approaches cannot fulfill the current physician needs [2,3]. Medical education in Iran, like most of countries, consists of 3 levels of education; undergraduate, postgraduate, and continuing medical education (CME) [4]. The last decade has seen the rapid and relentless use of the Internet and information technology (IT) to enhancing all the 3 levels of medical education and professional development [1,2]. As we know, Learning is widely acknowledged as a part of the working life of physicians. One of the best domains of medical education that could benefit greatly from E-learning is Continuous Medical Education (CME). The effect of electronic medical education on application of health care knowledge in compare with traditional medical education could show the effectiveness of program. E-Learning technologies offer learners control over content, pace of learning, time to meet their personal learning objectives. In diverse medical education contexts, E-Learning appears to be at least as effective as traditional lecture base methods of medical education [1,3].

Compared to traditional method, E-Learning has the advantage that participants can choose the place and time of education themselves. Within a clinical context, the effect of Internet-based Medical Education programs is comparable to traditional approaches [5].

A barrier for E-Learning in Medical Education in health care could be that elder GPs are not frequently using the Internet for obtaining information [2,5]. The aim of this study, therefore, was to assess the effect of E-Learning on knowledge gain as compared to regular lecture-based learning in a Medical Education program.

2. MATERIALS AND METHODS

A randomized controlled trial (RCT) was performed, within a series of Medical Education workshops. The main reason to perform these educational meetings was to assess the effectiveness of the electronic medical education program of a medical center in a type 1 medical university in Tehran.

Learners were randomly assigned to four different groups, by means of a four-block randomization system. The learners were unaware that two teaching approaches were compared during the meeting. Two groups received same content by means of traditional lecture-based teaching while the other two groups received individual E-Learning. The E-Learning program delivered in "Electronic Educational Packages," covering three main topics: diagnosis, prognosis, and next step in patient management. The packages include a self-directed online module for GPs Learners. The module provides participants with information, invites them to search for information on the internet, and asks them to solve proposed cases in exam.

Participants anonymously completed a self-administered knowledge test 30-item questionnaire for the quality level of entire course and learning method, immediately before and after the study session. Learners' knowledge and clinical reasoning have measured by pre-post test scores. Each knowledge test consisted of 28 true/false recall questions and 2 Extended Matching Items (EMI) with using Clinical vignettes to Assess Application of Basic Science Knowledge).

Recall items are thought to test examinees' knowledge of isolated facts Interpretation items require examinees to review some information (often in tabular or graphical form) and reach some conclusion (e.g., a diagnosis).

Problem-solving items present a situation and require examinees to take some action (e.g., the next step in patient management).

Application of knowledge items requires an examinee to reach a conclusion, make a prediction, or select a course clinical action. These items assess the ability of using the basic knowledge in clinical situation.

There were two versions of the test, version "A" and "B". Each of them contained different questions. One E-Learning group completed knowledge tests A before finishing the E-Learning module and knowledge tests B after finishing. The other E-Learning group completed test B before the E-Learning module and test A after finishing it. (Time of upload was checked on the E-Learning website). The same procedure was used in the two traditional lecture-based learning groups. We put '1' for each correct answer, and '0' for each incorrect answer.

We compared Learners scores participated in lecture based medical education sessions with the scores of an equal number of randomly selected physicians in E-Learning program. In both pre- and post-tests using paired t-tests. P =0.05 was considered as significant.

The effect of both learning approaches on knowledge was evaluated by comparing the change in knowledge between the two groups. Data were analyzed using SPSS version 15.0.

3. RESULTS

68 Physicians attended the meeting in medical information technology department. Randomization assigned half of them to the E-Learning and half to the lecture-based groups. The characteristics of the learners are described in Table 1. Our comparison of the baseline characteristic in both E-Learning and Lecture based group, detected no significant differences.

In Table 2, the scores of the four groups are shown. Although the scores of the four Groups differed at baseline; they differed not significantly within each teaching approach as well as between the two teaching approaches. Both

learning approaches significantly enhanced physician's knowledge.

Table 1. Baseline characteristic of learners

Characteristics Group	GP years of experience, mean (SD)	Used the website previously, (%)
E-learning group (n =34)	18 (5.6)	90%
Lecture-based group (n=34)	19 (6.5)	88%

Our comparison of the baseline scores in both E-Learning and Lecture based group detected no significant differences, which we considered equivalent before the intervention. Course completers had significant improvements in application level of knowledge. Both learning approaches significantly enhanced physicians s' knowledge.

The mean score compared by paired t-test for the lecture-based approach was 49.95 (SD 5.84) at baseline and 55 (SD 2.96) at post-test (P < 0.001). For the E-Learning approach, the mean score was 49.3 (SD 9.0) at baseline and 56.5 (SD 2.74) at post-test (P < 0.001).

4. DISCUSSION

Cook et al.'s 2008 meta-analysis addressed efficacy, and concluded that, on average, Internet formats were equivalent to non-Internet formats in terms of learner satisfaction and changes in knowledge, skills, and behavior [6]. Since computer skills are part of the current MEDICAL education program in Iran, E-Learning play even more important role in the in the learning.

Two meta-analyses compared the utility of computer-based instruction to traditional teaching methods [7,8]. The studies used a variety of training models a academic environments designs.

Table 2. Mean scores of the two E-learning groups and the two lecture-based learning groups at baseline and at post-test

Learning approach	Group	Mean score, baseline (SD)	Test version	Mean score post-test (SD)	Test	P value
E-learning	1	47.9 (8.3)	A	58.9 (9.2)	B	< 0.001
	2	50.2 (8.6)	B	59.3 (10.2)	A	< 0.001
Lecture based	3	52.0 (10.0)	A	59.1 (7.3)	B	< 0.001
	4	47.7 (7.4)	B	58.9 (10.5)	A	< 0.001

Several studies in higher education, outside of health care system, have revealed that E-Learning if not better than, is at least as good as traditional instructor-led approaches such as lectures in contributing to demonstrate learning [8-12].

The results of learners' gaining knowledge, measured by pre-post test scores, show that for physicians, E-Learning in enhancing knowledge is as effective as lecture-based learning.

Today, Computer skills and using information technology in learning are essential part of the current medical education; therefore, E-Learning will be the most useful for medical education and health care in the near future. Electronic communication is becoming popular, has the potential to transform the health care system, and support the patient-physician interaction. Patients are enthusiastic about this convenience model of communication, and feel strongly embraced in communicating via email & web messaging [13].

A study showed that a lack of computer skills is a major barrier that prevent doctors to use computer-based learning methods, rather than a lack of preference for new technologies [14]. The potential predictors' age and experience as a physician in relation to knowledge scores within the two learning approaches can be further explored.

Although our E-Learning module enhanced the physicians application of medical knowledge', the impact of different E-Learning models on physicians gaining Knowledge, clinical reasoning and professional practice should be further explored.

5. CONCLUSION

The effect of electronic medical education on Physicians' health care knowledge and application of their knowledge is comparable to a lecture-based approach. E-Learning offers the opportunity for shift from traditional education toward adult learning approach, and competency-based medical education. The integration of E-Learning into undergraduate, graduate, and continuing medical education can promote lifelong learning-learning will be useful for Medical education when appropriate to learners' level of computer expertise, in order not to become a source of frustration. In this way, it will enable Physicians to have a self-directed

learning with choosing the place and time of their lifelong learning process.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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