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Comparison of the effects of vid-cast and lecture-based training courses on burn knowledge among medical interns at the Motahari burn hospital

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Article info

Abstract

Background: A training course on burn infection and care is one of the courses that medical students take during their internship. This training course has not yet been taught through e-learning in medical schools in Iran. Therefore, this study aimed to compare the effects of two methods: traditional lecturing and employing a vid-cast with interactive electronic content, on the knowledge of interns in a training course on burns.

Methods: This quasi-experimental study with a pre-post non-equivalent group design was conducted among medical interns taking burn rotation training courses at the Motahari burn hospital, affiliated with the Iran University of Medical Sciences. The two groups were given a pre-test at the beginning of the course. One group was given in-person lectures, and the other was given the same content in the form of a vid-cast with interactive electronic files. At the end of the rotation course, a post-test was administered on the planned content, and scores of both groups were compared.

Results: The pre-test mean scores in the lecture group before and after the training intervention were 8 and 14.2, respectively; this difference was significant ($P < 0.001$). The difference between the pre-test and post-test mean scores in the vid-cast group was also significant ($P < 0.001$). The mean of post-test scores in the lecture group was 14.92 and 17.24 in the e-learning group; this difference was also significant ($P < 0.001$).

Conclusion: Post-test scores in the e-learning group were higher with a significant statistical difference, suggesting that the e-learning outperformed their counterparts in the traditional lecture model. It is recommended that e-learning be used either as a supplementary or the main method of training in burn infection and care for interns.

Introduction

One of the most important objectives of the education system is to familiarize the learners with up-to-date knowledge by using appropriate and effective teaching methods that will motivate and enhance the teaching and learning processes. Therefore, there is a need to revise traditional teaching methods and implement new methods in the educational system.[1-5] Technology advancements, the speed of knowledge advancement, and the need for cost-effective teaching methods have drastically changed teaching methods.[6] The employment of e-learning has been reported to lead to better management of time and increased lifelong learning.[7-9] Time saving, a reduction in commuting costs, and flexibility in learning anywhere and anytime are among the advantages of e-learning.[10] Some studies have shown that face-to-face and electronic teaching methods, namely blended learning, have better outcomes than either method alone.[11-14] In addition, some studies report that the outcome of e-learning is equal to face-to-face teaching methods and thus might be preferable due to the advantages mentioned above of e-learning.[10-16]

Currently, the mainstream teaching method in medical education is the lecture-based method. However,

improving the quality of medical students' education is unlikely without reforming teaching methods. New techniques accompanied by technology, particularly electronic equipment, and software, allow medical educators and learners to reach teaching and learning objectives anywhere and anytime more efficiently. The application of modern teaching methods can facilitate the learning process and promote learning motivation as well.[17-19]

By considering students as active participants, e-learning can revamp various forms of education in the 21st century and, according to some research studies, increase learning by 20% to 30% compared to traditional classroom teaching methods.[20]

Interactive electronic content not only makes learning possible but also gives the learner more control over their own learning process.[21] It has been reported that using electronic methods to train people working in the field of health community is more common in developed countries.[22-24] Presently, curriculum planners in Iran are paying more attention to the use of information technology (IT) in different fields of education.[23]

The quality and effect of e-learning with interactive content have not yet been comprehensively and adequately evaluated.[25] There are few studies on the effects of modern technologies and interactive multimedia on learning. Thus, if there is insufficient information about the capacity and impact of these approaches, their use in teaching can be challenging.[26] Vid-casts provide clear and significant benefits to medical students[27] Research among various medical students has shown that using vid-cast has sound effects on their learning.[28-30]

A vid-cast is a video clip designed to be viewed on portable devices; it uses RSS syndication for delivering material to users. The purpose of a vid-cast is to implement the two main features of e-content; flexibility and interactivity.[31] Vid-cast in e-learning classes may face the interaction problem between the instructor and learner. In lecture-based classes, the learner can ask a question and receive an instant response, but this is not the case in e-learning courses where a vid-cast is used. However, this gap can be addressed by an interactive vid-cast facilitating communication between instructors and learners who are actively engaged in learning.[32]

Incidences of burn mortality and disability resulting from burns are high in Iran.[31,32] A study conducted in the United Kingdom found that only 13% of medical schools offer to burn infection and care courses to their medical students, with a particular focus on lectures and often in lectures on burns. This suggests some shortcomings in burn care training courses, and there is a demand for training medical students concerning this issue.[33] Another study in public health in the State of São Paulo showed that students lacked enough information about burns.[34] Typically, there is no ward for providing care services to patients with burn injuries in educational hospitals in Iran. These patients are usually hospitalized in separate health facilities and there are few such centers/facilities for providing services to these patients. 35 Moreover, the courses on burn are short time courses which are not obligatory in rotations, and not many of interns take this course and if they do it is a very short time course. Therefore, they are not familiar with the management of patients with burn injuries while they encounter such patients after graduating from medical schools. An e-learning course on burn injuries can be beneficial for interns and can cover a large number of interns across the country.[36]

Burn care training is one course offered for medical students in Iran during their internship in medical schools. To the authors' best knowledge, there has not yet been any e-learning training course on burn offered in Iran for medical students. The reason that the participants of the study consisted of both Tehran and Iran university of medical sciences was that Motahari hospital was the only center offering this course in Tehran province. There are few centers, if any, offering this course in medical universities in Iran. The findings of this study could contribute to the inclusion of this course in the form of e-learning in the current medical curriculum, Therefore, it could be offered to all the medical students in all the medical universities in Iran. This study aimed to compare the effects of lecture-based and e-learning via a vid-cast with interactive content on burn training on the knowledge of interns attending a training course on burn care.

Materials and Methods
This quasi-experimental study was performed as a pre-post non-equivalent double group and evaluated the effects of two teaching methods of lecture and vid-cast via interactive electronic content on medical students' learning. As Motahari hospital is the only center offering burn training course and only 50 students enroll in each course, we could not have random sampling. The participants were all medical students from Tehran and Iran university of medical sciences (50 students) assigned to take the burn training course at Motahari burn hospital in 2018. The participants were 50% (25) female and 50% (25) male interns. First, the list of students enrolled for the course was obtained from the education office of the hospital. Due to the small number of students, census sampling included all in the study. They were then divided into two teaching groups, lecture-based and vid-cast, using systematic random sampling. In the lecture group, 56% of the participants were male, and 44% were female; in the vid-cast group, 44% were male, and 56% were female. Medical students were included if they were interns referred to Motahari burn hospital of Iran University of Medical Sciences (IUMS) to undergo a rotation of burn training course in June 2019. Interns were excluded from the study if they could not complete their training course for whatever reason.

The regular lecture method was used for the control group (n = 25); for the intervention group (n = 25), training was delivered through vid-cast with interactive electronic content prepared by Storyline version 3. The interns in the intervention group were given a flash memory stick containing the training file with a vid-cast prepared by the instructor using Storyline software 3. The length of the vid-cast was about an hour on the topic of burn infection training (clinical signs, diagnosis, and treatment of burn infection) as well as educational links related to the topic. The file had the instructor's voice on the slides, audio files, subject-related tutorials, and exercises with multiple-choice questions. The content was based on the curriculum accredited by the Iran Ministry of Health, Treatment and Medical Education. The final content was reviewed by a faculty member of the medical education department and two faculty members of the infectious diseases department where the course was offered. Changes were made on the basis of their comments. Due to the interactivity of the software, which allows the user to skip some parts, repeat specific parts, and use hyperlinks of multimedia, Storyline (version 3) software with interactive capability and HTML5 output was used to produce the vid-cast. The instructor prepared the content in the form of slides; her voice was recorded and then synchronized with the slides with the help of an instructional designer at the Virtual Education Center (VEC) at IUMS. The design was based on the e-content approved by the VEC and available on its site. Finally, a multimedia vid-cast in the form of web-based content with SCORM standards was prepared. (SCORM, which stands for Sharable Content Object Reference Model, is a set of technical standards for eLearning software products. SCORM tells programmers how to write their code so that it can "play well" with other eLearning software. It is the de-facto industry standard for eLearning interoperability.) Afterward, the interns without regularly attending classes held at Motahari burn hospital were provided with flash drives with the content for their learning.

The reluctance of some students to enter the program was resolved by justifying and explaining the importance of the research. Some students did not have personal electronic devices to view the vid cast; this problem was resolved by using hospital computers located in the hospital library, and sending the links to their mobile phones. It was decided that if a student did not want to enter the study, he would be excluded from the study and trained according to conventional program on burn used to train the interns. However, all of them accepted to participate in the study.

Pre- and post-tests were given to both groups at the beginning and the end of the course, and the mean scores of the two groups were compared. Four faculty members verified the content validity of the test. Ten similar interns to the group enrolled in the study were asked to take the test to measure Cronbach's alpha, which was found to be 0.80. Informed consent was obtained at the beginning of the course from all participants.

The course was organized based on the accredited curriculum of the Iran Ministry of Health and Medical Education to address external validity. Medical schools in Iran use this curriculum. The study setting was Motahari burn hospital, the main center for treating burns and educating interns for Iran's two main medical universities: Tehran University of Medical Sciences and Iran University of Medical Sciences. Concerning internal validity, we asked both groups not to share their files for the research. We also checked their background knowledge on the topic on the pre-test, which showed no significant difference between the two groups. A P value of less than 0.05 was considered significant.

The data were analyzed using descriptive statistics (frequency, mean, and standard deviation) and analytical statistics (ANOVA), using SPSS-16 software. Testing methods suitable for comparing the means of two independent and dependent groups (parametric/ nonparametric) were used to perform the comparisons intended for the research goals.

Results

In the current study, 50 students in two groups (lecture-based and vid-cast) of 25 were compared. According to a chi-square test, the difference in gender frequency distribution between the two groups was not statistically meaningful ($P = 0.396$). The mean age of the participants was 23.56±0.65 in the lecture group and 23.0 ± 56.65 in the vid-cast group. This difference was not statistically meaningful based on the independent test ($P = 0.238$) (Table 1).

Based on the results of the independent t test before the training intervention, there was no statistically significant difference in pre-test scores between the study groups. The pre-test mean score for the lecture group was 8 ± 2.36 and 7.6 ± 2.79 for the vid-cast group; this difference was not statistically significant ($P = 0.588$). This indicates that the two study groups did not differ in their level of knowledge and were similar before the intervention (Table 2).

In the mean comparison of the pre- and post-tests in the lecture group and concerning the distribution normality of the pre- and post-test variables based on the Kolmogorov–Smirnov test, the paired t test was used to compare the scores before and after the lecture-based method. The mean score of the pre-test before the training intervention was 8 ± 2.36 and 14.2 ± 1.63 after the intervention; based on the paired t test, this difference was significant ($P < 0.001$; Table 3).

According to the results of Table 4 and based on the paired t-test, the difference between the pre-and post-test mean scores in the vid-cast group was statistically significant ($P < 0.001$).

Based on the results in Table 5, the post-test score was 14.92 ± 1.63 in the lecture group and 17.24 ± 2 in the vid-cast group; this difference was statistically significant based

Table 1. Comparison of demographic characteristics of the two groups

Study groups	Gender		P value	Age	P value
	Female number(%)	Male number (%)		Mean ± SD	
Lecture-based group	11(%44)	14 (%56)	0.396	23.8±0.76	0.238
Vid-cast group	14(%56)	11(%44)		23.56±0.65	

Table 2. Comparison of the mean of the pre-tests in the study groups

Study groups	Pre-test scores Mean±SD	t statistics	P value
Lecture method	8±2.36	0.546	0.588
Vid-cast method	7.6±2.79		

Table 3. Comparison of pre-test and post-test mean scores in the lecture group

Group	Pre-test score Mean±SD	Post-test score Mean±SD	Mean differences	P value
Lecture group	8±2.36	14.2±1.63	6.92±1.63	<0.001

Table 4. Comparison of the mean of pre-test and post-test scores in the vid-cast group

Group	Pre-test score Mean±SD	Post-test score Mean±SD	Mean differences	P value
Vid-cast group	7.6±2.79	17.24±2	9.64±2.64	<0.001

Table 5. Comparison of the mean of post-test scores in both study groups

Study groups	Post-test scores (Mean±SD)	Mean differences	P value
Lecture group	14.92±1.63	-4.487	<0.001
Vid-cast group	17.24±2		

Table 6. The comparison between the scores of the two groups by covariance

Source	Degree of freedom	F	P value	Partial Eta squared
Corrected model intercept	2	12.47	0.000	0.35
	1	321.47	0.000	0.87
Pre-test	1	4.1	0.048	0.08
Group	1	22.79	0.000	0.32
Error	47			
Total	50			

on the independent t test results ($P<0.001$), suggesting that the vid-cast group outperformed the lecture-group.

As Table 6 shows, there was a statistically significant difference between the lecture and vid-cast groups, F (1, 47) = 22.79, $P<0.001$, partial $\eta^2 = 0.32$. The vid-cast group performed better, statistically than the lecture group.

Discussion

According to the findings, the mean of the post-test scores for the vid-cast group was significantly higher than that of the group trained by the lecture-based method. In line with our findings, Aloraini compared the use of two methods of multimedia and lecturing and found that there was a significant difference in the knowledge level of the two groups ($P=0.05$), and more learning took place in the multimedia group.[37]

Similarly, Wahabi et al, performed a study on the effect of triage training through lecture and multimedia software on the learning of nursing students, where there was no meaningful statistical difference between the levels of learning through the two methods of lecture and multimedia software. However, the mean of the scores at the recall stage in the multimedia group was higher than those in the lecture group.[39] In our study, the mean of posttest scores of the vid-cast group was also higher than that of the lecture group, but the statistical difference in our study was significant. In a study performed by Zolfaghari et al, the effects of two methods of e-learning and lecture on the learning of nursing students were compared and the findings showed that the rate of learning in both methods was similar.[40]

In addition, the results of this study confirmed the findings of a 2021 study by Chelsea Stunden et al., Which aimed to evaluate the results of a multimodal e-learning course for a group of first-year medical undergraduates. This study also concludes that multimodal e-learning can be a good way to improve learning outcomes and learning experiences for undergraduate medical students who do not have access to corpses.[41] Matheus Lemos Azi et al. Also conducted a study in 2022 to evaluate the effectiveness of an online course to orthopedic surgeons' development to acquire the core competWencies needed to prevent and treat fracture-related infections (FRI). In this study, an online questionnaire with 16 questions was created through six clinical scenarios. Participants were invited to answer the questionnaire before and after the course. At the end of the e-learning course, the mean evaluation score for the prevention, diagnosis and treatment of FRI surgery increased significantly. Finally, this study concluded that the e-learning course was effective and significantly increased the knowledge of the course users. This study also confirms the findings of our study.[42] The Noor M Alqudah study was conducted in 2020 to evaluate the e-learning experience among Jordanian university ophthalmologists. Stated in this study that E-learning is a type of education that uses information and communication technology to access online education and learning. The results of this study also showed that the e-learning experience was positive and most of the participants believed that e-learning will play a prominent role in the future of medical education, which will confirm the results of our study.[43]

Contrary to our study's findings, in a study performed by Akbarzadeh et al among medical students in electrocardiographic interpretation, the use of multimedia in teaching the students showed the same

effects as lecturing in a classroom.[44] In a study performed by Ramazani et al comparing three methods, lecturing, e-learning, and concept mapping, in nursing education, there was no statistically significant difference between the lecturing and e-learning groups.[45] In a study by Healy et al comparing e-learning and lecturing among surgical assistants, the researchers found similar results in both groups.[46] Differences in the findings of those studies might be due to differences in the topic of training (burns) and the difference between participants, who were medical interns in this study.

Limitations
This study has some limitations. First of all, we did not measure the participants' technology literacy level or their familiarity with the educational software used in the study, Storyline. Students in the lecture group may have had access to the vid-cast, even though we asked their counterparts to observe research principles.

Conclusion
The findings of our study showed a significant difference between two groups, lecture, and vid-cast, in post-test scores, where the scores of the vid-cast group were higher than the other group, suggesting that the learners who were trained by vid-cast outperformed the learners trained by the lecture in an in-person class. It is suggested that e-learning, especially with interactive content, be used as a supplementary or alternative method for training interns in burn infection and care training. Curriculum designers in medical education could use the findings of this study. However, further studies on other medical subjects could better consolidate the findings of this study.

Study highlights
- One of the most important objectives of the education system is to familiarize the learners with up-to-date knowledge by using appropriate and effective teaching methods that will motivate and enhance teaching and learning processes.
- The application of modern teaching methods can facilitate a learning process and promote learning motivation in the learner as well
- This quasi-experimental study was conducted as a pre-post non-equivalent double group, and the effect of two teaching methods of lecture and vid-cast via interactive electronic content on medical students' learning was evaluated.
- It is suggested that e-learning, especially with interactive content, be used as a supplementary or alternative method for training interns in burn care. Curriculum designers in medical education could use the findings of this study.

Authors' contribution
MR performed the experiment. ZS designed the study method. SHB and ZH contributed to the manuscript development. AD supervised the study and revised the manuscript.

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