Original Article

The Effect of Self e-Learning before "Low Back Pain" Lecture Using Pre- and Posttest Examination Scores among Medical Students

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Objective: To evaluate the efficacy of self e-learning (electronic learning) before class lecture among medical students.

Materials and Methods: The study employed a prospective cohort design. All students were tested by multiple choice examination before (pretest) and after (posttest) teaching lecture. Then data were collected by questionnaire after class to separate all students in two groups where group A studied self e-learning before class, while group B did not. After that, all data analysis determined mean, SD, median, and t-test.

Results: Of 175 students divided into group A 106 (60.57%) and group B 69 (39.43%). Group A had significantly higher scores than group B both pretest (*p*-value <0.0001) and posttest (*p*-value 0.0138). Furthermore, the difference between posttest and pretest score in group B significantly increased more than in group A (*p*-value <0.0001).

Conclusion: Self e-learning before class was effective to increase understanding in contents both before and after class. However, class lecture is still important and effective by increasing the posttest score compared to pretest score in group B more than group A.

Keywords: E-learning, Medical students, Class lecture, Score, Orthopedics

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Educational programs for medical students have been developed during the past years[(1)]. The use of internet and web-based learning has been increased. The objective is to improve learners' abilities in self-studying in and outside of class. Internet can be integrated in many teaching-learning methods such as lecture, case discussion and interactive class. It can be used for testing with multiple choice, essay, or even interactive questions. The teacher could interact with the student at real appointment times. Furthermore, students could leave questions or answers and discuss feedback through specific social network groups. This could create an effective and stimulating environment for learning. Thus, the use of internet for medical curriculum has been improved and developed.

However, literature reporting the advantages of internet learning for medical student syllabus is limited. Therefore, the objective of the authors was to evaluate the efficacy of self e-learning (electronic learning) before class lecture among medical students using pre- and posttest scores.

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Materials and Methods

The present prospective cohort study of all fifth-year medical students attending the Orthopedic Department was conducted between May 2014 and April 2015 at Ramathibodi Hospital, Mahidol University, Bangkok, Thailand.

First, all medical students have been encouraged to do self e-learning one week before the "low back pain" lecture. All principal contents were as same as in the lecture. After that, they completed the questionnaires regarding "whether you used self e-learning or not", type of equipment, internet access, and the quantity and quality of self-learning. Then they were tested about "low back pain" before (pretest) and after (posttest) class lecture by the same teacher. Data were collected by questionnaire separating all students in two groups where group A studied self e-learning before class and group B did not (Figure 1). After that, all data analysis determined mean, SD, median, and t-test. All data were recorded using the Stata/MP 12 Program. Statistical analysis was performed using IBM SPSS statistics,

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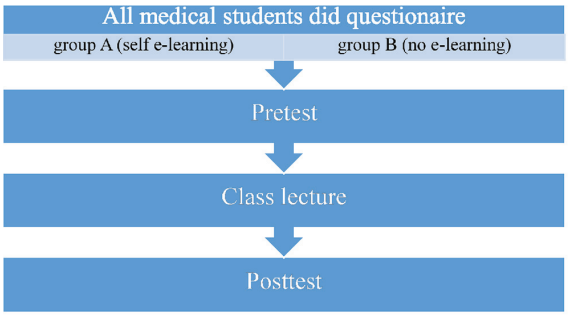

Figure 1. Flow chart showed method.

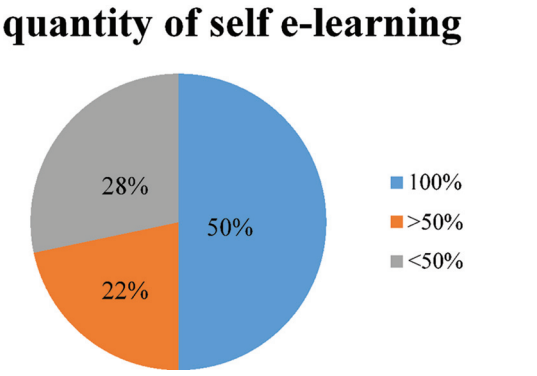

Figure 2. Quantity of self e-learning (total video time is 100%).

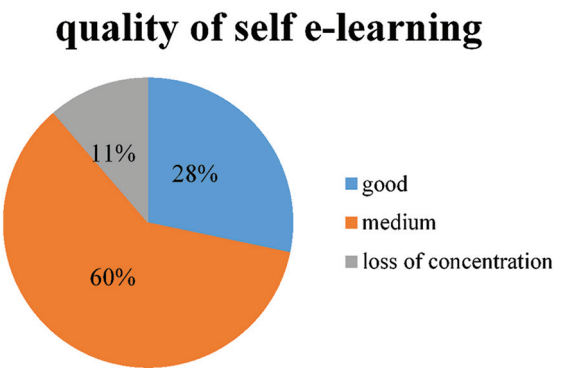

Figure 3. Quality of self e-learning.

version 23.0 (SPSS Inc., Chicago, IL, USA). A *p*-value less than 0.05 was considered statistically significant.

Results

In Academic Year 2014, 175 medical students were enrolled in the study. Of these, group A had 106 (60.57%) and group B had 69 (39.43%) students. In group A, complete self e-learning (from beginning until the end of the video) scored 53 (50%), more than 50% of the video scored 23 (22%) and less than 50% of the video scored 30 (28%) as shown in Figure 2. The quality of self e-learning was classified as good, fair, or poor attention. The questionnaire revealed good attention scored 30 (28%), medium attention scored 64 (60%), and poor attention scored 12 (11%) as shown in Figure 3. The most common IT equipment was laptop (55.6%), using Wi-Fi (88.7%), and at hospital (76.4%). More than 90% of medical students were satisfied with self e-learning as shown in Table 1.

Regarding efficacy of e-learning, group A had significantly higher scores than group B in both pretest (*p*-value <0.0001) and posttest (*p*-value 0.0138), as shown in Table 2. Furthermore, the difference between pretest and posttest scores in group B (40.76%) significantly increased more than in group A (24.91%) (*p*-value <0.0001) as shown in Table 3 and Figure 4.

Discussion

Presently, technology is more advanced and teaching-learning methods in medical education go beyond lecture-based instruction. Tele-education allows distance learning using Information Communication Technologies [ICT]. With the emergence of students, who have grown up with technology, e-learning as a part of tele-education has become highly popular in the last decade. The application of e-learning in medical student curricula is increasingly observed. The advantages of this application are access to the lessons anytime and almost anyplace. It can be studied repeatedly depending on learner interest. It can be used for self-education, interactive tests or questions, discussion, and feedback sharing information for examinations in the medical field[2,3]. Integrating e-learning in medical education is supported by adult learning theory; learners control the content, sequence,

Table 1. Questionnaire of self e-learning (%)

Equipment	Internet	Facility	Source	Contents	Satisfaction
Desktop 5.6	ADSL (LAN) 6.6	Home 18.9	Excellent 23.6	Excellent 23.6	Excellent 23.6
Laptop 55.6	Wifi 88.7	Hospital 76.4	Good 55.7	Good 68.9	Good 70.0
Tablet 27.4	3G 4.7	Others 4.7	Fair 17.9	Fair 7.5	Fair 5.4
Mobilephone 10.4	Others 1.0		Poor 2.8	Poor 0.0	Poor 1.0

Table 2. Number of medical students in group A and B and compared pretest and posttest scores in each group by *p*-value

	Number	%	Pretest score (mean ± SD)	Posttest score (mean ± SD)
Group A	106	60.57	2.44±0.13	7.38±0.15
Group B	69	39.43	1.37±0.10	6.77±0.19
p-value			<0.0001	0.0138

Table 3. Percentage of score increase (posttest minus pretest) in each group, results showed percentage scores in group B increased significantly more than in group A

	Mean ± SD	*p*-value
Group A	24.91±2.45	<0.0001
Group B	40.76±2.52	

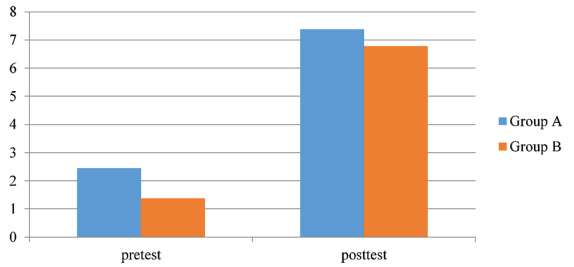

Figure 4. Comparison of pretest and posttest scores in each group.

pace, time, and media, tailoring different learning styles[4-6].

However, the concept that e-learning could be effective in knowledge acquisition or superior to traditional teaching methods is still debated. Our study focused on the effect of before class e-learning regarding understanding of a "low back pain" lecture by evaluating pre- and posttest examinations. The results in our study showed that the group attending e-learning before traditional lectures concerning "low back pain" had significantly higher pre- and posttest scores than the control group. These support the concept that e-learning could provide knowledge before class (pretest score) and could improve learning ability compared with the traditional lecture (posttest score). Moreover, the difference between pre-and posttest scores increased significantly in the e-learning group compared with the control group, reflecting improved understanding of the class lecture in the e-learning group. Previous studies of the influence of e-learning on gains in student knowledge have showed variable results, but not directly compared with the traditional lecture. Silva et al[7] found medical students of the Dermatology Department who participated in online discussions associated with class activities had significantly higher posttest scores than those who only participated in classes affirming the same effectiveness of e-learning in the present study. Grasl et al[8] studied the efficacy of the Unified Patient Project [UPP], a type of web-based e-learning that is case-oriented, blending concepts that the students can discuss among themselves and the teacher compared with lecturing alone. The result of differing of pre-and posttest scores showed UPP effectively increased understanding of the contents only in higher pre-knowledge students. The lower pre-knowledge group benefitted more by face-to-face teaching.

On the other hand, Khasawneh et al[2] found that e-learning did not improve knowledge in either pre- or posttest scores concerning pediatric exam results. However, medical students were satisfied and improved their self-confidence, representing the benefits of e-learning.

Bandla et al[9] showed that learning outcomes, interpreted by multiple-choice examination, standardized patient encounter and patient write-up, were roughly equivalent between face-to-face and online learning in a sleep disorder curriculum for medical student. However, the cost effectiveness of online learning comprised a more economically beneficial platform for clinical clerkships. That may be because some subjects experienced difficulties in understanding only self e-learning, reflecting that class lecture was still important. The in-class lecture still had a beneficial support by our result that posttest scores were significantly increased compared with pretest scores in the control group.

Another study[10] used e-learning as a free web application, which was represented as Flashcards that contained knowledge and open ended questions. The present did not have pre- or posttest scores, but surveys showed that students highly agreed that the system was useful and was willing to use it as a reference tool. The authors suggested it helped individualizing study (adaptive learning), enhancing learner's interactions with others (collaborative learning) and transforming the role of the teacher. Hong et al[11] used e-learning as a user-friendly online interactive teaching and examination model adjunct to traditional bedside teaching concerning dermatology. They found that more than 90% preferred the online examination to a traditional paper and pencil examination reporting that the quality of digital images was clearer.

Many studies[6,7,12] and the authors agreed that e-learning technologies should not replace traditional training but be used to complement it, forming part

of a blended-learning strategy. Blended learning is a combination of online and face-to-face learning. Morton et al[12] found that undergraduate students prefer blended learning to either face-to-face or online alone. However, some studies[8] found students' satisfaction with blended learning was not significantly lower than face-to-face teaching. Furthermore, the advantages of using a blended learning course instead of purely online learning is that resources can be updated more easily because tutors can highlight how scientific knowledge has advanced in their tutorials[12].

Although many studies have shown that e-learning program was useful and encouraged their students to use it, the e-learning environment was not accessed by 100% of the students on a self-determined survey, similar to the present, only 60.57% of the group experienced self e-learning before class. Mahnken et al[13] concluded that extrinsic motivation resulted in a more extensive use of e-learning units compared with intrinsic motivation. In addition, easy access to the internet and quality of e-learning were very important to attract medical students to use the new learning technology.

One limitation in the present study was the small sample size. The authors evaluated the pre- and posttest scores just before and after class lecture, which may not have reflected the long-term effects or application of knowledge of the students. The present was performed using a "low back pain" lecture and did not include more difficult topics. In more complicated lessons, the effects of self e-learning may differ regarding some points of view.

Conclusion

Self e-learning before class was sufficiently effective to increase the understanding of contents both before and after class. However, class lecture is still an important and effective method because the increased posttest scores compared with pretest scores in the control group were higher than in the e-learning group.

What is already known on this topic?

The application of e-learning in medical student curriculum is increasingly used now. In theory, there are many advantages of this application including it can be accessed to the lessons anytime and almost anyplace. E-learning might improve and facilitate the understanding of the medical lessons. However, the concept that e-learning could be effective in knowledge acquisition or superior to traditional teaching methods is still debated and needed to be proved.

What this study adds?

The study revealed significantly higher scores in e-learning group on pretest and posttest scores. This result supports the efficacy of self e-learning to improve the understanding of low back pain class both before and after the lesson. However, the class lecture may still have an important part since the difference of posttest and pretest scores was significantly higher in non-e-learning group. This showed that the class lecture could help to increase the scores more in non-e-learning group.

Potential conflicts of interest

The authors declare no conflict of interest.

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