Original Research

The Combination of Lecture-Based Education and Computer-Assisted learning (CAL) in the Preliminary Hospital Pharmacy Internship Course

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Abstract

Introduction: Developments in the field of information technology has profoundly affected our educational system. The efficacy of Computer-Assisted Learning (CAL) has already been evaluated in medical education, but in this study, we examined the efficacy of CAL in combination with Lecture-Based Education.

Methods: This quasi-experimental before and after study included 33 senior-year pharmacy students who had passed the preliminary hospital pharmacy internship course. Pre-test questionnaires were given to the students in order to examine their knowledge and attitudes. Then, three chemotherapy prescriptions were given to them. Pharmacology recourses also were available virtually. At the end, students were asked to answer post-test questionnaires with questions based upon knowledge and attitude.

Results: The mean score of their knowledge was 3.48 ± 2.04 of 20 before intervention and 17.82 ± 2.31 of 20 after intervention. There was a statistically significant difference between the pre-test and post-testing scores ($p < 0.001$). The mean attitude score of students before intervention was 42.48 ± 15.59 (medium) and their score after intervention was 75.97 ± 21.03 (high). There was a statistically significant difference between pre-test and post-test results ($p < 0.000$).

Conclusion: The combination of Lecture-Based Education and Computer-Assisted Learning improved senior pharmacy students' knowledge and attitude in hospital pharmacy internship course.

Introduction

Information technology (IT) has made great advances over the past few years. Personal computers and laptops as IT productions have affected all features of human life. Nowadays, these productions have wide use in education systems. They may improve education, bring about development, and cause active learning. In most medical colleges around the world, computer assisted learning is applied to qualify medical education. Computer assisted learning (CAL) is defined as a kind of education that uses a computer to teach content.[1-4] CAL encourages students to actively participate in learning processes. Many studies have been done on the effectiveness of CAL in medical education. Using CAL has been reported to decrease IV drug administration errors and improves the clinical skills of nursing students.[5-6] In another study on nursing students, web-based education had improved their knowledge about bird flu.[7] Najafi and Eteraf-Oskouei also found out that using computer simulation improves the learning quality of the pharmacology course among pharmacy students.[8] Case-based learning as another method of education has been reported to be effective in teaching clinical pharmacokinetics.[9] Considering the increasing role of pharmacists in the healthcare system, education of pharmacy students seems to be very important. Owing to difficulties of anticancer drug prescriptions, learning how to release them is more important than releasing other drugs. IT also revolutionized drug administration and prescription, and accelerated these processes. Today, the approach to anti-cancer prescriptions is being taught traditionally in our pharmacy school. The traditional method is lecture-based, and its effectiveness is uncertain. The role of the education process on the effectiveness of electronic prescriptions to reduce errors and quality improvement has not been studied yet.[10]

Simulation of clinical situations for pharmacy students seems to improve their occupational skills and encourage them to study more and increase their knowledge.[8] Since these clinical situations are so important, using new methods to educate these people is necessary. In this study, we have examined the efficacy of Computer-Assisted

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Learning in combination with traditional Lecture-Based Education on senior pharmacy students' learning in the preliminary hospital pharmacy internship course.

Materials and Methods

This quasi-experimental before and after study has been done in the pharmacy faculty of Tabriz University of Medical Sciences during the 2010-2011 academic year. The sampling method was a census, and all of the senior pharmacy students who had passed the preliminary hospital pharmacy internship course were included. Students who not passed the prerequisite courses were excluded from the study.

Pre-intervention

Before intervention, the traditional Lecture-Based Education method was in place.[4] An hour long class was held, and the approach to chemotherapy prescriptions was taught to the students.[3] Chemotherapy prescriptions were discussed using an oral presentation. At the end of the class, they were asked to answer the questionnaire. Another questionnaire was given to students that evaluated their attitude towards using Computer-Assisted Learning in their education.

Intervention

After one week, students were asked to attend the media center of the pharmacy school. They were given access to private computers and the 11th edition of *Basic and Clinical Pharmacology* by Katzung in PDF format (2008), the 12th edition of Goodman and Gilman's *The Pharmacological Basis of Therapeutics* in chm format, the 35th edition of Matindale's *The Complete Drug Reference* (2006), *Physicians' Cancer Chemotherapy Drug Manual* software (Chu 2007), and the 7th edition of *Principles and Practice of Oncology* (Devita 2005), all of which were installed to the computers.

The other three chemotherapy prescriptions and post-test questionnaires were given to the students. They were given enough time to answer these questions. After four hours, they were also asked to answer the attitude questionnaire.

Data gathering tool

Knowledge pre-test and post-test questionnaires included 15 questions about determination of anti-cancer used protocol, type of cancer, dose limiting toxicity of anti-cancer drugs, frequency of used protocol, reason of assisted drugs administration, irritant effects of drugs, vesicant effect of anti-cancer drugs, dose adjustment in renal failure, dose adjustment in liver dysfunction and nausea-creating effects. At the end of the questionnaire, a case had been designed and five questions were asked about this case and the prescription. The validity of this researcher-made questionnaire was approved by the expert opinion method. Reliability of the questionnaires was approved using SPSS 20 software and Cronbach's alpha co-efficient measured at 0.9.

The attitude questionnaire also included 15 questions about the items discussed above.

This questionnaire had 15 questions about students' attitude, and all of them were designed using the Likert scaling method including very high, high, medium, low and very low. Validity and reliability of these questionnaires was approved by experts, like the previous one. Pre-test and post-test questionnaires consisted of the same content.

Statistical analysis

Data were analyzed using SPSS version 20, and a paired T-test was used to compare pre-test and post-test questionnaires. $P < 0.05$ was considered significant.

Result

Thirty-three senior pharmacy students who had passed the preliminary hospital pharmacy course were included for the study. Ten of the participants were male (30.3%) and 23 were female (60.7%). The mean score of their knowledge before intervention was 3.48±2.04 and was 17.82±2.31 after intervention. There was a significant difference between pre-test and post-test scores ($p<0.001$). The mean attitude score of students before intervention was 42.48±15.59 (medium) and their score after intervention was 75.97±21.03 (high). There was significant differences between pre-test and post-test results ($P<0.000$), as seen in Table 1.

Discussion

This study showed that a combination of case-based and Computer-Assisted learning improved senior year pharmacy students' knowledge and attitude in a hospital pharmacy internship course. Amirnia had asked Tabriz University of Medical Sciences students' viewpoints on using e-learning in medical education, and found students' tendency toward learning electronically.[11] Many studies evaluated the efficacy of using IT and E-learning in the medical education system. Baghayi found that web-based education improved the learning quality of students studying cardiac dysrrhythmias when compared to lecture-based education.[12] Akbarzadeh also examined web-based education in medical students' learning of normal ECG, and reported that this method of education was not significantly different from the traditional method, and was very interesting and exciting for medical students.[13] In another study, Khatooni reported that e-learning was as efficient as traditional methods in improvement of nursing students' knowledge of bird flu.[4] Our findings showed significant improvement in students' knowledge in contrast to the findings of Khatooni and Akbarzadeh.[7-13] This difference can be accounted for because of research methodology. Their study was done by case-control method, but our study was done using the before and after method. These differences could also be because of our research in interventions, since we combined some innovative methods of education, including CAL, CBL, team-working and self-studying. Jafari's findings replicate this claim. She compared lecture to team-based learning and showed a significant difference between TBL and Traditional Methods.[14] New teaching methods

Table 1. Students' attitude table

Individual's Attitude on efficacy of computer assisted learning in combination with lecture based education on...	Mean before intervention	Mean before intervention	P value
Obtaining an anti cancer prescription protocol	42.42±15.57(medium)	84.85±17.40(very high)	0.000
Enhancing dose-limiting toxicities (DLTs) of anti-cancer agents in a recipe	44.44±16.66(medium)	88.89±16.66(very high)	0.000
Determining the usage frequency of (i.e. periods of 21 days) anti-cancer treatment protocols available in a prescription	45.45±16.81(medium)	81.82±17.40(very high)	0.000
Determining the root cause of auxiliary drugs prescription (i.e. anti-vomiting medications or antihistamines) in a cancer patient prescription	46.91±21.20(medium)	80.25±19.08(very high)	0.000
Determining the presence of inflammation induced by (irritant) anti-cancer agents (in case of contact with skin or mucosa) in a prescription	39.39±13.48(low)	72.73±25.02(high)	0.002
Determining the presence of effects of vesicant (tissue damage if the drug leaks out of the vein) anti-cancer agents in a prescription	39.39±13.48(low)	81.82±17.40(very high)	0.000
Detecting of anticancer drugs that need dosage adjustment in case of renal failure presence-	38.89±12.78(low)	74.07±21.55(high)	0.000
Detecting anticancer drugs that need dosage adjustment in case of liver failure presence-	38.10±12.10(low)	76.19±24.20(high)	0.000
Recalculating the dose of anticancer drugs in recipe of a renal failure patients according to serum Creatinine level or clearance	43.33±16.10(medium)	80.00±17.21(very high)	0.000
Recalculating the dose of anticancer drugs in recipe of a liver failure patients according to serum Creatinine level or clearance	33.33±21.36(low)	70.83±21.36(high)	0.002
Calculating dosages of anticancer drugs (according to height, weight and age) in a prescription	36.36±10.05(low)	81.82±17.40(very high	0.000
Determining the level of nausea induced by anti-cancer drugs	46.03±16.58(medium)	79.37±16.58(high)	0.000
Authority to fulfill the possible problems and questions raised in a specialized hospital	39.39±13.48(low)	63.64±17.97(high)	0.004
Acquainting students with electronic resources	42.11±15.08(medium)	82.46±23.22(very high)	0.000
Informing students with the role of the pharmacist in the treatment process	45.83±19.19(medium)	73.61±21.93(high)	0.000

have been put to use in teaching pharmacy students. Simulation-based medical education was reported as an effective method of teaching pharmacology in Najafi's study.[8] Dupuis also reported CBL as an effective method of teaching in a clinical pharmacokinetics course.[9] Our study has evaluated the efficacy of CBL, CAL and TBL in combination. It also showed students' attitude toward this method. A basic defect of our study was the absence of a control group. More studies should be done in the future on this subject with even more complete methodology.

Conclusion

The combination of case-based and Computer-Assisted Learning improved senior pharmacy students' knowledge and attitude in the hospital pharmacology internship course.

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