Evaluation of the Effectiveness of a Computer-Based Learning (CBL) Program in Diabetes Management

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Objective: *Evaluate the effectiveness of a computer-based program (CBL) introduced to improve the clinical and patient history taking skills of clinical pharmacists in the area of diabetes management. This program involved a self-learning approach utilizing interactive digital videos, video simulations, and audio clips.*
Material and Method: *The present study compared the pre- and post-test results of two groups of final year pharmacy students. The study group used the CBL program and the control group was exposed to formal lectures and discussions.*
Results: *Eighty-three volunteers entered the present study. Forty-three were constituted into the study group, and forty acted as the control group. The overall results showed that the study group post-test scores in all basic knowledge areas were significantly higher than the control group (p = 0.001). Whereas, there was no statistical difference between groups in patient history taking skills (p = 0.645). Nevertheless, the post-test scores of SOAP writing skills in the study group were statistically higher than the control group (p = 0.001).*
Conclusion: *Overall, the CBL program was considered effective in the development of basic knowledge of diabetes and in the improvement of patient history taking skills.*

Keywords: *SOAP note writing, Patient profile, Patient history taking*

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The authors developed a computer-based learning (CBL) program in the area of diabetes management using interactive, self-learning techniques[1]. The contents of the program included an introduction to diabetes, basic information relating to the condition, patient history taking, patient monitoring, and self-assessment tests. One of the most attractive applications of the present program is the use of digitalized video clips of patient interview to simulate pharmacist-patient interactions. This multimedia technology has already been employed in CAL programs in Medicine, Nursing, and Pharmacy[2-5]. Previous studies showed positive outcomes regarding the acquisition of skills using self-learning materials[6-12]. While the results of the introduction of this program were generally favorable, there were some limitations in its application, such as a familiarity with multimedia interactive functions of a CBL program, the duration of the program, and minor problems with the audiovisual effects.

As a follow-up to the introduction of this new program, the authors aimed to evaluate its effectiveness in the Thai context, focusing on the development of knowledge of diabetes management, improvement of patient history taking skills, and self-monitoring. It was anticipated that this evaluation would assist the fine-tuning of the use of the program as a self-learning tool in the teaching and learning of practicing clinical pharmacists and university pharmacy students.

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Material and Method

Evaluation of the Effectiveness of the CBL program

The effectiveness of the program was evaluated by the comparison of the results of pre- and post-studies involving eighty-three final year students in the Department of Pharmaceutical Sciences at Ubon Rajathanee University, Thailand.

Materials

The materials in the study involved:

1. Patient history profile form
2. SOAP note (S = subjective, O = objective, A = assessment, P = plans)
3. Pharmacist-patient interview scripts
4. Multiple choice questions in diabetes knowledge
   - Pre-post tests
5. Patient cases for CBL program
6. Demonstrating case: patient history taking skills - CBL program
7. Patient case: patient history and SOAP notes
   - Post test

The study involved eighty-three final year pharmacy students and was conducted in February and March 2006 at the Pharmacy Practice Unit, Ubon Rajathanee University. All participants had passed some prerequisite courses related to pharmaceutical care and patient history, including clinical pharmacy, clinical pharmacology, and general medicine subjects. The students were randomly divided into two groups, a study group (43), and a control group (40). All participants completed a pre-test that assessed their basic knowledge in diabetes management. The study group then undertook a diabetes management session of approximately 2 hours' duration[a] ([a] time spending was roughly estimated by the volunteers. The appropriate time spending in CBL session was not performed at this point) using the CBL program including basic knowledge review, patient history taking demonstration, and MCQ assessment. This group was allowed access to the program on the departmental computers. The control group had two three-hour sessions involving a brief lecture about patient history taking, a SOAP writing skills, and a group discussion of diabetes management. There was also some consideration of diabetic patient cases.

At the end of March 2006, a post test paper was completed by both groups to assess basic knowledge in diabetes management, patient history taking, and SOAP writing skills. Results were assessed by descriptive and analytical statistics, including total scores, percentages, means, and $\pm$ standard deviations. T-test was also used to determine the significance of differences between the groups. A p-value of less than 0.05 was considered statistical significant difference.

Results

Forty-three randomly selected pharmacy students constituting the study group completed the CBL program and forty students acting as the control group attended lectures and case demonstrations as part of the evaluation of the effectiveness of the program. Comparisons of the study group's pre- and post-test scores showed that the latter were statistically significantly higher in all areas ($p < 0.05$; see Table 1). For the control group, post-test scores were significantly higher than pre-test scores in all areas except nutrition ($p < 0.05$; Table 1). Comparisons of post-test scores of basic knowledge of diabetes management between the groups showed that the study group had statistically significantly higher results ($p < 0.05$) (Table 2).

Comparisons of the results of the post-test showed no statistically significant difference between the groups regarding patient history taking skills ($p > 0.05$; Table 3). However, there was a statistically significant difference between the groups in that the study group performed better than the control group in relation to SOAP note writing skills ($p < 0.05$) (Table 4).

Table 1. Pre- and post-test scores of the study and control groups (n = 83)

Groups	Mean $\pm$ SD						t	df	p-value (2-talied)
	Diabetes contents (23)	Patient monitoring			Total scores (68)	Percentage (100)			
		Nutrition (25)	Exercise (8)	Self-monitoring (12)					
Study (43)									
Pre-test	17.16$\pm$1.8	15.81$\pm$2.7	5.34$\pm$1.3	6.93$\pm$1.72	45.23$\pm$4.7	66.51$\pm$6.89	-2.441	42	0.001
Post-test	18.72$\pm$1.2	22.27$\pm$2.3	7.09$\pm$0.8	9.02$\pm$1.7	57.09$\pm$4.2	83.95$\pm$6.19			
Control (40)									
Pre-test	16.95$\pm$2.1	17.17$\pm$2.1	65.52$\pm$1.3	5.65$\pm$1.7	45.22$\pm$5.3	66.50$\pm$7.79	-11.47	39	0.019
Post-test	18.42$\pm$1.3	16.75$\pm$3.1	5.8$\pm$1.1	7.42$\pm$1.4	47.87$\pm$4.4	70.39$\pm$6.55			

Table 2. Comparison of the 2 groups' post-test scores (n = 83)

Groups	Post-test scores (Mean ± SD)	t	df	p-value
Study group (43)	57.09±4.2	-25.42	81	0.001
Control group (40)	47.87±4.4			

Table 3. Post-test scores of patient history taking skills (n = 83)

Groups	Mean ± SD					Percentage (100)	t	df	p-value (2-talied)
	Demographic data (5)	Medication Hx (5)	SH & FH (5)	Miscellaneous (5)	Total scores (20)				
Study group (43)	2.90±0.5	3.08±0.5	2.87±0.6	2.61±0.7	11.47±1.6	57.35±8.3	-0.462	81	0.645
Control group (40)	2.72±0.8	3.04±0.5	3.16±0.7	2.45±0.9	11.30±1.6	56.5±8.4			

Table 4. Post-test scores of SOAP note writing skills (n = 83)

Groups	Mean ± SD					Percentage (100)	t	df	p-value (2-talied)
	Subjective (5)	Objective (5)	Assessment (5)	Plans (5)	Total scores (20)				
Study group (43)	4.06±0.2	4.01±0.2	3.03±0.8	2.98±0.8	14.13±1.7	70.65±8.4	5.01	81	0.001
Control group (40)	3.85±0.4	3.84±0.5	2.50±0.7	2.62±0.7	12.78±1.9	64.03±8.5			

Discussion

The CBL program in diabetes management was initially found to be a practical, user-friendly, and interactive self-learning tool, especially for hospital pharmacists. Some limitations were identified and adjustments were made to the package prior to a further evaluation involving final year pharmacy students.

Results of this evaluation of the program's effectiveness showed that the forty-three participants who undertook the CBL program made significantly better gains in basic knowledge and SOAP note writing skills compared to the control group ($p < 0.001$, $p < 0.001$ respectively). A number of studies have demonstrated that the same or better scores can be achieved by the use of a CBL program compared to more traditional methods of teaching and learning such as lecturing and group discussions[9-12]. This outcome may be due to better opportunities provided by interactive, user-friendly self-learning materials to gain an adequate knowledge of diabetes and develop patient solving skills.

Both the study and control group performed similarly in skills related to patient history taking ($p = 0.645$). This may indicate the necessity for students to be exposed to the real-life patient interview process, irrespective of teaching and learning techniques used. The inclusion of either patient interview video clips in the CBL program or patient case discussion may not appear to adequately improve the participants' skills in this area.

The study group performed significantly better than the control group in SOAP note writing skills ($p = 0.001$). This may be due to the number of practice opportunities offered by the CBL program to the study group members. The provision of adequate

patient profiles, patient interview video clips, and the requirement for participants to evaluate themselves via the self assessment at the end of the program session may have assisted the development of judgment skills in the study group. Whereas, the control group exposed to lectures and discussions might not have offered the same opportunities to integrate knowledge and judgment to develop problem-solving skills.

However, there are a number of limitations. Firstly, the language used in the CBL program was English. This may present difficulties in the Thai context, especially in the patient interview video clips. Secondly, the large size of the packaged-program may make it inconvenient to post on a web site. Thirdly, there needs to be a range of patient cases included in the program to provide a variety of practice situations for the users. Finally, some external factors influenced the present study such as time spending, the frequencies of CBL program access, and the volunteer motivation should be further investigated. As a result, it might not be possible to conclude whether the higher scores in basic knowledge and SOAP note writing skills in the study group came from the program functions itself. Nevertheless, the program did give the opportunity for the users to gain an adequate knowledge and develop problem solving skills at a certain point.

Suggestions

1. The number of volunteers used in the present study was limited. Thus, more participants for future evaluations are required.

2. More program usability tests are needed to provide an improved perspective of the attitudes toward the program.

3. A study involving a range of participants from different institutes should be performed.

4. Further assessments of the effectiveness of the program in different hospital areas should be conducted.

Conclusion

Effective communication between patients and clinical pharmacists is essential for the accurate recording of patients' personal histories and the determination of appropriate pharmaceutical care plans. The CBL program might be a useful supplement for hospital pharmacists, and pharmacy students in self-learning. It contains information about diabetes, patient history gathering, and patient monitoring based on an up-to-date diabetes guideline, allowing users to be confident about the reliability of the data regarding diabetes management. The patient video clips are helpful for new practitioners or clerkship students who may have limited experience of hospital ward rounds. The program provides information about patient self-monitoring and demonstrates correct procedures for questioning patients, giving examples of acceptable questions and ways of developing a positive and relaxed atmosphere. Nevertheless, the traditional methods of teaching and learning are still necessary and can be performed in collaborated with this new strategy; a CBL program to develop adequate problem solving skills.

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การทดสอบประสิทธิภาพการทำงานของโปรแกรมคอมพิวเตอร์เรียนรู้ด้วยตนเอง เรื่องการดูแลรักษาผู้ป่วยโรคเบาหวาน

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วัตถุประสงค์*: วัตถุประสงค์ของการศึกษาครั้งนี้ เพื่อที่จะศึกษาถึงประสิทธิภาพการทำงานของโปรแกรมคอมพิวเตอร์เรียนรู้ด้วยตนเอง (CBL) ในด้านทักษะการเก็บประวัติผู้ป่วยเบาหวานโดยเภสัชกร ทั้งนี้โปรแกรมดังกล่าวถูกพัฒนาให้สามารถโต้ตอบกับผู้ใช้งานผ่านทางระบบดิจิตอลบันทึกภาพและเสียง, ระบบมัลติมีเดียและออร์ดิโอคลิปที่ใช้ในการบันทึกเสียง*

วัสดุและวิธีการ*: เปรียบเทียบค่าคะแนนเฉลี่ยจากการทำ pre-post tests ของกลุ่มทดลองและกลุ่มควบคุม โดยใช้นักศึกษาเภสัชศาสตร์ชั้นปีที่ 5 โดยที่กลุ่มทดลองจะใช้โปรแกรม CBL ในขณะที่กลุ่มควบคุมจะใช้การฟังบรรยาย และการเข้ากลุ่มอภิปราย ในการเรียนรู้เรื่องการเก็บประวัติและดูแลผู้ป่วยโรคเบาหวาน*

ผลการศึกษา*: มีผู้เข้าร่วมในการศึกษาครั้งนี้ทั้งสิ้น 83 คน แบ่งเป็นกลุ่มทดลอง 43 คน และกลุ่มควบคุม 40 คน ผลการศึกษาพบว่าค่าคะแนนเฉลี่ยด้านความรู้พื้นฐานเรื่องโรคเบาหวานของกลุ่มทดลองสูงกว่ากลุ่มควบคุมอย่างมีนัยสำคัญทางสถิติ ($p = 0.001$) ในขณะที่ทักษะด้านการเก็บประวัติผู้ป่วยเบาหวานนั้น ไม่พบความแตกต่างทางสถิติระหว่าง 2 กลุ่ม ($p = 0.645$) อย่างไรก็ตาม ทักษะการวางแผนการดูแลรักษาผู้ป่วยโรคเบาหวานในกลุ่มทดลองสูงกว่ากลุ่มควบคุมอย่างมีนัยสำคัญทางสถิติ ($p = 0.001$)*

สรุป*: จากการศึกษาครั้งนี้พบว่าโปรแกรมคอมพิวเตอร์เรียนรู้ด้วยตนเอง สามารถนำไปประยุกต์ใช้ในการพัฒนาองค์ความรู้ ทักษะการเก็บข้อมูลผู้ป่วยเบาหวานได้*