

Effects of A Mobile Phone Short Message Service on Nurses' Knowledge about Diabetic Ketoacidosis

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Abstract: *Introduction:* One of the nursing education purposes is improving professional qualification of nurses. Due to difficulties in lecture-based nursing training and uncertainty regarding the effectiveness of training through SMS, this study aimed to compare the effectiveness of using SMS and that of lecturing on nurses' knowledge about diabetic ketoacidosis. *Method:* This study was carried out in 2014 as a randomized intervention study. The subjects in this study were selected by cluster sampling among the nurses in the hospitals of Arak, Iran. Then, they were randomly divided into two intervention groups: through lectures (Group I: n = 43) and through SMS (Group II: n = 43). The first group was trained on diabetic ketoacidosis through lectures and the second group through short message service. One month past training, knowledge of nurses was assessed. The data gathering tool includes 1) Demographic questionnaire and 2) Knowledge and awareness of diabetic ketoacidosis questionnaire. Face and content validity of the instrument was obtained as 0.86 and its reliability as 0.83 in terms of internal consistency. The collected data were analyzed by SPSS 20 using frequency, percentage, mean, standard deviation, independent t-test, paired t-test and Analysis of Covariance. *Results:* The average age of the subjects was 32.71±6.92 years. There was no significant difference between the two groups in terms of demographic variables (Age, sex, education level, marital status). The results of this study showed that there was a significant difference between the pre-test and post-test scores in each group (P< 0/001). This means that both on the job training methods promoted awareness of the nurses. In addition, there was a significant difference between the post-test scores of the two groups (P< 0/001) as the average of scores in the lecture-based group was higher than that in the SMS-based group (P< 0/001). *Conclusion:* On the job training through lectures and short message service has been effective in increasing the knowledge of nurses. It is recommended that teaching strategies like using SMS is used, in addition to lecturing, as an efficient and cost-effective assistive tool in on the job training for nurses.

Key words: Diabetic Ketoacidosis • Nurses • Short Message Service (SMS) • Knowledge • Mobile phone

INTRODUCTION

One of the nursing education purposes is improving professional qualification of nurses. Professional qualification makes the nurses feel power and do their duties more effectively [1, 2]

Lecturing is the dominant form of teaching in educational centers and its main advantage is the possibility of presenting information to a large number of

learners [3, 4, 5]. Lecturing is a teacher-centered method which is still considered as an important teaching method in spite of developing new techniques and promoting knowledge [6]. Despite introducing new learning methods and availability of reference books, computer and internet, lecturing is still one of the typical methods of presenting information; for it is the safest and easiest way of learning and allows for more control over the class [7, 8]. The results of various studies show that teaching through

lectures has a positive and significant effect on the rate of learning and remembering the content [9, 10]. Besides the advantages such as cost-effectiveness and direct and organized presentation of information, lecturing has also some disadvantages. This is a passive teaching method not suitable for teaching practical skills and fortifying mental skills in high levels of learning. In addition, individual differences are not taken into consideration in this method and there is a possibility for learners to forget the content within a short time [11].

Today, traditional methods of teaching and learning lose their efficiency with the advent of new technologies and methods. To keep pace with their constantly changing surroundings, learners should seek new practices and methods for exchanging knowledge and promoting learning. In order to increase knowledge of the people in society, The Third Wave Civilization needs a powerful tool which is in time, cost-effective, quick and reliable [12,13].

Traditional classes are no longer much effective, as they are tied to a certain time and place and cannot provide the suitable and real context for learning. Accordingly, many of education systems in recent decades have attempted to improve learning by introducing and applying new technologies [14]. Mobile technology is one of the manifestations of information and communication technology which has entered, like other communicative technologies, to education area and has been proposed as mobile-based education [15]. Using mobile phones technology in education can improve learning process [16]. This practice allows the learners to study in various times and places and in turn allows for freedom of action and creativity [17]. Mobile technology can develop the ability to access, discover, discuss and exchange information using SMS [17, 18]. SMS is a mutual technology creating a mutual relationship between instructor and learner and also among learners and instructors [17]. Studies show that using SMS in education has been welcomed [19, 20]. However, results of the studies on the effectiveness of using SMS in medical education are inconsistent [21, 22]. The question to answer here is whether SMS is effective in on the job training of nurses and if it is, whether on the job training through SMS.

As it is noticed in comprehensive review of scientific literature, there is no study comparing the effectiveness of two education methods of lecturing and using SMS in on the job training of nurses. It seems that SMS with its own features and attraction and also possibility of sending the required information is useful especially for nurses in their on the job training. As a result, given the

problems, costs and the time required in nursing training through lectures, seminars and workshops and uncertainty regarding the effectiveness of education in class, the researchers in this study aim to compare the effectiveness of two methods of education as lecturing and using SMS.

MATERIALS AND METHODS

This study was carried out in 2014 as a randomized intervention study. The subjects were selected among the nurses in the hospitals affiliated to Arak University of Medical Sciences. The size of sample was obtained as 41 subjects in each group through pilot study and comparing the means of two populations considering $\alpha=0.05, \beta=0.2$, mean difference=3.54 and standard deviation=5.7. Finally, considering the possibility of sample loss, 43 subjects were selected in each group.

Sampling method in this study was cluster sampling in this way that public hospitals affiliated to Arak University of Medical Sciences across the city, including Vali-e-Asr, Amir Al-Momenin, Taleghani, Amir Kabir and Khansari Hospitals, were firstly considered as the cluster. Then, two hospitals were randomly selected, that is, Vali-e-Asr and Amir Al-Momenin Hospitals. Afterwards, were randomly selected out of the nurses working in these two hospitals 86 nurses as sample. Then, they were randomly and through tossing divided into two groups of intervention through lecturing (n=43) and intervention through using SMS (n=43).

Criteria to be considered as subjects' characteristics to enter the study included tendency for participating in the study, working as a nurse or supervisor in a hospital ward in Arak, at least one year working experience, having mobile phone with the ability of sending and receiving SMS. Those who were not willing to participate in the study in any stage were excluded from the study.

The tool used for collecting data included a questionnaire containing demographic information (Participants' age, sex, education level and residence and the hospital in which they work) and knowledge and awareness of diabetic ketoacidosis questionnaire. Knowledge and awareness of diabetic ketoacidosis questionnaire is a research-made tool prepared based on scientific available information and research on diabetic ketoacidosis in Iran and all over the world. This tool consists of 23 clauses designed as multiple choice questions derived from the taught content. Validity of this tool was obtained through content validity and face validity. Primarily designed, the questions were given to 5 faculty members of Arak University of Medical

Sciences and two gland post specialists and they were asked to comment on content of questions and their design. To this aim, the designed tool was given to the above-mentioned specialists along with required explanations. Then, they were asked to determine the rate of relatedness, simplicity and clarity of each clause based on content validity index of Waltz and Bausell [23] on the four-point score criterion. The clauses with relatedness higher than 75% based on the index were preserved and the other clauses were omitted. Then, clauses were modified based on comments of experts on their clarity and simplicity. In general, content validity index was obtained as 0.86. In order to determine face validity, the researchers tried to use interesting and reasonable style, phrasing and appearance for this tool. Comments of experts when determining content validity were also used for improving face validity. Tool reliability was obtained through internal consistency. Preparing the questionnaire, it was distributed among 30 nurses and Cronbach's alpha was calculated as 0.83.

This study was carried out in three phases. In the first phase, the rate of nurses' awareness of diabetic ketoacidosis was determined through the questionnaire in both groups. In the second phase, the researchers held retraining through lectures for the first group. One month passed the retraining, the research tool was given to them and nurses' awareness of diabetic ketoacidosis was again determined. In the third phase, the researchers held retraining using SMS for the second group at the same time retraining was began for the first group. One month passed the retraining, the research tool was distributed among them and nurses' awareness of diabetic ketoacidosis was again evaluated.

Education program through lecturing was held in one day in 5 hours including introducing and explaining research purposes, background factors, clinical features, differential diagnosis, laboratory findings, caring practices for patients with ketoacidosis and ketoacidosis prevention practices; summarizing mentioned materials; and taking feedback from subjects. Training program through SMS included sending 20 text messages on introducing and explaining research purposes, sending 20 text messages on background factors, clinical features and differential diagnosis, sending 20 text messages on laboratory findings, sending 20 text messages on caring patients with ketoacidosis and preventing ketoacidosis and finally sending 20 text messages on summarizing mentioned materials. Text messages were sent in one week and in hours which the subjects under study preferred. It should be mentioned that the taught content and questions of both groups were selected similar to each

other. To ensure the similarity of materials presented by both methods, teaching materials prepared for lecturing and being included in text messages were given to two medical training experts to comment on their content. The researchers tried to be present in all stages of filling the questionnaire by the study's subjects and answer their queries. Also, enough time was allowed for filing the questionnaire and there were attempts to minimize environmental distractors such as noises in the ward.

The obtained information was analyzed by SPSS 20 using frequency, mean, standard deviation, paired t-test, independent t-test and covariance. Acquiring the agreement of Arak University of Medical Sciences, the researchers obtained permission for sampling in the selected hospitals affiliated to this university and introduced themselves to these medical centers to take the agreement of their officials. Also, a written consent was taken from every subject regarding participating in the study and research purposes were explained to them. Subjects were said that they are free to leave the study in any stage.

RESULTS

In general, 86 nurses participated in this study out of which 4 subjects were excluded from the intervention group using SMS due to their request to leave the study. So, the information analyzed was obtained from 39 nurses in the group trained using SMS and 43 nurses in the group trained through lectures. Average age of the nurses under the study was 32.71 ± 6.92 . 5 nurses (6.1%) were male and 77 nurses (93.9%) were female. Regarding marital status, 29 were single (35.4%) and 53 were married (64.6%). All the subjects have B.S. in nursing. 74 nurses were living in Arak (90.2%) and 8 in Khomeyn (9.8%).

There was no significant difference between the two groups (Lecture and SMS) in terms of demographic characteristics. Based on the results of independent t-test, there was no significant difference in age average between the two groups ($P > 0.05$). Also, no significant difference was observed between the two groups in terms of qualitative background characteristics including sex and marital status based on the results of Chi-Square test (Table 1).

The results of Kolmogorov-Smirnov test showed that scores of the nurses in the two groups (Trained through lectures and trained using SMS) had normal distribution before and after training ($P > 0.05$). Thus, paired and independent t-tests were used for comparing score of the nurses (Table 2). To compare the effectiveness of the two training methods of lecturing and using SMS,

Table 1: Demographic characteristics of the nurses participating in the study in the two groups (Lecture and SMS)*

Variable		SMS group	Lecture group	P-value
Age		34.26±5.36	31.35±7.90	0.06
Sex	Male	4 (10.3%)	1 (2.3%)	0.13
	Female	35 (89.7%)	42(97.7%)	
Marital status	Single	10 (25.6%)	19 (44.2%)	0.08
	Married	29 (74.4%)	24 (55.8%)	

* Quantitative variables: mean and standard deviation, qualitative variables: number and percentage

Table 2: Mean and standard deviation of scores of the nurses' awareness of ketoacidosis before and after training intervention in the two groups (SMS and lecture)

Variable	Group	Before training	After training	P-value before and after
Score of the nurses' awareness of ketoacidosis	SMS	12.87±2.73	16.15±2.68	>0.001
	Lecture	11.72±3.45	18.93±1.86	>0.001
P-value between the two groups		1.00	>0.001	

Table 3: The results of analysis of covariance for comparison of the two groups (SMS and lecture) with modifying the effect of score before intervention

Variable	Index				
	Degree of freedom	Square mean	F	P-value	Effectiveness
Pretest score	1	3.72	0.71	0.40	0.009
Group	1	161.19	30.75	>0.001	0.28

independent t-test was used and the results showed that there is no significant difference between the scores of the two groups before training (P=1.00), while after training, mean of scores of the group trained through lectures was significantly higher than that of the group trained using SMS (P < 0.001).

To determine the effect of training by the two methods of lecturing and using SMS on increasing the nurses' awareness of ketoacidosis, paired t-test was used and the results showed that mean of awareness scores has significantly increased in both methods after intervention (Table 2).

Given that mean of awareness scores after intervention cannot be independent of the score before intervention, covariance analysis was also used with modification of effect of mean awareness score before intervention in order to verify the above results (Table 3). The results showed that by controlling on the effect of awareness score before intervention, there was a significant difference in awareness score after intervention between the two groups (Trained using SMS and trained through lectures) (P<0.001).

DISCUSSION

The results of the present study showed that both methods of continuous training through lectures and using SMS were effective in increasing the nurses' awareness of ketoacidosis. Also, it was found out that

training through lectures has been more effective than training using SMS.

The results of the study show that retraining using SMS has been effective. These results are consistent with the results of research by mc McConatha *et al.* [24]. Also, a reference to the results of research by Rosen *et al.* [25], Déglise *et al.* [26] and Goh *et al.* [27] which show that SMS has positive and desired results in learning, can confirm the results of the present study. In addition, study of Chuang *et al.* showed that training through SMS can increase awareness of nursing students about medication therapy [28]. Results of research have indicated that SMS can be used as a live and useful method for education and educational discussions [19]. Result of a meta-analysis based on the results of several research done in Turkey, England, India, Cyprus, Germany, Italy, Australia and some Asian countries shows that SMS is effective and efficient in different learning situations such as seminars and professional fairs by creating positive attitude among people and increasing social interest and creativity [17].

In another study using SMS, results showed that the level of glycated hemoglobin in patients with type 2 diabetes had no statistically significant change [29]. Results of the present study are different from the above study. The reason of this difference may be due to the difference in type of intervention and research samples in the two studies. However, more research should be done on effectiveness of using SMS in educational fields.

Results of the present study show that retraining through lectures is effective as well. Results of a study by Ghaemi *et al.* [30] showed that lecturing is effective on awareness and attitude of participants about AIDS so that awareness and attitude of participants improved considerably after training. In the study of Masoumy *et al.* [31] there was a statistically significant difference between scores before and after training through lecturing and this method increased awareness of studied subjects. Results of the study by Al-Qahtani *et al.* [32] also showed effectiveness of training through lecturing in university students. Results of these studies all show that lecturing as a traditional method is still valuable and can be used in on the job training.

Results of the present study showed that there was a statistically significant difference between scores of the two groups of retraining through SMS and lecturing, as mean of scores in the group retrained through lectures was higher than that in the group retrained using SMS. Maybe this higher mean in lecture group was due to clarity of explanations of the instructor, provision of materials in an organized way, activity of the learners in the class or note taking of the nurses during the class.

In the study of Karimi *et al.* [33] carried out among female students in the last grade of high school, the students' awareness and attitude of and toward AIDS were assessed before and after an educational program by two methods of lecturing and providing pamphlet. The results showed that awareness and attitude of the students improved after an educational program through lecturing; while education using the pamphlet had no effect on the attitude, although it caused an increase in awareness. In the study of Rose [34] there was no statistically significant difference between training nursing students through lecturing and training by the help of a conceptual plan for promoting critical thinking; in other words, both methods were able to enhance critical thinking among students at the same rate. Also, there was no statistically significant difference between the effect of lecturing and that of problem solving on the learning ability of nursing students in the study of Choi *et al.* [35]. Results of this study and similar studies can indicate that in spite of developing education and new educational methods, particularly multimedia educational methods, lecturing can be still considered as an effective educational method.

The study of Jalali [36] showed that both methods of prevention by the help of SMS and presenting educational pamphlet were effective on changing attitude and creating negative attitude toward using drugs among

students. Also, mutual comparison of means of students' scores on attitude and self-efficiency toward using drugs in the control and experimental groups indicated that although both methods of preventing drugs use were effective on changing attitude and improving self-efficiency, effectiveness of SMS method was estimated higher. Results of this study were different from that of the present study. In the study of Jalali [36] training through SMS was compared with training using pamphlet, while training using SMS has been compared with training through lecturing in the present study. This can be a reason for the discrepancy observed in the results of these two studies. Also, populations are also different in these two studies.. Results of the research by Hopson *et al.* [37] and Subramanian *et al.* [38] showed that effectiveness of new communication methods based on information propagation such as presenting prevention programs by internet and cell phones is higher than that of traditional methods such as lecturing and presenting educational pamphlet. Results of this research are also different from that of the present study.

Since learning through SMS, compared to learning through traditional methods, has higher flexibility and is more resistant against forgetting [39] it can be particularly used in on the job training of the employees who do not have enough time to participate in the classes or be considered as a complement for methods used in classes.

Among limitations of this study can refer to loss of 4 subjects in the intervention group using SMS due to the reluctance of these four nurses to participate in the study. They mentioned their job responsibilities as the main reason for leaving the study. It is recommended that the method of training using SMS be compared to other educational methods in future studies to identify its effectiveness more extensively. Also, it is recommended that cost-effectiveness of this method be evaluated versus other educational methods.

CONCLUSION

In the present study it was shown that both teaching methods through SMS and through lectures were effective in on the job training of nurses. However, the study revealed that effectiveness of teaching through lectures is higher than that of training using SMS. In addition, given the results of the research and interest of the nurses to receive information through text messages, it is recommended that teaching strategies like using SMS is used, in addition to lecturing, as an efficient assistive tool in on the job training for nurses and for presenting

health-care messages to people as well. The researchers hope that the results of this research can attract the attention of authorities and decision makers in Ministry of Health and Medical Education to the importance of providing and presenting various educational programs and be effective in promoting society health.

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