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Comparing the effect of electronic and lecture education of pain management on the knowledge, attitude, and practice of nurses: A randomized-controlled trial

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Abstract:

INTRODUCTION: Efficient pain management by nursing staff initially needs accurate knowledge and proper attitude in this field. The aim of present study was to compare the effects of lecture and electronic education on the knowledge, attitude, and practice of nursing staff regarding pain management.

MATERIALS AND METHODS: The present superiority randomized controlled trial with two parallel arms was conducted on 78 occupied nurses of surgery wards of X. The participants were recruited randomly and divided into two groups of lecture and electronic education through random blocking (4 and 6 blocks). For allocation concealment, coded nontransparent pockets numbered 1–78 containing the type of intervention were used. Educational material was presented using teacher-centered method in lecture group, as well as through multimedia program using FLASH software in e-learning group through 1-h sessions for 4 weeks. Data on nurses were collected before and 4 weeks after the training using demographic questionnaire, Pain Management Principles Assessment Tool, Nurses' Attitude Survey, and nursing practice checklist. Data were analyzed using SPSS software (version 24) utilizing descriptive and analytic statistical test such as Chi-square, Fisher, independent *t*-test, and ANCOVA. $P < 0.05$ was considered statistically significant.

RESULTS: Mean ± standard deviation of nurses' knowledge, attitude, and practice regarding pain management had significant increase in both groups post-training ($P < 0.001$). According to ANCOVA the mean postintervention knowledge score in e-learning group by controlling baseline score had significant increase compared to the lecture group (adjusted mean difference [aMD] = 1.8: 95% confidence interval [CI] = 1.5–2.1, $P < 0.001$). Furthermore, the mean of total scores of post-intervention attitude and practice in e-learning group adjusted for baseline score significantly increased compared to lecture group (aMD = 1.8: 95% CI = 1.5–2.1, $P < 0.001$) and (aMD = 3.2: 95% CI = 2.7–3.6, $P < 0.001$).

CONCLUSION: Electronic education was more efficient than lecture education in increasing of knowledge, attitude, and practice on pain management among nursing staff.

Keywords:

Attitude, education, knowledge, pain management, practice

Introduction

Surgery is a fundamental part of health care system. Annually, more than thousands of millions of people undergo surgical procedures, worldwide.[1] A prevalent side effect of surgery is pain.[2] which is a main challenge all over the world.[3] According to a definition by the American Society of

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Pain, it is an undesirable and emotional feeling caused by either a real or potential damage in tissue.[4] In a research by Gan *et al*., in the United States, it was depicted that 86% of patients experience pain after surgery and 75% complain from moderate to severe pain.[5]

Loose pain control can cause tachycardia, hypertension, myocardial ischemia, reduced alveolar ventilation, poor wound healing, pneumonia, deep vein thrombosis, infection, delayed treatment, and development of chronic pain.[6]

According to the instruction provided by the American Society of Pain, five main factors help pain management including: physiological, sensory, emotional, cognitive, and sociological factors that should be focused according to the situation and mechanism of action for each patient.[7] According to the guidelines provided by the American Pain Society, 5 novel instructions with regard to pain management are: immediate assessment and diagnosis of pain and its treatment, patients' participation in planning for pain treatment, further assessment and adjustment of palliative plans when needed, and finally, evaluating the procedures in terms of efficient pain management and control.[8] Efficient pain management by nursing staff initially needs accurate knowledge and proper attitude in the field of pain management. In order to conduct more practical and effective nursing trainings on pain management, affecting factors must be considered. Training method is a key affecting factor in this regard.[9]

Training is a purposeful activity in promoting learning. The main aim of training in medical disciplines is to develop decision making and problem-solving skills and achieving more efficiency as well as promoting professionalism.[10] Urgent need of medical sciences to refresh knowledge that would cover extensive range of information highlights the importance of student-oriented and highly argumentative educational methods[11,12] The technological advancements in the field of e-learning have revolutionized learning and are the main reasons of scientific and cultural leap.[13,14] Growing tendency toward e-learning suggests the numerous advantages of this methods compared to the other conventional education approaches.[15,16] The challenges of e-learning in Iran are expressed in the form of 5 approaches electronic, teaching, curriculum development, and psychological and cultural approaches.[17]

The necessity to promote knowledge, attitude, and practice of nursing staff in the field of pain management and also the importance of designing effective educational plans in this field has highlighted the need to select the most efficient and practical training method. Regarding the limited studies in our country in the field of e-training and also considering the fact that the conventional approaches are still being implemented and cannot come along with the rapid scientific progressions and constant changes in social needs, the present study was conducted to draw a comparison between the effect of e-training and oral training on the knowledge, attitudes, and practice of nursing staff in terms of pain management.

Materials and Methods

This study was a superiority randomized controlled trial with two parallel arms. Study population comprised all nurses occupied in surgery wards of X in 2019. A total of 78 working nurses who had at least BS degree, minimum of 3 months of job experiences, and were willing to participate in the study recruited from X, X, X, X, X, and X. These nurses were selected using convenience sampling. Then, they were randomly allocated into two groups of oral and e-training utilizing Random Allocation Software (RAS)/Ver 1.0.0 developed by department of anesthesia, Isfahan, Iran through 4–6 sized blocks. Generation of random allocation sequence was carried out by a noninterfering person and the type of received intervention was written on a paper and was numbered on sequential nontransparent pockets from number one to the last sample. The first pocket was assigned to the first participant and in sequential manner, it lasted to the last participant. Allocation concealment was followed in terms of researcher and participants until the pockets were opened up. For sampling, 27 pockets were allocated to X hospital, 13 for X, 10 for X hospital, 10 for X hospital, 8 for X hospital, and final 10 for X hospital.

The sample size was calculated considering knowledge, attitude, and practice as variables and utilizing the mean difference between two independent groups and according to Hosseinzadegan *et al*. study.[18] In terms of knowledge, 30 participants were allocated to each group considering $m_1 = 9.26$, $m_2 = 11.11$ (considering 20% post intervention increase), $sd_1 = sd_2 = 5.92$, power = 95%, $\alpha = 0.05$, and utilizing one-tailed test. In terms of attitude, 7 participants were allocated to each group considering $m_1 = 55.54$, $m_2 = 66.65$ (considering 20% post intervention increase), $sd_1 = sd_2 = 5.92$, power = 95%, $\alpha = 0.05$, and using one-tailed test. In terms of practice, 34 participants were allocated to each group considering $m_1 = 10.46$, $m_2 = 12.55$ (considering 20% post intervention increase), $sd_1 = sd2 = 2.57$, power = 95%, $\alpha = 0.05$ and utilizing one-tailed test. Finally, considering 15% drop rate, the sample size was calculated as 39 participants for each group.

The present randomized-controlled trial was approved by the committee of ethics of X University of Medical Sciences (IR.UMSU.REC.1397.051) and registered in IRCT: 1N 20181220042061). The purpose of study was

explained to all participants and signed written consent form was taken. After the questionnaires were filled, the participants were randomly divided into two groups of e-training and oral.

At first, hospitals and wards authorities get informed on the study. An educational needs assessment was conducted by consulting with head nurses of surgery wards, supervisors, and learners. Then, the program objectives were prepared and approved by the academic members and hospital authorities. The educational content was prepared using authoritative sources, guidelines and articles. In the oral teaching method, the content was given in the form of four weekly 1-h lectures. A teacher-centered instruction in the usual way of lecturing using PowerPoint slides in combination with questions and answers were held by researcher. Considering the dispersion of surgery wards in the six hospitals, the participants of each hospital attended the oral training sessions separately based on prearranged meetings.

In the electronic method, the content was converted into FLASH software through designing and producing a multimedia program (producing a movie) by the engineers of e-learning unit of X Continuing Medical Education Center. Nurses in e-learning group were provided by educational CD and how to use it was instructed by researcher in the computer room. The nurses were asked to read the content of training package in computer room and in case of any question they were allowed to ask. The facilities of computer room only allowed the presence of at most 6 participants in a single time and then nurses were instructed to study the educational CD at home in this group for 4 weeks. They received weekly phone call to remind reading educational CD by researcher. It should be noted that the educational content was the same for both groups [Tables 1 and 2]. The questionnaires and checklist were collected and analyzed at baseline and 4 weeks after training.[19]

To collect data, a self-reporting demographic questionnaire on demographic features of participants including gender, age, marital status, education, job position, experience, working ward, employment status (impermanent, contracted, and registered nurse), and training experience in terms of pain management and also Pain Management Principles Assessment Tool (PMPAT), Nurses' Attitude Survey (NAS) questionnaire, and Nurses' practice checklist were utilized.

PMPAT and NAS are valid self-reporting questionnaires. McMillan *et al*. (2000) calculated the internal cohesion of nurses' knowledge questionnaire ($P < 0.001$ and $r = 0.84$).[20] NAS was initially designed by Leek and Ferrell (1992) and its internal cohesion was calculated by McMillan *et al.* (2000) ($P < 0.001$ and $r = 0.89$).[20] Both questionnaires were translated by Aflatoonian *et al*. in Jiroft University of Medical Sciences and their validity and reliability were evaluated. The reported reliability in Cronbach's Alpha Coefficient for both questionnaires was $r = 0.86$.[21] Nurses' practice checklist developed by Hosseinzadegan *et al*. and was utilized to evaluate their practice e in terms of pain management. The checklist

Table 1: Comparison of education in both lecture and electronic methods

Lecture group	E-learning group
Teaching tools: The educational materials were taught to the nurses by the researcher using an educational booklet based on authoritative sources, guidelines, and articles by using power point slides and whiteboard	Teaching tools: The educational materials were taught to the nurses by educational software consisted of separate pages with video, audio and animation. It provided based on authoritative sources, guidelines, and articles
Duration of training: Four 1-h sessions	Duration of training: The software was given to the nurses of this group for 4 weeks

Table 2: Details of pain management training in two groups of lecture and e-learning

Session	Training issues	Main contents
Session 1	Definition of pain, physiology and types of pain	Physiology and types of pain and pain in specific groups, the difference between chronic and acute pain, pain in the elderly and its difference with youth pain, the effects of acute and chronic pain and the importance of effective pain control and side effects of pain control, postoperative pain and chemicals Effective in causing pain, reducing pain and effective factors in aggravating or reducing pain
Session 2	Principles of proper pain assessment and evaluation	Proper use of pain control tools, the importance of pain assessment, important points in pain assessment, how to ensure the patient's pain is real
Session 3	Principles of using analgesics	Dosage and amount of narcotics, non-steroidal analgesics, anti-inflammatories, local anesthetics and general principles of analgesics, analgesics and nursing care, side effects and analgesic pumps (PCA)
Session 4	Principles of using nonpharmacological methods of pain	A variety of non-pharmacological methods of pain such as distraction, massage and relaxation, spiritual therapy and diagnosis and care of non-pharmacological pain control

PCA=Patient-controlled analgesia

was made based on the review of related literature, articles, and scientific sources. To confirm the validity of the utilized questionnaire, content validity index (CVI) and content validity ratio (CVR) were used. The CVI and CVR were respectively calculated to be 80% and 85% in the present study. Moreover, internal consistency test was used to calculate the reliability ($\alpha = 0.71$).[18]

PMPAT evaluated nurses' knowledge on physiology, pain characteristics, pain palliation methods, addiction to painkillers, evaluation, aims, and principles of pain management. It includes 31 multiple choice questions. The right answer gains 1 and the wrong answer or unanswered question gain zero. Scoring range is 0–30. If more than 70% of scores is gained, the nurse has the highest knowledge, 50%–70% indicates the average knowledge and <50% shows poor knowledge on pain management.

NAS questionnaire asks about the attitudes of nursing staff on using narcotics (fearing from addiction, palliation, sedation, and respiratory depression), nonpharmacological palliative methods, and pain management methods. The tool included 25 questions and was in the form of a 4-point Likert scale. Scoring range was 25–100. Phrases that adopted positive orientation "completely disagree" gained score 1, "disagree" gained score 2, "agree" gained score 3, and "completely agree" gained score 4. Phrases with negative orientation, "completely disagree" gained score 4, "disagree" gained score 3, "agree" gained score 2, and "completely agree" gained score 1. Scores ≥70% showed highest and most positive attitude, 50%–70% showed intermediate attitude, and ≤50% indicated poor and negative attitude.

Nurses' practice checklist included 12 items. It was filled by the researcher. In case of good practice it gained "yes" choice and scored 2 and in case of "no" choice it gained zero score. In case of incomplete practice it gained score 1. Scoring range was 0-24. Scores ≥70% showed highest and most positive attitude, 50%–70% showed intermediate attitude and ≤50% indicated poor and negative attitude. Scores ≥70% showed highest practice, 50-70% showed intermediate practice and scores ≤50% indicated poor practice.

Statistical analysis

Data were analyzed by SPSS/Ver 23 (IBM SPSS Statistics, IBM Corporation, Chicago, IL). Normality of quantitative data distribution for each group was confirmed by Kolmogorov–Smirnov test. Utilizing descriptive statistics such as mean ± standard deviation (SD) and frequency (%), the knowledge, attitude, and performance of nursing staff in two groups were demonstrated and paired *t*-test was implemented to demonstrate the alterations in intergroup scores pre- and post-training. In order to compare mean scores of knowledge, attitude, and practice of nurses between two groups, we used independent *t*-test for pretraining and ANCOVA for posttraining phase. The primary outcome was the difference in the mean scores of knowledge, attitude, and performance between the groups. $P < 0.05$ was considered to be statistically significant.

Results

Data were collected from June 22, 2018 to March 6, 2019. Out of the total 78 participants, 38 were in intervention group (e-training) and 39 were the controls. There was one drop in intervention group [Figure 1]. All nurses in e-learning group had BS degree versus in lecture group, 37 nurses had BS and 2 others had MS degree. The mean ± SD ages of participants were 33.7 ± 5.6 and 35.4 ± 6.3 in e-learning and lecture groups, respectively. Independent *t*-test did not show any statistical difference between two groups ($P = 0.239$). Two groups were homogenous in terms of age, gender, marital status, education, job position, job experience, working place, and training experience in terms of pain management in their last 1 year and no significant difference was observed in this regard [Table 3].

The results of Kolmogorov–Smirnov test showed normal distribution in terms of knowledge, attitude and practice pre- and post-intervention, separately in each group ($P > 0.05$). Results obtained from PMPAT indicated that the mean ± SD of knowledge score in e-learning group reached from 35.4 ± 9.5 to 49 ± 8.8 after intervention. In addition, in lecture group, it reached from 36.6 ± 12.5 to 44.6 ± 3.9 that was statistically significant ($P < 0.001$). The mean ± SD of NAS questionnaire in e-learning group changed from 64.3 ± 4.8 to 76.9 ± 4.7 after the training and in lecture group it altered from 66.5 ± 4.6 to 73.2 ± 4.7 after the training that were statistically significant ($P < 0.001$). The mean ± SD of nurses practice scale in intervention group increased from 20.7 ± 7.5 to 49.3 ± 6.6 after the intervention and in controls it altered from 20.9 ± 5.7 to 36.2 ± 6.5 which was also statistically significant ($P < 0.001$) [Table 4, Figures 2-4]. All suggested that training both orally and electronically can affect knowledge, attitude, and practice of the nurses in terms of pain management.

According to the ANCOVA, the mean of nurses' knowledge in e-learning group after the intervention compared to the lecture group had significant increase (adjusted mean difference [aMD] = 1.8: 95% CI = 1.5–2.1, $P < 0.001$). Furthermore, the mean score of NAS (aMD = 1.8: 95% CI = 1.5–2.1, $P < 0.001$) and nurses' practice (aMD = 3.2: 95% CI = 2.7–3.6, $P < 0.001$)

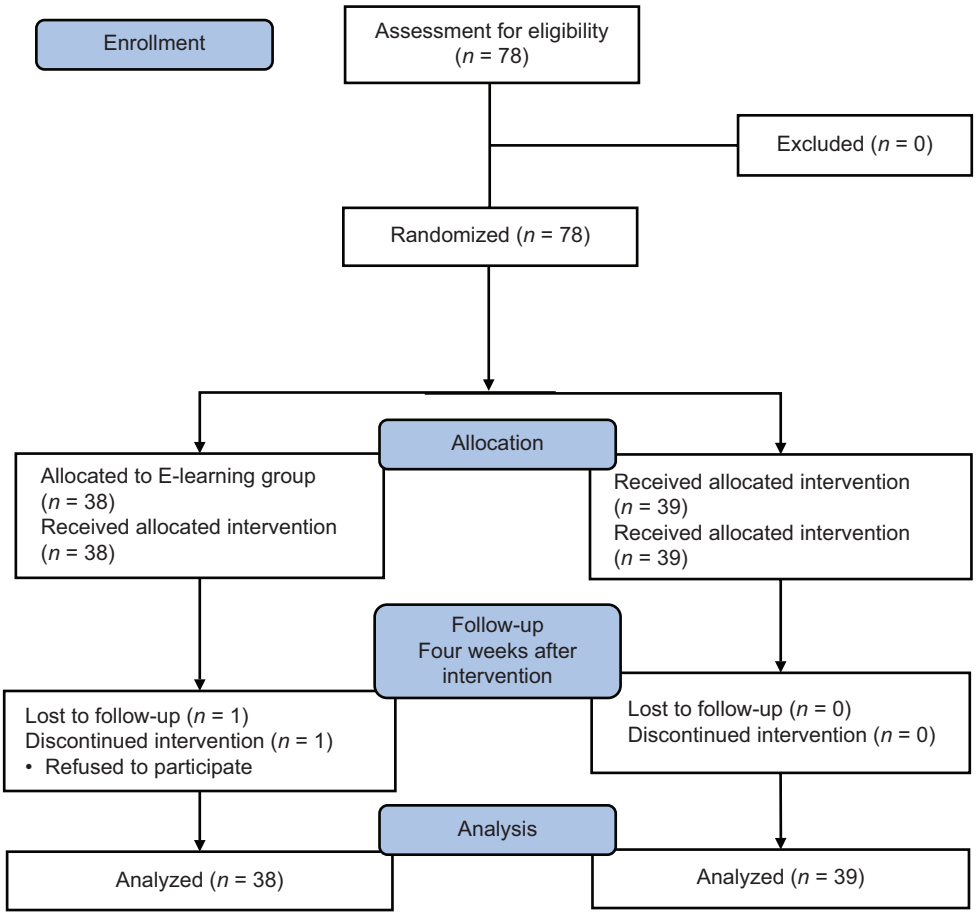

Figure 1: Participant flow in the study

in e-learning group had significant increase after the training compared to the lecture group [Table 5].

Discussion

The present investigation was conducted with the aim of designing electronic educational content and comparing it with the conventional approach of oral training in the field of nursing education. The findings indicated that knowledge, attitude, and practice on pain management significantly increased among nurses after the training. However, this increase was higher in e-learning group compared to the lecture group. It was also found that in both groups the participants had the lowest score of knowledge on pain management before the training (31.14% in e-learning and 36.64% in lecture group).

According to the study by Ucuzal and Doğan working nurses at emergency departments still possessed insufficient knowledge and decision making skills and poor practice and negative attitudes to control pain in patients.[22] In a study by Bonkowski *et al*., nurses were not sufficiently knowledgeable to manage pain at postsurgery phase.[23] In an investigation by González-Fernández *et al*., there was a big gap between nurses knowledge and pain management. The gap was more significant in the diagnosis of pain symptoms in patients by nurses. The study showed that nurses need to be trained in terms of pain management.[24] Yin *et al*., in an investigation in Hong Kong observed a significant relation between the former trainings and nurses' clinical experiences in terms of pain management. They believed that more constant trainings are needed to increase knowledge, change their attitudes and enhance practice among nurses.[25]

More than 60% of the participants had average to negative attitude toward pain assessment before the intervention. Study by Ekim and Ocakcı also indicated insufficient knowledge and negative attitudes of nurses in pain management.[26] This finding was also in line with Aflatoonian *et al*., who reported insufficient and negative attitudes of nurses in terms of pain management.[21]

Beck *et al*. concluded that knowledge and attitude on pain management is a necessary issue and constant efforts must be done in this regard.[27] Keen *et al*. also showed that educational interventions can enhance knowledge and attitudes of the nurses on pain management. They

Table 3: Demographic and job related characteristics of participants

Characteristic	Intervention 1 (*n*=38), *n* (%)	Intervention 1 (*n*=39), *n* (%)	*P*
Age (years), mean±SD	33.7±5.6	35.4±6.3	0.293[]
Age (years)			
29-25	9 (23.7)	7 (17.9)	0.570*
30-34	10 (26.3)	11 (28.2)	
39-35	3 (33.3)	16 (42.1)	
40<	8 (20.5)	3 (7.9)	
Gender			
Female	34 (89.5)	39 (100)	0.055[§]
Male	4 (10.5)	0 (0)	
Marital status			
Single	15 (39.5)	8 (20.5)	0.132*
Married	23 (60.5)	30 (79.9)	
Separated	1 (2.6)	0 (0)	
Educational level			
BSc degree	38 (100)	37 (94.9)	0.494[§]
MA degree	0 (0)	2 (5.1)	
Career position			
Head nurse	0 (0)	1 (2.6)	0.506[§]
Nurse	38 (100)	38 (97.4)	
Work experience, mean±SD	8.6±5.2	10±6.3	0.333[]
1-5	13 (34.2)	1 (25.6)	0.995*
6-10	11 (28.9)	11 (28.2)	
11-15	11 (28.9)	10 (25.6)	
16<	3 (7.9)	8 (20.5)	
Employment status			
Impermanent nurse	4 (10.5)	4 (10.3)	0.433*
Contracted nurse	9 (23.7)	5 (12.8)	
Registered nurse	30 (76.9)	25 (65.8)	
Working unit			
Cardiac surgery	3 (7.9)	6 (15.4)	0.878*
Gynecology surgery	10 (26.3)	9 (32.1)	
Neuro surgery	1 (2.6)	2 (5.1)	
Thoracic surgery	4 (10.5)	3 (7.7)	
General surgery	17 (44.7)	15 (38.5)	
Orthopedic surgery	3 (7.9)	4 (10.3)	

[]Independent *t*-test, [§]Fisher's exact, *Chi-square. Intervention 1=Teaching by e-learning, Intervention 2=Teaching by lecture method, SD=Standard deviation

suggest the necessity of a purposeful training program and an efficient training method accordingly.[28]

The present study reported the mean scores of nurses' practice in both e-learning group and lecture group were less than 30 before training which showed poor practice of the nurses in pain management. After the training, it was significantly increased in both groups. However, in e-learning group the difference was more significant. It must be noted that knowledge and practice were still lower than 50 and the need for more training was felt. In a study by Noghabi *et al*., nursing staff had poor practice in pain management and assessment and 100% of nurses did not use any pain measurement tool in neonates.[29] The outcomes of the present intervention was in agreement with that of Farahani *et al*., who reported that educational interventions enhanced practice score in implementing pain measurement tools postintervention.[30] Their study also revealed that training along with operational guidelines enhanced and improved pain management-related practice of nurses. The investigation by Aghdaii *et al*., indicated that applying pain measurement tool and consumption of painkillers affected and raised patient's satisfaction.[31]

The present research showed that nurses did not receive any type of training on pain management during their last year. Tomaszek and Dębska concluded that better care quality and pain management at postsurgery is achieved through constant training of nurses and physicians and better compliance with pain management guidelines[32] In addition, according to Cui *et al*., in China, training and implementing pain management standard protocols can affect care and nurses' practice in pain management improves pain control outcomes in patients.[33]

Table 4: Comparison of the within group mean score of knowledge, attitude, and practice of nurses in the field of pain management among participants

Variable	Mean±SD		Mean difference (95% CI)	*P*
	Baseline	After intervention		
Knowledge (0-31)				
Intervention 1	10.89 (2.94)	15.21 (2.74)	4.31 (4.03-4.59)	<0.001"
Intervention 2	11.35 (3.87)	13.84 (3.72)	2.48 (2.30-2.66)	<0.001"
Knowledge (%)				
Intervention 1	35.14 (9.51)	49.06 (8.80)	13.92 (13.02-14.81)	<0.001"
Intervention 2	36.64 (12.50)	44.66 (12.01)	8.02 (7.44-8.60)	<0.001"
Attitude (25-100)				
Intervention 1	64.28 (4.80)	76.89 (4.72)	12.60 (11.50-13.70)	<0.001"
Intervention 2	66.56 (4.56)	73.20 (4.74)	6.64 (5.92-7.36)	<0.001"
Practice (0-24)				
Intervention 1	4.94 (1.80)	11.84 (1.58)	6.86 (6.42-7.31)	<0.001"
Intervention 2	50.02 (1.38)	8.69 (1.55)	3.66 (3.41-3.91)	<0.001"
Practice (%)				
Intervention 1	20.72 (7.53)	49.34 (6.6)	28.61 (26.75-30.47)	<0.001"
Intervention 2	20.94 (5.77)	36.21 (6.49)	15.27 (14.23-16.32)	<0.001"

"Paired *t*-test. A score of over 70% as good, between 50 and 70% moderate and<30% was considered as weak. Intervention 1 (*n*=38)=Teaching by e-learning; Intervention 2 (*n*=39)=Teaching by lecture method, SD=Standard deviation, CI=Confidence interval

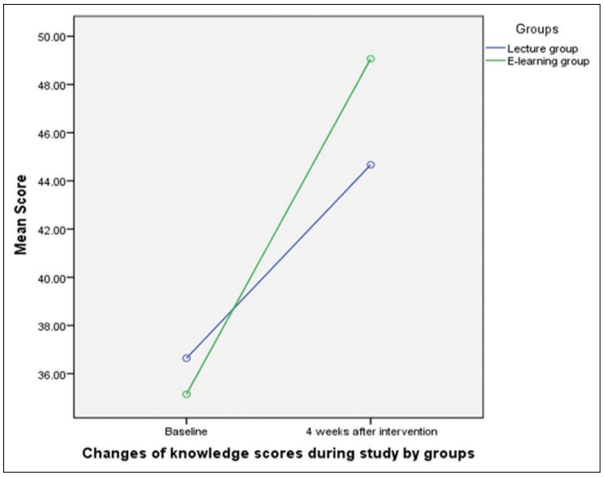

Figure 2: Changes of knowledge scores during study by groups

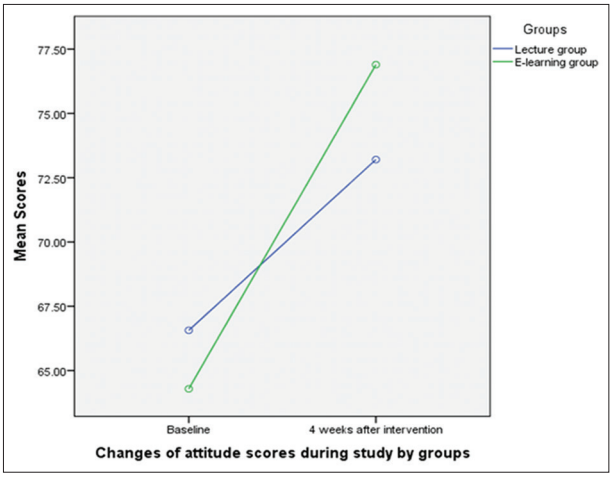

Figure 3: Changes of attitude scores during study by groups

The present study also showed that despite significant increase in knowledge, attitude, and practice in both groups especially in thee-learning group, knowledge and practice still remained < 50 but attitude changed to positive level. Despite 20 years of hard work on behalf of nursing educators and professional nursing and medical organizations and publication of many clinical guidelines, there has been only minimal progression in the field of pain management.[34,35]

The findings of present study suggested that the effectiveness of e-learning group was more than oral education. This finding was in line with the findings of Feng *et al*. They concluded that e-training effectively increased knowledge and practice in trainees.[36] According to Romero-Hall animations, movies, and educational e-texts significantly increased learning and training of nursing staff.[37] Mohammadimehr *et al*.'s study showed that e-training and multimedia software were preferred educational methods in medical sciences.[38] Kim *et al*., in their study indicated that knowledge, skill, and satisfaction level of nursing students in airways management of pediatric patients in e-training group (by cell phone) was significantly higher compared to the oral.[39] With the increasing presence of digital facilities in nursing care systems, e-training method can be an efficient and useful in this field. Utilizing electronic interventions in nursing and integrating them with nursing research, management, and education can provide more improved care and consequently, better clinical outcomes in patients.

The present investigation faced some limitations including plurality of patients, overcrowded wards, and insufficient cooperation on behalf of working nurses. It made sampling process to be conducted at the ending

Table 5: Comparison of the between group mean score of knowledge, attitude, and practice in the field of pain management

Variable	Intervention 1	Intervention 2	Adjusted difference (95% CI)	*P*
Knowledge				
Baseline	10.89 (2.94)	11.25 (3.87)	-	0.557[]
After intervention	15.21 (2.74)	13.84 (3.72)	1.79 (1.48-2.10)	<0.001*
Knowledge (%)				
Baseline	35.14 (9.51)	36.64 (12.50)	-	0.557[]
After intervention	49.06 (8.8)	44.64 (12.9)	5.79 (4.80-6.78)	<0.001*
Attitude				
Baseline	64.28 (4.80)	66.5 (4.5)	-	0.037[]
After intervention	76.89 (4.72)	73.20 (4.74)	5.57 (4.29-6.84)	<0.001*
Practice				
Baseline	4.94 (1.80)	5.02 (1.38)	-	0.888[]
After intervention	11.84 (1.58)	8.69 (1.55)	3.18 (2.72-3.65)	<0.001*
Practice (%)				
Baseline	20.72 (7.53)	20.94 (5.77)	-	0.888[]
After intervention	49.34 (6.60)	36.26 (6.49)	13.28 (11.3-15.23)	<0.001*

[]Independent *t*-test, *ANCOVA. A score of over 70% as good, between 70 and 50% moderate and<30% was considered as weak. Intervention 1 (*n*=38)=Teaching by e-learning; Intervention 2 (*n*=39)=Teaching by lecture method, CI=Confidence interval

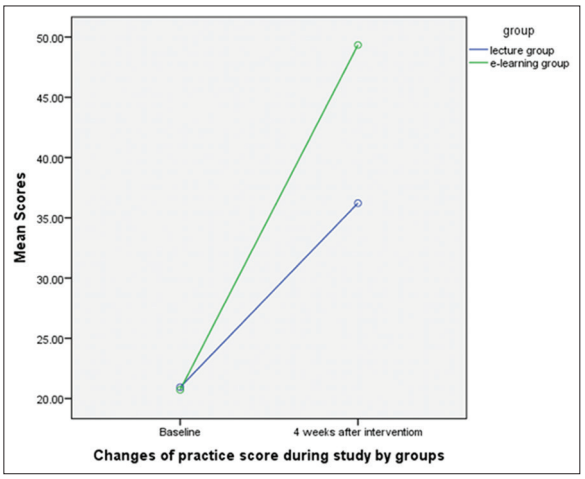

Figure 4: Changes of practice score during study by groups

time of working shifts' or other times. Another limitation was the nongeneralizability of findings to other wards. The presence of the researcher as an observer could to some extent affect the practice of nurses and cause a change in their behavior. This is a limitation that was somewhat beyond the control of the researcher. However, the researcher tried to normalize and reduce the impact of his presence in the department with a continuous and long presence during the research. It is suggested that more studies with longer intervention time, more sample size, and with complementary training methods should be conducted in all wards. E-training interventions must be emphasized in nursing educational procedures. More studies on educational interventions based on interactive learning through e-training and evaluating its effect on the quality of care is also suggested. Furthermore, the number of male participants was low in our study. Therefore, it is suggested including the balanced number of both sexes in the study.

An advantage of the present investigation was that the study setting was were surgery wards in which pain management was a crucial factor. In addition, this study was conducted in surgery wards of all training hospitals. With high effectiveness, the present investigation can be regarded as a comprehensive educational reference in medical education.

Conclusion

Training pain management can be effective in promoting knowledge, attitude, and practice of nursing staff. It is also suggested to be included in in-service training curriculum. As a novel educational method, e-training can help more deep and meaningful learning and facilitate positive motivation in learning process. Therefore, it is suggested that authorities in educational planning must use multimedia educational software to train nurses and emphasis on promoting novel educational methodologies, using e-learning systems, and saving time and energy of nursing staff.

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Conflicts of interest

There are no conflicts of interest.

References

1. Rose J, Weiser TG, Hider P, Wilson L, Gruen RL, Bickler SW. Estimated need for surgery worldwide based on prevalence of diseases: A modelling strategy for the WHO Global Health Estimate. Lancet Glob Health 2015;3 Suppl 2:S13-20.
2. Jendoubi A, Naceur IB, Bouzouita A, Trifa M, Ghedira S, Chebil M, *et al*. A comparison between intravenous lidocaine and ketamine on acute and chronic pain after open nephrectomy: A prospective, double-blind, randomized, placebo-controlled study. Saudi J Anaesth 2017;11:177-84.
3. Imani F, Safari S. "Pain Relief is an Essential Human Right", we should be concerned about it. Anesth Pain Med 2011;1:55-7.
4. Treede RD. The International Association for the Study of Pain definition of pain: As valid in 2018 as in 1979, but in need of regularly updated footnotes. Pain Rep 2018;3:1.
5. Gan TJ, Habib AS, Miller TE, White W, Apfelbaum JL. Incidence, patient satisfaction, and perceptions of post-surgical pain: Results from a US national survey. Curr Med Res Opin 2014;30:149-60.
6. Meissner W, Coluzzi F, Fletcher D, Huygen F, Morlion B, Neugebauer E, *et al*. Improving the management of post-operative acute pain: Priorities for change. Curr Med Res Opin 2015;31:2131-43.
7. Glowacki D. Effective pain management and improvements in patients' outcomes and satisfaction. Crit Care Nurse 2015;35:33-41.
8. Chou R, Gordon DB, de Leon-Casasola OA, Rosenberg JM, Bickler S, Brennan T, *et al*. Management of postoperative pain: A clinical practice guideline from the American Pain Society, the American Society of Regional Anesthesia and pain medicine, and the American Society of Anesthesiologists' Committee on Regional Anesthesia, Executive Committee, and Administrative Council. J Pain 2016;17:131-57.
9. Imanipour M, Harati T, Sepehrinia M, Vaezi A, Shali M. Problem-based learning approach in medical education in Iran: A systematic literature review. Iran J Nurs Res 2019;14:1-9.
10. Monaghi HK, Rad M, Bakhshi M. Do the new methods of teaching in medical education have adequate efficacy? A systematic review. SDME 2013;10:153.
11. Pourghaznein T, Sabeghi H, Shariatinejad K. Effects of e-learning, lectures, and role playing on nursing students' knowledge acquisition, retention and satisfaction. Med J Islam Repub Iran 2015;29:162.
12. Mokaripour P, Shokrpour N, Bazrafkan L. Comparison of readiness for e-learning from the perspective of students and professors of Medical Sciences. J Educ Health Promot 2020;9:111.
13. Golband F, Mojtahedzadeh R, Hosseini AF, Mirhosseini F, Bigdeli SH. Effective E-learning view point of Tehran University of medical sciences virtual faculty post-graduate students. Bimonthly Educ Strateg Med Sci 2014;7:93-7.
14. Lawal Bello U, Abd L, Abd E, Hassan E, Yunusa U, Idris A, *et al*. Challenges of information and communication technology utilization among undergraduate community health nursing students in Tanta University, Egypt. Am J Nurs 2017;6:274-9.
15. Heydari A, Emami Zeydi A. Barriers to and facilitators of research utilization among Iranian nurses: A literature review. J Caring Sci 2014;3:265-75.
16. Yazdannik A, Mohamadirizi S, Nasr-Esfahani M. Comparison of the effect of electronic education and workshop on the satisfaction of nurses about Emergency Severity Index triage. J Educ Health Promot 2020;9:158.
17. Okhovati M, Sharifpoor Ghahestani E, Islami Nejad T, Hamzezadeh Marzooni M, Motamed Jahroomi M. Attitude, knowledge and skill of medical students toward E-learning Kerman University of Medical Sciences. Bimonthly Educ Strateg Med Sci 2015;8:51-8.
18. Hosseinzadegan F, Shahbaz A, Jasemi M. survey of nurse's knowledge, attidude and practice in surgery wards toward assessment and management of patients's pain in teaching hospitals of urmia in 2016. J Urmia Nurs Midwifery Fac 2017;15:620-9.
19. Rahnavard F, Shirin A. Evaluation of training effectiveness on management development and identifying its constraining factors. Organ Resour Manage Res 2015;5:73-96.
20. McMillan SC, Tittle M, Hagan S, Laughlin J, Tabler RE. Knowledge and attitudes of nurses in veteran's hospitals about pain management in patients with cancer. Oncology nursing forum. 2000;27 (9):1415-23.
21. Aflatoonian MR, Rafati F, Soltaninejad M, Mashayekhi F. The survey of nurses, knowledge and attitude towards pain management in Jiroft University of medical sciences. Anesth Pain 2017;8:14-21.
22. Ucuzal M, Doğan R. Emergency nurses' knowledge, attitude and clinical decision making skills about pain. Int Emerg Nurs 2015;23:75-80.
23. Bonkowski SL, De Gagne JC, Cade MB, Bulla SA. Evaluation of a pain management education program and operational guideline on nursing practice, attitudes, and pain management. J Contin Educ Nurs 2018;49:178-85.
24. González-Fernández M, Aboumatar H, Conti D, Patel AM, Purvin MA, Hanna M, *et al*. Educational gaps among healthcare providers: An institution needs assessment to improve pain management for postsurgical patients. J Opioid Manag 2014;10:345-51.
25. Yin HH, Tse MM, Wong FK. Systematic review of the predisposing, enabling, and reinforcing factors which influence nursing administration of opioids in the postoperative period. Jpn J Nurs Sci 2015;12:259-75.
26. Ekim A, Ocakcı AF. Knowledge and attitudes regarding pain management of pediatric nurses in Turkey. Pain Manag Nurs 2013;14:e262-7.
27. Beck SL, Brant JM, Donohue R, Smith EM, Towsley G, Berry PH, *et al*. Oncology nursing certification: relation to nurses' knowledge and attitudes about pain, patient-reported pain care quality, and pain outcomes. Oncol Nurs Forum 2016;43:67-76.
28. Keen A, McCrate B, McLennon S, Ellis A, Wall D, Jones S. Influencing nursing knowledge and attitudes to positively affect care of patients with persistent pain in the hospital setting. Pain Manag Nurs 2017;18:137-43.
29. Noghabi FA, Soudagar S, Nazari O. Knowledge, attitude and performance of nurses regarding pain assessment and measurement, Bandar Abbas, Iran. HMJ 2012;16:403-13.
30. Farahani PV, Pou DH, Saeedi M, Shamsikhani S. Investigation on the effects of pain assessment workshop on knowledge, attitude, and practice of nurses in Valie-Asr Hospital in Arak. Mod Care 2013;10:183-91.
31. Aghdaii N, Navabi ZS, Azarfarin R. The effect of using. Eur J Cardiovasc Nurs 2015;4:14-22.
32. Tomaszek L, Dębska G. Knowledge, compliance with good clinical practices and barriers to effective control of postoperative pain among nurses from hospitals with and without a "Hospital without Pain" certificate. J Clin Nurs 2018;27:1641-52.
33. Cui C, Wang LX, Li Q, Zaslansky R, Li L. Implementing a pain management nursing protocol for orthopaedic surgical patients: J Clin Nurs 2018;27:1684-91.
34. Sherrill Robin J. "Assessment of Nurses' Knowledge and Attitudes

toward Pain Management: Novice to Expert". Nursing Theses and Capstone Projects. 85. Available from: https://digitalcommons.gardner-webb.edu/nursing_etd/85. [Last accessed on 2020 Oct 13].

35. Shahnazi H, Saryazdi H, Sharifirad G, Hasanzadeh A, Charkazi A, Moodi M. The survey of nurse's knowledge and attitude toward cancer pain management: Application of Health Belief Model. J Educ Health Promot 2012;1:15.
36. Feng JY, Chang YT, Chang HY, Erdley WS, Lin CH, Chang YJ. Systematic review of effectiveness of situated e-learning on medical and nursing education. Worldviews Evid Based Nurs 2013;10:174-83.
37. Romero-Hall E. Pain assessment and management in nursing education using computer-based simulations. Pain Manag Nurs 2015;16:609-16.
38. Mohammadimehr M, Zargar Balaye Jam S, Moradi R. Comparison of E-learning and the Classroom Lecture in Microbiology Course Based on Gagne's Instructional Model. Res Dev Med Educ 2016;5:42-6.
39. Kim SJ, Shin H, Lee J, Kang S, Bartlett R. A smartphone application to educate undergraduate nursing students about providing care for infant airway obstruction. Nurs Educ Today 2017;48:145-52.