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# Comparing the Effect of Electronic and Lecture Education on the Knowledge of Sedation in Cardiac Intensive Care Unit Nurses

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## ABSTRACT

**Introduction:** Evaluate the lecture-based and e-education on the increasing knowledge of nurses in ICU in terms administration of sedative drugs.

**Methods:** in quasi-experimental 60 cardiovascular ICU nurses were randomly divided into two groups, receiving in-person training and electronic training through 2 hours sessions for two weeks. Data then were collected before, 1 week, 2 weeks, and 1 month after training using a medication information questionnaire and evaluated with statistical analysis.

**Results:** The positive effect of the educational intervention one week and two months after intervention ($p<0.001$) either in an in-person or e-learning group was observed. A significant reduction in the knowledge level of the two groups was observed two months after education($p<0.001$). However, the knowledge of the two groups were at a higher level than before the intervention ($p< 0.001$).

**Conclusion**: E-learning methods can be an alternative to teaching and retraining pharmacology topics in the traditional way for nurses.

***Keywords:*** *Epidemiology, Trauma, Pediatrics*

## 1. INTRODUCTION

Cardiovascular diseases have a major effect on the health and economic status of people in the world.[1] These diseases are a significant public health problem worldwide accounting the 80% of the cause of death in low and middle-income countries.[2] The urgent need for mechanical ventilation after cardiac operations introduces the concept of fast-track cardiac anesthesia (FTCA), defined as removing the tracheal tube 6 hours after cardiac surgery.[3] Controlling the pain and applying proper sedation are essential in treating patients admitted to the intensive care unit. Light sedation is required to facilitate this process.[4]

Drug-related activities form one-third of nurses' workload and make drug administration a continuous task. So, improper administration of the drug would lead to devastating effects on patients, failing the therapeutic strategies, as well as increased healthcare costs. Although nurses are aware of the dosage, signs, and adverse effects of drugs, they often do not have enough information on pharmacodynamics and pharmacokinetics.[5] Studies have shown that participating in retraining programs independently affects the performance of nurses and increases their productivity, reduces job risks, decreases medical errors, improves the organizational atmosphere, and increases the satisfaction of nurses and patients.[6] In the traditional teaching method, the interaction between the teacher and the learner is considered as a main key for successful learning which contributes to the mental and practical satisfaction of education but having in-person education would burden some human resources, financial, equipment application, and course planning designing also, it forced people to leave the work environment to participate in training courses. This method costs a lot, especially in continuous training courses, and is not affordable.[7] New education methods are now more suitable and applicable to overcome the traditional obstacles of education.

Alterations in nurses' practices and the development of new therapeutic strategies indicate the need a learning updates knowledge and technologies.[8]

Especially in recent years, when the clinical learning environment has been severely affected by the spread of the coronavirus.[9] The electronic learning system has emerged and developed as a significant strategy for educational awareness of healthcare staff. The electronic education system has added new domains to the educational process by using new technologies and creating methods to improve the education process and distance education activities.[10] Forgetfulness can occur regardless of the nature of the skills or ontent being taught and the learner's age or background. Psychologists have noted that interval training leads to more durable learning than continuous training.[11] So the current study aimed to evaluate the effect of in-person and e-learning learning of nurse in ICU in terms of their awareness and duration of maintaining their knowledge, especially in terms of the administration of sedatives after heart surgeries.

## 2. METHOD

The present study is a semi-experimental type carried out on nurses working in cardiac intensive care units in Shahid Rajaei Cardio Vascular Center Tehran, Iran during 2023. All nurses from the cardiac ICU unit were divided into two groups randomly by ICU A and ICU B wards receiving in-person and electronic education as no one was aware of their group in preventing the chance of sharing information between two groups. After the educational process, 60 nurses were selected from both ICU A and B wards. The inclusion criteria were having at least a bachelor's degree in nursing, at least three months of work experience in an intensive care unit, and access to a computer or a laptop.

The Exclusion criteria included unwillingness to continue participating in the study, transfer to other departments except for the intensive care, and unwillingness to take any of the two tests. Finally, 54 nurses remained in the study. The tool used in this research was a researcher-made questionnaire that contained questions about pharmaceutical and demographic information. The drug information questionnaire contains 20 classified questions related to sedative drug usage in the intensive heart care unit, designed in collaboration with relevant experts. The correct answer to each question has a score of 1, and the wrong answer has of 0. In addition, some information about their age and gender, questions regarding the history of training courses, and the duration of working in the ICU were also provided in the demographic information section. To carry out validity, six professors of the academic faculty with specializations in anesthesia, special care, and pharmacology confirmed the questions, and their opinions were used. The test-retest method was used for reliability. The intra-class correlation coefficient (ICC) is equal to 0.908, indicating the reliability of the nurses' drug assessment questionnaire regarding sedation after heart surgery. The current study was approved by the Research Council and the Ethics Committee of the Shahid Rajaei Cardiovascular Center under the number IR.RHC.REC.1402.010/ Before implementing the two methods of e-learning and lectures, the nurses were given complete explanations about the objectives of the research, the way of intervention, the duration of its implementation, and the cases of withdrawal from the study and after providing these explanations, written consent was obtained from nurses. in the face-to-face training group, nurses were divided into 5 groups receiving in-person training in the hospital environment for 4 hours, during two sessions each day. For the e-learner nurses' group the recorded training files were provided through flash memory drives. The nurses had two weeks to study it and contacted the researcher via mobile phone to follow up on the questions. The researcher also did necessary follow-ups regarding the study of the files and checked their contents every week.

It should be noted that the flash memory provided to the nurses in the electronic training group were collected immediately after the two-week training period. In the end, both groups took part in the final exam one week after the training, which was held face-to-face, and answered the questions of the initial exam. The test was repeated in person in both groups to measure knowledge retention two months after the intervention.

***Data analysis***

The data of the questionnaires collected by SPSS software version 26 were subjected to statistical analysis. The results for quantitative data were reported as "standard deviation ± mean" and for qualitative data as "number (percentage)." During the intervention period (before, one week after, two months after the intervention), two-way repeated measures ANOVA was used to compare the average knowledge score of the nurses of the special cardiac care department in the field of sedation after heart surgery in nurses who are trained by lecture and electronic methods. The significance level in the tests was considered 0.05.

## 3. RESULTS

Comparing the demographic characteristics of the two groups revealed no statistically significant difference between the in-person and e-learning groups. Most of the participants in both groups are women with bachelor's degrees. Despite the higher age and work experience in the electronic education group, statistical analysis with the independent sample two t-test showed no significant difference between the two groups (Table 1).

**Table 1. Comparison of demographic characteristics of intensive care unit nurses (ICUA, ICUB) according to demographic groups**

| Variable | Face-to-face training (n = 27) | Electronic training (n = 27) | The value of the statistical index of the test | p-value |
|---|---|---|---|---|
| Age (years) | 35.78 ± 7.45 | 37.93 ± 8.44 | -0.992 | 0.326 |
| Gender | | | | 1.000 |
| Male | 4(14.8) | 4(14.8) | 0.000 | |
| Female | 23(85.2) | 23(85.2) | | |
| Marital status | | | 0.074 | 0.785 |
| Single* | 13(48.1) | 14(51.9) | | |
| Married | 14 (51.9) | 13 (48.1) | | |
| Number of children | | | | |
| Zero | 19 (70.4) | 16(59.3) | | 0.491 |
| One | 7 (25.9) | 7(25.9) | 1.943 | |
| Two | 1 (3.7) | 4(14.8) | | |
| Level of Education Bachelor | 22(81.5) | 25(92.6) | | 0.420 |
| Masters | 5(18.5) | 2(7.4) | - | |
| The number of years of graduation | 11.11±8.17 | 14.15±8.57 | -1.333 | 0.188 |
| The number of years of employment in the special sector | 9.74±7.43 | 12.48±8.99 | -1.221 | 0.228 |
| Type of employment Official | 12(44.4) | 15(55.6) | | |
| a plan | 6 (22.2) | 3(7.4) | 2.302 | 0.332 |
| * Other | 9 (33.3) | 10(37.0) | | |
| History of participating in the same course | | | | |
| Yes | 2(7.4) | 4(14.8) | - | 0.669 |
| No | 25(92.6) | 23(85.2) | | |
| Study history in this field | | | | |
| Yes | 8(29.6) | 4(14.8) | 1.714 | 0.190 |
| No | 19(70.4) | 23(85.2) | | |

The data in the Table are reported as "standard deviation ± mean" for quantitative variables and as "(percentage) number" for qualitative variables.

*Singles include unmarried, divorced, and widowed.

** Other has corporate, contract, and agreement.

The overall knowledge scores of the two groups before the study indicated the nurses' low knowledge level before the educational intervention. In addition, one week and two months after the educational intervention, the scores of the two groups had significantly increased, although there was no difference between the scores in any of the periods (Table 2, Figure 1, Table 3).

**Table 2. Comparison of the average knowledge score of special care nurses according to the investigated groups**

| Variable / Group | Face-to-face training (n=27) mean ±standard deviation | E-learning (n=27) mean ± standard deviation | The value of the statistical index of the test | p Value |
|---|---|---|---|---|
| Knowledge score before training | 8.19±2.11 | 8.48±1.74 | -0.562 | 0.576 |
| Knowledge score one week after training | 15.93±1.49 | 16.70±1.86 | -1.697 | 0.096 |
| Knowledge score two months after training | 13.11±2.34 | 13.30±2.28 | -0.294 | 0.770 |

**Table 3. The mean and standard deviation of the knowledge score of nurses in the intensive care unit (ICU A and ICU B) according to the studied times in each of the studied groups**

| -Variable / Group | Face-to-face training (n=27) | | | | Electronic training (n=27) | | | |
|---|---|---|---|---|---|---|---|---|
| | Standard deviation ± mean | the amount of Statistical index of the test | Degrees of freedom | p Value | Standard deviation ± mean | The value of the statistical index of the test | Degrees of freedom | p Value |
| The difference in knowledge score one week after the educational intervention and before the Intervention | 7.74±2.19 | 18.331 | 26 | 0.001 > | 8.22±2.17 | 19.670 | 26 | >0.001 |
| The difference in knowledge score two months after the intervention and one week | -2.82±-2.17 | -6.750 | 26 | 0.001 > | -3.41±2.44 | -7.263 | 26 | >0.001 |
| After the intervention | | | | | | | | |
| The difference in the knowledge score two months after the intervention and before the educational intervention | 4.93±2.18 | 11.727 | 26 | 0.001 > | 4.82±2.27 | 11.017 | 26 | > 0.001 |

The average knowledge score increased significantly one week after the intervention compared to before the intervention ($p<0.001$). hence, it significantly decreased two months after the intervention, compared to one week after the intervention ($p<0.001$). but the overall knowledge of nurses in two groups two months after education was still significantly higher than before education ($p<0.001$).

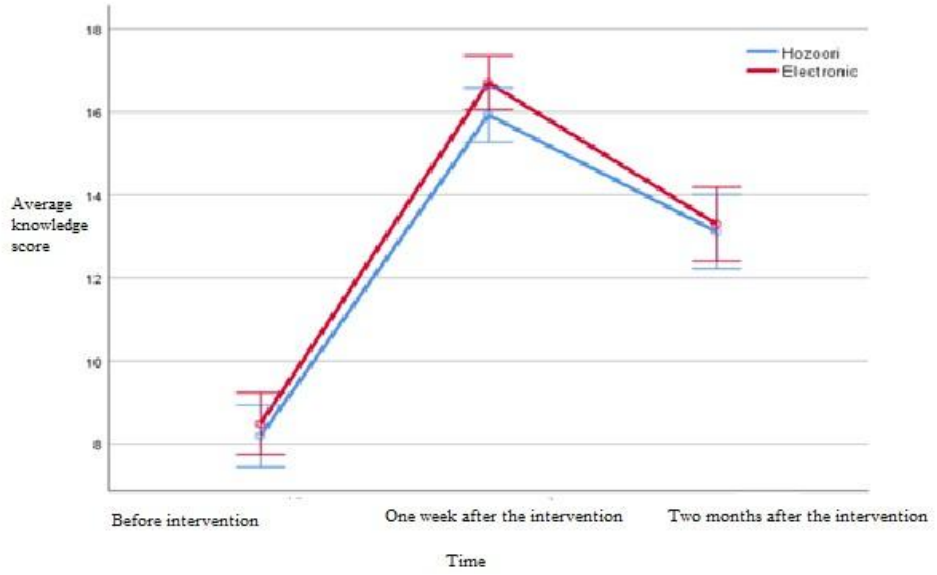


**Figure 1. comparison effect of average knowledge score before intervention, one week after intervention, and two months after intervention**

## 4. DISCUSSION

This research was conducted to compare the effect of e-learning in a continuous education manner on the knowledge and knowledge retention of cardiac intensive care nurses. The findings showed that traditional education is not superior to electronic education, and the level of knowledge in both groups significantly increased one week after receiving education. In addition, two months later, the knowledge level is higher than before the training, although it has dramatically decreased compared to one week later.

These results reflect the results of the study by Hjorth-Jhansen et al. in 2016, which found that electronic education is not superior to traditional education about congenital heart failure learning in nurses.[12] In addition, the Soper et al. study showed the same effect of electronic and traditional education on nurses' knowledge in the field of coronary artery diseases.[13]

Another study was conducted in Sao Paulo, Brazil, in the field of training nurses in the oncology department; the results showed the electronic training method's superiority over the face-to-face training method. The advantage of electronic training can be due to the type of education and the possibility of frequent reference to the content on the educational platform. In the face-to-face group, people received the materials during specific sessions, while the electronic group had more time to review the files repeatedly whereas in the face-to-face group, the classes were held at a specific time, even after the intensive shifts of some nurses.[14]

Statistical analysis in the present study showed that the "time effect" is statistically significant. This means that the changes in the average knowledge score in all the investigated groups during the study period are statistically significant. In a clinical trial entitled “Effectiveness of video self-instruction training on cardiopulmonary resuscitation retention of knowledge and skills among nurses in north- western Nigeria”, the participants were instructed to respond to the post-test. There was no difference between the two groups in the pre-test. Cardiopulmonary Resuscitation (CPR) knowledge was significantly increased in both groups at post-test and one-month, three-month, and six-month follow- ups, but there was no significant difference between the two groups. Similarly, there was no significant increase in CPR knowledge and skills in the groups compared to the pre-test.[15] A cohort study in Thailand evaluated the retention of knowledge and skills after training in medical students. Participants were evaluated for knowledge and skills of basic life support (BLS) before training (pre-test), immediately after training (post-test), and six months after training (retention test). The post-test scores were found to be significantly increased. Likewise, scores for knowledge and skill were decreased in the retention test but were still significantly higher compared to the pre-test.[16]

The present study couldn’t find any difference in the educational methods regarding knowledge acquisition and retention. A declining trend in knowledge retention in nurses seems to be controlled by altering the type of education. The use of novel methods for knowledge retention is paramount to achieving sustained education. In the field of learning sciences, Mardan Parvar et al.[17] speculate that using active teaching methods enhances the participation of students in educational subjects and facilitates a better retention of information. Trane et.al reported that cooperative learning methods outperform teacher-centered learning in knowledge retention.[18] Similarly, a systematic review showed that problem-centered education outperforms teacher-centered education in knowledge retention.[19]

Considering the high workload of nurses and the importance of time in the continuous training courses of nurses, it can be concluded that the electronic education method is a more suitable option in terms of time and cost. However, the results of the present study cannot be generalized to all educational topics.

## 5. LIMITATIONS

One of the limitations of this research is the inability to investigate nurses' performance in sedative drugs and the reduction of medication errors after training. Problems in following up samples in more extended periods and checking whether holding continuous education courses in today's form increases the knowledge level of nurses in the long term.

## 6. CONCLUSION

The results of this study indicate the positive effect of educational intervention in both groups. The level of knowledge in both groups increased significantly after training. There was no statistically significant difference between the two groups regarding acquiring knowledge. In addition, the results show the effect of time on the knowledge level of nurses, so that two months after the intervention, the knowledge scores of both groups have significantly decreased. Although they are still at a high level compared to before the start of training.

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**Author's contributions:**

Dr..Maryam Ghadimi: conception, developed the theory and performed the computations, performed the analytic calculations, manuscript prepration

Rana Haddadi: developed the theoretical framework,,data collection

Dr.Yasmin Chaibakhsh: conception, manuscript prepration

Dr. Mohammad Zia Totonchi: developed the theoretical framework

Dr. Shiva Khalegh-Parast:developed the theorical framework, Dr. Mahmood Sheikh Fatholahi: performed the analytic calculations

Samaneh Shahidifar: data collection

Mahnaz shamseh: data collection

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