



Effect of blended-learning in promoting clinical skills of nursing students

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Abstract

Background and aims: Before the COVID-19 epidemic, the main part of university education was presented in traditional form, but nowadays, E-learning and blended learning evolve in students' education. This study was conducted to determine the effectiveness of blended learning in promoting the clinical skills of nursing students.

Methods: In this quasi-experimental study, 76 nursing students in the Sirjan School of Medical Sciences were entered through the census method in 2019 and 2020. They were allocated to intervention ($n = 36$) and control ($n = 40$) groups based on their academic year. Those who entered university in 2017 (control group) received standard education, while the students of 2018 (intervention group) received blended clinical training, which included podcasts, vodcasts (40%), and standard training in the clinical courses of adult-geriatric nursing three and critical care nursing. Students' performance was evaluated through an Objective Structured Clinical Examination (OSCE) method. Data were collected using a researcher-made checklist after assessing its validity and reliability. Data were analyzed using descriptive and analytical statistics (chi-square, independent sample t test, and paired t test) by SPSS-19.

Results: There was not any significant difference between the scores of clinical skills in the control group before (2.15 ± 0.48) and after (2.44 ± 0.29) the intervention ($P = 0.58$), but there were significant differences between the scores of clinical skills in the intervention group before (2.28 ± 0.31) and after (3.22 ± 0.16) the intervention and also between the scores of the two groups, in all subscales after the intervention ($P < 0.001$).

Conclusion: The study results highlighted the need for using blended-learning methods and appropriate technology to help nursing students achieve their clinical skill learning goals in clinical settings.

Keywords: Blended-learning, E-learning, Clinical skills, Nursing students

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Introduction

The main goal of nursing education is to train nurses to provide safe, competent, compassionate, and ethical care in different practice settings (1). It is expected that all of the nursing students achieve entry-level competencies to assess patients' needs and make appropriate decisions related to their health, as well as do interventions to fix health problems (1,2). Before the COVID-19 epidemic, the main part of university education was presented in traditional form, but nowadays, E-learning has evolved in students' education (3,4). E-learning is a potential platform accessible for students without time and place limitations. Also, it is a flexible, attractive, and student-oriented method (5,6). Today, e-learning is used increasingly in medical colleges and can differ from simple methods like MP3s and podcasts to even more complicated methods such as video conferences (7). Lack of communication, feedback, and motivation are some of the disadvantages of e-learning, and blended learning is advised to solve these problems (8). Blended learning is defined as the systematic emergence of face-to-face and virtual education (9). This kind of education has some advantages compared to

traditional face-to-face learning; for example, students explore and analyze the course content more carefully and thoughtfully to obtain the required information and complete assignments so that effective learning will occur (2,3). Strategies like blended learning are effective in promoting students' judgment, clinical, and psychomotor skills (4).

Clinical education is the main part of nursing training, in which students synthesize theoretical concepts and practical skills in interaction with an instructor in a clinical setting (10). Nursing students acquire clinical skills, such as patient assessment, communication with patients, decision-making, and providing safe care during clinical training (5). In a study by Forbes et al, results indicated a positive effect of educational videos in improving the quality of clinical training (6). The results of other studies have also confirmed the positive effect of the blended learning method in improving nursing and midwifery students' knowledge and performance (7-9).

Nowadays, related to the advantages of e-learning and blended learning methods, teachers are motivated to use this innovation in nursing education, too. On the other

hand, sufficient clinical skills are necessary for nursing students to maintain patients' safety and provide high-quality care, which should be paid close attention to. Therefore, it is very important to use an appropriate, innovative method in nursing education that keeps the quality of practical education despite technology. Studies revealed that blended learning has some disadvantages, such as the requirement to take responsibility for their learning and manage their time and the necessity of reliable access to a good quality internet connection (11). Using e-learning and blended learning in nursing education has been accepted as a new approach in Iranian medical universities. So, more research is needed to recognize the efficacy, advantages, and disadvantages of this educational method and help enhance this method, especially in clinical settings and practical skills training. Therefore, the present study was conducted to determine the effectiveness of blended learning in promoting the clinical skills of nursing students before entrance to the internship at Sirjan Medical School. The results of this study can guide teachers in choosing the best method to impart clinical skills to nursing students during academic years.

Research hypothesis

Blended learning is effective in promoting the clinical skills of nursing students.

Materials and Methods

Study design and sample size

This quasi-experimental study, with a nonequivalent control group posttest-only design, was conducted at the Sirjan School of Medical Science to evaluate the effect of blended learning in promoting the clinical skills of nursing students. The study participants comprised 76 undergraduate nursing students in the third academic year of nursing in two consecutive academic years (2019 and 2020). Both groups of students were exposed to identical theoretical and clinical courses at the same university, under the same conditions, with the same teachers and access to the same facilities prior to the commencement of the study. The participants were selected through the census method and allocated to intervention and control groups based on their academic year. The control group consisted of 40 nursing students who started university education in 2017, and 36 students participated as the intervention group in their first year at university in 2018. The inclusion criteria were a willingness to participate in the study, and the exclusion criteria were not getting a passing grade in nursing sciences courses (core content of the nursing curriculum).

Procedure

The intervention group received blended clinical training in the clinical courses of adult and geriatric nursing three and critical care nursing, which included standard training in terms of face-to-face training in skill lab and practical

work in the clinical field (60%), as well as e-learning using podcasts, vodcasts (40%), which were uploaded on the university websites, and online classes. The intervention was done during two semesters, and online and offline (podcasts, vodcasts) classes were held every other week for the intervention group. These educational contents (vodcasts and podcasts) were prepared by researchers and were delivered to students after nursing experts' and faculty members' approval. Virtual contents consisted of training about taking care of a patient with respiratory problems, methods of O₂ therapy, lung physiotherapy, airway suctioning, familiarity with resuscitation trolley, preliminary interpretation of ECG, and appropriate care in common dysrhythmia as well as urinary and nasogastric catheterization and ongoing care. The control group received standard training.

Data collection and instruments

A researcher-made checklist was used to assess students' clinical skills and performance. The checklist contained 30 items that were rated as 4 (excellent), 3 (good), 2 (fair), and 1 (poor). Therefore, participants' answers derived a score range of 30-120. The checklist had six subscales: general skills, with six items and a score range of 6-24; taking care of a patient with respiratory problems, with five items and a score range of 5-20; familiarity with resuscitation trolley with six items and score range 6-24; the subscale of preliminary interpretation of ECG and appropriate care in common dysrhythmia, with four items and score range 4-16; urinary catheterization and ongoing care, with five items and score range 5 – 20; and subscale of nasogastric catheterization and ongoing care, with four items and score range 4-16. The content and face validity of the mentioned instrument were assessed using the opinions of 10 faculty members and the Sirjan School of Medical Sciences nursing experts. Content validity ratio (CVR) was measured by assessing whether "the item is essential, useful but not essential or not necessary." from the viewpoint of experts, CVR was calculated as 72%. The reliability of the present checklist was calculated using Cronbach's alpha of 0.73.

The researcher collected the data after describing the aim of the study and obtaining informed consent from students, and obtaining the permission of the ethics committee of Sirjan Medical School (IR.SIRUMS.REC.1398.009). The study was done during two consecutive academic years. Students were divided into two groups: control (n=40) and intervention (n=36); former students made up the control group, and the intervention group was made up of junior students, and the intervention was done for them in their third year of university. An Objective Structured Clinical Examination (OSCE) was held at the beginning of the third year of study for each group; then, the control group received routine education in practical and clinical courses that included face-to-face training in skill labs and clinical settings. The intervention group received blended clinical training, including podcasts and vodcasts

(40%), which were uploaded on the university websites, and online classes and face-to-face training in (60%) skill lab and clinical settings. Students' performance was evaluated again by the OSCE. The OSCEs were held in five OSCE stations; every station lasted 10 minutes. In order to prevent possible cheating in exams, the students were quarantined. Test scenarios were developed based on nursing textbooks in collaboration with the research team and were reviewed by ten faculty members and nursing experts. In addition to the required equipment, appropriate medical manikins were used, and an exam was done. The resuscitation trolley was arranged with a layout similar to the university-affiliated sponsored hospital, and the students were asked about the equipment and the proper use them, cardiopulmonary resuscitation (CPR) drugs, and nursing intervention during CPR. An examiner gave scores based on a procedure-related checklist to assess students' performance at each station. Each subscale score was computed by calculating the average scores of related items.

Data management and analysis

Categorical and continuous variables were presented as the numbers (percent) and Mean (Standard Deviation), respectively. Categorical variables were analyzed using the chi-square test. T-tests assume that the data are normally distributed and that variances are equal across groups. Data were normally distributed based on the results of the Kolmogorov-Smirnov test ($P > 0.05$) as well, and Levene's test results showed that variances were equal across groups ($P > 0.05$). Therefore, a comparison of continuous variables between intervention (blended) and control

(traditional) groups was carried out using an independent t-test. Paired t-test was used to compare the scores of each group before and after the intervention. Statistical analysis was performed using SPSS-19 software. The significance level was set at 0.05.

Results

In this study, 76 nursing students from two separate entrance years were enrolled, and all of them participated until the end of the study. The mean (SD) of students' age was 23.3 (1.8) in the control group and 23.3 (0.9) in the intervention group; according to the t-test, there was not any significant difference in age between the two groups ($P = 0.82$). According to the results of descriptive analysis, 52.4% and 53.2% of students in the control and intervention groups were females, respectively; there was not any significant difference in the variable of sex between the two groups according to the chi-square test ($P = 0.91$).

The mean score of the clinical skill checklist in six subscales and total items were compared between two groups after the intervention using an independent sample t-test. Results showed a significant difference in scores of clinical skill checklists between control and intervention groups ($P < 0.001$; Table 1).

Paired t test was used to compare the intervention group's scores before and after the intervention. Table 2 shows a significant difference between the scores of the intervention group before and after the intervention ($P < 0.001$).

The paired t test results did not show any significant difference between the scores of the control group before and after the intervention ($P > 0.05$). All the details are

Table 1. The mean scores and comparison of clinical skill checklist scores between control and intervention groups after intervention

Subscale	Control (Traditional) Mean (SD)	Intervention (Blended) Mean (SD)	P value*
Taking care of a patient with respiratory problems	2.59 (0.44)	3.25 (0.33)	<0.001
Familiarity with resuscitation trolley	2.20 (0.36)	3.00 (0.30)	<0.001
Preliminary interpretation of ECG and appropriate care in common dysrhythmia	2.60 (0.36)	3.29 (0.36)	<0.001
Urinary catheterization and ongoing care	2.59 (0.82)	3.33 (0.35)	<0.001
Nasogastric catheterization and ongoing care	2.67 (0.32)	3.43 (0.38)	<0.001
General skills	2.59 (0.44)	3.25 (0.33)	<0.001
Whole	2.44 (0.29)	3.22 (0.16)	<0.001

*P values were calculated by independent t-test.

Table 2. The mean scores and comparison of clinical skill checklist scores pre- and post-intervention in the intervention group

Subscale	Before intervention Mean (SD)	After intervention Mean (SD)	P value*
Taking care of a patient with respiratory problems	2.12 (0.20)	3.25 (0.33)	<0.001
Familiarity with resuscitation trolley	2.8 (0.42)	3.00 (0.30)	<0.001
Preliminary interpretation of ECG and appropriate care in common dysrhythmia	2.42 (0.14)	3.29 (0.36)	<0.001
Urinary catheterization and ongoing care	2.23 (0.65)	3.33 (0.35)	<0.001
Nasogastric catheterization and ongoing care	2.13 (0.42)	3.43 (0.38)	<0.001
General skills	2.00 (0.44)	3.25 (0.33)	<0.001
Whole	2.28 (0.31)	3.22 (0.16)	<0.001

*P values were calculated by paired t test.

Table 3. The mean scores and comparison of clinical skill checklist scores pre- and post-intervention in the control group

Subscale	Before intervention Mean (SD)	After intervention Mean (SD)	P value*
Taking care of a patient with respiratory problems	2.09 (0.14)	2.59 (0.44)	0.25
Familiarity with resuscitation trolley	2.00 (0.35)	2.20 (0.36)	0.42
Preliminary interpretation of ECG and appropriate care in common dysrhythmia	2.44 (0.56)	2.60 (0.36)	0.45
Urinary catheterization and ongoing care	2.16 (0.62)	2.59 (0.82)	0.38
Nasogastric catheterization and ongoing care	2.15 (0.82)	2.67 (0.32)	0.20
General skills	2.07 (0.37)	2.59 (0.44)	0.20
Whole	2.15 (0.48)	2.44 (0.29)	0.58

*P values were calculated by paired t test.

reported in Table 3.

Discussion

The results of the present study showed a significant difference in the mean scores of the clinical skill checklist in all the subscales and the whole of it after the intervention, which indicates the positive effect of blended learning on improving nursing students' clinical skills. The results of the present study are consistent with the results of some other studies, which indicate that the blended approach is significantly better than traditional education in all areas of the educational setting (12,13). Another study showed that using e-learning in active education can improve students' critical thinking and performance in clinical settings (14).

A previous study mentioned that blended methods and educational software increase students' learning motivation, clinical performance, communication skills, and clinical competence (15). Another study showed that the neonatal examination score after the blended education intervention significantly increased in the intervention group (16). As the previous studies showed, electronic education, along with the traditional methods, leads students to a higher level of awareness (17), promoting various clinical skills such as patients' pain management (18) and prescribing medication (19). Results of a study also showed that blended learning in nursing education positively affected critical thinking and satisfaction of learning among nursing students (20).

Virtual classrooms are being developed in higher education due to the COVID-19 pandemic. E-learning, Web-based, and collaborative learning are currently the most powerful educational options in higher education (21). Studies showed that E-learning as a teaching method has some limitations, such as a lack of face-to-face interaction and not providing real experimental learning (22). Some other disadvantages of E-learning were reported as its high cost and need for user training. In parallel, traditional learning needs the physical presence of students and teachers at the same time and place (23), which is impossible in some situations, such as the current pandemic. According to the mentioned advantages and disadvantages of E-learning as well as traditional learning methods, and due to the results of this study and other similar studies, it is clear that blended learning by using the appropriate technology to combine online educational

materials with the traditional classroom can help students achieve their learning goals (3,24). Although this study had a limited sample size, the result of the present study especially emphasized the effectiveness of blended learning in improving the clinical skills of nursing students. This method can be helpful in nursing education because nursing students require high competencies to provide safe, effective, and evidence-informed care for patients (25).

The study's limitations were the small sample size and the absence of any comparison between groups before the intervention. Therefore, we recommended conducting future studies with a larger sample size and utilizing a nonequivalent control group pretest-posttest design. Moreover, while this study focused only on the advantages of blended learning, it is important to acknowledge that this educational approach also has certain drawbacks, which should be evaluated in future research.

Conclusion

According to the study results, promoting the clinical skills of nursing students and nurses is achieved effectively through blended learning, which combines traditional face-to-face education with electronic content and virtual education. Blended education integrates real classroom environments with electronic resources, enhancing nursing students' clinical skills and improving the quality of patients' care. The current COVID-19 pandemic has further highlighted the importance of virtual learning in higher education. The study emphasized the importance of using blended-learning methods and appropriate technology to help nursing students achieve their learning goals for clinical skills in university and clinical settings. This educational approach is also recommended for continuing education courses for nurses.

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Competing Interests

The authors declare that there is no conflict of interest.

Ethical Approval

Ethical considerations in this study included obtaining permission from the Ethics Committee of the Sirjan School of Medical Science (IR.SIRUMS.REC.1398.009) and obtaining written consent to participate in the study from the participants.

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