Original Article

The Effect of Self-learning Module on Nursing Students' Clinical Competency: A Pilot Study

Abstract

Background: Self-learning module (SLM) is designed for independent learning. In this study, the hypothesis that SLM is effective to some extent in improving clinical competence in nursing students was tested. **Materials and Methods:** The study employed a randomized controlled design. In this study, 46 nursing students were randomized into the control or intervention group. Study tools included a demographic information form and nursing skills checklist. Unlike the control group, the intervention group received clinical SLM. Nursing students' clinical competency was measured at the end of the intervention through objective structured clinical examination. Statistical analysis was performed in SPSS software. A p value < 0.050 was considered statistically significant. **Results:** In total, 46 students participated in this study. The Mean (SD) age of the study participants was 18.80 (1.06) years. There was a significant difference in students' clinical competency between the control and intervention groups (Mann–Whitney U-test: $p = 0.010$). Mean (SD) of clinical competency in the control and SLM groups was 58.19 (6.41) and 62.83 (6.05), respectively. Results of the group equivalency test indicated that all demographic variables were equivalent between the groups. Moreover, there was no significant difference between women and men in terms of clinical competency. **Conclusions:** According to the results, the use of SLM could help the students enhance the quality of nursing clinical competency.

Keywords: *Education, Iran, nursing, self-directed learning, students*

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Introduction

Nursing is a practice-based discipline; about 50% of undergraduate nursing courses in Iran are related to clinical skills. In addition, based on the evidence, employers value graduates for their non-nursing skill and work experience.[1] Clinical education is the basis of the nursing education program.[2] Clinical competency is one of the most important requirements in the nursing profession, based on which nurses are assessed,[3] and the lack of clinical skills competency can threaten patient care and safety. There are still controversies over the standards of specialized skills in nursing and the efficiency of common teaching methods.[4] The relationship between the practical and educational aspects of nursing education programs is created through clinical competence, and if we are to continue nursing education in a competence-based environment, we need to administer it correctly.[5] Moreover, nursing education could take advantage of

informal learning opportunities to develop students' nontechnical skills and produce more competent students.[6] One method of self-education is self-learning module (SLM). SLMs are designed for independent learning and meeting learning needs. SLM contains learning objectives, pretest, and posttest, and uses directory module, content, and resources for further study.[7] Flexibility, accessibility, transferability, easiness, learner's accountability, learner motivation, cost-effectiveness, safe learning environment, and time saving are the features of SLM.[8] Until 2016, three papers have been published with the aim to compare SLM with other teaching methods.[4,9,10] No significant difference was observed between the effect of traditional methods and SLM on learning,[9,10] and it was shown that SLM is more effective than face-to-face education.[4] Furthermore, three other papers determined the effectiveness of SLM. SLM has a positive impact on learning theoretical and practical topics.[8,11,12] In previous studies, the outcomes of SLM were measured

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Access this article online

Website: www.ijnmrjournal.net

DOI: 10.4103/ijnmr.IJNMR_46_17

Quick Response Code:

through objective structured clinical examination (OSCE), multiple-choice tests, and self-assessment.

Whereas a number of nursing studies have examined the effects of SLM, few have focused on its role in clinical skills education. Therefore, this study used quantitative approaches to evaluate the effectiveness of SLM on nursing students' clinical competency. In their studies, Abutarbush *et al*.[13] and Alfieri *et al*.[14] reported higher scores for students learning through SLM compared with those learning through conventional methods. However, equivalent knowledge or skill performance scores were reported for these two groups in the studies conducted by Norouzi *et al*.,[9] Kaliyadan *et al*.,[8] and Swensson *et al*.[15] A variety of learning activities should be provided in medical schools in order to address the range of learning styles.[16] Healthcare costs, patient morbidity, mortality rates, and patient threats are decreased by ensuring a high level of competency in clinical skills. An advantage of audio and video productions in higher education is the enhancement of student-learning outcomes.[17] Training through video methods reduces the fear of falling in the elderly.[18] Furthermore, the advantages of OSCE overweigh the advantages of the tradition evaluation method.[19] None of the studies have assessed the use of SLM to improve clinical skills in new nursing students. Therefore, this gap in the literature was reviewed and investigated in this study.

Materials and Methods

This study was conducted in 2016. This study was a randomized controlled design study (IRCT: 20170611034457N2). The sample size was calculated using the formula for a difference in means (equal sized groups), which is based on some parameters according to the previous studies) $\alpha = 0.05$, $1 - \beta = 0.80$ and effect size $(\delta) = 0.84$), and the 46 freshman undergraduate nursing students (23 per group) who had registered for the course of "Principles and clinical skills of nursing" at the School of Nursing and Midwifery of Hamedan University of Medical Sciences, Hamedan (the administrative town of Hamedan Province in the west of Iran) took part in the study. Data were collected between January and July 2016. All students met the study inclusion criteria, including having registered for the "Principles and clinical skills of nursing" (four credits), being a first-year undergraduate nursing student, and not having clinical skills training. The study exclusion criteria were unwillingness to take part, absence from OSCE [Figure 1], and participation in other education programs. Baseline data, generated from a demographic information form (on age, gender, etc.) and nursing skills checklist, were collected from all the participants soon after the intervention. In this study, the raters' reliability of the nursing skills' checklist (by 2 raters and 10 participants) showed a correlation coefficient of 0.9. The validity of the nursing skills' checklist in this study was confirmed by faculty members in the School of Nursing and Midwifery. Higher scores represent a higher level of skills.

Modules of specific clinical skill topics were created. The broad topics included suctioning the airway, blood pressure measurements, nasogastric tube, forms of subcutaneous/ intramuscular/intradermal injections, and serum therapy. Modules included basic power-point presentations, videos and signs used in nursing clinical skills, introduction, learning objectives, interactive quizzes, immediate feedback, pictures, additional resources such as books and
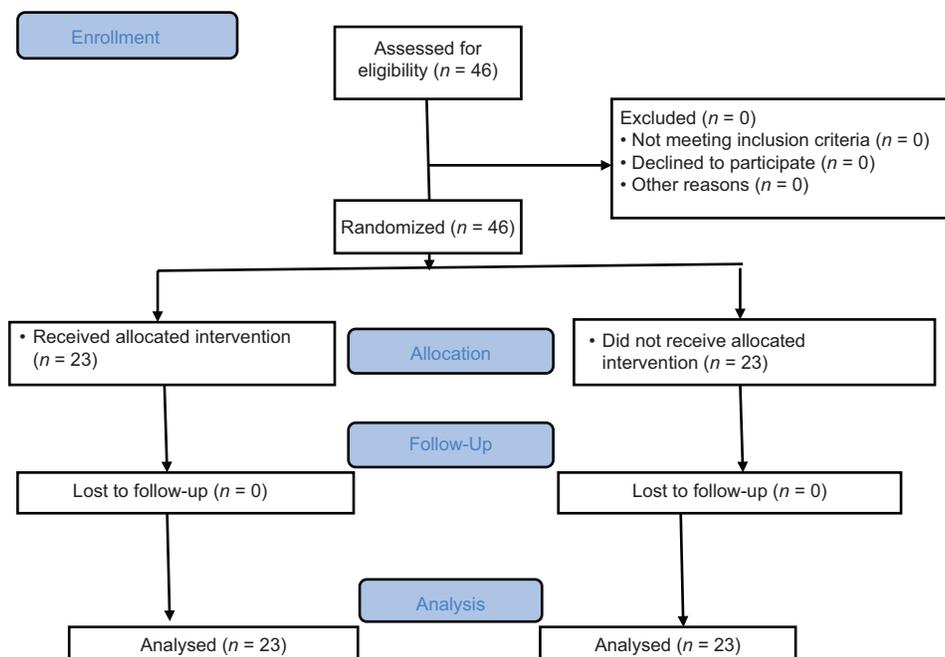

Figure 1: CONSORT Diagram

websites, and the researcher's phone number and email address. The interactive components were designed in order to be effective. Two educational videos were used: one was made in the university's Clinical Skills Center and the other was retrieved from reputable websites. The clinical skills' module was created and edited by the faculty members of the department. The modules were modified after focused group discussions with the students and the faculty. Camtasia was used to make the clinical skills' SLM.

Having received the approval of the Ethics Committee of Hamedan University of Medical Sciences, 46 nursing students were randomized into the control group and the intervention group. Data were collected through Convenience sampling in one semester in 2016 (between January and July 2016) using OSCE. With the beginning of the academic semester, clinical nursing skills were taught in the Clinical Skills Center of the university through the conventional method for all the students. The intervention and control group members completed the demographic information questionnaire. Pretest could not be used, because the participants were first-year undergraduate nursing students. None of the students had been previously trained in clinical skills. The control group did not receive the module. Control group members' clinical skills were measured at the end of the semester as a posttest in the OSCE. The intervention group received clinical SLM, and after 3 days, when they had received the module, objective assessments of students' clinical competencies were conducted using the nursing skills' checklist during OSCE. The average time for module completion was 2 h; half an hour for each topic including blood pressure, subcutaneous/intramuscular/intradermal injections, intragastric tube, and suctioning the airway. Each module was named based on the type of skills being taught (suctioning the airway module, blood pressure measurements module, intragastric tube module, subcutaneous/intramuscular/intradermal injections module, and serum therapy module). Modules could be distributed and transferred to a CD, flash memory, and mobile phone. The features of SLM included availability, easiness, simple use, and convenience in use. Considering that the participations were first-year undergraduate nursing students, they were not given a pretest examination. Data were analyzed using Mann–Whitney *U*-test, two-way analysis of variance (ANOVA), and descriptive statistics via SPSS software (version 16.5, SPSS Inc., Chicago, IL, USA).

Ethical considerations

Written consents were obtained from the research subjects. The study was approved by the Ethics Committee of Hamedan University of Medical Sciences with the code IR.UMSHA.REC.1395.129 in 2016.

Results

Among the 46 students, 52.17% (*n* = 24) were women [intervention group: 13 (54.17%); control group:

11 (45.83%)] and 47.83% (*n* = 22) were men [intervention group: 10 (45.45%); common method of teaching group: 12 (54.55%)]. The Mean (SD) age of the study participants was 18.80 (1.06) years. Results of the Mann–Whitney *U*-test and Chi-square test indicated that the groups were matched in terms of all demographic variables [Table 1].

Mann–Whitney *U*-test was conducted to compare the differences in student's clinical competency between the two groups. There was a significant difference in student's mean (SD) clinical competency score between the control group [58.19 (6.41)] and SLM group [62.83 (6.05)] (Mann–Whitney *U*-test: $z = -2.58$, $p = 0.010$). These results suggested that the use of SLM had increased the student's clinical competency [Table 2]. Comparison of the clinical competency scores in the SLM group in terms of gender indicated that there was no significant difference between women [*n* = 13; mean (SD): 61.60 (7.86)] and men [*n* = 10; mean (SD): 64.43 (3.66)] in this respect (Mann–Whitney *U*-test: $z = -0.49$, $p = 0.650$). Comparison of the clinical competency scores in the common method of teaching group in terms of gender indicated that there was no significant difference between women [*n* = 11; mean (SD): 59.11 (6.63)] and men [*n* = 12; mean (SD): 57.34 (5.62)] in this respect (Mann–Whitney *U*-test: $z = -0.68$, $p = 0.520$). Using two-way ANOVA, the effects of group and gender variables on clinical competency scores were investigated. Homogeneity of variances in the group and gender variables was examined using Levene's test. According to the results of two-way ANOVA, the main effect of the group was significant; however, the main effect of gender and the interaction between gender and group were not significant. This indicates that the significant effect of the intervention on the response variable and its effect on both men and women were the same [Table 3].

Discussion

The findings of this study are very encouraging and positive for the use of SLM for first-year undergraduate nursing students to learn and practice their nursing clinical skills, and increase their competency. The study provided

Table 1: Demographic characteristics of the participants

Gender	Intervention group, *n* (%)	Control group, *n* (%)	Chi-square test
Male	10 (45.45)	12 (54.55)	χ^2=348, df=1,
Female	13 (54.45)	11 (45.83)	p=0.550

Table 2: Comparison of the changes in clinical competency scores by group

Variable	Control group (*n*=23) Mean (SD)	Intervention group (*n*=23) Mean (SD)	Mann-Whitney U-test	
			z	*p*
Clinical competency	58.19 (6.41)	62.83 (6.05)	−2.58	0.010

Table 3: Two-way ANOVA results regarding the simultaneous effects of gender and group (intervention)

Variable	Mean square	F	df	p	Observed power	Levene's test
Y-intercept	167429.03	4266.300	1	<0.001		$F(3,42) = 1.24$,
Group	261.49	6.66	1	0.013	0.73	p=0.308
Gender	3.20	0.08	1	0.777	0.10	
Group* Gender	60.28	1.53	1	0.222	0.22	
Error	39.25		42			

ANOVA: Analysis of variance

evidence supporting the benefits of using SLM, allowing students to practice their clinical skills, and improving their clinical competency by increasing their clinical skills. For nursing faculties, the use of SLMs is useful in upgrading and enhancing students' clinical skills within a learning environment without anxiety where it strengthens students' self-learning. In this study, OSCE was used to assess the students. Bahreini *et al.* used a combination of nurses' competence assessment methods in order to reach a more valid and precise conclusion.[20] Previous studies have also shown that using SLM method improves residents' knowledge of MRI and CT safety[15] and provides an effective strategy for teaching both the theory and practice of hand-washing to nursing students.[4] In the study by Gahutu, the students appreciated the modular teaching system and stated that, if the computer access is enhanced, self-directed learning before or after classroom lectures will ensure classroom readiness or consolidation.[17]

In some studies, there was no significant difference between teaching strategies and speech SLM. No considerable difference was observed between the effects of lecture and SLM on the knowledge and practice of oncology nurses concerning safety standards with cytotoxic drugs.[4] SLMs could be as effective as lectures in the competency of nurses and could be useful in nursing education.[9] All the nursing students who had participated in this study were first-year undergraduate nursing students and did not have a history of clinical skills training. The significantly higher nursing clinical skills' performance scores achieved by the intervention group may have been influenced by the opportunity that students had to self-direct their own learning experiences. Being able to concentrate on specific aspects of the learning materials and watch the nursing clinical skills video more than once would have provided opportunities to practice and refine clinical nursing skills potentially increasing proficiency.[4] This was supported by the findings of Li *et al.*[21] They reported the effectiveness of electronic learning module for volumetric image-guided radiation therapy (IGRT). They also reported that the module ensures the delivery of consistent information as a component of yearly continuing education for radiation therapists.[21] Furthermore, the use of a learning module for radiation oncology is a useful method of ameliorating the radiologic anatomy knowledge and treatment planning skills of radiation oncology residents.[8] The study of Kaliyadan *et al.* suggested that the difference between

digital SLM and conventional method in the teaching of dermatology was not significant ($p = 0.084$; 5% significance level); they concluded that technology-based SLM might improve dermatology teaching.[8] In their study, dermatology modules included power-point presentations, instructive videos demonstrating signs in dermatological examination, interactive quizzes, and images.[8] In this study, the module included basic power-point presentations, videos demonstrating clinical skills, signs used in nursing clinical skills, introduction, learning objectives, interactive quizzes, immediate feedback, pictures, and additional resources, such as books, websites, and the researcher's phone number and email. The interactive components were designed in a way to be effective.

The participants' performance, the practice of passing the NG tube, was videotaped;[13] however, in this study, two educational videos were used. These videos were either made in the university's Clinical Skills Center or were retrieved from reputable websites. Viewing familiar environments in SLM videos might be more effective on student learning than videos that have been prepared in an unfamiliar environment or downloaded from academic and legitimate websites. Other studies support the results obtained in this study. For instance, in a study conducted by Khalil *et al.*, a significant difference was observed in students' performance in comparing SLMs-related items with non-SLM items in the midterm examination.[22] Finally, they expressed that SLMs can be used in an integrated method in medical curriculums in order to facilitate and individualize the learning of basic sciences. In their article, Jenkins *et al.* stated that, notwithstanding the increased use of CAI (computer-assisted instruction) in medical education, barriers still remain to the widespread implementation of CAI. It is also stated that perhaps CAI should not be compared with other teaching methodologies, but instead there should be research studies on how effective CAI is as an adjunct to traditional teaching.[23] The main limitation of this study was the lack of a pretest, since the participants were first-year undergraduate nursing students. Thus, this can be a proposal for further research.

Conclusion

The use of SLMs presents a modern and dynamic approach to medical education. The use of an interactive information technology-based SLM could help the students enhance the

quality of nursing clinical competency. In addition, SLMs can be more effective in self-directed learning. The use of SLMs independently and without faculty supervision is one of the important benefits of this method.

Conflict of interest

Nothing to declare.

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