BMC Surgery

RESEARCH Open Access

An investigation of the effectiveness of two different methods in teaching surgical aseptic skills: a quasi-experimental study

Esma Ozsaker[1], Burcak Sahin Koze[1*], Yelda Candan Donmez[1], Eda Dolgun[1], Turkan Ozbayir[1], Meryem Yavuz Van Giersbergen[1] and Fatma Demir Korkmaz[1]

Abstract

Background It is of the utmost importance in the prevention of infections in surgery that nursing students should learn surgical aseptic skills fully and in the correct order. There is a need for innovative teaching strategies to ensure that the contents of students' skills education are the same and that instruction is similar. Therefore, this study was conducted to investigate the effectiveness of two different methods in teaching surgical aseptic skills.

Methods A quasi-experimental research design was used. A total of 67 students were included in the study, 35 in an intervention group (video-assisted teaching), and 32 in a control group (skill demonstration) were recruited in the nursing faculty of a university in Türkiye. In both groups, the level of aseptic skill knowledge, the level of psychomotor skill, and the satisfaction score were assessed.

Results Although the students' surgical aseptic technique pre-test knowledge scores were higher in the control group, the post-test knowledge scores of both groups were high, and no significant difference was found between the groups. It was found that the gown and glove-wearing post-test scores of the students in the intervention group were higher than those of the control group. The students' sterile technique and surgical hand-washing skill levels were higher in the intervention group, and satisfaction with the teaching method was higher in the control group.

Conclusions The conclusions of this study show that the results of interactive video teaching in teaching nursing skills are as good as the traditional face to face demonstration method. This is a positive indicator, suggesting that interactive videos can suitably be integrated into basic nursing skills training.

Keywords Surgical aseptic skills, Nursing education, Video-assisted teaching, Skill demonstration, Student satisfaction

*Correspondence:
Burcak Sahin Koze
burcak.sahin.koze@ege.edu.tr; burcaksahinkoze@gmail.com
[1]Surgical Nursing Department, Ege University Faculty of Nursing, Bornova, Izmir 35100, Turkey

Introduction

Aseptic procedures are a basic technical skill used in all disciplines of medicine, reducing infections by preventing contamination from micro-organisms which cause disease [1]. A breakdown of aseptic technique in surgical environments can cause surgical site infections (SSI), which have a negative effect on patient health and lead to increased health care costs [2, 3, 4].

Learning surgical aseptic skills correctly is of vital importance in preventing SSIs [4]. It is necessary to manage the aseptic area by means of personal protective equipment including a mask, bonnet, and a sterile gown and gloves [5] and to ensure hand hygiene before putting on the sterile gown and gloves [6].

Surgical aseptic technique is a fundamental skill that nursing students are required to learn in many nursing programs worldwide, as it is essential for infection prevention and patient safety across various healthcare settings [7, 8]. Learning psychomotor skills in the laboratory prepares students for the clinical environment [9]. When basic skills are not learned properly, the quality of nursing care and patient safety may be endangered [10, 11]. For this reason, improving surgical aseptic skills by teaching them correctly during undergraduate education and enabling nursing students to provide safe care is the most basic aim of schools which give nursing education [4, 12].

Even if the use of traditional face to face teaching methods in the clinical skills laboratory is seen as an invaluable strategy, education skills must be based on learning needs and expectations and learning styles [13]. Nursing education includes cognitive, affective and psychomotor learning fields, and in education to produce nurses who can combine practice with abstract knowledge, think critically and solve problems effectively, it is necessary to keep up with innovative practices [14, 15]. All over the world, teaching has gone from face to face education programs to on-line teaching. Distance on-line education has directed all educators on to new and creative teaching and learning paths [16, 17]. In psychomotor skills training today, along with traditional methods such as demonstration and the use of skills lists, much learning technology such as role play, showing video, games, virtual reality, simulated patients and standardized patients are widely used to enrich learning and to develop students' general learning [18, 19].

Video is a kind of self-teaching which allows a multimedia approach to learning, including various learning methods such as both visual and auditory methods and reading and writing [20, 21]. When video-supported teaching is compared with other methods, it is seen to have many advantages [15]. In particular, audio-visual instruments involve many sensory organs and make perception and learning easier [14]. The advantage of skill- focused videos is that the learning process is student-oriented. It allows students to learn from any education level at their own speed, and students can work when and where they choose, and go through any section according to their abilities and preferences [4, 22, 23, 24, 25]. Perhaps the greatest advantage of using video in learning is that it is easy to use. Videos can be accessed from desktop or laptop computers, or from mobile devices; they can be stopped, fast-forwarded and replayed indefinitely [4].

Researchers have shown that the use of technologies such as interactive videos or virtual reality simulators provide encouraging education for students and health experts [26, 27]. It has been shown that the use of video technology makes skills learning easier for nursing students [28], increases the readiness of medical students for clinical examinations, develops suture ability and increases the general performance of learning in the operating room [4]. In a study by McKenny et al. (2011), it was found that videos showing nursing students how sterile covers were changed had a direct effect on improving their understanding and application of aseptic techniques [24]. Nageswaran et al. (2011) showed that in teaching the surgical scrubbing technique to medical students, increasing clinical skill by video teaching was better than clinical skills teaching alone [29].

In the field of psychomotor learning, there is insufficient evidence to show that video-based teaching is an effective method [15]. Despite surgical aseptic skill being a basic skill for nursing students, more research is needed on how the teaching and assessment of these skills can be developed in degree programs [30]. Which teaching strategy, video or traditional methods, provides a more effective surgical aseptic skill for nursing students? Increasing nursing students' skill competence is a concern both for educators and for students. For this reason, a study on strategies to develop nursing students' skills will be valuable for educators and nursing students. The aim of this study is to examine the effectiveness of two different methods in the teaching of surgical aseptic skills.

Methods

Aim

To investigate the effectiveness of two different methods in teaching surgical aseptic skills.

Study design

A Quasi-Experimental Study design was used in the study. A control group and an intervention group were used to compare the effectiveness of the traditional teaching method of skill demonstration and video-assisted teaching as a teaching strategy to develop nursing students' surgical aseptic skills.

Study setting and sample

The research was conducted at a Faculty of Nursing in Izmir, Turkey, during the 2021–2022 academic year. The research population consisted of 392 first-year nursing students, and the research sample was drawn from this population, including only those students who had no prior clinical experience and voluntarily agreed to participate in the study. Exclusion criteria included being a health vocational high school graduate (due to prior clinical experience), not participating in the practice stage of the research, and not completing the pre-test and/or post-test. These criteria were established to ensure that the study sample consisted of students without prior clinical experience and who fully participated in all stages of the research, rather than representing cases of missing data or loss to follow-up. A total of 70 students voluntarily formed the sample: 35 students in the intervention group, with video-assisted teaching, and 35 in the control group, with skill demonstration. Three students in the control group did not continue with the process and were excluded from the research, and the study was completed with a total of 67 students: 35 in the intervention group and 32 in the control group. Post hoc Power Analysis: According to the ANOVA results obtained in the study, a significant difference was found between the two groups (a classical and b video) on t_score ($F(1, 65) = 23.951$, $p < 0.001$). The observed power value was calculated as 0.998. This value indicates that the probability of correctly detecting the difference between the groups is 99.8%. This suggests that the study has a high statistical power and is highly reliable in detecting whether the difference between the groups exists.

Randomization

In order to create a randomization list which would assign the participants to two 35-person groups – an intervention group with video and a control group with skills demonstration – a random ordering randomization algorithm (Maximum Allowed Deviation = 10%) PASS 11.0 (NCSS LLC, Kaysville, UT) was used.

Blinding

Due to the nature of this study, researchers and participants could not be blinded. An independent statistician performed the analysis to prevent any bias during analysis of the data. The flow diagram of the study is given in Fig. 1.

Education video flow chart: A scenario was prepared in the research to achieve standardization in the exposition of all skills. The video shooting was performed by a professional team in the scenario. The expert views of ten teaching staff members were sought for the preparation of the teaching videos, and the videos were given their final form in line with their recommendations. Four 2-10-minute videos were created: (1) Putting on and taking off the bonnet and mask (2:29 min); (2) Surgical hand-washing (9:24 min); (3) Putting on and taking off the sterile gown and gloves (4:35 min); (4) Opening sterile packages and equipment (2:05 min). The videos lasted a total of approximately 18:03 min. The length of the videos is in accordance with the literature, which recommends that from a technical viewpoint, videos should not last longer than 15 min [31].

Data collection tools

Personal information form

The Personal Information Form consisted of questions on the students' age, gender, and previous education level, specifically whether they graduated from a general high school or a health vocational high school.

Surgical asepsis knowledge assessment form

This information form was prepared by the researchers by making a scan of the literature, and consisted of 12 multiple choice questions. This form evaluated the students' levels of knowledge of surgical asepsis, and one point was given for each correct answer. The lowest possible score was 0, and the highest was 12. The content of the questions included the topics of hand washing, wearing gown and gloves, and maintaining sterility in the operating room.

Surgical aseptic skills checklist

In the evaluation of skills in this study, the Skills Checklist was used. This list was prepared according to the literature [6, 32, 33, 34, 35, 36] and covers operation steps in detail. The skill evaluation form used in this study had not undergone a formal validation or reliability testing process; however, it was reviewed by faculty members from 10 different nursing faculties, and expert opinions were obtained before its use to ensure content validity. The checklists include the procedural steps of the skills which must be performed in the operating room. In assessing skills, the checklists used cover the following:

1. Putting on and taking off the bonnet and mask (8 steps).
2. Surgical hand-washing (20 steps).
3. Putting on a sterile gown and gloves, having sterile gloves put on, taking off the gown and gloves (19 steps).
4. Opening a sterile package or equipment (9 steps).

The students were given 1 point for each procedural step carried out correctly, and 0 points for each procedural step carried out incompletely or incorrectly. The evaluation of each skill was made according to the mean score

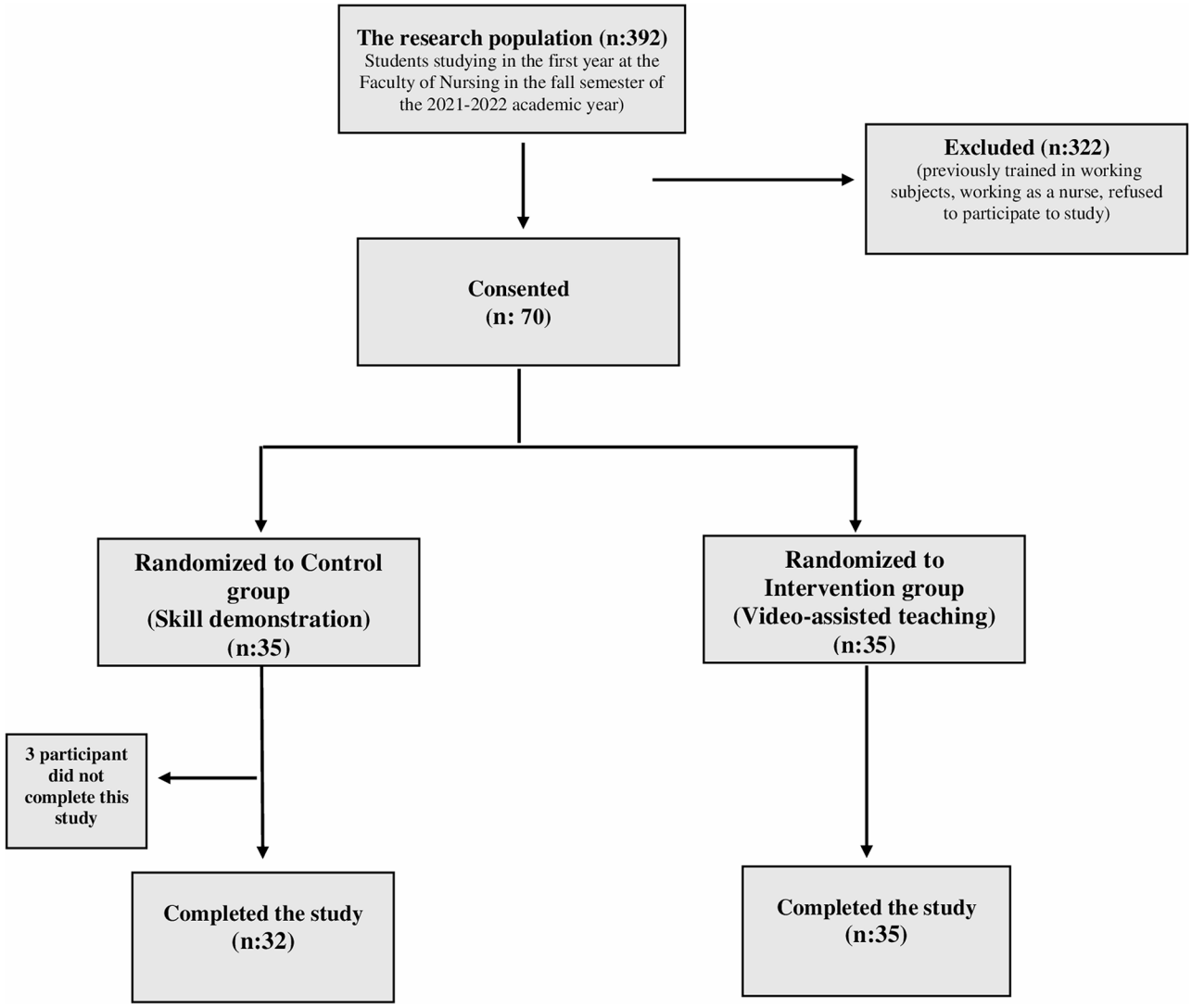

Fig. 1 The flow diagrams of the study

of the item within itself. A high score showed that the skill level was high.

Education assessment questionnaire

Each student who completed the education method was asked to evaluate the teaching which they had received with a questionnaire prepared by the researchers. Students in both groups were asked to answer questions about their feedback on the training method.

* What did you like the most about the skill practice or the videos? And why?

* What would you change if you had the chance to change in the skill practice or videos? And why?

* Can you write your feedback and suggestions about the study?

Questionnaire of satisfaction with teaching methods

This questionnaire was developed by Gürpınar et al. and its validity and reliability was performed by the same authors (Gürpınar et al., 2010) [37]. The questionnaire consisted of 16 propositions. Each one was scored according to a five-way Likert-type scale: 1 I definitely disagree, 2 I disagree, 3 I am undecided, 4 I agree, 5 I definitely agree. The lowest possible score on the scale was 16, and the highest was 80. A higher score indicated a higher level of satisfaction with the teaching method. Permission to use the questionnaire was obtained from Gürpınar by email. The Cronbach alpha value of the questionnaire was reported as 0.84 in its original validation study. In the present study, based on the data obtained from our sample, the Cronbach alpha value was found to be 0.81.

Procedures

Preparation stage

Step 1: The students included in the research signed the informed consent form.

Step 2: The participants were randomized into two 35-person groups: a video show intervention group and a skill demonstration control group (Fig. 1).

Theoretical lesson

After the students who agreed to participate in the study were given information about the study and their written approval was obtained, they were given a 40-minute theoretical lesson using Microsoft Powerpoint (Microsoft Corporation, Redmond, Washington, USA) on asepsis, antisepsis, putting on and taking off the bonnet and mask, surgical handwashing, putting on and taking off a sterile gown and gloves and opening a sterile package.

Completing the pre-tests

All students completed the Surgical Asepsis Knowledge Assessment Form immediately after the lesson.

Skill demonstration (control group)

In order to prevent them from accessing the education videos, the procedure was carried out first with the control group. The students were given theoretical information on 12 November 2021. After the teaching, the information pre-test was given. After that, a virtual class including the control group students was created on Microsoft TEAMS, and access was provided to the students' theoretical knowledge materials and the lists of skill stages. They could review these materials as much as they wanted at any time until the evaluation day, 7 days later.

Video supported teaching (intervention group)

In the intervention group, skill teaching was conducted with video. Before applying the skill, educational videos were prepared by the researchers on the skills which the students had to acquire, relating to sterile surgery technique and surgical handwashing. On 19 November 2021, the students were given theoretical instruction, and after that, the information pre-test was given. Then, a virtual class including the intervention group students was created on Microsoft TEAMS, and students were given access to the teaching videos, their theoretical knowledge lesson scores and the lists of skill steps. The students were able to watch the teaching videos by themselves and as often as they wanted. After the students were given access to the virtual classroom created in Microsoft TEAMS, they were able to watch the videos as much as they wanted at any time until the evaluation day 7 days later. The students were told that they should watch a skill until they thought they could do it on their own. Therefore, while some students could watch the videos 2 times and understand them, another student stated that he watched them once every day until the day of the application. The students were not asked how many times they watched the skill when they came to the skill practice, they could watch it until the moment they thought they could do that skill on their own within the given time (7 days).

Evaluation of skills in a laboratory setting

The skills taught to the students in both groups included putting on and taking off the bonnet, putting on and taking off the mask, surgical handwashing, putting on and taking off the sterile gown and gloves, and opening a sterile package and equipment. Skill training was conducted one week after theoretical teaching for both groups.

The researchers performed a face-to-face skill demonstration in the laboratory on surgical aseptic skills. After explaining and showing a suitable technique, the teacher the students were asked to perform the skills in the way in which they were shown.

The students of the video supported teaching group again watched the teaching videos in the skills laboratory before practicing them. After watching the skill videos, the students were asked to perform the skills according to the videos.

Later, the students of both groups performed the procedures in front of clinical teachers, and they were assessed using the skill checklists.

Completing the post-tests and the survey of satisfaction with the training method

Students of both groups who completed the skill implementation completed the post-test and the surveys of satisfaction with the training method.

Data collection

Data were collected in November 2021.

Statistical analysis of data

Data obtained from the research was analyzed using the program Statistical Package for the Social Sciences (SPSS, Windows). The results were expressed as numerical values (percentages), means and standard deviations (± sd). For analysis of the conformity of data to normal distribution, the Kolmogorov-Smirnov test was used. In comparisons between the groups of quantitative data, the Mann Whitney U Test and the Kruskal-Wallis Test were used if data was not normally distributed, and for normal distribution, the Independent Samples t-Test and the One-Way Anova Test were used. In determining whether there was a difference in knowledge scores before and after the skill training in the intervention and control groups separately,

Table 1 Descriptive characteristics of students in groups

	Control group (*n*:32) M ± SD (min-max)		Intervention group (*n*:35) M ± SD (min-max)		*P*Value
Age	19.12 ± 0.94 (18–21)		19.14 ± 0.84 (18–21)		0.935[a]
	n	**%**	***n***	**%**	
Gender	28	87.5	29	82.9	0.594[b]
Female	4	12.5	6	17.1	
Male					
High school of graduation	23	71.9	31	88.6	0.222[b]
Anatolian High School	5	15.6	2	5.7	
Sciences High School	4	12.5	2	5.7	
Other					

M: Means, SD: standard deviation, Min: the smallest vaue, Max: the largest value,[a] Independent Samples t-Test, [b] Pearson $\chi^{2\text{-test}}$

Table 2 Correct answer of students to the surgical aseptic technical knowledge test

Surgical aseptic technical knowledge test	Control group Median (Min-Max)	Intervention group Median (Min-Max)	*P*Value [a]
Hand washing (0–5)	5 (4–5)	4 (2–5)	0.008*
Pre-test	5 (4–5)	5 (2–5)	0.221
Post-test			
Wearing gowns and gloves (0–2)	1 (0–2)	0.0 (0–2)	0.001*
Pre-test	1 (0–2)	1 (0–2)	0.118
Post-test			
Maintenance of sterility in the operating room(0–5)	4 (1–5)	4 (2–5)	0.221
Pre-test	4(2–5)	4(2–5)	0.697
Post-test			

*$p < 0.05$, [a] Mann-Whitney U test, Min: Minimum, Max: Maximum

the Paired Samples t-Test was used in cases of normal distribution, and the Wilcoxon Signed Ranks Test was used where distribution was not normal. At the same time, time-related change in the groups of variable measurements were analyzed with the non-parametric method Brunner-Langer model (F1-LD-F1 design) R 3.5.2 program (*R software*, *version 3.5.2*, *package: nparLD*, *R Foundation for Statistical Computing*, *Vienna*, *Austria;*http://r-project.org*).* When time-related change in the groups was found not to be similar as a result of the Brunner-Langer model (interaction < 0.1), time comparison was conducted with the Wilcoxon test in each group separately. In the first monitoring period, (basal) groups were compared with the Mann-Whitney U test, and later, taking Z2-Z1 (basal) differences, the groups were again compared with the same test. The results were evaluated at a confidence interval of 95% and a significance level of $p < 0.05$.

Ethical considerations

The study was reviewed and approved by Ege University Scientific Research and Publications Ethics Committee. (approval number: 06/05, Date: 4 September 2018). Written approval was obtained from the institution where the research was conducted. All of the students were informed about the aim and procedure of the research, and oral and written approval was obtained from those who agreed to participate. Participants were informed beforehand that this study was part of a research project and that their performance in the study would not affect their grades in the course.

Results

Table 1 gives data relating to the descriptive characteristics of the students included in the research. According to this, the mean age of the students was 19.12 ± 0.94 years (Min:18, Max:21) in the control group and 19.14 ± 0.84 years (Min:18, Max:21) in the intervention group. It was seen that the groups were homogeneous with respect to the students' mean ages, gender and high school of graduation ($p > 0.05$) (Table 1).

Basic knowledge test scores

It was found that regarding ***hand washing*** and ***glove wearing***, there was a statistically significant difference between the intervention and control groups in knowledge pre-test scores ($p < 0.05$). However, no statistically significant difference was found in post-test scores ($p > 0.05$). No significant difference was found between the groups in pre-test and post-test knowledge scores relating to the ***maintenance of sterility in the operating room*** ($p > 0.05$) (Table 2).

Regarding hand washing, the difference in pre-test and post-test score changes was significant

Table 3 Handwashing and maintaining sterility scores of the students in the groups according to the measurement time

Hand washing	Pre-test		Post-test	
Group	**M ± SD**	**Median (Min-Max)**	**M ± SD**	**Median (Min-Max)**
Control group (*n*:32)	4.71 ± 0.45	5.00 (4.00–5.00)	4.78 ± 0.42	5.00 (4.00–5.00)
Intervention group (*n*:35)	4.14 ± 0.94	4.00 (2.00–5.00)	4.57 ± 0.69	5.00 (2.00–5.00)
		Group $P = 0.004$* Time $P = 0.048$* Interaction $P = 0.215$		
Maintaining sterility	**Pre-test**		**Post-test**	
	M	**Median (Min-Max)**	**M**	**Median (Min-Max)**
Control group (*n*:32)	3.75 ± 1.07	4.00 (1.00–5.00)	3.96 ± 0.86	4.00 (2.00–5.00)
Intervention group (*n*:35)	3.51 ± 0.78	4.00 (2.00–5.00)	3.85 ± 1.03	4.00 (2.00–5.00)
		Group $P = 0.291$ Time $P = 0.064$ Interaction $P = 0.522$		

*$p < 0.05$, M: Means, SD: standard deviation, Min: Minimum, Max: Maximum

Brunner-Langer model (F1-LD-F1 dizayn), R 3.5.2 software (R software, version 3.5.2, package: nparLD, R Foundation for Statistical Computing, Vienna, Austria; http://r-project.org)

Table 4 Wearing gowns and gloves scores of the students in the groups according to the measurement times

	Pre-test		Post-test		Intra-Group Comparison	Between Groups Comparison	
Group	**M**	**Median (Min-Max)**	**M**	**Median (Min-Max)**	***P***	**difference**	***P***
Control group (*n*:32)	1.09 ± 0.58	1.00 (0.00–2.00)	1.09 ± 0.58	1.00 (0.00–2.00)	> 0.05	0.00 (-2.00-2.00)	**< 0.001**
Intervention group (*n*:35)	0.48 ± 0.56	0.00 (0.00–2.00)	1.31 ± 0.67	1.00 (0.00–2.00)	**< 0.001**	-1.00 (-2.00-1.00)	
			Group $P = 0.084$ Time P **< 0.001*** Interaction P **< 0.001***				

*$p < 0{,}05$, M: Means, Min: Minimum, Max: Maximum

Brunner-Langer model (F1-LD-F1 dizayn), R 3.5.2 software (R software, version 3.5.2, package: nparLD, R Foundation for Statistical Computing, Vienna, Austria; http://r-project.org)

($p = 0.004$), and the difference was also significant by time ($p = 0.048$). The score increase in the intervention group was greater than in the control group. Examining the interaction of groups and time, it was found that the effect size by time was not different between the groups (interaction $p = 0.215$). For maintaining sterility, there was no significant difference between the groups ($p = 0.291$) or by time ($p = 0.064$), and the effect size over time was not different between the groups (interaction $p = 0.522$) (Table 3).

For wearing gowns and gloves, there was no significant difference between the groups in pre-test and post-test score changes ($p = 0.084$), although the score increase in the intervention group was significantly greater than in the control group ($p < 0.001$). Examining the interaction of groups and time, it was found that the effect size by time was different between the groups (interaction $p < 0.001$) (Table 4).

Skill score in a laboratory setting

There was no significant difference in mean scores for surgical handwashing, putting on and taking off the bonnet and mask, or putting on and taking off the sterile gown and gloves ($p > 0.05$). However, there was a significant difference in the mean scores for the skill of opening a sterile package, with the intervention group showing higher scores than the control group ($p < 0.05$) (Table 5).

Score of satisfaction with training methods

The students' mean satisfaction scores for the training methods were 68.34 ± 13.43 (Min:16, Max:80) for the control group and 51.28 ± 14.95 (Min:16, Max:80) for the intervention group. The control group had a higher mean

Table 5 Students' skill scores and satisfaction with the education method by groups

Skills Scores (0–2)	Control group (*n*:32) M ± SD	Intervention group (*n*:35) M ± SD	*P*Value [a]
Surgical hand-washing	1.76 ± 0.20	1.76 ± 0.19	0.950
Putting on and taking off the bonnet and mask	1.91 ± 0.14	1.94 ± 0.11	0.254
Putting on and taking off the sterile gown and gloves	1.71 ± 0.15	1.79 ± 0.19	0.097
Opening a sterile package	1.49 ± 0.38	1.88 ± 0.22	**0.001***
Score of satisfaction with training methods	68.34 ± 13.43 (16–80)	51.28 ± 14.95 (16–80)	**0.001***

*$p < 0,05$, [a] Independent Samples t-Test, M: Means, SD: standard deviation, Min: Minimum, Max: Maximum

satisfaction score than the intervention group ($p < 0.05$) (Table 5).

Discussion

It is of the utmost importance for preventing surgical site infections that nursing students should learn the psychomotor skills of sterile surgical technique and handwashing completely and in the correct order. The four-part video series prepared in this study was used to teach nursing students sterile aseptic technique and surgical handwashing. Examining the descriptive characteristics of the students in both the video-assisted teaching (intervention) and skill demonstration (control) groups, it was found that the groups were homogeneous in terms age, gender and education ($p > 0.05$). The similarity is crucial in preventing bias and ensuring the validity of comparisons between the groups.

Basic knowledge test scores

There was a significant improvement in students' knowledge regarding **handwashing**, **maintaining sterility in the operating room**, **and wearing gowns and gloves** in both groups. However, no significant difference was found between the post-test mean scores of the two groups ($p > 0.05$), indicating that both teaching methods effectively enhanced students' knowledge. In particular, both groups showed improvement in understanding the importance of gowning and gloving in maintaining sterility. However, these aspects were addressed separately during the intervention to ensure that students received clear and focused education on each of these essential practices. These findings align with studies showing that both **traditional skill demonstration and video-assisted training** are equally effective in improving theoretical knowledge in nursing education [1, 10, 23, 38, 39, 40].

When examining the pre-test and post-test score changes for ***handwashing and maintaining sterility***, no significant difference in effect size between the groups was found ($p > 0.05$). However, for **wearing gowns and gloves**, the effect size was significantly higher in the intervention group ($p < 0.001$). The effect size refers to the magnitude of the difference between the groups, indicating the strength of the intervention's impact on these outcomes. This indicates that the video-based training had a stronger impact on students' knowledge of gown and glove usage compared to traditional skill demonstration. The larger effect size observed in the intervention group suggests that video-assisted training may be particularly effective in enhancing students' understanding and retention of these critical procedural elements. Stanton et al. (2012) found no significant difference in test scores between e-learning and traditional training groups [41], but Abdelaziz et al. (2011) reported that the post-test score of a group receiving training by e-learning was significantly higher than that of a control group trained by traditional education methods [42]. In a study by Sheikhaboumasoudi et al. (2018), it was shown that a combination of e-learning with traditional face to face teaching methods could improve learning results in nursing students [23]. Teaching by the traditional method is very valuable in the teaching of basic skills, but e-learning provides a greater advantage in combination with the traditional method, and can be effective in increasing students' knowledge levels [23, 40]. In nursing education and especially in skill training, the use of different education methods should be made more widespread.

Skill score in a laboratory setting

Competence in basic skills is a prerequisite for nursing students in the provision of comprehensive care. For the safe care of patients, clinical skills must be learned completely, and the most effective methods must be used in skill training [23]. There are many positive contributions, such as saving different methods and materials used in training from the ordinary, increasing the desire for learning by providing a multiple learning environment, and providing an effective contribution to teaching. In particular, it is shown that audio-visual means make perception and learning easier by involving many sensory organs [14]. In this study, examining the skill scores by groups of the students participating in the research, no significant difference was found regarding the mean scores of surgical hand-washing, putting on and taking off the bonnet and mask, and putting on and taking off the sterile

gown and gloves ($p > 0.05$). It was found that the mean skill score for opening a sterile package was higher in the video-supported education group ($p < 0.05$). Similarly, there are studies showing that videos are more effective in skill acquisition [43, 44, 45, 46]. In a study by Chuang et al. (2018) examining the effects of skill demonstration video presented by smartphone on the skill competence and self-reliance of nursing students, it was found that although there was no significant difference in students' self-reliance levels, there was an improvement in their knowledge and skills [45]. In another study by Shippey et al. (2011), three different methods to teach stitching techniques – teaching with video, demonstration by a teacher and independent learning – were compared, and it was seen that the students taught by video had better results [47]. There are studies reporting that the use of video in skill training was as effective as demonstration by the traditional method [10, 11, 24, 39, 48] but also others which show that routine teaching methods, that is demonstration, are more effective than a video-supported teaching program [15, 49]. When there is no demonstration method, video based teaching may be a suitable alternative [11]. Generally, educational videos are recognized as an adequate teaching approach for students to learn basic skills independently and at their own pace [10]. It allows better visualization of the topic being worked on and provides mentally real life experience for what students have previously learned [4]. A quiet, stress-free positive learning environment comes to the fore as an important factor in effective teaching and learning and is an important element in students' control over their own learning [50]. After reviewing the relevant literature, it is evident that while some studies support the effectiveness of video-assisted teaching in skill acquisition, others suggest that traditional demonstration methods remain superior. The findings of this study align with previous research indicating that video-assisted education is as effective as traditional demonstration methods in certain skills, such as opening a sterile package, where students in the intervention group scored higher ($p < 0.05$). However, for other aseptic skills, such as surgical hand-washing and donning/doffing sterile attire, no significant difference was observed between the groups ($p > 0.05$), which is consistent with studies showing that both methods can be equally effective in skill training [10, 11, 24, 39, 48]. These findings suggest that while video-assisted teaching can enhance certain aspects of skill acquisition, a blended approach that combines both video instruction and hands-on demonstration may provide optimal learning outcomes.

Satisfaction score with training methods

It has been found that students' motivation and satisfaction are increased using different education methods with e-learning [23]. In the present study, it was found that the mean scores of satisfactions with education methods of the students in the control group were higher than in the intervention group, and that there was a significant difference between the groups ($p < 0.05$). As this is first year nursing students' first experience of skill learning, they may have appreciated the face-to-face student-teacher interaction and valued the chance to ask questions. Studies have reported varying levels of student satisfaction with video-based learning compared to traditional teaching methods. While some research suggests that students appreciate managing their own learning through videos [51], others indicate that video-assisted teaching can enhance satisfaction for specific nursing skills. For example, in a study by Natarajan et al. (2022), 92% of students in the video group and 87% in the traditional teaching group expressed satisfaction with oral medication administration training [10]. Similarly, nursing students learning urinary catheterization through videos reported higher satisfaction levels compared to those receiving general demonstration-based instruction [45]. However, other studies have found no significant differences in student satisfaction between e-learning and traditional methods [52].

A systematic review by Lathi et al. (2014) and a study by Ariana et al. (2016) suggest that a blended learning approach—combining e-learning with traditional methods—may enhance student satisfaction compared to traditional learning alone [52, 53]. Additionally, a literature review by Hernon et al. (2023) emphasized that students generally view technology positively and find it beneficial in nursing education [18]. These findings indicate that while video-based teaching is effective, student satisfaction may depend on the type of skill being taught and the extent to which interactive components are incorporated.

Study limitation and strengths

Certain methodological limitations of this study must be considered. First, its generalizability is limited because the sample consisted of first-year nursing students from a single nursing faculty in Türkiye. This may not fully represent nursing students in other educational settings, as variations in curricula, teaching methodologies, and institutional resources can influence learning outcomes. The skill evaluation form used in the study did not demonstrate definite validity or reliability. Additionally, since there was a statistical difference between the pre-test knowledge scores of the two groups, another limitation was that the

students were not randomized based on their academic performance. Furthermore, because it was not possible to track how many times students in the video group watched the instructional videos outside of class, the effect of video exposure frequency on skill acquisition and knowledge retention could not be assessed.

Implications

This study highlights the potential of video-assisted learning to enhance perioperative nursing education, particularly in the teaching of critical surgical aseptic skills. As the development of psychomotor skills, such as sterile technique and surgical hand washing, is critical to the prevention of perioperative infections, the integration of interactive video training into the perioperative curriculum may improve the effectiveness of skills teaching. Furthermore, the higher satisfaction rates achieved with traditional teaching methods suggest the need for a blended approach combining video-based instruction with hands-on demonstration to optimise both skill retention and student engagement in perioperative nursing education. Supplementing traditional skills demonstration with video is a promising strategy to provide a quality experience in nursing specialties such as operating theatre nursing.

Conclusions

It was found in this study that both traditional skill demonstration and the video-supported teaching method were equally effective in instilling knowledge specific to surgical aseptic skills. It was found that the level of satisfaction with the teaching method of students in the skill demonstration group was higher. For this reason, to increase students' skill development, it is recommended that a combination of teaching methods be adopted. Skill demonstration in the laboratory is traditional and preferred method, but video can also be used. It is recommended that in future studies, both methods should be used together to determine whether better results are obtained in a group receiving traditional education or in a group receiving both traditional and video education.

Recommendations for future research

Future research should investigate the long-term retention of surgical aseptic skills learned through video-assisted methods compared to traditional face-to-face training by increasing the sample size. Additionally, the effect of combining both teaching methods could be explored to determine whether a hybrid approach maximizes learning outcomes. Furthermore, future studies should consider the integration of interactive videos and serious games into nursing education, as these methods can enhance engagement, provide real-time feedback, and improve decision-making skills. Such interactive learning tools may further strengthen students' ability to retain and apply aseptic techniques effectively in clinical practice.

Acknowledgements

The authors would like to thank the Ege University Scientific Research Projects for their support (Grant Number: TGA-2019-20513). In addition, we would like to thank the nursing students who participated in this study.

Author contributions

All authors have agreed on the final version and meet at least one of the following criteria (recommended by the ICMJE*): (1) substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; (2) drafting the article or revising it critically for important intellectual content. Study design: EO, BSK, YCD, ED, TO, MYVG, FDK. Data collection: EO, BSK, YCD, ED. Data analysis: EO, BSK. Study supervision: EO, BSK, TO, MYVG, FDK. Manuscript writing: EO, BSK. Critical revisions for important intellectual content: EO, TO, MYVG, FDK

Funding

This research was supported by the Ege University Scientific Research Projects Coordination Unit (Grant Number: TGA-2019-20513).

Data availability

The data that support the findings of this study are available from the authors upon reasonable request.

Declarations

Ethics approval and consent to participate

; All participants gave their informed consent for inclusion before they participated in the study. The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Ethics Committee of Ege University (approval number: 06/05, Date: 4 September 2018).

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Clinical trial number

not applicable.

Received: 2 January 2025 / Accepted: 25 March 2025
Published online: 11 April 2025

References

1. Bloomfield J, Roberts J, While A. The effect of computer-assisted learning versus conventional teaching methods on the acquisition and retention of handwashing theory and skills in pre-qualification nursing students: A randomised controlled trial. Int J Nurs Stud. 2010;47:287–94. https://doi.org/10.1016/j.ijnurstu.2009.08.003
2. Adewunmi MC, Salawu RA. Outcome of Nurse-Led intervention on knowledge and practice of aseptic technique among surgical nurses in two teaching hospitals in Lagos State, Nigeria. Afr J Health Nurs Midwifery. 2021;4(2):88–104. https://doi.org/10.52589/AJHNMWCH721KJ
3. Bashaw MA, Keister KJ. Perioperative strategies for surgical site infection prevention. AORN J. 2019;109(1):68–78. https://doi.org/10.1002/aorn.12451
4. Pilieci SN, Salim SY, Heffernan DS, Itani KMF, Khadaroo RG. A randomized controlled trial of video education versus skill demonstration: which is more effective in teaching sterile surgical technique?? Surg Infect. 2018;19(3):303–12. https://doi.org/10.1089/sur.2017.231
5. Denton A, Hallam C. Principles of Asepsis 2: technique for a simple wound dressing. Nurs Times. 2020;116(6):29–31. https://www.nursingtimes.net/clinical-archive/infection-control/principles-of-asepsis-2-technique-for-a-simple-wound-dressing-16-04-2020/

6. Spruce L. Back to basics: sterile technique. AORN J. 2017;105(5):478–87. https://doi.org/10.1016/j.aorn.2017.02.014
7. Hawker C, Courtenay M, Gould D. How aseptic technique is taught to undergraduate student nurses: A qualitative study. Nurse Educ Today. 2023;122:105717. https://doi.org/10.1016/j.nedt.2023.105717
8. Loveday HP, Wilson JA, Pratt RJ, Golsorkhi M, Tingle A, Bak A, Browne J, Prieto J, Wilcox M, UK Department of Health. epic3: National evidence-based guidelines for preventing healthcare-associated infections in NHS hospitals in England. J Hosp Infect. 2014;86(1):S1–70. https://doi.org/10.1016/S0195-6701(13)60012-2
9. Hernon O, McSharry E, MacLaren I, Carr PJ. The use of educational technology in teaching and assessing clinical psychomotor skills in nursing and midwifery education: A state-of-the-art literature review. J Prof Nurs. 2023;45:35–50. https://doi.org/10.1016/j.profnurs.2023.01.005
10. Natarajan J, Joseph MA, Shibli A, Hajji ZSA, Hanawi SSA, Kharusi DKA, A. N., Maqbali A, I.M. Effectiveness of an interactive educational video on knowledge, skill and satisfaction of nursing students. Sultan Qaboos Univ Med J. 2022;22(4):546–53. https://doi.org/10.18295/squmj.2.2022.013
11. William A, Vidal V, Moham H. Video versus traditional teaching strategy for enhancing intramuscular injection skills among college of nursing students in Kuwait: A comparative study. J Health Med Nurs. 2021;6(3):66–88. https://doi.org/10.47604/jhmn.1320
12. Boztepe H, Terzioğlu F. Skill assessment in nursing education. J AnatoliaNursing Health Sci. 2013;16(1):57–64.
13. Bloomfield JG, Jones A. Using e-learning to support clinical skills acquisition: exploring the experiences and perceptions of graduate first-year pre-registration nursing students a mixed method study. Nurse Educ Today. 2013;33(12):1605–11. https://doi.org/10.1016/j.nedt.2013.01.024
14. Yorulmaz ET, Belhan Z, Koca E, Kocatepe V, Ünver V. How should the story board be for nurse education?? J Hacettepe Univ Fac Nurs. 2022;9(1):115–22. https://dergipark.org.tr/tr/download/article-file/2375786
15. Devi B, Khandelwal B, Das M. Comparison of the effectiveness of Video-assisted teaching program and traditional demonstration on nursing students learning skills of performing obstetrical palpation. Iran J Nurs Midwifery Res. 2019;24(2):118–23. https://doi.org/10.4103/ijnmr.IJNMR_35_18
16. Barton AJ, Murray TA, Spurlock DR. An open letter to members of the nursing education community. J Nurs Educ. 2020;59(4):183. https://doi.org/10.3928/01484834-20200323-01
17. Dewart G, Corcoran L, Thirsk L, Petrovic K. Nursing education in a pandemic: academic challenges in response to COVID-19. Nurse Educ Today. 2020;92:104471. https://doi.org/10.1016/j.nedt.2020.104471
18. Hernon O, McSharry E, Simpkin A, et al. Effectiveness of structured self-evaluation of video recorded performance on peripheral intravenous catheter insertion: a randomised control trial study protocol. Trials. 2023;24:182. https://doi.org/10.1186/s13063-023-07200-8
19. Akın Korhan E, Tokem Y, Uzelli Yılmaz D, Dilemek H. Video-Based teaching and OSCE implementation in nursing psychomotor skills education: sharing of an experience. İzmir Katip Celebi Univ Fac Health Sci J. 2016;1(1):35–7.
20. Abram MD, Forbes MO. High-fidelity simulation: an application to psychopharmacological training for the psychiatric nurse practitioner student. Issues Ment Health Nurs. 2019;40(3):260–7. https://doi.org/10.1080/01612840.2018.1519621
21. David D, Kaur S, Siddiqui A, Sarin J. Efficacy of lecture cum demonstration versus video-based teaching regarding active management of third stage of labor in terms of knowledge and skills of GNM students: an interventional study. J Edu Health Promot. 2020;9:243. https://doi.org/10.4103/jehp.jehp_236_20
22. Yuda Handaya A, Fauzi AR, Andrew J, Hanif AS, Tjendra KR, Aditya AFK. Effectiveness of tutorial videos combined with online classes in surgical knotting course during COVID-19 pandemic: A cohort study. Annals Med Surg (2012). 2021;69:102751. https://doi.org/10.1016/j.amsu.2021.102751
23. Sheikhaboumasoudi R, Bagheri M, Hosseini SA, Ashouri E, Elahi N. Improving nursing students' learning outcomes in fundamentals of nursing course through combination of traditional and e-Learning methods. Iran J Nurs Midwifery Res. 2018;23(3):217–21. https://doi.org/10.4103/ijnmr.IJNMR_79_17
24. McKenny K. Using an online video to teach nursing skills. Teach Learn Nurs. 2011;6(4):172–5. https://doi.org/10.1016/j.teln.2011.04.003
25. Ramlogan S, Raman V, Sweet J. A comparison of two forms of teaching instruction: video vs. live lecture for education in clinical periodontology. Eur J Dent Education: Official J Association Dent Educ Europe. 2014;18(1):31–8. https://doi.org/10.1111/eje.12053
26. Plotzky C, Lindwedel U, Sorber M, Loessl B, K¨onig P, Kunze C, Kugler C, Meng M. Virtual reality simulations in nurse education: a systematic mapping review. Nurse Educ Today. 2021;101:104868. https://doi.org/10.1016/j.nedt.2021.104868
27. Putnam EM, Rochlen LR, Alderink E. Virtual reality simulation for critical pediatric airway management training. J Clin Transl Res. 2021;7(1):93–9. https://doi.org/10.18053/jctres.07.202101.008
28. Mete S, Uysal N. Evaluation of psychomotor skill training at the nursing professional skill laboratory by students and instructors. J Res Dev Nurs. 2010;12(2):28–38.
29. Nageswaran H, Fernando R, Still D, Greenwood S, Atkinson S, Rodd C. Worth a watch: video tutorials augment practical demonstration for learning in the psychomotor domain. Med Educ. 2011;45:40.
30. Hawker C, Gould D, Courtenay M, Edwards D. Undergraduate nursing students' education and training in aseptic technique: A mixed methods systematic review. J Adv Nurs. 2022;78:63–77. https://doi.org/10.1111/jan.14974
31. Hartsell T, Yuen SCY. (2006). Video Streaming in Online Learning. *AACE Review (formerly AACE Journal), 14*(1), 31–43. Chesapeake, VA: Association for the Advancement of Computing in Education (AACE). Retrieved November 8, 2023 from https://www.learntechlib.org/primary/p/6152/
32. Bilik Ö. 2016. Surgical Hand Washing. *3. Sterilization Operating Room Disinfection Congress Book*, 132–138.
33. Kaymakçı Ş. 2022. Asepsis in the Operating Room. *Operating Room Nursing Book*, Meta basım, İzmir, 497–520.
34. Dolgun E. 2022. Aseptic Technique. *Operating Room Nursing Book*, Meta Basım, İzmir. 479–487.
35. Özbayır T. Wearing a surgical gown and gloves. In: 3 Steriliz Operating Room Disinfection Congress Book. 2016;139–43.
36. Gök F, Kabu Hergül F, Özbayır T. Surgical hand washing: A systematic review. Int J Disinfect Steril. 2016;1(1):23–32.
37. Gürpınar E, Alimoglu MK, Mamaklı S, Aktekin M. Can learning style predict student satisfaction with different instruction methods and academic achievement in medical education. Adv Physiol Educ. 2010;34(4):192–6. https://doi.org/10.1152/advan.00075.2010
38. Alkhalaileh M, Hasan A, Al-Rawajfah O. Evaluate the effectivenessof clinical simulation and instructional video training on the nursing students' knowledge about cardio-pulmonary resuscitation: comparative study. Am J Educ Res. 2017;5:172–8. https://doi.org/10.12691/education-5-2-10
39. Sugathapala RDUP, Chandrika MGR. Student nurses' knowledge acquisition on oral medication administration: comparison of lecture demonstration vs. video demonstration. BMC Nurs. 2021;20:9. https://doi.org/10.1186/s12912-020-00527-6
40. Preeti U, Deaver PK. Effectiveness of conventional teaching (CT) and video assisted teaching (VAT) on neonatal endotracheal intubation in terms of knowledge and practice among nursing students. Galore Int J Appl Sci Humanit. 2022;6(3):13–9. https://doi.org/10.52403/gijash.20220702
41. Stanton M, Crow C, Morrison R, Skiba DJ, Monroe T, Nix G, et al. Web-based graduate education in rural nursing case management. Online J Rural Nurs Health Care. 2012;5:53–63. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7880817/pdf/nihms-1580276.pdf
42. Abdelaziz M, Kamel SS, Karam O, Abdelrahman A. Evaluation of E-learning program versus traditional lecture instruction for undergraduate nursing students in a faculty of nursing. Teach Learn Nurs. 2011;6:50–8. https://doi.org/10.1016/j.teln.2010.10.003
43. Zengin D, Yardımcı F. An evaluation of the effectiveness of the educational videos on pediatric diagnostic skills in nursing. E-J Dokuz Eylul Univ Nurs Fac. 2017;10(4):267–74. https://dergipark.org.tr/en/download/article-file/752885
44. Lopes JL, Baptista RCN, Lopes CT, Rossi MB, Swanson EA, Barros ALBL. Efficacy of a video during bed bath simulation on improving the performance of psychomotor skills of nursing undergraduates: a randomized clinical trial. Int J Nurs Stud. 2019;99:103333. https://doi.org/10.1016/j.ijnurstu.2019.04.001
45. Chuang YH, Lai FC, Chang CC, Wan HT. Effects of a skill demonstration video delivered by smartphone on facilitating nursing students' skill competencies and self-confidence: A randomized controlled trial study. Nurse Educ Today. 2018;66:63–8. https://doi.org/10.1016/j.nedt.2018.03.027
46. Constantinescu WU, Woermann MA, Schmitz U, Schnabel F, K. Video-based instructions for surgical hand disinfection as a replacement for conventional tuition? A randomised, blind comparative study. GMS J Med Educ. 2016;33(4). https://doi.org/10.3205/zma001056
47. Shippey SH, Chen TL, Chou B, Knoepp LR, Bowen CW, Handa VL. 2011 Teaching subcuticular suturing to medical students: video versus expert instructor

feedback. J Surg Educ *68*(5), 397–402. https://doi.org/10.1016/j.jsurg.2011.04.006
48. McCutcheon K, Lohan M, Traynor M, Martin DA. Systematic review evaluating the impact of online or blended learning vs. face-to-face learning of clinical skills in undergraduate nurse education. J Advenced Nurs. 2015;71(2):255–70. https://doi.org/10.1111/jan.12509
49. Jairus R, Naihar RP, Samuel S. Effectiveness of structured Video-Assisted learning vs demonstration on closed tracheal Suction among undergraduate student nurses. Nurs Midwifery Res J. 2023;19(1):22–33. https://doi.org/10.1177/0974150X221141743
50. Ünver V, Akbayrak N. Peer tutoring model in nursing education. E-J Dokuz Eylul Univ Nurs Fac. 2013;6(4):214–7. https://dergipark.org.tr/en/download/article-file/753450
51. Kelly M, Lyng C, McGrath M, Cannon G. A multi-method study to determine the effectiveness of and student attitudes to, online instructional videos for teaching clinical nursing skills. Nurse Educ Today. 2009;29(3):292–300. https://doi.org/10.1016/j.nedt.2008.09.004
52. Lahti M, Hätönen H, Välimäki M. Impact of e-learning on nurses' and student nurses knowledge, skills, and satisfaction: A systematic review and meta-analysis. Int J Nurs Stud. 2014;51:136–49. https://doi.org/10.1016/j.ijnurstu.2012.12.017
53. Ariana A, Amin M, Pakneshan S, Dolan-Evans E, Lam AK. Integration of traditional and e-learning methods to improve learning outcomes for dental students in histopathology. J Dent Educ. 2016;80:1140–8. https://doi.org/10.1002/j.0022-0337.2016.80.9.tb06196.x

Publisher's note