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The effect of Mobile-Assisted training and counseling on nurses' ventrogluteal injections application of nursing: A mixed method study

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Abstract

Background: Nurses often administer intramuscular (IM) injections. However, they do not use the ventrogluteal (VG) site, although it is highly recommended.

Aim: This study investigated whether a mobile-assisted training and counseling program (intervention) encouraged nurses to use the VG site to administer IM injections.

Methods: This study adopted a pretest-posttest interventional design with no control group and employed a mixed research design. The sample consisted of 105 nurses from a public hospital in a metropolitan city in Turkey. Quantitative data were collected using a descriptive characteristics form and a Ventrogluteal Site Information Form (VSIF). Qualitative data were collected using a semi-structured interview form. First, participants took a pretest and then watched an animation about VG injections on their mobile devices. Afterward, they were provided with counseling and then administered a posttest. Sixteen participants were interviewed after the posttest.

Results: Participants had a significantly higher mean posttest VSIF score (17.50 ± 3.23) than the pretest score (12.73 ± 5.40) ($p < 0.05$). They stated that the intervention helped them reinforce what they already knew and encouraged them to use the VG site to administer IM injections. They also noted that it boosted their confidence and helped them experience less anxiety.

Conclusion: The results showed that the intervention helped participants learn more about IM injections into the VG site. Therefore, hospitals should provide nurses with mobile-assisted training and counseling programs to encourage them to use the VG site to administer IM injections.

KEYWORDS

counseling, mobile learning, nursing, ventrogluteal site

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1 | INTRODUCTION

Nurses are responsible for safely administering medications to patients. Intramuscular (IM) injection, which is a parenteral administration route, is the process of administering medicine to the muscle tissue. A critical point for an IM injection is that the nurse should choose a safe site away from blood vessels, nerves, and bones. Intramuscular injections are administered into deep muscle tissue and can be life-threatening if administered at the wrong site. Therefore, healthcare professionals should choose safe sites for IM injections.^{1,2} The dorsogluteal (DG) site is a traditionally common site for IM injections. It is rich in blood vessels and close to the sciatic nerve. It has thicker subcutaneous tissue than other sites. Therefore, there is a high probability of the needle hitting the sciatic nerve, bone, and large blood vessels during injection.¹⁻³ Sciatic nerve injury is a critical complication of DG injections. However, research shows that most nurses prefer the DG site for IM injections.⁴⁻⁷

The ventrogluteal (VG) site is a safe and recommended site for IM injections because it does not contain major nerves or blood vessels and has an enormous gluteal muscle thickness consisting of both the gluteus medius and the gluteus minimus.^{1,3} The VG site also has thinner subcutaneous tissue and fat layer than the DG site, which reduces the possibility of inadvertent injections into the subcutaneous tissue.^{1-3,8} However, research shows that nurses do not prefer the VG site for IM injections⁴⁻⁷ because they have difficulty locating it.^{7,9,10}

Nurses are responsible for administering safe injections. They should have sufficient knowledge and skills for IM injections to avoid harming patients and protect themselves against lawsuits.¹¹ Therefore, we must provide them with training and counseling to encourage them to use the VG site for IM injections. Nevertheless, habits are hard to break. Research shows that experienced nurses are reluctant to change the way they do things.¹⁰

Moreover, nursing textbooks and manuals do not refer to the VG site for IM injections. Instead, they focus on the dorsogluteal (DG) site. Therefore, nurses tend to use the DG site for IM injections. Nursing students are expected to observe experienced nurses and put their knowledge into practice in clinical settings. Turkish nursing students learn about VG site injections but do not have the chance to see them put into practice in clinical settings because guide nurses do not administer IM injections to the VG site. Moreover, they encourage nursing students to use the DG site for IM injections. Therefore, there is a gap between theory and practice.¹¹ We should identify and eliminate the obstacles that prevent nurses from implementing better medical procedures.^{10,12}

Nurses have difficulty using the VG site for IM injections for three reasons. First, insufficient data points out the advantages of the VG site. Therefore, nurses are hesitant to change their habits. Second, nursing students lack practical skills because they never see experienced nurses use the VG site.¹³ Third, nurses do not have the opportunity to attend in-service training programs and keep up with the latest developments in the literature.

Nurses are responsible for deciding whether to administer IM injections to the VG site. They should base their decision on scientific data. Therefore, training and counseling are critical to encouraging them to use the VG site for IM injections. Counseling involves guiding, creating an enabling environment, and providing information.¹⁴ The more the counseling offers an individual-centered approach that considers individual differences, the more effective it will be.¹⁵ In-service training is one of the best ways to implement individual-centered training in hospitals. Today, technology is an integral part of in-service training. For example, mobile learning (mobile phones, tablets, notebooks, etc.) allows learners to access resources anywhere, anytime, and watch content multiple times until they learn.^{16,17} Grierson et al.¹⁸ had nursing students view a video on VG injections. They found that the video helped the students learn more about administering safe IM injections to the VG site. Çırlak et al.¹⁹ provided healthcare professionals with theoretical and practical training about VG injections on models. They reported that the participants preferred to use the VG site for IM injections more after the intervention. Özener²⁰ provided nurses with training (mobile learning) on the VG site and determined that the training helped them learn more about the VG site for safe IM injections. The present study investigated whether a mobile-assisted training and counseling program (intervention) encouraged nurses to use the VG site for IM injections.

2 | METHODS

2.1 | Design

This study employed a sequential explanatory mixed-methods research design, which begins with collecting and analyzing quantitative data that primarily correspond to the research question. Then, qualitative data are collected and analyzed.²¹ The quantitative part involved a pretest-posttest design with no control group, while the qualitative part involved one-to-one interviews.

2.2 | Study participants

The study population consisted of 225 nurses from a public hospital in a metropolitan city in Turkey. The quantitative sample consisted of 105 nurses. The inclusion criteria were (1) having a mobile device and Internet access, (2) working in adult inpatient units, and (3) volunteering. The exclusion criteria were (1) working in the pediatric ward, (2) declining to participate or deciding to withdraw, (3) not filling out the posttest, (4) not watching the video, and (5) not receiving counseling.

The qualitative sample was recruited using maximum variation sampling, a purposive sampling method used to identify the main themes of differences. Purposive sampling involves selecting participants based on the criteria defined according to the research purpose.^{21,22} Since there is no strict rule such as interviewing a certain percentage of the entire sample in qualitative research,²³ the

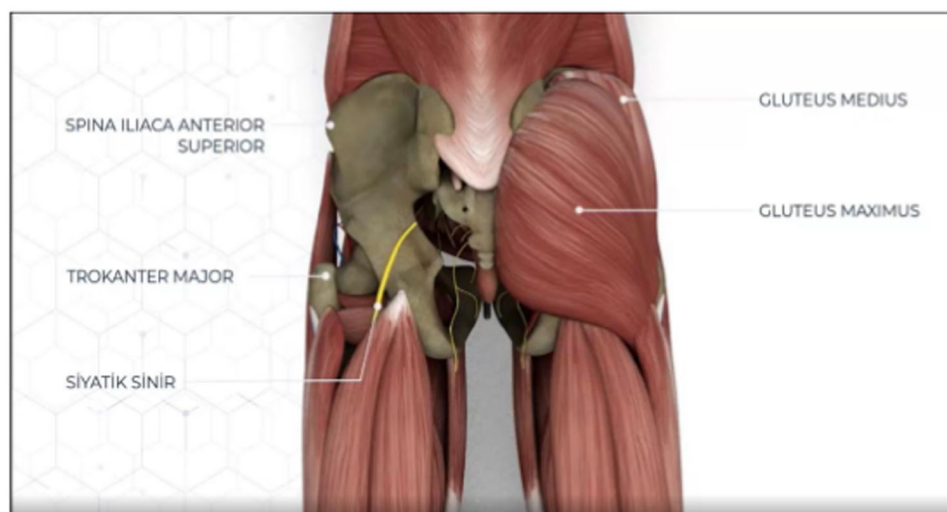


FIGURE 1 Muscles.

qualitative part was terminated when data saturation was reached.²⁴ The qualitative sample comprised 16 intensive care unit, emergency room, and internal/surgery nurses or supervisor nurses with bachelor's or associate's degrees. Qualitative interviews are a data collection technique that reveals the participants' perspectives and provides deep and rich data on their experiences.²¹ The present study conducted semi-structured interviews to determine participants' views on VG injection applications. Interviews were conducted after the posttest.

2.3 | Data collection

The quantitative data were collected using descriptive characteristics form and a Ventrogluteal Site Information Form (VSIT), while the qualitative data were collected using a semi-structured interview form.

2.3.1 | Descriptive characteristics form

The personal information form consisted of nine items on socio-demographic characteristics and six items on using the VG site for safe IM injections.

2.3.2 | Ventrogluteal site information form

The Ventrogluteal Site Information Form (VSIF) was developed by Gülnar & Çalışkan.⁴ It consists of 12 true and 12 false statements about the VG site. The true responses are scored 1 point, while the false ones have scored 0 points. The total score ranges from 0 to 24. The form has a pretest and posttest Cronbach's alpha of 0.87 and 0.71, respectively.

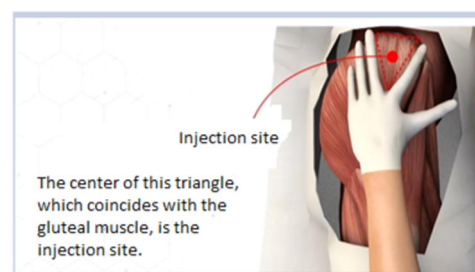


FIGURE 2 VG site.

2.3.3 | Semi-Structured interview form

The semi-structured interview form consisted of general, unbiased, and non-leading open-ended questions designed to explore the process and meaning. Three experts were consulted regarding the relevance and intelligibility of the questions, which were then finalized based on their feedback.

2.3.4 | Animation

The animation was created by Özener (2021).²⁵ It is almost a 5-min-long animation (4 min 39 s.) about what materials to use for VG injections, how to landmark the VG site, and how to administer a safe VG injection (<https://youtu.be/2kHiKKPJp8>) (Figures 1 and 2). The animation has a nurse demonstrating the steps of a VG injection on a virtual patient. Furthermore, the animation brings written information to the screen during important details and shows in detail the anatomical location of the muscles at the injection site. The animation was first divided into scenes. Maxon Cinema4D was used for visualization and three-dimensional modeling of the objects in the scenes. For the animation software, services were purchased by the Scientific

Research Projects unit within the research project Code No: 47/2019-10 (Özener).²⁵

2.4 | Procedure

This study investigated whether a mobile-assisted training and counseling program (intervention) encouraged nurses to use the VG site to administer IM injections. The study adopted a sequential explanatory mixed-methods research design. First, quantitative data were collected and then the quantitative results were supported by qualitative data. In this design, quantitative and qualitative data collection processes are linked.²¹

2.5 | Quantitative data collection

In the first phase of the study, quantitative data were collected using the descriptive characteristics form and the VSIF. To collect quantitative data, first, participants filled out the pretest and then watched the animation for 4 weeks. Afterward, supervisor clinical nurses ($n = 27$) were trained to mentor clinical nurses on VG injections. The training involved a PowerPoint presentation and demonstration on a mannequin. After the training, each participant was asked to locate the VG site on the mannequin and administer a safe IM injection. In addition, the researchers prepared posters about VG injections and hung them in each clinic. Afterward, the researchers taught each participant how to administer a safe VG injection. They explained the process on a mannequin and then asked the participant to administer a safe VG injection on it. They answered all participants' questions. They also observed and guided each participant in helping a safe IM injection to the VG site. The mentors also supported participants at this stage. The counseling sessions lasted 4 weeks. Afterward, participants filled out the VSIF again (posttest).

2.6 | Qualitative data collection

In the second phase of the study, qualitative data were collected. The aim was to determine whether explaining VG site injection through a mobile application and counseling would encourage nurses to perform VG injections more frequently. In addition, their views on VG injections were determined. Qualitative data were collected after the quantitative data were collected. Face-to-face semi-structured interviews were conducted with sixteen participants. The researcher continued to interview new participants until data saturation. Participants were interviewed in their clinics and at their convenience after they gave written consent. All interviews were recorded with the authorization of the participants. The interviews were conducted by a reporter in a quiet and well-lit environment where the participants could express themselves comfortably. During each interview, the reporter and the participant sat at the same level facing each other. The reporter actively listened to the participant and conducted

the interview with the help of questionnaires. The researchers avoided judgmental and negative statements and attitudes in the interviews. Participants' responses were quoted verbatim in the Findings section. Each interview lasted 15–25 min. All interviews were transcribed. Interviews and analyses were conducted by researchers with previous qualitative research experience. COREQ-Consolidated Criteria for Reporting Qualitative Research was used in the structuring and reporting phase of the qualitative study.

The validity and reliability of qualitative research are derived from its credibility, transferability, dependability, and confirmability.²⁶ For the validity and reliability of the qualitative data, the relationships between themes and subthemes were examined. For reliability, two researchers independently analyzed the data, and the final version was decided by comparing the findings.

2.7 | Data analysis

The data were analyzed using the Statistical Package For Social Sciences (SPSS, v. 23.0) at a significance level of 0.05. Number, percentage, mean, median (min.-max.), and standard deviation were used for descriptive statistics. The Kolmogorov–Smirnov test was used for normality testing. The results showed that the data were normally distributed. Therefore, a parametric test (paired sample t-test) was used to analyze the data.

A qualitative study design was performed based on interpretative phenomenological analysis. Data collection was terminated after 16 interviews, held in the order received to the mail, after reaching data saturation. The qualitative data were analyzed using thematic analysis. Colaizzi's inductive qualitative content analysis method was used to analyze the qualitative data. The method consists of seven steps: (1) recording data, (2) selecting important statements, (3) grouping themes, (4) describing formulated meanings into themes, subthemes, and categories, (5) improving the themes and describing details, (6) articulating the phenomenon in question in a comprehensible way, (7) and verifying findings with participants to see if they match their own experiences.²⁷ At the end of the analysis, the researchers developed themes and subthemes. After the interviews, they created a raw data document from the audio recordings (Microsoft Word). The data were evaluated independently by both researchers. They reached a consensus after creating themes. They transformed the data into categories, themes, and sub-themes. During the analysis, each participant was assigned a code for confidentiality and anonymity (P1, P2, P3, etc.)

2.8 | Ethical considerations

An ethics committee approved the study (Date: 23.11.2021 and No: 2021-1105). Permission was obtained from the hospital. Nurses were informed about the research purpose and procedure. Informed consent was obtained from those who agreed to participate in the study.



3 | RESULTS

Participants had a mean age of 39.38 ± 7.14 years. They had 18.71 ± 8.56 years of work experience. Most participants were women (93.3%) and had bachelor's degrees (77.1%). Almost half of the participants worked in the inpatient unit (48.6%). Half of the participants used mobile devices for 1–3 h daily (50.5%) (Table 1).

3.1 | Nurses' site preference for IM injections

Participants stated that they performed an average of 13.64 ± 56.62 IM injections per week. More than half of the participants preferred the DG site to administer IM injections (62.9%) (Table 1). Nurses were asked why they tended to choose the DG site for IM injections. The qualitative analysis revealed two themes: Sticking to the traditional method and attitude.

Participants stated that they stuck to the traditional method because they wanted to ensure patient satisfaction and comfort. They also took the physical characteristics of their patients into account. They also noted that they stuck to the traditional method because they believed their patients were hard to persuade. They had difficulty locating the VG site because they were inexperienced. They also added that they used the traditional method because they believed that it was safe. They also pointed to working conditions (Table 3).

... it's harder to administer VG injections in patients with obesity (P6)

... it's a bit hard to persuade patients to get VG injections... (P5)

... I'm worried that I won't be able to locate the site (P7)

...my hands are different from those of my colleagues'... (P16)

The ventrogluteal site is too narrow, but I could use it in all positions when the patient is lying on her side or in the supine or prone position...It was pretty hard to give the patient the correct position for a dorsogluteal injection...(P1)

...The advantage of the ventrogluteal site is that you can administer the injection in every situation (P4)

I feel like I need to locate the site over and over again because I'm never sure. (P7)

...The dorsogluteal site is easier to give injections to. (P8)

Additionally, participants had negative attitudes toward the VG site. They stated that they were undecided about whether to use the

VG site. They also felt concerned and fearful about it. They were used to using the usual practices. They were also worried about the challenges of change (Table 3). The following are direct quotes:

... it's hard to break the taboos...(P4)

... it's easier to administer injections to the dorsogluteal site. We're kind of used to it (P12)

...I was concerned about reaching the bone and hurting the patient. (P14)

... I'm afraid to administer the injection to the wrong site (P12)

Some participants stated that their attitudes changed positively after the training on VG injection.

...the ventrogluteal site is an option now....(P9)

I'll use the VG site from now on... It's the best option to avoid harming the patient and to protect ourselves...(P1)

I'll use the VG site for our safety and the safety of the patient...(P1)

3.2 | Mobile learning and counseling

Nurses watched the animation 3.70 ± 0.91 times within 4 weeks (Table 1). Participants had a significantly higher mean posttest VSIF score (17.50 ± 3.23) than the pretest score (12.73 ± 5.40) ($p < 0.001$) (Table 2). The qualitative analysis showed that the participants found mobile-assisted training useful because it was easy to access, it was effective, and it allowed them to watch the animation more than once. However, they stated that it had a handicap because it did not allow them to practice. The following are direct quotes (Table 3):

...the mobile-assisted training and counseling helped us go over the topic and feel less nervous (P14)

The training made me more courageous; so I won't use the DG site anymore. I'll use the VG site from now on. (P5)

Participants also considered the counseling helpful because it allowed them to practice one-to-one and reinforce what they already knew. It encouraged them to use the VG site for safe injections and helped them get used to the process. It boosted their self-confidence and helped them experience less anxiety. It also allowed them to answer questions quickly (Table 3).

TABLE 1 Sociodemographic Characteristics (n = 105).

Sociodemographic characteristics	N	%
Age (year)	39.38 ± 7.14 (min: 23.00 max: 51.00)	
Work experience (year)	18.71 ± 8.56 (min: 1.00 max: 32.00)	
Gender		
Woman	98	93.3
Man	7	6.7
Education (degree)		
Associate's	15	14.3
Bachelor's	81	77.1
Master's	9	8.6
Unit of service		
Inpatient unit	51	48.6
Intensive care unit	19	18.1
Special units	35	33.4
Daily use of mobile devices (hour)		
<1	12	11.4
1–3	53	50.5
4–6	31	29.5
≥7	9	8.6
Site for IM injection		
Dorsogluteal site	66	62.9
Ventrogluteal site	26	24.8
Deltoid muscle	9	8.6
Vastus lateral muscle	3	2.9
Rectus femoris muscle	1	1.0
Knowing how to locate the VG site		
Yes	79	75.2
No	26	24.8
Source of information about VG injections ^a		
Education	47	44.8
Books	14	13.3
Periodicals	5	4.8
Internet	23	21.9
Colleague	29	27.6
Number of IM injections (week) Mean ± SD	13.64 ± 56.62	
(Min: 1- Max: 400)		
Number of animation views (Mean ± SD)	3.70 ± 0.91	
(2–5)		

^aMore than one answer.

The counseling helped us learn about the VG site. Now, we have it in our pocket (P8)

The one-to-one training during the counseling made it more precise (P1).

4 | DISCUSSION

This study investigated whether a mobile-assisted training and counseling program (intervention) encouraged nurses to use the VG site for IM injections. Participants had a significantly higher mean posttest VSIF score (17.50 ± 3.23) than the pretest score (12.73 ± 5.40) ($p < 0.05$). This result indicated that the intervention helped the participants learn more about the VG site and develop more positive attitudes toward it. Meteris and Kılıç²⁸ conducted a one-group pretest-posttest quasi-experimental study. They sent a training slide video, a training brochure and a VG site demonstration video to the nurses' mobile phones. They found that the nurses had significantly more knowledge of VG injections after the training. Şimşek et al.²⁹ conducted a pretest-posttest randomized-controlled trial design study. They reported that the experimental group had significantly more knowledge and higher skill scores regarding VG injections than the control group. Çınar Kardaş³⁰ conducted an experimental study with a non-randomized pre-test-posttest control group. They divided the participants into experimental and control groups. They conducted a power point presentation to the experimental group. They found that the experimental group had significantly more knowledge of VG injections than the control group. Vicdan et al.³¹ determined that the experimental group had higher mean knowledge scores than the control group. Gülnar and Özveren³² provided nurses with training on VG injections. They found that the training improved the participants' knowledge about the VG site and encouraged them to use it to administer safe IM injections. McGee⁹ offered nurses coaching about VG injections and determined that more than half the participants (55.4%) administered at least one VG injection after the intervention. She also concluded that nurses avoided using the VG site for IM injections for two reasons. First, patients refuse to get injected into the VG site. Second, nurses are unsure whether they can administer VG injections safely.⁹ Our participants also stated that they had difficulty locating the VG site and felt insecure because they were unsure about their patients' reactions. Nurses must acquire the necessary knowledge and skills to safely administer VG injections.³³ They should be provided with training and counseling through mobile learning methods because it takes time to learn new methods and techniques and put them into practice. In addition, mobile learning methods should be integrated with counseling to encourage nurses to change their habits and use the VG site for safe IM injections.

Before the intervention, more than half of the participants preferred to use the DG site to administer IM injections (62.9%). Şimşek et al.²⁹ divided nurses into experimental and control groups. They gave training to the experimental group. They found that the experimental

**TABLE 2** VSIF Scores.

Pretest/Posttest	$\bar{X}$	SD	Min	Max	Significance
Pretest	12.73	5.40	0	22	t: -8.491 ^a
Posttest	17.50	3.23	8	23	p: 0.001

^aPaired sample t-test.

group participants chose the VG site for IM injections more than the control group. Çınar Kardaş³⁰ divided nurses into experimental and control groups and provided training to the former. He reported that the experimental group participants chose the VG site for IM injections significantly more often than the control group participants. He also stated that the nurses did not know how to landmark the VG site before the training, but after the training, they were able to locate the VG site. Meteris and Kılıç²⁸ determined that nurses' views of the VG site changed positively after training. Wynaden et al.⁷ conducted a descriptive study to compare the IM injection site choices of nurses working in mental health settings in 2006 and 2012. They found that despite sharing research results about the VG site with nurses, most nurses continued to use the DG site.⁷ Research also shows that nurses prefer the DG site to the VG site to administer IM injections for a variety of reasons.^{4,7,34-36} First, they do not find the VG site safe because it is anatomically too small. Second, they feel incompetent in using the VG site for IM injections because they have difficulty locating it. Third, they think the hand size may prevent them from landmarking the VG site. Fourth, they do not have enough knowledge and experience about VG injections. Fifth, they fear hurting their patients. Sixth, they are hesitant about using the VG site because they have difficulty breaking their habits.^{7,10,13,37-40} Our participants also noted that they preferred to use the DG site for IM injections because they felt worried when locating the VG site. Most nurses prefer the DG site to the VG site for IM injections. However, experts view the VG site as an ideal alternative to the DG site because DG injections may cause sciatic nerve and gluteal artery injuries.^{2,40,41} Floyd and Meyer¹³ maintain that nurses avoid administering VG injections because they have difficulty getting used to a new method. However, the intervention changed our participants' views about DG injections, stating they would consider using the VG site for IM injections. Our results indicate that mobile training and counseling effectively encourage nurses to administer VG injections. Mobile technology is integrated into in-service training. Mobile learning helps learners acquire knowledge and develop skills.⁴² Such methods as mobile learning also allow learners to learn at their own pace.⁴³ Our results indicated that although mobile learning was an effective way to teach nurses about VG injections, it fell short of achieving the desired result. Therefore, mobile learning should be integrated with counseling to allow nurses to acquire the necessary knowledge and develop the skills to administer VG injections safely. Our participants considered the mobile-assisted helpful training because they could watch the animation anytime. However, they did not find it very effective because watching the animation alone did not allow them to put new knowledge into practice. Jeong⁴⁴ determined that smartphone videos helped nursing

TABLE 3 Context, themes, and subthemes.

Context	Themes	Subthemes
Sticking to the traditional method	For the patient	Habit
		Satisfaction
		Comfort
		Physical characteristics
		Fear of negative reactions
		Difficulty convincing the patient
		Frequent practice
		Inexperience
		Hesitation
		Difficulty locating the site
Attitude	Negative	Working conditions
		Traditional methods
		Habit
		Safe site
		Indecision
		Taboo
		Feeling concerned
		Fear
		Stereotyped practices
		Challenges of change
Training	Positive	Self-efficacy
		Safe site
	Mobile-assisted training	Ease of access
		Multiple views
		Effective
		Preparation
		No practice
		One-to-one practice
		Reinforcement
		Encouraging
Counseling	Counseling	Getting used to the site
		Manual skill
		Boosting self-confidence
		Less anxiety
		Answering questions easily
		Effective

students develop the necessary skills regarding safe IM injections. Özener and Çalışkan²⁰ found that mobile learning improved nurses' cognitive abilities to administer safe IM injections to the VG site. Davis et al.⁴² reported that mobile learning positively affected the

development of psychomotor skills. Our result showed that mobile learning integrated with counseling boosted our participants' courage and confidence and helped them reinforce their current knowledge. Our results suggest that we should integrate mobile learning with counseling to encourage nurses to replace the traditional method of IM injection (DG site) with a safer one (VG site). We should provide nurses with that kind of training regularly. Mobile learning promotes cognitive information, while counseling helps learners develop psychomotor skills. Therefore, integrating mobile learning with counseling allows nurses to develop cognitive and psychomotor skills.

5 | LIMITATIONS

The results are sample-specific and, therefore, cannot be generalized to all nurses. The second limitation is the lack of a control group. The third limitation may be that since the interviews were conducted by educators, nurses may have given positive and biased answers to the questions.

6 | CONCLUSION

Nurses' knowledge scores increased significantly after mobile learning and counseling training. The training positively affected their knowledge level and increased their awareness on this issue. In addition, nurses who received counseling training through mobile learning reinforced their knowledge, were encouraged to practice, gained confidence, and experienced less anxiety. Our results suggest that we should provide nurses with mobile learning integrated with counseling to teach them how to administer IM injections to the VG site safely.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

Research data are not shared.

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