

The assessment of knowledge and practical skills of intramuscular injection administration among nursing staff: a cross-sectional study

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ABSTRACT

Aim: This study aimed to assess the level of knowledge and practice of intramuscular injection among nurses and nursing assistants in primary healthcare.

Background: Evidence-based guidelines recommend the use of the ventrogluteal site for intramuscular injection; however, it remains infrequently utilised by nurses.

Study design and methods: Cross-sectional study was conducted using a convenience sample of 200 nurses and nursing assistants employed in one of the largest healthcare centres on the primary healthcare level in Slovenia. The data were collected using a self-reported questionnaire and analysed using descriptive and inferential statistics.

Results: The majority of the participants (88.5%) prefer to use the dorsogluteal site for intramuscular injections, while the ventrogluteal site is commonly used only by 7.5% of the respondents. Participants avoid the ventrogluteal site because of not being used to it (30.5%), unfamiliarity (27.0%), lack of adequate knowledge (19.5%), fear of harming the patient (8.5%), and not knowing how to determine the site (10.3%).

Conclusion: Nursing staffs knowledge and use of ventrogluteal site for intramuscular injection is

limited and are using traditional methods instead of current evidence-based guidelines.

Implications: Improvements are needed in nursing education and continuous training. The nurse administrators in clinical practice should increase awareness of the benefits of using evidence-based practice and re-evaluate how the nursing professionals provide the administration of intramuscular injections and the need for additional education. The education and training about intramuscular injections should be implemented regularly in daily clinical practice of nursing professionals for promoting the safest practice for patients.

What is already known about the topic?

- The administration of intramuscular injections is a commonly performed nursing intervention in clinical practice.
- The technique for delivering intramuscular injection is associated with potential safety risks for the patient when it is not done according to evidence-based guidelines and safe practices.
- The use of ventrogluteal muscle has been recommended in nursing literature for many years now, but nurses still use it infrequently and prefer to use the dorsogluteal site.

RESEARCH ARTICLES

What this paper adds:

- Despite being both legally permitted to administer intramuscular injection, nurses and nursing assistants demonstrated different levels of knowledge and the use of evidence-based recommendations about intramuscular injection administration.
- Nurses avoid using the ventrogluteal side due to lack of knowledge and skills.

- Stronger emphasis on raising awareness about the importance of using evidence-based practices during nursing education and continuous training is needed.

Keywords: Injections, intramuscular; primary healthcare; punctures; evidence-based nursing

INTRODUCTION

Intramuscular injections (IMI) are important and frequently performed nursing interventions.^{1,2} World Health Organization (WHO) defines IMI as a parenteral, preventive, or curative route of administering the drug into muscle tissue by choice of the appropriate size of a needle.³ Although interpreted as simple intervention, it requires critical assessment, skills, and knowledge about choosing the proper site and the safest practice.^{4,5} WHO estimates that out of 12 billion injections administered globally every year, 50% of them are administered unsafely.⁶

IMI can cause various serious complications when evidence-based guidelines and safe practices are not followed. Complications can be a pain, tissue necrosis, abscesses, cellulite, nerve damages, haematoma, granuloma, muscular fibrosis and contracture, infection, vascular or bone injuries and permanent or temporary paralysis of lower extremities.^{2,5,7-9}

There are three main muscle groups identified for IMI administration: the deltoid muscle of the upper arm, gluteal muscles of the buttocks that states for dorsogluteal (DG) (gluteus maximus) and ventrogluteal (VG) site (gluteus medius), and quadriceps muscles in the thigh that include rectus femoris and vastus lateralis.¹⁰⁻¹² The selection of an appropriate site depends on factors, such as the type and the volume of medication, patient's age and health condition.^{9-11,13} Carelessness, inaccuracy, and misperception of appropriate application can cause serious complications.^{2,5,8,14} The most complications occur when the IMI is administered into the DG site, as this area includes a rich intertwining of the vessels, is in the proximity of the sciatic nerve. There is also a thinner layer of subcutaneous tissue.^{8,15} Much of the recent evidence-based literature recommends the use of a VG site, as it is relatively free of large blood vessels, nerves (sciatic nerve) and sealed off by bone; it is also easier to identify, and the layer of subcutaneous tissue there is much thinner than the one on the DG site. Gluteus medius muscle in this site is large and well developed.^{1,16,17} It has been discovered that patients suffered less pain, discomfort, and bleeding when receiving an IMI into the VG

site compared to those receiving it into the DG site. The VG site enables faster absorption of the medication and easier as well as better access to the muscle tissue.¹⁸

Although the use of VG muscle has been recommended, nurses still use it infrequently, due to the fact they instead rely on the traditional approach of IMI administration preferring DG site.^{12,18-20} It is crucial to continuously determine the level of knowledge and the use of evidence-based recommendations about IMI administration among nurses to develop effective education and training.¹⁶

Our study aimed to assess the level of knowledge and practical skills in the area of IMI among nursing staff working in one of the largest healthcare centres in Slovenia.

METHOD

RESEARCH DESIGN AND SETTING

A cross-sectional study was conducted in one of the largest healthcare centres in Slovenia. Health Centre provides primary healthcare and includes general or family medicine clinics, outpatient clinics for preschool and school children, gynaecologist outpatient clinics, emergency service, dental clinics, and community nursing services, clinics of occupational, traffic and sports medicine, clinical laboratories, radiology services, and some specialist clinics. The number of employed healthcare professionals at the time this research was carried out was approximately 197 physicians, 211 nurses and 186 nursing assistants.²¹

SAMPLE

Convenience sampling was used for recruiting nurses and nursing assistants. All nurses and nursing assistants who are administering an IMI to adult patients in everyday clinical practice and working at the selected institution in the Department for Family Medicine Clinics, Community Healthcare Centre, Department of Occupational, Traffic and Sports Medicine, or Emergency Service were invited to fill out the anonymous questionnaire (N=267). The 212 questionnaires were returned after two reminders, giving an overall response rate of 79.4%. Twelve questionnaires were

RESEARCH ARTICLES

excluded due to missing data, resulting in a total sample of 200.

In Slovenia, the nursing education system consists of a minimum four year secondary education (for nursing assistants), three years of the first cycle Bologna higher education (for nurses with a diploma degree), two years of the second cycle Bologna higher education (for nurses with a master's degree) and three years of third cycle Bologna higher education (for nurses with a PhD).²² Nursing assistants are trained in providing basic nursing care and also have competencies for medication administration (per os, intramuscular and subcutaneous therapy).²³ Nurses are independent experts who are responsible for nursing care and independently and autonomously perform nursing procedures and interventions in the nursing process.^{22,23} The current study included 65 nursing assistants (32.5%) and 135 nurses (67.5%).

INSTRUMENT

Data were collected using a self-reported questionnaire, which was developed based on a comprehensive literature review on nurses' knowledge and experiences about the IMI.^{15,16,19,20,24} The questionnaire consisted of 46 questions on nurses' demographic, knowledge and experiences about the IMI and was divided into five sections.

The first section included four questions on participants demographic characteristics (gender, educational status, working service, years of experience).

The second section included three questions with multiple choice questions regarding daily frequency of administering IMI, most frequently used site for IMI and knowledge on the site recommended in the latest literature.

The third section included three questions about education and practice concerning the VG site. Participants have been offered multiple-choice questions.

The fourth section included 19 questions regarding participants habits in their daily clinical practice on IMI. The frequency (never, sometimes, always) of performing specific steps to perform an IMI was evaluated (eg. checking the dose and the date of the medication, the use of gloves, Z-track method, two-needle technique, aspiration technique before administration, considering injection site, weight and size of the patient, the use of different needle sizes, controlling patient's response on medication).

The fifth section included 16 questions related to participants theoretical and practical knowledge of IMI. Seven statements were prepared as correct and nine as incorrect, and the participants were asked to respond to these statements with the options "true", "false" or "do not know". Each correct answer was considered as 1 point, while wrong or "do not know" responses were considered as 0 points. The minimum score was 0 points, and the maximum score was

16, with higher scores indicating better knowledge about IMI administration.

The draft instrument was pilot tested with 10 nurses to evaluate the feasibility of the questionnaire as well as face validity. No further revisions of the questionnaire were identified.

DATA COLLECTION

The data were collected between May and early July 2019. The selected institution gave written permission for the research. No approval from an ethics committee was required because no patients or interventions were involved. Questionnaires were given out with the assistance of head nurses of each department in a paper form. The completed questionnaires were returned in a sealed envelope.

DATA ANALYSIS

Data were analysed using the IBM Statistical Package for the Social Sciences (SPSS) program for Windows (version 27.0). Descriptive statistical methods were employed for descriptions of respondents' demographic characteristics and items scores knowledge (average, standard deviation, percentage), Mann-Whitney U, and Kruskal-Wallis one-way analysis of variance tests. A probability level of 0.05 or less was used to indicate statistical significance.

RESULTS

Out of 267 distributed questionnaires, 212 were returned, and 200 included in the analysis (74.9% realisation). The detailed demographic characteristics are presented in Table 1.

The total average score relating level of knowledge was 5.0 ± 3.020 (points ranging of 0–16). Statistical significance was found between working service and educational level ($p < 0.05$). Participants working in emergency service and participants who had post-graduate degrees had higher average scores (Table 1).

99.5% of participants reported they administer up to nine IMI per day. From Table 2, it can be seen that the majority of participants (41.5%, $n=83$) said DG site is recommended site in the latest literature. While the third (36.5%, $n=73$) of the participants were aware that the VG site is currently evidence-based recommendation, the most frequently used site for IMI remains DG (88.5%, $n=177$), VG site is commonly used only by 7.5% of participants ($n=15$). Some individuals reported that they most frequently use deltoid muscle (2.0%, $n=4$) or the vastus lateralis and rectus femoris muscles (1.0%, $n=2$). 15.5% ($n=31$) participants reported they do not know what the recommended site is in the latest literature (Table 2).

When asked whether participants received any courses about administering IMI into the VG site, 52 (26.0%) answered affirmatively. Others, 148 (74.0%) were not trained or educated on current evidence-based guidelines either in secondary

RESEARCH ARTICLES

or higher education. Sixty one (30.5%) participants were not used to the VG site and therefore avoid it. Other reasons that discouraged participants from selecting the VG site for IMI were unfamiliarity (27.0%, n=55), lack of adequate knowledge (19.5%, n=39) and do not know how to determine the VG site (10.5%, n=21). All these factors could be related to the fear of harming the patient, which was selected by 17 (8.5%) respondents. Statistical significance between nurses and nursing assistants was found for questions related to education about the VG site during studying ($p < 0.005$) (Table 3).

TABLE 1: PARTICIPANTS' CHARACTERISTICS AND LEVEL OF KNOWLEDGE OF INTRAMUSCULAR INJECTION

Characteristics	n	%	Level of knowledge of intramuscular injection	p value
Gender**				
Male	38	19.0	5.00	0.921
Female	162	81.0	5.01	
Working service***				
Department for General Healthcare Services	89	44.5	4.53	0.037*
Community healthcare centre	53	26.5	5.32	
Department of Occupational, Traffic and Sports Medicine	12	6.0	3.50	
Emergency service	46	23.0	5.96	
Educational status***				
Nursing assistants (Secondary vocational education)	65	32.5	4.12	0.002*
Nurses (Diploma degree)	117	58.5	5.03	
Nurses (Postgraduate degree)	18	9.0	7.72	
Experience in nursing since graduation***				
1–9 years	61	30.5	4.84	0.334
10–19 years	56	28.0	5.50	
20–29 years	39	19.5	4.97	
30–39 years	38	19.0	5.16	
>40 years	6	3.0	1.33	
Sources of training***				
Seminar, course, etc.	87	43.5	4.69	0.502
Brochure, book, etc.	22	11.0	4.41	
By oneself	23	11.5	5.70	
From physicians	6	3.0	5.31	
From nurses	62	31.0	6.00	

n = number

% = percentage

* = Significant level at the 0.05 level

** = Mann–Whitney U Test

*** = Kruskal–Wallis one-way analysis of variance

TABLE 2: FREQUENCY OF USED SITE AND KNOWLEDGE OF RECOMMENDED INTRAMUSCULAR INJECTION SITE

Answer	n = 200	%
Most frequently used site		
Deltoid muscle	4	2.0
Vastus lateralis and Rectus femoris	2	1.0
DG site	177	88.5
VG site	15	7.5
Missing data	2	1.0
Site recommended in the latest literature		
DG site	83	41.5
VG site	73	36.5
Vastus lateralis	3	1.5
Rectus femoris	2	1.0
Deltoid muscle	8	4.0
Don't know	31	15.5

TABLE 3: EDUCATION AND PRACTICE CONCERNING THE VENTROGLUTEAL SITE

Answer	Nursing assistants	Nurses	p value
Education about the VG site during studying?***			
Yes	28	24	0.000*
Not received	37	111	
Have you given an IMI to the VG site in your professional career?***			
Yes	21	36	0.409
No	44	99	
Reasons for avoiding VG site***			
I am not used to it	19	42	0.101
Lack of adequate knowledge	6	33	
VG site is too small	0	5	
Fear of harming the patient	8	9	
I cannot locate it	8	13	
I am not acquainted with VG site	22	33	

* = Significant level at the 0.05 level

** = Mann–Whitney U Test

*** = Kruskal–Wallis one-way analysis of variance

RESEARCH ARTICLES

More than half of the participants (59.0%, n=118) answered that they take into consideration patient's body mass index (BMI) when selecting the appropriate needle size and injection site (52.0%, n=104). They prefer to use needle size 21 G (24.0%, n=48, »always«, and 40.0%, n=80, »rarely«) in comparison to needle size 23 G (6.0%, n=3, »always«, and 41.0%, n=82, »rarely«). The two-needle technique was most reported to be used (78.5%, n=157). Seventy nine percent (n=158) and participants reported they always wipe the injection site with an antiseptic wipe or alcohol wipe (97.0%, n=194) and wait till the antiseptic solution is completely dry before administering IMI (67.5%, n=135 »always« and 28.5%, n=57 »rarely«). The majority of participants reported »always« to use the technique of aspiration to check the presence of blood before administering prescribed medication (80.0%, n=160). Most were not familiar with Z-track technique and consequently reported they do not use it (68.5%, n=137) (Table 4).

Regarding educational status, statistical significance was found for questions related to checking the dose and use-by date before administering medication, considering injection site, weight and size of the patient when selecting needle

size before administering the medication, the use of a 23 Gauge needle size, assessing the injection site immediately after administrating the medication, controlling the patient's response and possible side effects, adjust the injection site to the prescribed medication, observing the possible occurrence of side effects to medication, aspiration, administering injection at the dry disinfected area ($p<0.005$) (Table 4).

Very few participants were familiar that exercise is recommended after administrating IMI (8.0%, n=16), that VG site is recommended in children over the age of seven months (12.5%, n=25) and that VG site can take up to 4 millilitres of medicine (15.5%, n=31) (Table 5).

Nurses expressed a higher level of knowledge of administering an IMI to the VG site when compared to nursing assistants. Statistical significance was found in questions related to the speed of administrating IMI (quickly, in few seconds), occurring complications in the VG site (damaging sciatic nerve), volume (up to 4 ml of medication), determining injection site (place nurse's left hand on the patient's right hip and palpating bone structures in the VG site) ($p<0.005$).

TABLE 4: NURSES' PRACTICE ON INTRAMUSCULAR INJECTION IN THEIR DAILY CLINICAL PRACTICE

Question	Answer	Nursing assistants	Nurses	Mann-Whitney U-test	p value
1. Do you wash and disinfect hands before every IMI?	Never	0	0	4637.5	0.210
	Rarely	9	11		
	Always	56	124		
2. How often do you check the dose and use-by date before administering medication?	Never	6	0	4750.5	0.032*
	Rarely	2	6		
	Always	57	129		
3. How often do you use gloves when administering IMI?	Never	15	34	4739.0	0.320
	Rarely	38	58		
	Always	12	42		
4. How often do you consider the injection site when administering an IMI based on the medication being given?	Never	16	5	5446.0	0.002*
	Rarely	18	42		
	Always	31	88		
5. How often do you consider the weight and size of the patient when selecting needle size and length to administer IMI?	Never	14	10	5552.5	0.001*
	Rarely	23	35		
	Always	28	90		
6. How often do you consider the weight and size of the patient when selecting the site to administer IMI?	Never	17	19	5199.5	0.020*
	Rarely	21	39		
	Always	27	77		
7. Do you administer IMI to the patient in the standing position?	Never	28	57	4301.5	0.871
	Rarely	35	77		
	Always	3	0		

RESEARCH ARTICLES

TABLE 4: NURSES' PRACTICE ON INTRAMUSCULAR INJECTION IN THEIR DAILY CLINICAL PRACTICE (CONTINUED)

Question	Answer	Nursing assistants	Nurses	Mann-Whitney U-test	p value
8. How often do you use the Z-track method of administration?	Never	52	85	4848.0	0.143
	Rarely	5	27		
	Always	3	9		
	Missing	19	0		
9. When giving an IMI, do you swab the site with an alcohol wipe before administering the injection?	Never	0	2	4291.5	0.397
	Rarely	1	3		
	Always	64	130		
10. How often do you use a 21 G needle (green colour. for administering IMI)?	Never	20	52	4231.5	0.664
	Rarely	31	49		
	Always	14	34		
11. How often do you use a 23 G needle (blue colour. for administering IMI)?	Never	44	68	5210.5	0.014*
	Rarely	21	61		
	Always	0	6		
12. How often do you use a two-needle technique to give an injection, which means, using one needle to draw up the medication and another needle to administer the medication?	Never	7	9	4796.5	0.136
	Rarely	11	16		
	Always	47	110		
13. How often do you assess the injection site immediately after administering the medication?	Never	10	6	5661.5	0.000*
	Rarely	17	11		
	Always	38	118		
14. Do you control patient's response and possible side effects to medication 30 minutes after administering medication?	Never	0	3	5418.0	0.000*
	Rarely	23	12		
	Always	42	120		
15. Do you aspirate for blood before administering the medication?	Never	1	6	5520.0	0.000*
	Rarely	24	9		
	Always	40	120		
16. Do you wipe the injection site with an antiseptic wipe in a circle of 5 cm diameter from the injection site?	Never	0	13	4612.0	0.409
	Rarely	17	12		
	Always	48	110		
17. How often do you give an injection after the antiseptic solution has completely dried?	Never	6	2	5734.0	0.000*
	Rarely	28	29		
	Always	31	104		
18. When locating the injection site, do you specify anatomical structures?	Never	11	12	4498.5	0.729
	Rarely	11	34		
	Always	43	89		
19. How often do you massage the injection site after the injection?	Never	29	69	4012.5	0.288
	Rarely	18	38		
	Always	18	28		

* = Significant level at the 0.05 level

RESEARCH ARTICLES

TABLE 5: KNOWLEDGE OF ADMINISTERING AN INTRAMUSCULAR INJECTION TO VENTROGLUTEAL SITE

Question	Correct answer	Nursing Assistants	Nurses	Mann-Whitney Test	p value
1. Injection to the VG site may be difficult in very overweight patients because the greater trochanter cannot be found.	True	23	44	4195.0	0.573
2. The tissue at the injection site is bunched between the thumb and the forefinger.	False	22	29	3782.5	0.054
3. Medication is injected in a few seconds, quickly.	False	38	122	5288.5	0.001*
4. After administrating IMI it is recommended to exercise.	True	11	5	4716.5	0.260
5. IMI is safer at the VG site since it is away from large blood vessels and nerves.	True	25	69	3863.5	0.128
6. The most common complication in the VG site is damaging the sciatic nerve.	False	6	60	5234.0	0.019*
7. Complications, such as pain, infection, necrosis, nerve damage, fibrosis, do not occur at the VG site.	True	8	53	3310.5	0.002*
8. VG site is not recommended for injecting oily solutions or irritants.	False	18	16	4369.0	0.951
9. It is harder to reach the muscle tissue at the VG site because of the thickness of the subcutaneous layer.	False	11	45	4323.5	0.855
10. VG site can take up to 4 millilitres of medicine.	True	4	27	3213.0	0.000*
11. In order to determine the injection site, the nurse has to place her right hand on the patient's right hip.	False	16	28	3457.5	0.009*
12. The VG site is palpated using imaginary lines, DG site by the use of bone structure.	False	15	31	3089.0	0.000*
13. Patients are advised to lay on their back or on the right/left side.	True	30	76	3874.5	0.135
14. Use of the VG site is recommended in children over the age of seven months.	True	11	14	4154.5	0.435
15. VG site can be used only with adult patients.	False	18	40	4103.0	0.416
16. The risk of contamination is very high at the VG site.	False	11	74	4055.0	0.341

* = Significant level of $p < 0.05$

DISCUSSION

We found that participants' knowledge about evidence-based recommendations regarding IMI administration is limited. Nurses with a post-graduate degree working in emergency service reported the highest level of knowledge. Differences in education between nursing assistants, nurses with diploma degree and post-graduate degree may account for the findings. Although Bajracharya found the level of education had no statistically significant relationship between knowledge and practice regarding IMI,²⁵ it was later found to influence the selection of the VG site for administering IMIs.¹⁸ Nurses with a post-graduate degree also tend to have better knowledge and attitudes towards evidence-based practice.²⁶ In Slovenia, most subjects or modules on evidence-based practice are offered in master's nursing programmes.²⁷ Findings could also be influenced by the frequency of administered IMIs. In the emergency service, IMIs are frequently administered, especially for pain relief, or even for faster therapeutic results.²⁸ From 12,594 IMIs administered in a selected healthcare centre in 2019, most were administered in the emergency service.

Although the VG site for IMI is suggested in evidence-based nursing literature, the DG site was the most common choice for application of IMI. Others report similar results.^{16,18,20,29} Most also reported the DG site is recommended in the latest literature; almost one-tenth did not know what the recommended site is. It seems nursing staff did not get adequate education and have therefore rarely administered IMI to the VG site. Almost three-quarters of participants reported they did not receive education about the VG site during their studies. According to Floyd and Meyer,²⁹ the theory about injections into the VG site are taught in some nursing schools. Our findings suggest the opposite, and there is a need to evaluate curriculums not only at secondary vocational education level but also in higher education to confirm these findings. Despite the more significant percentage not receiving education, nurses expressed better knowledge about site determination, complications concerning site selection, speed and volume of IMI when compared to nursing assistants. However, nurses' knowledge about volume VG can take and appropriateness to use the VG site in children also was limited. Nurses have also expressed better adherence to current guidelines and knowledge of

RESEARCH ARTICLES

administering an IMI when compared to nursing assistants. It could be they receive education and training on IMI and other skills, as well as biology, anatomy, pathophysiology, and pharmacological theory when nursing assistants receive more limited theoretical education.^{30,31} Further research is therefore needed to evaluate nursing student's knowledge and practice on evidence-based recommendations concerning IMI. Emphasis should not only be placed on theoretical education but also clinical training and clinical mentors. Some suggest nursing students rarely have the opportunity to observe the application of IMIs into the VG site in clinical practice.²⁹ The level of knowledge could also decrease if not used constantly in clinical practice.

We found that nursing staff, although being informed about the VG site, avoid using it mostly as they are not used to it, followed by not being acquainted with it, and not having enough knowledge. A few have also expressed fear of harming the patient when administering an IMI to the VG site. Not used to giving injections at the VG site was also reported as the main reason for not using it by Turkish nurses working in hospitals.¹⁹ Others have listed other possible reasons for avoiding the VG site, such as age of nurses,⁸ insufficient knowledge about the advantages of using the VG site, small surface area for injection, lack of confidence,^{14,16,32} and concern about harming the patients.³³ Further studies in Slovenia should evaluate whether there are some factors that influence possible reasons for avoiding the VG site.

When evaluating daily clinical practice, most participants reported adherence to hand hygiene in terms of washing and disinfecting as well as to disinfect the injection site. Findings are not surprising, as there is a strong emphasis on five moments for hand hygiene and preventing infections not only in education but also in clinical practice.³⁴ What is concerning, is the poor practice of wearing gloves when administering IMI. Findings are in contrast to the results, where a vast majority of participants reported they often or always wear gloves.^{35,36} Nursing assistants also do not allow the skin to dry during the process of disinfection of the injection site. Further research is needed to determine the reasons for this poor practice, not only quantitative but also qualitative research. For more than two decades nursing students in Slovenia have been educated on using gloves and the disinfection process when administering IMI.³⁷ Nurses and nursing assistants are also working in accordance with the same institutional standards, and standards in a healthcare centre are in line with international recommendations which suggests wearing gloves,³⁸ even though WHO recommended not to use gloves for routine IMI.³⁹ Nonetheless, nursing standards in all healthcare institutions should be reviewed to determine if institutions have different standards and whether they are following current recommendations.

Also, several other practices are not in line with evidence-based recommendations. More than half of the participants in this research always consider the BMI of patients when choosing the needle size, its length and the injection site. A tenth of participants have never adjusted the needle size or choice of the injection site to the patient's gender, weight or BMI, thus increasing the risk of administering the IMI to the subcutaneous tissue or outside the muscle tissue.³² When locating the injection site, only two-thirds of our participants have specified anatomical structures.

On the other hand, the majority of participants have reported consistent use of the aspiration technique to check the presence of blood before administering the prescribed medication. However, more recent recommendations from WHO and the Centers for Disease Control and Prevention's (CDC) report, the practice of aspiration during IMIs is premature and is expected to be eliminated. Aspiration only makes sense in areas with large vascular structure, such as the DG site.¹¹ If nurses succeeded in completely eradicating the use of the DG site as the chosen site for IMI, aspiration could be removed from routine nursing care.⁷

Also, the two-needle technique was well respected by participants. We have found that three-quarters of participants regularly use the two-needle technique, 13.5% use it occasionally, and 8% never, which is similar to other research.^{20,40,41} The two-needle technique seems to be firmly rooted in our nursing practice. Probably as in rare specific medical areas, pre-filled syringes are not common. Also, nurse educators put a strong emphasis on using the two-needle technique, when IMI of drug includes preparing and administering medication.³⁷

Nurses and nursing assistants reported they are not familiar with the Z-track method and therefore never or rarely use it, which is similar to other findings.^{24,36,40} Although Z-track method is more commonly used in psychiatry,⁴² it is recognised as the most appropriate technique for IMI.³⁶ Most probable reason for unfamiliarity is the lack of knowledge as this technique is not included in nursing textbooks.

LIMITATIONS

The main limitation of this study is sampling. The generalisation of the results is limited due to convenience sampling. The data have been gathered only in one healthcare centre, so they may not apply to other healthcare centres. The analysis of non-respondents was not conducted as their answers were not collected. Social desirability should also be taken into consideration.

RESEARCH ARTICLES

CONCLUSIONS AND IMPLICATIONS FOR NURSING

Despite the limitations, the study shows that nurses and nursing assistants most frequently use the DG site, do not follow evidence-based recommendations and work on the traditional methods learnt from older colleagues due to a lack of knowledge and skills.

Results of this study could help nurse educators and nurse managers to increase awareness of the benefits of using the evidence-based practice guidelines of using the VG site. It is recommended to ensure adequate theoretical and practical education and training for nursing students, as well as proper training of nurses already working in clinical practice and especially for clinical mentors. Students are continually learning on clinical placements, not only from their clinical mentors. Only by that, can we provide a safer and more efficient delivery of medication into the muscle. Additional studies are needed to determine the level of knowledge and practice among all nursing students and all other nursing employees in primary, secondary, and tertiary healthcare organisations.

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