FREQUENCY OF APPLICATION AND LEVEL OF NURSES’ KNOWLEDGE ON ADMINISTERING INTRAMUSCULAR INJECTIONS INTO THE VENTROGLUTEAL SITE

**Summary**

**Introduction.** The most recent literature data and studies have recommended the middle gluteal muscle or the ventrogluteal side as the site for the application of intramuscular injection. Although it has been recommended for many years because of its many advantages it is rarely used in the clinical practice. The aim of this study was to evaluate the frequency of application of intramuscular injection and the level of nurses’ knowledge on how to give injections at the ventrogluteal site. **Material and Methods.** This study was conducted as an observational, analytical cross-sectional study at two health-care institutions of different medical care levels on a sample of 96 nurses. The Questionnaire on the level of knowledge concerning the Ventrogluteal Site for Intramuscular Injection was used as a research instrument. **Results.** A quarter (28.1%) of the nurses knew that the ventrogluteal site or the middle gluteal muscle was the recommended site for intramuscular injection, while in their clinical practice only 20.8% of the nurses used it. The average score on the Questionnaire on the level of knowledge concerning the Ventrogluteal Site for Intramuscular Injection was 8.8 ± 4.1 (SD), the maximum score being 22. **Conclusion.** The results of the study show that the ventrogluteal site for administering intramuscular injections is rarely used, and the level of knowledge which the nurses from the study sample have shown about the procedure and the advantages of using the ventrogluteal site for intramuscular injections is rather low. **Key words: Health Knowledge, Attitudes, Practice; Nursing Staff; Injections, Intramuscular; Muscle, Skeletal; Buttocks; Evidence-Based Nursing**

**Introduction**

Intramuscular (IM) injections represent the parenteral application of medication through the skin and subcutaneous tissue into the big muscles of the body by means of the appropriate syringe and needle for prophylactic (vaccinations) and therapeutic purposes (antibiotics and hormones) [1]. Until the late 1960s this procedure was done exclusively by physicians when antibiotic therapy was being administered; however, it has become a common practice for nurses since then [2]. According to the estimations of the World Health Organization (WHO) around 12 billion injections are given annually, and about 50% are not performed safely and present a health risk [1, 2].

Until recently the application of IM injections was mostly based on the theoretical and practical knowledge of nurses gained during their formal clinical education and their personal preferences and habits. Today the applications of intramuscular injections have to be in line with the current best practice guidelines, which are periodically revised according to the existing evidence obtained by studies [1, 3, 4].

To perform IM injections adequately and safely it is necessary to select a sterile needle of the correct length and diameter, depending on the site of injection, and the drug to be administered [1]. The needle is inserted through the skin and subcutaneous tissue into the big muscles of the body by means of the appropriate syringe and needle for prophylactic (vaccinations) and therapeutic purposes (antibiotics and hormones) [1]. Until recently the application of IM injections was mostly based on the theoretical and practical knowledge of nurses gained during their formal clinical education and their personal preferences and habits. Today the applications of intramuscular injections have to be in line with the current best practice guidelines, which are periodically revised according to the existing evidence obtained by studies [1, 3, 4].

To perform IM injections adequately and safely it is necessary to select a sterile needle of the correct length and diameter, depending on the site of injection, and the drug to be administered [1].
length, so the tip of the needle can reach the deep muscles. The needle length depends on the application site, amount of medicine given, patients’ age, body weight, muscle mass and the thickness of the subcutaneous fatty tissue at the application site [5–7]. The most commonly used needles for most adults are 21G (green) or 23G (blue), the length of the needle being from 3 to 5 centimeters. It is recommended to use two needles to give an injection, where one is used during the preparation of the medicine and the second one for the application. The changing of the needle reduces pain, and should prevent unwanted complications [7].

The current literature mentions five muscles as potential sites for IM injections: m. gluteus maximus (its dorsal side (DG)), m. gluteus medius ventrogluteal side (VGi), m. vastus lateralis, m. rectus femoris and m. deltoideus [8]. According to the most recent studies and literature the recommended site for the application of IM injections for adults and children older than 7 months is the ventrogluteal site [1–3, 7, 9]. For infants below 7 months of age the recommended site for IM injections is the m. vastus lateralis because it is well developed after birth [7, 9].

Every site recommended for IM injections is rich in nerves and blood vessel, but only the ventrogluteal site does not contain large blood vessels and big nerves, it is far away from bone structures; it has a large muscle surface, the chances of injecting the medicine into the subcutaneous tissue are low and the site can be easily anatomically determined [1, 2]. The results of conducted studies show that injections into the ventrogluteal site are the least painful and there is almost no bleeding. Compared to the dorsogluteal site, the positioning of the patient is easier, and the risk of contamination with feces and urine is lower [2, 10].

The ventrogluteal site can be located by using either V or G method. If the injection is to be administered to the left side by using V method, the nurse places her right wrist parallel to the patient’s left femur and spreads the index and middle finger. The index finger is pointing to the anterosuperior iliac spine, the middle finger is then pointed toward the iliac crest. The index and middle fingers create a V-shape, and the injection site is the middle of the V-shape. If the injection is given on the patient’s right side, nurses use their left hand and vice versa [2, 7].

The Geometric method (G method) to determine the VG site was proposed by Meneses [12], who claimed that its reliability was 100%. To determine the puncture point when using the G method, the bony prominences and imaginary lines are drawn in between them to be used as orientation points. The first imaginary line is drawn from the greater trochanter to the iliac crest, then the second one from the iliac crest to the anterosuperior iliac spine, and the third line from the greater trochanter to the anterosuperior iliac spine. Thus, a triangle is created by imaginary lines. After that, the median lines are drawn for every single corner of triangle. The convergence point of the three median lines is the needle entry point for the injection [2, 11, 12].

The site for the application of IM injections which nurses use most often is the dorsogluteal site also known as m. gluteus maximus [13]. When administering medication into this muscle there is a great chance of unwanted complications such as: hematoma, abscess, muscle fibrosis, injury of the gluteal artery or the sciatic nerve [2, 5, 13]. None of the sites used for IM injections are 100% safe and without the risk of injury, but the dorsogluteal site is the most disadvantageous [13].

Although the ventrogluteal site has been the recommended site for the administration of IM injection because of its many advantages, very few nurses use it, and the most common reasons for avoiding this site the nurses have mentioned are that the site is anatomically too small, it is hard to locate, they are afraid they might hurt the patient, or they are not accustomed to using this site as well as the lack of training after completing their formal education [2, 13]. The inconsistent information given in the textbooks which are used during the education of nurses is also a contributing factor. The dorsogluteal site is mentioned as a favourable injection site in almost every textbook. However, the VG site has been recommended for the application of IM injections in the Fundamentals of Nursing textbook since the seventh edition published in 2010 while the dorsogluteal site and m. rectus femoris are not mentioned et al. [7].

Therefore, the aims of this study were to evaluate the frequency of using the ventrogluteal site for intramuscular injections in the everyday clinical practice of nurses and to evaluate the nurses’ level of knowledge about giving intramuscular injections at the ventrogluteal site.

Material and Methods

The study was conducted in November and December, 2017 as an observational, analytical cross-sectional study, and included nurses from two healthcare institutions, one of the primary level and the other one of the secondary level. The sample size was N = 96 nurses (n = 20 nurses from the primary level and n = 76 nurses from the secondary level institution).

Study Instruments

The questionnaire on the level of knowledge concerning the Ventrogluteal Site for Intramuscular Injection by Gulnar and Çalışkan was used as the study instrument [13]. The questionnaire consisted of 22 items on administering injections in the ventrogluteal site, and the nurses could answer with one of three given choices (true, false, don’t know). Eleven items were true, and eleven items were false. The reliability of the questionnaire was confirmed with Cronbach’s alpha coefficient (α) which in Sari and colleagues’ study was 0.84 [2]. In this study after translation and cultural adaptation α was equal to 0.90.

The authors also used a questionnaire for nurses to gather information about the most frequently used injection site for intramuscular injections, to identify the frequency of use of the ventrogluteal site, to determine the level of knowledge about recommendations from
contemporary nursing literature and a questionnaire to gather sociodemographic data (sex, age, length of work experience expressed in years, educational level).

**Statistical Data Analysis**

Descriptive statistics were used to determine the average values, standard deviations (SD), minimal (Min) and maximal (Max) values, 95% confidence interval that is the absolute frequency of occurrences with corresponding percentages depending on the nature of the variable. The normalness of the distribution of data was confirmed with the Kolmogorov Smirnov test (p>0.05). The comparison of the average values from two different groups was done with the t-test, and ANOVA was used to compare average values of multiple groups. Statistical analysis of the results was accomplished with the statistical package IBM SPSS 23 Statistics, and statistical significance was determined at p < 0.05.

**Results**

Most of the nurses participating in the study were female (91.7%) and high school graduates (94.8%) (Table 1).

The nurses’ average age was 37.3 (SD = 10.7). The youngest nurse was 19 years old, while the oldest one was 59 years of age. The average length of work experience was 16.7 (SD = 10.6) years, ranging from minimum 1 and a maximum 38 years.

Over half (n = 63; 65.6%) of nurses thought that according to current literature the dorsogluteal site is the best for giving IM in injections and most of them (85.4%) use it in their daily clinical practice. Only 28.1% of the nurses knew that the ventrogluteal site or *m. gluteus medius* was the recommended site for IM injections, and only n = 20 nurses (20.8%) used it in their clinical practice. Being not accustomed to using the VG site was the reason why 51.7% of nurses did not

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**Table 1. Distribution of nurses according to sociodemographic characteristics**

| Sociodemographic characteristics of nurses | n   | %   |
|--------------------------------------------|-----|-----|
| Gender/Male/Muško                           | 8   | 8.3 |
| Gender/Female/Žensko                        | 88  | 91.7|
| Educational level                           |     |     |
| High school/Srednja škola                   | 91  | 94.8|
| Associate degree/Viša škola                 | 2   | 2.1 |
| Professional bachelor/Strukovne studije     | 3   | 3.1 |

**Table 2. The distribution of nurses according to the characteristics of giving intramuscular injections**

| Data on application of intramuscular injections | n   | %   |
|------------------------------------------------|-----|-----|
| Most frequently used site/Najčešće korišćeno mesto |     |     |
| Dorsogluteal site/Dorzoglutealno mesto          | 82  | 85.4|
| Ventrogluteal site/Ventroglutealno mesto        | 8   | 8.3 |
| m. rectus femoris/Mišić rectus femoris          | 6   | 6.3 |

**Table 3. The distribution of nurses according to the reasons for not using the VG site**

| Reasons for not using the VG site | n   | %   |
|-----------------------------------|-----|-----|
| I′m not used to it./Nisam naviknut/a na to. | 46  | 51.7|
| I don’t have enough information to use the VG site./Nemam dovoljno znanja za primenu injekcije na tom mestu. | 29  | 32.6|
| Other/Drugi razlog                | 14  | 15.7|

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n - absolute frequency/apsolutna učestalost, % - relative frequency/relativna učestalost
Statement about IM injections into the VG site

| Tvrđnje o IM injekciji u VG mesto | Tačan odgovor | n  | %   |
|----------------------------------|---------------|----|-----|
| After entering the tissue and before administering the medicine, a blood check is made by drawing back the piston./Posle ulaska u tkivo, a pre davanja leka provjerava se prisutnost krvi aspiracijom. | True/Tačno | 91 | 94.8|
| The injection site is wiped with an antiseptic pad in a circle of 5 cm diameter from the injection site. Mesto davanja injekcije se dezinfikuje antiseptikom u krugu od 5 cm okolo ulaznog mesta igle. | True/Tačno | 87 | 90.6|
| The injection is given after the antiseptic solution has dried. Injekcija se daje kada se antiseptik usušio. | True/Tačno | 79 | 82.3|
| Injection at the VG site is safe because it is far from large blood vessels and nerves./Davanje injekcije na VG mesto je bezbedno zato što je daleko od velikih krvnih sudova i nerva. | True/Tačno | 68 | 70.8|
| To establish the injection site, the nurse places the lower part of the palm of her hand on the greater trochanter of the femur./Da bi se odredilo mesto injekcije medicinska sestra postavlja dlan sake na veliki trohanter femura. | True/Tačno | 53 | 55.2|
| After the injection, the injection site is massaged./Posle davanja injekcije mesto davanja se masira. | False/Netačno | 16 | 16.7|
| Injection to the VG site may be difficult in very overweight patients because the greater trochanter cannot be found./Davanje injekcije na VG mesto može biti teško zato što se ne može pronaći veliki trohanter femura. | True/Tačno | 41 | 42.7|
| For injection to the VG site, the patient may be lain on the back, prone, or on the side. Za davanje injekcije na VG mesto pacijent može da leži na leđima, na stomaku ili na boku. | True/Tačno | 40 | 41.7|
| The risk of contamination of the VG site with feces is high. Rizik od kontaminacije VG mesta fecesom je veliki. | False/Netačno | 65 | 67.7|
| High volume muscles such as the VG site can take up to 4 ml of medicine./Mišići velike zapremine, kao onaj u VG mesto mogu primiti do 4 ml leka. | True/Tačno | 29 | 30.2|
| In the VG site, it is difficult for the needle to reach the muscle because of the thickness of the subcutaneous fatty layer./Kod davanja injekcije u VG mesto, igla teško dolazi do mišićne mase zbog velike deblijine supkutanog masnog tkiva. | False/Netačno | 22 | 22.9|
| The commonest complication in the VG area is damage to the sciatic nerve./ Najčešća komplikacija kod davanja injekcije u VG mesto je oštećenje ishijadičnog nerva. | False/Netačno | 40 | 41.7|
| At the VG site, injection-related complications such as fibrosis, nerve damage, abscesses, tissue necrosis and pain do not occur./Kod davanja injekcije u VG mesto komplikacije kao što su: fibroza, povreda nerva, apscesi, nekroza tkiva i bol se ne javljuju. | True/Tačno | 35 | 36.5|
| Patients are recommended to exercise the leg after the injection. Pacijentima je preporučeno da rade vežbe posle davanja injekcije u VG mesto. | True/Tačno | 8  | 8.3 |
| Use of the VG muscle is recommended in children of over 7 months because it is well developed./Primena injekcije u VG mesto se preporučuje kod dece starije od 7 meseci. | True/Tačno | 16 | 16.7|
| Medication is injected quickly in a few seconds. Prilikom davanja injekcije lek se ubrizgava brzo, tokom nekoliko sekundi. | False/Netačno | 39 | 40.6|
| The VG site is not recommended for the administration of irritants or oily solutions. G-mesto se ne preporučuje za davanje iritantnih lekova i masnih solucija. | False/Netačno | 30 | 31.3|
| In order to determine the injection site, the nurse should use her right hand in the patient’s right hip, and her left hand on the left hip./Za određivanje VG mesta medicinska sestra koristi desnu ruku na pacijentovom desnom kuku, i levu ruku na pacijentovom levom kuku. | False/Netačno | 28 | 29.2|
| The VG site is palpated using imaginary lines and the DG site by the use of bone structure./VG mesto se locira korišćenjem nevidljivih linija, dok se DG mesto locira palpiranjem koštanih struktura. | False/Netačno | 3  | 3.1 |
| The VG site is used only with adults./Injekcija u VG mesto se koristi samo kod odraslih. | False/Netačno | 33 | 34.4|
| The tissue at the injection site is grasped between the thumb and the forefinger. Tkivo na mjestu davanja injekcije prilikom davanja leka treba obuhvatiti palcem i kažiprstom. | False/Netačno | 14 | 14.6|
| The injection site is the area below the iliac crest and above an imaginary diagonal line connecting the posterior superior iliac spine and the greater trochanter of the femur./Mesto davanja injekcije je površina ispod karličnog grebena (spina iliaca) i iznad zamišljene dijagonalne linije koja povezuje zadnju gornju ilijacnu bodlju (spina iliaca posterior superior) i veliki trohanter femura. | False/Netačno | 5  | 5.2 |
Table 4. Total average score on the knowledge questionnaire: differences regarding the sociodemographic characteristics of the nurses

| Age/Godine života | Average ± SD | t/F | 95% CI | p      |
|-------------------|-------------|-----|--------|--------|
| 19 – 30 years (n = 32) | 9.5 ± 3.6 |      | 8.2806 – 10.8444 | > 0.05 |
| 31 – 40 years (n = 34) | 8.8 ± 3.8 | 1.312** | 7.4502 – 10.1380 | > 0.05 |
| > 40 years (n = 30) | 7.9 ± 4.7 |       | 6.1504 – 9.65922 |        |

| Place of employment/Radno mesto | Average ± SD | t/F | 95% CI | p      |
|---------------------------------|-------------|-----|--------|--------|
| Health Centre/Dom zdravlja (n = 20) | 8.8 ± 4.9 | 0.036* | -1.99653 – 2.07022 | > 0.05 |
| Hospital/Bolnica (n = 76) | 8.7 ± 3.8 |       | -2.40404 – 2.47773 |        |

| Length of work experience/Godine radnog staža | Average ± SD | t/F | 95% CI | p      |
|---------------------------------------------|-------------|-----|--------|--------|
| 1 – 19 years (n = 33) | 9.1 ± 3.6 |      | 7.8113 – 10.3705 | > 0.05 |
| 20 – 30 years (n = 31) | 9.2 ± 3.7 | 0.874** | 7.8543 – 10.5973 | > 0.05 |
| > 30 years (n = 32) | 8.0 ± 4.7 |       | 6.2917 – 9.7083 |        |

Discuss the differences in the average scores and the implications for patient safety.

Discussion

According to the most recent literature the ventrogluteal site is recommended as the safest site for the application of intramuscular injections [1–3, 5–8, 14]. In every healthcare system the best quality service and maximal safeness of the patients is the priority. The aim of this study was to examine the frequency of using ventrogluteal site for intramuscular injections and the nurses’ level of knowledge on giving intramuscular injections at the ventrogluteal site.

The results of our study show that only 28.1% of nurses are informed that the most recent studies have recommended the ventrogluteal site for intramuscular injections and only 20.8% of them have used this site during their clinical practice. The most commonly used injection site by the nurses who participated in this study was the dorsogluteal site (65.5%). The authors of a study conducted in Turkey have concluded that the number of nurses using the ventrogluteal site for intramuscular injections is low [2]. Similar results have been found in studies conducted in Australia, Ireland and Jordan [3, 14, 15]. Although 70.8% of nurses know that the ventrogluteal site is safe, because it is far from big blood vessels and nerves, most of them still use the dorsogluteal site as their primary choice for the application of intramuscular injections. The dorsogluteal site is thought to be the site with the highest risk of complications when administering an intramuscular injection because it is rich in blood vessels; it is close to the sciatic nerve and the subcutaneous tissue layer is thicker. Sciatic nerve injuries most commonly occur during intramuscular injections at the dorsogluteal site [5, 13]. It has been estimated that 86% of cases of sciatic nerve injuries occur while the injection is being given [13]. The sciatic nerve is the most commonly hit nerve, especially in children, older patients and thin patients. Also, the absorption of medicine is much slower after DG application, because of the thicker layers of fatty tissue [10, 14].

As the most common reason for not using the ventrogluteal site when applying medicine intramuscularly, nurses said that they were not sufficiently informed about the VG site (Table 2).

The mean score of knowledge of all nurses about intramuscular injection into ventrogluteal site was 8.8 ± 4.1 out of maximum 22 (the lowest score was 0, and the highest 17).

The average score on the knowledge questionnaire revealed that the lowest percentage of correct answers was given to the items related to the technique of giving an intramuscular injection (items number 19 and number 22). Although almost all of the nurses (94.8%) knew that after entering the tissue, and before injecting the medicine, the presence of blood is checked with aspiration, only 16.7% knew that after the application of the medicine the site should not be massaged. The correct answers for the items regarding the theoretical knowledge about the application of injections into the VG site were under 50% (Table 3).

Although there was a difference in the average score on the knowledge questionnaire about IM injections into the VG site among the nurses when their sociodemographic characteristics were analyzed, it was not statistically significant (Table 4).
the ventrogluteal site. The reason for insufficient knowledge may be the fact that even though nurses were taught how to use this site during their education they have never seen it in practice [11]. The teacher themselves are often not confident in their skills of giving IM injections into the VG site and cannot influence their students to opt for this site of administering IM injections [14].

In the knowledge questionnaire used in this study the percentage of correct answers was low for the items related to the location and finding of the ventrogluteal site. According to some studies done in Turkey and Ireland nurses have similar problems and find it hard to locate correctly the puncture site for IM injections at the VG site [2, 11, 14].

The average score on the knowledge questionnaire was 8.8, the maximum being 22. Such a low score confirms that the knowledge of this procedure is insufficient. The percentage of correct answers to some individual statements regarding the technique of intramuscular injections was satisfactory, but the percentage of correct answers regarding the statements about theoretical knowledge of administering IM injections at the VG site was under 50%. Although in the study of Sari and his colleagues the nurses had a higher average score on the knowledge questionnaire (X = 14.4) [2], our results are comparable. However, unlike the nurses in Serbia, a high percentage of Turkish nurses (77.6%) knew that the application site should not be massaged after the injection [2]. Massaging of the application site after the application of IM injections was once recommended with the explanation that it would make the absorption of medicine faster and prevent the reaction of local tissues. However, massaging is not recommended anymore because it causes the irritation of the tissue [1, 7].

**Conclusion**

Based on the results obtained in this study it can be concluded that nurses do not have sufficient knowledge regarding individual elements of the application of intramuscular injections into the ventrogluteal site, such as locating the injection site by using V or G method. Besides, the generally low score achieved on the knowledge questionnaire reveals that the method used by nurses for the application of intramuscular injections lags behind the corpus of current theoretical knowledge.

However, the quality of care and treatment of patients could be improved with the implementation of appropriate additional educational program, which is mandatory for healthcare workers and with the creation of good clinical practice guidelines for IM injections.

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