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Nurse's Knowledge Levels of Ventrogluteal: A Scale Development Study

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Abstract

Aim: The aim of this study is to develop a valid and reliable measurement tool to determine the knowledge level of nurses about the ventrogluteal area.

Method: The study was based on the methodological method. The study was carried out with 250 nurses who worked in the private unit, internal and surgical clinics of a university hospital in Turkey between February 20, 2021 and April 20, 2021 and agreed to participate in the study. The data were analyzed with IBM SPSS V23 and the factor structure was revealed by explanatory factor analysis. KMO-Bartlett test was used for sample adequacy. Tukey's Test for Nonadditivity was used to determine whether the scale was additive or not. The Cronbach Alpha value was checked for the reliability of the scale, and the dependent groups t-test was used for test repetition, and the Pearson correlation test was used for the relationship.

Results: After the psychometric analysis, the Ventrogluteal Area Information Scale was finalized with a single sub-dimension and 17 items. The lowest score that can be obtained from 17 items is 17 and the highest score is 85. There is no item that needs to be reverse scored in the created scale. As the score obtained from the scale increases, it is determined that the knowledge of the nurses about the ventrogluteal area increases. According to the internal consistency reliability analysis results, the Cronbach alpha reliability coefficient of the Ventrogluteal Area Information Scale was 0.96; The scale was found to be quite reliable.

Conclusion: It has been concluded that the Ventrogluteal Area Information Scale is a reliable and valid measurement tool that can be used in nursing practices.

Introduction

Intramuscular (IM) injection administration is a nursing function that is frequently applied in clinical practice, which has an important place among parenteral drug administration[1-3]. While IM injection was first applied by physicians with the discovery of antibiotics in the 1940s, it began to be carried out under the responsibility of nurses in the 1960s[3]. Although the technique and application of IM injections are thought to be easy, they can cause very serious complications if they are not performed with appropriate methods[3-5]. IM injection can cause serious complications such as abscess, cellulitis, tissue necrosis, granuloma, muscle fibrosis and contracture, intravascular injection, hematoma, and nerve damage if not performed carefully and with the correct technique[3,5].

Site selection and a safe area are very important in IM injection[2,3]. This area should be free from major blood vessels, nerves, and bone. In order to apply the injection to the right area, the area to be injected

must first be seen well[6]. It should be checked whether there is infection, necrosis, bruising, deterioration of skin integrity in the area to be injected[7]. The advantages and disadvantages of each region should be well known. Before the injection application, the preparation of the material to be applied, the selection of the materials and the methods to be used to control the pain should be planned, the injection site should be determined and the patient should be positioned appropriately[8,9]. VG (Ventrogluteal) area, which is one of the IM injection sites, contains the gluteus minimus and gluteus medius muscles, as well as the advantages such as the large vascular structures and neural networks in the region, its distance from the bone tissue, thin subcutaneous tissue and easy positioning of the patient. It is a preferred area for IM injection[9-11]. Due to its distance from the rectum, the risk of fecal contamination in the area is also low. Studies have also reported that IM injection complications are more common in injection sites other than the VG area[6,12]. In recent studies, it is recommended to use a VG field instead of a DG (Dorsogluteal) field for IM injection due to its distance from the sciatic nerve and major blood vessels[4,9,13]. However, when the literature is examined, it has been determined that nurses use DG area more frequently in IM injection applications[14-16]. Walsh and Brophy[16] found that 71% of nurses and Gülnar and Çalışkan[15] 85.9% of nurses used DG area for intramuscular injections. Again, it is reported in the literature that nurses have insufficient knowledge and skills in using VG field and therefore they do not want to use VG field[3,10], instead they prefer DG field in IM injection applications[4,5,17]. In addition, it is reported that nurses are not given advanced training on the technique of intramuscular injection, apart from the training they receive in associate and undergraduate programs. Floyd and Meyer[5] teaches injections into the VG area in some nursing schools, but students rarely have the opportunity to observe the application of this technique in clinical practice. Greenway[10] reports that nurses do not know how to inject into the VG area and do not want to use that place, thinking that it may cause tissue damage. In the literature, it has been stated that bony prominences will allow manual detection of the VG area and facilitate positioning the patient. However, it has been determined that nurses avoid using the area because they have a fear of harming the patient, their knowledge and skills in this technique are insufficient, and it is difficult to detect, and they inject into the DG area instead[3,10]. In this context, nurses should benefit from evidence-based research results instead of relying on traditional methods.

For this reason, it is aimed to develop a valid and reliable measurement tool in order to measure the knowledge level of nurses about VG.

Method

Purpose and Form of the Study

In this study, the methodological method was used to determine the level of knowledge of nurses on the ventrogluteal area.

Sample of the Study

The population of the study consisted of 250 nurses who worked in the private unit, internal and surgical clinics of a university hospital in Turkey between February 20, 2021 and April 20, 2021 and agreed to participate in the study. In the development of a scale, in the reliability and validity studies of the scale, it is recommended to work with a sample of 5-10 times the number of items that make up the scale in order to perform factor analysis, and to obtain 30 pairs of data for the test-retest management, which is used to examine the invariance over time[18,19]. Based on the number of items (n=20) of the scale created in this study, it was aimed to reach nurses with five times the number of items (20x10). A total of 250 nurses were included in the study, in which the random sampling method was used.

Data Collection

Two forms were used to collect the data: "Individual Identification Form" and "Ventrogluteal Area Information Scale (VAIS) Draft". In the first part, there are seven questions regarding the demographic characteristics of the participants (gender, age, education level, working year, clinical position, type of work, clinic where works). In the second part, there is a 20-item Draft VAIS that was developed by the researchers in order to evaluate the knowledge level of nurses about the ventrogluteal area. Draft scale; It is a likert-type scale that was developed with the support of the literature and evaluated between (I- agree, 2- I partially agree, 3- I am undecided, 4- I do not agree, 5- I strongly disagree). Informed consent was obtained from the nurses who agreed to participate in the study and the forms were applied online. The contact numbers of 30 nurses in this sample group were obtained and test-retest application was performed 20 days later.

Validity and Reliability Studies of the Scale

In VAIS development work; Content validity and factor analysis methods were used for validity, and Cronbach α coefficient calculation methods were used to determine internal consistency for reliability. In addition, the item total correlation score was calculated for the reliability study.

Ethical Dimension of Research

Ethics Committee Approval (2020-02/03) from "Sivas Cumhuriyet University Non-Interventional Clinical Research Ethics Committee", institutional permission

from the institution where the study was conducted, and informed consent from the participants were obtained for the study. The research was carried out in accordance with the Principles of the Declaration of Helsinki.

Statistical analysis

Data were analyzed with IBM SPSS V23. The factor structure was revealed by explanatory factor analysis. The KMO-Bartlett test was used for sample adequacy, and whether the scale was additive was examined with Tukey's Test for Nonadditivity. For the reliability of the scale, the Cronbach Alpha value was checked and the significance level was taken as $p<0.05$. The dependent groups t test was used for test repetition, and the Pearson correlation test was used for the relationship.

Results

Demographic Data of Participants

It was determined that 56.4% of the participants were male, 45.6% had a bachelor's degree, 39.9% had 10-14 years of working experience and 74.4% were service nurses. It was also determined that 66.8% of the participants were working in day-shift mode and 51.2% were working in surgical clinics. In addition, the mean age of the participants was found to be 34.24±8.07 (Table 1).

Table 1: Demographic data of the participants

Variables	n	%
Gender		
Female	109	43,6
Male	141	56,4
Age (average)		
34,24±8,07		
Level of education		
Health vocational high School	37	14,8
Associate degree	99	39,6
Licence	114	45,6
Years of Work		
1-4 Years	30	12,0
5-9 Years	58	23,2
10-14 Years	99	39,6
15-20 Years	63	25,2
Clinical Mission		
Responsible Nurse	17	6,8
Service Nurse	186	74,4
Special Unit Nurse	47	18,8
Way of working		
Daytime	20	8,0
Shift	63	25,2
Day-Shift	167	66,8
Workıng Clınıc		
Internal Clınıc	68	27,2
Surgical Clınıc	128	51,2
Special Unit Clınıc	54	21,6

VAIS Content and Scope Analysis

In order to evaluate the content and content validity of the scale, two stages were followed. In the first stage, in order to ensure that the 20-item draft scale, which was prepared in a five-point Likert type, does not contain expression disorders, expert opinion was obtained from two faculty members who teach in the field of Turkish Language and Literature. Language experts reported that each item is appropriate in terms of meaning and structure, and there is no change or inconsistency. The 20-item draft scale that emerged at the end of the first phase was presented to the opinion of 11 academicians working in the nursing department. The appropriateness and comprehensibility of each scale item was determined by experts as "(1) Appropriate-The item measures the targeted structure", "(2) Correction should be made - The item measures the targeted structure but needs slight correction", "(3) Not appropriate - The item does not measure the targeted structure". They were asked to make their scores and write their suggestions for each statement separately in the "suggestion" box. After the feedback from our experts, the content validity ratio (CVR) regarding the presence or absence of the items in the scale was calculated according to the formula below[20].

$$KGO=Nu/(N/2)-1$$

"Nude; The number of experts who said "Applicable" to the item"

"N; The total number of experts who gave their opinion on the item"

According to the Lawshe technique, each item with a KVR ≤0 does not have content validity. For this reason, these items in the scale were directly eliminated[20-22]. According to the Lawshe technique, the content validity criterion (CVR) at the $\alpha=0.05$ significance level of each item with a CVR>0 value should be checked. The CGI value is used to determine the minimum number of experts who must say "Adjustable" in order to decide whether an item is appropriate or not. At 21 $\alpha=0.05$ significance level, the CGQ value for 11 experts was 0.63[21]. Accordingly, the item with KVR<0.63 was removed from the scale.

After the CVR is defined for each item, the Content Validity Index (CGI) is calculated for the entire test. In this case, the CGI value is obtained by calculating the average of the calculated CVR values of the items that were decided to remain in the scale. The draft scale was found to be KVR=0.99. This finding shows that the Content Validity of the remaining 20 items of the scale is statistically significant, since CGI>CDS.

Pilot Application

The prepared draft scale was applied to a group of 30

nurses and checked for intelligibility. At the end of this pilot application, no incomprehensible item was determined and the resulting draft scale consisting of 20 items was applied to a sample group of 250 people, and reliability and validity analyzes were made.

Construct Validity of the Scale

In order to ensure the construct validity of the scale, exploratory factor analysis was performed.

Exploratory Factor Analysis (AFA)

Kaiser-Meyer-Olkin (KMO) and Bartlett tests were performed to determine whether the number of samples taken was sufficient for factor analysis. The KMO value was calculated as 0.773 in the factor analysis of VAIS. The number of samples taken according to this value was suitable for factor analysis (KMO>0.500). Within the scope of the Bartlett test, the X2 value was found to be 6780.622 and statistically significant ($p<0.05$). Accordingly, the normal distribution condition was met (Table 2).

In order to determine the factor structure of the created scale, a Scree Plot chart showing the expansion of the eigenvalues was created. When the graph was examined, it was determined that the scale showed a single factor structure (Figure 1).

Table 2: KMO and Bartlett's Test

KMO		0,773
Bartlett's Testi	X^2	6780,622
	Sd	190
	P	0,000

In order for the created item to be included in the measurement tool, the minimum value of the factor load should be 0.35[22]. In order for the scale to have a stronger structure, the lowest value of factor load was accepted as 0.50. As a result of the EFA, three items (item1-item2-item10) with a factor load of less than 0.50 were excluded from the scale (Table 3). The results of the exploratory factor analysis of the AWAI draft are shown in Table 3. "Item-Total Correlation" was calculated as the item statistics of the items in VAIS. The item total correlation means the relationship between the attitude score obtained from each item and the total attitude score[23] and the correlation coefficient of each item is given in Table 4. It was found that VALBÖ item total score correlations had high correlation coefficients with scores ranging from 0.645 to 0.867.

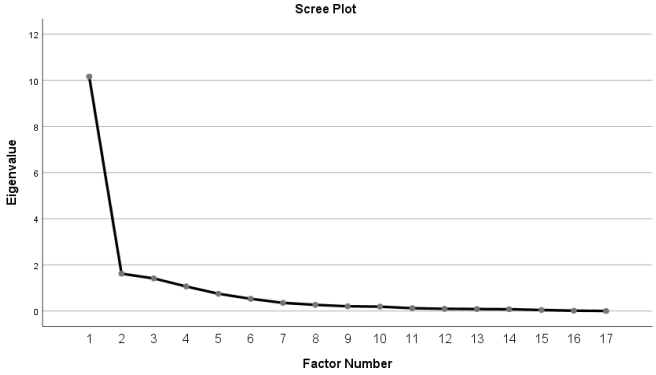

Figure 1: Scree Plot Chart

Table 3: Results of Exploratory Factor Analysis

Substances	Factor Load	Ratio of Total Variance
I3.VG. The amount of drug that can be given to the injection area is 2.5-3 ml.	,637	**57,285**
I4. VG. The patient can be placed in lateral, prone, and supine positions while administering an IM injection to the injection site.	,669	
I5. VG. The airlock technique may not be used when injecting into the area.	,665	
I6. VG. The injection angle of the needle into the muscle is 90 degrees.	,795	
I7. IM places the palm of the hand on the greater thoracentery and the wrist perpendicular to the femur to detect the VG area during injection.	,742	
I8. In VG injection, rotation is made between both injection sites.	,746	
I9. In VG injection, the drug is injected slowly, giving 1 ml every 10 seconds.	,710	
I11. After the injection application, the area is only pressed, not massaged or rubbed, unless otherwise stated.	,834	
I12. Women have a larger area of gluteal adipose tissue than men.	,621	
I13. In IM injection applications, site selection differs according to the age of the patient.	,710	
I14. IM injection complications are less common in VG injection compared to other regions.	,891	
I15. Body Mass Index (BMI) is important in IM injection site selection.	,833	
I16. The VG area is easy to palpate and locate.	,797	
I17. VG area has greater thickness of gluteal muscle than DG area.	,793	
I18. The drug is given to the M. Gluteus medius-M. Gluteus minimus muscles by IM injection in the VG area.	,852	
I19. The safest area to use for IM injection is the VG area.	,759	
I20. In IM injection application, it is important that the drug volume is suitable for the muscle region.	,748	

Table 4: Item Analysis for the Scale of Knowledge towards the Ventrogluteal Area

	Scale Mean When Item is Deleted	Scale Variance when Item is Deleted	Item Total Score Correlation	Cronbach's Alpha When Item Is Deleted
item 6	27,1000	77,038	0,781	0,953
item 7	27,0440	75,946	0,731	0,954
item 8	27,0080	75,887	0,726	0,954
item 9	27,0440	76,548	0,705	0,954
item 13	27,0640	76,646	0,680	0,955
item 14	27,1640	76,089	0,867	0,952
item 15	27,0720	76,196	0,805	0,953
item 16	27,0960	76,336	0,756	0,953
item 17	27,0480	75,765	0,750	0,954
item 18	27,0880	75,607	0,828	0,952
item 19	27,0600	76,306	0,732	0,954
item 20	27,0440	76,147	0,738	0,954
item 3	27,1680	78,317	0,645	0,955
item 4	27,1520	77,921	0,684	0,955
item 5	27,1160	78,079	0,679	0,955
item 11	27,1560	76,293	0,816	0,953
item 12	26,9920	77,309	0,606	0,956

Table 5: Examining the Change in Scale Scores for Test Repetition

		Dependent Sample t-Test					Correlation	
		Mean	N	ss	t	p	R	p
VAIS	Pretest	29,43	30	1,98	,297	,769	,999	,000
	Posttest	29,40	30	1,93				

p*<0,05

VAIS Reliability

Test-Retest Reliability

After re-administration of VAIS to 30 nurses with an interval of 3 weeks, test-retest reliability coefficient was evaluated by using "Paired Samples Test and Pearson Product-Moment Correlation". As a result of the analysis, it was determined that there was no significant difference (p>0.05) between the two measurements obtained at different times of VAIS. In addition, the relationship between the two measurements was evaluated with the "Pearson Product Moments Correlation"[18]. It was determined that there was a statistically significant relationship between the test-retest scores of VAIS (r=.99 p= .000) (Table 5). This result; It has been shown that VAIS is not affected by time and therefore it is a reliable scale.

Cronbach Alpha Internal Consistency Reliability

According to the results of the internal consistency reliability analysis of the VAIS, the Cronbach's alpha reliability coefficient of the VAIS was 0.96; The scale was found to be quite reliable.

VAIS Scoring

In Likert-type scales, the total score of the scale consists of the sum of the answers of each item[24]. For this reason, each item must be scored separately. In the scoring of Likert-type scales, the scores are given in ascending or descending order according to the positive or negative status of the items. Positive items should be scored in ascending order and negative items should be scored in descending order[25]. In our study, the scoring of the items was determined as "1-Agree, 2-Partly Agree, 3-Undecided, 4-Disagree, 5-Strongly Disagree". The lowest score that can be obtained from the 17 items in the final version of the scale is 17 and the highest score is 85. There is no item that requires reverse scoring in the created scale. As the score obtained from the scale increases, it is determined that the knowledge of the nurses about the ventrogluteal area increases.

Discussion

After the scale development study was decided, the studies on scale development were examined and the steps to be taken were determined in order[26-29].

As a first step, a literature review was made; While creating the item pool, guidelines and comprehensive studies were based on[1,3,10,13] 20-item, "1-I agree, 2-I partially agree, 3- A five-point Likert-type draft scale form was created as I am undecided, 4-I do not agree, 5-I strongly disagree.

Expert opinion was sought to test the language and content validity of the 20-item draft scale created as the

second step. Language and content validity, according to Özdamar, "It is the feature of the scale to be within the scope to control the objectives determined in the targeted subject. It is the feature of being detectable with the scale of all the features related to the event/phenomenon to be measured"[24]. In order to test the language suitability, the 20-item draft scale was presented to the opinions of two lecturers who teach in the field of Turkish Language and Literature. Language experts reported that each item is appropriate in terms of meaning and structure, and there is no change or inconsistency. After receiving the opinion of language experts, expert opinion was sought for content validity[29,30]

It is stated that the number of experts to be consulted for content validity should consist of at least three people[31]. During the study period, 11 experts' opinions were taken based on statistical techniques, taking into account all these recommendations in the literature. Content validity evaluations made using statistical techniques consist of "scope validity rate" and "scope validity index" stages[32]. The CVR ratio for 11 experts is 0.63[24]. Accordingly, an item below the minimum value of 0.63 was excluded from the scale. The CGI obtained by calculating the average of the calculated CVR values of the remaining 20 items was found to be 0.99. This finding was CGI>CVR, and the Content Validity of the remaining 20 items of the scale was found to be statistically significant. The prepared draft scale was applied to a group of 30 nurses and checked for intelligibility. At the end of this pilot application, no incomprehensible item was determined. After the resulting draft scale consisting of 20 items was applied to a sample group of 250 people, reliability and validity analyzes were made.

Exploratory factor analysis was used to determine the construct validity of the scale. KMO and Bartlett tests were performed to determine whether the sample size of the scale was suitable for factor analysis. The KMO value was found to be 0.773 in the factor analysis performed for VAIS, and it was concluded that the sample size was sufficient for factor analysis (Table 2).

"While performing factor analysis, the assignment of scale items to factors or their removal from the scale is based on factor load values. The factor loading value is a coefficient that explains the relationship of the items with the factors. If the factor load of the item is less than 0.35, the item is removed from the scale and the analysis is continued[19,23,21]. Accordingly, in order to make the scale more reliable, the minimum factor load value was determined as 0.50 and the items with a factor load below 0.50 were excluded from the analysis. In this context, three items were removed from the scale and the number of items in the scale decreased to 17" (Table 3).

Scree Plot graph and explained variance ratio are used to determine the total factor number of the scale[19,31]. As a result of the analyzes made in our study, it was determined that the scale had a single factor structure (Figure 1).

Looking at the results of the last factor analysis with the remaining items, it was determined that it explained 57.28% of the total variance (Table 3). The higher the total variance rate, the stronger the scale, and the variance values between 40% and 60% are considered ideal in scales where attitudes and behaviors are evaluated[24]. In this context, it was seen that the total variance value of our scale was sufficient.

The reliability of a scale whose validity is accepted also needs to be tested[19,33]. Therefore, the Cronbach alpha value was calculated in our study. If Cronbach's alpha value is 0.00 < 0.40, it is stated that the scale is not reliable, if 0.40 < 0.60, the scale has low reliability, if 0.60 < 0.80, the scale is highly reliable, and if 0.80 < 1.00, the scale is highly reliable[19,24]. Accordingly, in the reliability analyzes of our scale, it was determined that the Cronbach's alpha internal consistency coefficient was 0.97 and the factor loads ranged between 0.621 and 0.891, and the scale was found to be reliable.

Another step of the scale reliability study is to determine the invariance over time[19]. Therefore, in our study, the scale was reapplied to 30 nurses with an interval of three weeks, and the relationship between the measurements made at two different times was evaluated with the "Pearson Product Moments Correlation".

The test-retest correlation coefficient is expected to be at least r=0.70 for a newly developed scale[33]. In this context, it was determined that there was a significant relationship between the test-retest scores of VAIS (r= 0.99 p< 0.001) (Table 5). This result showed that VAIS was not affected by time and was a reliable scale.

It is very important to determine the knowledge level of nurses in order to make the use of the ventrogluteal region a standard practice in IM injection applications and to prevent possible complications. It is important to develop the knowledge levels determined for the VG field in case of lack.

Limitations

Study may not be representative of all nurse in centers in Turkey for example. The generalizability of the results is therefore limited. Therefore, studies from different hospitals. It is discussed to improve generalizability in future studies.

Conclusion

It is very important to use it in IM injection applications because the VG region does not contain large blood vessels

and nerves, has a thick muscle density and is a less painful area during injection. In this context, the VG region should be used correctly in order for patients to feel less pain and to prevent complications that may occur. For this purpose, we have developed It has been concluded that VDIS is a reliable and valid measurement tool that can be used in nursing practices. As a result of the statistical analyzes, it was determined that the scale was appropriate to be used in a structure with one factor and 17 items. In this content, it is recommended to use the scale we developed to determine the knowledge of nurses towards the ventrogluteal area.

Conflict of Interest

No conflict of interest is declared by the authors.

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