ORIGINAL ARTICLE / ARAŞTIRMA YAZISI

Evaluation of the Knowledge Level of Nurses about the Follow-up of Complications That May Occur after Coronary Angiography

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ABSTRACT

Objective: In this study, it was aimed to determine the level of knowledge of nurses about follow-up complications and whether this level of knowledge was related to age, education level, and experience in patients who underwent coronary angiography.

Methods: The sample of this cross-sectional and descriptive study consisted of 89 nurses who worked in the cardiology clinic for at least one year and agreed to participate in the study, among the nurses in a training and research hospital and a tertiary cardiovascular center in Istanbul between 01 September 2021 and 31 September 2021. In the study, the "Personal Information Form" and "Coronary Angiography Knowledge Form" prepared based on their levant literature were used to collect data. Statistical analysis was performed using the R studio package program.

Results: The mean number of total correct answers in the cardiology knowledge questionnaire was 5.07±1.94; the average of correct answers to all questions on interventional cardiology complications showed a statistically significant increase with 5.37 (p=0.034) for nurses with a bachelor's degree, 5.50 (p=0.013) for those with 15 years or more of Professional experience, and 6.43 (p<0.001) for those with cardiology experience of 10 years or more.

Conclusion: The results of this study showed that education, Professional, and field experience were associated with an increase in knowledge about effective patient follow-up after coronary angiography.

Keywords: coronary angiography; complications; level of knowledge; experience; nurse; care

Koroner Anjiyografi Sonrası Oluşabilecek Komplikasyonların Takibiyle İlgili Hemşirelerin Bilgi Düzeyinin Değerlendirilmesi

ÖZET

Amaç: Bu çalışmamızda koroner anjiyografi uygulanan hastalarda hemşirelerin komplikasyonların takibi ile ilgili bilgi düzeylerini ve bilgi düzeyinin yaş, eğitim düzeyi, deneyim ile ilişkili olup olmadığının saptanması amaçlanmıştır.

Yöntemler: Kesitsel ve tanımlayıcı nitelikteki bu çalışmanın örneklemini, 01 Eylül 2021 ve 31 Eylül 2021 tarihleri arasında İstanbul'da bir eğitim ve araştırma hastanesinde ve bir tersiyer kardiyovasküler merkezdeki hemşireler arasından en az bir yıldır kardiyoloji kliniğinde çalışan ve çalışmaya katılmayı kabul eden 89 hemşire oluşturmuştur. Araştırmada verilerin toplanmasında ilgili literatüre dayanarak hazırlanan "Kişisel Bilgi Formu" ve "Koroner Anjiyografi Bilgi Formu" kullanılmıştır. Rstudio paket programı kullanılarak istatistiksel analiz yapılmıştır.

Bulgular: Kardiyoloji bilgi anketi toplam doğru yanıt ortalamasının 5.07±1.94 olduğu; girişimsel kardiyoloji komplikasyonları tüm sorularına doğru yanıt ortalamalarının lisans mezunu hemşirelerde 5.37 (p=0.034), mesleki deneyimi 15 yıl ve üzeri olanlarda 5.50 (p=0.013) ve kardiyoloji deneyimi 10 yıl ve üzeri olanlarda 6.43 (p=0.0001) ile istatistiksel olarak anlamlı olacak şekilde arttığı bulunmuştur.

Sonuç: Bu çalışma sonuçları, eğitim, mesleki ve alana ilişkin deneyimin, koroner anjiyografi sonrası etkin hasta takibine ilişkin bilgi düzeyinin artması ile ilişkili olduğunu göstermiştir.

Anahtar sözcükler: koroner anjiyografi, komplikasyon, bilgi düzeyi, deneyim, hemşire, bakım

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Ischemic heart disease (IHD) is the main global cause of death. It is estimated by the World Health Organization (WHO) that 17.9 million people died from ischemic heart disease (IHD) globally in 2019, accounting for 32% of all deaths (1,2). According to 2019 Turkish Statistical Institute data, it is reported that 36.8% of deaths are caused by circulatory system diseases and 39.1% of these are caused by ischemic heart diseases (3). According to the data of TEKHARF (Heart Disease and Risk Factors in Turkish Adults), the largest heart health study conducted in Turkey, it is reported that ischemic heart disease ranks first among all causes of death in Turkey with a share of 42% over 26-years (4). Invasive angiography is recommended as an alternative test for the diagnosis of ischemic heart disease in patients with a high clinical probability of diagnosing ischemic heart disease and with severe symptoms unresponsive to medical therapy, or in patients with a clinical assessment indicating a high risk of events and typical angina at a low level of exercise (5).

Although coronary angiography is more comfortable and less risky for the patient, there is a potential risk of complications during and after the procedure (6,7). Prevention, early detection, and intervention of complications that may occur after coronary angiography is possible with a high level of awareness, sufficient theoretical knowledge, and experienced nursing services (8, 9,10). In today's coronary angiography procedure, the pre-procedure, during and post-procedure evaluation and follow-up forms include vital signs monitoring (heart rhythm, blood pressure, saturation, fever, and pain), blood sugar, edema, pain, a catheter (sheath) location and peripheral circulation monitoring (bleeding, hematoma, numbness, tingling, peripheral filling, limb diameter, skin temperature), planned catheter (Sheath) extraction time, urine output, amount of contrast media used are evaluated (6,7,8). Standard forms are indispensable for patient follow-up and nursing practices. However, nurses' knowledge level and critical thinking skills are very important in increasing the quality of care and improving patient outcomes by increasing the level of knowledge to the optimal level, ensuring that patients receive the same quality service in every shift (9,10,11).

Our study, it was aimed to determine the level of knowledge of nurses about the processes followed and whether the level of knowledge is related to age, education level, and experience in patients who planned and applied interventional cardiological procedures.

MATERIAL AND METHODS

Study Setting and Time of Research, Population

The population of this cross-sectional and descriptive study consisted of 134 nurses working in the cardiology clinic for at least one year, among the nurses in a cardiac-specified training and research hospital in Istanbul between 01 September 2021 and 31 September 2021. Among these 134 nurses, 89 who agreed to participate in the study were included.

Statistical Analysis

Statistical analysis was performed using the Rstudio (Version 1.4.1106 2009-2021 RStudio, PBC, General Public License.) package program. Continuous variables were expressed as mean ± standard deviation (SD) values, a 95% Confidence Interval while categorical variables were expressed as numbers and percentages. The K-means clustering method was used to determine the cut-off point, and conformity to normal distribution was evaluated with the Shapiro-Wilk test. The Henryson method was used to evaluate the difficulty of the questions in the Angiography Information Form, and the simple method was used to evaluate the discrimination index. When the distribution was abnormal, the Mann-Whitney U test was used to compare whether there was a difference between the mean scores of two independent groups and the Kruskal Wallis test to compare whether there was a difference between the mean scores of three or more independent groups. In cases where both dependent and independent variables were categorical, the x^2 test was used to test the difference between the observed frequency values of the variables and the expected frequency values. Item Difficulty Index and Item Discrimination Index were used in order to perform Distractor Analysis Based. A p-value of <0.05 was considered statistically significant.

Data Collection Tools and Data Collection Process

In the study, the "Personal Information Form" and "Coronary Angiography Information Form", which were prepared based on the relevant literature, were used to collect data. The personal information form included questions about the nurses' age, gender, educational background, professional experience, and experience in the cardiology clinic. In the coronary angiography information form, 10 multiple-choice questions from the literature and studies evaluating nurses' knowledge of the coronary angiography process and patient follow-up were used (8,9,10). Each question in the form consists of 1 correct answer and 4 wrong answers, and the participant gets 1 point when he/she marks the correct answer

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and 0 points when he/she marks the wrong answer. While the highest score that can be obtained from the Coronary Angiography Information Form is 10, the lowest score that can be obtained is 0. The latest version of the questions in the form can be seen below.

Table 1. Coronary Angiography Information Form	
Question no.	**Questions**
Q1	What are the local complications that occur in patients after coronary angiography?
Q2	With what signs and symptoms do you detect pseudoaneurysm after coronary angiography?
Q3	When should you check the serum creatinine level of patients after coronary angiography?
Q4	What is the complication of delayed sheath removal?
Q5	When does contrast media-induced nephropathy develop after coronary angiography?
Q6	Who is at risk of developing kidney failure after coronary angiography?
Q7	What are the signs and symptoms of thrombus formation after coronary angiography?
Q8	How many hours should the patient's treated extremity remain immobilized after coronary angiography?
Q9	Who is at risk of developing pulmonary edema after coronary angiography?
Q10	When you detect a hematoma at the puncture site after coronary angiography, which of the following shouldn't you do?

Ethical Aspect of Research

Ethics Committee approval was obtained on 05/08/2021, numbered 225. Helsinki declaration principles were followed in our study. In the e-mail where the link of the Google Form was shared with the participants, the participants were informed about the purpose of the study. Participants whose written consents were obtained by marking the phrase "I agree to participate in the research" at the top to the Google Form were asked to fill in the form.

RESULTS

The mean age of the 89 nurses working in the cardiology clinic was 36.18±9.27 years, 78.65% of them were female and 58.42% of them had a bachelor's degree. The duration of professional experience is 14.18±9.87 years and the duration of cardiology nursing experience is 5.46±3.39 years, the cut-off point for professional experience is 15 years, and cardiology experience is 10 years (Table2).

Table 2. The demographical data of nurses (n=89)		
Demographic Features	**N**	**%**
Age 36.18±9.27 (%95 CI [34.23-38.13])		
Gender		
Female	70	78.65
Male	19	21.35
Educational status		
High School	2	2.25
Associate degree	14	15.73
Bachelor's	52	58.42
Master's Degree	21	23.60
Professional experience period 14.18±9.87 years		
14 years or less	34	38.20
15 years or more	55	61.80
Cardiology nursing experience period 5.46±6.39 years		
9 yearsor less	68	76.40
10 years or more	21	23.60

Item analysis is a process of interpreting the items with the answer given by the participants to the questions. The item difficulty (p) of the questions ranged from 0.25 to 0.75, and the total item difficulty of 10 questions was 0.50. The item discrimination (r) of the questions ranged from 0.25 to 0.67 (Table 3).

According to education levels and years of experience in cardiology, it was statistically significant that a nurse was able to answer the question "What are the local complications that occur in patients after coronary angiography?" (x^2=12.54 p=0.001; x^2=7.19 p=0.007 respectively). Local complications that occur in patients after cardiac catheterization are known as the level of education increases or is learned as experience in cardiology nursing is gained.

According to their education level, professional experience, and cardiology experience, it was found statistically significant that the 4th question "What is the complication of delayed sheat removal?" was answered correctly (x^2=8.05 p=0.018; x^2=9.42 p=0.002; x^2=7.95 p=0.005 respectively). 70% of all nurses participating in the study, 86% of those with a master's degree, 82% of those with a professional experience of more than 15 years, and 95% of those with a cardiology professional experience of more than 10 years answered this question correctly.

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Table 3. Question item analysis (n=89)										
	Q1	**Q2**	**Q3**	**Q4**	**Q5**	**Q6**	**Q7**	**Q8**	**Q9**	**Q10**
True	59	48	67	63	41	35	54	29	22	34
Item difficulty (p)	0.66	0.54	0.75	0.71	0.46	0.39	0.61	0.33	0.25	0.38
	Middle	Middle	High	Middle	Middle	Middle	Middle	Low	Low	Middle
Item discrimation (r)	0.67	0.29	0.63	0.67	0.58	0.46	0.42	0.25	0.54	0.33
	High	Quite High	High	High	High	High	High	Quite High	High	Quite High
Q: Question										

According to education level, High School/Associate Degree graduates were able to answer the fifth question "When does contrast media-induced nephropathy develop after coronary angiography?' was found to be statistically significant (x^2=9.58; p=0.008). 46% of the nurses who participated in the study, 75% of those with high school/ associate degree education, 50% of those with 15 years or more of professional experience, and 62% of those with 10 years or more of cardiology experience answered this question correctly.

It was found statistically significant that the correct answer to the seventh question "What are the signs and symptoms of thrombus formation after coronary angiography?" (x^2=10.45; p=0.005). While 60% of the nurses participating in the study and 76% of those with more than 10 years of cardiology experience answered this question correctly, only 25% of those with high school education answered this question correctly. The correct answer to the tenth question was found to be statistically significant (x^2=13.13 p=0.001). Only 38% of the nurses participating in the study answered this question correctly, and 54% of those with bachelor's degrees answered this question correctly.

According to education level, professional experience, and cardiology experience, giving the correct answer to the ninth question "Who has the risk of developing pulmonary edema after coronary angiography?" was found to be statistically significant (x^2=8.97 p=0.011; x^2=6.88 p=0.009; x^2=4.86 p=0.027 respectively). While 24% of the nurses participating in the study and 43% of the master's degree answered correctly, none of those with high school/associate degree could give the correct answer 34% of those with more than 15 years of professional experience

and 43% of those with more than 10 years of cardiology experience gave the correct answer.

53% of the nurses who participated in the study answered the question "With what signs and symptoms do you detect pseudo aneurysm after coronary angiography?" and the rate of correct answers increased as the education level, professional years and cardiology professional experience increased. The question "When should you check the serum creatinine level of patients after coronary angiography?" was answered correctly by 75% of the participants in the study. The rate of correct answers increased in those with more professional and cardiology experience. The question "Who has the risk of developing kidney failure after coronary angiography?" was answered correctly by 39% of the participants, and the rate of correct answers was increased in those with more cardiology experience. To the eighth question, " How many hours should the patient's treated extremity remain immobilized after coronary angiography?", 32% of the participants answered correctly, and the correct response rate of those with more professional experience increased. For these questions, no statistically significant difference was found (Table 4).

The mean of the total correct answer in the cardiology information questionnaire was 5.07±1.94 (95% CI [4.66-5.49]). The average of those who gave correct answers to all questions about interventional cardiology complications was 5.37 (x2=4.502;p=0.034) in nurses with a bachelor's degree, 5.50 (U=634; p=0.013) in those with 15 years or more of professional experience, and 6.43 (U=350; p<0.001) in those with 10 years or more of cardiology experience was found to be statistically significant (Table 5).

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Table 4. Differences in Survey Items by Descriptive Characteristics

Education % (a)			Professional exp. % (b)		Cardiyology exp. % (c)	
Hig school/associate (n=16)	Bachelor (n=52)	Master(n=21)	14 years or less% (n=34)	15 years or more% (n=55)	9 years and less% (n=68)	10 years and more% (n=21)
Correct Answer						
1. What are the local complications that occur in patients after coronary angiography?% (a,c)*						
31% (5)*	69% (36)	86% (18)	58% (19)	71% (40)	59% (40)	90% (19)*
2. With what signs and symptoms do you detect pseudoaneurysm after coronary angiography?						
44% (7)	52% (27)	67% (14)	48% (16)	57% (32)	53% (36)	57% (12)
3. When should you check the serum creatinine level of patients after coronary angiography?						
69% (11)	81% (42)	67% (14)	64% (21)	82% (46)	72% (49)	86% (18)
4. What is the complication of delayed sheath removal? (a,b,c)*						
44% (7)*	73% (38)	86% (18)	52% (17)	82% (46)*	63% (43)	95% (20)*
5.When does contrast media-induced nephropathy develop after coronary angiography?(a)*						
75% (12)*	46% (24)	24% (5)	39% (13)	50% (28)	41% (28)	62% (13)
6. Who is at risk of developing kidney failure after coronary angiography?						
63% (10)	31% (16)	43% (9)	42% (14)	38% (21)	34% (23)	57% (12)
7. What are the signs and symptoms of thrombus formation after coronary angiography?(a)*						
25% (4)*	69% (36)	67% (14)	61% (20)	61% (34)	56% (38)	76% (16)
8. How many hours should the patient's treated extremity remain immobilized after coronary angiography?						
38% (6)	37% (19)	19% (4)	24% (8)	38% (21)	32% (22)	33% (7)
9. Who is at risk of developing pulmonary edema after coronary angiography?						
0% (0)*	25% (13)	43% (9)	9% (3)	34% (19)*	19% (13)	43% (9)*
10. When you detect a hematoma at the puncture site after coronary angiography, which of the followingshouldn't you do?						
13% (2)	54% (28)*	19% (4)	39% (13)	38% (21)	37% (25)	43% (9)
*statistically significant (Chi-square test; p<0.05) Exp: experience						

Table 5. Distribution of Exam Results According to Nurses' Descriptive Characteristics (n=89)

Characteristics	Mean +SD	95% CI	x²/U	P
Education				
High school/associate degree	4.00±2.03	2.92-5.08	4.50*	0.034***
Bachelor's degree	5.37±1.93	4.83-5.90		
Master's degree	5.19±1.81	4.37-6.01		
Professional Experience				
14 years or less	4.36±1.88	3.70-5.03	634.00**	0.013***
15 years or more	5.50±1.91	4.99-6.01		
Cardiology Nursing Experience				
9years or less	4.66±1.91	4.20-5.12	350.00**	<0.001***
10 years or more	6.43±1.50	5.74-7.11		
*Kruskal Wallis H **Mann Whitney U Test ***statistically significant (p<0.05) CI: confidence interval				

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DISCUSSION

In our study, more than 50% of the nurses who participated in the study gave correct answers to the questions about local complications after coronary angiography, pseudoaneurysm, when to check the serum creatinine level, complications of delayed sheath removal, and thrombus formation after the procedure. However, less than 50% of the nurses who participated in the study answered the questions correctly about contrast-induced nephropathy, the risk of developing kidney failure, the duration of immobilization of the affected extremity, the risk of developing pulmonary edema, and the practices that should not be done in the area where hematoma was detected. Studies on contrast-induced nephropathy has been detected in cases of acute and basic eGFR <45 ml/min/1.73 ml of the risk of contrast-induced nephropathy in patients with acute only 150> dose is important that the dose of contrast with pre-existing renal function is an interaction between short and long-term negative effects on survival and quality of life have shown (12,13). Preventing the occurrence of all these effects is one of the basic rules for ensuring adequate hydration in patients after angiography in terms of in-hospital and long-term mortality. In addition to providing hydration in the provision of nursing services, it is important to monitor the patient for complications that may occur (14,15).

In the literature, in the study of Hasballah et al. (11) with 40 nurses, it was found that all of the nurses working in the cardiac catheterization unit had insufficient knowledge about patient safety and 77.5% of nurses had a negative attitude towards patient safety. Feroze et al. (9) study with 171 nurses found that the total level of knowledge was over 40%. In Hassan's (10) study in 2015, less than 50% of the nurses who participated in the study answered correctly the questions about contrast-induced nephropathy, the risk of developing kidney failure, and the duration of immobilization of the affected extremity (9,10). Vascular complications and back pain associated with the mobilization time of the limb can be observed after transfemoral coronary angiography. In particular, the provision of nursing services today is aimed at preventing complications that may occur in the patient, as well as increasing the comfort of the patient. Especially in recent years, studies have been conducted that reveal the importance of position and early mobilization after transfemoral angiography (16,17). According to the protocol of the clinic that performs transfemoral angiography, it is mostly followed up with a sandbag for six hours and, as can be seen from the studies conducted, complaints of low back and back

pain are often observed (18). After coronary angiography, the patient follow-up procedures are performed by our nurses as nurses establishment and implementation of the employer but less than %50 of the time to be affected extremity immobilized, hematoma detected in the region with information that applications need to be made level (19).

As education level, professional experience and cardiology experience increased, the rate of correct answers to questions about local complications after a cardiac catheterization, pseudoaneurysm, and complications of delayed sheat removal increased. Both professional experience, and cardiology experience have been effective in correctly answering questions about when to control serum creatinine level, contrast-induced nephropathy, thrombus formation, and the risk of developing pulmonary edema. In the literature, it is shown that the level of knowledge increases in parallel with the level of education and experience (9,10). In the study conducted by Henedy et al. (8) with 40 nurses, it was found that nurses who graduated from faculty had higher average and practice knowledge scores than nurses who graduated from technical institutes. In our study, it was found that the mean of total correct answers to the cardiac catheterization information questionnaire increased as the education level, professional experience, and cardiology experience increased, similar to the literature (6,9). In parallel with education and experience, the level of awareness and knowledge increases (20). In addition, the patient follow-up charts used after cardiac catheterization are believed to be a guide for systematic patient evaluation and patient follow-up, therefore answers to the questions of local complications, pseudo-aneurysm, when to check the serum creatinine level, complications of delayed sheath removal, and thrombus formation after the procedure is highly correct. We believe that updating the patient follow-up forms used in clinics, especially by experienced and trained nurses, and revising them in line with quality standards will contribute to the delivery of health services to the patient.

CONCLUSION

In order for the health service, which is a dynamic system carried out with human power, to continue 24/7 uninterrupted, it is not always possible to plan nurses who are specialized in the relevant field and/or professionally experienced. The results of the study show that education level, and professional and field experience increase the level of knowledge. Therefore, in addition to general education, we think that it is important to determine

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the knowledge level of the people before the education and to create the pieces of training planned for the lack of existing knowledge, the guides used in the clinics, and the checklists in line with the identified deficiencies in the provision of quality nursing service.

The results of this study showed that education, Professional, and field experience were associated with an increase in knowledge about effective patient follow-up after coronary angiography.

Ethics Approval

The study was approved by the S.B.Ü Ümraniye Eğitim ve Araştırma Hastanesi Klinik Araştırmalar Etik Kurulu, no: 225 (05/08/2021).

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