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ORIGINAL ARTICLE

Turkish nurses' level of knowledge regarding implantable port catheter care

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Abstract

Aim: The aim of this study was to determine the knowledge levels of Turkish nurses regarding implantable port catheter care.

Methods: A descriptive method was used inside a university hospital that was located in a Turkish metropolis. The data were collected via a questionnaire that was given to a total of 45 nurses who were employed in the internal medicine clinics where the oncology patients were treated.

Results: In this study, 42.2% of the nurses received in-service training about the implantable port catheter. It was determined that the mean knowledge point was 15.13 ± 4.78. The difference between the knowledge points of the nurses regarding implantable port catheter care, based on whether or not the nurses had received in-service training, was statistically significant. Moreover, it was determined that the majority of the nurses did not know where the implantable port catheter is placed, its period of use following implantation, the amount of normal saline to be used for washing the catheter, the special port (Huber) needle, the number of the needle, and the exchange time of these needles.

Conclusion: In this study, there existed significant differences between the scores of the nurses who received in-service training about the implantable port catheter and the scores of those who did not receive in-service training. The majority of the nurses who participated in the study were willing to receive in-service training regarding this subject. Thus, the organization of in-service training programs and the implementation of care, according to the developed standards and guidelines, are considered as significant for reducing the occurrence of the complications that are related to the use of the implantable port catheter.

Key words: implantable port catheter, knowledge, nursing.

INTRODUCTION

The use of central venous access devices, especially the use of implantable port catheters, is becoming more frequent in the oncology setting (Arch, 2007). An implantable port catheter is a device that contains a subdermal reservoir, in which access to the dermis is actualized by using a needle, and a catheter that extends to the central vein (Gullo, 1993; Yazıcı & Akyüz, 2004; Yeşilbalkan, 2005). The difference between the implantable port catheter from other central catheters is that it is located completely under the dermis and also contains a closed system. Medicine and liquids that are to be administered to the vein are given directly, without continuous needle insertions, to the blood stream by using this system that is located under the dermis (Yeşilbalkan, 2005).

The use of an implantable port catheter is more frequently preferred for cancer patients who have been receiving chemotherapy treatment for a long time. Frequent needle insertions for the treatment, lengthy treatments, the use of cytotoxic agents, and the administration of liquids that are high in amount and

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density cause peripheral vessel problems and the problem of finding the peripheral vessel frequently induces anxiety among the patients and their family (Arch, 2007; Carlo, Lamant, McCarty, Livingston, & Kuhn, 2004; Dilon & Foglia, 2006; Gullo, 1993; Schumacher & Wagner, 2007; Schwarz, Groeger, & Coit, 1997; Yeşilbalkan, 2005). In contrast, using the implantable port catheter induces a lower level of anxiety, as the frequency of needle insertions is decreased, there are lower levels of infection, and there is a better cosmetic appearance because the catheter is located completely under the dermis. The sufficiency of monthly normal saline (NS) washes and having no constraints regarding one's activities, such as bathing and swimming, while the catheter is not in use, increase the contentment of the patients (Arch, 2007; Dilon & Foglia, 2006; Kreis *et al*., 2007; Long & Ovaska, 1992; Rosenthall, 2006; Schwarz *et al*., 1997; Tsai *et al*., 2008).

The high cost ($US2000–3000) of using an implantable port catheter (Bow, Kilpatrick, & Clinch, 1999; Hammond, 1991) and the occurrence of some complications, as well as the ease of use (Biffi *et al*., 1998; Carlo *et al*., 2004; Gullo, 1993; Kreis *et al*., 2007; Yazıcı & Akyüz, 2004; Yeşilbalkan, 2005), are also a matter of discussion. These complications could eradicate many of the advantages of using the implantable port catheter and could inhibit the safe continuation of treatment for both patients and health personnel. These complications can be listed as mechanical dysfunctions that are related to the catheter (breaking, splitting, bending, emboli, displacement, and blockage by thromboses), thrombosis, catheter-related infections, and extravasations (Carlo *et al*., 2004; Kreis *et al*., 2007; Kurul, Saip, & Aydın, 2002; Samancı, Mandel, Bozkurt, Kutlu, & Uras, 2004; Tsai *et al*., 2008; Vescia *et al*., 2007).

Infections and thrombosis are stated to be the most frequently encountered complications that are related to the implantable port catheter in the literature (Kreis *et al*., 2007; Schumacher & Wagner, 2007; Schwarz *et al*., 1997; Tsai *et al*., 2008). The rate of infection that is related to the implantable port catheter is reported to be between 0.4% and 16%, while the rate of thrombosis is stated to be between 2.6% and 28% in various studies (Biffi *et al*., 1998; Damascelli *et al*., 1998; Kock, Pietsch, Krause, Wilke, & Eigler, 1998; Kreis *et al*., 2007; Poorter *et al*., 1996; Samancı *et al*., 2004; Schwarz *et al*., 1997; Tsai *et al*., 2008; Vescia *et al*., 2007). The application of nursing care for oncology patients who have an implantable port catheter by nurses with special training plays a significant role in reducing these complications (Bow *et al*., 1999; Kock *et al*., 1998; Schumacher & Wagner, 2007) and in increasing the contentment level of the patients (Kreis *et al*., 2007).

The description of the implantable port catheter insertion procedure to the oncology patient, the identification of the need for care and information, as well as their provision, and the overcoming of the psychological anxiety of the patients are carried out by nurses. Moreover, it is known that nurses have a significant role in the inhibition of implantable port catheter-related complications, the implementation of initiatives regarding the occurrence of the complications, and the provision of health education to the patient, who will be discharged from the hospital with this catheter. Nurses should have sufficient knowledge and skills to carry out these aforementioned significant activities (Christianson, 1994; Tsai *et al*., 2008).

Although studies regarding the complications that are related to the implantable port catheter are encountered in the literature (Biffi *et al*., 1998; 2004; Kreis *et al*., 2007; Schwarz *et al*., 1997), there exists no study that aims to measure the knowledge levels of nurses about these complications. Although the implantable port catheters are known about in Turkey, they are not widely used, with the exception of metropolitan cities, such as Istanbul, Ankara, and Izmir (Karamanoğlu *et al*., 2003). Consequently, education about implantable port catheter care does not exist in the curricula of all undergraduate nursing programs in the country.

It has been observed that no care protocol regarding implantable port catheter care existed in the hospitals until 2005, the year in which the study was conducted, and that implantable port catheter care differed from clinic to clinic and even from nurse to nurse. The care of implantable port catheters in the clinics was carried out by the inexperienced nurses under the supervision of the senior nurses; thus, the information deficiencies of the senior nurses were likely to become permanent. This research was conducted with the aim of determining the knowledge level of nurses regarding the implantable port catheter. Also, the research can be instructive in determining the knowledge level of the nurses regarding the various components of the implantable port catheter in-service training program that was used in the study, consequently improving the quality of care.

METHOD

A descriptive design (the survey method) was used in this study. The participants were nurses who were employed in the internal medicine clinics of a university

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hospital that was located in a metropolitan city in Turkey.

Participants

The implantable port catheters were inserted into the oncology patients who were staying in the internal medicine clinics within the research hospital and the care of these catheters was realized by the nurses in these clinics. Thus, a total of 45 nurses who were employed in the four internal medicine clinics of the hospital made up the universe of this research. The entire universe was taken as the sampling set because of the low number of nurses who were employed in the hospital.

Instrument

The data were obtained with the aim of evaluating the knowledge levels of the nurses regarding implantable port catheter care, by means of a survey form that was prepared by one of the researchers with the help of various studies in the literature (Arch, 2007; Gullo, 1993; Yazıcı & Akyüz, 2004; Yeşilbalkan, 2005). This form contained 14 questions to determine the sociodemographic features of the nurses and 30 questions about the care of the implantable port catheter. The correct answers to the questions that were related to implantable port catheter care were scored as 1 point, whereas the wrong answers were scored as 0. Then, the knowledge points were evaluated on the basis of the total of 30 points. No reliability or validity test was carried out on the form that was used in this study. The data were collected by one of the researchers via sample forms between 1 and 30 January 2005 and face-to-face interviews with the nurses. The interviews with each nurse lasted ~30 min.

Following the preparation of the sample forms, preapplication tests were implemented with five nurses who were employed in an oncology hospital's day care center, which was not included in the study, between 15 and 21 December 2004. Then, the surveys were given to the participants following a re-examination of the incomprehensible, inexplicit, and dysfunctional questions.

Procedure

This research was conducted after getting the permission of the Directorate of Head Physician and Nursing Services of the university hospital. The nurses were requested to participate in this study by explaining the purpose of the study orally. The study's objectives and procedures were orally explained to the participating nurses and they were informed that their anonymity would be guaranteed, their participation and withdrawal would be of their own free will, and the refusal to participate or a withdrawal of consent would not result in any negative consequences. All of the nurses who were working in the internal medicine clinics agreed to participate in the research.

Data analysis

The data that were obtained were analyzed by using the SPSS (V 13 for Windows) computer program (SPSS, Chicago, IL, USA). Percentage calculations, Kruskal–Wallis variance analysis, and the Mann–Whitney *U*-test were used for the evaluation of the data (Özdamar, 2004; Polit & Beck, 2010).

RESULTS

Participants

The mean age of the nurses who participated in the research was 25.68 ± 3.39 years (21.0–35.0 years). It was determined that 88.9% of the nurses had a Bachelor's degree, while 46.7% of them had worked in the internal medicine clinics for ≤1 year.

It was determined that 42.2% of the nurses had received in-service training about the implantable port catheter: 89.5% of those who had received in-service training participated in a 2 h training session and 84.2% of them had received information about the care of the implantable port catheter. Of these nurses, 22.2% stated that this training induced them to re-evaluate their information about implantable port catheter care, while 2.2% said that it improved their application skills. About half (50.8%) of the nurses found that the information regarding implantable port catheter care was sufficient, whereas 20.0% of them found the information to be, according to their own expression, insufficient. Eighty percent of the nurses stated that they wanted to receive in-service training related to implantable port catheter care. Nonetheless, it was determined that 93.3% of the nurses carried out the care of the implantable port catheters, while 40.0% of them stated that they carried out the insertion process of the port needle, ranging between 1 and 20 times (see Table 1).

Knowledge

The mean knowledge score of the nurses regarding implantable port catheter care was calculated as 15.13 ± 4.78 in this study. The difference between the knowledge scores, based on whether or not the nurses had received in-service training, was found to be statistically significant ($P = 0.029$). Likewise, the difference

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Table 1 Nurses' in-service training about the implantable port catheter and the implementation of port care ($n = 45$)

Variable	N	%
In-service training about the implantable port catheter		
Received	19	42.2
Not received	26	57.8
Duration of in-service training ($n = 19$)		
2 h	17	89.5
2 weeks	2	10.5
Content of in-service training ($n = 19$)		
Implantable port care	16	84.2
Oncology and nursing	3	15.7
Effect of the training on the nurses†		
Formed basic knowledge	13	28.9
Enabled the re-evaluation of their information	10	22.2
Improved their skills regarding implantable port care	1	2.2
Enabled them to be aware of contemporary approaches	10	22.2
Nurses' perception of their ability regarding port catheter care		
Sufficient	23	50.8
A little sufficient	13	28.9
Insufficient	9	20.0
Desire to receive in-service training		
Yes	36	80.0
No	9	20.0
Previously implemented port care and port needle installation process		
Yes	42	93.3
No	3	6.7
Number of times that implantable port care was implemented		
0	3	6.7
1–20	18	40.0
20–50	14	31.1
50–100	4	8.9
>100	6	13.3

†More than one alternative could be marked.

between the knowledge scores, based on the nurses' perception of self-sufficiency, was found to be statistically significant ($P = 0.009$). This difference resulted from those nurses who perceived themselves as sufficient and those nurses who perceived themselves as insufficient regarding implantable port catheter care (see Table 2).

Implantable port catheter care by the nurses

It was determined that 75.6% of the nurses did not know which type of material that the implantable port catheter consists, 82.2% of them did not know the location of the port catheter, 73.3% of them did not know where it extends to, and 44.4% of the nurses did not know in which veins the catheter is to be located. Moreover, 86.7% and 91.1% of the nurses did not know the length of time that the implantable port catheter can be used following implantation and the amount of NS that is used for the washing of the implantable port catheter, respectively (see Table 3).

It also was determined in the study that 31.1% of the nurses did not know the amount of heparin that should be placed into 1 mL of NS for washing the catheter, 71.1% of them did not know the amount of NS to be used in washing, and 84.4% of the nurses did not know the implantable port catheter's heparinization time. Also, it was found that 71.1% and 33.3% of the nurses did not know the dressing time and the antiseptic solution that was used for dermal sanitation, respectively. Moreover, 44.4% of the nurses did not know about the special port (Huber) needle type, 55.6% of them did not know the special port needle number, 46.6% of the nurses did not know the changing time, and 57.8% of them were not aware that they would have to use large-capacity needles for the implantable port catheter insertions. Among the implantable port catheter-related complications, about two-thirds (68.9%) of the nurses knew about the risk of infection, whereas most did not know about the complications of extravasation (71.1%), air embolism (80.0%), catheter dysfunction (95.6%), and the splitting of the implantable port catheter (95.6%) (see Table 3).

DISCUSSION

Although the implantable port catheter has been used for oncology patients in Turkey in recent years, the knowledge level of the nurses who work with oncology patients is limited. Attempts have been made to overcome this lack of knowledge by organizing in-service training programs. The care of the oncology patients who have an implantable port catheter by nurses who have had special training plays a significant role in reducing the complications of the implantable port catheter and in increasing the contentment level of these patients. In this study, there existed a significant difference between the scores of the nurses who had received in-service training about implantable port catheter care and the scores of the nurses who had not received in-service training. The majority of the nurses who participated in the study were willing to receive in-service training regarding this subject.

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Table 2 Knowledge point means of the nurses regarding port catheter care ($n = 45$)

Variable	$\bar{X} \pm SD$	*P*-value
Knowledge point		
Mean	15.13 ± 4.78(5–27)	
In-service training[†]		
Received	16.57 ± 3.67	0.029
Not received	14.07 ± 5.28	<0.050
Nurses' perception of their ability regarding port catheter care[‡]		K–W = 9.375; d.f. = 2; $P = 0.009$
Sufficient	11.11 ± 4.10	
A little sufficient	14.38 ± 3.12	
Insufficient	17.13 ± 4.78	

[†]Mann–Whitney *U*-Test was used;
[‡]Kruskal–Wallis (K–W) variance analysis was used.

In-service training is a type of education that is implemented with the purpose of enabling nurses to achieve related information, skills, and attitudes about their tasks (Öztürk & Savaşkan, 2008). The statistically significant ($P = 0.029$) difference between the knowledge scores regarding implantable port catheter care, based on whether or not the nurses had received in-service training, is important for showing that in-service training is indeed useful. Although half of the nurses perceived their knowledge regarding implantable port catheter care as sufficient and the difference between the knowledge scores, based on the nurses' perception of self-sufficiency, also was found to be statistically significant ($P = 0.009$), the majority (80.0%) of the nurses still wished to receive in-service training. This result is important as it shows the nurses' perception of themselves as insufficient regarding implantable port catheter care-related information and skills. Although the great majority of the nurses had a Bachelor's degree, the fact that theoretical information and application skills in relation to implantable port catheter care were not included in the curriculum in any of the undergraduate nursing schools in the country and the fact that almost half of the nurses had been working in the internal medicine clinics for only a short period of time might have caused the nurses to perceive themselves as insufficient. Some of the nurses, despite their previous in-service training, wished to receive in-service training again.

As mentioned previously, it was determined in this study that most of the nurses were implementing implantable port catheter care and port needle insertion, but they still wished to receive in-service training about these subjects. It is a necessity that nurses should have a high level of knowledge about every activity in which they are involved in order to not harm their patients by making an error that is caused by a lack of information (Aşti & Acaroğlu, 2000; İnal, 2005). According to the literature review, Kreis *et al*. (2007) found that the complication rate that was related to implantable port catheter care was significantly low (6.9%), whereas in other studies, this complication rate was observed to be high (Bow *et al*., 1999; Chang, Tsai, Huang, & Shih, 2003). The reason for this lower rate in the study of Kreis *et al*. (2007) is that the care of the patients who had an implantable port catheter was carried out by nurses who had special training in this subject matter. It is emphasized in the literature that the care of the implantable port catheter by nurses who have special training increases the contentment level of the patients (Kreis *et al*., 2007) and prevents the occurrence of many complications, especially infection (Chang *et al*., 2003).

It could be stated in this study that the nurses did not know the type of catheter that the port attaches to and where the catheter should be located anatomically. This situation might cause the dislocation of the port needle, as the needle would not be located correctly in the first place, and consequently the occurrence of extravasation in the patient (Arch, 2007; Schulmeister & Camp-Sorell, 2000). It is also extremely important that nurses should know about the features of the implantable port catheter and inform the patient about this subject in order to prevent the probable complications.

The majority of the nurses who participated in the study knew the amount of washing time with heparin, whereas less of them knew the amount (mL) of heparin to be used in the NS solution and few knew how to prepare the NS solution with the heparin. It is recommended in the literature that if a catheter is not to be used again, then it should be washed with NS and, following the washing, the port needle should be taken off (Larouere, 1999a,b; Yazıcı & Akyüz, 2004;

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Table 3 Nurses' knowledge regarding implantable port catheter care ($n = 45$)

	Knowledge item			
	Know		Do not know	
Item	N	%	N	%
Implantable port catheter				
Material of which it is made	11	24.4	34	75.6
Location where it is implanted	8	17.8	37	82.2
To where it extends	12	26.7	33	73.3
Veins in which it is located	25	55.6	20	44.4
Its purpose	35	77.8	10	22.2
Amount of time that it can be used after implantation	6	13.3	39	86.7
Purpose of washing it with normal saline	43	95.6	2	4.4
Amount of normal saline to be used for washing	4	8.9	41	91.1
Amount of washing time with heparin	35	77.8	10	22.2
Amount of heparin in 1 mL of normal saline	31	68.9	14	31.1
Amount of normal saline to be used in washing	13	28.9	32	71.1
Heparinization time if it is not used for a long time	7	15.6	38	84.4
Dressing time	13	28.9	32	71.1
Antiseptic solutions to be used for dermal sanitation	30	66.7	15	33.3
Special port (Huber) needle type	25	55.6	20	44.4
Special port needle number	20	44.4	25	55.6
Special port needle changing time	24	53.4	21	46.6
Use of large-volume injectors for its installation	19	42.2	26	57.8
Implantable port catheter complications				
Infection	31	68.9	14	31.1
Extravasation	13	28.9	32	71.1
Air embolism	9	20.0	36	80.0
Catheter dysfunction	2	4.4	43	95.6
Port catheter splitting	2	4.4	43	95.6

Yeşilbalkan, 2005). The implementation of this procedure is important in order to prevent the occurrence of thrombosis (Arch, 2007; Biffi *et al*., 1998; Bow *et al*., 1999; Carlo *et al*., 2004; Gullo, 1993; Kreis *et al*., 2007; Yazıcı & Akyüz, 2004). Thrombosis causes an increase in the duration of stay in the hospital, suspension from the chemotherapy treatment, and the relocation of the catheter with a surgical procedure because the implantable port catheter needs to be taken out in the case of thrombosis. Therefore, this situation results in an increase in the cost of patient care and additional diagnostic methods (Carlo *et al*., 2004). Biffi *et al*. (1998) stated that the occurrence of thrombosis in patients with an implantable port catheter brought an additional cost of $US1840 and increased the duration of stay in the hospital by 3 days.

The rate of infection in patients who have an implantable port catheter is low because the catheter is located under the dermis. Nonetheless, because of an increase in pressure in the bone marrow due to treatments and infections that are caused by a weakness of the immune system, insufficiencies in the implantable port catheter care of oncology patients might be encountered (Yeşilbalkan, 2005). Chang *et al*. (2003) stated that most of the factors that are accountable for infections result from the dermal flora. Therefore, the application of dermal sanitation, according to aseptic principles, is important for the prevention of catheter-related infections. It was determined in this study that some of the nurses did not know the right antiseptic solutions to be used during dermal sanitation before placing the needle into the implantable port catheter. This finding is considerably important, as it shows the lack of standards regarding the care of the implantable port catheter. Standards ensure the provision of a service according to a definite plan and program and the continuation of higher-quality service (Flynn & Sinclair, 2005).

It was identified that approximately half of the nurses who participated in the study did not know about the type, number, and changing time of the special port needle. The use of needles that are longer than the height of the implantable port catheter reservoir would cause problems with the diagnosis, whereas needles with a shorter length would result in extravasations as they would be an insufficient length for insertion (Hadaway, 2004; Rosenthall, 2006; Schulmeister & Camp-Sorell, 2000). Chang *et al*. (2003) specified that the infection rate in oncology patients who had an implantable port catheter was 5.6% and a change of port needles every 7 days was significant.

The use of injectors with small volumes for the inoculation of medicine and washing the catheter causes excessive pressure and breaks inside the catheter. The breaks inside the catheter result in the occurrence of extravasations in the subcutaneous tissue (Arch, 2007; Schumacher & Wagner, 2007). It was determined that less than half of the nurses in this study knew that injectors with a volume of $\geq$10 mL are needed for the implantable port catheters. This rate is considered to be notably low.

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Most of the nurses in this study did not know about the complications of the implantable port catheter, with the exception of infection. The complications that occur in relation to the implantable port catheter can cause discontentedness among the patients and their family, a longer duration of stay in the hospital, an increase in costs (as more diagnoses have to be made), and the death of patients. Therefore, knowledge about the complications and their indications is important for higher-quality care. It is specified in the literature that there has been an increase in the number of malpractise lawsuits, caused by the extravasations that are one of the complications related to implantable port catheters. It also has been stressed that this complication can lead to a mastectomy because it causes necrosis in the chest tissues. In order to confirm the process of the health deterioration resulting from this complication, it is stated in the literature that this chest complication is caused by the negligence of nurses (Schumacher & Wagner, 2007).

It was determined that, according to the results that were obtained from this study, there was a significant difference between the knowledge points regarding implantable port catheter care of the nurses, based on whether or not they had received in-service training. However, the majority of the nurses still wanted to receive additional in-service training. This finding is important as it shows that the contribution of the previously received in-service training, in terms of the level of knowledge and skills, is not at a desirable level. It can be stated that the knowledge of Turkish nurses regarding implantable port catheter care is generally insufficient.

Limitation of the study

This study has one limitation. It demonstrates the results in only one hospital. Therefore, the results of this study cannot be generalized to all other hospitals.

Recommendations

As slightly more than half of the nurses who participated in this study had not received in-service training, the organization of continuous, planned, and efficient in-service training programs for nurses who treat patients with implantable port catheters and the inclusion of implantable port catheter care in the curricula of all the undergraduate nursing programs in Turkey are recommended in this study. Moreover, the development and actualization of implementation standards, based on evidence-based research results, for all of the hospitals in the country and the conduction of research by the observation method in order to determine the nursing applications that are related to the use and care of the implantable port catheter are recommended.

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