RESEARCH ARTICLE

Determining the Use of Peripheral Intravenous Catheter in Installed Patients with Some Markers

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Abstract
Objective: The aim of this study is to evaluate the medical conditions of patients who are inpatient with a peripheral intravenous catheter inserted in a private hospital in Northern Cyprus and to determine the frequency of use and risk factors that have occurred or may occur.
Methods: The research is descriptive and cross-sectional. All patients who are hospitalized in a private hospital in Northern Cyprus formed the universe. The data were collected using a form of with 18 items. Data collection was provided face-to-face with the patients and from their own patient files. Written informed consent was obtained from the university ethics committee, the university administration and the patients for the study.
Results: It was determined that most of the patients were male (49.09%) and peripheral intravenous use was more used (92.73%) in patients older than 18 years of age. It was determined that 98.18% of the patients had the date of the catheter documented, and 54.55% did not specify the insertion time. The anterior part of the arm was found to be the most common catheter application (36.36%). In 85.45% of the patients, a catheter-related problem(s) did not develop and 61.82% of them were evaluated in the last 24 hours.
Conclusion: The latest status of peripheral intravenous catheter applications and compliance and focus on internationally published guidelines in peripheral intravenous catheter applications and management bring about a serious improvement in surveillance, evaluation, decision-making, minimizing application errors, reducing the risk of complications, and documentation.
Key words: Catheter, intravenous, patient, peripheral

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INTRODUCTION

Peripheral intravenous catheter (PIC) applications are frequently used to provide vascular Access (1, 2). Thanks to PIC, intravenous (IV) fluid and electrolyte treatments, total parenteral nutrition, drug treatments, administration of blood and blood products, laboratory techniques, hemodialysis treatment, hemodynamic monitoring can be done easily (2, 3). Peripheral venous catheters, central venous catheters, pulmonary artery catheters and peripheral artery catheters are widely used in hospitals and other healthcare institutions (3 - 5).

PIC applications can be life-saving especially when done correctly. However, complications may develop due to inadequate diagnosis, erroneous application and some problems that may occur while giving care. These complications are important causes of mortality and morbidity (1). Complications that may develop from PIC include thrombophlebitis, infection (catheter entry site, catheter colonization, septic thrombophlebitis, endarteritis, pocket and/or tunnel infection, bloodstream and metastatic infections), extravasation, occlusion, embolism, fistulation, cardiac arrhythmias, pneumothorax, hemothorax (3, 6 - 8).

PICs are often used. It is stated that approximately 300 million intravenous catheters are used annually in the United States (USA) and 1.2 billion in the world (9 - 11).

Alexandrou et al. (2018) conducted a study on PIC involving 51 countries. 40.620 PICs were evaluated in the study. It has been stated that PICs are mostly worn in inpatient clinics or general health centers, nurses perform the application most often, PIC is administered for IV drug therapy, 20-22G intraketes are used most often, and the application area is mostly hands (12).

Regulations are made with published guidelines for the proper use of PICs, which are so common and cause serious complications. According to this, The size of the catheter should be chosen according to the age of the patient, the condition of the vein, the treatment to be applied, the diagnosis and the activity status of the individual. According to the recommendation of the Center for Disease Control and Prevention, catheters can be used up to 72 - 96 hours if they do not pose a risk in terms of infection and phlebitis. The patient should be constantly monitored for complications (1, 13).

Aim of the Study

The aim of this study is to evaluate the medical conditions of PIC patients who are hospitalized in a university hospital in Northern Cyprus, and to determine the frequency of use and risk factors that may occur.

Questions of The Study

1. What is the status of inpatients regarding PIC?

2. Do inpatients have any problems with PIC?

METHODS

Type and Population of the Study:

The population of this cross-sectional and descriptive study consisted of patients who were hospitalized in the inpatient wards of a university hospital in Northern Cyprus and voluntarily accepted to participate in the study.

Inclusion Criteria for Research:

Among the criteria for inclusion in the research; The patient had PIC, agreed to participate in the study voluntarily, and did not have any communication problems. All patients who were being treated at the hospital on the day the data were collected were included in the study. The data of the study were collected in a single day. No specific sampling method was applied.

Data Collection:

The data were collected by means of a data collection form (10,12) containing 18 items (consisting of questions and statements) and prepared in line with the literature. The application of the data collection form for each patient took between 15-20 minutes. During the data collection phase, information was collected and verified by face-to-face interviews with patients and from patient files (written or computerized). During the implementation phase, the patients were given verbal information about the research and their written consents stating that they participated in the study were obtained.

Statistical analysis

Data were analyzed in the Statistical Package for Social Sciences (SPSS) (version 21.0) (IBM Corp.; Armonk, NY, USA) program. In the analysis of the data, the frequency distributions of the patients and PIC characteristics were evaluated. The resulting frequency results are given in the tables as numbers (n) and percentages (%) and interpreted.

Ethical Approach:

In order to carry out the study; Institutional permission from the head of the university, approval of the university ethics committee (YDU/2020/83-1158), and written consent from the patients who accepted the study were obtained.

RESULTS

The presence of PIC according to the descriptive characteristics of the hospitalized patients is given in Table 1. According to this; PIC was found to be higher in male patients (49.09%) (n=27) and in patients older than 18 years (92.73%) (n=51) (Table 1).

Table 2 gives the first part of some descriptive characteristics related to PIC. PIC insertion date was documented in 98.18% (n=54) of the patients, but PIC insertion time was not specified in 54.55% (n=30) patients. PIC was inserted in 72.73% (n=40) of the patients due to IV drug therapy. It was

determined that the nurses applied to patients with PIC (96.36%, n=53), the majority of the catheters (81.82%, n=45) were inserted in the patient's room, and 36.36% (n=20) of these catheters were placed in the antecubital/forearm region of the arm (Table 2).

Table 1. PIC distribution according to the descriptive characteristics of the patients (n=55)

Introductory Feature	Number(n)	Percentage(%)
Gender		
Female	27	47.27
Male	26	49.09
Not reported	2	3.64
Age		
<18 years	3	5.45
>18 years	51	92.73
Not reported	1	1.82
Total	55	100

Table 2. Distributions related to PIC (1) (n=55)

	Number (n)	Percentage (%)
The day of insertion of the catheter		
Documented	54	98.18
Undocumented	1	1.82
Catheter insertion time		
Documented	25	45.45
Undocumented	30	54.55
Catheter insertion reason		
IV fluid	13	23.64
IV medication/drug	40	72.73
Unstability/Resuscitation	1	1.82
Unknown	1	1.82
The person applying the catheter		
Nurse	53	96.36
Technician	2	3.64
Department where the catheter is inserted		
Operating room	3	5.45
Intensive care unit	7	1.73
Inpatient clinics	45	81.82
Where the catheter is located		
Back of hand	15	27.27
Wrist	13	23.64
Forearm	20	36.36
Upper arm	6	10.91
Foot	1	1.82

Table 3 shows the distributions related to PIC. 74.55% (n=41) of the patients had a 20G (pink color) catheter. No catheter-related symptoms or complications developed in

85.45% (n=47) of the patients. Most of the patients were evaluated within the last 24 hours (61.82%, n=34). When the sites with the catheter were examined, it was determined that 92.73% (n=51) were clean, dry and intact. It was determined that 38.18% (n=21) of the catheters used stepcock/3-way taps (Table 3).

Table 3. Distributions related to PIC (continued) (n=55)

	Number (n)	Percentage (%)
Catheter size		
16G (grey)	1	1.82
18G (green)	3	5.45
20G (pink)	41	74.55
22G (blue)	9	16.36
24G (yellow)	1	1.82
Catheter site assessment		
No clinical symptoms	47	85.45
Redness >1 cm from the catheter site	2	3.64
Swelling >1 cm from the catheter site	2	3.64
Bruising, tearing of the skin	2	3.64
Hardening of the vein	1	1.82
Blood in the catheter line	1	1.82
Is the catheter evaluation documented?		
Yes	34	61.82
No	20	36.36
Newly applied	1	1.82
Catheter dressing assessment		
Clean, dry, solid	51	92.73
Dry, dirty and runny	2	3.64
Other	2	3.64
IV connectors		
Stepcock/3-way faucet	21	38.18
IV end cup	12	21.82
Direct connection	20	36.36
None	2	3.64

Table 4 shows the distributions related to PIC. The patients were given more crystalloid fluids (69.09%, n=38) by IV catheter, the number of patients who received continuous infusion was high (47.27%, n=26), the catheters

were flushed with 0.9% Sodium Chloride as 100% (n=55), however, 98.18% (n=54) of these washes were not documented, and 27.47% (n=15) of the patients received analgesia on the day of data collection (Table 4).

Tablo 4. Distributions related to PIC (continued) (n=55)

	Number (n)	Percentage (%)
Treatment administered during the day		
Crystalloid (e.g. normal saline, 5% dextrose)	38	69.09
Parenteral nutrition	1	1.82
None	16	29.Eyl
Treatment applied on the day of data collection		
Ongoing infusion	26	47.27
Intermittent infusion	1	1.82
Bolus infection	5	9.Eyl
Combination of intermittent and bolus	4	7.27
None	19	34.55
Flushing the catheter		
0.9% Sodium Chloride	55	100
Is catheter flushing documented?		
None	54	98.18
IV medications during the day		
Electrolytes	3	5.45
Antibiotic	14	25.45
Analgesia	15	27.47
Anti-emetic	7	1.73
Insulin	1	1.82
Stomach protection	3	5.45
Other	1	1.82
None	11	20.00

DISCUSSION

This study shows the PIC usage rate, characteristics, management, practices and differences between them in a university hospital in Turkish Republic of Northern Cyprus. According to the results of our study, PIC was inserted mostly in patients older than 18 years (n=51). In the study of Alexandrou et al. (2018), 40,620 PICs included in the study were implanted and the majority of the patients were between the ages of 37-74 (mean 59) (12). It is important that PIC applications are recorded in writing and that this registration is done correctly. For this, the nurses are required to record the PIC applications with the necessary information on the observation forms (2, 14). In our study, it was determined that the PIC application was recorded in the observation form as date (98.18%) and time (45.45%). It is stated that the application should be recorded in order to provide easy access to all information of the patients, especially for the control of infection that may occur in PICs, and to keep patient safety in the foreground. In these records, the type of IV application, the number of the catheter used, the area of application, the person performing the application, the reason why it was removed and inserted should be included (15).

In the study of Alexandrou et al. (12), it is stated that PICs are mostly used for IV drug treatment (70%). In this study, it was concluded that 72.73% of PICs were used for IV drug treatment. In the study of Wallis et al. (2014), IV administration of antibiotics was found to be a risk factor for the development of phlebitis and occlusion (8). In the study of Enes et al. (16), it was determined that phlebitis developed in patients who received fluid infusion and drug therapy together.

PIC procedure is routinely applied in hospitals. However, studies have shown that 4-28% of the applied catheters are not used for therapeutic purposes. At the same time, it has been reported that 20% of the patients who have a catheter inserted are unnecessary (17, 18). According to a study conducted in the USA (2016), it was stated that the number of applications that were made unnecessarily and/or resulted in wrong and unsuccessful attempts was 150 million, causing an extra $1.5 billion in financial expenditure (19). In this study, 11 patients (20%) were not given any medication/medication etc. Although not administered, patients appear to have the presence of PIC.

PIC applications are generally the responsibility of nurses. According to the regulation published in Turkey in 2011, nurses are defined as the occupational group that performs PIC and should monitor complications (20). In this case, the importance of nurses' theoretical knowledge and practical applications regarding PIC application increases even more. In our study, it was determined that 96.36% of PIC applications were performed by nurses. Nurses' education on PIC is also of great importance. In the study of Keleekai et al. (19), the knowledge, confidence and skills of the experimental group on PIC were determined at a considerably higher level than the control group after the training program was completed. The level of education

and knowledge that affects the quality of PIC applications; It is affected by criteria such as working shifts, conditions, hours, the position of the nurse in the institution, and the patient service/clinic (21).

There are also many difficulties that nurses face during PIC application. Among them, The patient is obese or a baby, the veins are small, edema, burns, hypovolemia, the presence of chronic diseases, and dehydration (21). It is of great importance to ensure that nurses have sufficient equipment and skills with PIC application, starting from the undergraduate student period. The mistakes made by nurses who do not have sufficient equipment and skills during PIC application are stated in the study of Uzen Cura et al. (20). According to the study, During the observation, it was determined that 82.8% of the nurses did not wash their hands, the area where asepsis was provided with alcohol was palpated again at a rate of 65.6%, and 71.7% did not wait for the aseptic solution to dry.

PIC is applied to more than 70% of the procedures performed for IV applications. Some criteria should be considered for PIC applied so many times. These; the patient's age, vascular characteristics, medical condition, the region where the treatment will be applied, the purpose of the treatment (1). In addition to the frequent use of PICs, the occurrence of catheter-related complications is inevitable (6).

Appropriate material selection is also important in PIC application. Because the material or materials used in PIC application may be associated with the development of complications (such as extravasation, phlebitis, infection). In addition to the appropriate material, vein selection is also important. What makes the application more successful is that the vein is more visible and fuller (2, 22). There is no explanation in the current guidelines as to which catheter size should be. However, it is recommended to apply 20G (pink color) and higher catheters in PIC applications (23). In the study of Wallis et al. (8), 18G and larger catheters are among the risk factors for the development of phlebitis, and 22G and smaller catheters are shown in case of accidental catheter removal.

According to the recommendation of the Infusion Nurses Association Practice Guide (2016); It is stated that 14-18G catheters should be preferred for adults with visible and palpable veins, 20-24G for patients with short veins and feeding problems, and 24-26G for sensitive age groups such as children and the elderly (13). In this study, it was found that the 20G (pink) catheter was mostly applied to the patients (74.55%), and the forearm region was the most preferred (36.36%) region. According to the Infusion Nurses Association Practice Guide, If veins on the back of the hand are to be used in children, short-length catheters are recommended if the vein is convoluted and non-palpable, and long catheters are recommended for use of straight/palpable veins in adult patients (13).

Materials such as dosiflow used to adjust the hour in PIC applications or three-way taps for medication/solutions that will be applied more than once can be preferred. In order to prevent an infection that may occur, materials that can be operated without a needle are recommended. Needle-free intervention is also important and recommended in terms of employee safety (1, 7, 13). In this study, it was determined that stepcock/three-way tap (38.18%) was used the most.

According to the results of this study, IV crystalloid fluids are used with a rate of 69.09% in patients with PIC, in addition to this, IV antibiotic treatment is applied to 25.45% and analgesia/PCA treatment is applied to 27.47%. As stated in the Practice Guide of the Infusion Nurses Association, drug administration is not recommended in liquid infusions. If the drug is to be administered, it should be diluted with an appropriate amount of liquid and the infusion should be administered intermittently. It is recommended to wash the IV line with physiological saline after each fluid therapy and/or between treatments (1, 13). In this study, it was found that the IV route was 100% washed.

CONCLUSION

In this study, information about the health status and management of patients hospitalized

in a university hospital and undergoing PIC application was concluded. Although recommended in the guidelines, many PIC applications are still not recorded in writing and IV medication/solution is not administered to some patients, but we are faced with the result that PIC is applied.

The latest state of PIC applications and compliance and focus on internationally published guidelines in PIC applications and management bring about a serious improvement in surveillance, evaluation, decision making, minimizing application errors, reducing the risk of complication development and documentation. The serious complications stated in the studies conducted on the subject still show that the healthcare team involved in PIC applications needs the necessary training. With the necessary training, standard procedures, up-to-date guidelines, and regular application of aseptic techniques, complications will be drastically reduced.

Ethics Committee Approval: Appropriate permission for the study was obtained from the Committee of Ethics of Derince Training and Research Hospital (YDU/2020/83-1158),

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