Original Article

Experiences and Observations of Nurses Regarding Dislodgement of Peripheral Venous Catheters

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Abstract

Background: Safe use of PVCs for a long time and without any problems is very important for the continuity of the treatment.
Aim: This descriptive study examined experiences and observations nurses have regarding factors related to partial or complete dislodgement of the PVCs.
Methodology: This study was conducted with nurses working at a university hospital. The study was completed with 297 nurses who met the inclusion criteria and agreed to participate, between February 2019 and July 2019. The study data were collected using a questionnaire prepared by the researchers.
Results: 87.5% of the nurses claimed experiencing PVC dislodgement. 66.9% of the nurses claimed observing this incident five times or more during occupational life. 66.1% stated that the patients dislodged PVCs. Nurses stated that PVC dislodgement mostly occurred among elderly patients and in surgical services. 36.6% of the nurses stated that new PVCs were inserted in patients after the PVC dislodgement. 69.6% of the nurses stated that there was no complication after the PVC dislodgement. 44.5% reported that bleeding complications developed after the PVC dislodgement.
Conclusion: The partial or complete dislodgement of the PVCs is an important problem causing PVC failure. It is recommended to take necessary precautions according to clinics for patients at risk of dislodgement of the PVCs in particular and in order to prevent complications.

Keywords: Peripheral venous catheterization, dislodgement of catheter, nursing, venous catheter, nursing care

Introduction

Peripheral venous catheters (PVC) are widely used invasive procedures in modern medical therapy (Keleekai et al., 2016; Mihala et al., 2018). Approximately 70% of hospitalized patients require vascular access for their treatment (Mihala et al., 2018; Atay, Şen & Cukurlu 2018; Nobre & da Silva Martins, 2018). PVCs are commonly used to treat patients, monitor their physical well-being,

and prevent them from experiencing possible complications (Kus & Buyukyilmaz, 2017; Gorski et al., 2016; González López et al., 2014).

Treatment continuity requires that PVCs be used in a safe manner and for a long period of time. There are variations on the literature about how long PVCs should be used after they are inserted. Many hospital protocols state that replacement of PVCs should occur between 72 to 96 hours, regardless of clinical indication. This time span has been suggested to prevent possible complications such as occlusion, infection, and/or phlebitis (Alloubani, Awwad & Akhu-Zaheya, 2019). In the Disease Control and Prevention Center Guide (2017), it is stated that PVCs in adults can be used safely for up to 72-96 hours as long as there is no risk of infection and phlebitis (CDC, 2017). According to the Infusion Nurses Society (INS) guidelines however, there is no need to change the PVC for adult patients, after 72 hours. The INS guidelines revealed that the catheter for adult patients should be changed when clinically indicated only. According to INS, PVCs are removed upon an unresolved complication, discontinuation of infusion therapy, or when deemed no longer necessary for the plan of care (Gorski et al., 2016).

Patients can be repeatedly exposed to unsuccessful PVC insertions when nurses cannot find the appropriate vessel to insert the PVC. PVCs can cause serious, life-threatening, and preventable complications. The endothelial layer becomes damaged based on the inserters technical skills. Pain, extravasation, phlebitis, and even hematoma are complications related to poor PVC insertion (Mihala et al., 2018; Palese et al., 2016). There is an increased risk of infection and patient safety with repeated insertion attempts, thus leading patients to be exposed to unnecessary diagnostic and treatment procedures, prolonging the length of hospital stay, causing patients, their relatives, and health personnel to experience stress and increasing the care costs (Palese et al., 2016; Sarani et al., 2013; Mermel 2017). In addition, PVC placement can cause patients to be constantly exposed to painful stimuli and experience many behavioral and physiological changes (Van Donk et al., 2009).

Many factors result from the patient, healthcare professionals, repeated interventions or long hospitalizations may cause problems with PVC insertion to patient. Therefore, if there is no complication associated with the inserted PVC or there is no indication for removal of the catheter, the catheter should be maintained regularly and its long-term use should be ensured (O'Grady et al., 2011). PVC area and every implementation performed from PVC are regularly checked for infusion accuracy, expiration dates of the infusate, system integrity, dressing, and administration set (Gorski et al., 2016). These practices protect the patient from repeated attempts by ensuring the safe long-term use of PVC ((Kus & Buyukyilmaz, 2017). In the PVC, catheter-skin junction area and surrounding area are evaluated by visual examination and palpation in terms of redness, tenderness, swelling, and drainage. In addition, site care, both skin antisepsis and dressing changes, are implemented at established intervals and immediately if the dressing integrity loosened, becomes damp, visibly soiled, and if moisture or blood are present under the dressing (Gorski et al., 2016). However, no matter how careful nurses are, inserted PVCs can become dislodged. This situation leads to delays in treatment and care of patients with possibly repeated procedure. Repeated procedures may cause patients to experience pain (Palese et al., 2016; Sarani et al., 2013; Mermel 2017). Many studies have been conducted on complication-related PVC failure (Wallis et al., 2014; Helm et al., 2015; Marsh et al.,2018; Murayama et al., 2018; Blanco-Mavillard et al., 2019). Although the study findings showed that various complications cause catheter failure, it points to PVC dislodgement as being the main problem because the catheters cause infiltration, infection, extravasation, and phlebitis (Gorski et al., 2016). There are no studies examining the experiences of nurses regarding partial or complete dislodgement and complications to cause PVC removal. All studies assessing PVC failure-related problems have been conducted on patients. However, nurses are mainly responsible for conducting the PVC procedure in clinics, as well as monitoring and providing the necessary care related to the PVC (Altuntas, Yildiz & Unal, 2004). Therefore, nurses' observations about PVC are important. For this reason, this study aimed to find out experiences and observations of nurses regarding PVC dislodgement by asking the following questions:

- Have nurses experienced and observed partial or complete PVC dislodgement in any of the clinics where they are currently working/had previously worked at?
- Which patient groups under the nurses care have experienced PVC dislodgement?

- What are the interventions and complications regarding dislodgement of the PVCs?

Methodology

Study design and participants: This descriptive study examined experiences and observations of nurses regarding factors related to partial or complete PVC dislodgement. The study was conducted with nurses on duty at the internal medicine, surgical, intensive care, emergency, operating room, oncology, obstetrics, gynecology, dermatology, ophthalmology, pediatrics clinics, infectious diseases, and hemodialysis unit as well as outpatient clinics of a university hospital. The study took place between February 2019 and July 2019 and involved 297 nurses who met the inclusion criteria and agreed to participate.

The inclusion criteria for nurses were determined as follows; working as a nurse for minimum 3 months, experience caring for patients with PVC who received infusions, and voluntary participation in the study. Nurses who had no previous experience for providing care to patients with PVCs were excluded from the study.

Properties of the Study Place: PVCs are used for numerous procedures to diagnose, treat, and monitor patients at the hospital. PVCs are mostly inserted by nurses. There is not a vascular access team in the hospital where the study was conducted. Therefore, if the nurse cannot find suitable vascular access, PVC is inserted by the doctor in specialty departments such as pediatrics and anesthesia. If peripheral vascular access could not be provided despite all attempts, a central venous catheter is inserted by the doctor according to the clinical condition of the patient.

The purpose of fixing and dressing the PVC is to limit movement, reduce transmission of external skin bacteria into the insertion site, and reduce the occurrence of accidental dislodgement (Gorski et al., 2016). Generally a transparent cover film dressing, adherent strips, and a non-sterile tape are used as PVC dressing and securement practice (Marsh et al., 2015).

Data Collection and Measuring Tools

The form consists of a total of 24 questions distributed across three sections: the first section asks nurses their demographic characteristics, the second asks their work status, and the third asks about partial or complete PVC dislodgement. The researchers prepared the tool based on studies about PVC failure in patients ((Kus & Buyukyilmaz, 2017; Phillips & Gorski, 2014; Ahlqvist et al., 2010; Cicolini et al., 2014a). A pilot study was carried out on 10 nurses to test clarity, applicability relevance of the tools and to define the needed time for collecting data. After the pilot study, 10 questionnaires were examined one by one by the researchers. As a result of this, it was determined that the questions in the questionnaire form measure the research questions and the questions are understandable.

Data Analysis: The data of the study were analyzed on IBM SPSS Statistics 22.0 (IBM Corp, Armonk, NY). Descriptive statistics included number (n), percentage (%), and mean ± standard deviation (Mean ± SD).

Ethical Considerations: Approval from the University's Clinical Trials Ethics Committee (2018/211) and written permission from the university hospital were obtained. In addition, all participants were informed about the study and their written consents were obtained.

Results

The average age of the nurses was 33.0 ± 6.81. 91.2% of them were female and 86.5% had a bachelor's degree (Table 1). 91.9% of the nurses worked as clinic nurses, 27.3% had a professional experience of 6-10 years, 62.0% worked 48 hours a week, and 58.2% worked both day and night shifts (Table 2).

Table 3 shows the characteristics related to partial or complete PVC dislodgement. Accordingly, 87.5% of the nurses experienced PVC dislodgement. 66.9% recalled observing such incidents at least 5 or more times during occupational life. 66.1% stated that the patients dislodged their own PVCs. The nurses said that the PVC dislodgement was mostly seen in the elderly patients and in the surgical services. 27.1% stated the patients accidentally dislodged the PVCs. 36.6% of the nurses stated that new PVCs were inserted in patients after the PVC dislodgement. 69.6% stated there were no complications after the PVC dislodgement. 44.5% said that bleeding complication developed after the PVC dislodgement.

Table 1. Demographic characteristics of the participants

Characteristics	
Age (Mean±SD)	33.0±6.81
	n(%)
Gender	
Female	271(91.2)
Male	26(8.8)
Education	
High school	6(2.0)
Associate degree	11(3.7)
Bachelor's degree	257(86.5)
Master's degree	23(7.7)

Table 2. Working status-related characteristics of the participants

Characteristics	**n(%)**
Working status	
Clinic nurse	273 (91.9)
Intensive care nurse	14 (4.7)
Polyclinic or outpatient unit nurse	10 (3.4)
Professional experience	
1 year and less	18 (6.1)
1-5 years	68 (22.9)
6-10 years	81 (27.3)
11-15 years	76 (25.6)
16-20 years	17 (5.7)
21 years and more	37 (12.5)
Average weekly working hours	
40 hours	88 (29.6)
48 hours	184 (62.0)
56 hours	25 (8.4)

Shifts	
Day	85 (28.6)
Night	39 (13.1)
Day and night	173 (58.2)

Table 3. Characteristics related to partial or complete PVC dislodgement

Characteristics	n(%)
Nurses' experiences about the PVC dislodgement	
Yes	260 (87.5)
No	37 (12.5)
The number of nurses' experiences	
1 time	23 (8.8)
2 times	27 (10.4)
3 times	20 (7.7)
4 times	16 (6.2)
5 and more	174 (66.9)
Who dislodged the PVCs*	
Patient	242 (66.1)
The patient relatives	98 (26.8)
Other**	26 (7.1)
In which services the dislodgement of the PVCs was observed*	
Internal medicine service	84 (26.0)
Surgical service	98 (30.3)
Intensive care service	65 (20.1)
Operating room	2 (0.7)
Emergency	13 (4.0)
Pediatrics	25 (7.8)
Oncology-KIT	17 (5.2)
Other***	19 (5.9)
In which age group, patients dislodged PVCs *	
Newborn	78 (13.2)
Child	98 (16.7)
Adolescent	91 (15.4)

Adult	143 (24.2)
Elderly	180 (30.5)
The reason for the dislodgement of the PVCs*	
Patients were aggressive/angry	167 (22.4)
Patients wanted to draw attention / wanted to listen to themselves in this way	47 (6.3)
Patients thought that they received inadequate care	20 (2.3)
Patients dislodged the catheter accidentally	202 (27.1)
Patients were from pediatric group	103 (13.9)
Patients suffered from delirium	119 (16.0)
Patients had catheter-related pain	68 (9.1)
Complications developed in the catheter site and discomforted patient	39 (5.2)
How was the intervention to dislodge the PVCs*	
Patient was restricted physically	84 (13.3)
Patient was sedated	36 (5.8)
New catheter was inserted into the patient	231 (36.6)
For new PVC, an appropriate vein was not found in patient and asked for help	45 (7.1)
New catheter could not be inserted into the patient	50 (8.0)
The patient was informed	184 (29.2)
Did the dislodgement of the PVCs cause complications	
Yes	79 (30.4)
No	181 (69.6)
Type of complication*	
Bleeding	48 (44.5)
Infiltration	18 (16.7)
Extravasation	13 (12.0)
Hematoma-ecchymosis	7 (6.4)
Phlebitis-infection	11 (10.2)
Pain	11 (10.2)

PVC: peripheral venous catheter * More than one answer is given. ** Student, visitor, the catheter trip on clothes, bed sheets *** Ophthalmology service, obstetrics, infectious diseases, hemodialysis unit

Discussion

Intravascular catheterization is a commonly used procedure in hospitals (Avsar et al., 2013). PVC is the most widely used one among these procedures (Tunger & Tireli, 2013). The amount of patients requiring PVC has doubled over the last 20 years (Sarani et al., 2013). The vast majority of hospitalized patients need at least one PVC (Alexandrou et al., 2015; Ray Barruel et al., 2014); approximately 50% of patients with PVCs develop complications. Many PVCs are removed before the completion of patient treatment because of complications (Wallis et al., 2014; Helm et al.,

2015). These complications include local infection, bloodstream infection, phlebitis, infiltration, extravasation, occlusion, and dislodgement of catheter (Gorski et al., 2016).

PVCs have a long use period. Even functional catheters can be used for longer than 72 and 96 hours (Gorski et al., 2016; González López et al., 2014; Helm et al., 2015). However, they need to be removed before the expected time due to phlebitis, occlusion, infiltration, displacement, and infection (Helm et al., 2015; Marsh et al., 2018). Murayama et al (2018) reported that 29.9% of PVCs failed, Marsh et al (2018) stated that the rate of failed PVCs was 32%, Blanco-Mavillard et al (2019) reported that 42% of PVCs failed and Rickard et al (2018) stated that the rate of failed PVCs was 41%. In the study by Marsh et al (2018) it was stated that catheter failures developed due to phlebitis (17%), occlusion/infiltration (14%), and dislodgement (10%). Rickard et al (2018) stated that catheter failure occurred due to phlebitis (25%), occlusion (20%), and dislodgement (9%). The present study revealed that 87.5% of the nurses experienced partial or complete dislodgement of the PVCs. 66.9% of the nurses observed this event 5 or more times. The findings of this study suggested that PVC dislodgement is one of the problems leading to catheter failure.

Other studies have reported that phlebitis, followed by infiltration, occlusion, dislodgement, and infection are the leading causes of catheter failure (Wallis et al., 2014; Helm et al., 2015; Marsh et al., 2018; Murayama et al., 2018; Blanco-Mavillard et al., 2019). The endothelial layer can become damaged due to the PVC insertion. Complications such as pain, extravasation, phlebitis, and hematoma may develop during and after the insertion (Mihala et al., 2018; Atay, Şen & Cukurlu, 2018; Nobre & da Silva Martins, 2018; (Kus & Buyukyilmaz, 2017; Gorski et al., 2016; González López et al., 2014). Repeated insertion of PVC into the same vein increases the risk of phlebitis because that vein is exposed to repeated trauma (Nyika, Mukona & Zvinavashe, 2018). In the present study, the nurses stated that dislodgement of the catheter caused bleeding (44.5%), infiltration (16.7%), extravasation (12.0%), phlebitis, infection, and pain (10.2%). This result supports the idea that catheter dislodgement causes many complications. 66.1% of the nurses stated that patients were the reason for catheter dislodgement. While the majority of the patients did this without realizing this, it was stated that especially aggressive patients did it deliberately with anger.

The nurses stated they witnessed catheter dislodgement across all age groups, but mostly among the elderly. The results of several studies in the literature indicate that catheter failure and related complications increase with advanced age (Sarani Ali Abadi et al., 2013; Carr et al., 2018; Abolfotouh et al., 2014). Moreover, diseases like diabetes and hypertension also change the vascular wall structure with advanced age and thus increase the risk of the PVC complications (Phillips & Gorski, 2014).

Blanco-Mavillard et al (2019), report that the PVC failure largely develops during surgical services. In the present study, the nurses also stated that catheter failure mostly developed in surgical services. This may be due to a great number of intravenous fluid therapies administered to surgery patients within a short period of time (Wallis et al., 2014; Zhang et al., 216). Patients hospitalized in the internal medicine ward constitute the other group with catheter failure. Considering that patients are elderly and have chronic diseases, it can be asserted that prolonged hospital stay, anxiety, dementia, confusion, and even impaired consciousness can all lead to catheter failure (Sarani Ali Abadi et al., 2013).

The first step in the PVC is to ensure no complications (O'Grady et al., 2011) since a negative situation resulting in catheter failure causes re-insertion of the catheter. Many practices changes can be made to prevent this negative situation. According to INS, it is emphasized that the size, diameter, and the material of the catheter are effective in reducing catheter-related complications. In addition, it is stated in the literature that the duration of catheter use, the type of fluid / drug administered, and the osmolarity of the fluid also affect the development of complications (Gorski et al., 2016). The size of PVC applied to individuals is selected according to the prescribed therapy; anticipated duration of therapy; vascular characteristics; activity status; and patient's age, diagnosis, and history of infusion therapy (Kuş & Büyükyılmaz, 2016; Gorski et al., 2016). The INS recommends selecting the smallest-gauge (20- to 24-gauge PVC for most infusion therapies) PVC that will accommodate the prescribed therapy and patient need (Gorski et al., 2016). Because, PVCs larger than 20 gauge are more likely to cause phlebitis (Gorski et al., 2016; Hagle & Mikell, 2014; Alexander et al., 2014). Fluids with an osmolarity

higher than 500 mOsm/L should be administered centrally. Before inserting PVC, the vein site should be well determined. Catheters should not be placed in redness, tenderness, swelling, and difficult-palpable vascular site (Kus & Buyukyilmaz, 2017; Gorski et al., 2016). The most appropriate anatomical area for PVC placement should be used to increase patient participation in self-care and reduce side effects such as catheter dislocation/occlusion and other complications. The use of the upper extremities for PVC insertion is recommended by current guidelines, yet with no specification of preferred anatomical site (Gorski et al., 2016). In some studies reported that the use of antecubital fossa and forearm veins in catheterization minimizes the risk of phlebitis development (Marsh et al., 2015; Comparcini et al., 2017). In addition, there are studies reporting that the use of dorsal and wrist veins compared to the forearm significantly increases the risk of phlebitis (Wallis et al., 2014; Marsh et al., 2015; Comparcini et al., 2017; Jamal et al., 2019). On the other hand, there is study reporting that anatomical regions such as forearm, wrist, and dorsum of the hand do not affect the rate of phlebitis development in upper extremity catheterization (Salgueiro-Oliveira, Parreira & Veiga, 2012). The lower extremity veins should not be used unless necessary due to risk of tissue damage, thrombophlebitis, and ulceration. The ventral surface of the wrist should be avoided due to pain and possible nerve damage during insertion. In individuals receiving hemodialysis treatment, the extremity with arterio-venous fistula should never be used for PVC application (Gorski et al., 2016). It is recommended to use vascular imaging technologies for short peripheral catheter placement in patients with difficult venous access and/or after failed venipuncture attempts (Gorski et al., 2016; Stolz et al., 2015).

When PVC failure occurs, intravenous treatment process gets disrupted, patients repeatedly get exposed to painful interventions, and both risk of complications and the cost of treatment increase (Wallis et al., 2014; Zhang et al., 2016). When PVC failure develops, professionals mostly look for a new vascular access, repeat the procedure, and inform the patients. Indeed, the findings of the present study support this. However, the process is not always limited to this. In the literature, it is stated that physical restraint is used in some health institutions in order to calm patients down, keep their movements under control, and prevent them from removing and damaging their own PVC, tube, drain, and other medical device connections, and implementing the care and treatment interventions of patients (Eser & Hakverdioglu, 2006). It is frequently used in patients whose care and treatment is difficult due to confusion, agitation, delirium, multiple drug use, mechanical ventilation (Ozdemir, 2014). Although physical restraint is perceived as a beneficial intervention for the patients, it should be evaluated in terms of its harms and benefits. Physical damage that can occur due to the use of physical restraints includes decreased physical functions, pressure ulcers, contractures, orthostatic hypotension, urinary and fecal incontinence, an increased risk of nosocomial infection, edema in lower extremities, strangulation, cardiac arrest, and/or death from asphyxia (Cotter, 2005; Martin & Marthisen, 2005).

Regularly monitoring and protecting PVC to maintain and manage intravenous therapy is of great importance. Therefore, nurses must observe PVCs and keep records (O'Grady et al., 2011). Although it varies according to the health institution policy, PVC should be evaluated at least every 4 hours. In critically ill, sedated, or cognitive deficits patients, it should be evaluated every 1 to 2 hours. Hourly for neonatal/pediatric patients, and more often for patients receiving infusions of vesicant medications evaluation should be performed (Gorski et al., 2016). Also, the reason why PVCs fail to reduce the incidence of catheter failure and to avoid preventable side effects needs to be better understood (Marsh et al., 2018). It is very important that nurses comply with the principles of preventing PVC-related complications to improve patient care, reducing health-care costs, supporting clinical recovery, and reducing complications (Cicolini et al., 2014b). These principles include all PVC-related processes such as selecting the appropriate catheter, determining the correct anatomical area for practice, ensuring effective skin antisepsis, correct insertion and fixation of the catheter, and evaluation of the catheter and catheter environment (Kus & Buyukyilmaz, 2017; Gorski et al., 2016).

Conclusion: According to the findings of this study, PVCs appear to be dislodged mainly in surgical patients, among elderly patients, and accidentally. The PVC dislodged caused complications such as bleeding, phlebitis, infiltration, extravasation, hematoma, and ecchymosis. It has also caused some patients to experience pain. It is recommended to take necessary precautions especially for the patients at risk of PVC dislodgement of the PVCs and based on clinics to prevent com-

plications. The results of this study would be beneficial to conduct new interventional studies in order to prevent dislodgement of the PVCs. In addition, further prospective studies on dislodgement of the PVCs are recommended.

Limitations: One of the limitations of this study it was conducted with nurses on duty in a single hospital and it was not carried out as a prospective follow-up study. Furthermore, nurses were not asked questions about the total amount of infusion given to patients, the catheters size, acuity, and number of lines. These constitute the limitations of the study. It is our recommendation for future studies to eliminate these limitations.

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