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Frequency of nursing care of vascular access in hemodialysis patients

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ABSTRACT

Background: Hemodialysis is a critical treatment method, which depends on the vascular access route. Lack of care for the vascular access route could diminish its efficiency in a short time. Regarding this, the present study aimed to evaluate the frequency of nursing care for vascular access route in the hemodialysis patients.

Methods: This cross-sectional study was conducted on 20 nurses and 120 hemodialysis patients, who referred to the Hemodialysis Department of Shahid Beheshti Hospital, Babol, Iran, in 2015. The method of nursing care for vascular access route was evaluated using a researcher-made checklist. The data analysis was performed using the descriptive statistics in the SPSS version 16.

Results: In total, 14 cases of nursing care were evaluated, in 100% of which all the caring steps, including wearing gloves and a mask, early bolus injections of heparin, washing the catheter tubing, frequent monitoring of blood pressure, rinsing the catheter tubing, returning the blood to the body after hemodialysis, and sterile covering of the puncture site, were observed. However, some of the other techniques, such as the care related to appropriate pump speed when starting the dialysis machine (81.66%), observance of the needle distance from fistula (75.83%), appropriate placement of catheter (75%), pressing the injection site (54.17%), blood pressure monitoring at the end of dialysis (50%), and change of the needle site between two sessions (27.5%), were not adhered to by the nurses.

Conclusion: According to the results of this study, some of the nursing care steps, which are necessary in the beginning and end of the hemodialysis, were not accurately followed by the nurses. It is recommended that constant training courses be held for the nurses in this regard.

1. Introduction

Chronic kidney disease is a clinical condition, which is associated with permanent dependence on alternative renal treatments (e.g., hemodialysis and kidney transplant) due to irreversible loss of renal function.[1]

According to the statistics, 2,358,000 individuals have undergone hemodialysis in the world until the end of 2014. During this period, the dependence on hemodialysis has been reported to vary from 164-470 individuals per million in different provinces of Iran in 2015. In addition, the prevalence of hemodialysis has been reported to be 426 per million in Mazandaran, Iran, whereas the mean use of hemodialysis was estimated to be 333 per million in all provinces.[2]

One of the basic and important needs of the patients undergoing hemodialysis is vascular access. Since the vessel access in these patients has been introduced as the second heart, care for this access route is of paramount importance.[3, 4]

Vascular access route might be established using different techniques, such as arteriovenous fistula, central venous catheter, arteriovenous graft, and external arteriovenous shunt. Maintaining the proper functioning of this route is one of the most fundamental problems of the individuals undergoing hemodialysis for a long time.[5] Despite the advances in the techniques and materials, 10-20% of the grafts and fistula lose their efficiency after a year.[6] It has been reported that each dialysis-dependent patient is hospitalized once or twice a year due to the complications related to vascular access route. In this regard, 16-25% of the hospital admissions in these patients is due to vascular access complications. In some cases, permanent Shaldon catheter might be needed until death due to the lack

of access to proper vessels.[7] Therefore, nursing care is of paramount importance in this regard.

The importance of nursing care has also been emphasized by Little et al. (2015). Accordingly, they stated that the long-term maintenance of the vascular access routes, such as grafts, requires significant attention and care since these routes may cause infections and thrombosis.[8] In this regard, the care should be started from the moment of establishing the vascular access route and lasts to the end of the life of the patients. Accurate and constant care could lead to decreased risk of infection, improved quality of life, and patient survival.[9] Meanwhile, several studies have demonstrated that there is insufficient accurate and comprehensive preventive care for the hemodialysis patients, in a way that 47% of these patients have had at least one positive culture, the majority of which are resistant to antibiotics.[10- 12] According to the literature, 80,000 vascular access-related infections occur in the hemodialysis patients, leading to 35% mortality in these patients.

Several studies have introduced remarkable methods to decrease the risk of inflammation and infection of the vascular access routes. These methods include the use of masks and washing hands by the patients and nurses, application of proper antiseptics before the vascular access, appropriate placement of catheter, selection of a convenient location for the insertion of the catheter, and care provision after the placement of intravascular catheter.[4, 5, 10, 13] In a study, Adib Haj Bagheri et al. (2011) evaluated the quality of vascular access care in one of the hospitals of Isfahan, Iran, and reported it to be on an average level.[14] In addition, the mentioned study highlighted the importance of directing attention to constant training of the nurses and creating standard treatment protocols for the improvement of care techniques.

Given the importance of this subject, the shortcomings in this regard, and relatively high prevalence of hemodialysis in Mazandaran,[15] this study aimed to evaluate the frequency of nursing care for vascular access route in the hemodialysis patients.

2. Methods

2.1. Design

This cross-sectional study was conducted on 120 patients undergoing hemodialysis and 20 nurses of Hemodialysis Unit of Shahid Beheshi Teaching Hospital in Babol, Iran, during January 21, 2016-March 21, 2016.

2.2. Participants and setting

The participants were selected through census method. The inclusion criteria for the patients were: 1) being at the end-stage renal failure, 2) undergoing at least three months of hemodialysis, 3) using a fistula or graft, and 4) having a regular hemodialysis schedule (with the minimum of two sessions a week).

On the other hand, the inclusion criterion for the nurses was working at the hemodialysis unit.

2.3. Instruments

The data collection tools included a demographic form and a checklist. The demographic form included age, gender, and work experience for the nurses. For the patient, these data included the age, gender, type of vascular access, as well as the duration of hemodialysis and use of vascular access.

The modified checklist designed by Haj Bagheri et al. (2011) was applied to evaluate the process of the care of the vascular access site.[14] This 14-item checklist determines the care of the vascular access site by nurses when connecting the patient to the device, at before, during, and after the hemodialysis using two alternatives of yes or no. One score was allocated to the "yes" alternative, which revealed the accurate performing of care, whereas "no" received zero score due to the lack of performing the required care. Therefore, the score range of this checklist was 0-14, where the highest score was indicative of the highest quality of care.

The interrater reliability of this tool was previously approved in other studies.[14, 16] However, the reliability and validity of the mentioned checklist was assessed in the present study again due to the changes made in eight items of the checklist. To this aim, the content validity of the modified checklist was approved by eight faculty members of Nursing Faculty of Kashan, Iran, and two experienced nurses of hemodialysis unit of Kashan. Moreover, to evaluate the interrater reliability of this instrument, two nurses (researcher and another trained nurse) filled out the checklist for four patients. Afterwards, the interrater reliability was estimated to be 0.85-1 (mean=0.92) for each item of the checklist applying the technique proposed by Polit and Beck.[17]

2.4. Data Collection

The rate of nursing care of the vascular access site was evaluated using the observation technique. To do so, the nurses were informed that they will be observed during a hemodialysis process; however, the actual time of this observation was not determined. The researcher attended the

hemodialysis unit three weeks before the study in order to prevent affecting the care behavior of the nurses by his presence. The method used to care for the vascular access site for each patient was monitored during one hemodialysis session. All observations were performed by the second researcher, who was efficiently trained in this regard.

2.5. Ethical considerations

Following the ethical principles of research, this study was conducted after obtaining the approval of the Research Committee of the Faculty of Nursing and Midwifery of Kashan. In addition, all the patients and nurses were aware of being observed during a hemodialysis process, and their written informed consents were obtained. Moreover, the subjects were assured of the confidentiality of their data regarding their personal information.

2.6. Statistical analysis

Following the ethical principles of research, this study was conducted after obtaining the approval of the Research Committee of the Faculty of Nursing and Midwifery of Kashan. In addition, all the patients and nurses were aware of being observed during a hemodialysis process, and their written informed consents were obtained. Moreover, the subjects were assured of the confidentiality of their data regarding their personal information.

3. Results

The demographic characteristics of the subjects are presented in Table 2. The mean total score of care was 10.0±89.98, indicating the obtaining of mean percentage of 77.85±7.04 of the total score.

According to the Table 2, such cares performed before hemodialysis as wearing masks and gloves by nurses, bolus injection of heparin at the onset of dialysis, and compliance with aseptic techniques when inserting the needle at the beginning of the process (99.17%) were almost completely performed by the nurses. On the other hand, the cares related to proper pump speed of the dialysis machine (81.67%) and appropriate needle distance from the fistula location (75.83%) were neglected by the nurses. The data presented in this table revealed that the defined cares during the hemodialysis process were completely followed.

In terms of the cares that should be performed after hemodialysis, only two processes, including complete cleanse of the catheter tubing and the return of the blood to the body, were completely implemented. However, such techniques as correct treatment of the puncture site after the needle withdrawal (75%) and control of the patient's blood pressure at the end of the dialysis (50%) were neglected. Moreover, no significant relationship was observed between the demographics of the nurses and care score.

Table 1. Demographic characteristics of the participants

Group	Variable		N(%)
Patients	Gender	Male	50(41.7)
		Female	70(58.3)
	Type of vascular access	Arteriovenous fistula	55(45.8)
		Graft	6 (54.2)
	Age	M±SD	52.35±9.15
	Duration of hemodialysis (year)	M±SD	3.20±1.18
	Duration of use of the present vascular access (month)	M±SD	2.80±0.76
Nurses	Gender	Male	3(15)
		Female	17(85)
	Age (year)	M±SD	43.67±7.12
	Work experience (year)	M±SD	13.25±6.22

Table 2. Frequency of nursing care in vascular access in hemodialysis patients

Time of care	Type of care	Followed N(%)	Not followed N(%)
Before hemodialysis	Wearing masks and gloves by nurses	120(100)	0(0.0)
	Bolus injection of heparin at the onset of dialysis	120(100)	0(0.0)
	Compliance with aseptic techniques when inserting the needle at the onset of dialysis	119(99.17)	1(0.83)
	Change of needle site every two sessions	87(72.5)	33(27.5)
	Sufficient distance between arterial and venous needle (4-6 cm)	55(45.83)	65(54.17)
	Appropriate needle distance from fistula location (minimum of 5-6 cm)	29(24.17)	91(75.83)
	Proper pump speed of the machine at the onset of dialysis (150 ml/min)	22(18.33)	98(81.67)
During hemodialysis	Washing catheter tubing with normal saline during hemodialysis	120(100)	0(0.0)
	Constant control of the patient's systolic and diastolic blood pressure during hemodialysis (not to be <100 and <60 mm Hg, respectively)	120(100)	0(0.0)
After hemodialysis	Complete cleanse of catheter tubing and return of the blood to the body at the end of hemodialysis	120(100)	0(0.0)
	Covering the needle insertion site with sterile dressing after needle withdrawal	120(100)	0(0.0)
	Considering the safety measures when removing the needle	119(99.17)	1(0.83)
	Control the patient's blood pressure at the end of hemodialysis	60(50)	60(50)
	The proper treatment of the puncture site after needle withdrawal	30(25)	90(75)
Total	M±SD	77.85±7.04	

4. Discussion

According to the results of the current study, more than three-fourths of all nursing cares of vascular access route in the hemodialysis patients were implemented. Similar results were obtained in a study conducted in Isfahan, Iran, revealing the implementation of 73% of all the related cares.[14] While the scores obtained in the present study was higher than those reported by Haj Bagheri et al. (2011), it is expected that all cares be performed and 100% score be gained due to the critical importance of vascular access site for these patients.

Some studies have indicated that about 50% of readmissions of the hemodialysis patients are due to problems at vascular access site. In addition, the improper functioning of fistula has been reported as one of the most common causes of secondary interventions and patient readmission. Some of these complications could be justified by insufficient care of the critical route.[18, 19] Therefore, it seems necessary to attract the nurses' attention toward the importance of improving care quality using the appropriate management and education methods.

The present study indicated that out of the seven evaluated cares that should be performed before hemodialysis, only three techniques (i.e., wearing masks and gloves by nurses, compliance with aseptic techniques when inserting the needle at the onset of dialysis, and bolus injection of heparin) were almost always performed. While our findings regarding the infection prevention are in line with the results obtained by several studies carried out in the hospitals of Isfahan, heparin injection was not accurately performed in these studies.[14, 16]

These results demonstrated that the nurses of the present study had the required accuracy in compliance with the care related to the prevention of infection. Furthermore, they were well aware of the importance of accurate use of heparin for the prevention of clotting in the extracorporeal circulation blood path. However, these differences in the nurses' performances could be greatly related to providing training courses in this regard and improving the knowledge of the nurses by the educational units. Furthermore, the performance of the monitoring system and head nurses could also interfere with the accurate control and implementation of cares. Nevertheless, the present study indicated that such important cares as compliance with appropriate needle distance from the fistula site, proper distance between arterial and venous needles, accuracy of changing the needle site over consecutive sessions, and proper pump speed of the machine before the dialysis were neglected by the nurses. These results are in congruence with the findings of Adib Haj Bagheri et al. (2011)14. Meanwhile, the repeated needle injection at a single site leads to damages to vessel walls, early failure of vascular access, and increased risk of rupture of the vascular access5, 20. The lack of attention to the distance between the needles and also between the needles and fistula could affect the fistula function and efficiency of dialysis.[3, 6] It is possible that the nurses pay inadequate attention when selecting an appropriate needle insertion site

due to the lack of knowledge or proper supervision. Therefore, it seems necessary to emphasize the importance of the mentioned topics in retraining programs and apply higher levels of monitoring during the process.

Out of the three stages of cares conducted before, during, and after hemodialysis, only the cares during the procedure were completely performed. These findings are inconsistent with the results obtained by Adib Haj Bagheri et al. (2011). In the mentioned study, only half of the cares during dialysis were fully conducted,[14] which could be indicative of higher quality of care performed during dialysis in the present study. This lack of complete performance of the tasks could be due to the awareness of the nurses about the importance of this stage, leading to more attention by the nurses during this process.

In the current study, out of the five evaluated cares, only three techniques (i.e., complete cleanse of catheter tubing, return of the blood to the body, considering the safety measures when removing the needle and sterile bandage of the puncture site) were performed, which were related to the end of hemodialysis. In total, the amount of performed cares was higher in the present study, compared to those reported the previous studies.[14, 16] As stated before, the causes of complete implementation or lack of implementation of cares depend on the nurses and whether they consider these measures essential even with their heavy workload and multiple responsibilities.

In the present study, such cares as proper treatment of the needle insertion site after the needle withdrawal and control of the patient's blood pressure at the end of dialysis were not completely performed. The lack of attention to these cares could be due to the nurses' heavy workload (e.g., the completion of hemodialysis of several patients at the same time), and the fact that the nurses think that the patients are able to press the puncture site themselves. In addition, the lack of attention to cares related to after dialysis might cause increased bleeding from the needle insertion site and unstable hemodynamic status in the patients.

Some of the major drawbacks of this study were evaluating the patients of only one hemodialysis center and small sample size, which limited the generalizability of the final results to the units with similar conditions and structures. Therefore, it is recommended that further studies be conducted on larger sample sizes using multiple hemodialysis centers.

5. Conclusion

According to the findings of the current study, while care of the vascular access site was completely performed during hemodialysis, other cares related to the beginning and end of this process were neglected. Our findings could shed light on the need to the educational programs for the nurses and emphasize the importance of improving the supervision of this procedure. It seems necessary to design and implement constant educational programs for the nurses in the field of vascular access care in the hemodialysis patients in order to enhance the quality of care for such patients.

Conflicts of interest

The authors declare no conflicts of interest.

Authors' contributions

Iman Taghizade Firoozjayi: Monitoring the study process, data analysis, scientific editing and final confirmation of the article. Mohsen Adib-Hajbaghery: Drafting of the manuscript, data collection. Mohammad Ehsan Adib: Participation in article review, editiing article

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