

Nurses Practices Regarding Medication Administration through a Central Venous Catheter

SANIA ABDUL REHMAN, MUHAMMAD HUSSAIN, MUHAMMAD AFZAL
SYED AMIR GILANI

Lahore School of Nursing, The University of Lahore, Pakistan

DOI 10.36552/pjns.v24i2.444

ABSTRACT

Objective: Around 25% of patients in the hospital have central vascular access, which is even more common in patients admitted to ICU. Central venous catheters (CVCs) are usually used for energy, electrolyte supply, blood processing, drug administration, and central venous pressure measurement. The purpose of this study was to examine nurses' practices related to medication administration through the CVC.

Material and Methods: A cross-sectional observational study was conducted at Tertiary Hospital. The study subjects were the female Nurses aged between 21 – 60 years (n = 133). A convenient sampling technique was used. Data collected through an observational checklist which contain two sections; demographic and 19 items of their practices. A pilot study was done on 20 participants to assess the reliability of the observational checklist. Data analyzed by using SPSS version 25.

Results: 82.7% participants' ages were between 21 – 30 years, 13.5% were between 31 – 40 years and 3.8% were between 41 – 50 years. Participants' education was as follows: general nursing diploma (84.2%), BS Nursing Post RN (registered nurse) (11.3%), BSN -Bachelor Science in Nursing (Generic) (4.5%). Only 41.4% participants performed hand hygiene before procedure and 58.6% did not perform. 34.6% participants remove gloves and perform hand hygiene; remaining 65.4% did not perform hand hygiene correctly. All participants 100% performed documentation on drug chart.

Conclusion: The significance of quality care, combined with good practices, particularly when medicines are administered through the Central Venous Catheter. Incorrect practices of medication administration through CVC increase the risk of blood stream infection. This research study shows 50% unsatisfactory practices.

Keywords: Central Venous Catheter, Nurses, Medicine, Practices.

Abbreviations: ICU: Intensive Care Unit. CVCs: Central Venous Catheters. PICC: Namely Central Catheter.

INTRODUCTION

In healthcare settings, technologies used in daily work are central to the development of care.¹ About 25 percent of hospitalized patients in the United States of America have central vascular access, which is more common among patients admitted in ICU. Central venous catheters (CVCs) are usually used for energy, water, and electrolyte supply, blood processing, drug administration, and central venous pressure measurement. However, the use of CVCs may also be linked to complications, including bloodstream

infections. The importance of quality care linked to harmlesstechniques, especially when medicines are administered through the Central Venous Catheter.²

Long-standing treatment of drugs, such as chemotherapy or total parenteral nutrition, usually requires a central venous catheter (CVC) instead of a regular IV catheter. A CVC in your back, chest, arm, or groin is inserted into the vein. The CVCs may be used over a standard IV line. A CVC may remain in place for several weeks, or even months. There are three types of CVCs, namely central catheter (PICC),

tunneled catheter, and implanted tube.³

Surgical gloves and non-sterile aprons are essential pieces of personal protective equipment (PPE) used to secure medical personnel from the infection risk and mitigate micro-organism cross-transmission possibilities. Disposable gloves and aprons are used to protect patients and health professionals from the risks of infection. However, they should be used appropriately or they can increase the risk of health-related infections for patients.⁴ Flushing with normal saline is essential between two consecutive intravenous drug infusions to maintain the potency of the lumen and prevent the incompatibility reactions. A good nursing practices and quality of care are needed to improve drug administration and quality through CVCs.⁵

The syringe diameter and the direction of the injection flow are important aspects related to flushing, for lasting central venous catheters, syringes with a diameter of at least 10 ml are traditionally recommended. Nurses have important responsibilities in the administration of safe drugs through CVCs.^{6,7}

Medication administration requires a thorough understanding of the medication including, how it moves your body, when should it be administered, dangerous reactions and possible side effects, proper handling, storage, and disposal. Nurses should train in all of these matters. When administering drugs through CVC, they keep in mind “five rights”: The right patient, the right prescription, the right time, the correct dosage, the right route.⁸ The purpose of this study was to evaluate nurses’ practices related to medication administration through the CVC.

MATERIAL AND METHODS

Study Design

A hospital-based **cross-sectional observational study** was conducted. The study conducted from December, 2019 to March, 2020 at Tertiary Hospital, Lahore. Through visits and hospital records, it was found that there were six neurointensive care units and found a total of thirty patients with CVC and 90 staff nurses seen these patients. One surgical ICU, one emergency ICU, two medical ICU and four high dependency unit (HDU) found 10, 5, 10, 10 patients with CVC, respectively and 110 nurses seen these patients.

Sample Size

Target population was 200 female nurses. Sample size

calculated through Slovin’s formula = $N(1+(1+N(e)^2))$. Level of confidence 95% and margin of error 0.05 were considered for this study. The sample size was 133. A convenient sampling technique was used.

Inclusion Criteria

The registered nurses who were working in the intensive care unit and high dependency unit, nurses aged between 21 – 60 years. Nurses who gave written consent were included in the study.

Exclusion Criteria

The nurses who were not present at the time of data collection. Doctors and pharmacists.

Data Collection

Data were collected through an adopted observational checklist from another study with author’s permission.⁹ The observational checklist contained two sections: the first section of demographic characteristics and the second section contained practices related to 19 items. Two concerns were considered for each item: ‘Done’ & ‘Not done’/ incorrect. Each item rated done for 1 and not done/ incorrect for 0 scored. Practices measured in terms of percentage: less than 75% considered un-satisfactory practices and 75% – 100% considered satisfactory practices.¹⁰ The total practice score was 100%.

Data Analysis

A pilot study was done on 20 participants to assess the understanding of the observational checklist. Reliability checked by Cronbach Alpha which was 0.84. Two experts were appointed for observation. By using statistical Packages of Social Sciences (SPSS) version 25 data was scrutinized. Descriptive statistics were expressed through frequencies, percentages, pie charts, and bar charts.

RESULTS

Age Incidence

Table 1 presents that 82.7% of participants’ age were between 21 – 30 years, 13.5% were between 31 – 40 years and 3.8% were between 41 – 50 years.

Level of Education and Experience

Participants’ education was as follows; general nursing

diploma (84.2%), BS Nursing Post RN (11.3%), BSN (Generic) (4.5%). 82% of participants had job experience between 1-10 years, 12.8% had 11 – 20 years and 5.3% had 21-30 years. 35.5% of nurses were observed in the morning shift, 45.1% observed in the evening shift and 19.5% observed in the night shift.

Table 1: Demographic Characteristics

	Frequency	Percentage
Age		
a. 21 – 30 Years	110	82.7
b. 31 – 40 Years	18	13.5
c. 41 – 50 Years	5	3.8
d. 51 – 60 Years	0	0
Education		
a. General Nursing Diploma	112	84.2
b. BS Nursing Post RN	15	11.3
c. BSN (Generic)	6	4.5
d. Master in Nursing	0	0
Job Experience		
a. 1 – 10 Years	109	82
b. 11 – 20 Years	17	12.8
c. 21 – 30 Years	7	5.3
d. > 30 Years	0	0
Work Shift		
a. Morning	47	35.5
b. Evening	60	45.1
c. Night	26	19.5

Table 2 shows that only 41.4% of participants performed hand hygiene before the procedure and 58.6% did not perform. All participants (100%) were checked medication orders on the drug sheet. The

majority of participants 88.7% prepared medication material. Only 36.8% of participants wore disposable gloves before drug administration. 21.8% of nurses checked the patient’s identity by name and medical record number and the majority 78.2% did not identify the patient. Only 29.3% of the participants checked the right drugs to be administered and 70.7% did not check. 34.6% of participants evaluated the IV catheter area for inflammation and infiltration and the remaining participants did not assess the area. 25.6% of participants labeled the fluid to be administered and 74.4% did not label the fluid. 42.1% of nurses evaluated the line to be used for administration. Only 31.6% of nurses did not contaminate the three-way stopcock entrance and the remaining 68.4% contaminated the entrance. 35.3% of participants scrubbed the three-way stopper entrance with 70% alcohol and waited for the drying of the alcohol at least 15second, remaining participants 64.7% did not clean the entrance properly. The majority of nurses 80.5% chose compatible fluid for flushing. Only 33.1% of participants flushed a sufficient amount of fluid before drug injected and 66.9% not flushed a sufficient amount. 48.1% of nurses administered proper doses of the drug and 51.9% did not administer a proper dose. The majority of nurses 85.7% chose compatible fluid for flushing. Only 41.4% of nurses were flushed a sufficient amount of fluid after drug administration. 48.1% of participants placed the screw lure lock on the three-way stopcock correctly, which was previously removed. 34.6% of participants remove gloves and perform hand hygiene; remaining 65.4% did not perform hand hygiene correctly. All participants 100% performed documentation on the drug chart.

Table 2: Distribution of Practices Regarding Medication Administration through Central Venous Catheter.

S#	Practice Items	Done	Not Done/Incorrect
1.	Perform hand hygiene before procedure	55 (41.4%)	78 (58.6%)
2.	Checking medication chart	133 (100%)	0 (0%)
3.	Preparing the medicine material	118 (88.7%)	15 (11.3%)
4.	Wearing disposable gloves	49 (36.8%)	84 (63.2%)
5.	Identification of patient by name and medical record number	29 (21.8%)	104 (78.2%)
6.	Prescribed drugs identification	39 (29.3%)	94 (70.7%)

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7.	Inflammation and infiltration evaluation of IV catheter site	46 (34.6%)	87 (65.4%)
8.	Label the fluid to be administered	34 (25.6%)	99 (74.4%)
9.	Evaluation of the line to be used for administration	56 (42.1%)	77 (57.9%)
10.	The three-way stopcock entrance not contaminated	42 (31.6%)	91 (68.4%)
11.	Scrubbing the three-way stopcock entrance with 70% alcohol and waiting for the alcohol to dry at least 15 second	47 (35.3%)	86 (64.7%)
12.	Choose compatible fluid for flushing	107 (80.5%)	26 (19.5%)
13.	Sufficient amount of fluid is flushed before drug injected	44 (33.1%)	89 (66.9%)
14.	Administer the proper dose of drug	64 (48.1%)	69 (51.9%)
15.	Flushing with a compatible fluid after drug administration	114 (85.7%)	19 (14.3%)
16.	Sufficient amount of fluid is flushed	55 (41.4%)	78 (58.6%)
17.	Placing the screw lure lock on the three-way stopcock correctly, which was previously removed	64 (48.1%)	69 (51.9%)
18.	Remove gloves and perform hand hygiene	46 (34.6%)	87 (65.4%)
19.	Documentation on drug chart	133 (100%)	0 (0%)

DISCUSSION

This study conducted to observe the nurses' practices of medication administration through the CVC. Results show an unsatisfactory level of practice which is 50%.

In the present study, 82.7% of participants' ages were between 21 – 30 years and 82% of participants had job experience between 1 – 10 years. A study showed 65.5% of respondents within the 25 – 34 age group range. One-third of the respondents (34.5%) worked as a nurse for 2 – 5 years, while 33.9% worked for more than 5 years and 31.6% worked less than 2 years.¹¹

The present study results show minimum participants performed hand hygiene and moderate participants did not/incorrect perform. A study conducted in September 2018 showed compliance with hand washing was found to be poor and manual care knowledge was moderate (61.8 percent) among all study respondents was observed. Public university students demonstrated more expertise than private and semi-private university students.¹²

The current study result shows all participants' adherence regarding checking medication charts. A study conducted in 2014 by Alsulami, which showed

there were 13 studies reported, just three studies have been reported whether and how separate and primed double checks are distinguished. Nurses have reported a wide variation in their constancy to the different steps of the verify the procedure, varying from 30 percent to 100 percent adherence. Many procedures in most countries seemed to be double-checked.¹³

In this study, only 21.8% of the participants checked patient identity by name and medical record number and the majority of participants (78.2%) did not perform. An absolute majority of nurses responded that the most widely used method of preventing patient misidentification was for patient identification wristbands. More than 90 percent (90.6 percent) of nurses confirmed the use of patient ID bracelets for all patients. In addition to the ID wrist bands, nearly 80 percent (77.4 percent) reported using effective verbal identification. Respondents reported (76.2 percent) that a review of patient history was the commonly used tool to prevent patient misidentification in the Operation Theater and ICU.¹⁴

In the present study, only 29.3% of the participants checked the right medication before administration, and the majority of participants did not check the medicine. A study conducted in 2019 that's shows the

results with a significant deviation in the preparation stage. One-third of the nurses reported that they do not always follow guidelines when preparing medicines and those they sometimes deviate from them when administering medicines.¹⁵

In investigating the risks associated with using CVCs, catheter treatment, and flushing solutions were identified as risk factors for infection. The literature indicates that the flushing frequency not only helps avoid pathogens, but also holds the CVC open.⁶

Recommendation

Standard protocols of practices should be available in departments and nurses should encourage them to read and follow standard guidelines. Workshops, conferences, manager supervision should be organized to improve the awareness and practices of nurses. Annually audits must be conducted to check the nurses' practices of medication administration through the CVC. The results of this research are based on the upcoming researches. There is a need to know more about nurses' knowledge and behavior.

CONCLUSION

The importance of quality care linked to safe practices, especially when medicines are administered through the Central Venous Catheter. Incorrect practices of medication administration through CVC increase the risk of bloodstream infection. This research study shows unsatisfactory practices which are 50%. There are many factors that influence nurses' clinical practices. Hospital management should try to overcome those factors which influence nurses' practices. Good practices provide quality care to patients and reduce the risk of healthcare-associated infection.

Ethical Consideration

Approval letter was obtained from Principal, Lahore School of Nursing to conduct the study. Permission letter was obtained from the setting. Written consent was taken from participants. This study did not harm to any participants. Participation was completely voluntary. All data collected were kept confidential. Study participants were greatly appreciated.

Financial Support

No financial support received from any institution.

ACKNOWLEDGEMENT

I would like to acknowledge participants and authors for their immense contribution.

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Additional Information

Disclosures: Authors report no conflict of interest.

Ethical Review Board Approval: The study was conformed to the ethical review board requirements.

Human Subjects: Consent was obtained by all patients/participants in this study.

Conflicts of Interest:

In compliance with the ICMJE uniform disclosure form, all authors declare the following:

Financial Relationships: All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work.

Other Relationships: All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

Address for Correspondence:

Sania Abdul Rehman

Lahore School of Nursing, The University of Lahore, Pakistan

Email Address: Saniageee1234@gmail.com

AUTHORSHIP AND CONTRIBUTION DECLARATION

S#	Author's Full Name and Affiliation	Intellectual Contribution to paper in term of:
1.	Sania Abdul Rehman Muhammad Afzal Syed Amir Gilani	Study design and methodology
		Paper Writing, referencing, data calculations
		Data Collection and Data Calculations
		Analysis of data and interpretation of results etc.
		Literature Review and Manuscript Writing
2.	Muhammad Hussain	Analysis of Data and Quality Insurance
		Proof Reading, Editing

Date of Submission: 01-4-2020

Date of Revision: 09-05-2020

Date of Online Publishing: 30-06-2020

Date of Print: 30-07-2020