



Assessment of Up-Grading Nursing Students' Knowledge and Practice towards Short Peripheral Catheters (SPCs) Care at Al-Quds University

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Abstract

A short peripheral catheter is a medical device, a plastic tube inserted into a vein. A cross-sectional descriptive study was conducted to assess knowledge and practice towards short peripheral catheter care among first-year up-grading nursing students at Al-Quds University in Palestine. A convenience sample of 90 students filled questionnaires that showed they were newly- graduated with 46.1% having low experience and an inadequate knowledge level and 57.5% having a moderate practice level, with an inverse correlation between knowledge and practice. Sessions in the simulation laboratory about peripheral catheter care should be conducted to enhance quality and safety.

Keywords: *knowledge, nurse, practice, quality, safety, short peripheral catheter, up-grading nursing students*

Introduction

According to Beecham and Tackling,^[1] "Short peripheral catheter (SPC) is the insertion of an indwelling single-lumen plastic conduit across the skin into a peripheral vein, such devices may be referred to as peripheral intravenous cannulas, or catheters depending on the country" (p.1). It is used for different therapeutic purposes, preferably fixed well with a sterile, semi-permeable transparent dressing if available.

Nurses in Palestine are responsible for using SPCs in hospitals. The patients' health records in Palestine mostly lack documented assessment related to SPCs care and nurses' high workload sometimes impede them from monitoring care. Moreover, many nurses insert cannula during patients' admission to hospitals as routine policy, and it remains in-site without care till their discharge leading to harm and financial burden. Marsh et al.^[2] stated that almost 70% of hospitalized patients required SPCs insertion, and up to 69% of them fail before completion of therapy. This study is the first one conducted in Palestine about SPCs care, an essential nursing procedure in health care.

The new guidelines by the Centers for Disease Control (CDC) and Infusion Nurses Society (INS) emphasized that there is no need to replace peripheral catheters more frequently than every 72-96 hours to reduce the risk of infection and phlebitis in adults and for children, only when clinically indicated without a schedule,^[1,3] or removal of SPCs when not needed^[4,5].

SPC care competency is essential for nurses to maintain patients' safety and previous studies had reported that high percentages of nurses had low work experiences^[6,7] and showed that some nurses had deficit in knowledge and practice in caring and maintaining IV cannula specifically in children who need safe and efficient care^[8]. Keleekai et al.^[9] showed that the positive effect of education and training for nurses about SPCs care in simulation program improved nurses' knowledge and skills by 31% and 24%, respectively. Thus, structured education is effective in improving knowledge and practice for nurses to promote quality care^[10].

Nurses play a vital role in assessing SPCs and identifying factors that lead to phlebitis or other complications like an inadequate technique when inserting the catheter, the patient's clinical situation, the characteristics of the vein, drug incompatibility, acidity of the medicine or solution, duration in a vein, and ineffective filtration. Catheter quality as diameter, size, length, material, and an inadequately secured SPC increases the phlebitis risk^[2,11,12]. Furthermore, catheter-related bloodstream infection (CR-BSI) during catheter insertion, manipulation, or poor skin antisepsis is a threat to health care that can be prevented by comprehensive infection control strategies^[13].

The aim of this study is to assess the knowledge and practice towards SPCs care among first-year up-grading nursing students at Al-Quds University. These students joined the nursing or midwifery college at Al-Quds University after passing the

challenge exam held in this University for nurses who completed at least two years in nursing institutes successfully.

Objectives

1. Identify the factors that influence the up-grading nursing students’ knowledge and practice towards SPCs care at Al-Quds University.
2. Investigate the up-grading nursing students’ level of knowledge and practices towards SPCs care at Al-Quds University.
3. Determine the relationship between knowledge and practice among up-grading nursing students and socio-demographic factors related to SPCs care at Al-Quds University.

Materials and Methods

From the total population of 140 first-year up-grading nursing students who registered in the year 2019/2020 at Al-Quds University, a convenience sample of 90 students who positively responded to this descriptive study was chosen. The response rate was about 64%. Some students were excluded due to lack of professional experience, unwillingness to participate, registration before the year 2019, and refusal to provide consent.

A pilot test was conducted to test the reliability of questionnaire items, identify the clarity or ambiguity of questionnaire items, and determine the time needed to fill the questionnaire. Necessary modifications were made based on the results. All of the students handed the answers to the researchers within the same day of finishing at Al-Quds University campuses in Jerusalem and in Al-Beirih with 2-3 frequent visits to prevent exhaustion.

The original self-administered questionnaires [6,7] were adopted after minor modifications. The questionnaires were validated by disseminating them to a panel of experts. The first part was about participants’ demographic characteristics (see table1), followed by two sections about knowledge on care and maintenance of short peripheral catheters measured through 18 items with a three-point scale (“yes,” “no,” and “I don’t know”). Then, only answers for “yes” were considered correct knowledge and presented in percentages. The SPCs care practice was measured through a total of 20 items with a three-point scale (“always,” “sometimes,” and “not at all”), where only “always” answers were considered correct practice and presented in percentages (see tables 2 and 3). Cut-off points for categorizing level of knowledge and practice were calculated: inadequate (less than 50%), moderate (50-74%), and adequate (75-100%) [14].

Ethical considerations

Ethical Committee at Al-Quds University approved the study according to ethical standards described in the Declaration of Helsinki. Verbal consent was taken from students before providing questionnaires that had attached informed consent. The data was

collected by researchers who assigned a code number to the forms to ensure confidentiality.

Results

The data were analyzed using a statistical package for social science (SPSS) program to interpret descriptive statistics like mean and percentages. Demographic variables were expressed in percentages to identify the highest and lowest categories. Knowledge and practice score variables were expressed in percentages with total mean percentages indicating items in which students’ knowledge and practice levels were adequate, moderate or inadequate. Pearson’s correlation coefficient was used to examine if there was correlation between students’ experiences and knowledge or practice variables and to assess the correlation between knowledge and practice to recommend theoretical and practical training for students about SPCs care in the future.

Demographic variables: (Table 1) Most up-grading nursing students were less than 26 years old and newly- graduated with low experience. They may face difficulty in inserting SPC safely in the first attempt when patients’ veins are difficult. The highest percentages of students worked in the Medical and Surgical wards, followed by the Emergency Department, and the least in Pediatrics.

Table 1: Distribution of Students by Demographic Variables (N=90).

Demographic variables	Percentages	
Age in years	20–25	67%
	26–30	20%
	>30	13%
Gender	Male	54%
	Female	46%
Experience	<1 year	50%
	1–3 years	15%
	>3 years	35%

Knowledge variable: (Table 2) The total mean percentage of correct (yes) knowledge scores of 46.1%. This revealed inadequate knowledge level in SPCs care which affects the quality of nursing care. The highest percentage of knowledge scores was still in the moderate level related to the item about “factors like catheter material, size, movement, experience, duration of catheter, composition of fluid, frequency of dressing change influence of risk of infection,” but the lowest knowledge item correct score that revealed inadequate knowledge level was in the item related to students recognizing cannula gauge followed by item related to recent guidelines about cannula removal. These findings indicate that students didn’t recognize standards or read labels for different cannula gauges. Also, many students had inadequate knowledge regarding infection control, wearing gloves, and maintaining aseptic techniques that can harm patients. The remaining items were regarding veins selection, nosocomial infection, transparent dressing, environmental sanitation; increase attempts for cannula insertion and removal were scored between 50-70% which was in moderate knowledge level.

Table 2: Students’ Correct “Yes” Answers for SPCs Knowledge (N=90).

	Knowledge items related to SPCs	Correct%
Lowest knowledge scores	Gauge (14-20) suitable for adult and (22-26) for pediatrics.	5.9%
	Recent guidelines recommend that cannula must be removed when clinically indicated not on fixed schedule 72 hours from insertion time.	12.1%
	Wearing non-sterile gloves during insertion advisable.	18.4%

	Skin preparation at insertion site is required before insertion.	21.1%
	Maintaining aseptic technique only during insertion prevent infection.	23.5%
Highest knowledge scores	Factors like catheter material, size, movement, experience, duration, composition of fluid, dressing change will influence infection risk.	74.7%
	Hand hygiene before insertion help prevent infection.	73.7%
	Patients' education help reduce infection risk.	72%
	Phlebitis is the most identifiable infection related to cannula.	70.2%

Note. The total mean percentage of correct knowledge scores was 46.1%.

Practice variable: (Table 3) The total mean percentage for practice was moderately adequate (57.5%), so about 42.5% of students' scores revealed incompetency in practice. The highest scoring item was performing hand hygiene, which is a simple and basic practice for infection control. The lowest scoring item was using transparent dressing when securing cannula, which resulted

from using plaster instead when unavailable in hospitals in Palestine. The remaining items had moderate practice level: implementing guidelines, infection control, flushing cannula, documentation, patients' education, giving intravenous therapy, lines removal, being confident, and phlebitis care.

Table 3: Students' "Always" Answers for SPCs Practice Correctly (N=90).

	Practice items related to SPCs	Always
Lowest practice scores	I use transparent dressing when securing cannula.	52.5%
	I change the dressing when wet or dislodge.	53.3%
	I educate my patient about cannula care.	53.4%
	I aware of cannula complications as (infiltration, phlebitis and extravasation).	54.9%
	I maintain aseptic technique.	58.4%
Highest practice scores	I aware of doing hand hygiene before cannula insertion.	67.3%
	I aware of doing skin preparation before cannula insertion.	66%
	I flush cannula with N/S.9 when required.	66%
	I write date, time, site, size, date change, name of person	63.5%
	When phlebitis starts, I immediately change the cannula.	61%

The total mean percentage of always practice scores is 57.5%.

Correlation between knowledge and practice levels: (Table 4) An inverse weak correlation was found between knowledge and practice levels related to SPCs. This resulted from inadequate knowledge level but moderate practice level among students due to having experience but lacking theoretical knowledge.

Table 4: Correlation between knowledge and practice levels towards spcs care among students

	Knowledge	Practice
Pearson Correlation	-.311**	-.311**

P value =0.006

Discussion

This study assessed up-grading nursing students' knowledge and practice towards SPCs care at Al-Quds University and some demographic variables. About 54% of newly registered up-grading students were males, probably due to their greater chance of employment in nursing with higher salaries than other professions in Jerusalem district, 50% weren't experienced, nearly similar to what Osti et al.,^[7] found. Hence, SPCs standards must be taught to build competency among students with low experience. According to work departments, most students worked in sensitive wards like Medical-Surgical wards and Emergency Department where SPCs are inserted in a hurry; thus, students' compliance to CDC guidelines requiring removal of SPCs inserted in the Emergency Department to prevent transmission of infection is essential^[2,3,8].

The total mean percentage of correct knowledge scores in this study was 46.1%, inadequate level, compared to some international studies^[6,7] that showed adequate levels (75.9 % and 82.47%). This significant difference may be due to the deprivation of students in this study from attending in-service education programs in their worksites or updating their knowledge regarding

nursing procedures by doing routine tasks without supervision or continuous education.

The highest knowledge score in this study related to the item "Factors like catheter material, size, duration, experience of the staff, etc. influences risk of infection" (74.7%), followed by the item about hand hygiene (73%); the scores for the same items were 100% of participants in Ghazalee and Arabee^[6] and 90.5% and 98.5% of participants, respectively, in Osti et al.^[7] All students should be knowledgeable about infection control and hand hygiene standards^[15] for safety act of hospital team.

The lowest percentage of correct answers in knowledge items was about cannula gauge in this study, as opposed to Osti et al.^[7] that observed 100% correct answers. The authors attributed this finding to the fact that students in this study had identified cannulas by colors without reading their gauges on the cover or had a deficit in theoretical knowledge that catheter selection should be the smallest gauge (G) and length, with the fewest number of lumens, specifically in infants or children, to minimize mechanical phlebitis^[16,17] Our findings revealed inadequate knowledge about the recent standard of care that there was no need to replace peripheral catheters routinely to reduce the risk of infection and phlebitis in adults and for children only when clinically indicated^[1,3]. This study also found inadequate knowledge about the benefits of gloves in preventing transmission of infection, and skincare, contrary to Osti et al., which revealed adequate knowledge about wearing gloves before cannula insertion. In this study, students had inadequate knowledge about the item related to maintaining aseptic technique, which had moderate knowledge in Osti et al. The researchers suggested supervision from nurse leaders with assessment or education bundle about SPCs care for students and bedside nurses to prevent transmission of infection similar to DeVries et al.,^[18] in order to improve patients' services.

The percentage of students' correct answers in practice in this study was at a moderate level (57.5%) compared to Ghazali and Arbaee [6] and Osti et al. [7] that observed an adequate level (83.7% 84.72%, respectively).

For practice, the highest malpractice items were about using transparent dressing to secure cannula, probably due to its high cost or unavailability, then changing dressing when wet or dislodged, this was practiced "always" by all nurses who participated in Ghazali and Arbaee [6]. For infection control items, a high percentage of students in this study malpractice the necessary standards compared to Ghazali and Arbaee, [6] which found 100% of nurses practiced these standards, and above (95%) of nurses in Osti et al. [7] practiced infection control items correctly. This requires swift actions from infection control committees in Palestinian hospitals to educate and train nurses about infection control standards.

Regarding cannula removal when clinically indicated, many students still neglected this practice and need refreshment courses to implement what is stated in previous studies [4,5].

There was an inverse weak correlation between knowledge and practice levels due to poor theoretical knowledge of students who rarely share in-service education or have effective feedbacks about recent standards of nursing procedures from their leader, but they practiced SPCs procedure correctly due to long experience.

This study was limited to up-grading nursing students in one university with a non-probability small sample size and a quantitative design; this may affect the generalizability of the results. Some students lack professional experience in SPCs care. Not all students were available in their classrooms. In addition, resource-supported researchers were not funded. Moreover, all findings were based on self-reporting and therefore subject to potential self-reporting bias.

Conclusion

The current study showed an inadequate level of knowledge and a moderate level of practice among first-year up-grading nursing students at Al-Quds University towards SPCs care in addition to a weak inverse correlation between nurses' knowledge and practice regarding SPCs care. Therefore, nursing students need education and training sessions at Al-Quds University in the simulation laboratory about this essential nursing procedure which should be included in the content of nursing courses to promote the objectives of learning outcome. Further studies with different methodology with larger sample recommended. The chances for students to practice SPCs are very low, and some hospitals lack policies to monitor SPCs care. Thus, opening free simulation laboratory hours to facilitate independent training is highly recommended. The researchers in this study designed an assessment form for SPCS care to guide students in evaluating phlebitis during training.

Conflicts of Interest and Source of Funding

"The authors declare that they have no competing interests or source of funding."

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