Original Article

Nursing Students' Levels of Knowledge on the Prevention of Intravascular Catheter Infections

Gulcan Bahcecioglu Turan
Research Assistant, Ataturk University, Faculty Nursing, Department of Internal Medicine Nursing, Erzurum, Turkey

Talip Mankan, RN, PhD Student
Inonu University Health Sciences Faculty, Malatya, Turkey

Zeliha Cengiz
Research Assistant, Inonu University, Faculty of Health Sciences, Department of Nursing, Malatya, Turkey

Correspondence: Gulcan Bahcecioglu Turan, Res. Asst. Ataturk University, Nursing Faculty, Department of Internal Medicine Nursing, Erzurum / Turkey E-mail: glcnbah@hotmail.com

Abstract

Objective: This study was conducted to determine nursing students' levels of knowledge about the prevention of intravenous catheter infections.
Methods: This descriptive study was carried out with junior and senior students (n=430) studying at the Department of Nursing in Faculty of Health Sciences in the Inonu University and the Fırat University. A 21-item 'Questionnaire' was used for data collection. The questionnaires were handed out by the researcher to students to fill them out. In summarizing the data, number and percentage distributions for categorical variables, and means, standard deviation, minimum and maximum values were used for the numerical variables. In the interpretation of the data, t-test was used for the comparison of knowledge scores in terms of the school attended, grade and gender since the parametric test assumptions were met in this way.
Results: According to the data obtained in the study, nursing students' mean knowledge scores about the prevention of intravenous catheter (IC) infections was found to be 52.60. A statistically significant difference was found between mean knowledge scores and schools and years in school of the nursing students. Students studying at Faculty of Health Sciences in the İnonu University had higher scores than the students in the same faculty in the Fırat University; and, scores of the senior students were found to be higher than of junior students.
Conclusion: As a result of the study, the mean knowledge score of the nursing students on the prevention of IC infections was found to be 52.60±15.11

Keywords: Intravenous Catheter, Student nurse, Infection.

Introduction

Intravenous catheters (IC) are necessary for many interventions such as fluid treatment, parenteral nutrition, monitoring, blood and blood products, infusion of various medicines (Hakyemez et al., 2012, Akova et al., 2005, Aygun, 2008). Particularly, IC applications are often performed in intensive care units (Hakyemez et al., 2012, Aygun, 2008).

Significant complications arise because of the ICs, which are inevitable in many cases. The risk of local and systemic infection is one of the most important complications. An increase in catheter infections is seen in proportion to frequent use of catheters. In line with this increase, intravenous catheter infections have become the leading cause of health care-related infections.

Although all intravenous catheters cause infections, central venous catheters are the leading medical devices that cause catheter-related infections. In addition to increasing morbidity/mortality rates, catheter infections incur additional financial burdens on patients and institutions.

Therefore, understanding and proper treatment of such infections is of critical importance (Hakyemez et al., 2012, Beekman and et al. 2010, Oncu, 2012).

All of the studies in the last two decades have shown that there is a reduction in the risk of infection following aseptic technical standardization and training in this regard (Akova et al., 2005). In accordance with the assessments, it is recommended to implement a training program to prevent catheter-related bloodstream infections. It is recommended to include practices with well-defined efficacy such as hand hygiene, maximum barrier precautions, skin antisepsis with chlorhexidine, catheter site selection and daily assessment of the catheter. In addition, many studies have shown that catheter-related infections can significantly be reduced with an effective training program (Aygun 2008). Yilmaz et al. (2007) showed that the training program could reduce catheter-related infections by 41% (Yilmaz et al.,2007). In this context, it is expected that nursing students, who will be part of the health team in the future, should be knowledgeable about the prevention of catheter-related infections. This study was conducted to determine the nursing students' level of knowledge on this subject.

Materials and Methods

Type of the Study

This study was done as a descriptive.

The Location and Time of the Study

This study was carried out in Faculty of Health Sciences of the İnonu University and the Fırat University between December 2013 and December 2015.

Study Population and Sampling

The study population consisted of 665 junior and senior nursing students. No sampling was performed in the study, and the study was completed with 430 students who agreed to participate in the research.

Data Collection Instruments

A 'Questionnaire' developed by researchers in accordance with the literature (Ulusoy et al., 2005) was used for data collection. The questionnaire consists of 21 items. The first 3 questions include the socio-demographic characteristics (age, gender and years in school) of the students; the 4th question includes opinions of students about the routes of transmission of pathogens; the 5th question includes the question on the definition of healthcare-related infections. And, 6th-21tst items test their knowledge on intravenous catheters. One of the items was multiple choice, and 16 of them include "true", "false" and "do not know" options.

Data Collection

Study data were collected between December 2013 and March 2014. After informing the nursing students about the research, they were asked to fill out the questionnaire handed out to them.

Evaluation of Data

The level of knowledge was assessed over 100 points by taking the opinion of the statistical expert. The 100 points were divided into 16 items in the questionnaire, resulting 6.25 points for each item.

In summarizing the data, number and percentage distributions for categorical variables, and means, standard deviation, minimum and maximum values were used for the numerical variables. In the interpretation of the data, t-test was used for the comparison of knowledge scores in terms of the school attended, grade and gender since the parametric test assumptions were met in this way.

Ethical Principles of the Study

Written permissions from the Faculty of Health Sciences of the studied İnonu University and the Fırat University were obtained. After informing the students about the research, their verbal consent were obtained. Volunteer and enthusiastic students were included in the research, and they have been informed that they are free to join.

Results

It was found that 27.4% (118) of the nursing students was male and 72.6% was female; 59.8% (257) was studying at Inonu University Faculty of Health Sciences, 40.2% (173) was studying at Fırat University Faculty of Health Sciences, 80% (344) was junior student and 20% (86) was senior student.

The question 'what is the most common way of contagion of pathogens from one patient to another in a hospital' was responded with 'contaminated hands of the employees' and 'inappropriate care given in the environment' by 42.3% (182) and 8.4% (36), respectively (Table 1).

Table 1. Introductory Characteristics of Nursing Students Included in the Study (n=430)

Introductory Characteristics		n	%
Gender	Male	118	27.4
	Female	312	72.6
School	Inonu University Faculty of Health Sciences	257	59.8
	Fırat University Faculty of Health Sciences	173	40.2
Class	3. Class	344	80
	4. Cass	86	20
What is the most common way of contagion of pathogens from one patient to another in a hospital	Through air	79	18.4
	As a result of contact with contaminated material	133	30.9
	Through contaminated hands of the employees	182	42.3
	Through care provided in an inappropriate environment	36	8.4

Table 2. Distribution of Responses of Nursing Students on the Definition of Healthcare-Related Infections

1. In your opinion, which of the following definitions is true for hospital infections?	n	%
They are infections that have been in the incubation period on admission, which develop after 48-72 hours.	87	20.2
They are the infections that spread from one patient to another and develop after 48-72 hours.	56	13
These infections have symptoms during the hospital stay, and develop after discharging the patient.	21	4.9
They are the infections that were not in the incubation period during admission but develop 48-72 hours after hospitalization in the hospital or that can develop within 10 days after discharge.	266	61.9

Table 3. Distribution of Responses of Nursing Students to Questions Regarding the Prevention of Intravenous Catheter Infections

	Correct Answer	True Answer n	%
Hand hygiene must be provided before inserting a peripheral venous catheter.	True	406	94.4
Catheters inserted for intravenous therapy in adult patients should be replaced at least after 48-72 hours.	False	350	81.4
The infusion of blood and blood products should be completed within maximum four hours.	True	309	71.9
Catheter insertion sites on the lower extremity bear higher risk of infection than upper extremities.	True	308	71.6
The infusion sets used to deliver blood and blood products should be replaced within 48 hours following the start of the infusion	False	288	67.7
Central venous catheters must be routinely replaced to prevent catheter-related infection.	False	275	64.0
Peripheral venous catheters can be replaced at intervals longer than 72-96 hours if finding a new peripheral venous vessel is problematic in adult patients and if there are no symptoms of phlebitis or infection.	True	269	62.6
The antiseptic solution, applied before inserting the catheter, should be allowed to dry.	True	249	57.9
It is not necessary to replace infusion sets and any associated connections at intervals shorter than 72 hours, unless there is a catheter-related infection.	True	229	53.3
The infusion sets used to deliver lipid emulsions should be replaced within 24 hours following the start of the infusion.	True	228	53.0
When povidone iodine solution is used on the catheter entry, one must wait at least two minutes for the solution to dry.	True	222	51.6
Sterile gloves should be worn to insert peripheral venous catheters , and the catheter entry site may be re-palped after cleaning with antiseptic solution.	False	216	50.8
Dressings of central venous catheters should be replaced every two days if gauze bandage is used, or every seven days if a sterile transparent cover is used.	True	187	43.5
Routine replacement of peripheral venous catheters is not necessary in pediatric patients unless complications develop.	True	163	37.9
Nonsterile gloves should be worn when fitting arterial or central catheters.	False	147	34.2
Solutions remained in single dose ampoules or vials should be stored for later use.	False	88	19.1

Table 4. Mean Knowledge Scores of Nursing Students on the Prevention of Intravenous Catheter Infections

		N	Min.	Max.	Mean	SD	p value
School							
	Inonu University Faculty of Health Sciences	257	12.50	87.50	57.0588	3.64438	t=7.970 p=.000
	Fırat University Faculty of Health Sciences	173	12.50	81.25	45.9884	14.80846	
Class	3. Class	344	12.50	81.25	51.7474	15.19123	t=-2.365
	4. Class	86	18.75	87.50	56.0349	14.40135	p=.018
Gender	Female	312	12.50	87.50	52.1141	15.45171	t=-1.095
	Male	118	18.75	81.25	53.9025	14.17899	p=.274
Total Score		430	12.50	87.50	52.6049	15.11794	

t*=t-test for independent groups

Table 2 presents the distribution of the responses given by nursing students participating in the survey to the question of definition of hospital infections. In regard to the responses given to the question "in your opinion, which of the following definitions is true for hospital infections?", 20.2% (87) of the nursing students responded with "they are the infections that have been in the incubation period on admission, which develop after 48-72 hours", 13% (56) responded with "they are the infections that spread from one patient to another and develop after 48-72 hours", 4.9% (21) responded with "these infections have symptoms during the hospital stay, and develop after discharging the patient", and 61.9% (266) responded correctly with "they are the infections that were not in the incubation period during admission but develop 48-72 hours after hospitalization in the hospital or that can develop within 10 days after discharge."

Table 3 shows the distribution of responses of nursing students to the questions regarding the prevention of intravenous catheter infections.

Of the sixteen questions about prevention of intravenous catheter infections, ten questions were responded correctly by 50% (222), whereas six items were correctly answered by less than 50% (187).

The most incorrectly answered item was 'catheters inserted for intravenous therapy in adult patients should be replaced at least after 48-72 hours' by 81.4% (350), whereas the least incorrectly answered item was 'hand hygiene should be provided before the insertion of peripheral venous catheters' by 3.7% (16).

Nursing students responded to the 'infusion sets used to deliver lipid emulsions should be replaced within 24 hours following the start of the infusion' item with 'I don't know', which was the most common answer, by 30% (129), whereas the item 'catheters inserted for intravenous therapy in adult patients should be replaced at least after 48-72 hours' was responded with 'I don't know' only by 1.6% (7).

A statistically significant difference was found between mean knowledge scores and schools and years in schools of the nursing students ($p<0.05$). However, no statistically significant difference was found between mean knowledge scores and genders of the nursing students ($p>0.05$) (Table 4).

Discussion

Intravenous catheters are medical devices that are frequently used in the treatment of patients and their follow-up (Fraenkel et al. 2000). In spite of its many benefits, there is an increase in intravenous catheter infections in parallel with the increasing frequency of use (Fraenkel et al. 2000). In line with this increase, intravenous catheter infections have become the leading cause of health care-related infections.

Of the nursing students, 42.3% gave the correct answer to the question 'what is the most common way of contagion of pathogens from one patient to another in a hospital' by responding with

'contaminated hands' (Table 1). Based on these data, it is seen that nursing students are knowledgeable about routes of transmission of pathogens, however 57.7% of them had no adequate knowledge in this regard. For this reason, more time can be devoted to the subjects of prevention of health-care infections and to the transmission of microorganisms in the curriculum to increase the level of knowledge of nursing students.

Of the nursing students, 61.9% answered the question on definition of healthcare-related infections correctly with the response of "they are infections that were not in the incubation period during admission but develop 48-72 hours after hospitalization in the hospital or that can develop within 10 days after discharge" (Table 2). Based on these data, it is seen that most of the nursing students know what healthcare-related infections are and what time intervals they occur. In the study of Mankan et al. (2015), 81.1% of the nurses correctly described the definition of healthcare-related infections (Mankan and Kasikci 2015). In a study by Artan et al. (2015) conducted with healthcare workers and health care services vocational higher school students, 70.6% of the staff and 50.8% of the students correctly responded to the definition of health care related infections (Artan et al., 2014, Artan et al., 2015).

Of the nursing students, 81.4% (350) gave an incorrect answer to the item 'catheters inserted for intravenous therapy in adult patients should be replaced at least after 48-72 hours', whereas 17% (73) responded correctly (Table 3). In the study by Mankan et al. (2015), 92.6% of the nurses gave an incorrect answer to this question (Mankan and Kasikci, 2015). In the old literature, the time to replace catheters has been reported as 48-72 hours (Esen, 1999). This may be the cause of this great number of incorrect answers given by the nurses.

It was determined that the mean knowledge score of nursing students on the prevention of intravenous catheter infections was 52.6 (Table 4). In the study by Mankan et al., the mean knowledge score of the nurses has been found to be 63.47 (Mankan and Kasikci, 2015). Based on these data, it is seen that nursing students have knowledge about prevention of IC infections, but the number of those who were not knowledgeable was also considerably low. In the United States (US), the Health Care Improvement Institute has developed the concept of bundles to improve the health care practices. Bundles are groupings of ideal practices that accompany evidence-based precautionary guidelines. It contributes positively to the prognosis in these patients. These bundles are the hand hygiene, taking maximum barrier measures during catheterization (use of masks, bonnets, sterile gowns, sterile gloves and sterile patient scrub), applying skin antisepsis with chlorhexidine to the catheter entry site and surroundings, selecting the most suitable catheter site (avoiding insertion of catheter at femoral region), and evaluating the need for a central catheter on a daily basis (Beekmann et al., 2010). Therefore, considering the fact that nursing students who will work in almost every department of hospitals should be more knowledgeable on this issue, an importance should be given to evidence-based, zero-risk studies on prevention of catheter-related bloodstream infections due to high mortality-morbidity rate and cost (Mclaws et al., 2012).

There was no statistically significant difference between the nursing students' mean IC knowledge scores in terms of gender (Table 4). A statistically significant difference was found between mean IC knowledge scores and schools and years in schools of the nursing students (Table 4). Despite the fact that both universities included in the research are state universities and their curricula are similar, the mean IC knowledge score in the Inonu University Faculty of Health Sciences (57.05) was fund to be higher than of Firat University Faculty of Health Sciences (45.98). When examined according to the years in school, it can be expected that the mean knowledge score increases as the years in school increases since the comprehension, practice, analysis and synthesis abilities also increase with increasing years in school. This result once again show the positive effects of education on the learning, analysis and implementation of the behaviors. As the rationality characteristics of individuals increase through education, cognitive consistency, that is, correct information, correct attitude and right behavior characteristics also increase. The increase in correct knowledge scores with increasing number of years in school reveals the presence of a positive social learning environment, as well as an effective control mechanism. Here, it is possible to say that the

teaching staff have a positive influence on the control mechanism.

Conclusion and Recommendations

The mean level of IC-infection knowledge of the nursing students included in the study was found to be high (52.60). There was no statistical significance in the mean IC knowledge score in terms of gender. The mean IC knowledge score in the Inonu University Faculty of Health Sciences (57.05) was found to be higher than of Firat University Faculty of Health Sciences (45.98). According to the years in school, it was higher in senior students (56.03) than the junior students (51.74).Nursing students' training requirements should be identified regarding the prevention of healthcare-related infections and intravenous catheter infections through qualitative and quantitative assessments as well as performing administrative supervisions in their internship practice in order to provide up-to-date continuous training. Nurses should receive in-service training programs for specific and clear knowledge-attitude-behavior targets to prevent health-related infections before starting the profession. Healthcare-related infections can be addressed in curriculum as a separate course in nursing schools.

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