

Effect of Structured Nursing Education Programs in Prevention of Admitted Patients' Phlebitis

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Abstract

Background: In the hospitalization wards where phlebitis has an incidence and accounts for the most serious complications of environmental fluid therapy.

Objectives: This study aimed to determine the effect of structured nursing education programs in prevention of admitted patients' phlebitis.

Methods: In this quasi-experimental study in which the post-test design with control and intervention group was used, 400 patients were randomly divided into two groups of 200. Data were collected by questionnaire including demographic questions and Jackson's Visual Infusion Phlebitis (VIP) scale was used to evaluate the complications of peripheral vascular catheter (phlebitis). The findings were analyzed by SPSS 25 software.

Results: The mean score of phlebitis incidence in the hospital wards, whose nurses that had undergone such trainings, was significantly decreased ($p < 0.001$) compared to the mean score of phlebitis occurrence in the wards, whose nurses represented the control group and had taken part in no such training programs. Moreover, the mean score of intensity of Phlebitis complications in the wards, whose nurses that were members of the experimental group, significantly decreased ($p < 0.001$) compared to the mean score of phlebitis intensity among patients of the wards whose nurses represented the control group.

Conclusion: The findings of this study testify that holding a structured nursing education programs will be effective in checking the incidence of phlebitis and its complexity among the patients hospitalized in Imam Khomeini Hospital in Mahabad.

Keywords: structured care training, intravenous catheter, complications, phlebitis, nurse

Introduction

More than 80 to 90 percent of the patients nowadays hospitalized receive intravenous injections for getting treated. Moreover, beyond 500 million peripheral venous catheters are yearly implanted [1]. Intravenous catheter insertion is the most prevalent invasive method practiced in hospitals. That's considered the best or only option, however [2]. That's highly risky [3]. The access to the intravenous system through catheter placement is proved to lead to numerous

complications, alike any other methodology. The most important such methods used for the purpose can be fluid leakage, phlebitis, fluid accumulation in the body, infection, and bleeding of the injection position. Phlebitis is regarded the most customary complication of all and the most dangerous problem resulting from the phenomenon is infection [4].

Phlebitis jeopardizes the patient's health, prolonging the period of hospitalization. The following problems come as a result: Infections

and less patient comfort and consequently inflicting soaring cost on the patient and the Medicare center [5]. The following factors raise the risk of phlebitis and the venous infection: Factors relating to the demographic features of the patient (age, sex and background disease); characteristics of catheter (type, type of dressing, type of vein injection, anatomic location of the vein, how to prepare a vein for venipuncture, the time from venipuncture). Add to the list the skill

and experience of the person responsible for venipuncture. Other factors like old age, being female, neutropenia, malnutrition, immune system weakness, circulatory dysfunction and peripheral neuropathy are also influential in incidence of phlebitis [6]. The most important factor leading to phlebitis is the shelf life of catheter. Phlebitis is most probable occurring within times beyond 48 hours [7]. Jackson's Phlebitis Scale (JPS) classifies phlebitis into 4 degrees.

Jackson's Phlebitis Scale (VIP):

degree	Symptoms
0 degree	IV site appears healthy
1 degree	One of the following is evident Slight pain near IV site Slight redness near IV site
2 degree	Two of the following are evident Pain at IV site Erythema Swelling
3 degree	All of the following signs are evident and extensive Pain along the path of cannula Erythema Induration
4 degree	All of the following signs are evident and extensive Pain along the path of cannula Erythema Induration Palpable venous cord

Phlebitis of one to 63 percent is reported in California [8]. American Nurses Association considers five percent and/or less than the percentage as acceptable level of phlebitis incidence: This testifies the fact that phlebitis eruption is inevitable [9]. Furthermore, the rate of mortality as a result of cuthether infection is 20 percent and hospitalization prolongation as a result is almost one week with extra cost of \$ 3,700 [10].

As for Iran, phlebitis is said to be present by 69% in hospitals of the city of Sanandaj, by 88% Isfahan and by 65% in Zanjan [11]. In the 1950s, peripheral catheters survived less than 24 hours on the average, while in the 1970s between 24 and 48 hours, and today between 48 and 96 hours [12]. Maximum period for phlebitis incidence in Tehran hospitals is reported between 24 and 48 hours just following insersion of catheter [13].

Phlebitis is classified into three types: Mechanical, chemical and bacterial. The

mechanical phlebitis occurs as a result of the intravenous catheter corrosion; prolongation of venous catheter insersion; catheter being larger in size than vein diameter; and insersion of the venous catheter where joint flexion is present; this is while, chemical phlebitis comes as a result of passage of intravenous medications and infused fluids. That is closely related to manifestation of the pH plus phlebitis, osmolality of materials, speed of infusion and incompatibility of solutions [14,15]. On the other hand, bacterial phlebitis is the result of bacteria colonization at the peripheral catheterization site in consequence of lack of hands' hygiene, any shortcoming in checking the instruments linked to catheter, and substandard clinical care in the course of medication and receipt of fluids and necessary supplements [16]. Nurses are suggested that the best kind of treatment in the cases of chemical, mechanical and bacterial phlebitis is to prevent their incidence [17,6]. To avoid the phenomenon, the nurses are

recommended to repeatedly check the position angiocut is inserted and think of changing the location of placement upon observing the first and early symptoms like redness, tenderness and inflammation are observed [18,9].

As the bodies responsible for others' health, nurses are advised to enhance their knowledge and skills and get updated to deliver standard care in different phases of medication care, including insertion and change of catheter or in the period the device is placed in the body. In general, qualitative improvement of services, lowering expenditures, upgrading social health standards and trying to bring national standards to the level of international standards should be regarded as advantages of implementing guidelines in the medication centers. Following guidelines should be interpreted as a sort of consensus in carrying out procedures. That will raise logical measures and minimize errors. That will also offer a definite standard for care, which will in fact provide an environment for learning, while preparing the ground for equal care [19]. One of the kinds of education that can be provided in that domain is structured education. A structured nursing education programs, provided within framework of the clinical guidelines of classified and developed information, will serve promotion of nursing services and clinical skills [20]. The structured learning method has been introduced and influenced more than half a century ago. Reaches and enjoys high research support. Structured training is an idea raised in the past half a century, distinguished as the most effective method among all. The issue is well supported by research. Structured education has stages like a ladder, indicating how the learners would contribute to and be recruited for the sake of education. This ladder has eight different kinds of steps (manipulation, decoration, symbolic participation, informed learner, the learner as a counselor, involvement of the learners in decision makings, the initiator learner and a guide to decision makings, and getting teachers involved in the decision making). The higher the learners ascend in the ladder, the more participant they will have in the process of education [21].

Regarding excessive use of the intravenous catheterization and spread of certain related complications, resulting from wrong conduct of nurses and their failure to observe related

standards, a structured nursing education programs needs to be designed in conformity with related clinical guidelines [22]. Hence, the study at hand tries to address the following question: "Is structured nursing education program effective in checking phlebitis occurrence among the admitted patients?"

Methods

This study is quasi-experimental in nature, carried out through collection of descriptive data from a post-test, involving two control and experimental groups. The statistical population were all the patients admitted to the surgery and internal medicine wards in Mahabad Hospital. The data were obtained from the participants from October 2018 to January 2018. Initially, the researcher obtained permission from university and the Ethics Committee with the ethics code being IR.UMSU.REC.1397.045. The researcher then referred to the environment where the research was to be done and made necessary arrangements with the nursing office and other related authorities.

A total of 400 patients, admitted to the surgery and internal medicine wards of Imam Khomeini hospital of Mahabad, were drawn as samples through the availability sampling method and joined the study. The criteria of sampling were as follows: 1. The patient's signing informed consent for participation in this study; his/her consciousness and cooperation while the research project was underway 2) No addiction (confirmed so by related tests), 3) Usability of the patient's upper limb for intravenous catheterization 4) The patient's insensitivity to any drug or adhesive; the information was gained through questioning the patient, 5) No precedence of phlebitis in the area intravenous catheter (Angiocut) was to be inserted 6) having a healthy skin where the catheter was to be placed, 7) Not having any vascular disease or any illness that involved the musculoskeletal system and not having diabetes and the infectious, skin and peripheral vascular diseases such as lupus and sclerosis, 8) Having no fever or any symptoms of infection, 9) Having no co-occurrent kinds of treatment such as radiation therapy, 10) The patients falling within the age group of 20 to 50. The criteria for discarding the non-qualified were as follows: The subjects' failure to fill up the

demographic information and the phlebitis registration forms; non-willingness of the patient or his/her family to continue contribution to the research study; furthermore, the patient sample was discarded from the study when observing any skin or seasonal allergies.

The instruments for collection of the demographic information was the demographic questionnaire and peripheral vascular catheter complication (phlebitis) questionnaire. To study severity of phlebitis, Jackson's phlebitis scale (VIP) was used.

To assess validity of the forms, content validity methodology was used. Once corrected and confirmed by the supervisor and the reader, the form was given to 10 content experts in Urmia School of Nursing and Midwifery to judge them and offer necessary comments for its improvement. Then validity of the instrument was confirmed. Furthermore, reliability of the demographic information form was approved because its questions were objective and were repeatedly used in other studies. Three content experts were asked to comment and their triangulated consensus was taken as the criteria for approval of the reliability of the observation forms. The researcher filled up the forms for 15 people in the research centers and then correlation among the scores was estimated. Three investigators then confirmed the process through the Pierson correlation coefficient formula.

Prior to intervention, the researcher, in charge of collecting the filled-up questionnaires, frequently referred to related wards in coordination with those in charge of the wards in order to monitor questionnaire completion during the working shifts. Those in charge of the wards were requested to provide nurses in their ward with necessary information and goals of the research. Furthermore, the nurses, who were not willing to take part in this research, were asked to announce the issue so as to be discarded. To collect the data, indirect (invisible) observation method was used through an observation checklist. To raise the precision and accuracy of the data, indirect observation was preferred and the nurses under observation were not informed of the issue, hence avoiding any bias. To observe ethics, nursing directors and chief nurses had already been briefed on the subject and the methodology of the research. They were requested to provide the

nurses taking part in this study on the given information. The researchers then brought the environment under initial examination to be ensured of feasibility of conduction of the project there. After signing the informed consent, the nurses in the internal medicine and surgery wards of Imam Khomeini Hospital in the city of Mahabad were randomly assigned into the experimental and control groups.

In line with the structured nurse education program, the experimental group was subdivided into four small 10-member groups in the intervention phase and nurses took part in the training sessions, characterized by critical learning situations. There were five sessions of training for each group (a collection of 20 sessions) marking the phase of intervention and four such sessions took place in a week to outline goals specific to each of the sessions. Each session lasted for an hour, extendable to one and half an hour regarding the level of awareness and rich information and interest of the participants. The research was in charge of deciding about final outline of the subjects raised in the meetings. Concurrently, the control group was controlled of not being aware of the training and information given to the experimental group. After intervention, the researcher again controlled the checklist for eventual evaluation. The researcher then identified the patients in whose body the experimental group nurses had placed intravenous line. The researcher carefully checked the position to be ensured of non-occurrence of catheter insertion complications. Then the researcher washed arms of the patients and removed catheter-specific dressing from their body, deciding the degree of phlebitis based on the instrument brought in the checklist. Then the researcher examined whether phlebitis is present in the area of venipuncture within 72 hours from venipuncture. Eventually, to honor research ethics, the intervention phase educational resources were given to the control group nurses as well.

To meet the goals of the research, the structured training class was decided to be held in five sessions to include the following subjects: Anatomy of skin; body composition and liquids; types of injectable solutions; venipuncture principles; types of catheterization; the measures

nurses were to be adopted for venipuncture and different kinds of phlebitis.

The collected data were analyzed on descriptive statistics (including mean, standard deviation, frequency and percentage) and independent t-test, paired t-test, and chi-square through the SPSS software version 25.

Results

The study sample size included 400 patients: 200 patients were assigned to the control group while 200 to the experimental group (50% of the

samples were male and 50% were female). Out of 200 control group patients, 99 (49.5%) had been admitted to the men's internal medicine ward and 101 (50.5%) to the women surgery ward. This is while, the experimental group included 200 patients: 99 (49.5%) of the patients had been admitted to the women internal medicine ward and 101 (50.5%) were hospitalized in the men surgery ward. Table 1 shows the frequency distribution and percentage of the patients' demographic variables placed in the two control and experimental groups.

Table 1: A Comparison of the Frequency Distribution and Percentage of the Qualitative Demographic Features of the Control and Experimental Group Patients

Variable	Classes	Control Group		Experimental Group		Test
		Number	Percent	Number	Percent	
Age	20-30 Years Old	53	26.5	68	34	$X^2=2.708^*$ df=2 p=0/258
	31-40 Years Old	44	22	41	20.5	
	41-50 Years Old	103	51.5	91	45.5	
Venipuncture Side	Right	140	70	107	53.5	$X^2=11.527^*$ DF=1 p=0/001
	Left	60	30	93	46.5	
Dominant Hand of the Patient	Right Handed	164	82	151	75.5	$X^2=2.525^*$ DF=1 p=0/112
	Left Handed	36	18	49	24.5	
Angiocut Insertion Location	Hand Dorsum	55	27.5	43	21.5	$X^2=2.193^*$ df=5 p=0.334
	Forearm	66	33	67	33.5	
	Antecubital Fossa	79	39.5	90	45	
Angiocut Type	Pink-Vitro	64	32	69	34.5	$X^2=15.127^*$ df=3 p=0.002
	Blue-Vitro	18	9	31	15.5	
	GreenVax	55	27.5	68	34	
	PinkVax	63	31.5	32	16	
Type of Serum	Normal Saline	28	14	36	18	$X^2=3.834^*$ DF=3 p=0.280
	Dextrosaline	25	12.5	24	12	
	Dextro Water	23	11.5	13	6.5	
	Normal Saline and Dextrosaline	124	62	127	63.5	

*Chi-Square Test

Table 1 shows that the control and experimental groups did not have any difference of significant in terms of age, patient's dominant hand, place of angiocut insertion, and the type of serum used. Speaking the other way, the experimental and control groups were homogeneous ($p>0.05$). However, there was difference of statistical significance between the two groups in terms of the venipuncture side and the type of angiectomy.

Additionally, based on the data illustrated in Table 2, the risk of phlebitis incidence in the control group was 57.5% while it was 28.5% in the experimental group. Therefore, there is a relative danger $R.R = \frac{0.285}{0.575} = 0.49$ at work with confidence interval of 95 percent (falling in an area between 0.42 and 0.67). Therefore, training seems to check the risk of phlebitis occurrence.

Table 2: Chi-Square Test Results for Eruption of Phlebitis in the Experimental and Control Groups

Variable	Classification of Subjects	Control Group		Experimental Group		Test
		Number	Percentage	Number	Percentage	
Phlebitis	Subjects With Phlebitis	115	57.5	57	28.5	X ² =34.313* df=1 p≤0.0001
	Subjects Without Phlebitis	85	42.5	143	71.5	
	Total Number of Subjects	200	100	200	100	

The study findings illustrated in Table 3 show that there is a significant difference in the control and experimental groups' scores in terms of severity of phlebitis occurring among the admitted patients after an intervention. In other words, with 95th percentile confidence, it should be claimed that

structured nursing education programs was effective in severeness of phlebitis hitting the admitted patients to the extent that the rate declined in the case of the experimental group compared to the control one.

Table 3: Results of Independent T-Test to Check Severity of Phlebitis among the Control and Experimental Groups after Intervention

Group	Descriptive Statistics				Levin Test		Independent T-Test		
	Number	Mean	SD	SEM	F	Level of Significance	t	df	Level of Significance
Control Group	200	1.38	1.09	0.077	1.613	0.205	5.840	398	0.0001
Experimental Group	200	0.760	1.04	0.074					

Discussion

This study showed that the incidence of phlebitis in the experimental group patients was lower than in the control group. Karadeniz et al. (2014) indicated in Turkey that though having enough information on venipuncture and phlebitis, nurses often have difficulty in using and implementing the information, having poor function [23]. The finding is in vein with this study results.

The study results also pointed to the fact that phlebitis was highly prevalent in the control group. Tazakori et al. (2014) in a study noted that regarding high rate of occurrence of phlebitis, necessary education and training need to be offered in connection with appropriate insersion of catheter in a bid to check incidence of phlebitis [24]. This is in vein with results of this study.

Furthermore, Alirmani (2008) in a study claimed that the time period for implanting angiocut seemed to be the most important factor leading to different degrees of phlebitis as patients received antibiotics. Cutting the period for angiocut insersion from 72 hours to 48 hours and less seems minimizing rate of phlebitis incidence, which is one of the factors causing hospital

inflection [11]. That is in line with findings of this research to some extent.

This study's results indicated that there was a significant difference between the rate of incidence of phlebitis in the experimental group patients compared to that in the control group. In this regard, Madar-Shahian et al. (2010) claimed that evidence-based trainings are as effective as traditional trainings in ensuring clinical care. They said such trainings will also upgrade the receipients' knowledge, skills and high-quality care [25].

Results of this research indicated high percentage of phlebitis severity in the patients lying in the control group. Borzou et al (2009) indicated that the highest rate of phlebitis incidence was observed in 48 hours after catheter insersion [10]. Furthermore, Jaafarnejad et al. proved that majority of patients suffering from phlebitis had catheter in their body for more than two days. Their findings showed that rate of phlebitis occurrence significantly correlated with the time catheter had been placed in their vein and also with consumption of specific medicine and antibiotics [26], which is relatively in vein with the findings of present study.

Of course, some studies suggest that besides profession and experience of nurses, there might be other factors at work in eruption of phlebitis. Taghi Nejad et al. (2005) showed that rate of occurrence of phlebitis and local infection in the group treated with betadine was less observed than in the group treated by alcohol [27]. This study findings were in favor of structured nursing education programs, proving their effectiveness as rate of phlebitis incidence was lower in the experimental group patients than the control group ones. Oziazikioglu et al. (2008) in Turkey in a study indicated that education of nurses is effective in checking venous complications, including phlebitis [28]. Zhang Xia et al. (2011) in China also proved that nurse training before insertion of angio cut in patients subject to chemotherapy was effective in decreasing rate of phlebitis incidence [29]. Moreover, Kanishka et al (2013) in India showed that 8.54 percent of patients suffered from phlebitis. Majority of patients contradicted degree 1 phlebitis. The experimental group in that study had undergone structured training well upgrading their knowledge and practice significantly to control and prevent incidence of phlebitis [30]. The study is in conformity with the results of this study.

The results showed that the rate of phlebitis in the control group was higher than that in the experimental group. This signifies that structured education was influential in minimizing the risk of phlebitis. To this end, Dink et al. (2015) proved in a study that training would be effective in upgrading nurses' knowledge and performance, while contributing to promotion and improvement of the performance of the personnel in charge of catheter care, thus leading to less bacterial catheter colonization [31]. The finding is in agreement with the results of this study.

Alike other studies, the study at hand faced a number of limitations, which should be taken into consideration when generalizing its findings. Hope that researchers will consider and judge this study with respect to the limitations on the way and that likely limitations will be lifted when attempting to design future studies. The present study just concerned two groups, namely nurses and patients admitted to the internal medicine and surgery wards of Iranian city of Mahabad. This is believed to limit generalizability of the findings. In other words, results of this study might not be

generalized to nurses and patients in other contexts. The results of this study are cross-sectional: The data were collected in a juncture of the year, expected to be different in other times of the year; so, the research could not control the variable 3) Among other limitations of this study were nurses' psychological condition at work and their care for the patients, which might have been affected their behavior. That was beyond the researcher's control 4) To cite other limitations of the study, reference should be made to the type of angiectomy selected by the nurses for different groups under this study. Controlling the variable was not possible for the researcher for being invisibly assessing likely phlebitis occurrence in the wards.

The complications and risks of phlebitis occurrence as a result of venous injections to the patients would delay their treatment and recovery, inflicting delayed and irreversible complications. Therefore, nurses are recommended to raise level of their awareness of the dangers, symptoms and signs to check such bitter incidents and events. Regarding their key and vital role in implementing guidelines to care patients, nurses should be updated and kept abreast of the latest in clinical care and update their clinical knowledge. The researcher hopes that the study findings will afford promotion of patients' health standards and empower nurses, while serving their education.

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Conflict of interest

The authors of this article confirm that there is no conflict of interest with regards to present study.

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