

Educational Intervention Program for Maternity Nurses about Intravenous Catheter and Its Effect on Phlebitis Rate

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Abstract:

Background: Today's hospitals rely on intravenous (IV) catheter as essential tools to deliver IV medication, blood products, and nutritional fluids to patients. Approximately 90% of all patients entering the hospital environment for care have some form of intravenous therapy during their hospital stay. Administering vital medications to these patients through the use of IV catheter can be complicated by related serious infection. **Aim of the study:** was to evaluate the impact of the educational intervention program for maternity nurses about intravenous catheter and its effect on phlebitis rate. **Subjects & Methods: Research design:** A Quazi experimental design was used to fulfill the aim of the study. **Setting:** The study was conducted at the (maternity) obstetrical and gynecological units of El-Minia University hospital. **Sample:** The sample of the study comprised 40 nurses and 40 patients. **Tools of data collection:** Two tools for nurses: Assessment sheet comprised two parts; a-Socio-demographic data and Pre/Post knowledge Assessment sheet and Pre/Post Observational Checklist for nurses practical level and another two tools for patients: Assessment Sheet & Pre/ post phlebitis Scale for Patients **Results** of the present study were; there were statistically significant differences in pre and post knowledge and practical level for nurses. Rate of phlebitis among patients after application of program were decreased. **Conclusion,** Nurses who received educational intervention program had improved in their knowledge and practical level and reflects patient's phlebitis rate. **Recommendations:** Continuous in – service training program to update the nurses' knowledge and practice about IV catheter for all nurses. Hospital should have implementation plans designed to prevent the incidence of phlebitis.

Key Words: Peripheral intravenous catheters, Peripheral venous catheters, phlebitis rate.

Introduction:

Intravenous (IV) therapy can have beneficial effects for patients by providing hydration and stabilizing hemodynamics in various clinical conditions. Peripheral intravenous catheters (PIVCs) are the most widely used devices for vascular access. ⁽¹⁾ Peripheral venous catheters (PVC) are the most frequently used invasive devices in hospitals. ⁽²⁾

The use of (PIVCs) has become routine practice in modern medicine. It is one of the most common invasive procedures in today's health care setting. (IV) therapy saves numerous lives; however patients may develop complications from this procedure is phlebitis. About 5% to 70% of patients receiving intravenous therapy develop phlebitis. Phlebitis is the most common intravenous therapy complication so, patients experience requiring removal of the cannula. ^(3,4) Up to 70% of patients require a peripheral venous line during their hospital stay, and

conservative estimates suggest that PVC days account for 15-20% of total patient days in acute care hospitals. ⁽²⁾

In fact, phlebitis rates increase from 12% to 34% after the first day of IV therapy, followed by an increase of 35% to 65% after 48 hours post catheter placement. ⁽³⁾ However, the difference in incidence of phlebitis rates in obstetrical patients specifically unknown. Phlebitis is defined as inflammation of a superficial vein caused by irritation to the lining of the vessel. ⁽⁵⁾ Approximately 150 million peripheral intravenous (PIV) catheters are inserted annually in the United States. ⁽³⁾

Phlebitis refers to the subjective clinical manifestation at an access site with the following symptoms: redness, pain, swelling, palpable venous cord, thrombosis or streak formation. ⁽⁶⁻⁸⁾

There are three types of phlebitis: mechanical, chemical, and infectious. Mechanical phlebitis occurs when a peripheral intravenous catheter (PIVC)

is not secured properly, leading the catheter to change position within the vein. Subsequent irritation causes vessel inflammation, which can result in a clot at the distal end of the catheter, leading to platelet aggregation around the injured vessel.⁽⁹⁾

Mechanical phlebitis can also occur if a cannula is too large for the vein and consequently prevents free flow of blood around it. Mechanical phlebitis often leads to removal/replacement of the catheter.⁽¹⁰⁾ Chemical phlebitis is caused by highly vesicant irritants, such as drugs, which lead to thrombus formation, causing a sterile inflammation of the vein intima. In fact, drug irritation was indicated as the most significant predictor of phlebitis.⁽¹¹⁾ Other causes of chemical phlebitis are physicochemical properties of solutions, with high or low osmolarities or pH, as well as antibiotics, blood products, and glucose containing fluids.^(5,6)

Infectious or bacterial phlebitis is caused when an infectious agent is introduced onto the PIVC, this starts an inflammatory response. Infectious phlebitis can be caused by contamination of the catheter tip any time during IV insertion⁽⁵⁾. Infectious phlebitis may also occur if a cannula is left in place longer than time limit recommended by the CDC. Another possible variable related to the occurrence of phlebitis could be the patient's overall physical health. Phlebitis severity was measured by assigning a numerical score on a phlebitis scale of 0 to 5.⁽¹²⁾

Significance of the study:

Advanced practice nurses need to be aware of the factors that increase the likelihood of phlebitis and take appropriate measures to prevent it.⁽¹³⁾ Nurses are responsible for the care they give to the patients. So educational program might constitute the first and most important factor in preventing and controlling of phlebitis, also improve nurses knowledge, practice and to be reflect upon patients

condition.

Aim of the study:

Evaluate the impact of the educational intervention program for maternity nurses about intravenous catheter and its effect on phlebitis rate.

Research Hypotheses:

1. Improvement of maternity nurses' knowledge and practice related to intravenous catheter after the program
2. Reduction in phlebitis rate for maternity patients after the program

Subjects and methods:

Research design:

A Quazi-experimental design was utilized to fulfill the aim of the study

Setting:

The study was conducted in (Maternity) Obstetric and Gynecological Unit of El-Minia University Hospital.

Subjects:

Sample included in this study (Maternity Nurses & female Patients) were selected according to the following Inclusion Criteria:

Maternity nurses: A convenient sample of forty nurses who working in (Maternity) obstetric and Gynecological units, their age ranged between 20-59 years and agree to participate in the study.

For patients: A Purposive sample. consists of forty patients who had peripheral intravenous catheter, agree to participate in this study, admitted to maternity ward, used intravenous catheter for long periods (more than 5 days).

Exclusion criteria for patients with (cancer, immune compromised diseases, patient taken anticoagulants factors and or any medication taken to decrease blood clotting, patients who were transferred from another medical facility with intravenous therapy already in place, in complete or missing data & patients with an existing blood stream infection.

Tool of data collection:

Data collection was carried out by

four tools (two tools for nurses and two tools for patients). Based on designed questionnaire sheets which were prepared by the researchers to collect data about the following:

A. Tools for the Nurses:

Tool (1): Assessment Sheet for nurses: It was developed by the researchers comprised two parts:

- Socio-demographic data characteristics for nurses including Ages, educational level, level of experiences for nurses, time of spend in area for patient'setc.
- **Pre/post knowledge Assessment sheet:** include the following items definition of peripheral intravenous catheter, how to choose the catheter, objectives of intravenous catheter, measures of cannula, meaning of phlebitis, causes, and symptoms of phlebitisetc.

Scoring system:

Each right answer ranged from (Excellent =1, very good=2, Good=3, Fair=4, weak=5)

Tool (2): Pre/ Post observational Checklist for nurse's practical level:

It was developed by the researchers. It was used before the educational program and after application of the program to assess nurse's practical level. Covering the following items: how insert of peripheral intravenous catheter, using aseptic technique during insertion, methods of dealing with when problem present, care of the peripherals intravenous catheter....etc. every answered question ranged from (done =1, & Not done =2) and then the total was collected, the total score (pre/ post)program of the maternity staff.

B. Tools for the Patient:

Tool (3): Assessment Sheet for Patients:

It was developed by the researchers concerning on Socio-demographic characteristics for patients including; Ages, medical diagnosis, time of spend in area, type and dose of I.V. solution, and the dose of antibiotics or other medication.

Tool (4): phlebitis Scale (Pre& post):

It was developed by Zarate et al.⁽¹²⁾ Phlebitis severity was measured by

assigning a numerical score on a phlebitis scale of 0 to 5 for each patient .According to patients' score, it was ranged as following 0= No signs of phlebitis, 1= Possibly first sign of phlebitis, 2 = Early stage of phlebitis, 3 = Medium stage of phlebitis, 4= Advanced stage of phlebitis or start of thrombophlebitis, and 5 = Advanced stage of thrombophlebitis.⁽³⁾

Content Validity and reliability:

Content validity was used for the tools to make sure that they are Comprehensive, clear, understandable and cover the aims of the study. Tools were submitted to a panel of 5 experts in the field of Medical –Surgical Nursing & Obstetrics Gynecological Nursing. Reliability of the proposed tools was done by Cronbach's Alpha test.

Pilot study:

Before performing the main study, a pilot study was carried out on a number of 10% of the study sample for nurses to test applicability of the tools of the study .The necessary modifications were done .These sample were excluded from the main study sample.

Field work:

The data collection was done first using assessment sheet for the nurses and the patients .The researcher filled the data collection tools within 15-20 minutes, observational checklist (pre) was done in order to assess nurses' practical level .Then knowledge assessment sheet (pre) to assess knowledge of nurses, The program prepared and developed according to the nurse's needs of knowledge and practices that can help them in identification and reduce of phlebitis among patients attached with peripheral intravenous catheters. The program implementation was within the schedule of their working hours,10 session were applied in 10 days and repeated ten times (10 group of nurses each contains 4 nurses).Teaching methods included, lectures, small group training ,various teaching aids were cited including visual material about procedure and care for

peripheral intravenous catheter .To improve nurses knowledge and practices. Arabic booklets were given to the nurses by the researchers.

Evaluation was applied pre and post program implementation firstly; the researchers assess nurses' knowledge & practices before application of the teaching program and after one week after application of teaching program. Secondly, evaluation of the programs was based on finding differences or no differences between the assessment sheets of patients' phlebitis pre & post program and its effect on phlebitis rate on patients. The program developed during the period from June 2010 to July 2010, and implemented during August 2010 up to December 2010 .then the same technique for data collection before the program was applied after program.

Administrative and ethical Considerations:

Permission to conduct the study was obtained from the responsible authorities of El- Minia University Hospital after explanation of its purpose. The volunteers read a detailed description of the protocol and provided written informed consent was obtained from each participating nurses and patients to be included in this study. Clarification of the nature and purpose of the study was done on initial intervention with each nurse and patient. All participants were informed about their right to withdraw from the study at any time and confidentiality was assured.

Statistical Design:

The collected data were coded for entry and analysis (SPSS) statistical soft ware package version 17. Data were presented using descriptive statistics in the form of frequencies and percentage. Quantitative variables were presented in the form of means and standard deviation. Statistical significance was considered at p- value <0.05.

Results:

Table (1): Presents socio-

demographic characteristics of the studied nursing staff .The mean age was (30.2 ± 7.855) years of the studied nurses. About two thirds (62.5%) of the nurses were married. Near to half (47.5%) of the studied nurses had Nursing Diploma while (42.5%) of the nurses had Bachelor of Nursing. More than one third (37.5%) of the nurses had experience years more than 10 years. More than two thirds (67.5%) of the nursing staff had training workshop and only one third (32.5%) had not training workshop.

Table (2): Shows Pre and Post Knowledge assessment of the nurses about the intravenous canula. There was observed increase in the Post Knowledge of the nurses about the intravenous canula; so there were statistical significant differences regarding to the Knowledge of the nurses (P<0.000**).

Table (3): Clarifies pre and post knowledge assessment of the nurses about the Phlebitis. There was observed increase in the knowledge of the nurses about the phlebitis; so there were statistical significant differences regarding to the Knowledge of the nurses about the Phlebitis (P<0.000).

Table (4): Shows pre and post practical evaluation of the nurses about the intravenous catheter. About two thirds of the nurses (62.5%) followed hand washing before the procedure after the educational program, while only one third (37.5%) who did not. The majority of the sample (95.0%) followed sterile technique during the procedure. Also the majority of the sample (97.5 % &92.5%) fixed IV. Catheter in its place and made hand washing after the end of the procedure; So there were statistical significant differences regarding to all steps of inserting intravenous Catheter (P<0.000).

Table(5): Shows pre and post observational sheet scores for the nurses staff The mean scores of the nurses increased in the post test in observational sheet of the Nursing staff due to the educational program.

So, there were statistical significant differences ($P < 0.000$).

Figure (1): shows pre & post percent of phlebitis of the studied sample of patients. There was a decrease in the percent of all degrees of the phlebitis among the patients after the educational program to the nurses. The 1st criteria of phlebitis percent were 26%. Also, the percent in the 2nd, 3rd & 4th criteria of the phlebitis was (4%); while the percent was (2%) in the 5th criteria of the phlebitis.

Table (6): Clarifies relationship between phlebitis degree of the studied sample of the patients and factors affecting it. There were statistical significant relation ($P < 0.000$) related to patient age, amount of injected solution and the number of I.V.

Discussion:

Concerning demographic data, in the present study nearly half of nurses study were having nursing diploma. In a study conducted by ⁽¹⁴⁾ most of nurses were diploma nurses. In relation to years of experience more than one third of them had experience more than 10 years. In contrast Hindley⁽¹⁵⁾ found that nurses with longer years of experience had better practice of IVCS than lower years of experience. Also, Gallat and Schultz⁽³⁾ found that there was an improvement in the level of performance with the increase in years of experience. As regard to training courses, in the present study more than two third of the nurses study reported attending training courses. For this nurses there was a statistical significant difference pre-post program concerning knowledge and practice related to IVCs and phlebitis,

As regard nurses knowledge assessment about intravenous cannula and phlebitis, the present study findings revealed that there was a statistically significant difference in nurses knowledge pre/post educational program. This difference in knowledge found in this present

study might be related to knowledge acquired from the educational program. This is similar to Gorski ⁽¹⁶⁾ who stated that nurse who received educational program had improvement of their knowledge after implementation of educational program. Also this goes on line with Attia ⁽¹⁷⁾, who explained that a highly significant difference was found concerning total nurses' knowledge scores in post Knowledge.

The current study showed that there was a highly a statistically significant differences improvement in total nurses practices' scores pre/post program this differences in practical level found among the nurses might be related to the skill from program this goes in line with Alexander et al., ⁽¹⁸⁾ who clarified that there was a highly significant statistically differences in the practice nurses between pre and post test.

Furthermore, Gabriel et al.⁽⁵⁾ who stated that a structured teaching program is able to improve practices of nurses related IVCs. Also this result accordance with Hamilton⁽⁹⁾ who stated that educational and training health care worker on the indication for the methods of inserting IVCs are vital in the fight to reduce infection and complication associated with vascular access devices.

As regard to phlebitis rate, the results of this study showed that there was a decreases in phlebitis rate after educational program for nurses. This is supported by Karadeniz et al., & Rathore et al., ^(14,19) who report that the rate of phlebitis is decreased post educational of nurses 66% pre education to 9% post education. As regard to increased risk of phlebitis in relation to factors affecting to increase it; In this study, there was a significant correlated with age of patients, amount of solution infusion, number of cannula used in the same time to insert it and increase phlebitis rate. This finding is approved by Gorski ⁽¹⁶⁾ who concluded that several factors contribute to the development of phlebitis, type and amount of fluid

injected, number of frequency of inserted cannula. This finding is opposite by Hindley, Nassaji et al., & Jose et al.,^(15,20,21,) who stated that there was no significant relationship between age and phlebitis rate.

Conclusion:

Phlebitis is still a common problem in fluid therapy. Based on the results of the present study, the following can be concluded: health education intervention was successful for nurses related to knowledge and practice for IVCs. After implementation of the educational program the rate of phlebitis was decrease.

Recommendations:

1. Continuous in-service training program to update their knowledge and practice about IVCs for all nurses.
2. Hospital should be Implementation plans designed to prevent the incidence of phlebitis.
3. Qualification of nurses scientifically and practical to reach the level of competent practical skills for intravenous.
4. Nurses must be aware about prevention, early detection of IV complications and how to avoid it.
5. Reapplication of the current study on larger probability sample.

Table (1): Socio-demographic Characteristics of the Nursing Staff

Variables	Maternity Nurses n= 40	
	N	%
Age :		
▪ 20-	20	50
▪ 30-	10	25
▪ More than 40 years.	10	25
Mean ± SD	30.2 ± 7.855	
Marital Status:		
▪ Single.	12	30
▪ Married.	25	62.5
▪ Divorced.	3.0	7.5
Education :		
▪ Nursing Diploma.	19	47.5
▪ Nursing Institute.	4.0	10.0
▪ Bachelor of Nursing.	17	42.5
Experience years:		
▪ Less than 2 years.	7.0	17.5
▪ 2 – 5 years.	9.0	22.5
▪ 6 -10 years.	9.0	22.5
▪ More than 10 years.	15	37.5
Training Workshop:		
▪ Yes	27	67.5
▪ No	13	32.5

Table (2):Pre-Post Knowledge Assessment of the Nurses about the Intravenous Catheter

Variables	Excellent %	Very Good %	Good %	Fair %	Weak %	X ² P. Value
Definition of Canula:						
▪ Pre.	2.5	25	37.5	25	10.0	15.25
▪ Post	20	30	40	10	0.0	P<0.05*
Correct site of canula:	15.0	10.0	47.5	15.0	12.5	19.25
▪ Pre.	27.5	42.5	22.5	7.5	0.0	P<0.05*
▪ Post.						
How to choose the vein:	2.5	20	42.5	30.0	5.0	22.75
▪ Pre.	25	40	27.5	7.5	0.0	P<0.000**
▪ Post.						
Objectives of canula dressing:	5.0	12.5	30.0	45.0	7.5	23.25
▪ Pre.	27.5	40.0	22.5	7.5	2.5	P<0.000**
▪ Post.						
Canula and drug complications:	10.0	15.0	32.5	40.0	2.5	19.75
▪ Pre.	20.0	40.0	30.0	7.5	2.5	P<0.05*
▪ Post.						

Table (3): Pre- Post Knowledge Assessment of the Nurses about the Phlebitis

Variables	Excellent %	Very Good %	Good %	Fair %	Weak %	X ² P. Value
Definition and types of phlebitis:	10.0	7.5	32.5	45.	5.0	25.25
▪ Pre.	22.5	32.5	35.0	10.0	0.0	P<0.000**
▪ Post.						
Causes of phlebitis:						
▪ Pre.	10.0	2.5	32.5	50.0	5.0	33.75
▪ Post.	22.5	32.5	32.5	12.5	0.0	P<0.000**
Signs &Symptoms :						
▪ Pre.	10.0	10.02	32.5	42.5	5.0	21.75
▪ Post.	22.5	27.5	40.0	10.0	0.0	P<0.000**

Table (4): Pre / Post Practical evaluation of the Nurses about the Intravenous Catheter

Variables	Pre %	Post %	X ² P. Value
Hand washing before procedures:			
▪ Done	15.0	62.5	6.7
▪ Not done	85.0	37.5	P<0.05*
Follow sterile technique during the procedure:			
▪ Done	72.5	95.0	5.5
▪ Not done	27.5	5.0	P<0.05*
Use tourniquet correctly :			11.7
▪ Done	62.5	85.0	P<0.000**
▪ Not done	37.5	15.0	
Making alcohol in one direction:			0.04
▪ Done	22.5	25.0	P >0.05
▪ Not done	77.5	75.0	
Correct vein angle :		67.5	4.6
▪ Done	52.5	32.5	P<0.05*
▪ Not done	47.5		
Fix canula in its place:			3.07
▪ Done	75.5	97.5	P<0.05*
▪ Not done	25.0	2.5	
Correct discard :			9.5
▪ Done	62.5	87.5	P<0.000**
▪ Not done	37.5	12.5	
Hand washing after use:			1.1
▪ Done	62.5	92.5	P >0.05
▪ Not done	37.5	7.5	

Table (5): Pre and post nurses' practice score level

	Pre Test Scores	Post Test Scores	P-Value
Mean ± SD	62.67 ± 20.88	87.65 ± 9.62	P<0.000**

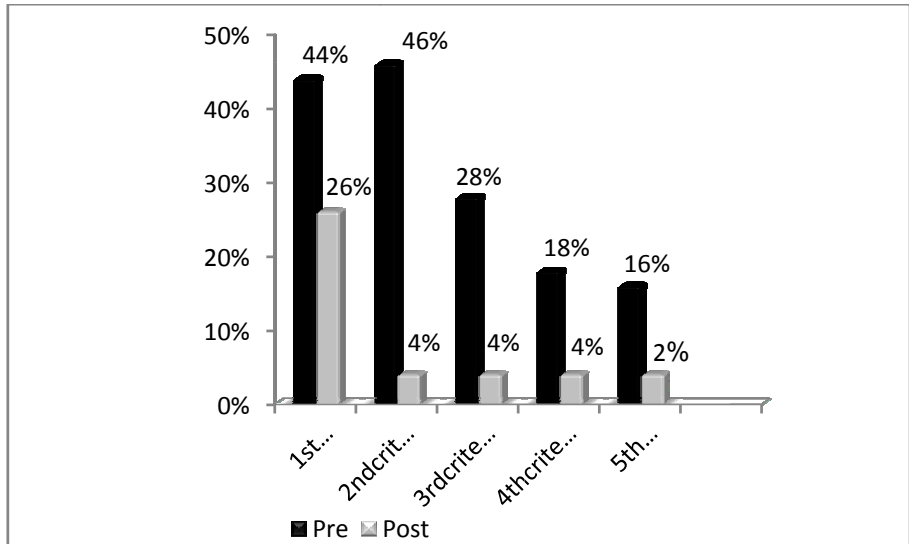


Figure (1): Pre & Post Percent of Phlebitis of The studied Sample of Patients

Table (6): Relationship between Phlebitis Degree of the Studied Sample of the Patients and Factors affecting it

Variables	1 st	2 nd	3 rd	4 th	5 th
	criteria1 +1 %	Criteria 2+ %	Criteria 3+ %	criteria 4+ %	criteria 5+ %
Patients age :					
▪ Less than 20 years.	45.0	30.0	25.0	25.0	25.0
▪ 20- 30 years..	37.5	37.5	16.7	16.7	16.7
▪ 30- 40 years..	25.9	25.9	11.1	7.4	0.0
▪ More than 40 years.	44.8	10.3	13.8	0.0	0.0
P. Value	P>0.05	P>0.05	P>0.05	P<0.05*	P<0.000**
Amount of injected solution					
▪ Less than 500ml/24h.-	38.7	12.9	12.9	3.2	0.0
▪ From 1000-2000ml/24h.	25.9	27.8	13.0	9.3	7.4
▪ More than 2000ml/24h.-	85.7	42.9	35.7	35.7	35.7
P. Value	P<0.000*	P>0.05	P>0.05	P<0.000*	P<0.000**
Number of IV catheter:					
▪ Only one	38.9	0.0	11.1	5.6	0.0
▪ From 2 - 3.	34.4	40.8	22.4	16.3	16.3
▪ More than 3	42.4	15.2	9.1	6.1	3.0
P. Value	P>0.05	P<0.000*	P>0.05	P>0.05	P<0.05*

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