

## ■ Basic Research

### Training Program to Avoid Common Pitfalls Among Nurses During Blood Transfusion Process

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#### Abstract

Blood transfusion is the direct administration of whole blood and/ or blood components. Nurses play a crucial role in the administration of blood transfusions, with correct and safe usage of blood and its components the probability of incidence of blood transfusion risks will be reduced to a minimum rate. **Aim of the Study:** to assess the effect of training program to avoid common pitfalls among nurses during blood transfusion process. **Subjects and methods:** Quasi experimental one group pretest– posttest design was used to conduct the present research. **Setting:** it was conducted at Damanhour National Medical institute, Alexandria University Hospital, Cairo university: Kasr Eleiny Emergency Hospital, Ministry of Health: Mukatam Hospital, and The Arab Contractors private hospital. Purposeful sample, 111 nurses in the mentioned settings were included in the study. **Tool:** " Blood transfusion questionnaire ", Part A; "Demographic characteristics of nurses ", Part B; " Issues Relating to Patient Preparation for blood transfusion ", Part C; " Nurses' Knowledge about blood pack collection", Part D: " Nurses' Knowledge about Pre-Transfusion Initiation Nursing Activities ", Part E "Nurses' Knowledge about Post Transfusion Initiation Nursing Activities and Issues", Part F" Nurses' Knowledge about Complications related to Blood Transfusion" and Part G" Nurses' Evaluation about training program". **Results:** There was statistically significant difference between pre, post and follow up evaluation of the program regarding almost all steps of issues relating to patient preparation for blood transfusion. **Conclusion:** nurses' knowledge regarding almost all steps of issues relating to patient preparation for blood transfusion was statistically significant in pre and follow-up. **Recommendation:** develop a comprehensive checklist for the essential nursing intervention regarding process of blood transfusion and enroll scheduled updated workshops about safe blood transfusion process in all hospital settings

**Keywords:** blood transfusion, process, pitfalls, nurses

## 1. Introduction

Every year, millions of people around the world undergo blood transfusions <sup>(1)</sup>. Blood transfusion is the direct administration of whole blood and/ or blood components with knowledge of appropriate administration techniques and preventing possible complications <sup>(2)</sup>. Blood products include both blood components and plasma fractionation products <sup>(3)</sup>. The purposes of transfusion are to increase blood volume, replace missing blood components (erythrocytes, thrombocytes, leukocytes, clotting factors, plasma proteins), increase blood oxygenation capacity in patients with anemia, correct lipoproteinemia, provide blood exchange, transport oxygen to tissues, to restore bleeding and coagulation disorders <sup>(4)</sup>.

The administration of blood transfusion has five interlocked phases, or stages, four of them related to nursing performances which include preparation before collecting blood units from the storage site, blood bag collection, pre-transfusion activities, post transfusion activities and monitoring to maintain patients 'safety <sup>(5)</sup>. Preparation of patient prior to blood bag collection in which nurse must check a written prescribe by physician, should provide sufficient information to patients about indication of blood transfusion, its risks and benefits and advantages. Also, patent and intravenous set must be available, pre medication and other intravenous solutions should be complete prior to blood transfusion as prescribed <sup>(6)</sup>.

Regarding blood bag collection; nurse shouldn't receive the blood unit bag if it has clots, air bubbles, or not enclosed in protective cover and she shouldn't shake the blood bag unit strongly to mix its components, it may lead to destruction of blood cells. In addition to not store blood components in nursing unit or another unmonitored refrigerator. Nurse shouldn't keep blood out of a monitored refrigerator for more than 30 minutes before transfusion is started, never warm blood in an unmonitored water bath, or sink, oven. It may cause contamination from bath water. Nurse shouldn't use microwave to warm the blood, this method may damage the blood cells and harm the patient. Red cells must not be warmed above the set point temperature of the approved device, commonly 41°C. Nurse shouldn't

allow any solution other than 0.9% normal saline to come in contact with the blood component or administration set <sup>(7)</sup> .

As regards pre-transfusion activities; the strict aseptic technique should be followed by hand washing and wearing gloves during receive the blood unit from blood service provider, when attach the blood to the client, and when disconnect the unit. Nurse should assess of IV catheter and size of vein receiving the blood is very important. Additional vital signs measurement during transfusion, including oxygen saturation, according to clinical area and hospital policy should be observed <sup>(8)</sup> .

In addition, nurse must flush the IV line with normal saline 0.9% if transfuse more than one blood unit and she shouldn't add medications, including those intended for IV use, to blood or components. Nurse shouldn't infuse through the same administration set as the blood component, never administer a blood component without the appropriate blood filter, she should change blood tubing and filter According to hospital policy and do not transfuse a single unit of blood for more than 4 hours <sup>(8)</sup> .

In relation to post transfusion activities and monitoring to maintain patients 'safety; after transfusion finishing open normal saline and flush the line again until it is patent, discard sharp needles in puncture resistant container, remove gloves and hand washing and discard the blood product bag on biological hazard waste or as agency policy instruction <sup>(9)</sup> . Blood components transfusion considered transplantation of foreign cells and expose the patient to multiple hazards, including variety of transfusion reactions, diseases, and inflammatory complications <sup>(10)</sup> .

The adverse effects and complications associated with blood transfusion includes acute hemolytic transfusion reaction, blood incompatibility, febrile non hemolytic transfusion reaction, allergic reaction, circulatory overload, transfusion related acute bacteremia reactions due to contaminated blood and delayed complications such as delayed hemolysis, viral infection, and iron overload (particularly with regular blood transfusion such as in patient with thalassemia <sup>(11)</sup> .

Studies reviewing transfusion incidents have reported that human error accounts for the overwhelming proportion of failures at the point of blood administration. Typical errors could ascend because of miscommunication between healthcare staff, poor documentation and poor compliance among healthcare professionals with pre-transfusion checking procedures, which could lead to misidentification of errors. It is important to found ways to train and support the staff involved mainly in many transfusion procedures <sup>(12,13)</sup>.

Physicians make the decision to prescribe blood and blood products. Knowledge of physicians regarding indications for transfusion and the amount of blood and blood products has an important impact on the optimal use of blood and blood products. Improper identification of patient as the main cause of mis-transfusion resulting in significant transfusion mortality may indicate similar lack of knowledge. Therefore, for nurses to provide high quality care and function effectively, they must have adequate knowledge that they actually use in practice. Bedside administration of blood is an area which mostly needs improvement. This is because transfused patients continued to receive suboptimal care without nurses questioning the evidence base for practice <sup>(14)</sup>.

Growing awareness of avoidable risk, and improved reporting systems, have led to a culture of better safety procedures as well as steps to minimize the use of transfusion. However, transfusion errors continue to occur and some serious adverse reactions continue to be unreported. Alternative approaches to patient management should be used to reduce or eliminate the need for transfusion whenever possible <sup>(15)</sup>.

Nurses play a crucial role in the administration of blood transfusions and play a significant role in correct, scientific and safe usage of blood and its components, and if they can do it correctly, the probability of incidence of blood transfusion risks will be reduced to a minimum <sup>(16)</sup>. Nurses had integral role of blood transfusion if they practice it properly, also nursing performance and safety of transfusion is reliant on nurses' knowledge and practice lead to diminish its risk <sup>(17)</sup>. The nurse if responsible for all aspects of blood transfusion therapy and must continually assess patient's response to the transfusions includes blood

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types, blood component therapy, Administration equipment and specific techniques for administering each component <sup>(18)</sup>.

The nurse who is at the point of care and therefore has an essential role in patient safety during a blood transfusion and they have an opportunity to provide essential contributions to the national transfusion safety initiatives and to nursing science by conducting research that is focused on the gaps in transfusion knowledge, surveillance and reporting transfusion adverse events <sup>(19)</sup>.

Based on these steps updated training of all nurses is needed to maximize the effect of blood transfusion and eradication of common pitfalls of blood transfusion. Training involves knowledge and practical aspects which are the common aspects of nursing care regarding blood transfusion.

### **1. Significance of the study:**

It is established worldwide that most causes of blood transfusion adverse reactions (80%) are resulted from human errors. As nurses and midwives play a significant role in the blood transfusion process, it might be claimed that a nurse's knowledge and practices about blood transfusion could influence whether or not blood transfusion procedure is safe. Assessing nurses' knowledge and behaviors can help determine if they understand and follow the recommended blood transfusion safety standards, as well as their role in hazardous transfusion responses. Nurses may perform risky blood transfusion methods or provide the wrong blood components due to a lack of expertise.

The studies regarding nurses' knowledge about blood transfusion may guide nurse managers and clinicians to develop regular in-service training to ensure safe blood transfusion administration. Therefore, the aim of the present study was to assess the effect of training program to avoid common pitfalls among nurses during blood transfusion process.

### **Aim of the Study:**

The present study aims to assess the effect of training program to avoid common pitfalls among nurses during blood transfusion process.

### **2. Hypothesis:**

Nurses who receive the proposed nursing training program will exhibit less/no common pitfalls during blood transfusion process.

### **5. Subjects and methods:**

#### **5.1. Research design:**

Quasi experimental pretest– posttest design was used to conduct the present research.

#### **5.2. Setting:**

This study was conducted at Damanshour National Medical institute (hematemesis unit), Alexandria University Hospital divided as follow (hematemesis unit, - Oncology unit, - and burn unit,) and Cairo university: Kasr Eleiny Emergency Hospital (emergency unit, and oncology unit), Ministry of Health: Mukatam Hospital, and (The Arab Contractors, oncology unit ) .

**This study was conducted at different setting divided as follow:**

<b>affiliation</b>	<b>Hospital</b>	<b>Unit</b>	<b>Number</b>
Alexandria University	Main hospital	hematemesis	10
		Oncology	15
		burn	20
Cairo University	Kasr Eleiny	Emergency	20
		oncology	20
Ministry of Health	Mukatam - Cairo	-	10
	Damanshour National Medical	Hematemesis unit	10

	institute		
Non- governmental hospitals	The Arab Contractors Private hospital	oncology	6
Total			111

### 5.3. Subjects:

The subjects of this study comprised of convenient sample, 111 nurses who were willing to participate in the study from above mentioned setting at the time of the study, to have enough number of staff to obtain proper data for the study. They were assigned to perform blood transfusion procedure in their departments (units). They received face to face training in addition to Microsoft Teams distance training.

### 5.4. Tool of the study:

One tool “Blood transfusion questionnaire” was adapted from Hijji *et al.* (2012)<sup>(20)</sup>. This tool was aimed to evaluate the effect of one day workshop related to pitfalls during blood transfusion process among nurses, it is a self-administered questionnaire, it consisted of six domains.

#### Part (A) Demographic characteristics of nurses:

It included age, gender, level of education, years of experiences, job description, and previous training about care of patients undergoing blood transfusion process.

#### Part (B) Issues Related to Patient Preparation for blood transfusion:

It consists of five questions (two questions true - false in addition to three questions multiple-choice) related to starting blood transfusion process to assess nurses' knowledge about patient preparation for blood transfusion.

#### Part (C) Nurses' Knowledge about blood pack collection:

It consists of three multiple-choice questions to nurses' knowledge about the blood pack collection and its data which related to the patient information.

**Part (D) Nurses' Knowledge about Pre-Transfusion Initiation Nursing Activities:**

It consists of six multiple-choice questions to nurses' knowledge about activities that the nurse practiced pre blood transfusion process.

**Part (E) Nurses' Knowledge about Post Transfusion Initiation Nursing Activities and Issues:**

It consists of ten multiple-choice questions to evaluate nurses' knowledge about activities that the nurse practiced immediately after the initiation activities of blood transfusion.

**Part (F) Nurses' Knowledge about Complications related to Blood Transfusion:**

It consists of four multiple-choice questions to evaluate nurses' knowledge about complications may occurs after blood transfusion.

**Part (G) Nurses' Evaluation about training program:**

It consists of six (two multiple-choice questions in addition to four open ended questions) to evaluate training program from nurses' point of view.

**Scoring system**

**Scoring system:** Total items were scored by yes = 1 or no= zero. Evaluation of practice was considered to be competent level when  $\geq 80\%$ , while incompetent level was  $< 80\%$ .

**5.5. Ethical consideration:**

An official permission was obtained from the Faculty of Nursing Dean and head of the Departments of Hospitals to conduct the study. Informed consent was taken from every nurse to participate in the study and included the right to withdrawal at any time. Confidentiality was taken into consideration regarding data collection. A code number was used instead of names.



### 5.6. Methods of data collection:

1- The tool of the study was adapted from Hijji *et al.* (2012) and modifications were done to suit the present study and used to collect data.

2-The adapted tool was submitted to a jury of five experts in the area of Medical - Surgical Nursing and Nursing Education related to the field for its content validity, their opinions were elicited regarding tool format, consistency and scoring system, based on their comments; necessary modifications were done. In addition, Reliability of the tool was asserted using Cronbach's Coefficient Alpha test ( $r = 0.89$ ).

3- A pilot study was carried out to test the study tool. It was conducted 10% of the total sample size to test the feasibility and applicability of the tool, evaluate the research plan and to determine any obstacles that may be encountered during the period of data collection; accordingly, needed modification was done. Moreover, the results of the pilot study were excluded from the original study to avoid contamination.

4-Data collection for this study was carried out at the beginning of April 2021 to the end of August 2021.

5- Educational workshop about the blood transfusion procedure was conducted in (1) session to all nurses who are divided into (7) groups; each group was from one different hospital except Alexandria main hospital and Kasr Eleiny hospital; they divided into two groups for each because the number of nurses. It was carried out through four phases (assessment, planning, implementation, and evaluation):

**Assessment phase:** The nurses were assessed in the 1st week before starting education about blood transfusion procedure by using the study tool to collect baseline data. The knowledge questionnaire sheet was filled by the nurse within 20 minutes.

- The educational workshop was developed by the researchers after extensive review of the related literature, observation of the infection control committee regarding blood transfusion procedure, needs of the nursing staff in previously mentioned Hospitals and results of the data collection. <sup>(21,22)</sup>

- An illustrative handout about the blood transfusion procedure was prepared and written in simple Arabic language as a guide for the nurses, and different methods were used as video, group discussion and power point for the training program. A booklet was given to each nurse during educational session to refresh their knowledge.

**Implementation phase:** workshop regarding blood transfusion was implemented by the researchers, it was one session as the following:

**The session:** was given to the nurses regarding knowledge about blood transfusion procedure preparation for transfusion, blood Pack Collection, pre-transfusion initiation nursing activities, post transfusion initiation nursing activities and issues, complications related to blood transfusion, through:

1. Time and place of implementation were selected, prepared with the needed presentation equipment. In addition to online meeting for ensuring knowledge.
2. Time and place for the training program was announced by the infection control committee to all hospital units.
3. Session was one hour: first 10 minutes for introduction and learners' expectations. The next 20 minutes for program presentation, 10minutes for discussion and 10 minutes video show and comments. The 10 minutes for feedback.

**Evaluation Phase:** Immediately and post one month later, the researchers were reassessed knowledge of the nurses regarding blood transfusion procedure to test if there were any improvement and retained knowledge over time among the participants by using the study tool.

## 6. Results

**Table (1)** illustrated that more than of third (32.4%) of the study group their age was between 25 to less than 35 years old. The mean age was  $31.83 \pm 8.54$  for the study group. As for gender, about three quadrants of the study group were female (71.2%). Considering studying nursing years, 41.4% of them studied nursing for three years followed by 33.3% had studied nursing four-years with mean  $3.38 \pm 0.86$ . Nearly half (47.7%) of the study group had more than ten years with mean  $11.93 \pm 8.75$ . as for working unit and more than one third of them were work at emergency unit followed by about 18% work at Obstetrics and urology & dialysis unit respectively.

**Table (2)** indicated that the majority of the study group (97.3%) cared of patient undergoing blood transfusion almost the same percent (95.5%) performed blood transfusion procedure and they work in wards where blood transfusion is performed with mean  $11.46 \pm 8.69$ . as for training program related to blood transfusion nearly half (44.1%) of the participants did not have training program related to blood transfusion, more than three quadrants (79.3%) had their information since they graduated from school, majority of them reported that they need more training and nearly half of them (44.1%) need to be trained regarding collection of blood bag and serious hazards (43.2%).

**Table (3)** revealed knowledge changes during the different study phases among the nurses. There was highly statistical significant improvement in the nurses' knowledge regarding patient preparation for blood transfusion as  $P= 0.000$  for all knowledge items at pretest and post phase; also, pretest and follow up phase.

**Table (4)** indicated knowledge changes during the different study phases among the nurses. There was highly statistical significant improvement in the nurses' knowledge regarding blood pack collection as  $P= 0.000$  for all knowledge items at pretest and post phase; also, pretest and follow up phase.

**Table (5)** mentioned knowledge changes during the different study phases among the nurses. There was highly statistical significant improvement in the nurses' knowledge regarding pre-transfusion initiation nursing activities as  $P= 0.000$  for most knowledge items at pretest and post phase; also, pretest and follow up phase.

**Table (6)** illustrated knowledge changes during the different study phases among the nurses. There was highly statistical significant improvement in the nurses' knowledge regarding post-transfusion initiation nursing activities as  $P= 0.000$  for most knowledge items at pretest and post phase; also, pretest and follow up phase.

**Table (7)** demonstrated knowledge changes during the different study phases among the nurses. There was highly statistical significant improvement in the nurses' knowledge regarding complications related to blood transfusion where  $P= 0.000$  for most knowledge items at pretest and post phase; also, pretest and follow up phase.

**Table (8)** revealed that there are statistically significant differences were found between total knowledge level at pre implementation of the program and nurses' demographic characteristics except qualification.

**Table (9)** showed that there are statistically significant differences were found between total knowledge level at post implementation of the program and nurses' demographic characteristics except age and years of study.

**Figure (1)** illustrate the changes in knowledge regarding blood transfusion among nurses during the three phases of the study. As 21.6% of the nurses had good level of knowledge regarding blood transfusion before the program compared to 84.7% and 70.3 after the training program immediately and at follow up respectively.

**Table (1): frequency and percentage distribution of demographic characteristics among studied nurses. N=111**

Items	N	%
<b>Age</b>		
< 25 years	33	29.7
25 < 35 years	36	32.4
35 < 45 years	34	30.6
45 < 55 years	8	7.2
<b>Mean ± SD</b> 31.83 ± 8.54		
<b>Gender</b>		
Male	32	28.8
Female	79	71.2
<b>How many years do you studied nursing</b>		
Two years	17	15.3
Three years	46	41.4
Four years	37	33.3
Five or more	11	9.9
<b>Mean ± SD</b> 3.38 ± 0.86		
<b>Qualification</b>		
Diploma	38	34.2
Technical	36	32.4
Bachelor Degree	37	33.3
<b>Years of experience in nursing</b>		
One year	12	10.8
>One year ≤ 5 years	25	22.5
5 years – 10 years	21	18.9
≥ 10 years	53	47.7
<b>Mean ± SD</b> 11.93 ± 8.75		
<b>Unit of working</b>		
Medical wards	10	9.0
Surgical wards	10	9.0
Pediatrics	10	9.0
Obstetrics	20	18.0
Emergency	40	36.0
Urology and dialysis ward	21	18.9

**Table (2): Frequency and percentage distribution regarding nurses' performance of blood transfusion. N= 111**

Items	N	%
<b>Did you cared of patient undergoing blood transfusion</b>		
Yes	108	97.3
No	3	2.7
<b>How long have you been working on ward(s) where blood transfusion is performed</b>		
One year	14	12.6
>One year ≤ 5 years	25	22.5
5 years – 10 years	21	18.9
≥ 10 years	51	45.9
Mean ± SD	11.46 ± 8.69	
<b>Over the past 6 months, what was the approximate number of times you performed a blood transfusion?</b>		
None at all	1	.9
1-4 times	1	.9
9-12 times	3	2.7
More than 12 times	106	95.5
<b>Did you participate in-service training program related to blood transfusion</b>		
Yes	62	55.9
No	49	44.1
<b>Did you think you need more training about blood transfusion</b>		
Yes	107	96.4
No	4	3.6
<b>What specific area(s) related to transfusion practice do you feel you would like further training/education?</b>		
Collection of blood bag	49	44.1
Administration	12	10.8
Adverse reactions	2	1.8
Serious hazards	48	43.2
<b>Sources of your information about blood transfusion</b>		
Hospital policy	9	8.1
Peers	14	12.6
In class at school	88	79.3

**Second domain (Issues Relating to Patient Preparation for blood transfusion)****Table (3): Frequency and Percentage Distribution of Nurses' Knowledge Regarding Patient Preparation for Blood Transfusion among Studied Nurses. N=111**

Items		Incorrect		Incompletely Correct		Completely correct		Pretest & Post	Posttest & follow up	Pretest & follow up
		N	%	N	%	N	%			
1. The nurse assigned to a patient in need for a blood transfusion should check the availability and patency of an intravenous access line after bringing the blood to the ward.	Pre	85	76.5	15	13.5	11	10.0	$\chi^2=174.32$ P = 0.000*	$\chi^2=3.117$ P=0.2104	$\chi^2=206.848$ P=0.001**
	Post	1	0.9	1	0.9	109	98.2			
	Follow	2	1.8	5	4.5	104	93.7			
2. Blood collection from blood bank should take place before the administration of any prescribed pre-medication(s).	Pre	32	28.8	55	49.5	24	21.6	$\chi^2=121.64$ P =0.000*	$\chi^2=3.184$ P=0.203	$\chi^2=99.725$ P=0.000**
	Post	1	0.9	5	4.5	105	94.6			
	Follow	4	3.6	9	8.1	98	88.3			
3. The nurse read the physician's request of "Give one unit of packed cells IV". What should be the nurse's immediate decision?	Pre	45	40.5	48	43.2	18	16.2	$\chi^2=148.701$ P =0.000*	$\chi^2=14.36$ P=0.007	$\chi^2=96.320$ P=0.000**
	Post	2	1.8	1	0.9	108	97.3			
	Follow	8	7.2	12	10.8	91	82.0			
4. On what issues should the patient be informed before each blood transfusion episode?	Pre	27	24.3	68	88.3	16	14.4	$\chi^2=154.629$ P =0.000*	$\chi^2=5.47$ P=0.06	$\chi^2=129.481$ P=0.001**
	Post	1	0.9	2	1.8	108	97.3			
	Follow	7	6.3	4	3.6	100	90.1			
5. When should the baseline vital signs be recorded before initiating the blood transfusion?	Pre	30	27.0	70	63.1	11	9.9	$\chi^2=167.248$ P =0.000*	$\chi^2=0.495$ P=0.780	$\chi^2=160.277$ P=0.000**
	Post	3	2.7	1	0.9	107	96.4			
	Follow	4	3.6	2	1.8	105	94.6			

Not significant at  $P > 0.05$  \*significant at  $P \leq 0.05$  \*\* Highly significant at  $P \leq 0.001$

**Third domain (Blood Pack Collection)****Table (4): frequency and percentage distribution of Nurses' Knowledge regarding Blood Pack Collection among studied nurses. N=111**

Items		Incorrect		Incompletely Correct		Completely correct		Pre & Post	Post & follow up	Pre& follow up
		N	%	N	%	N	%			
1. What information should a nurse have to ensure collecting the right blood for the right patient provided that the nurse has the patient's full name, date of birth and hospital number?	Pre	56	50.5	50	45.0	5	4.5	$\chi^2=152.91$ P=0.000**	$\chi^2=1.243$ P=0.537	$\chi^2=138.19$ P=0.000**
	Post	1	0.9	15	13.5	95	85.6			
	follow	2	1.8	20	18.0	89	80.2			
2. Which method should the nurse use to transport blood from blood bank to ward?	Pre	30	27.0	17	15.3	64	567.6	$\chi^2=38.545$ P=0.000**	$\chi^2=5.2725$ P=0.071	$\chi^2=20.245$ P=0.004**
	Post	2	1.8	17	15.3	92	82.9			
	follow	9	8.1	20	18.0	82	73.9			
3. When collecting a unit of blood from blood bank for a patient whose blood group is a positive, the nurse noted that the unit is a negative. If the collected blood is compatible with the patient blood, what action should the nurse take first?	Pre	31	27.9	70	63.1	10	9.0	$\chi^2=177.542$ P=0.000**	$\chi^2=5.885$ P=0.052	$\chi^2=153.277$ P=0.000**
	Post	1	0.9	1	0.9	109	98.2			
	follow	8	7.2	4	3.6	99	89.2			

Not significant at  $P > 0.05$  \*significant at  $P \leq 0.05$  \*\* Highly significant at  $P \leq 0.001$



**Fourth domain (Pre-Transfusion Initiation Nursing Activities)****Table (5): frequency and percentage distribution of Nurses' Knowledge regarding pre-transfusion initiation nursing activities among studied nurses. N=111**

Items		Incorrect		Incompletely Correct		Completely correct		Pre & Post	Post & follow up	Pre & follow up
		N	%	N	%	N	%			
1. On the ward after obtaining the blood pack but before starting the transfusion, what is the most important nursing action that the nurse must do with regards to patient?	Pre	80	72.1	30	27.0	1	0.9	$\chi^2=206.360$ P=0.000**	$\chi^2=4.951$ P=0.0840	$\chi^2=110.00$ P=0.000**
	Post	2	1.8	1	0.9	108	97.3			
	Follow	1	0.9	7	6.3	103	92.8			
2. When is blood warming prior to administration clinically indicated?	Pre	104	98.2	2	1.8	5	4.5	$\chi^2=198.672$ P=0.000**	NA	$\chi^2=196.2486$ P=0.000**
	Post	1	0.9	1	0.9	109	98.2			
	Follow	1	0.9	1	0.9	109	98.2			
3. A unit of blood was delivered to the ward at 4.00 PM. What is the best time by which the transfusion should start?	Pre	35	31.5	24	21.6	52	46.8	$\chi^2=67.073$ P=0.000**	$\chi^2=5.9034$ P=0.052	$\chi^2=63.044$ P=0.000**
	Post	2	1.8	2	1.8	107	6.3			
	Follow	1	0.9	10	9.0	100	90.0			
4. In the ward after obtaining a blood bag, how would you handle the blood?	Pre	97	87.4	3	2.7	11	9.9	$\chi^2=165.755$ P=0.000**	$\chi^2=0.011$ P=0.9941	$\chi^2=164.935$ P=0.000**
	Post	2	1.8	8	7.2	101	91.0			
	Follow	2	1.8	13	11.7	96	86.5			
5. Select THREE most important steps that a nurse has to follow in order to properly identify the right patient prior to initiating the transfusion	Pre	44	39.6	31	27.9	36	32.4	$\chi^2=93.632$ P=0.000**	$\chi^2=1.356$ P=0.507	$\chi^2=103.323$ P=0.000**
	Post	1	0.9	5	4.5	105	94.6			
	Follow	1	0.9	1	0.9	109	98.2			
6. What is the suitable filter size of blood transfusion set?	Pre	42	37.8	30	27.1	39	35.1	$\chi^2=142.105$ P=0.000**	$\chi^2=3.328$ P=0.189	$\chi^2=110.007$ P=0.000**
	Post	1	0.9	2	1.8	108	79.3			
	Follow	1	0.9	12	10.8	98	88.3			

Not significant at  $P > 0.05$  \*significant at  $P \leq 0.05$  \*\* Highly significant at  $P \leq 0.001$

### Fifth domain (Post Transfusion Initiation Nursing Activities and Issues)

**Table (6): frequency and percentage distribution of Nurses' Knowledge regarding post transfusion initiation nursing activities and issues among studied nurses. N=111**

Items		Incorrect		Incompletely Correct		Completely correct		Pre & Post	Post & follow up	Pre follow up
		N	%	N	%	N	%			
1. Select THREE ROUTINE nursing activities a nurse has to perform just after starting the blood transfusion until it ends.	Pre	31	27.9	20	18.0	60	54.0	$\chi^2=51.538$ P=0.000**	$\chi^2=10.269$ P=0.0058	$\chi^2=24.315$ P=0.000**
	Post	1	0.9	4	3.6	106	95.5			
	follow	6	5.4	14	12.6	91	82			
2. What may happen to a patient if rapid administration of cold blood is performed through a central venous route terminating in or near the right atrium?	Pre	21	18.9	55	49.5	35	31.5	$\chi^2=75.620$ P=0.000**	$\chi^2=4.404$ P=0.1105	$\chi^2=51.437$ P=0.000**
	Post	1	0.9	12	10.8	98	88.3			
	follow	5	4.5	18	16.2	88	79.2			
3. The doctor has prescribed a unit of blood to an adult patient. At what rate would you start this transfusion?	Pre	17	15.3	32	28.8	62	55.9	$\chi^2=50.294$ P=0.000**	$\chi^2=4.965$ P=0.0835	$\chi^2=31.205$ P=0.000**
	Post	2	1.8	2	1.8	107	76.4			
	follow	3	2.7	9	8.1	99	89.2			
4. In your ward, how do you regulate blood flow rate?	Pre	33	29.7	11	9.9	67	60.4	$\chi^2=32.792$ P=0.000**	$\chi^2= 6.02$ P=.0492	$\chi^2=16.239$ P=0.000**
	Post	2	1.8	18	16.2	91	82			
	follow	10	9.0	20	18.0	81	73			
5. For continuous multiple blood transfusions, what is the maximum duration each blood administration set could be used?	Pre	54	48.6	13	11.7	44	39.6	$\chi^2= 76.553$ P=0.000**	$\chi^2=13.364$ P=0.0012	$\chi^2=39.795$ P=0.000**
	Post	1	0.9	7	6.3	103	92.8			
	follow	12	10.8	14	12.6	85	76.5			
6. A unit of blood intended for an adult patient was removed from blood bank at 4.00 PM. What is the maximum duration when the unit should be totally consumed by the patient?	Pre	42	37.8	8	7.2	61	54.9	$\chi^2=58.090$ P=0.000**	$\chi^2=1.0185$ P= 0.6009	$\chi^2=53.961$ P=0.000**
	Post	1	0.9	1	0.9	109	98.2			
	follow	1	0.9	3	2.7	107	96.4			
7. Slow blood transfusion should be considered for which of the following patients?	Pre	17	15.3	77	69.4	17	15.3	$\chi^2=144.410$ P=0.000**	$\chi^2=0.115$ P=0.943	$\chi^2=140.917$ P=0.000**
	Post	1	0.9	4	3.6	106	95.5			
	follow	1	0.9	5	4.5	105	94.6			
8. Specify which of the following solutions/agents could be safely mixed with transfusion of blood	Pre	15	13.5	35	31.5	61	54.9	$\chi^2=49.016$ P=0.000**	$\chi^2= 0.8612$ P=0.6501	$\chi^2=41.6728$ P=0.000**
	Post	1	0.9	4	3.6	106	95.5			
	follow	1	0.6	7	6.3	103	92.8			
9. A unit of blood was initiated at 2.00 PM and is expected to be completed at 5.00 PM. When should the patient's vital signs be recorded after initiation until completion?	Pre	12	10.8	55	49.5	44	39.6	$\chi^2=79.019$ P=0.000**	$\chi^2=1.787$ P=0.4091	$\chi^2=64.613$ P=0.000**
	Post	1	0.9	4	3.6	106	95.5			
	follow	2	1.8	8	7.2	101	91.0			
10. When and for how long it is essential to physically observe the patient for possible transfusion reaction?	Pre	17	15.3	23	20.7	71	64	$\chi^2=22.163$ P=0.000**	$\chi^2= 2.126$ P=0.3452	$\chi^2=23.987$ P=0.000**
	Post	1	0.9	9	8.1	101	91.0			
	follow	4	3.6	11	9.9	96	86.5			

Not significant at  $P > 0.05$  \*significant at  $P \leq 0.05$  \*\* Highly significant at  $P \leq 0.001$

**Sixth domain (Complications Related to Blood Transfusion)****Table (7): Frequency and percentage distribution of Nurses' Knowledge regarding complications related to blood transfusion among studied nurses. N=111**

Items		Incorrect		Incompletely Correct		Completely correct		Pre & Post	Post & follow up	Pre & follow up
		N	%	N	%	N	%			
1. What interventions could minimize the risk of the patient experiencing acute transfusion reaction?	Pre	70	63.1	34	30.6	7	6.3	X <sup>2</sup> =169.943 P=0.000**	X <sup>2</sup> =11.258 P= .003*	X <sup>2</sup> =132.173 P=0.000**
	Post	3	2.7	4	3.6	104	93.7			
	Follow	4	3.6	19	17.1	88	79.3			
2. What signs and symptoms indicate that the patient is developing an acute hemolytic transfusion reaction?	Pre	65	58.6	43	38.7	3	2.7	X <sup>2</sup> =161.365 P=0.000**	22.364 0.000**	X <sup>2</sup> =89.725 P=0.000**
	Post	3	2.7	12	10.8	96	86.5			
	Follow	15	13.5	31	27.9	65	58.6			
3. What should be done IMMEDIATELY when signs and symptoms of acute hemolytic transfusion reaction are seen?	Pre	80	72.1	20	18.0	11	9.9	X <sup>2</sup> =174.273 P=0.000**	NA	X <sup>2</sup> =174.273 P=0.000
	Post	1	0.9	1	0.9	109	98.2			
	Follow	1	0.9	1	0.9	109	98.2			
4. Due to an emergency situation, a unit of blood collected at 8.00 PM was kept in the nurses' station until 9:30 PM. What should the nurse do with the blood?	Pre	42	37.8	60	54.1	9	8.1	X <sup>2</sup> =180.904 P=0.000**	NA	X <sup>2</sup> =177.1203 P=0.000**
	Post	1	0.9	1	0.9	109	98.2			
	Follow	1	0.9	2	1.8	108	97.3			

Not significant at  $P > 0.05$  \*significant at  $P \leq 0.05$  \*\* Highly significant at  $P \leq 0.001$  NA: No statistics available

**Table (8): Relationship between nurse's total knowledge level at pre implementation phase and their demographic characteristics.**

Item	Nurse's total knowledge pre implementation of program						X <sup>2</sup>	P value
	Poor N = 21		Average N =66		Good N =24			
	N	%	N	%	N	%		
<b>Age</b>								
< 25 years	5	23.8	21	31.8	7	29.2	16.1209.	.0131*
25 < 35 years	11	52.4	19	28.8	6	25.0		
35 < 45 years	3	14.3	25	37.9	6	25.0		
45 < 55 years	2	9.5	1	1.5	5	20.8		
<b>Gender</b>								
Male	7	33.3	24	36.4	1	4.2	9.1484	.0103*
Female	14	66.7	42	63.6	23	95.8		
<b>How many years do you studied nursing</b>								
Two years	3	14.3	13	19.7	1	4.2	22.6843	.000**
Three years	5	23.8	22	33.3	19	79.2		
Four years	11	52.4	25	37.9	1	4.2		
Five years	2	9.5	6	9.1	3	12.5		
<b>Qualification</b>								
Diploma	8	38.1	23	34.8	7	29.2	5.4696	.2424
Technical	7	33.3	17	25.8	12	50.0		
Bachelor Degree	6	28.6	26	39.4	5	20.8		
<b>Years of experience in nursing</b>								
< One year	3	14.3	7	10.6	2	8.3	17.607	.007*
One year ≤ 5 years	9	42.9	14	21.2	2	8.3		
5 years – 10 years	3	14.3	17	25.8	1	4.2		
≥ 10 years	6	28.6	28	42.4	19	79.2		
<b>Unit of working</b>								
Medical wards	7	33.3	2	3.0	1	4.2	19.799	.011*
Surgical wards	1	4.8	7	10.6	2	8.3		
Pediatrics	2	9.5	4	6.1	4	16.7		
Obstetrics	3	14.3	15	22.7	2	8.3		
Emergency	7	33.3	24	36.4	9	37.5		
Urology and dialysis ward	1	4.8	14	21.2	6	25.0		

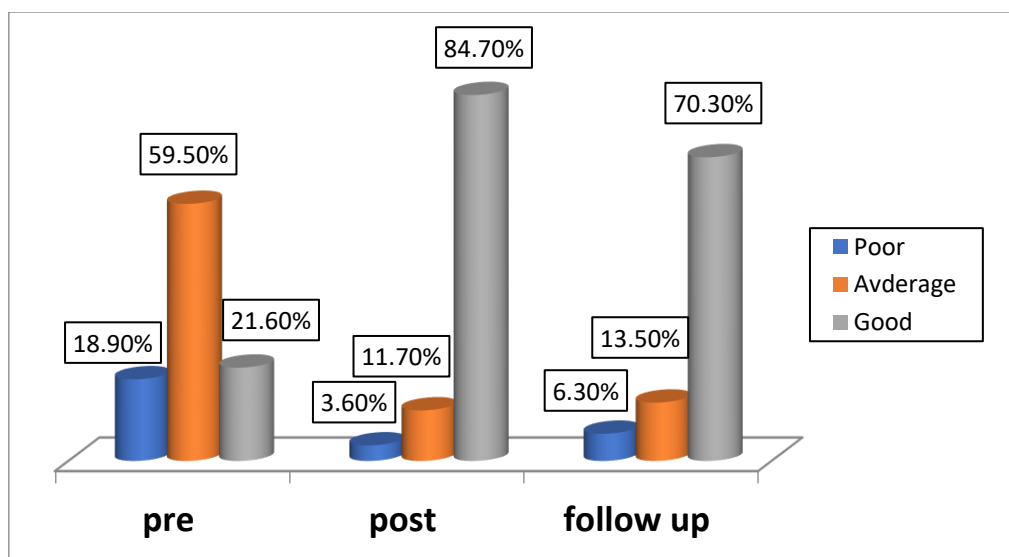
Not significant at P > 0.05    \*significant at P≤0.05    \*\* Highly significant at P≤0.001

**Table (9): Relationship between nurse's total knowledge level at post implementation phase and their demographic characteristics.**

Item	Nurse's total knowledge						$\chi^2$	P value
	Poor N = 4		Average N = 12		Good N = 95			
	NO	%	NO	%	N	%		
<b>Age</b>								
< 25 years	1	25.0	3	23.1	29	30.9	7.3632	.2885
25 < 35 years	1	25.0	6	46.2	29	30.9		
35 < 45 years	1	25.0	1	7.7	32	34.0		
45 < 55 years	1	25.0	3	23.1	4	4.3		
<b>Gender</b>								
Male	2	50.0	7	53.8	23	24.5	5.710	.0575*
Female	2	50.0	6	46.2	71	75.5		
<b>How many years do you studied nursing</b>								
Two years	1	25.0	2	15.4	14	14.9	2.669	.8491
Three years	1	25.0	4	30.8	41	43.6		
Four years	1	25.0	5	38.5	31	33.0		
Five years	1	25.0	2	15.4	8	8.5		
<b>Qualification</b>								
Diploma	2	50.0	10	76.9	26	27.4	15.28	.004*
Technical	1	25.0	1	7.7	34	35.8		
Bachelor Degree	1	25.0	1	7.7	35	36.8		
<b>Years of experience in nursing</b>								
< One year	1	25.0	4	30.8	7	7.4	15.253	.0183*
One year ≤ 5 years	2	50.0	5	38.5	18	19.1		
5 years – 10 years	1	25.0	3	23.1	17	18.1		
≥ 10 years	0	0.0	1	7.7	52	55.3		
<b>Unit of working</b>								
Medical wards	1	25.0	3	23.1	6	6.4	24.211	.002*
Surgical wards	1	25.0	5	38.5	4	4.3		
Pediatrics	0	0.0	1	7.7	9	9.6		
Obstetrics	0	0.0	1	7.7	19	20.2		
Emergency	1	25.0	1	7.7	38	40.4		
Urology and dialysis ward	1	25.0	2	15.4	18	19.1		

Not significant at  $P > 0.05$     \*Significant at  $P \leq 0.05$     \*\* Highly significant at  $P \leq 0.001$

Figure (1): percentage distribution of total knowledge at pre, post and follow implementation of the program.



## 7. Discussion

Blood transfusion is a common therapy for different patients. Proper blood transfusion practices could be a lifesaving aspect. One of the challenges faced by health organizations supporting blood transfusion is to prevent common pitfalls among health care workers during blood transfusion process and ensuring that all nurses are aware of the risks, benefits and principles of administration of blood and blood products, and practice accordingly in order to prevent many pitfalls that could be hazardous to patient's life <sup>(21)</sup>. Comprehensive training of nurses and all specialized health care workers on these practices is the best method to eliminate common blood transfusion errors which minimize patients' blood transfusion hazards <sup>(20-24)</sup>.

As for nurses' knowledge regarding patient preparation for blood transfusion among studied nurses; blood collection from blood bank should take place before the administration of any prescribed pre-medication(s), blood collection from blood bank should take place before the administration of any prescribed pre-medication(s), nurse read the physician's request of "Give one unit of packed cells IV", and when should the baseline vital signs be recorded before initiating the blood transfusion were significant in pre and follow up where the majority of nurses had it correctly in post and slightly lower percent in follow up. This may be related to the fact that most of nurses in the study worked in units practicing blood transfusion for more than 11 years and practicing blood transfusion for 12 times which give them the proper steps of patient preparation. These results are in line with Elewa A, Elkattan, 2017 who found that there is highly

statistically significant difference in nurses' knowledge regarding blood transfusion after the educational program than before it. continuous education, presence of posters, and guidelines in different units provided after the educational program <sup>(25)</sup>. The reason for absences of statistical significance in post may be related to the fact that the results were higher in post then slightly decreased in follow up which may be related to the fact that by time some data may be lost but level of retention still high.

Regarding nurses' knowledge regarding blood pack collection among studied nurses including what information should a nurse have to ensure collecting the right blood, proper method that should be used to transport blood from blood bank to ward and first action if the collected blood is compatible with the patient blood. It was noticed that mostly nurses in pretest had incomplete correct answers then became correct answers in post and in follow up the majority of the still had correct answers but slightly lower than post. It may be related to the nurses tended to use one identification method only most of the time "first and sur name" but within workshop they realized that many pitfalls could arise from poor identification, so they started to apply more than one method for proper identification and at the same time they tried to develop new form of patient identification in the request and apply it already. On the other hand, around half of nurses knew the proper method that should be used to transport blood from blood bank to ward, about half of nurses had correct complete then the majority in post nearly and decreased to about three quarters in follow up may be due to lack of knowledge of important of using the appropriate method of transportation. On the contrary, regarding action if the collected blood is compatible with the patient blood, what action should the nurse take first the correct complete answer was less than tenth in pre may be related to lack of priority in nursing care in this situation. These results were in harmony with Hijji et al (2012) who found that many nurses were not aware of patient preparation before blood bag collection <sup>(20)</sup>. These results may be explained by their need of further education in the area of collection of blood bag as shown in their demographic profile and the nature of their working in units with high rate of turnover of patients who need blood transfusion thus make then in a hurry to accomplish all of the requests within time.

In relation to nurses' knowledge regarding pre-transfusion initiation of nursing activities, regarding the most important nursing action that the nurse must do with regards to patient after obtaining the blood pack but before starting the transfusion, if

blood warming prior to administration clinically indicated and after obtaining a blood bag, how would nurse handle the blood; nearly all nurses had incorrect answer in pretest, the majority of them had it correct in post and follow up. This may be related to the positive effect of component of the workshop with application of knowledge into practice within very short time. At the same time nurses in the study had given materials that contains steps of blood transfusion process within the unit which provide continues reminding of the correct steps. On the other hand, regarding correct time of starting transfusion of unit of blood after delivering to the ward, THREE most important steps that a nurse has to follow in order to properly identify the right patient prior to initiating the transfusion and the suitable filter size of blood transfusion set about two thirds of nurses had complete correct answer in the pretest while in posttest and follow up test more than nine tenths complete correct answer. These may be related to that the main concern of nurses in the ward was to transfuse the blood as soon as possible when patient temperature was average and blood pack temperature is suitable regardless time between receiving blood pack and its transfusion because of the work overload. These results were in harmony with Elewa et al who found that Level of nurses' practice pre/post program implementation improved almost by double ratio <sup>(25)</sup>, Azdiana et al who mentioned that poor and inadequate knowledge regarding blood transfusion procedures and risks among healthcare professionals, especially in nurses which clarify the positive effect of training program <sup>(26)</sup> And Darbandi et al who recommended implementation of an educational/training program for professionals working in the blood transfusion establishments or hospitals in some countries including Egypt <sup>(27)</sup>.

Regarding post transfusion initiation nursing activities and issues including what three routine nursing activities a nurse has to perform just after starting the blood transfusion until it ends, rate of starting transfusion, rate regulation, maximum duration of transfusion, what solutions/agents could be safely mixed with transfusion of blood and for how long it is essential to physically observe the patient for possible transfusion reaction, they were about only half had correct complete answer in pretest and improved to be more than nine-tenths in post with slight decline in follow up. On the other hand, around one third of nurses had correct complete answer in pretest regarding What may happen to a patient if rapid administration of cold blood is performed through a central venous route, maximum duration of each blood administration set that could be used if continuous multiple blood transfusions and when should the patient's vital signs be



recorded after initiation until completion of transfusion. Surprisingly, only about eighth of nurses had correct complete answer in pretest regarding indication of slow blood transfusion that is progressed to more than nine tenths in post and follow up evaluation. In general, nurses' knowledge regarding post-transfusion initiation nursing activities centered around completing the transfusion within a reasonable time without obstruction of the cannula, patient's complaints or delaying of transfusion. After the workshop nurses realized that there are many other activities that should be followed for safe blood transfusion and to avoid common pitfalls. Nurses' progress from pre to post and follow up test may be related to their observation of the positive effect of application of workshop content especially the application was within a very short time from the workshop which makes the application easier, as well as retention of knowledge, is higher. This insufficient knowledge initially was coherent with Panchawag et al who illustrated that repeated and focused training of nurses is vital to maintain basic principles of the procedure <sup>(28)</sup>.

As for nurses' knowledge regarding complications related to blood transfusion including interventions that could minimize the risk of the patient experiencing acute transfusion reaction, signs and symptoms indicate that the patient is developing an acute hemolytic transfusion reaction, what should be done immediately if acute hemolytic transfusion reaction occurred and what should be done with a unit of blood collected at 8.00 PM and kept in the nurses' station until 9:30 PM, whereas all these items had less than tenth correct complete answer in pretest while the majority of them had correct complete answer in post and follow up evaluation. This change could be explained by what they actually practiced in the unit which showed them the benefits of the complete application of the content of the workshop as they experienced less pitfalls and complications which internalized the proper intervention all the time afterward. On the other hand, some acute hemolytic transfusion reaction manifestations could be confusing with other disorders which make it hard to be identified sometimes and the immediate intervention depends on analysis of these manifestations. Finally, regarding nurses' action due to an emergency situation of blood transfusion may be explained by their knowledge and actual application of emergency situation had stable clear. These results were in the same line with results of other studies which concluded that a decrease or elimination of most types of errors, especially those related to patient or sample misidentification, which is essential for safe and quality transfusion medicine

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practice with the positive effect of education update <sup>(29, 30)</sup>. Also, Kavaklioglu et al found in their study that the most frequent cause of hemolytic transfusion reaction is misidentification of either the blood unit to be transfused or the recipient <sup>(31)</sup>.

Regarding relation between nurse's total knowledge level at pre implementation of the program and their demographic characteristics, statistically significant difference was noted regarding years of studying nursing and years of experience in nursing where the highest poor percent was in whom studied nursing for four years (BSc) while the highest good knowledge was in whom studied nursing for three years (diploma) which may be related to the nature of work in a remarkable percentage of working staff in the setting were technical, diploma and the minority is BSc nursing degree. On the other hand, diploma nurses are the first line of patient care where blood transfusion is a basic role in their work. Consequently, the more experience the nurse had, the more knowledge they get basically from the work experience which was in consistency with the results of Ali et al who found nearly the same results regarding qualifications and experience of nurses <sup>(23)</sup>.

As for relation between nurse's total knowledge level at post implementation of the program and their demographic characteristics, statistically significant difference was noted regarding qualification and unit of working where the highest percent was average in diploma while the highest percent was good emergency unit. Thus, may be explained by the higher qualification retain the knowledge more due their nature of studying as the program refresh their knowledge that already studied before. While, the nature of work in working in emergency room enables nurses to apply knowledge into practice quicker and all the time as blood transfusion procedure is a basic task in this unit to save lives and as a preparation for surgery if needed. Consequently, the more experience the nurse had, the more knowledge they get basically from the work experience which was in consistency with the results of Ali et al who found nearly the same results regarding qualifications, experience and unit of working of nurses <sup>(23)</sup>.

The total knowledge score in pre, post and follow up test of the workshop was average in more than half, good in more than three quarters and good in less than three quarters consecutively which illustrate the positive effect of the workshop training on nurses regarding blood transfusion process as the nurses needed to eliminate the common pitfalls regarding blood transfusion from one hand for patient safety and for

their occupational safety and responsibility from the other hand. This result may be due to the ongoing interaction between nurses and patients in the hospital which gave the nurses chance to consciously apply the best knowledge into better practice regarding avoiding pitfalls during blood transfusion, the slight decline in knowledge by time usually due to the nature on human to forget little information that did not practice all the time. According to Elewa et al, training of nurses had a positive impact on improving their knowledge which reflected passively on their practice <sup>(25)</sup>.

By the end of follow up evaluation, retention of knowledge and internalization of it reflected of better practice of blood transfusion. Continuous supplying of those nurses with handout materials maintains reminding them with what to do and what to avoid which eventually minimize common blood transfusion pitfalls.

### **8. Conclusion:**

From the current study, it could be concluded that the majority of studied nurses performed blood transfusion more than 12 times over the past six months and they think they need more training about blood transfusion. Nurses' knowledge regarding almost all steps of issues related to patient preparation for blood transfusion was statistically significant in pre and follow-up.

### **9. Recommendations:**

- Develop comprehensive check list for the essential nursing intervention regarding process of blood transfusion
- Enroll scheduled updated workshops about safe blood transfusion process in all hospital settings
- Ensure comprehensive policy for process of blood transfusion including what to do if mistakes occur
- Develop handout materials as posters includes proper steps and nursing intervention regarding blood transfusion process
- Develop periodical test to identify nurses ability to avoid common pitfall blood transfusion process.

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### الملخص العربي

#### برنامج تدريبي لتجنب المخاطر الشائعة بين الممرضين والممرضات أثناء اجراءات نقل الدم

**مقدمة:** نقل الدم هو اعطاء المريض الدم الكامل و / أو مكونات الدم، حيث ان نقل الدم يعتبر احد الوسائل الحيوية لانقاذ حياة كثير من المرضى وتعويض الفاقد كما في حالات النزيف الشديد من الحوادث او نزيف ما بعد الولادة. تلعب الممرضات دورًا حاسمًا في إدارة اجراءات نقل الدم. مع الاستخدام الصحيح والأمن للدم ومكوناته ، سيتم تقليل احتمالية حدوث مخاطر نقل الدم إلى الحد الأدنى وبالتالي يستفيد المريض الاستفادة القصوى من عملية نقل الدم.

**أهداف البحث:** هدفت الدراسة الى تقييم تأثير برنامج التدريب لتجنب المخاطر الشائعة بين الممرضات أثناء عملية نقل الدم

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**افتراضات البحث:** اعضاء فريق التمريض الذين حضروا ورشة العمل سيظهرون تحسن ملحوظ فى المعلومات الخاصة بتجنب مخاطر اجراءات نقل الدم .

**عينة و طرق البحث:** شملت عينة البحث 111 ممرض وممرضة ، ، قد تم استخدام تصميم بحث شبه تجريبى من مجموعة واحده قبل وبعد الدراسه.

**أدوات الدراسة:** تم استخدام اداة واحده لجمع البيانات " استبيان نقل الدم "من 7 أجزاء ، " البيانات الديموغرافية ، " المسائل المتعلقة باستعداد المريض لنقل الدم "، " معلومات الممرضات حول جمع أكياس الدم "، " معلومات الممرضات حول أنشطة التمريض قبل نقل الدم "، " معلومات الممرضات حول أنشطة بدء نقل الدم "، " معلومات الممرضات حول المضاعفات الخاصة بنقل الدم " و " تقييم الممرضات لبرنامج التدريب ".

**النتائج:** أظهرت النتائج وجود فرق ذو دلالة إحصائية بين التقييم القبلي والبعدي والمتابعة للبرنامج فيما يتعلق بجميع خطوات القضايا المتعلقة بإعداد المريض لنقل الدم تقريباً.

**الخلاصة:** خلص البحث الحالي الى ان معلومات الممرضات فيما يتعلق بجميع خطوات المسائل المتعلقة بإعداد المريض لنقل الدم ذات دلالة إحصائية في ما قبل والمتابعة

**التوصيات:** أوصت الدراسة بإدراج قائمة مراجعة شاملة لنقاط التدخل التمريضي الأساسي فيما يتعلق بعملية نقل الدم وتطبيق ورش عمل محدثة مجدولة حول عملية نقل الدم الأمانة في جميع جلسات المستشفى لجميع اعضاء الفريق التمريضى.