

## Auditing and Re-auditing Nursing Care for Children Receiving Blood Transfusion

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### Abstract

**Background:** pediatric blood transfusion has many potential risks as infections with transmissible disease carried by the donor and transfusion-related acute lung injury which can be decreased by sufficient nursing interventions. **Aim** to audit and re-audit nursing care for children receiving blood transfusion. **Design:** descriptive research design was used. **Subjects and Method: Sample:** This study included all nurses' and nursing supervisors. **Setting:** the study was conducted in hematology unit, blood transfusion center, pediatric intensive care unit and emergency unit at Assiut University Children Hospital. **Subjects:** the study consisted of 70 pediatric nurses (No=70). **Tools:** A structured observational check-list was used by the researchers to assess nurses' performance about care of children receiving blood transfusion. Re-auditing was performed after giving guidelines to all study research. **Results:** the majority of nurses had unsatisfactory level of performance before giving brochure and had satisfactory performance level during re-auditing. **Conclusion:** Auditing nursing care for children receiving blood transfusion was revealed improved nurses' performance after distribution the designed nursing brochure. **Recommendation:** application of Job Training programs on regular basis suggested improving and updating nurses' performance related to blood transfusion among children.

**Keywords:** Auditing, Nurses' performance, Children, Blood & Blood transfusion.

### Introduction

Millions of people worldwide receive much needed and life-saving blood transfusions. In the United Kingdom (UK) alone, around 3.4 million blood components transfused every year. Whilst in general, this is a safe practice, morbidity and mortality can still occur in a small number of cases when the procedure is not followed correctly (Oldham et al., 2009) & (Hajji et al., 2013).

About 300,000 infants are born each year with thalassemia and sickle-cell disease and need regular blood transfusion. While the prevalence of these disorders of hemoglobin is unknown, there is a high requirement for regular transfusion in affected regions, particularly the Mediterranean region, Asia and North Africa (WHO, 2010).

Up to 50% of all critically ill children admitted to a pediatric intensive care unit (PICU) will receive one or more Red Blood Cell (RBC) transfusions during their stay, increasing to 75% for children whose stay exceeds 7 days. Anemia may be due to a single factor such as a nutritional deficiency or its cause may be multifactorial. Anemia results from one or more of the following events: loss of RBCs, reduction in the production of RBCs, increased destruction of RBCs, and shorter life span of RBCs (Istaphanous et al., 2011).

Blood is a crucial product in modern medical practice. Red blood cells (RBC) are utilized to enhance oxygen conveyance to tissues in situations of

hemorrhage and anemia. Red blood cell transfusion constitutes one of the pillars of treatment in the administration of anemic patients and is one of only a handful couple of medicines that satisfactorily reestablish tissue oxygenation when oxygen request surpasses supply (Wang & Klein, 2010).

Immediately following birth, all infants universally experience a decrease in hemoglobin (Hb) that results in varying degrees of anemia. Preterm infants are especially vulnerable to these processes for two reasons. First, the severity of the developmental postnatal decrease in Hb is most pronounced in the least mature infants, placing them at high risk of developing clinically significant anemia. Second, preterm infants are particularly prone to developing severe cardiorespiratory and infectious illnesses, the diagnosis and management of which requires frequent laboratory assessment, resulting in heavy phlebotomy loss (Widness, 2008).

Blood Transfusions commonly in pediatrics, particularly preterm neonates, those with hematologic malignancies or disorders, and children in pediatric intensive care units. In some high-risk intensive care populations, almost 5% of the pediatric patients receive at least one transfusion during the length of their stay. Children are quite different from adults during growth and development and present a unique set of needs to be considered in therapeutic practice when determining product type, modification, dose,

rate of delivery, and potential complications of transfusions (**Lavoie, 2011, Slonim et al., 2008**).

Red blood cell transfusions consider a common intervention with 90% of extremely low birth weight infants receiving RBC transfusions/during their stay in the neonatal unit. RBC transfusion is thought to be beneficial in neonates with acute perinatal blood loss and severe anemia; nonetheless, there is growing concern about its association with significant pathologies such as necrotizing enterocolitis (NEC) and intraventricular hemorrhage (**Baer et al., 2011, Mohamed & Shah, 2012**).

Blood transfusion practice is the administration of blood component or plasma-derived product to the patient, relative to the current requirements of national guidelines and laws. Transfusion medicine in hospitals is concerned with ensuring that, at time when transfusion is clinically indicated, the patient receives the correct blood safely (**Knowles & Cohen, 2011**).

Similarly to the adult total blood volume, these values are vital in the hospital perfusion care, including hemodynamic and pharmacologic interventions, and transfusion practices. The calculation of transfusion volumes in children is very important in order to prevent the risk of circulatory overload. In the UK, many pediatric unit protocols use a calculation of (weight of the patient in kg)  $\times$  (difference in hemoglobin [Hb] to be achieved in g/dL)  $\times$  a transfusion factor, usually either 3 or 4 (**hazinski, 2013**).

Multicenter study in United States involving 35 pediatric teaching hospitals showed that; approximately 0.95% of patients had blood transfusion reactions: children older than 2 years were the most vulnerable to this event, and most reactions were mild (**Slonim et al., 2008**).

Although many of the risks associated with blood transfusions have been recognized ever since the beginning of the use of transfusions, the emergence of HIV transmission brought the safety of the blood supply into the limelight of the public. Although challenges remain, significant advances have been made. In Egypt, having the highest recorded prevalence of HCV antibodies in the world. Prevalence of HCV was reported to be 13.9% among healthy populations. Adults have higher HCV prevalence (15.7%) than children (4.0%) (**Lehman & Wilson, 2009**).

Blood components transfusion considered transplantation of foreign cells and expose the patient to multiple hazards, including variety of transfusion reactions, diseases and inflammatory complications. The adverse effects and complications associated with blood transfusion include : 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 (**Scott et al., 2016**) & (**New, 2016**).

National Relative Review of Blood Transfusion of pediatric red cell transfusions detailed that the greater part of pediatric transfusions on non-neonatal departments were given to hematology/oncology patients. Other frequently transfused patients include those on PICU or undergoing cardiac surgery. A huge extent of children is transfused on general as opposed to master pediatric wards. Transfused children frequently have only a single transfusion during their admission and indications for transfusions ought to be followed precisely to guarantee to ensure that they are not given unnecessarily (**New et al., 2016**).

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. (**Murphy et al., 2009**) & (**Sellu et al., 2012**)

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. Both parents have parental responsibility; as a general principle they have the power to give or withhold consent to medical procedures on their children, including consent for blood transfusion (**Adams & Tolich, 2011**).

Improper identification of patient as the main cause of mistransfusion 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 (**Taylor et al., 2010**).

Blood product transfusions are a valuable health-care resource. Guidelines for transfusion exist, but variability in their application, particularly in children, remains. The quality of care associated with

blood product transfusion is threatened by avoidable error in practice, and under and over-utilization (Slonim et al., 2008).

Neonates are among the most transfused patients in the hospital but adherence to transfusion guidelines and adoption of unit-specific guidelines vary significantly. Differences exist in the criteria for transfusion, both within units between providers and across units (Baer et al., 2011).

Recent studies suggest that a significant percentage of pediatric transfusion recipients receive only one transfusion during their admission, raising the possibility that some errors may be avoidable (New et al., 2016).

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 (Murph et al., 2013).

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, and post transfusion activities and monitoring to maintain patients 'safety (Hijji et al., 2012).

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 (Bielby et al., 2011).

The blood transfusion procedure is a life-threatening procedure so, the nurse should be aware and understand the reaction process. 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 (Marianne, 2016).

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 (Davis, 2012). 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 (Ramos et al., 2008).

### **Aim of the study**

To audit and re-audit nursing care for children receiving blood transfusion.

### **Research question:**

What are the practical nursing defects related to blood transfusion at Assiut University Children Hospital?

### **Research Design**

Descriptive research design was used to carry out this study to fit the nature of the problem under investigation.

### **Setting**

The study was conducted at hematology unit, blood transfusion center, Pediatric intensive care unit and emergency unit at Assiut university children hospital.

### **Subjects**

The study subjects were (70) nurses including all nurses and nursing supervisors from the previous settings. Pediatric intensive care unit (39) Emergency unit (15) Blood transfusion center (3) Hematology unit (13) respectively.

### **Tools**

Tools of this study was developed by the researcher after reviewing the literature and consisted of two parts:

#### **Part (1): Personal characteristics of the nurses:**

This part included personal data such as (nurse's name, age, sex, unit, marital status, residence, qualification, years of experiences and training courses received).

**Part (2): Blood Transfusion Monitoring Sheet:**

This part included a structured observational checklist (Wilkinson et al., 2015) to assess nurse's performance related to blood transfusion which includes:

**Before transfusion**

Verify that informed consent had been obtained, verify the physician's instructions, noting indication, rate of infusion and any premedication orders, verify blood unit (blood group, RH, unit, time received, expired date and types of blood units), obtain vital signs (body temperature, pulse, blood pressure and respiration), obtain the blood product from the blood bank according to agency policy and warm the blood bag.

**During transfusion**

Wash hands, wear gloves, using aseptic technique, hang the blood product container on IV pole, attach the distal end of the administration set to the IV catheter, compress the drip chamber of the administration set and allow it to fill up half way, slowly open the roller clamp closest to the blood product, Using the roller clamp, adjust the drip rate, as prescribed, obtain vital signs in 15 minutes, then again in 30 minutes and then hourly while the transfusion infuses and management of abnormal reaction (fever, back pain, chills, itching, shortness of breath) if occur.

**Post Transfusion**

Discard the empty blood container and administration set in the proper receptacle according to agency policy, documentation of the date, time (in/out) of infusion, patient's reaction, administration of medication (pre/post transfusion), patient's vital signs and nursing management.

**Methods of data collection**

1. An approval was obtained from the directors of the previous settings to collect the necessary data for this study.
2. A pilot study was carried out before starting the data collection on 10% of nurses to test feasibility and applicability of tool used and they were excluded from the study sample.
3. Validity of tool was reviewed by five experts from medical and nursing staff and content validity index was 0.8.
4. Internal consistency of reliability was obtained by calculating test -retest and it was 0.70.
5. Nurse's consent for participation in the study after explaining the aim of the study and confidentiality of obtained data was taken.
6. Data were gathered through observation by using checklist. The checklist had been developed based on literature review and the current standard.
7. The period of the study covered 12 months from January 2017 to January 2018.

8. Guidelines were explained to all nurses who are directly involved in the blood transfusion process after assessing their performance to help them to overcome their defects and promote their performances and it included:

Indication for receiving blood transfusion, nursing role before a blood transfusion, nursing role during a blood transfusion and nursing role after a blood transfusion.

In addition to the potential side effects and the things all healthcare staff should be aware of when caring for someone who has had a blood transfusion and the risks and complications of a blood transfusion.

Re-auditing through observation of nurses' performance regarding care of child receiving blood transfusion by using observational checklist after one month of giving the guidelines.

**Scoring system**

To assess the performance of nurses regarding care of child receiving blood transfusion, scoring system was applied;

Each item done correctly= 2 degrees

Each incorrect or not done item= 0 degree

Total score of observation checklist were 68 degrees that divided into:

Pre-blood transfusion steps =36 degrees

During blood transfusion steps= 28 degrees

Post blood transfusion steps=4 degrees

Nurses who have lesser than 60% of total score were considered having poor level and it present among 91.4% of total nurses.

Scores from 60% to 70% were considered having satisfactory performance level and it present among 8% of total nurses.

Greater than 70% were considered having good level and none of them get it.

Statistical significance at (p-value below 0.05).

**A pilot study**

A pilot study was carried out before starting the data collection on 10% of nurses to test feasibility and applicability of tool used and they were excluded from the study sample.

**Ethical considerations**

Consent was taken from every nurse after explaining the nature and purpose of the study. Nurses were being assured that the data of this research will not be reused without second permission and they had the right to refuse to participate and/or withdrawal from the study without any rational any time. The study followed common ethical principles in clinical research and There was no risk for study subjects during application of research. Confidentiality and anonymity were assured during this study.

**Analysis of data**

Collected data were revised and coded for computerized data entry using statistical Package for

the Social Sciences (SPSS) version 19. Data were then verified prior to statistical analysis. Statistical methods were applied including descriptive statistics

such as (frequency, percentage, mean and standard deviation). P- values were considered as statistically significant when they were less than 0.05.

## Results

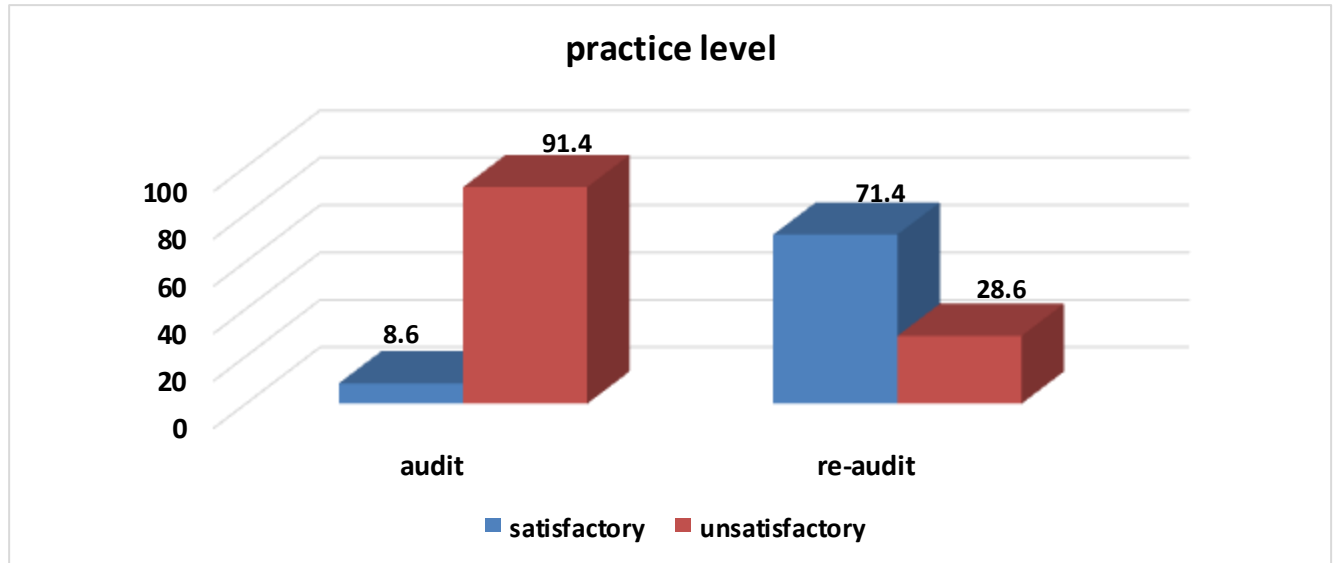
**Results of the present study were illustrated according to the following:**

1. Personal data.
2. Nurse's performance related to blood transfusion (pre, during and post procedure).
3. Relationships:
  - Relationship between nurse's performance level and their years of experience
  - Relationship between Nurse's performance level and their department
  - Relationship between Nurse's performance level and their qualification
  - It was found that; all nurses were females (100%) and all nurses didn't receive training programs related to blood transfusion.

**Table (1): Distribution of personal characteristics of studied nurses.**

personal characteristics	Group	
	No. (n=70)	%
<b>Age:</b>		
20 to < 35	58	82.9
35 to < 50	12	17.1
<b>Mean ± SD</b>	27.4±6.6	
<b>Range</b>	21 – 34	
<b>Years of experience:</b>		
< 1 year	17	24.2
1 to < 10	30	42.9
> 10	23	32.9
<b>Mean ± SD</b>	7.07±7.6	
<b>Range</b>	1 month – 14.67 years	
<b>Department:</b>		
Pediatric intensive care unit	39	55.7
Emergency unit	15	21.4
Blood transfusion center	3	4.3
Hematology unit	13	18.6
<b>Marital Status:</b>		
Single	22	31.4
Married	44	62.9
Divorced	2	2.9
Widowed	2	2.9
<b>Residence:</b>		
Rural	44	62.9
Urban	26	37.1
<b>Qualifications:</b>		
Baccalaureate degree	24	34.3
Secondary school of nursing	25	35.7
Technical institute of nursing	21	30.0





**Figure (1): Percentage distribution of nurses according to performance level in the audit and re-audit:**  
*Satisfactory=  $\geq 60\%$  of total score      Unsatisfactory=  $< 60\%$  of total score*

**Table (2): percentage of nurses with correct performance concerning Pre-blood transfusion Procedure steps during audit and re-audit.**

Items	audit		Reaudit		p-value
	No	%	No	%	
			N=7		
1. Verify that informed consent has been obtained.	4	5.7	4	5.7	---
2. Verify the physician's order.	22	31.4	67	95.7	0.001
3. Obtain the blood product from the blood bank.	70	100.0	70	100.0	---
4. Hand washing.	23	32.9	30	42.9	0.619
5. Administer any pretransfusion medications as prescribed.	65	92.9	67	95.7	0.004
6. Obtain IV fluid containing normal saline 0.9%.	0	0.0	0	0.0	---
7. Wear gloves whenever handling blood products	47	67.1	64	91.4	0.015
8. Recheck the physician's order	68	97.1	70	100.0	0.257
9. With another staff member verify the patient and blood product identification. Warm the blood bag if need.	17	24.3	44	62.9	0.097
10. Remove the blood administration set from the package. and labels the tubing with the date and time.	17	24.3	28	40.0	0.013
11. Close the clamps on the administration set.	70	100	70	100.0	---
12. Remove the protective covers from normal saline solution container port .	0	0.0	0	0.0	---
13. Hang the normal saline solution container on the IV pole.	0	0.0	0	0.0	---
14. Compress the drip chamber of the administration set.	66	94.3	70	100.0	0.053
15. Prime the administration set with normal saline.	0	0.0	0	0.0	---
16. Inspect the tubing for air. If air bubbles remain in the tubing, flick the tubing with a fingernail to mobilize the bubbles	69	98.6	67	95.7	0.704
17. Gently inverts the blood product container several times.	42	60.0	49	70.0	0.08
18. Remove the protective covers from the administration set.	70	100.0	70	100.0	---

**Table (3): percentage of nurses with correct performance during blood transfusion Procedure steps in audit and re-audit.**

Items	audit		Re-audit		p-value
	No.	%	No.	%	
19. Hang the blood product container on the IV pole.	70	100.0	70	100.0	---
20. Obtain and record the patient's vital signs, including temperature, before beginning the transfusion.	31	44.2	51	72.9	0.019
21. Wash hands and wear gloves.	25	35.7	45	64.3	0.015
22. Using aseptic technique attach distal end of administration set to the IV catheter.	33	47.1	39	55.7	0.025
23. Compress the drip chamber of the administration set.	70	100.0	70	100.0	---
24. Slowly open the roller clamp.	69	98.6	70	100.0	0.34
25. Using the roller clamp, adjust the drip rate.	51	72.9	69	98.6	0.63
26. Remain with the patient during the first 5 minutes to 30 minutes and then obtain vital signs.	45	64.3	46	65.7	0.77
27. Obtain vital signs in 15 minutes.	37	52.9	43	61.4	0.65
28. Make sure that patient's call bell or light readily available.	39	55.7	51	72.9	0.43
29. Flush the administration set with normal saline solution.	0	0.0	0	0.0	---
30. Second blood unit can be hung with same set.	67	95.7	70	100.0	0.65
31. After blood transfused clear IV tubing with normal saline.	0	0.0	0	0.0	---
32. Discard the empty blood container.	70	100.0	70	100.0	---
<b>If there is transfusion reaction</b>					
a. Stop the transfusion immediately if symptoms occur.	70	100.0	70	100.0	---
b. Disconnect the administration set from the IV catheter.	70	100.0	70	100.0	---
c. Obtain vital signs from the extremity opposite the transfusion site.	56	80.0	67	95.7	0.125
d. Maintain a patent IV catheter.	55	78.6	67	95.7	0.681
e. Notify physician when blood has been stopped.	67	95.7	70	100.0	0.584
f. Place the administration set inside a biohazard bag and send it to the blood bank immediately.	0	0.0	49	70.0	0.001
g. Obtain urine specimens according to agency policy.	2	2.9	25	35.7	0.001
h. Continue to monitor vital signs frequently.	67	95.7	70	100.0	0.657
i. Administer medications as prescribed.	70	100.0	70	100.0	---

**Table (4): percentage of nurses with correct performance concerning Post-blood transfusion Procedure steps in audit and re-audit.**

Items	audit		Reaudit		p-value
	No	%	No	%	
33. Discard the empty blood container and administration set in the proper receptacle according to agency policy.	70	100	70	100	---
34. Documentation of the date, time(in/out) of infusion, child's reaction, administration of medication (pre/posttransfusion), patient's vital signs, and nursing management.	3	4.3	37	52.9	0.081

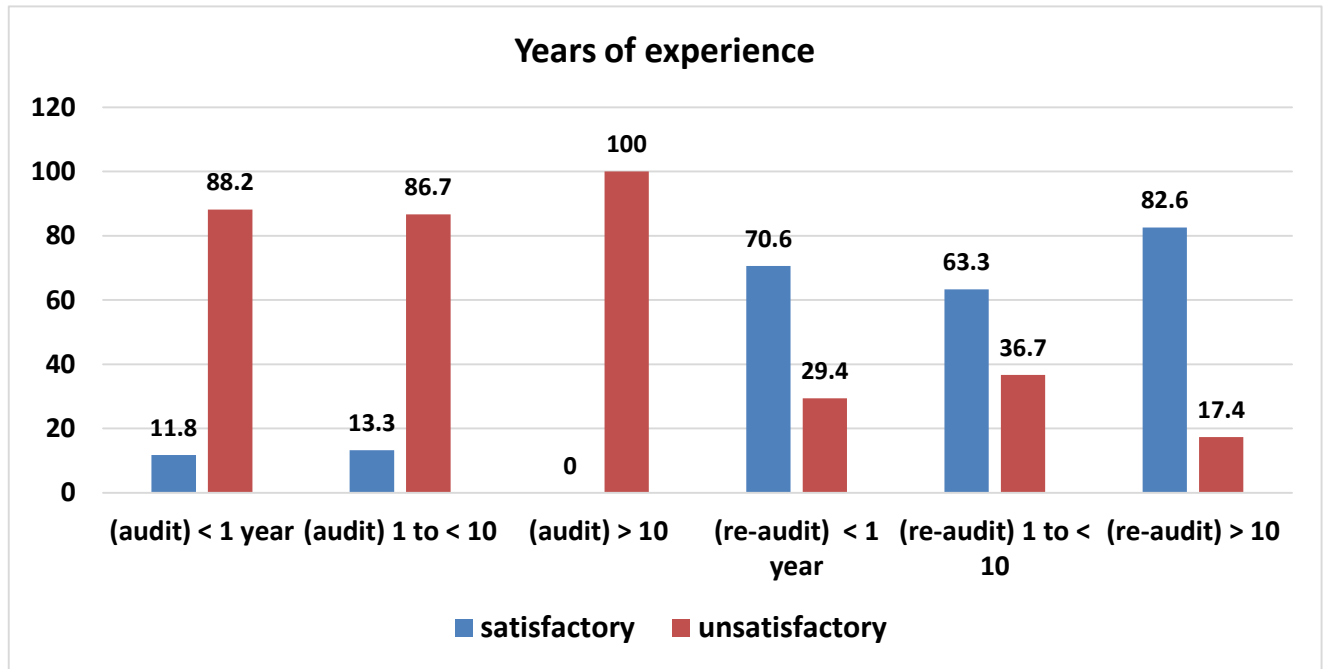


Figure (2): Relationship between Nurses performance level and their years of experience.

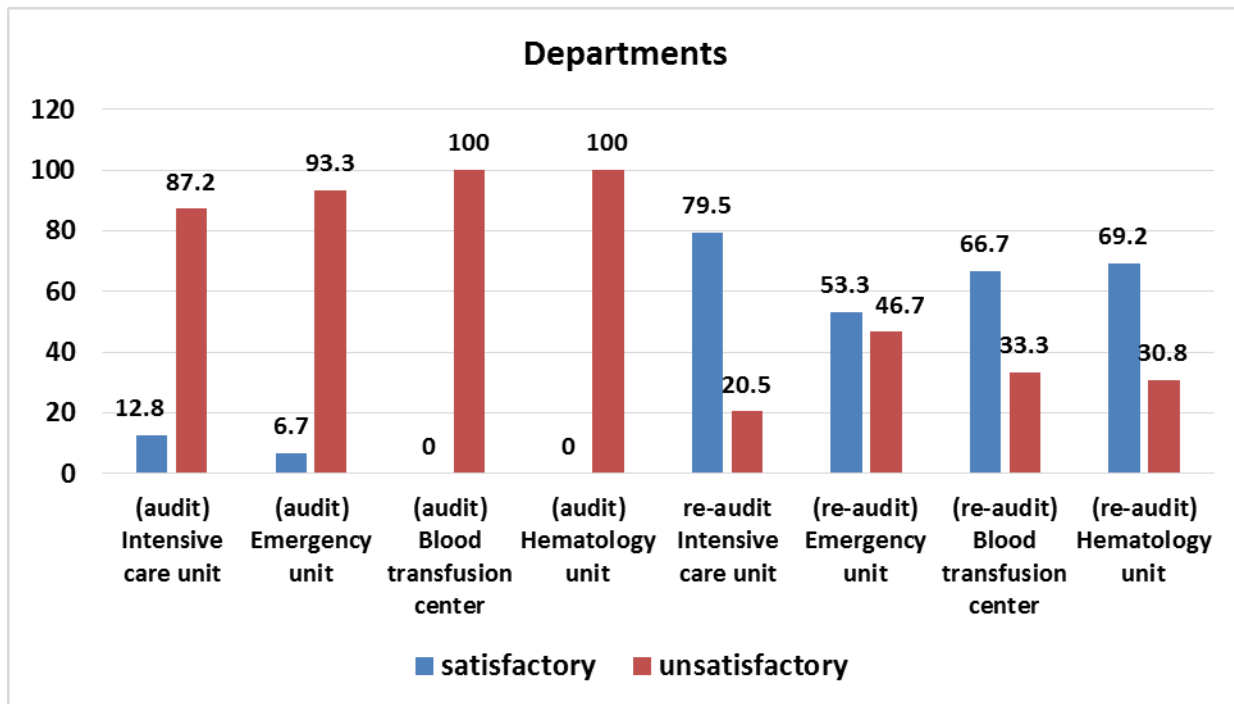


Figure (3): Relationship between Nurses practice level and their department.



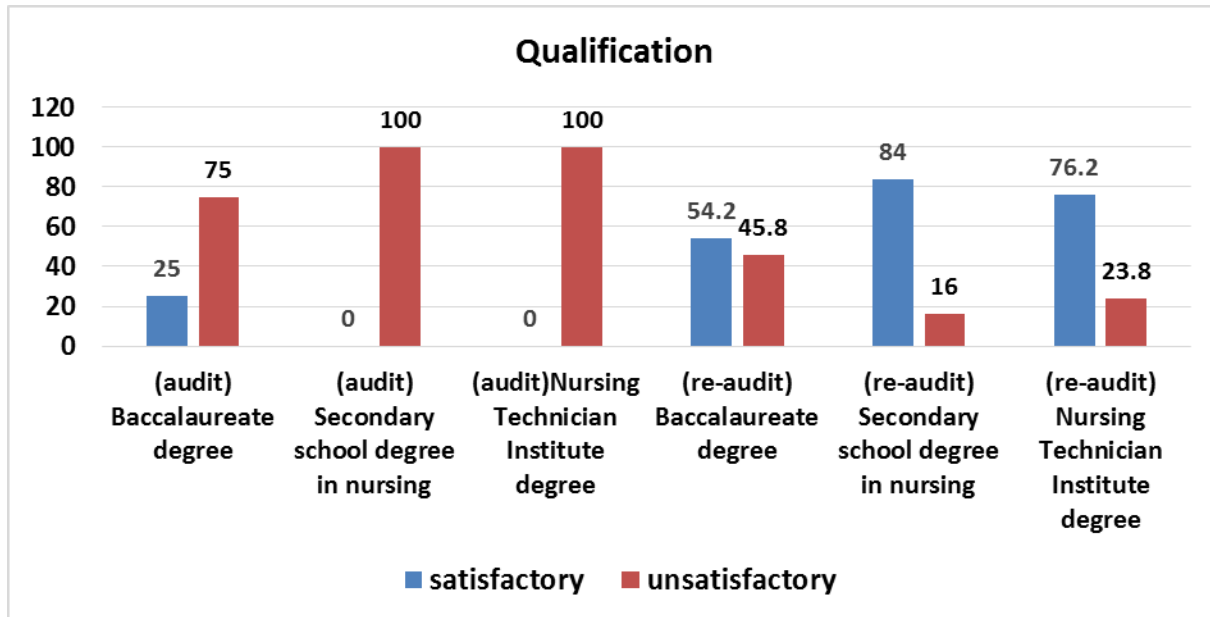


Figure (4): Relationship between Nurses practice level and their qualification.

**Table (1):** Shows the distribution of personal characteristics of studied nurses. It was found that; majority of nurses (82.9%) aged from 20 to <35 years while (17.1%) of them their ages were more than 30 years, Regarding the department, it was noticed that the percentage of nurses who were working in the studied units were 55.7%, 21.4%, 18.6% and 4.3% for Pediatric intensive care unit, Emergency unit, Blood transfusion center and Hematology unit, respectively. As for marital status; more than half of nurses (62.9%) were married, while (31.4%) of them were single and (2.9%) of them were widowed, and (2.9%) of them were divorced. It was found that more than half of nurses (62.9%) were living in rural areas, while (37.1%) of them were living in urban ones, it also shown from the table that; (35.7%) of nurses had secondary school in nursing while (34.3%) of them had baccalaureate degree in nursing, and (30%) had Technical Institute of Nursing.

**Figure (1):** Shows the percentage distribution of nurses according to performance levels. It was found that majority of nurses (91.4%) have unsatisfactory level of performance during blood transfusion while only 8.6% of them have satisfactory level. After re-auditing, it was found that about three quarters of nurses (71.4%) have satisfactory level of performance during blood transfusion while about one quarter (28.6%) of they have unsatisfactory level.

**Table (2):** Percentage of nurses with correct performance concerning Pre-blood transfusion Procedure steps in audit and re-audit. It was found that seven points from Pre-Procedure steps were

probably done with percent (>90%) which are obtaining the blood product from the blood bank according to agency policy, administering any pre-transfusion as prescribed, wearing gloves whenever handling blood products, rechecking the physician's order, closing the clamps on the administration set, inspecting the tubing for air. If air bubbles remain in the tubing, flicking the tubing with fingernail to mobilize the bubbles respectively. A set of steps which are totally neglected by the nurses were obtaining IV fluid containing normal saline 0.9%, removing the protective covers from normal saline solution container port, hanging the normal saline solution container on IV pole and priming the administration set with normal saline respectively.

**Table (3):** Percentage of nurses with correct performance during blood transfusion Procedure steps in audit and reaudit. It was found that; ten points from during procedure steps were probably done with percent (>90%) hang the blood product container on the IV pole, compress the drip chamber, of the administration set and allow it to fill up half way, slowly open the roller clamp, if another unit of blood is required, the second blood unit can be hung with the same set, discard the empty blood container and administration set in the proper receptacle according to agency policy, stop the transfusion immediately if symptoms occur, disconnect the administration set from the IV catheter, notify physician as soon as the blood has been stopped and the patient has been assessed, continue to monitor

vital signs frequently and administer medications as prescribed respectively. However, only three steps were not done by nurses: flush the administration set with normal saline, after blood transfused clear IV tubing with normal saline and place the administration set inside a biohazard bag and send it to the blood bank immediately, respectively.

**Table (4):** Percentage of nurses with correct performance concerning Post-blood transfusion Procedure steps in audit and re-audit. It was found that; all nurses (100%) discard the empty blood container and administration set in the proper receptacle according to agency policy and after the re-auditing there are more than three quarter about (52.9%) rather than only (3%) of them document the date, time (in/out) of infusion, child's reaction, administration of medication (pre/post-transfusion), patient's vital signs, and nursing management.

**Figure (2):** Shows the relationship between total nurses' performance and their years of experience. The different was found between total nurse's performance concerning blood transfusion and their years of experience. Nurses who had < 1 year of experience was 17 nurses with (30.8%) satisfactory practice and (5.6%) unsatisfactory practice while nurses who had 1 to < 10 years of experience was 30 nurses with (30.8%) satisfactory practice and (77.8%) unsatisfactory practice. Nurses who had > 10 years of experience was 23 nurses with (38.5%) satisfactory practice and (16.7%) unsatisfactory practice.

**figure (3):** Shows the relationship between total nurses' performance and their department. The different was found between total nurse's performance concerning blood transfusion and their department. Nurses who work at Intensive care unit was 39 nurses with (69.2%) satisfactory performance and (16.7%) unsatisfactory performance while nurses who work at Emergency unit was 15 nurses with (3.8%) satisfactory performance and (16.7%) unsatisfactory performance. nurses who work at Blood transfusion center was 3 nurses with (23.2%) satisfactory performance and (5.6%) unsatisfactory performance while nurses who work at Hematology unit was 13 nurses with (3.8%) satisfactory performance and (5.6%) unsatisfactory performance.

**Figure (4):** It shows the relationship between total nurses' performance and their qualification. The difference was found between total nurse's performance concerning blood transfusion and their qualification. Nurses who had Baccalaureate degree was 24 nurses with (15.4%) satisfactory performance and (88.9%) unsatisfactory performance while nurses who had Secondary school degree in nursing was 24 nurses with (44.4%) satisfactory performance and (11.1%) unsatisfactory performance while Nurses

who had Nursing Technician Institute degree was 21 nurses with (40.4%) satisfactory performance with no unsatisfactory performance.

## Discussion

Transfuse blood and its component consider most common therapeutic to save patients' life, although transfusion improve patients' life, it is not without risks. 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. (Al Nasr, 2016).

The present study revealed that; generally, nurses' performance score was low due to child care who receiving blood transfusion. About one quarter of nurses (24.3%) did not validate with another staff member the patient and blood product ID. Hogg et al., (2016) stated that the nurse ought to double-check the tags with the ABO group and Rh type and agrees with record also check that patient's blood has been cross-matched with another nurse.

During blood transfusion, nurse acting an essential role, also nurse must have acceptable performance to all steps of transfusion procedure to keep patient's safety. In the existing study all of studied sample were female and about one third were BSc in nursing. This result was in combatable with Silva et al., (2016) identified that more than two thirds of studied sample were female and have nursing bachelor's degree. The present study clarified that; most of participant did not obtain any training program; this result was in the same stroke with Ahmed (2011) who found as regarding to blood transfusion teaching program, majority of nurses did not join any.

Furthermore, recent study revealed that, Baccalaureate nurses had higher total score of performance than diploma nurses supported by Nurhusien et al., (2015) Morefore, Mohsen et al., (2016) reported that the level of performance of the nurses with baccalaureate degree is higher than the level of secondary school degree nurses. This outcome was not in the same line with Freahiywot et al., (2015) who reported that diploma nurses had two times more likely to performance when compared to those with Baccalaureate degree had knowledge and performance; due to the educational system of the nursing schools where in all three-year diploma nursing programs the percentage of practical courses is seventy to thirty percentage with thirty percentage theoretical supplement; however, in a four-year degree program the percentage of practical courses is below fifty percentage.

The current study found that all nurses included in the study reported that they had never received any training service in this field. This procedure requires

skilled and trained professionals to achieve transfusion safety. This is supported with **Valesca et al., (2016)** who documented that blood transfusion requires trained and updated professionals which enable to maintain blood transfusion safety.

In relation to age, majority of nurses aged between 20-35-years old and they had higher mean in performance score. These results agreed with **Labrague et al., (2012) & El-Sol & Badawy (2016)**. About half of nurses (44.2%) obtained vital sign including temperature before beginning the transfusion, this result was in contrast with **Khalil, et al., (2013)** who revealed that about one third of participant didn't recognize time for measuring vital signs post initiate blood transfusion.

About one fourth of nurses (37%) obtain vital signs in fifteen minutes, then again in half hour and then hourly, **Obsborn et al., (2010)** stated that the nurse should monitor vital signs, compare vital signs against base line reading.

None of nurses obtain Iv fluid containing normal saline 0.9% and after blood has transfused use it to flush line in contrast with **Hessig et al., (2014)** who stated an IV administration set should be primed with 0.9% saline solution before transfusion, the IV cannula patency confirmed with a 0.9% saline flush and the blood administration set primed then with blood.

Another area of weakness in performance was the documentation. The majority of nurses had low score related to post procedural documentation. **Rock et al., (2007) & Hill, (2016)** claimed that the lack of documentation of blood transfusions has been a problem in most hospitals for many years. **Lynn et al., (2005)** stated that documenting the procedure in patient's medical record, including patient assessment findings and any adverse reaction, document procedure in patient's medical record, document the time the infusion was started and completed, document the blood product volume and number, monitor patient for response to and effectiveness of the procedure and signature is very important.

The present study found that the majority of sample had good performance regarding how to deal with complications related to blood transfusion. This finding was in the same line with **Yaghoobi et al. (2014) & (Hussein & Ebd-Elmaged (2015)** who explained that most of studied sample had adequate performance related to complication, however this result in contrast with **Shaymaa et al., (2013)** and **Silva et al., (2016)** who observed that more than two thirds of studied sample had inadequate skills related to blood transfusion complication care.

The present study was in line with **Gray (2007)** who stated that the nurse should reverse the blood bag smoothly numerous times this step for mixing the

cells with the plasma, bare the port on the blood bag by pulling back the tube, insert the remaining Y set spike into the blood bag, open the filter to expel any residual air within the filter, close the clamp, insert firmly the Y set into the IV catheter and run the transfusion gently (10 to 15 drop/min) for first fifteen minutes.

Another zone of weakness in performance was checking that educated assent has been acquired. Formal signed assent by the parent is essential for blood transfusion **Sabto (2011)**, and he issues encompassing transfusion must be examined with the parent and patient (where age-fitting) and substantial assent was taken and recorded preceding transfusion wherever conceivable. For neonatal exchange transfusion, the British Association of Perinatal Medicine prescribes formal composed assent. (**Shaymaa et al., 2013**)

## Conclusion

**The general conclusions that can be reached from this study are as follow:**

It can be concluded that nurses working in blood transfusion center, Hematology unit, emergency unit and intensive care unit had low total score of performance as regards most of the aspects studied concerning in caring of children receiving blood transfusion.

The nurses with a baccalaureate degree had higher score of performance than other nurses with Secondary school degree in nursing and Nursing Technical Institute degree

After re-auditing a good improvement in performance were found, more than three quarter of nurses who had secondary school degree and Technical nursing institute graduates have satisfactory level of performance during blood transfusion.

The current study found that all nurses included in the study reported that they had never received any training service in this field. This procedure requires skilled and trained professionals to achieve transfusion safety.

## Recommendations

- 1- Continuous in-service training for nurses through educational programs must be established by using tools for assessment of nurse's knowledge and performance frequently to improve the procedures implementation quality and practical monitoring.
- 2- Films and audiovisual conferences about care of children receiving blood transfusion should be done.
- 3- Particular attention should be given to the practical part in the training of nurses and nursing supervisors who work in the field of care of

children receiving blood transfusion, this would help to improve nurse's skills

- 4- Educational courses given for nurses should be in Arabic, simple and small sessions and according to the level of understanding of each nurse because it is different from place to place.
- 5- Hospital should provide ongoing quality programs or workshops for nurses who are responsible of applying the blood transfusion procedure
- 6- Ongoing assessment and evaluation of nursing staff performance in infection control skills with blood transfusion procedure.
- 7- Availability of manual procedures for nurses to be aware of handling any problems that may arise.

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