Knowledge and Practice of Blood Transfusion by Nurses at Komfo Anokye Teaching Hospital, Kumasi, Ghana

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Authors' contributions

This work was carried out in collaboration among all authors. Author AKBY designed the study, contributed to data acquisition, analyzed and interpreted the data with authors AO and ONM under the supervision of authors AAO and AAD. Authors AO and ONM wrote the first draft of the manuscript. All authors read and approved the final manuscript for publication.

Article Information

ABSTRACT

Objective: To assess the knowledge and practice of nurses and midwivies in blood transfusion at Komfo Anokye Teaching. Hospital.
Methodology: This study used the descriptive cross-sectional approach with a total population of 280 Nurses and Midwives from Accident and Emergency, Surgical, Medical and Obstetric and Gyaenacology wards of Komfo Anokye Teaching Hospital. The total number of nurses and midwives working in the hospital is 1194. The sample comprised 280 nurses and midwives working in the selected wards of the hospital.

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Results: Most respondents (67.1%) had never participated in an in-service training programme on blood transfusion. Among those who had attended, 15.3% attended once, 7.1% twice, 5.1% thrice and 1.4% more than thrice. Further training needs identified by respondents included sampling (38.9%), administration of blood transfusion (35.4%), adverse reactions (46.1%) and serious hazards (35.4%). Ninety-two nurses and midwives constituting 32.4% indicated there were no written blood administration policy whiles 11.6% did not know of its existence. Among those who indicated there was blood administration policy, the majority (76.1%) had read the policy whereas 23.9% had never done so. Among those who said there was no blood administration policy or who had no knowledge of its existence, almost all except one (124) thought there was a need for one.
Conclusion: In conclusion, this study demonstrates a huge knowledge and training gap for blood transfusion among nurses and midwives at the Komfo Anokye Teaching Hospital.

1. INTRODUCTION

Blood transfusion is generally the process of receiving blood products into one's circulation intravenously. Transfusions are used for various medical conditions to replace the loss of the blood. Early transfusions used whole blood, but modern medical practice commonly uses only components of the blood, such as red blood cells, white blood cells, plasma, clotting factors, and platelets [1] Units of packed red blood cells are typically only recommended when a patient's haemoglobin level falls below 10 g/dL or hematocrit falls below 30% (the 10/30 rule). Because each unit of blood given carries risks, a trigger level lower than that at 7-8 g/dL [2] is increasingly being used and has been shown to have better patient outcomes [3].

Guidelines for blood transfusion direct that blood should not be transfused prophylactically and the threshold of transfusion is a haemoglobin level of 7.00 to 8.00 gm per deciliter. The safety directions include the selection of donors; heat treatment; solvent and detergent treatment; methylene blue addition; leucodepletion; irradiation; minimizing donor exposure and the use of American plasma and Recombinant products [4]. Though viral inactivation of cellular products is not possible with heat, pooled plasma products can be pasteurized at 80° c for 72 hours. Solvent treatment can be applied to the pooled plasma of up to 1000 donations. Methylene blue and ultraviolet B radiation can inactivate viral products and thus the addition of methylene blue to single units of plasma followed by subsequent irradiation gives the advantage of not pooling the plasma [5]. Modern leucocyte filters reduce the leucocyte count to less than 1x106. Leucodepletion seems to reduce Creutzfeldt-Jakob disease (CJD) risks too [6].

The administration of a single unit of blood is the standard for hospitalized people who are not bleeding. This treatment is then followed with re-assessment and consideration of symptoms and haemoglobin concentration [7]. Patients with poor oxygen saturation may need more blood [7].

The caution in avoiding transfusion of too much blood is, in part, due to the increasing evidence that there are cases where patients have worse outcomes when transfused [8]. One may consider transfusion for people with symptoms of cardiovascular disease such as chest pain or shortness of breath [2]. In cases where patients have low levels of haemoglobin but are cardiovascular stable, parenteral iron is increasingly a preferred option based on both efficacy and safety [9]. Other blood products are given where appropriate, such as clotting deficiencies. Transfusions of blood products are associated with several complications, many of which can be grouped as immunological or infectious. There is also increasing focus (and controversy) on complications arising directly or indirectly from potential quality degradation during storage [10]. Overall, adverse events from transfusions in the United States of America (USA) account for about $17 Billion, and in effect add more to the cost of each transfusion than acquisition and procedure costs combined [11]. While some complication risks depend on patient status or specific transfusion quantity involved, the baseline risk of complications simply increases in direct proportion to the frequency and volume of transfusion [11].

Blood transfusions are a life-sustaining and life-saving treatment but they aren't without risk. Conditions that warrant blood transfusions range from acute trauma to intraoperative blood loss to compromised blood-cell production secondary to disease or treatment. Nurse on the front line of patient care must be adept at administering blood products safely and managing adverse reactions with speed and confidence [12]. Nurses

being responsible for the final check before transfusion, have the final opportunity to prevent a miss-transfusion [13]. Blood products most often transfused by nurses include packed red blood cells, fresh frozen plasma, and platelets [14]. An understanding and knowledge of the pathophysiology of transfusion reactions, symptoms, and treatment are essential to safely administer and monitor transfusions [15]. A Failure Mode and Effect Analysis (FMEA) on the blood transfusion process to reduce the risk of problems inherent in the procedure has been developed recently to aid nurse decision making in the transfusion process [16]. Measures have been developed to analyse results and FMEA has been a valuable tool for error-trapping in the blood transfusion process. Transfusion error, resulting in the patient receiving the incorrect blood component, remains the largest risk related to transfusion. Nurses can increase compliance in high-risk areas of the transfusion process and reduce the potential for errors by developing accessible blood transfusion policies, auditable performance standards and training, and educational initiatives [17]. A study to assess the effect of a simple intervention in the form of a tag on blood bags positioned in such a way that the nurse is required to remove the tag to spike the unit reminding the nurse to check the patient's wristband has been shown that such a simple intervention is ineffective and there is a need for more stringent practice guidelines for the nurses [18]. Published guidelines highlight that most serious transfusion complications occur within the first fifteen minutes of transfusion and close monitoring has been recommended before and fifteen minutes after the commencement of each unit of blood [18]. The guidelines also recommend careful monitoring in the areas of sample collection, and pre-administration checking to avoid adverse reactions [19].

Blood transfusion errors that often occur to nurses include the following; 1. Samples being mislabelled with another patient's identity, 2. Blood sample being taken from the wrong patient. The blood transfusion errors often include administration of blood to the wrong recipient. The most important of all errors has been the failure to detect at the bedside before transfusion of the wrong unit [20]. A study has identified 1. Patient misidentification, 2. Preliminary diagnostic errors and 3.Final diagnostic errors in blood transfusion [21]. A lack of awareness of good transfusion practise has been identified as a reason for poor compliance [22]. A bar code patient identification system involving a hand-held computer for sample collection and for compatibility testing has been successfully evaluated recently to help nurses during a blood transfusion [18]. A decentralized phlebotomy skills Programme and cross-training in-patient care skills on the nursing units are effective with a reduction in errors of collection and labelling (Anson, 2000). Studies have proved that the effective and safe transfusion of blood depends on a series of linked processes and the safety measures a nurse should follow for blood transfusion includes donor selection and exclusion, post-collection processing such as leucodepletion and viral inactivation and neo technological innovations like the bar-code on the wrist band of each patient [23].

Against this background, Blood transfusion is a fundamental aspect of nursing practice and nurses' knowledge of it is essential for safe practice. Yet little is known about their blood transfusion practice and the knowledge that underpins it. The few studies that have investigated this topic previously have shown deficiencies in both knowledge and practice. To date, no such study has been carried out in the Komfo Anokye Teaching Hospital.

The transfusion process is complex, involving many interlinking chains of events, and a multidisciplinary group of health professionals with different levels of awareness and understanding of transfusion practice [24]. In recent years, many measures have been implemented to increase blood component safety and the clinical transfusion process. Haemovigilance programs report the greatest risks to patients from transfusion in many countries now relate to hospital-based steps in the process [24]. The role of the Transfusion Nurse (TN) is evolving as an integral part of efforts to optimise appropriate use of blood components, reduce procedural risks and improve transfusion practice generally [24]. The TN position is a relatively recent specialist role within hospitals and blood services and continues to develop with growing experience of areas requiring intervention in the clinical setting, and increasing expectations for improvements in transfusion clinical governance [24].

The role typically includes activities to improve clinician and patient awareness of transfusion issues and practical knowledge of blood product use, and therefore to improve clinical decision-making and enhance blood administration processes, along with responsibilities for

education/training, auditing and adverse event follow-up. Within the Blood Service in Australia the role also covers approval and provision of specialised blood products along with many of the hospital-based functions [24]. The TN serves as an expert resource and has been fundamental in the development of tools, resources and skills in the following areas: Patient blood management, Education, Governance, Professional Development and Research [24]. The nurse is clinically responsible for the donation session, with the care of the donors and the safety of the blood being their main priority. It is also the role of the nurses to supervise the donor careers, who carry out a function similar to that of health care assistants in hospitals and to ensure they deliver a first-class service. As well as providing clinical leadership for the teams, nurses are also required to provide medical assessment expertise and have a critical role to play in the care and selection of donors. A donor career will assess the suitability of the donor to a certain level but the nurse will provide advice relating to more complicated medical and travel issues. Making critical medical decisions regarding a donor's suitability to donate requires extensive training and medical knowledge [25]. Unlike other countries such as Australia where transfusion therapy is administered by the trained transfusion nurses, in Ghana and for that matter Komfo Anokye Teaching Hospital transfusion therapy is a responsibility of every nurse or midwife. Given the above, every nurse and midwife must have a fair knowledge about blood transfusion therapy. It is for this reason that the study seeks to evaluate the knowledge and practice of blood transfusion among nurses and midwives at Komfo Anokye Teaching Hospital.

2. MATERIALS AND METHODS

2.1 Study Design and Setting

The study used the descriptive cross-sectional questionnaire approach and was conducted at Komfo Anokye Teaching Hospital (KATH) in Kumasi, Ashanti Region. The Komfo Anokye Teaching Hospital is the second-largest hospital in Ghana and the only tertiary health institution in the Ashanti Region. It was the main referral hospital for the Ashanti, Brong Ahafo and northern regions of Ghana. The hospital currently has about 1000 beds up from the initial 500 when first built. The hospital has clinical and non-clinical directorates. The clinical directorates are Anaesthesia and Intensive Care Unit (ICU), Child Health, Dental, Eye, Ear, Nose and Throat (DEENT) Diagnostics, Medicine, Obstetrics & Gynaecology, Oncology, Polyclinic, Surgery, Accident and Emergency department, Pharmacy and Physiotherapy. The Non-clinical directorates are Domestic Services, Security, Supply Chain Management and Technical Services (Population and Housing Census, 2010).

2.2 Study Population / Respondents of the Study

To ensure that only pertinent data were gathered, the researcher used nurses and midwives from Accident and emergency, Surgical, Medical and Obstetric and Gyaenacology wards of Komfo Anokye Teaching Hospital as respondents. The total number of the number of nurses and midwives was 1194.

2.2.1 Inclusion criteria

944 Nurses and Midwives who were eligible for the study include those that had at least two years working experience, more clinical experiences and working in the Accident and Emergency, Medicine, Surgery and Obstetrics and Gynaecology Directorates.

2.2.2 Exclusion criteria

250 Nurses and Midwives who were on rotation or doing national service as well as enrolled nurses and other auxiliary nurses were also excluded from the study.

2.3 Sample Size and Sampling Techniques

The sample comprised 280 nurses and midwives working in the units of the hospital selected for the study. It will be reckoned that a sample size of 280 is an adequate representation of the nurses and midwives found in the hospitals.

The sample size was determined using the calculator. Net (https://www.calculator.net/sample-size-calculator.html)

Sample size : 280
Confidence Level : 95%
Margin of Error : 5%
Population Proportion: 40%
Population Size : 1194

2.4 Data Collection Tool and Data Collection Procedure

The tool used to collect data for the study was a questionnaire 46 items questionnaire. The

questionnaire was in 6 sections from sections A to F. The sections were as follows;

Section A: Demographic Details
Section B: Blood Transfusion Practices and Training Needs
Section C: issues relating to patient preparation
Section E: Post Transfusion Initiation Nursing Activities and Issues
Section F: Complications Related to Blood Transfusion

The questions were made up of mostly closed ended questions with few open ended. Each section of the questionnaire had about 7 questions averagely.

The questionnaire was administered to the participants by the researcher himself. The participants were then made to fill the questionnaires after the aim of the study was explained to them. On the spot data collection was achieved and all questionnaires from the field were then collated, checked for completeness and internal errors during data collection.

2.5 Pre-Testing

A pre-testing was carried out at Suntreso Government Hospital. Under the pretesting 10 nurses and midwives were selected. They were interviewed and questionnaire administered respectively. This exercise was carried out in order to ascertain the practicality, easy understanding of the questionnaire and the interview items. It also shown the level of clarity, presence of ambiguity which paved way for the necessary corrections to be effected.

2.6 Data Handling and Analysis

All questionnaires and interview results from the field were checked for completeness and internal errors during data collection. Questionnaires were sorted, numbered and kept in files confidentially. Data were coded and entered using SPSS software. Data were analysed using STATA 11 software. Descriptive statistics were compiled as frequencies and percentages and results were presented as graphs and tables. Associations between the various factors were tested using chi-square analysis.

3. RESULTS

3.1 Background Characteristics

Table 1 shows the background characteristics of the respondents involved in the study. The mean age of the health staffs was 26 years (standard deviation =3.75) and more than 90% were between the ages of 20 and 31 years. Most of the respondents were females (78.6%) and about 49.3% had a diploma in nursing as a qualification. About 31% and 15% had a diploma in midwifery and Bachelor of Science in nursing respectively. Only 2.4% had a masters degree.

3.2 Blood Transfusion Practices and Training Needs of Nurses and Midwives

Table 2 shows the nurses' practices and training needs about blood transfusion at the Komfo Anokye Teaching Hospital. Almost half (49%) of the respondents worked at the Obstetrics and Gynaecology ward of the hospital. About 27.2% worked at the accident and emergency ward whereas only 5.4% worked at the medical ward. Most of the respondents (54.4%) had worked at the respective ward from two to five years and the mean length of stay at the respective ward was 3years. Among 281 respondents, 18.5% had not performed any blood transfusion in the past 6years whereas 35.2% had performed up to four (4) surgical operations. Sixty-six nurses and midwives, constituting 23.5% of respondents had carried out more than 12 blood transfusions in the past six years. Most respondents (67.1%) had never participated in in-service training Programme on blood transfusion. Among those who have attended, 15.3% have attended once, 7.1% twice, 5.1% thrice and 1.4% more than thrice.

The hospital was the most cited place of in-service training on blood transfusion (64.5%) whereas 35.5% cited outside the hospital. Further training needs identified by respondents included sampling (38.9%), administration of blood transfusion (35.4%), adverse reactions (46.1%) and serious hazards (35.4%). Ninety-two nurses and midwives constituting 32.4% indicated there were no written blood administration policy whiles 11.6% did not know of its existence. Among those who indicated there was blood administration policy, the majority (76.1%) had ever read the policy whereas 23.9% had never done so. Among those who said there was no blood administration policy or who had no knowledge of its existence, almost all except one (124) suggested the need for one.

Table 1. Respondents' background information

Variables	Frequency (N=294)	Percentage
Age (n=280)		
— 21-30	267	95.4
— 31-40	10	3.6
— 41-50	3	1.1
— Mean (SD)*	26 (3.75)	
Gender (n=285)		
— Male	161	56.5
— Female	124	43.5
Nursing qualification		
— Diploma in general nursing	145	49.3
— Bachelor of Science in Nursing	44	15.0
— Diploma in midwifery	91	31.0
— Master's degree	7	2.4
— Other	7	2.4

*Source: Field data, 2015; *SD=Standard deviation*

3.3 Knowledge of Blood Transfusion among Nurses and Midwives

Tables 3 to 7 show results of knowledge of various aspects of blood administration among nurses and midwives in the Komfo Anokye Teaching Hospital. The correct responses and the respective frequency and percentage of respondents are presented. As shown in Table 3, knowledge of patient preparation was not fairly good. Most of the respondents (87.1%) were aware that nurses should check the patency and availability of an intravenous access line after bringing the blood to the ward. However, only 16.9% knew that blood collection from blood bank should NOT take place before the administration and a prescribed pre-medication. Majority of respondents were able to identify reasons for blood transfusion (87.1%) and reaction symptoms (63.9%) as issues to inform patients on before a blood transfusion episode. Only 40.5%, however, could identity possible consequences of the rejection of transfusion as an issue to inform patients on before a transfusion episode.

The knowledge of nurses and midwives about blood pack collection is shown in Table 4. Almost 60% of the respondents knew information a nurse should have to ensure collection of right blood for right patient with name, date of birth and hospital number. About 77% also correctly identified a validated blood transport box as the method nurses use to transport blood from blood bank to the ward. Knowledge on first action to take when collecting blood from a unit different from the patient blood group but the blood is compatible with the patient's blood. Only 17.7% were aware that in such instance, transfusion should be initiated but the patient must be observed and monitored.

As indicated in Table 5, the majority of the respondents were not able to correctly identify most responses related to pre-transfusion initiation. Only 47.2% for example, knew that the most important nursing action on the ward in between obtaining the blood pack and starting the transfusion is to identify the right patient. Only 30.8% and 34% also had knowledge of the period between delivery and blood transfusion at the ward and how to handle the blood in the ward after obtaining the blood bag respectively. Further, the majority of the nurses and midwives could not identify clinical indications for blood warming at the ward. Only 35.7% knew warming is indicated each time a unit of blood is to be transfused and only 29.9% knew it is indicated in rapid transfusion. Further, only 64 respondents representing 35.6% knew of the suitable filter size of blood transfusion set.

Results on the responses to questions related to post-transfusion initiation are presented in Table 6. Most of the correct responses given were below 50%. When asked about routine nursing activities from the beginning of blood transfusion till it ends, only 49.3% correctly identified setting up the flow rate; 43.2% documentation of relevant information including vital signs and 41.4% observation for a transfusion reaction. As low as eighty respondents, constituting 27.2% know of what happens to a patient upon rapid administration of cold blood through a central

Table 2. Blood transfusion practices and training needs

Variables	Frequency (N=294)	Percentage
Ward of respondent		
— Accident and emergency	80	27.2
— Surgical ward	54	18.4
— Medical ward	16	5.4
— Obstetric And Gyaenacology ward	144	49.0
Duration of service		
— <2 years	134	45.6
— 2-5years	160	54.4
— *Mean (SD)*	*3.03 (2.43)*	
Number of performed blood transfusion in past 6 years (n=281)		
— None	52	18.5
— 1-4	99	35.2
— 5-8	58	20.6
— 9-12	6	2.1
— >12	66	23.5
Ever participated in in-service training Programme? (N=280)		
— Yes	92	32.9
— No	188	67.1
Place of blood transfusion training (n=107)		
— Hospital	69	64.5
— Outside hospital	38	35.5
Specific areas further training preferred*		
— Sampling	109	38.9
— Collection of blood bag	56	20.0
— Administration	99	35.4
— Adverse reactions	129	46.1
— Serious hazards	99	35.4
— None	30	10.7
A written policy for blood administration available at the ward (n=284)		
— Yes	159	56.0
— No	92	32.4
— Don't know	33	11.6
If yes, ever read the policy? (n=159)		
— Yes	121	76.1
— No	38	23.9
If no, think there is need for one (n=125)		
— Yes	124	99.2
— No	1	0.8

*Source: Field data, 2015*Multiple responses*

Table 3. Responses related to patient preparation

Questions and correct responses	Responses	
	Frequency	Percentage
Nurse should check the availability and patency of an intravenous access line after bringing the blood to the ward		
— True	249	87.1
Blood collection from blood bank should take place before the administration of any prescribed pre-medication		
— False	48	16.9
Nurse's immediate decision after reading, "give one unit of packed cells IV"	229	81.5
— Collect the blood and clarify the order with the physician before administration		
Issues patients should be informed before each blood transfusion episode		
— Reasons for blood transfusion	256	87.1
— Reaction symptoms	188	63.9
— Possible consequences of refusing to have the transfusion	119	40.5
Time baseline vital signs be recorded before initiating the blood transfusion		
— Within 30 minutes	211	72.0

Source: Field data, 2015

Table 4. Responses related to Blood Pack Collection

Questions and correct responses	Responses	
	Frequency	Percentage
Information a nurse should have to ensure collection of right blood for right patient with name, date of birth and hospital number		
— The patient's identification details are identical on the blood bag and blood request form.	167	59.2
Method the nurses use to transport blood from blood bank to ward		
— A validated blood transport box	223	76.6
First action to take when collecting blood from a blood bank for a patient whose blood group is A positive and the nurse noted that the unit is A negative		
— Initiate the transfusion, but observe and monitor the patient closely	50	17.7

Source: Field data, 2015

Table 5. Responses related pre-transfusion initiation

Questions and correct responses	Responses	
	Frequency	**Percentages**
Most important nursing action on the ward after obtaining the blood pack but before starting the transfusion		
— Identify the right patient	137	47.2
When blood warming prior to administration is clinically indicated		
— Each time a unit of blood is to be transfused	105	35.7
— In rapid transfusion	88	29.9
— In patients with hypothermia	151	51.4
Time of beginning transfusion of a unit of blood delivered to ward at 4.00 PM.		
— 4:30 PM	88	30.8
How you handle the blood in the ward after obtaining a blood bag		
— Allow blood to wait in room temperature	97	34.0
Three most important steps that a nurse has to follow in order to properly identify the right patient prior to initiating the transfusion		
— Call patient name when possible	198	67.3
— Ensure that patient identification details match on blood bag,	235	79.9
— Compare ID band with blood bag	69	23.5
The suitable filter size of blood transfusion set		
— 170-200 micron	64	35.6

Source: Field data, 2015

Table 6. Responses related post-transfusion initiation

Questions and correct responses	Responses	
	Frequency	**Frequency**
Three routine nursing activities a nurse has to perform just after starting the blood transfusion until it ends		
— Setting up the flow rate	145	49.3
— Documentation of relevant information including vital signs	127	43.2
— Observation for a transfusion reaction	122	41.4
What happens to a patient upon rapid administration of cold blood through a central venous route terminating in or near the right atrium		
— Cardiac arrhythmia	80	27.2
Rate of starting transfusion after a doctor prescribes a unit of blood to an adult patient		
— Not more than 120 mL/ hour	82	27.9
Regulation of blood flow rate at the ward		
— Manually	167	56.8
Maximum duration each blood administration set could be used in continuous multiple blood transfusions		
— 4 hours	111	37.8
Rate of starting transfusion during the FIRST 15 minutes in order to initiate a blood transfusion SLOWLY on a 4 month-old infant		
— Not more than 2.00 mL/kg/hour	67	22.8
Maximum duration when a unit of blood should be totally consumed by the patient when it was removed from blood bank at 4.00pm		
— 4 hours	115	39.1
Patients for which slow blood transfusion should be considered		
— Patients with heart disease	140	47.6
— Patients with bronchial asthma	46	15.6
Solutions/agents that could be safely mixed with transfusion of blood		
— Normal saline 0.9%	150	51.0
When patient's vital signs be recorded after initiation until completion in situation where unit of blood was initiated at 2.00 PM and is expected to be completed at 5.00 PM		
— First hour - 2:05 and 2:15 PM		
— Second hour - 3:30 PM	129	43.9
— Third hour - 4:30 PM	84	28.6
	77	26.2
Time and duration to physically observe the patient for possible transfusion reaction		
— Throughout the transfusion	99	33.7

Source: Field data, 2015

venous route and terminating in or near the right atrium. Further, only 37.8% knew that the maximum duration each blood administration set could be used in continuous multiple blood transfusions is 4 hours and only 22.8% were also aware that the rate of starting transfusion during the first 15 minutes to initiate a blood transfusion slowly on a 4 month-old infant should not be more than 2.00 mL/kg/hour. On the other hand, a little about half of the respondents were aware that regulation of blood flow rate is done manually and 51% correctly identified normal saline 0.9% as the solutions/agent that could be safely mixed with transfusion of blood.

As shown in Table 7, knowledge level on some questions related to complications related to blood transfusion was above 50% whereas some were below. On interventions to minimize risk of experiencing acute transfusion reaction by patients, 56% correctly identified administering blood compatible with the recipient's blood. However the other responses this question were poorly identified (28.2%, 23.1% and 37.1%). With the exception of shallow respiration, the responses on signs and symptoms of acute haemolytic transfusion reaction were 50% (chest pain) or above (tachycardia, 67.7% and hypotension, 58.5%). About 57% knew that the usual presenting complain of patient who has sustained a mild allergic transfusion reaction is urticarial rash and 74.5% also knew that the first action to be taken to handle mild allergic transfusion reaction is to stop the transfusion and notify the doctor. Only 37.4% however were aware that error in blood bank testing is the commonest cause of the most fatal transfusion reactions.

Fig. 1 shows the combined responses to indicate comprehensive knowledge on blood transfusion among nurses and midwives in the Komfo Anokye Teaching Hospital. As shown, comprehensive knowledge level, which shows respondents who correctly responded to all questions, was very low. Only 17.3% for example had good knowledge of patient preparation and only 11.2% and 10.2% had good knowledge of blood pack collection and pre-transfusion initiation respectively.

3.3.1 Influence of socio-demographic factors and training needs on knowledge of blood transfusion

Table 8 and 9 present results of factors influencing knowledge of blood transfusion among nurses and midwives in the Komfo Anokye Teaching Hospital. As shown in Table 7, knowledge on patient preparation and blood pack collection were influenced by the age of respondents. With respect to patent preparation, the proportion of those with comprehensive knowledge was 30% as compared to 15.7% among those who were from 21 to 39 years. The male respondents were also more likely to respond correctly to the questions posed to tease their knowledge level. The proportion of males with comprehensive knowledge on blood transfusion complication for example was 168.6% as compared to 4% among females (p<0.001). The qualification of the nurses and midwives did not have influence on their knowledge of blood transfusion.
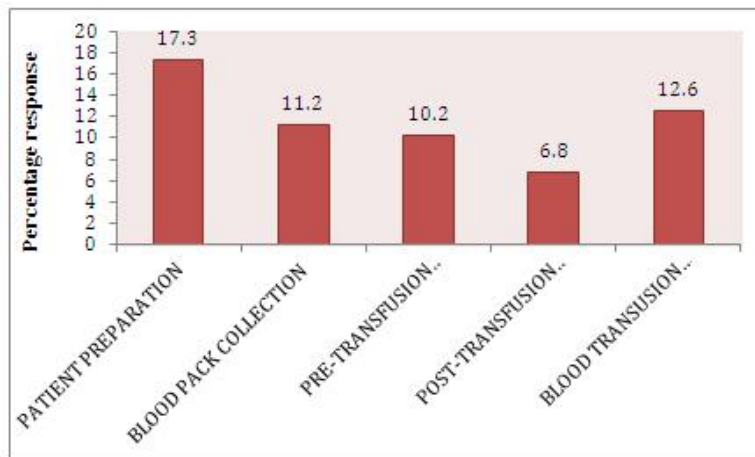

Fig. 1. Comprehensive knowledge level of blood transfusion
Source: Field data, 2015

Table 7. Responses on complications related to blood transfusion

Questions and correct responses	Responses	
	Frequency	Frequency
Interventions to minimize the risk of the patient experiencing acute transfusion reaction	166	56.5
⸺ Administration of blood that is compatible with that of the recipient		
⸺ Starting the transfusion within 40 minutes after collection from blood bank	83	28.2
⸺ Administering a unit of blood to the patient within 4 hours after collection	68	23.1
⸺ Not transfusing together drugs or solutions that are incompatible with blood	109	37.1
Signs and symptoms of acute haemolytic transfusion reaction		
⸺ Tachycardia	199	67.7
⸺ Chest pain	147	50.0
⸺ Hypotension	172	58.5
⸺ Shallow slow respiration	137	46.6
Action to take when observe signs and symptoms of acute haemolytic transfusion reaction		
⸺ Stop blood transfusion	239	81.3
⸺ Keep vein open with 0.9% normal saline	128	43.5
⸺ Check patient's vital signs	179	60.9
⸺ Write an incident report	109	37.1
What should be done with unit of blood collected at 8.00 PM was kept in the nurses" station until 9:30 PM due to an emergency situation		
⸺ Don't start the transfusion, notify the blood bank and return the blood	139	47.3
The usual presenting complaint of patient who has sustained a mild allergic transfusion reaction		
⸺ Urticarial rash	167	56.8
FIRST action to be taken to handle mild allergic transfusion reaction		
⸺ Stop the transfusion and notify the doctor	219	74.5
The commonest cause of the most fatal transfusion reactions		
⸺ Error in blood bank testing	110	37.4
When it is acceptable NOT to check patients" details at the bedside before administering blood		
⸺ Patient is barrier nursed	101	34.4

Source: Field data, 2015

As shown in Table 9, the ward of respondent also had significant influence on some knowledge parameters. This included knowledge on blood pack collection (p=0.010) and knowledge on activities related to post transfusion initiation (p=0.001). The duration of working at the particular ward also had significant influence on knowledge on post transition initiation, with knowledge level being higher among those who had been working for <2years as compared to those who have worked 2-5years (11.9% versus 2.5%; p=0.001). Further, knowledge on pre and post transfusion initiation was significantly higher among respondents who have performed more than eight (8) blood transfusions as compared to those who have performed none or less than eight. Training on blood administration also had positive influence on some aspects of knowledge on blood transfusion. The proportion of respondents with comprehensive knowledge on blood pack collection was 16% among those who had in-service training as compared to 3.3% among those with no in-service training (p=0.002). A similar trend was observed with respect to knowledge on pre and post transfusion initiation. The pattern of relationship between presence of written policy and knowledge level was not consistent across the various parameters. However, among those who indicated there was written policy available, the level of knowledge on blood transfusion was significantly higher among those who have read the policy as compared to those who had not read.

Table 8. Influence of socio-demographic characteristics on knowledge level

	Proportion of comprehensive knowledge									
	Patient preparation		Blood Pack Collection		Pre- Transfusion Initiation		Post Transfusion Initiation		Blood Transfusion Complications	
	%	P-value	%	P-value	%	P-value	%	P-value	%	P-value
Age										
— 21-30	15.7	0.001	9.0	0.001	10.1	0.483	6.4	0.198	11.6	0.384
— >/=30	30 .0		30.0		0.0		7.7		23.1	
Gender										
— Male	24.2	0.001	15.2	0.018	14.3	0.020	11.2	0.002	18.6	<0.001
— Female	9.7		6.5		5.6		1.6		4.0	
Nursing qualification										
— Dip General nursing/ Midwifery	19.1	0.298	11.0	0.873	8.5	0.053	7.6	0.461	13.6	0.445
— BSc Nursing	11.4		13.6		20.5		4.5		6.8	
— Master's degree/other	7.7		7.7		7.7		0.0		15.4	

Table 9. Influence of training and capacity on knowledge level

	Proportion of comprehensive knowledge									
	Patient preparation		Blood Pack Collection		Pre- Transfusion Initiation		Post Transfusion Initiation		Blood Transfusion Complications	
	%	P-value	%	P-value	%	P-value	%	P-value	%	P-value
Ward of respondent										
— Accident and emergency	13.8	0.171	17.5	0.010	6.3	0.184	16.3	0.001	15.0	0.733
— Surgical ward	24.1		1.9		14.8		5.6		14.8	
— Medical ward	31.3		25.0		0.0		0.0		12.5	
— Obstetric And Gyaenacology ward	15.3		9.7		11.8		2.8		10.4	
Length of time worked on the ward										
— <2 years	17.9		11.2		9.7		11.9		14.9	
— 2-5years	169	0.815	11.3	0.998	10.6	0.794	2.5	0.001	10.6	0.293
Number of times performed transfusion										
— None	13.5		7.7		7.7		0.0		7.7	
— 1-4	15.2	0.139	11.1	0.150	7.1	<0.001	8.1	0.001	10.1	0.072
— 5-8	25.9		20.7		10.3		0.0		12.1	
— >8	16.7		9.1		18.1		16.7		22.7	
Ever participated in in-service trainingProgramme?										
— Yes	12.0		16.0		15.4		12.0		8.7	
— No	19.7	0.107	3.3	0.002	3.3	0.046	4.8	0.029	14.9	0.146
Written policy for blood administration at the ward										
— Yes	10.7		0.0		19.6		6.3		9.4	
— No	26.1	0.006	27.2	<0.001	6.9	0.002	9.8	0.367	19.6	0.054
— Don't know	21.2		24.2		3.0		3.0		9.1	
Read policy										
— Yes	24.4	0.034	7.8	<0.001	17.8	0.005	8.2	0.047	11.6	0.158
— No	11.6		0.0		4.8		0.0		4.4	

4. DISCUSSION

4.1 Background Characteristics of Respondents

Nurses and midwives involved in this study were mostly younger with mean age of 26years. Most of them were females and this is reflective of the ratio of males to females in the nursing profession in Ghana. This also corroborates other results found in literature [26, Fereira et al, 2007). Until recently, the nursing profession is seen as female profession, and males who make their way into this profession are not given equal opportunity to move up in the ranks or are being denied equal employment opportunities [27]. The mean length of stay at the facility was 3 years, with most of the respondents having worked the respective ward from two to five years. Some respondents had not performed any blood transfusion in the past 6years.

4.2 Blood Transfusion Practices and Training Needs of Nurses and Midwives

This study found that staff training on blood transfusion at the Komfo Anokye Teaching Hospital was very low. In spite of the fact that most nurses have worked at their respective wards from 3 to 5 years and majority had been performing blood transfusion, most nurses have never participated in in-service training programme on blood transfusion. This outcome of this study indicates a huge training gap among nurses and midwives at the Komfo Anokye Teaching Hospital. Majority of the nurses disclosed that they need blood transfusion training in the area of sampling, administration of blood transfusion, adverse reactions and serious hazards. Blood transfusion is a critical safety issue that requires that nurses apply all required safety measures to ensure the safety of the patient.

Although blood transfusion saves lives, an error during the process could lead to loss of the life of a patient. In this field, training and equipping nurses with all safety measures cannot be taken for granted. The final bedside check before blood is transfused is the responsibility of nurses and they therefore could prevent mis-transfusion [13]. An in-depth understanding of nurses of the pathophysiology of transfusion reactions, symptoms and treatment is therefore very important, as this will enable them safely administer and monitor transfusions [15]. Efforts

should therefore be made to ensure regular training on blood transfusion are organized for nurses to ensure patients' safety. This will also ensure that various guidelines and policies instituted by management are well tailored down to nurses to inform their practices.

This study also found that about two-fifth of the respondents had no knowledge of or had no access to blood administration policies and almost all these respondents were of the view that blood the policies are necessary. Some respondents who have access to the policy have also never read it. This is consistent with the observational study by de Graaf et al (2009) in Mulago Hospital, Kampala Uganda, which also found that guidelines for blood transfusion practice were not easily available at the hospital. Blood regulation policy is used to promote clinical governance and help to improve quality, support staff and protect patients by providing up-to-date evidence-based practice and mange clinical risk. It also supports lifelong learning and professional self-regulation of health staffs. The absence of this important support document in some of the wards could therefore explain the training gap in this study. This could create avenue for adverse outcomes at the facility. This spells the need for health administrators to attach more importance to blood administration policies to ensure that stringent procedures are followed to help avert adverse health reactions.

4.3 Knowledge Level of Blood Transfusion among Nurses

The study further found low level of knowledge of blood transfusion among the nurses studied. Some questions relating to patient preparation, pre-transfusion preparation, post transfusion practices and transfusion complications had very low proportion of correct responses from the nurses and midwives. More than 59% of respondents for instance could identity possible consequences of rejection of transfusion as an issue to inform patients on before a transfusion episode.

In general, comprehensive knowledge of the respondents were less than 7% being able to correctly respond to all questions related to post transfusion practices. Knowledge on issues relating to blood pack collection was somewhat good, with majority of respondents choosing correct responses for information nurses should ensure collection of right blood for right patient and method use for transporting blood from bank to the ward.

This finding clearly indicated that the health staffs do not have mastery over the correct performance of blood transfusion and good monitoring of patients. Errors in blood sampling are especially dangerous as they can initiate a wrong process. It was estimated that 14% of ABO incompatible transfusions were due to sample collection errors [15].

This outcome is consistent with other previous studies that reported low comprehensive knowledge of blood transfusion among health workers. Previous study from Mali by Diakité, et al [28] and Iran by Gharehbaghian et al (2009) reported knowledge levels of 37.6% and 22% respectively. Similarly, in a French study in a setting of hospitalized care reported poor knowledge and practice among nurses concerning mainly the bed side blood compatibility test, pre-transfusion compatibility check when receiving blood units, delay between screening of red cell antibodies and transfusion, delay in presentation of blood unit in the ward, and recognition of abnormal reactions after transfusion [29]. Again, the study by Hijji, Oweis and Dabbour [30] among nurses in Jordan demonstrated that the majority of the nurses in their study lacked knowledge pertaining to proper patient identification. These evidence point to the fact that the problem of low knowledge of blood transfusion is not peculiar to Ghana, but also elsewhere.

On the other hand, some studies have shown high knowledge level on blood transfusion among health workers. This includes a descriptive study conducted among medical staff of 14 state run hospitals in France to assess the knowledge in blood transfusion among medical staff (mean weighted score of 62%) [31]. A study from Iran assessed the knowledge of health workers about proper methods of blood transfusion and how to promote their knowledge for proper performance also showed that 51.6% had acceptable knowledge (Reza et al, 2009). An above-average mean knowledge score (51.3%) has also been reported by Hijji, Oweis and Dabbour [30].

4.3.1 Factors influencing knowledge of blood transfusion among nurses

This study further assessed factors influencing knowledge of blood transfusion among nurses and midwives at the Komfo Anokye Teaching Hospital. The study outcome showed an influence of socio-demographic factors on knowledge of blood transfusion among nurses. Knowledge of patient preparation and blood pack collection was significantly higher among those 30years or older as compared to those younger. This could however be partly related to the many years of work experience among the nurses, which also showed significant influence with knowledge of blood transfusion.

Knowledge on pre and post transfusion initiation for example, was significantly higher among respondents who have performed more than eight (8) blood transfusions as compared to those who have performed none or less than eight. This parallels the findings from the study by Saillour-Glenisson et al [29], which also found frequency of transfusion to be strongly associated with hazardous knowledge and practice scores. Similar finding was also reported in a recent survey on evaluation of health care workers' knowledge in north India [32]. One's gender also influenced his or her knowledge of blood transfusion in this study, with male respondents being more likely to answer correctly questions relating to all aspect of blood transfusion than female respondents.

Training and development are integral part of healthcare delivery. In the advent of evidence-based medicine, nurses and other medical staff need regular training to improve their knowledge and keep them abreast with new developments in the practice. This is specifically important in an area that such as blood transfusion, where an uncontrolled error could possibly result in loss of life. Training on blood transfusion was low in this study, with most respondents indicating the need for further training. This study observed a positive association between participation in in service training and having comprehensive knowledge of blood transfusion. This outcome is consistent with the study by Saillour-Glenisson et al [29], which was conducted a study to describe knowledge, attitudes, and reported practice of blood transfusion of nurses in Aquitaine hospitals, France. Their study observed an association between training and knowledge of blood transfusion and concluded that low training and transfusion activity were key determinants of poor transfusion-related knowledge and practice. The study by Dubey, Sonker and Chaudhary [32] also found significantly higher knowledge of blood transfusion among health care workers who had received additional training as compared to those with no additional training. These findings underscore the importance of staff training to improve skill knowledge and

enhance job efficiency. This study again found an association between reading blood transfusion policy and knowledge of blood transfusion. Nurses and midwives who had read the blood transfusion policy were more likely to have comprehensive knowledge of blood transfusion. As discussed previously, these findings underscore the importance of training and equipping health staff with the requisite tools and information to improve their knowledge understanding of their respective fields and enhance efficient service delivery.

5. CONCLUSION

In conclusion, this study demonstrates a huge knowledge and training gap for blood transfusion among nurses and midwives at the Komfo Anokye Teaching Hospital including patient preparation, pre-transfusion preparation, post transfusion practices and transfusion complications. In addition most nurses had not had in-service training programme on blood transfusion and had no access to blood transfusion policies. It was therefore recommended that training programmes on blood transfusion should be organized for all nurses and midwives at Komfo Anokye Teaching Hospital. In addition, blood transfusion policy should be made available to all nurses and midwives for efficient blood transfusion practices.

CONSENT

The researcher did not in any way expose participants of the study to physical or psychological harm. Participation in the study was strictly voluntary with the informed consent of participants that guaranteed their right to privacy. Information obtained was treated with the strictest confidentiality.

ETHICAL APPROVAL

Ethical clearance for the study was obtained from the Committee on Human Research, Publications and Ethics (CHPRE) of the University of Cape Coast, after which permission was taken from the Research Unit of Komfo Anokye Teaching Hospital. The ethical clearance was taken from University of Cape Coast because the study was for master programme at the university.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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