ASSESSMENT OF UTILIZATION, PRACTICE, INDICATION AND COMPLICATIONS OF BLOOD AND BLOOD COMPONENT THERAPY AT INTERNAL MEDICINE WARDS, TIKUR ANBESSA SPECIALIZED HOSPITAL.

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Acronyms

FFP	Fresh Frozen Plasma
PRBC	Pack Red Blood Cell
PT	Prothrombin Time
WHO	World Health Organization
TASH	Tikur Anbessa Hospital

Contents

1 ABSTRACT

Background: Despite the increased use of blood and blood component transfusion there seems to be an obvious lack in the knowledge and practice of the process. There is also a lack of institution wide guideline on the practice and adequate training given to physicians. This is a special concern because even though blood and blood component transfusion is a life saving process it carries its own risks.

Objective: To evaluate the utilization, practice, indications, complications of blood and blood component therapy in medical patients admitted to Tikur Anbessa hospital.

Methodology: Institutional based prospective quantitative descriptive study will be conducted to assess utilization, indications, complications of blood and blood component transfusion. Data will be collected using pre prepared check list and will be analyzed using Statistical Package for Social Sciences, version 20.

Results: During the study period there were a total of 329 units of blood and blood component issued to the medical wards with 148 episodes of transfusion. Male patients accounted for % of patients and females accounted for -%. The most common age group transfused was (n = %). The most common indication for transfusion is (n = %). He most common primary diagnosis is (n %). The most commonly used blood component is (n = %). Vital sign was recorded only in (n = 8, 5.4%) prior to transfusion, (n = 5, 3.4%) during transfusion and (n = 10, 6.8%) post transfusion.

Conclusion: This study provides information about the trend of utilization, indication and practice of blood and blood component therapy in medical wards of black lion hospital. The data obtained will help to guide improve transfusion practice, and planning for future needs in blood and component therapy in the future.

2 INTRODUCTION

2.1 Background information

According to the World Health Organization (WHO), Transfusion Medicine is defined as that part of the health care system which undertakes the appropriate provision and use of human blood resources (WHO, 2017)**.** Currently there is an increasing demand for blood and blood component therapy worldwide. The goal of this research is to evaluate the practice, indication and complications of blood and blood component transfusion at tikur anbessa specialized hospital.

Blood transfusion is a life saving process but it doesn't mean it is without risks. If not done properly it leads to wastage of precious resource and exposes the patient to infectious and non infectious complications**.** The transfusion process involves the ordering of the blood product, acquisition of pretransfusion sample, laboratory studies, collection and administration of the blood product, monitoring the patient, managing adverse reactions and documenting the transfusion events and outcomes**.** This adverse reaction are occur during transportation from blood bank to hospital, due to incorrect cross –checking practice, lack of follow up at bedside and lack of regular monitoring before during and after transfusion.

Ethiopia is one of the developing countries which face different socioeconomic conditions, health care system being one of them. Black lion hospital is one of the tertiary hospitals in Ethiopia which faces different patients from all over the country hematologic illnesses being one of the most frequent. Many of the patients who visit the emergency room and patients admitted to the wards require blood and blood product therapy. There is a rapidly growing shortage of blood and blood components in the hospital partly because of ignorance and superstition mitigate against voluntary blood donation and due to misuse or overuse of blood and blood component therapy.

Despite the fact that institutions in Ethiopia including black lion hospital are focused on accelerating the improvement of blood transfusion, little is known about the utilization of blood and blood component transfusion in health facilities. Any of this can be achieved without all stake holders' focus on improving the quality of the service. One of the components of improving the service is regular audit and assessment of the transfusion procedures in a given hospital, there is also need to assure appropriate Provision of blood products according to the national guidelines.

There is a practice of standard guidelines or transfusion related policies in different countries, including Ethiopia developed by federal ministry of health. We also have blood transfusion committee in TASH. The guideline covers important processes of blood transfusion practice including the screening of donor blood for infectious diseases, analysis of the necessity of transfusion, and ABO compatibility tests. The guidelines also clearly state the indications of transfusion, the importance of proper identification of the patient that comprises complete name, date of birth, and hospital admission numbers given to each patient. These current guidelines further state that the patient undergoing blood transfusion should be assessed before, after and during the process.

2.2 Statement of the problem

Blood transfusion is an important part of patient management. Transfusion audits are useful tools in the education of those ordering blood components, potentially resulting in the reduction of inappropriate use of blood components. In the Ethiopia, there is lack of published researches, and data with regard to utilization and appropriateness of use of each blood products. Hence, such studies like this should be conducted to evaluate or assess rational and optimal utilization of blood products. In order to identify problem areas and make plans and implement them to improve the practice. This study is believed to be helpful in identifying these problems so that we have better standard of practice**.**

In our hospital blood transfusion is practiced frequently since it is one of the only hospitals where chemotherapy for hematologic malignancies is given and multiple patients which comprise greater than 50% of ward admission rates. TASH hospital has declared itself independent of requiring family members of the patient from donating even though, there is frequent shortage of blood and blood products leading to death of multiple patients. There also seems to be lack of data on the practice of transfusion of blood and blood products and gap in the knowledge among those who practice it.

First of all there is no existing data on the magnitude and utilization of blood transfusion there are also no formal education given to health care professionals in the hospital. In order to solve the problem there needs to be education given formally to health care professionals with regular update. There should be all inclusive guideline both Country wide and institution wide with easy access. There needs to be more studies done in order to identify the problem and need improving.

Therefore this paper will try to identify and make recommendations on the magnitude of the problem and factors affecting it and which areas need improving. It is expected that there will be problems identified in the ordering process like incomplete ordering forms for blood and blood component transfusion. Ordering of blood transfusion without proper indication. It's expected that there will be incomplete monitoring during the transfusion.

3 LITERATURE REVIEW

Blood transfusion saves lives and improves health, but many patients requiring transfusion do not have timely access to safe blood. Unnecessary transfusions and unsafe transfusion practices expose patients to the risk of serious adverse transfusion reactions and transfusion – transmissible infections. Unnecessary transfusions also reduce the availability of blood products for patients who are in need.(WHO June 2017)

There are several Clinical Blood Usage Parameters that affect safe blood transfusion these include the presence of National guidelines on blood usage, Size of hospital (s) and number of patients, Number and kind of procedures done, experience of staff, Training for hospital and blood bank staff and Annual blood usage review (past, present and future) in hospitals. WHO recommends the development of systems, such as hospitals transfusion committees and hemovigillance, to monitor and improve the safety of transfusion processes. Clinical audits are conducted in 54% of hospitals performing transfusion in high income countries and in 42% of hospitals in middle and low income countries.(WHO June 2017)

In high income countries, the most frequently transfused patient group is over 65 years of age, which accounts for up to 76 % of all transfusions. In the low income countries, up to 65% of transfusions are for children under the age of 5years.(WHO 2017) The indications for blood transfusion in Developing countries are complications during pregnancy and childbirth, severe anemia often resulting from malaria or malnutrition, and road-traffic accidents. Whereas in developed countries the indications are complex medical and surgical procedures, traumas care cancer chemotherapy and hematological malignancies.

In a study done in US to assess Demographic and epidemiologic characterization of transfusion recipients from four US regions the most commonly transfused blood products were red blood cells, followed by platelets and plasma. Among patients who received transfusions, the median number of RBC units was one, the pretransfusion Hgb level was 7.6 g/dL, and the Hgb increment per unit was 1.4 g/dL. Encounter mortality increased with patient age, the number of units transfused, and the use of platelet or plasma products. The most commonly reported transfusion reaction was febrile nonhemolytic. The study concluded a significant improvement in utilization of blood and blood products and the fact that an ongoing national survey allows for trend analysis and are important for future planning. (Matthew S. Karafin , Walter Bialkowski et al. July 26, 2017)

There was a study done in the US to assess Transfusion-related adverse reactions reported to the National Healthcare Safety Network Hemovigilance Module. Adverse reaction rates for transfused components, stratified by component type and collection and modification methods, were calculated. Allergic and febrile nonhemolytic reactions were most frequent; of all reactions were severe or life-threatening and were fatal. PLT transfusions had the highest adverse reaction rate. We don't have data in BLH about adverse reactions and which ones are the most frequent type and which blood group is involved in the most frequent adverse reactions.(Sandeep Sahu Sep-Oct 2014)

In a study done in Nepal with an aim to assess the blood transfusion practice among healthcare personnel in majority of the cases, blood was kept in the ward in uncontrolled and unprotected manner by the patients' relatives. Only a small number of the patients and/or the relatives were informed about the reasons, associated probable risks, and the benefits of transfusion. Assessment of vital signs at 15 minutes of initiation of transfusion was done on about 2 to 4% of cases**.** The suboptimal blood transfusion practice was attributable to substantial knowledge gap among healthcare personnel and the absence of quality culture, quality system, and quality management in the area of blood transfusion

practices. It was assumed and expected that complications associated with errors in transfusion practice can be minimized by assessing transfusion practices.(Abja Sapkota 12 February 2018)

In a study done in India to determine Utilization of blood and components the number of requests for blood products was from 428 patients, with many of these requests being for more than 1 unit. A breakup of the supply for whole blood and various components (n = 720) showed that whole blood (n = 308) was the maximum utilized product followed by packed red blood cells (PRBC), fresh frozen plasma (FFP) and then platelet concentrates Among the indications for all blood products taken together, anemia was the most common indication (n = 176/428, 41.1%) followed by elective surgery (n = 123/428, 28.7%). The total demands for whole blood were 211 out of 428 cases (49.3%), 104 requests for PRBCs, FFP had been transfused to 75 patients, The number of requests for platelets was 38 (n = 38/428, 8.9%). The most common indication was thrombocytopenia due to leukemia. The study concluded by stressing on the need of Periodic review of blood component usage to assess the blood utilization pattern in any hospital.(Pathak 17 August 2009)

In a study done in Iran to assess resident physicians' knowledge concerning transfusion medicine the mean total knowledge score regarding transfusion medicine was 15.44 ± 3.3 (7–25) out of 29. Only about one-fourth (27.4%) replied correctly to over 60% of questions. The mean score of knowledge was higher among residents who stated that they received special training regarding blood transfusion in their medical courses ($P < 0.01$). Seventy-five percent of residents believed that they had received insufficient education and 97.8% believed that they need additional training. The results reflect the uncertainties among resident physicians regarding blood transfusion. It has been suggested that a special transfusion medicine educational program should be added to the medical education curriculum. (Leila Kasraian, Alireza Tavassoli)

A retrospective study done on the transfusion practices in a Tertiary Care Institute in India showed the following results; the blood bank was requested to prepare 10,594 units of blood for 2556 patients. The blood utilized was 16.04% of total cross matched blood, leaving 83.9% of units cross matched but not transfused to patient for whom it was prepared, i.e. wasted. The surgery department had the highest number of units cross matched and transfused. The least number of units cross matched and wasted due to non‐transfusion were from the Department of Oncology. The most common reason for transfusion was anaemia, with haemoglobin of <10 g/dl.(Abja Sapkota 12 February 2018)

In a study done in Iran concerning the knowledge about blood transfusion among 1st year resident physicians the mean total knowledge score regarding transfusion medicine was 15.44 ± 3.3 (7–25) out of 29. Only about one-fourth (27.4%) replied correctly to over 60% of questions. The mean score of knowledge was higher among residents who stated that they received special training regarding blood transfusion in their medical courses ($P < 0.01$). Seventy-five percent of residents believed that they had received insufficient education and 97.8% believed that they need additional training. The results reflect the uncertainties among resident physicians regarding blood transfusion. This can only be achieved by first knowing about how the general status of blood transfusion practice is at that institution.

In a study done in Uganda to determine the indications, blood ordering practices and post-transfusion complications, and clinical transfusion practice the three most frequent indications for transfusion were malaria (38.8 %), bleeding (27.5 %) and other infections (16.1 %). There were no records for pretransfusion hemoglobin, compatibility testing, transfusion start-times and vital signs in the prespecified times of the recipients. Transfusion reactions were recorded for 10 (0・6%) patients. Although there was no evidence of blood wastage, inadequacies were noted in the documentation of the transfusion process. It was concluded in the study the need for educating the stuff on

blood transfusion process, safety and monitoring patients. It also stressed on the need for country wide and institution wide guidelines in the proper utilization of blood and blood products. (B. Natukunda 23 dec 2010)

Another study done in Nigeria to assess blood Transfusion Request Pattern: There were 1958 blood requests, consisting of 554 for males (28.3%) and 1404 for females (71.7%) with male: female ratio of (1:2.5). The obstetrics and gynecology department (52.3%) had the highest request for blood transfusion, while medicine had the least (9.3%). Whole blood was the most common form of blood product requested (87.3%) while only two (0.1%) request for plasma was made. The most common indication for blood transfusion was anemia (52.2%), followed by the need for blood transfusion during surgery (30.4%).(Ibrahim Aliyu February, 2017.)

In studies done in Ethiopia their main aim was to assess the amount of blood and blood component wastage specifically in surgical wards where the amount of blood transfused was significantly lower than the amount of requested and cross – matched blood A study from Gondor reported that; 43.6% of cross match was transfused with 56.4% of prepared blood being wasted. C/T ratio was 2.3. (Tadesse Belayneh 3 October 2013)

Unnecessary transfusions and unsafe transfusion practices expose patients to the risk of serious adverse transfusion reactions. Unnecessary transfusions also reduce the availability of blood products for patients who are in need. So it’s necessary to have an audit in the pattern of blood transfusion.

4 OBJECTIVES

4.1 General objective

The objectives of this study are to answer the following questions

- To assess the utilization, practice, indications, and complications of blood and blood component therapy.

4.2 Specific objectives

- To assess the utilization of blood and blood component therapy based on demographic characters of patients receiving blood and blood component transfusion.
- To assess the utilization of blood and blood component therapy based on indication and primary diagnosis.
- To assess the process of ordering blood and blood component therapy.
- To explore the transfusion process and monitoring of patients during transfusion.
- To explore the different complications of blood transfusion process.
- To use the findings to make recommendations on the improvement of the blood transfusion process.

5 Materials and methods

5.1 Study design

A prospective descriptive study was done among medical patients who received blood and blood component therapy admitted to medical wards IMW, B5, B8, C8 and D8.

5.2 Population, sampling technique and size

5.2.1 Source population

All patients admitted to medical wards of Tikur Anbessa specialized hospital.

5.2.2 Sample population

All patients in medical wards who received blood and blood component therapy in the month of July, 2019.

5.3 Data collection and entry

All patients admitted to medical wards (IMW, B5, B8, C8, and D8) in the month of July 2019 who received blood and blood component therapy where included in the research. Data was collected prospectively and each recorded cross match on BLH laboratory registrar was considered as an independent event/episode.

Data on primary outcome measures i.e. cross matched blood, age, sex, place of transfusion, blood group of the patient, pretransfusion hemoglobin, pretransfusion platelet count, indication for transfusion, primary diagnosis of transfused patients, recording of consent and vital sign recorded, and recorded or reported transfusion reactions were collected for each patient from the black lion laboratory blood bank register and patients medical record. Data was collected using Checklist that was used developed based on global blood safety (GDBS) indicators and WHO blood transfusion guideline.

5.4 Data handling and analysis

The data collected on the check list checked every day for errors and completeness. Data was entered and analyzed using statistical package for social sciences V 20 (SPSS statistics 20). For any associations chi square and odds ratio analysis will be used and in all p-value < 0.05 is considered statistically significant.

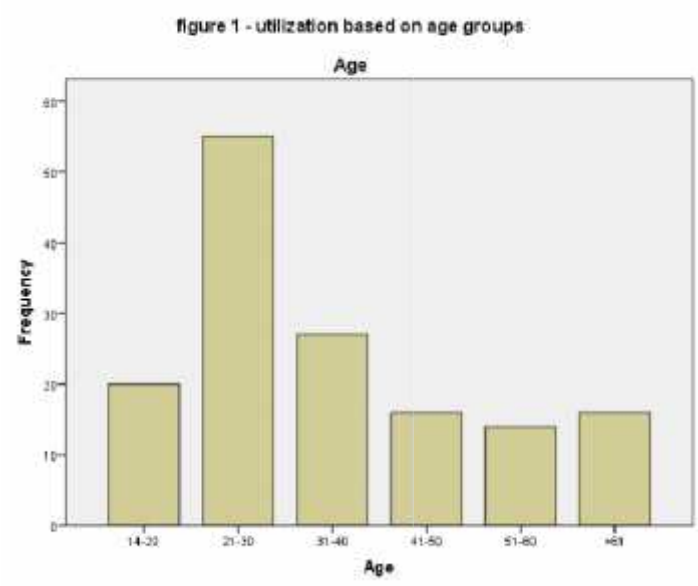
6 RESULTS

There were a total of 329 cross matched blood and blood components issued to medical wards in the month of July, 2019. There were 148 episodes of transfusion that were studied with a total of 87 patients who received transfusions. Of the total episodes of transfusion in the medical wards, (n = 30, 20.3 %) were in IMW, (n = 28, 18.9 %) in B5, (n = 3, 2 %) in B8, (n=52, 35.1 %) in C8 and (n = 35, 23.6 %) in D8.

Of the total 148 episodes of transfusion the most common age group transfused is the age group 21 -30 (n = 55, 37.2%). Of the transfused patients 65.5 % (n = 97) are male and 34.5 % (n = 51) are female with female to male ratio of 1:1.9.

The most frequently used blood and blood component therapy is PRBC (n=121, 81.8%), followed by platelet (n = 18, 12.2%), whole blood (n = 7, 4.7%), FFP (n = 2, 1.4%). Total units issued PRBC (n=228, %), platelet (n = 79, %), whole blood (n = 10, %), and FFP (n = 12, %).

figure 1 - utilization based on age groups



There were a total of 329 units cross matched and issued to the medical wards, with a total of 148 episodes of transfusion, most of the patients had only one episode of transfusion (48, 32.4 %) and two patents had 5 episodes of transfusion. Patients with hematologic malignancy accounted for 23 of the 26 patients who received more than or equal to two episodes of transfusion and 17 of the 18 patients who received 3 or more episodes of transfusion. But having ≥ 3 episodes of transfusion was not significantly associated with having primary diagnosis of hematologic malignancy. The median number of units per transfusion is 2(n = 95,64.2%).

The utilization of blood and blood component therapy based on indication taken as a whole is as follows, anemia (n = 124, 83.8 %), followed by thrombocytopenia (n = 18, 12.2%).

Of the episodes of transfusion with the indication of anemia the most prevalent primary diagnosis is hematologic malignancy (n = 87), followed by infection (n = 11). For pts with thrombocytopenia it was also hematologic malignancy (n = 17) with only one pt with primary diagnosis of sepsis.

There were only 2 patients transfused with FFP with the indication of prolonged PTT, one pt with acute liver failure and another with warfarin over anticoagulation with underlying solid malignancy.

Blood component	Frequency	Percent	Valid Percent	Cumulative Percent
PRBC	121	81.8	81.8	81.8
whole blood	7	4.7	4.7	86.5
platelet	18	12.2	12.2	98.6
FFP	2	1.4	1.4	100.0
Total	148	100.0	100.0	

Table 1– utilization based on type of blood/ blood Component

The utilization of blood and blood component therapy based on primary diagnosis is as follows, the most common primary diagnosis is hematologic malignancy (104, 70.3%) and the least common are renal and hepatic disorders.

The average hemoglobin level prior to transfusion of PRBCs for patients transfused with PRBC is 5.63 (SD – 1.4) and with range of (2.5 – 7.3). The average platelet count prior to platelet transfusion is 7056 with range of 1000 - 13400.The pretransfusion hemoglobin level was collected from the request paper if available, otherwise the closest hemoglobin level within 24 hrs prior to transfusion was used.

Of total cross matches issued from laboratory blood bank, issue paper for cross match was found from the medical record in 95 (64.2 %) pts. There were no recordings of consent, transfusion start time, transfusion end time. There were also no transfusions reactions recorded in patient's medical record or reported to the laboratory blood bank or to the hospital transfusion committee.

There were (n=8, 5.4%) had their vital sign recorded not more than 60 minutes prior to transfusion, (n=5, 3.4%) during transfusion, (n=10, 6.8%) not more than 60 minutes after completion of transfusion.

Data on the time from dispatch from the laboratory blood bank to transfusion and storage of blood and blood components in the wards was not available so not included in this study.

Table 2 – utilization based on primary diagnosis

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Primary diagnosis		Frequency	Percent	Valid Percent	Cumulative Percent
	hematologic malignancy	104	70.3	70.3	70.3
	solid organ malignancy	6	4.1	4.1	74.3
	infection	12	8.1	8.1	82.4
	hepatic diseases	6	4.1	4.1	86.5
	renal diseases	4	2.7	2.7	89.2
	gastro intestinal disease	12	8.1	8.1	97.3
	respiratory diseases	1	.7	.7	98.0
	Cardiac diseases	1	.7	.7	98.6
	other	2	1.4	1.4	100.0
	Total	148	100.0	100.0	

Table 3 – utilization based on indication

		Frequency	Percent	Valid Percent	Cumulative Percent
	anemia	118	79.7	81.4	81.4
	thrombocytopenia	16	10.8	11.0	92.4
	prolonged PT	4	2.7	2.8	95.2
	bleeding	7	4.7	4.8	100.0
	Total	145	98.0	100.0	
Missing	System	3	2.0		
Total		148	100.0		

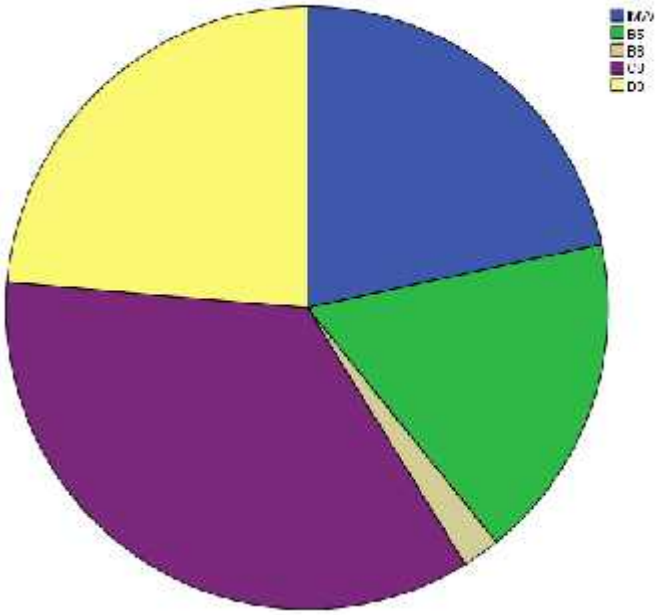
Table - 4 Demographic characteristics

Demographic characteristics		Number (%) transfused
Age groups	14 - 20	20 (13.5%)
	21-30	55 (37.5 %)
	31-40	27(18.2%)
	41-50	16(10.8)
	51-60	14(9.5%)
	≥ 61	16(10.8%)
Sex	Male	97(65.5%)
	Female	51(34.5%)

Table - 5 number of episodes of transfusion based on primary diagnosis

Primary diagnosis	Number of episodes of transfusion	
	1-2	3-5
Hematologic malignancy	39	17
Solid organ malignancy	3	0
Infection	7	1
Hepatic diseases	4	0
GI diseases	3	3
Renal diseases	3	0
Respiratory diseases	1	0
Cardiac diseases	1	0
Total	63	18

Figure 2- Episodes of transfusion in each ward.



7 Discussion

In the period of the month of July 2019, 329 units of blood and blood components were issued to the medical ward, with 148 episodes of transfusion. Of these 37.2 % were in the age group 21 – 30 and admitted largely with the diagnosis of hematologic malignancy. Of the hematologic malignancies acute leukemia's account for majority of the cases. Age ≤50 yrs accounted for 68.9 % of transfusions and of this patients (n= 89, 75.4%) had hematologic malignancy. Of the patients age >50, half of the patients had hematologic malignancy.

The most common diagnosis of patients requiring transfusions in this study is hematologic malignancy n =104, 70.3 %). This is attributed to the large number of patients coming from all over the country since black lion hospital is the only government hospital that provides this care. The requirement for blood and blood component therapy is also higher in these patients due to different mechanisms of cytopnia. This is different from WHO 2017 report which states age <65 yrs as the main age group that receives transfusion with the indication of severe anemia secondary to malaria. Study done in Uganda also shows malaria as the most common primary diagnosis. (B. Natukunda 23 dec 2010).

The rest where accounted by patients with solid organ malignancy, gastrointestinal and hepatic diseases with the indication of upper/lower gastro intestinal bleeding. Visceral abscess, sepsis, 2 patients with visceral leishmaniasis and one patient with complicated malaria accounted for patients transfused with the primary diagnosis of infection.

The most common indication for transfusion is anemia (121, 81.8 %), largely with the primary diagnosis of hematologic malignancy followed by infection. But of the total hematologic malignancy patients there were only 17 episodes of platelet transfusion episodes, despite the significant number of pts with severe to very severe thrombocytopenia with associated infections and bleeding, this might be explained by platelet shortages.

Requirements for the 2 episodes of FFP transfusion where accounted for by hepatic disease and warfarin over anticoagulation. There were no factor transfusions in the month of the study.

The mean value of hemoglobin triggering packed RBC transfusion is 5.63 with range 2.5 – 7.3 and average platelet count 7056 with range of 1000 – 13400 triggering platelet

transfusion. These trigger points are in line with the indications for PRBC and platelet transfusion respectively.

The most common blood component issued Is PRBC (n = 121, 81.8%) followed by platelets and whole blood. This is different from studies done in African countries showing a higher ratio usage of whole blood compared to PRBC (Ibrahim Aliyu February, 2017..). This might be because only medical patients were included in this study and due to lack of availability of blood component preparation in these countries.

There is significant inadequacy in the clinical practice of blood and blood component therapy observed in this study with no recording of consent, recording of transfusion start and end times. Request for transfusion was completely filled in most, request for transfusion couldn't be found for 13 patients. There is also significant deficiency in the recording of vital signs with only (n = 8, 5.4%) recordings prior to transfusion, (n = 5, 3.4%) during transfusion and (n = 10, 6.8%). There were no associations found between vital sign recording and diagnosis, place of transfusion, and blood component therapy. The reason for this poor practice needs further study.

There were no recorded or reported transfusion reactions during the study time. Whether this is due to failure to record or there actually were no transfusion reaction is not known.

8 Limitations

The duration of the study was one month, limiting the number of patients included in the study. The study also included only medical patients, the utilization of blood and blood component therapy is different in other departments. In the future a longer duration of study including transfusions from other departments is needed.

9 Conclusion and Recommendation

This study provides information about the trend of utilization, indication and practice of blood and blood component therapy in medical wards of black lion hospital. The data obtained will help to guide improve transfusion practice, and planning for future needs in blood and component therapy in the future.

The most commonly utilized blood product is PRBC followed by platelet and FFP. Hematologic malignancy being the most common diagnosis leading to transfusions. Of

the indications for transfusion overall anemia secondary to complications of malignancy is the most common.

There is poor practice of transfusion when it comes to clinical follow up and medical recording. This needs further study about the knowledge, attitude and regular assessment of transfusion practice. With regular education to health personnel involved in transfusion.

10 Acknowledgment

I would like to thank my advisor, staff from the TASH blood bank laboratory, and interns, residents and nurses in the medical wards for their cooperation.

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