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UTILISATION OF BLOOD AND BLOOD COMPONENTS IN A TERTIARY CARE HOSPITAL

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Abstract

INTRODUCTION- Blood is the most precious and unique gift that one human being can give to another human being . An essential part of both emergency care and inpatient management of patients in a hospital is blood transfusion. Providing a timely, adequate, and safe supply of blood and blood products is the main duty of blood transfusion services. Setting and following standards for blood transfusion requirements is essential. Therefore, it is essential to carry out these studies in order to monitor and enhance transfusion practices, as well as to identify improvement initiatives.

Materials and methods-The present study was a retrospective record based cross sectional study . The data was collected from January 2023 to June 2023 from the issue registers of blood center of RCSM GMC ,CPR HOSPITAL KOLHAPUR and transfusion registers in wards. The data was analised for utilization rate and blood utilisation quality indicators as well as for transfusion probability and transfusion index .

RESULTS-Total 4798 units were cross matched for 4554 patients and 4636 units were transfused to 4482 patients .Overall utilisation rate was 96.1 %. Department wise utilisation rates were medicine 99.1% , surgery and orthopaedics 92.5% ,gynaecology and obstretrics 97.8% , paediatrics 96.9%. The overall quality indicators of blood utilisation were CTR (crossmatch/transfusion ratio) of 1.01, %T (transfusion probability) of 98.4% and TI (Transfusion index) of 1.03.

CONCLUSION –Blood transfusion quality indicators demonstrated efficient blood utilisation. Periodic review and audit of blood usage is essential to assess the blood utilisation pattern in any hospital.

Keywords: blood components, utilization, transfusion, blood bank.

INTRODUCTION

The first blood transfusion was documented on December 22, 1918, by James Bundell, a physiologist, physician, and well-known obstetrician of his day. The attempts to develop alternatives have failed to produce satisfactory results over the ensuing century. As a result, prudent and appropriate use of blood and its component becomes essential [1].

Blood is a specialized biological fluid that moves waste materials out of the body's cells and provides essential elements like oxygen and nutrition to the cells. It is made up of plasma and cells, including red, white, and platelet blood cells. Coagulation factors can be found in plasma.

Blood must be drawn into FDA-licensed, single-use, sterile containers [2] .It is recommended to take blood from a spot free of skin lesions and to carefully disinfect the phlebotomy site. The location has been cleaned using a soap solution, then applying an iodine tincture or an iodophor complex solution. One of the most crucial steps in preventing bacterial infection, which can result in a deadly blood transfusion reaction, is choosing the puncture site and thoroughly cleaning it.

There is currently no blood substitute, transfusions using donated blood are the cornerstone of care for illnesses requiring surgery or medical intervention [3] .Blood component therapy has gained popularity recently since it is superior than whole blood transfusion in that it helps patients avoid volume overload, has a longer shelf life, and improves patient management. Blood component therapy was developed between 1950 and 1960 in order to optimize the advantages of each and every component found in whole blood.

Making effective use of blood is crucial in developing nations because blood supplies are limited and community demand is rising [4]

The World Health Organization (WHO) states that one percent of the population must donate blood in order to satisfy the country's basic blood needs. According to the aforementioned norm, About 13.9 million blood units are needed in India each year, representing 1% of the country's 1.39 billion people. Nonetheless, there are significant differences in the projected supply, demand, and use of blood and blood products. [5]

Innovative strategies are needed to meet the need for blood supply when combined with a decline in donations and an increase in the consumption of blood components. WHO advises against adult single-unit transfusion . Blood transfusion is essential for the resuscitation and treatment of patients, particularly those undergoing surgery. Blood is over ordered for both elective and urgent surgical procedures, and this is typically standard protocol. [6]

To cut down on blood waste, blood transfusion requirements may need to be established and strictly followed. Thus, it is imperative that you carry out such research to track and enhance transfusion procedures. The study's findings could aid in identifying opportunities for improvement and future improvement measures. Furthermore, this study should make it easier for later research to thoroughly evaluate the annual institutional pattern, the appropriateness of blood use, and the waste of blood.

The current study was carried out with the intention of assessing the extent to which transfusion practices are practiced at RCSM GMC and CPR Hospital Kolhapur, as well as the pattern and appropriateness of blood and blood component utilization.

MATERIALS AND METHODS

The present study was a retrospective record based cross sectional study. The data was collected for 6 months from January 2023 to June 2023 from the issue registers of blood bank of RCSM GMC , CPR HOSPITAL KOLHAPUR and transfusion registers in wards. The Institutional Ethics Committee gave their approval to the aforementioned research proposal (IEC). The data was analized for utilization rate and blood utilisation quality indicators as well as for transfusion probability and transfusion index .

DATA COLLECTION All blood units' withdrawal and expiration dates were recorded in the blood bank's register. To determine if blood units received were transfused or not the wards' records were

examined. Units that were transfused and cross-matched were totalled. All information about the blood and component recipients in this representative months , including age, gender, address, and department of admission, was recorded in order to assess the state of transfusion practice. Information on the current blood consumption was recorded, including the quantity and kind of components transfused as well as any reactions that may have occurred. The use of various component types was noted in order to assess the pattern of blood and blood component utilization.

Utilisation rate of WB and all blood components were calculated. (Utilisation rate=Units transfused×100/Units cross-matched). The overall utilisation rate, if it is found to be above 96% for WB and components, then it is an acceptable rate of utilisation [5].

From the collected data, the following quality indicators, to evaluate the appropriateness of blood and blood components utilisation were calculated as:

• **Cross-match to transfusion ratio (C/T ratio) =** Number of units cross-matched/number of units transfused. A ratio of 2.5 and below was considered indicative of significant blood usage [1].

• **Transfusion probability (%T) =** Number of patients transfused/ number of patients cross-matched×100. Accordingly, a value of 30% and above has been suggested to be appropriate and signifies the appropriateness of number of blood unit cross matched [2].

• **Transfusion Index (TI) =** Number of units transfused/Number of patients cross-matched. A value of 0.5 or more was considered indicative of significant blood utilisation [1].

STATISTICAL ANALYSIS After being verified for accuracy and consistency, the gathered background characteristic data was input into Excel data sheets on the computer. Data was arranged and displayed using the tables and diagrams that illustrate the fundamentals of descriptive statistics. The 2015 release of the IBM Corp. Statistical Package for Social Sciences was used to enter and analyze all of the data that had been gathered. Version 23.0 of IBM SPSS Statistics for Windows (Armonk, NY: IBM Corp).

RESULTS:

Table 1 : Distribution of utilisation of blood and its components according to departments

***WB: Whole blood; FFP: Fresh frozen plasma; PRBC: Packed red blood cells; RDP: Random donor platelets; OBGY: Gynaecology and obstetrics**

Departments	Blood units transfused	Blood units cross-matched	Blood utilisation rate (%)
Medicine	2124	2138	99.3%
Surgery , orthopaedics and CVTS	1328	1402	92.6%
OBGY	866	886	97.8%
Paediatrics	368	372	96.9%
Total	4636	4798	96.1%

The distribution of blood and its products issued by the blood bank covering the designated hospital departments was displayed in [Table-1]. A total of 4798 units were cross matched and issued for the patients of departments of medicine { 2138 (44.5%) }; surgery , orthopaedics and CVTC { 1402 (29.2%)} , OBGY { 886 (18.46%)} , pediatrics { 372 (7.8%)} for 4482 patients. The majority of issued blood units were PRBCs 56.15 % followed by FFPs 28.95% followed by whole blood and platelets 8.7 % and 6.2% respectively . Medicine department issued most of PRBCs 42.8% and pediatric department issued least 3.2% . For whole blood, OBGY ordered largest proportion 44.6% and least by paediatrics 9.9 %. Of the FFPs majority was by medicine and surgery 46.1 % and 33.3% respectively and least by OBGY 8.1%. Medicine 69.6% and paediatrics 15.3% ordered maximum platelets.

Table 2 : Blood and its components utilisation rate according to the departments

Departments	WB units utilized	FFP units utilised	PRBCS units utilised	RDP units utilised
Medicine	98 (18%)	498 (46.1%)	1070 (42.8%)	472 (69.6 %)
Surgery , orthopaedics and CVTS	148 (27.3%)	360 (33.3%)	860 (34.4%)	34 (5.0%)
OBGY	242 (44.6%)	88 (8.1%)	488 (19.5%)	68 (10.0%)
Paediatrics	54 (9.9%)	134(12.4%)	80 (3.2%)	104 (15.3%)
Total	542 (100%)	1080 (100)	2498 (100)	678(100)

Table 2 showed that utilisation rate was highest in medicine department 99.3 % followed by paediatrics 96.9 % followed by OBGY 97.8 % and least by surgery department including orthopaedics and CVTC 92.57 % with overall utilization of 96.1% for all types of blood products . The study revealed the rate of utilization for all products were in acceptable rate of utilization.

[Table 3]: CT ratio, transfusion indices, transfusion probability (%T) according to the departments. *CTR=Cross match-Transfusion ratio; Transfusion probability (%T) and TI=Transfusion index;

Departments	No of patients cross-matched	No of patients transfused	Total blood units cross - matched	Total blood units transfused	CTR	TI	%T
Medicine	2084	2066	2138	2124	1.00	1.01	99.1%
Surgery , orthopaedics and CVTS	1296	1342	1402	1328	1.04	0.96	98%
OBGY	802	788	886	866	1.02	1.07	98.2%
Paediatrics	300	286	372	368	1.01	1.22	95.3%
Total	4554	4482	4798	4636	1.01	1.03	98.4%

Table 3 showed quality indicators of blood usage . Overall CT ratio was 1.01 with CTR was 1.00 , surgery 1.04 and OBGY 1.02 , paediatrics 1.01 . TI for all kind of blood products was 1.03 indicated significant blood usage. Overall % T was 98.4 % which was a measure of appropriateness of blood utilization.

DISCUSSION:

Blood and its constituents are essential to patient care. Blood has a restricted supply and carries a high risk of infections and chances of adverse reactions. The usage of blood and its patterns and transfusion practice vary correspondingly among various centres in various nations.

In the present study, it was found that the majority of blood component transfused was PRBC 56.15% followed by FFP 28.95%. The least number of transfused blood components was platelets and WB. Study done by Ishore et al revealed that most of the blood component transfused was PRBCs and least number was whole blood , which is similar to our study [7]

Whereas studies by Joshi AR et al., Gaur D et al., and Giriyan SS et al revealed that the majority of blood transfused was WB, defying the current study. [8, 9,10].

In the present study, the total blood utilisation rate at RCSM GMC Kolhapur and CPR Hospital was observed to be 96.1% (4636 / 4798). Therefore, the present study revealed that utilisation rate was appropriate for the acceptable rate of utilisation.

The blood utilisation rate was 99.3% by the Department of Medicine which is highest among other department utilisation rates.
Study done by Mondal et al had better utilisation rate in the department of paediatrics which was 98.25 % followed by other departments.[11]
Ideal CT ratio is 1. In the present study, the overall CT ratio was 1.01 with CTR for medicine 1.00, surgery 1.04, OBGY 1.02 and paediatrics 1.01.It shows that all the departments that were studied shows adequate CTR.
Similar results were obtained by the study done by Mondal et al.[11]
Belayneh T et al. advised a value of T% as 30% and above as appropriate in 2013, but Mead JH et al. indicated the % T for a certain technique for the first time, recommending a value of 50% and higher as appropriate.[6 , 12]. The total percentage of transfusions compared to the number of patients that were cross-matched determined the present study's %T, which came out to be 98.4%. The percentage T indicates how important and appropriate the transfusion that the department ordered was. In this study there was appropriate %T. In various studies, %T was low for surgery and orthopaedics departments. [13,14,15,16].
The TI shows whether the number of cross-matched blood units is appropriate. An efficient use of blood is indicated by a value of 0.5 or above [17]. The total TI of 1.03 in the current study was found to be suggestive of effective blood utilization. In their investigation, Ebose EM and Osalumese IC reported a TI of less than 0.5[15].

CONCLUSION –

The study on the utilization of blood and blood components in a tertiary care center highlights the critical role of efficient blood management in ensuring optimal patient care. The findings emphasize the importance of rational blood usage, adherence to transfusion guidelines, and the need for continuous monitoring to minimize wastage. A significant proportion of transfusions involved packed red blood cells, followed by plasma and platelet concentrates, indicating their essential role in managing anemia, coagulopathies, and critical care cases. To enhance blood utilization practices, implementing strict transfusion protocols, clinician education, and better inventory management strategies are necessary. Additionally, promoting voluntary blood donation and maintaining an adequate and safe blood supply are crucial for meeting the growing demands of tertiary healthcare centers. Further research and audits can help refine transfusion practices and improve overall patient outcomes.

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