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## Original Research Article

# An audit to assess the clinical use of blood and blood components at a tertiary care hospital

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### ABSTRACT

**Background:** An understanding of trends in blood and its product usage profile and current usage can help predict future trends in demand and help to put efforts to reduce use in particular areas. Present study aimed to assess the use of blood and blood components issued by blood bank and indication for selection of specific blood products.

**Materials and Methods:** The present cross sectional observational time bound study was conducted at Father Muller Medical College & Hospital, which included all the patients to whom the whole or blood component are issued from blood between Jan 2016 to Jan 2020. All the units of blood and blood components issued to outside hospitals and institutions were excluded.

**Result:** A total of 20000 components were dispatched to 5002 patients request for the blood components from the blood bank, 2968 were males and 2032 were female patients (male to female ratio of 1.46:1). Highest request for blood components for transfusion was received from Medicine department and allied with 6063 units, followed with various Intensive care units (4477 units), oncology department (5729 units), OBG (1841 units), orthopaedics (1248 units) and surgery (453 units). The most common diagnosis for patients requiring blood components was haematological causes or Bleeding followed by elective surgery.

**Conclusion:** Auditing the use of blood, its components and indications for their use by the various departments of the hospital has helped to finding the trend of number of blood.

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## 1. Introduction

Blood is a valuable resource. When it comes to modern medical practice, this is especially important in developing country such as India. The demand for blood surpasses the blood supply in many countries with WHO stating that 87.5percent of developing countries are able to collect less than half of blood and blood components as per requirements of their population.<sup>1</sup>

In an ideal situation, this scarce and valuable resource would be used in a proper time bound manner with strict rationale for their usage. This will ensure that wastage and outdated of blood and blood products would not occur. Studies have shown that target intervention, adherence to strict guide lines and proper auditing can lead to a significant reduction in the wastage of blood components.<sup>2</sup>

Blood transfusion with hopes to benefit patients is an ancient practice and the available records date back to the thirteenth century, from then and till date transfusion of blood and blood components remain an important and indispensable part of patient management.<sup>3</sup> Progress made

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in the field of medicine and the advent of new technology transfusion is safer than ever before, even then like all therapeutic interventions it involves many significant and often unwanted side effects and underestimated risks. This and the fact that blood is a very limited and precious resource and the attempts to come up with substitutes have not yielded any satisfactory results, the judicious and appropriate use of blood and its component becomes imperative. For surgical patients blood transfusion play a major role for resuscitation and management. And there is over ordering of blood for elective and emergency surgical procedures and it is usually common practice.<sup>4</sup>

Health care expenses are increased due to inappropriate usage of medical technology and hence therefore inappropriate usage of blood is costly. Inappropriate use of transfusion adds additional cost to treatment of disease. Thus indication for ordering blood must be fully justified. Hence periodic review of blood components usage is essential to assess the blood utilization pattern in any hospital or health set up. An analysis of transfusion practices in a hospital set up can be of help to identifying key areas where there is a need to change policy and formulate strategies for clinician education.

Present study aimed to assess the use of blood and blood components issued by blood bank and indication for selection of specific blood products.

## 2. Materials and Methods

The present cross sectional observational time bound study was conducted at Father Muller Medical College & Hospital, which included all the patients to whom the whole or blood component are issued from blood bank attached to the tertiary care centre between Jan 2016 to Jan 2020. All the units of blood and blood components issued to outside hospitals and institutions were excluded from the study. The study was conducted after getting institutional ethics clearance. The demographic data (except identifying details like name/address/phone number), blood group data and other laboratory parameters, clinical diagnosis, and indication for transfusion of all in-patients to whom blood/blood components are issued from the blood bank attached to the Father Muller Medical College & Hospital.

Statistics: all the data was collected in proforma and entered in excel sheet. The collected data was summarised as mean, standard deviation, frequency and percentage. The statistical analysis was performed using SPSS v21 operating on windows 10.

## 3. Result

The study covered 5002 patients for the period of Jan 2016 to Jan 2020 who requested for blood and blood products from the blood bank of institute. A total of 20000 components were dispatched during the study period from

the blood bank. Our institute being a tertiary care health centre with a well equipped blood bank facility, various blood components were available for the patient care. Among the 5002 patients request for the blood components from the blood bank, 2968 were males and 2032 were female patients. In present study there was slight male preponderance with male to female ratio of 1.45:1

The total number of blood components issued from the blood bank of our institution during the period of study was 20000 units. Among them, the various components were as follows; 8593 units of packed red cells (PRC), 6410 units of fresh frozen plasma (FFP), 4954 units of platelets, 4 cryoprecipitate and 39 units of whole blood to different departments. (Table 1)

Among 20000 units of blood, the common blood group of the blood component was O+ve with 7105 units, followed by B+ve with 6093 units, A+ve with 4711 units, AB+ve with 1231 units. The Rh-ve blood components were less common, with AB-ve least with 97 units, A-ve with 216 units, B-ve with 289 and O-ve with 256 issued to patients. Only 2 Bombay blood group component was issued during the period of study. (Figure 1)

The request for the blood was from various departments was observed. Highest request for blood components for transfusion was received from Medicine department and allied with 6063 units, followed with various Intensive care units (SICU, MICU, PICU, NICU etc) with 4477 units, oncology department with 5729 units, OBG with 1841 units, orthopaedics with 1248 units and surgery with 453 units of blood. Paediatric department with least request for blood transfusion of 189 units of blood components. Cryoprecipitate was requested in very low number with only 4 units issued to ICU.(Table 2)

The most common diagnosis for patients requiring blood components was haematological causes or Bleeding (n=1360; 27.2%) followed by elective surgery (n=1319; 26.2%). Other common diagnosis in patients was carcinoma (n=850; 17.3%) and obstetric causes (n=490; 9.8%) which include the labour and LSCS. Others included renal disease (n=455), hepatic disease (n=345), infections (n=140).(Table 3)

## 4. Discussion

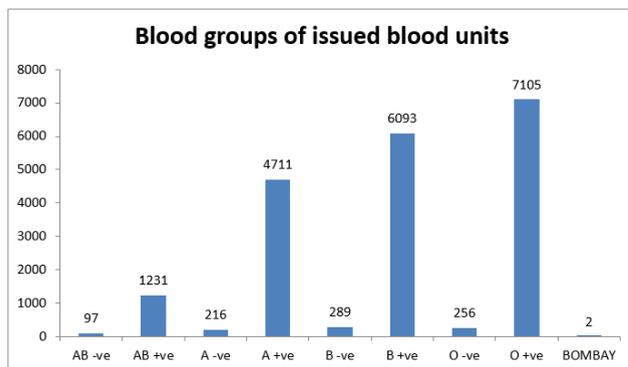
Internal audit is an essential component of a blood bank's quality control procedure, as it is in any other organisation or laboratory. The only goal of this quality assurance programme is to provide patients with safe and effective blood products. The Food and Drug Administration (FDA) considers whole blood and its components to be medications since their usage is intended to provide therapeutic advantages to patients. Thus, the FDA stresses blood and its products' quality by applying pharmaceutical industry standards to the collection, testing, storage, and provision of safe blood.

Gaur DS <sup>5</sup>	2008	More requests for blood components was from Medical ward and surgical wards.
Gomathi G <sup>6</sup>	2012	Request for blood components were from the medicine department followed by surgery and OBG.
Ambrose MM <sup>7</sup>	2015	More requests for blood components were from Medical, surgical and ICU.
Our study		Highest requests for the blood components were from the medical department, ICU's, Oncology, orthopaedics and surgical departments.

Blood components include packed red blood cells, fresh frozen plasma, platelet rich concentrates and cryoprecipitate, cryosupernatant (remnant plasma after the production of cryoprecipitate and bank plasma), and cryosupernatant (remnant plasma after the production of cryoprecipitate and bank plasma) (plasma that was never frozen). Products are generally those generated from plasma by the pharmaceutical process, such as factor concentrates, albumin, and immunoglobulins. The FDA oversees the quality of blood and related products by implementing pharmaceutical industry standards for collection, storage, testing, and provision of safe blood.<sup>5</sup>

**Table 1:** Units of blood components issued from blood bank

	Patients received	Total Units
No of Units issued	5002	20000
Packed red cells	4156	8593
Fresh frozen plasma	847	6410
Platelets	690	4954
Cryoprecipitate	2	4
Whole blood	30	39



**Figure 1:** Blood group distribution in study subjects.

Rational use of blood is intended to ensure that blood is used like a lifesaving drug – when essential. Besides, this

**Table 2:** Department wise distribution of blood component request.

Department ordered	No of Units issued	Packed red cells	Fresh frozen plasma	Platelets	Cryo-precipitate	Whole blood
Medicine	6063	2452	1961	1646	-	4
Surgery	453	348	50	55	-	-
OBG	1841	1030	601	206	-	4
Paediatrics	189	73	45	69	-	2
Orthopaedics	1248	853	169	225	-	-
ICU's	4477	1232	2034	1189	4	19
Oncology	5729	2605	1550	1564	-	10
Total	20000	8593	6410	4954	4	39

**Table 3:** Various diagnosis and blood components issued

Diagnosis	Frequency	Percent
Fracture/trauma	43	0.86
Carcinoma	850	17.3
Renal disease	455	9.1
Hepatic disease	345	6.9
Haematological cause/ Bleeding	1360	27.2
Obstetric cause	490	9.8
Infections	140	2.8
Elective Surgery	1319	26.2
Total	5002	100

it also ensures that there is adequate inventory to utilize for patients in need. Therefore, it is necessary for every blood bank besides ensuring quality of this life saving product, to monitor, assess and evaluate the existing trends and appropriateness of blood ordering. As it is lifesaving drug every attempt should be made to prevent any misuse of these products. In Internal audit of utilization of blood components can act as integral part of quality control programme similar to any other organization. Overuse or misuse can lead to shortage of blood specially the rare blood groups and sometimes it is really not available for patient who is in life threatening situation.

It is important to do the regular internal audits and educational campaigns for proper utilization of blood components for patients and to avoid inappropriate usage. Over a period of time indication for usage of blood components has been defined. Post-world war II blood transfusion usually given for every patient whose haemoglobin is less than 10 g/dL.<sup>5</sup> But due to developing strategies for transfusion, transfusion threshold, transfusion triggers and restrictive strategies for transfusion currently appropriate usage of blood is promoted globally. Usually retrospective audits are very efficient in finding out the areas where there is a need to change transfusion practice. Different studies have assessed the utilization trends of blood components with proper feedback to clinicians. Overall, when all red cells and components are considered, the Clinical demand to utilization ratio in our study is 59.8 %. While utilization ranging from 13.6% to 23.14%

has been shown in various studies.<sup>8</sup> After implementation of maximum surgical blood order schedule (MSBOS) in their surgical patients Vibhute et al showed an improved utilization rate from 23.14% to 74.74%.<sup>8</sup>

According to WHO 2012 statistics, 108 million blood donations collected globally with increase of 25% from 80 million donations collected in 2004.<sup>9</sup> There is increase in 8.6 million voluntary blood donations from 2004 to 2012. According to the National AIDS Control Organization (NACO) which is the statutory body for blood safety in India, annual requirement of country is estimated at 80 lakhs units for 2012-13, out of which 55 lakh units is target for NACO supported blood banks. During 2012 – 2013, 67.56 lakh blood units were collected across the country, till December 2012. Of this, NACO supported blood banks collected 38.68 lakh units.<sup>10</sup> This study is conducted in a tertiary care hospital among 5002 patients who received blood component transfusion during the period of study. Total number of transfusions carried in hospital during the period was 20000 units of blood and its products.

The gender distribution showed a preponderance of males (59.3%, 2968 patients) than females (40.7%, 2034 patients) who received blood, with male to female ratio of 1.45:1. Similar patterns are seen in other studies. In the Brazilian study by TT Gonzalez et al, 62% of all components were utilized by males.<sup>11</sup> Study conducted by Gaur DS et.al also recorded the preponderance of males in South Indian study with male female ratio of 1.6:1.<sup>5</sup> It can be noted that the more number of issues of blood in females was in age group of 21-30 years and 41-50 years, one being the age to bear child and other peak for gynaecological issues in women's.

We found the majority of the blood components were issued to the department of medicine (6063 units) and followed by intensive care units of various departments (4477 units). Surprisingly the oncology department patients received more number of blood components (5729 units). The request for the blood from OBG was with 1841 units of blood, from surgical department 453 units and from orthopaedics 1248 units of blood. The medicine department requested for various blood components; packed red cell (2452), FFP (1961) and PT (1646). On contrary, the surgical departments requested for packed red cells more than the FFP and PT. The oncology department requested for 1564 units of platelet. Compared to ICU setup, the majority of the blood component requested was FFP (2034) followed by PRC (1232) and PT (1189), and 19 units of whole blood. The overall whole blood request was very minimal and is comparable to the current trend.<sup>8</sup> Compared to routine and emergency, the utilisation of the blood products was found to be equal. The ICU's were considered the emergency requirement of the blood and the medical conditions like trauma, fractures, DIC, PPH, Bleeding.

The data obtained in present can be utilised to identify any shortfalls in the operation of the blood bank. Using

the inferences from the study, blood bank operations can be streamlined. A blood group profile of the population in this geographical area can be obtained which is of immense value when it comes to inventory of the blood bank and in situations like natural disasters and other catastrophes when large quantities of blood and blood products required

#### 4.1. Strengths

It was a prospective study conducted for period of 5 years. The entire consecutive recorded blood component issued from the blood bank is registered. The large sample size of the blood component utilisation audit. Having an oncology department in institution, this study documented major blood component request registration from the department.

#### 4.2. Limitation

Total number of blood components issued and transfused (probability of transfusion %) was not considered to account in the study. Also study did not consider the blood component expiration rate and wastage rate.

### 5. Conclusion

Auditing the use of blood, its components and indications for their use by the various departments of the hospital has helped to finding the trend of number of blood and its components used. This knowledge helps the blood banks to procure, preferentially categorise and release blood and blood components to as per requirement effectively. The inappropriate use of the blood component transfusion use has been reduced due to effective auditing in the institution. With the availability of the component substitution, the whole blood transfusion has reduced, <1% in our institution. This kind of audit also helps in efficient handling of blood and its components to minimise the wasteful usage. Also appropriate component therapy should be actively endorsed as it ensures optimum utilization of a scarce resource in a populous third world country like India.

### 6. Source of Funding

None.

### 7. Conflict of Interest

None.

### References

1. Kurup R, Anderson A, Boston C, Burns L, George M, Frank M. A study on blood product usage and wastage at the public hospital, Guyana. *BMC Res Notes*. 2016;9:307.
2. Baesler F, Nemeth M, Martinez C, Bastias A. Analysis of inventory strategies for blood components in a regional blood center using process simulation. *Transfusion*. 2014;54(2):323–53.
3. Vasavi P, Usha MK, Yadav A. Role of training session in improving the knowledge of blood transfusion practices among undergraduates:

- A hospital-based study. *J Pathol Nepal*. 2020;10(1):1702–7.
4. Belayneh T, Messele G, Abdissa Z, Tegene B. Blood Requisition and Utilization Practice in Surgical Patients at University of Gondar Hospital, Northwest Ethiopia. *J Blood Transfus*. 2013;758910:1–5.
  5. Gaur DS, Negi G, Chauhan N, Kusum A, Khan S, Pathak VP. Utilization of blood and components in a tertiary care hospital. *Indian J Hematol Blood Transfus*. 2009;25(3):91–96.
  6. Gomathi G, Varghese RG. Audit of use of blood and its components in a tertiary care center in South India. *Asian J Transfus Sci*. 2012;6(2):189–90.
  7. Ambrose MM, Ravichandran K, Ramdas A, Sekhar G. A study of blood utilization in a tertiary care hospital in South India. *J Nat Sci Biol Med*. 2015;6(1):106–16.
  8. Vibhute M, Kamath SK, Shetty A. Blood utilisation in elective general surgery cases: requirements, ordering and transfusion practices. *J Postgrad Med*. 2000;46(1):13–20.
  9. Gibbs WN, Corcoran P. Blood safety in developing countries. *Vox Sang*. 1994;67(4):377–81.
  10. Naco. Blood Transfusion Service; 2018. Available from: <https://naco.gov.in/blood-transfusion-services>.
  11. Gonzalez TT, Sabino EC, Capuani L, Liu J, Wright DJ, Walsh JH. Blood transfusion utilization and recipient survival at Hospital das Clinicas in Sao Paulo. *Brazil Transfusion*. 2012;52(4):729–67.

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