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Clinical Evaluation of Blood Requisition and Utilization Practices at a Teaching Hospital, Mirpur, Azad Jammu and Kashmir, Pakistan

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ABSTRACT

Background: A blood transfusion is a routine medical procedure in which donated blood is provided to recipient after necessary steps such as compatibility testing and donor screening for blood-borne viruses, bacteria and parasites. The balance between demand and supply is increasing significantly. The completion of the blood request form is equally important for the successful blood transfusion, haemovigilance and traceability of adverse events. The judicious use of blood products can be calculated by compatibility testing and transfusion (C:T) ratio, transfusion probability and transfusion index (TI).

Objective: To assess the clinical evaluation of blood requisition and utilisation practices at Divisional Headquarters Teaching Hospital, Mirpur, Azad Jammu and Kashmir.

Methodology: This was a prospective study carried out in a Department of Pathology and Transfusion Medicine from June to November 2023. A total of 3,213 patients were entertained during the study period. The data were entered in SPSS version 20.0 (IBM SPSS Statistics for Windows, IBM Corp., Armonk, NY, USA) and analysed for completeness, legibility, and blood component utilization through calculation of key indicators including C:T ratio, transfusion probability (%T), and TI.

Results: Out of the 3,213 blood request forms reviewed, 1% of the forms were filled. The overall C:T ratio, transfusion probability, and transfusion index were 1.5, 64.8%, and 0.6, respectively.

Conclusion: This study highlights significant gaps in the completion of BRF. There is a variation seen in blood transfusion practices among different hospital departments. A similar study is suggested at a larger scale and with an increased sample size to assess the real scenario of C:T ratio, transfusion probability (TP) and transfusion index (TI). The hospital transfusion committee should take a step forward to encounter this challenge.

Key words: blood transfusion, haemovigilance, transfusion index, transfusion probability

Introduction

James Bundell was a physician/ obstetrician who carried out the first blood transfusion on 22 December, 1818.[1] Nowadays, Blood transfusion is an important and life-saving therapeutic intervention within a hospital. In a blood bank, whole blood is collected and separated into components, screened and stored according to the standard protocols.[2] Blood transfusion services within a hospital are required according to various conditions such as treating patients for surgical interventions, chronic diseases, complications related to pregnancies, and malignant conditions. It remains a key component in the resuscitation and overall management of patients suffering from these conditions.[3]

The requirement of blood products in Pakistan is increasingly day by day. The total donations collected in Pakistan are approximately 3.2 million per annum and this demand is expected to increase up to 5 million by 2030.[4,5] Blood demand is frequently challenged by inefficient utilization practices. Preventing unnecessary crossmatch requests is essential, as they can negatively impact blood inventory and compromise optimal stock management in blood banks.[1]

Anecdotal evidence suggests that clinicians often overorder blood through request forms, which can adversely affect blood bank inventory. Once blood is reserved or crossmatched, it may limit

availability for patients who require transfusion on an urgent basis. This situation represents a significant challenge, as it can exacerbate shortages in already limited blood supplies and lead to the loss of shelf life of crossmatched blood products, ultimately contributing to resource depletion.[2] Excessive blood requests also result in the unnecessary consumption of laboratory reagents, staff time, and workforce capacity. Furthermore, these practices impose an additional financial burden on patients.[1]

In blood banking, auditing transfusion requests and analyzing quality indicators, such as the crossmatch-to-transfusion (C:T) ratio, transfusion probability (%T), and transfusion index (TI), are considered highly effective methods for evaluating the appropriateness of blood utilization. Proper completion of the Blood Requisition Form (BRF) plays a crucial role in minimizing inappropriate use of blood and blood components. The BRF typically captures essential information, including patient demographics, clinical location, relevant laboratory findings, and the requesting physician's name, signature, and contact details, thereby facilitating safe, efficient, and traceable transfusion practices.[6]

In 1975, Boral Henry used the C:T ratio which is a quality indicator in blood transfusion and later was used by many authors in blood banking.[7] The definition of Crossmatch-to-Transfusion (C:T) ratio is the number of packed red blood cell (PRBC) units crossmatched divided by the number of units actually transfused. According to the Association for the Advancement of Blood and Biotherapies (AABB), a C:T ratio greater than 2.0 indicates excessive or inefficient blood ordering. Elevated C:T ratios can be useful for identifying departments or clinicians with suboptimal blood-requesting practices and may highlight the need to adopt more appropriate crossmatching strategies or alternative blood management protocols.[7]

In Pakistan, the limited availability of blood and its components, coupled with an overreliance on family replacement donors, is often not managed in a rational or evidence-based manner. Additionally, the importance of accurately completing the BRF is frequently overlooked by clinicians. Such practices contribute to resource wastage and increase the risk of inappropriate transfusions. In many cases, prescribing practices do not align with established transfusion guidelines, further emphasizing the need for improved adherence to standardized protocols and responsible blood utilization.

Therefore, the present study was conducted to assess the clinical evaluation of blood requisition and utilization practices at the Divisional Headquarters Teaching Hospital, Mirpur, Azad Jammu and Kashmir (AJK), Pakistan.

Methodology

The current study was conducted in a 500-bedded teaching hospital which currently has major clinical departments such as general surgery (subunits: general surgery, urology, and neurosurgery), internal medicine, paediatrics, gynaecology & obstetrics, ophthalmology, orthopaedics, emergency, psychiatry, dialysis, and dental surgery as well as Intensive Care Units and Critical Care Unit.

This was a prospective study carried out in the Department of Pathology and Transfusion Medicine from June to November 2023. Ethical approval was obtained from the Ethical and Research Committee of DHQ Teaching Hospital, Mirpur, AJ&K.

A total of 3,213 consecutive BRFs submitted to the Blood Transfusion Services during the study period were compiled and reviewed. The data were entered and analyzed using SPSS (IBM SPSS Statistics for Windows, Version 20.0; IBM Corp., Armonk, NY, USA). All records were anonymized and identified using a unique study ID to ensure confidentiality.

Each BRF was examined for completeness of the required information, including the patient's name, patient control number (PCN), ward and bed number, type and quantity of blood components requested, relevant clinical history (defined as clinical history and/or differential diagnosis), previous history of transfusion, blood group, and the referring physician's name and signature.

Generally, all this information should be provided in the BRF. The usage of PRBCs was evaluated by some quality indicators which was, the Crossmatch-to-Transfusion (C:T) ratio, Transfusion Probability (%T), and Transfusion Index (TI), calculated using the following formulas:

$$\text{C:T ratio} = \frac{\text{Total Number of crossmatched red cell units}}{\text{Actual red cell units transfused}}$$

$$\%T = \frac{\text{Number of patients transfused}}{\text{Number of patients crossmatched}} \times 100$$

$$TI = \frac{\text{Number of red cells units transfused}}{\text{Number of patients crossmatched}}$$

A %T value of 30 or above is acceptable.[8] The C:T ratio should be 1.0 but a ratio of 2.5 or below shows effective blood practice.[8] A TI value of 0.5 or above is suggestive of effective blood usage.[9]

Results

In the present study, a total of 3,213 blood requests were evaluated, of which 2,084 (64.8%) resulted in actual transfusions, while 1,129 (35.1%) units were only crossmatched or reserved for patients. Tables I and II show the age groups distribution of patients and distribution of blood according to wards. The findings indicate a moderate to efficient level of blood utilization within the hospital. The C:T ratio, %T, and TI were calculated as 1.5, 64.8%, and 0.6, respectively (Table IV). These values fall within the acceptable thresholds recommended by the AABB, suggesting overall efficient blood utilization practices.

Table I: Age group distribution of patients

Sr. #	Age Group	Number of Patients (%)
1.	0-10 Years	257 (8)
2.	11-20 Years	482 (15)
3.	21-30 Years	964 (30)
4.	31-40 Years	482 (15)
5.	41-50 Years	321 (10)
6.	51-60 Years	289 (9)
7.	≥ 60 Years	418 (13)

Table II: Distribution according to wards

Sr. #	Wards	No of Patients (%)
1.	Gynaecology	739 (23)
2.	Paediatrics	193 (6)
3.	Thalassemia	707 (22)
4.	Orthopaedic	193 (6)
5.	Surgical wards	301 (9)
6.	Medical wards	312 (10)
7.	Dialysis Centre	450 (14)
8.	Emergency	96 (3)
9.	Urology	192 (6)
10.	Cardiac	30 (1)

Table III: Percentage of completion of blood requisition form parameters

Sr. #	Parameters of BRF	Number	Percentage
1.	Patient's name	3,213	100
2.	Blood sample ID	3,168	98.6
3.	Patient's age	2,377	74
4.	Patient's sex	2,483	77.3
5.	Patient's ward	2,300	71.6
6.	Type of blood component required	3,190	99.3
7.	Number of blood component required	3,148	98
8.	Date and time when components required	3,061	95.3
9.	Previous history of transfusion	170	5.3
10	Patients' blood group	2,056	64
11	Referring doctors Name	854	26.6
12	Indication of transfusion	427	13.3

The most frequently incomplete parameters (Table III) on the BRF were: patient name (100%), patient ID number (98.6%), type of blood components required (99.3%), number of components required (98%), date and time when components were needed (95.3%), patient age (74%), sex (77.3%), ward (71.6%), blood group (64%), referring physician's name (26.6%), indication for transfusion (13.3%), and previous history of transfusion (5.3%).

Discussion

Blood and its products remain an essential and frequently used therapeutic intervention. However, it carries an inherent risk of adverse reactions, some of which may be severe or even life-threatening. Ensuring transfusion safety requires the consistent application of quality assurance measures throughout the entire process, from donor selection to the administration of blood to the recipient.

Enhancing clinicians' knowledge of transfusion practices through regular audits and monitoring of blood requisition forms is essential for promoting appropriate blood utilization. Such measures help maintain optimal blood inventory levels and ensure the timely availability of blood components to meet patients' clinical needs.

Table IV: Blood utilization indicators in the hospital					
Departments	Blood Crossmatched	Blood Transfused	C:T Value	Transfusion Probability (%T)	Transfusion Index (TI)
Gynaecology	739	372	1.9	50%	0.5
Paediatrics	193	70	2.7	36%	0.3
Thalassemia	707	707	1	100%	1
Orthopaedic	193	63	3	32%	0.3
Surgical wards	301	150	2	48%	0.4
Medical wards	312	135	2.3	43%	0.4
Dialysis centre	450	415	1	92%	0.9
Emergency	96	96	1	100%	1
Urology	192	65	2.9	33.8%	0.3
Cardiac	30	11	2.7	36.6%	0.3
Total	3,213	2,084	1.5	64.8%	0.6

Ensuring the proper completion of BRFs in accordance with international guidelines helps reduce operational irregularities within blood banks. Improved documentation enhances traceability and accountability, thereby standardizing the transfusion process from donor to recipient. Moreover, these practices minimize the wastage of valuable resources and help reduce the financial burden on patients.

In the present study, only 1% of BRFs were completed in full. Among the demographic variables, age and gender were documented in 74% and 77.3% of forms, respectively. Accurate demographic information is essential for proper patient identification, particularly in cases where patients share similar or identical names. Furthermore, the requesting physician's name and official stamp were missing in 73.4% of the forms, raising concerns regarding accountability and the traceability of transfusion requests. Studies from Nigeria[10] and India[11] reported that 81.2% and 97% of BRFs were completely filled.

Previous transfusion history was documented on only 5.3% of BRFs, representing an alarming finding. Incomplete documentation of this critical information may increase the risk of preventable transfusion-related reactions, thereby contributing to higher morbidity and mortality.[12,13] The finding reflects a serious gap in documentation and communication between clinical departments and the blood bank. Incomplete BRFs compromise traceability, increase the risk of clerical errors, and hinder accurate assessment of transfusion appropriateness.

The Crossmatch-to-Transfusion (C:T) ratio, transfusion probability (%T), and transfusion index (TI) were calculated as 1.5, 64.8%, and 0.6 respectively. Similar findings have been reported by Joon et al., (2023),[4] who also observed optimal C:T ratios in tertiary care centres where regular transfusion audits are performed.

The C:T ratio of 1.5 is comparable with a study carried out in the UK (2.1),[14] Iran (3.71),[15] Nigeria (2.2),[16] and India (2.5).[17] Our C:T ratio is low compared to above countries. Departmental analysis revealed marked variation in blood utilization. The thalassaemia and dialysis units demonstrated optimal C:T ratios of 1.0 and high transfusion probabilities (100% and 92%, respectively) indicating efficient usage patterns and justified requisitions.

Conversely, orthopaedic, urology, and paediatric wards had relatively higher C:T ratios (2.7–3.0), signifying over-ordering or underutilization of crossmatched blood. Similar inter-departmental discrepancies have been highlighted in studies from India, UK, and Iran where surgery related disciplines often contribute to higher wastage rates due to over cautious blood ordering for elective procedures. It is important to mention that in 1980, transfusion probability (%T) was used for the first time[18] where a value of >30 is indicative of appropriate transfusion. The overall %T in our study was 64.8 which is comparable with studies from Ethiopia (47%)[19] and India (59%).[20]

Transfusion index (TI) is another indicator in which value of >0.5 is suggestive of effective blood usage practices.[9] In the present study, overall TI

was 0.6. This is comparable with studies from Ethiopia (0.77).[19]

Overall, the blood utilization indicators in this study are within acceptable limits, yet the incomplete BRFs and inter-departmental variations underline the need for continuous monitoring. Regular audit cycles, clinician education, and digitization of the requisition process can significantly enhance blood management efficiency.

Conclusion

This study highlights significant gaps in the completion of BRFs and there is a variation seen in blood transfusion practice among different hospital departments. However, the overall results of C:T ratio, %T and TI are according to acceptable range but the departments like surgical, orthopaedic and paediatric units' data show over ordering and underuse of blood and blood products. To ensure safe and efficient transfusion practices, it is essential to implement regular transfusion audits, clinician training, and adherence to evidence-based guidelines such as the Maximum Surgical Blood Ordering Schedule (MSBOS).

Standardizing BRF completion according to international benchmarks will strengthen hemovigilance, minimize wastage, enhance patient safety, and improve overall cost-effectiveness of transfusion services within the hospital.

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