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ANALYSIS OF BLOOD REQUISITION AND UTILISATION PRACTICES BY ASSESSMENT OF BLOOD UTILISATION QUALITY INDICATORS IN A TERTIARY CARE TEACHING HOSPITAL, SRINAGAR

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ABSTRACT

Blood components are a scarce and expensive resource. Therefore, there is a need to continuously monitor blood utilization and audit the transfusion practices to identify key areas of concern for blood usage. **Aim** Assessment of utilisation of blood and blood components through C/T ratio (crossmatch/transfusion ratio). **Material and methods** A retrospective survey of the blood ordering practice conducted over a period of one year from January 2022 to December 2022 in SMHS blood centre, Gmc Srinagar. **Results**: A total of 16,570 requests for cross matching of blood and its components were received. Out of these, 11,123units were transfused. The C/T ratio and transfusion index were 1.4 and 0.7 respectively. **Conclusion**: The blood transfusion quality indicators including CT ratio and TI of the present study demonstrated efficient blood utilisation.

KEYWORDS: Cross-match/Transfusion ratio; Transfusion index; MSBOS.

INTRODUCTION

Blood and blood products are the most precious resource to any healthcare institution. Judicious use of these limited resources is necessary and significant to preserve adequate supply. Blood obtained from voluntary non-remunerated blood donors is a scarce and precious resource, which must be effectively managed and stocked.[1] Excessive over-ordering of blood preoperatively is a very common problem in elective surgeries. Type and crossmatch are the routine protocol in Asian countries in contrast to electronic type and screen protocols followed in western countries. This causes the blood to be unavailable for the emergency patients for at least 48–72 h, increased workload on the technicians, reagent wastage, and added financial burden on the patient undergoing the elective surgery.[2]

American College of Critical Care Medicine has emphasized the need to reduce both unnecessary pre-operative blood testing and ordering of Red Blood Cell (RBC) units. Implementing a Hospital Based Patient Management (PBM) program can help identify ways of achieving these goals.[3]

To reduce this excessive blood wastage, medical centers need to adopt blood conserving policies such as maximum surgical blood order schedule (MSBOS), surgical blood order equation, or type and screening of blood which would lead to better utilization of blood products. MSBOS first published by Friedman in 1979 to guide ordering practices has universally resulted in substantial reduction of direct and indirect costs.[4,5] The primary objective of this study was to evaluate the blood requisition, blood utilization, and utilization management by analyzing crossmatch to transfusion ratio (C:T). Transfusion index (TI) was also calculated to determine average number of units transfused. With the help of transfusion index we were able to have knowledge about MSBOS of our institution.

AIMS AND OBJECTIVES

Assessment of utilisation of blood and blood components through C/T ratio(crossmatch/transfusion ratio).

MATERIAL AND METHODS

This is a retrospective study conducted over a period of one year from January 2022 to December 2022 in the department of Immunohematology and Transfusion Medicine, GMC Srinagar. Details of blood requisition and transfusion cases were collected and reviewed through blood bank record registers and blood requisition forms.

Blood utilization indices were computed by the following equations

(i) Crossmatch to transfusion ratio (C/T ratio)
Number of units cross-matched/number of units transfused. A ratio of less than 2.5 is considered indicative of significant blood usage.

(ii) Transfusion index (TI)
Number of units transfused/ number of patients cross-matched. A value of greater than 0.5 signifies blood usage.

(iii) Transfusion probability (%)
Number of patients transfused/number of patients cross-matched $\times$100. A value of 30% or more was considered indicative of significant blood usage.

(iv) Maximum Surgical Blood Ordering Schedule (MSBOS): 1.5 $\times$ TI
Excessive cross matching was considered when these indices were above thresholds for appropriate blood usage, i.e., C:T ratio >2.5 and TI <0.5.

The obtained data was evaluated and presented in the tabular and diagrammatic forms.

Ethical and Institutional Issues
The study has been approved by institutional ethics committee.

RESULTS
During the study period, total number of ordered units of packed red blood cells were 16,570 and all the units were crossmatched. Among 16,570 crossmatched units 11,123 were transfused to the patients in different departments. The blood issued to different departments are shown in table 1. Table 2 shows the C/T ratio during study period, which shows significant usage of blood as the C/T ratio is less than 2.5 in every month of study period. Transfusion index also shows significant usage of blood as TI during study period is either 0.5 or > 0.5. Table 3.

Table 1: Transfusion in different departments.

Departments	Number of transfusions(N=)	Percentage (%)
Medicine	5070	46.6%
Dialysis ward	1200	10.7%
Surgery	1180	10.6%
Oncology	1100	9.9%
Burn ward	700	6.29%
ICU	504	4.63%
Private nursing homes(PNH)	500	4.5%
Associated hospitals	322	2.9%
Thalassemia	249	2.23%
Triage	184	1.65%
Urology	70	0.62%
Neurosurgery	34	0.30%
ENT	10	0.08%
Total	11.123	100 %

Table 2: Month wise C/T ratio in present study.

| Months	Total number of crossmatched(N=)	Total number of transfusions(N=)	C/T ratio
January	746	625	1.1:1
February	780	744	1.0:1
March	1004	948	1.0:1
April	1002	984	1.0:1
May	1833	1048	1.7:1
June	1912	1047	1.8:1
July	2131	1158	1.8:1
August	1746	1038	1.6:1
September	1514	954	1.5:1
October	1616	968	1.6:1
November	1246	827	1.5:1
December	1022	782	1.3:1

Table 3: Month wise transfusion index (TI) in present study.

Months	Number of units transfused	Number of patients crossmatched	Transfusion index (TI)
January	625	746	0.8
February	744	780	0.9
March	948	1004	0.9
April	984	1002	0.9
May	1048	1833	0.5
June	1047	1912	0.5
July	1158	2131	0.5
August	1038	1746	0.5
September	954	1514	0.6
October	968	1616	0.6
November	827	1246	0.7
December	782	1022	0.8

Table 4: Mean Of The Indices In Present Study.

S. No	Indices	Mean
1	C/T ratio	1.4:1
2	TI	0.7
3	MSBOS	TI × 1.5

This table (table no. 4) depicts overall C/T ratio was 1.4:1 which indicates efficient blood usage by all the departments of our hospital. And transfusion index of 0.7 which again depicts the efficient usage of blood by the departments of our.
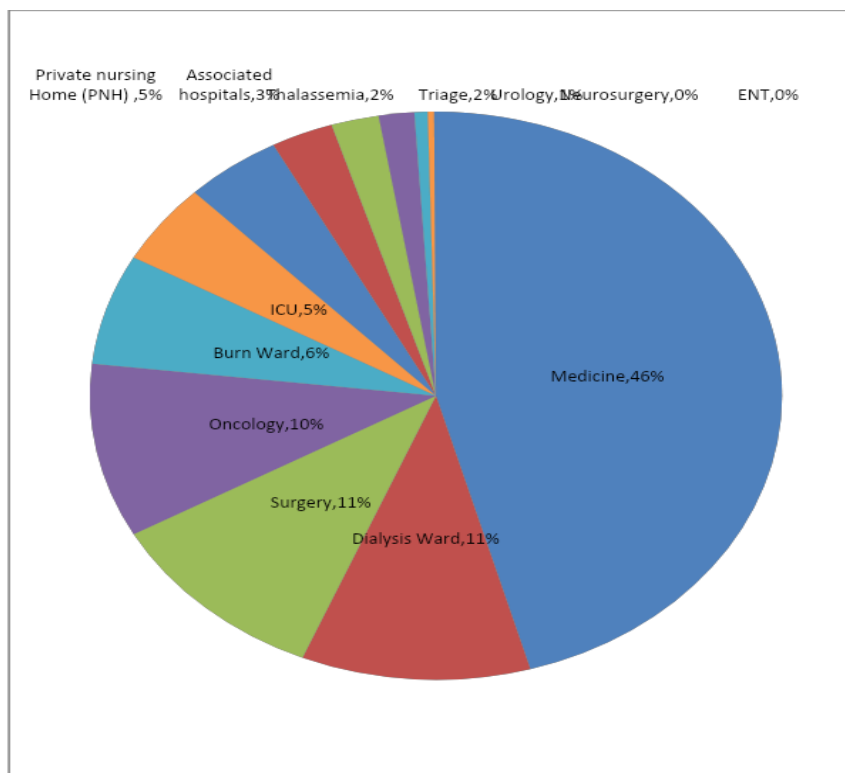
Diagram 1 Piechart showing transfusion rate in different departments.

DISCUSSION

Blood transfusion undoubtedly plays a major role in resuscitation and management of all the needy patients but overestimation of anticipated blood loss results in over-ordering of blood leading to artificial shortage of reserves and wastage of supplies and resources in terms of time and reagents. The use of C:T ratio was first suggested by Boral Henry in 1975.[6] Ideally, this ratio should be 1.0 but a ratio of 2.5 and below is considered to be indicative of efficient blood usage. The overall C:T ratio I.e 1.4 for all the patients in our study is much lower compared to other studies in India wherein C:T ratio was 2.5 and 4.3.[7,8] Kaur P et al and Raghuwanshi B et al showed C/T ratio of 2.4 and 6.31 respectively.[9,10] This indicates better utilization and utilization management in our hospital as compared to other above-mentioned studies. C:T ratio >2.0 means that <50% cross-matched units are transfused. Overall C:T ratio of 1.4 in current study is indicative of efficient blood usage.

Regarding TI, a value of 0.5 or more is indicative of efficient blood usage and appropriateness of number of units transfused.[10] TI reported in the current study for all cases is 0.7 higher than in studies conducted by Yazdi et al. (0.31), Gamage et al. (0.2), and Vibhute M et al. (0.35)[8,11,12]

Patient Blood Management (PBM) strategies like evaluation of appropriateness of transfusion orders and further discussion with clinical team, use of pharmaceutical products like intravenous iron, vitamin K etc., blood-sparing strategies during surgery such as normovolemic or haemodilution measures or usage of cell salvage can be implemented along with evidence-supported transfusion guidelines, eliminating unnecessary transfusions as these are considered the main goals of PBM programs during a disaster like COVID-19 pandemic.[13] Table 5,6 shows the comparison of different studies in terms of C/T ratio and transfusion index.

Table 5: Comparison of cross-matching to Transfusion ratio among different studies.

Studies	C/T ratio
Subramanian A _et al_	2.5
Vibhute M _et al_	4.3
Kaur P _et al_	2.4
Raghuwanshi B _et al_	6.31
Present study	1.4

Table 6: Comparison of Transfusion index(TI) among different studies.

Studies	TI
Yazdi _et al_	0.31
Gamage _et al_	0.2
Vibhute M _et al_	0.35
Present study	0.7

CONCLUSION
The blood transfusion quality indicators including CT ratio and TI of the present study demonstrated efficient blood utilisation. Blood transfusion services need to adopt blood conserving policies. Efforts should be made to adopt more conservative transfusion thresholds, conduct regular auditing about the effectiveness of blood requesting policy using C:T ratio and periodic feedback to improve blood ordering, handling, distribution, and utilization practices of this scarce resource.

To achieve the optimum value, i.e. 1.0 of cross-match to transfusion ratio on regular basis every hospital should apply Maximum Surgical Blood Ordering Schedule (MSBOS).

Conflicts of interest
There are no conflicts of interest.

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