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A Prospective Study on Blood Requisition and Utilization Practice in a Tertiary Care Teaching Hospital

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Abstract

Introduction: *Blood component transfusions form a vital role in the resuscitation and management of both medical and surgical patients. Treating doctors tend to over-order blood components in surplus of utilization. Policies for ordering a transfusion may be put into practice based upon audits, discussion and agreement made by the Hospital Transfusion Committee (HTC).*

Methodology: *A prospective study was undertaken for a period of 18 months in the department of transfusion medicine at a tertiary care teaching hospital. The data was collected from blood component request forms and blood-reserve & issue registers in the hospital blood bank. Blood utilization indices [Crossmatch/Transfusion Ratio (C/T Ratio), Transfusion Probability (%T) & Transfusion Index (TI)] were computed. Data were entered in MS excel and analyzed using SPSS version 20.*

Results: *During the study period, the department of transfusion medicine received 6197 cross match request forms for 1198 patients. From 6197 units cross matched, 1040 (16.8%) were transfused and the rest of the cross matched units were temporarily removed from main stock. The blood units prepared per patient ranged from one to eight units. The complete blood utilization indices of the hospital were C/T ratio of 5.95, %T of 67.7% and TI = 0.87 respectively.*

Discussion: *Blood transfusion indices of the present study were optimal but comparatively higher as most of the cross matched blood was not utilized. Developing a structured blood transfusion policy by the Hospital transfusion committee will pave way for better blood inventory, efficient blood utilization and financial savings.*

Keywords: *Blood component transfusions, Hospital transfusion committee (HTC), Blood utilization indices, Crossmatch/Transfusion Ratio (C/T Ratio), Transfusion Probability (%T), Transfusion Index (TI).*

Introduction

Blood component transfusions form a vital role in the resuscitation and management of both medical and surgical patients. Each year, the demand for blood components in hospitals far exceeds the collection of blood-by-blood banks. Statistics and

studies by various agencies have revealed that there is a inclination on part of treating doctors to over-order blood components in surplus of utilization.[1,2] This practice is a burden to the department of transfusion medicine as there is exhaustion of blood components, technical hands and money; thereby delay in issue of blood components for deserving patients. Regular audits are necessary to make sure that the demands for blood are met and inventory is maintained to save precious lives.

Frequent deviation in rates of blood transfusion might be due to various issues, including contradictory views on the threshold levels of haemoglobin percentage under which a patient requires blood transfusion, variations in surgical & anaesthetic methods, preoperative anaemia, and non-availability of transfusion protocols.[3]

Policies for ordering a transfusion may be put into practice based upon audits, discussion and agreement made by the Hospital Transfusion Committee (HTC).[4-6]

Two basic tests are performed when there is an request for blood component, namely group and save (G and S) and the major & minor crossmatch tests. The G and S procedure is ABO grouping & Rh typing of the blood sample and the remaining blood sample with the serum is saved for further needs. This procedure is time saving than the regular crossmatch and does not disturb the inventory of the blood bank.[6] Crossmatch of blood means to fully group & type a sample and to look for compatibility & cross-reactivity. Blood component is ready for issue and is removed from the common pool.

Haematological societies all over the world follow practical guidelines based on cross-match-to-transfusion ratio (C:T) of 2:1, thereby putting forward the concept that blood should not be issued/saved for surgery if the practice of use is below 50% of what was requested.[7]

Assessing blood transfusion practice & blood requests and further developing a blood ordering schedule helps in maintaining blood inventory for needy patients during emergency conditions, thus reducing the burden of the blood bank medical officer. The clinical condition of the patient should always be kept in mind, there should be relax ability, and suppleness in rules followed as patient's health and safety is important. The objective of this study was to study blood-ordering practice as to prevent unnecessary blood transfusion and to construct a policy to optimize blood transfusion practice that regulates inventory.

Methodology

A prospective study was undertaken for a period of 18 months in the department of transfusion medicine at a tertiary care teaching hospital. The data was composed from blood component request forms and blood-reserve & issue registers in the hospital blood bank. Ethical committee approval was obtained from Institutional Ethical Committee. The age & gender of the patient, diagnosis, complete blood count, number of blood units requested & crossmatched and number of blood units issued for transfusion were obtained from blood bank requisition form and registers. The blood unit which was crossmatched but not issued for transfusion and removed from blood inventory was considered as exhausted. To rationalize and consolidate the analysis, the departments were classified as Medical, Surgical, Obstetrics & Gynaecology, haematology and Oncology.

Data were entered in MS excel and analysed using SPSS version 20. Blood utilisation indices were computed with the following equation using MS Excel:

i. C/T Ratio = number of units cross matched / number of units transfused. Ideally, this ratio should be 1.0. A ratio of 2.5 and below is considered indicative of significant blood usage. The use of cross-match to transfusion ratio (C/T ratio) was first recommended by Boral Henry in 1975. [1]

ii. Transfusion probability (%T) = (number of patients transfused / number of patients cross matched) × 100. A value of 30% and

above was considered indicative of efficient blood usage. [5]

iii. 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 utilization. [5]

Results

During the study period, the department of transfusion medicine received 6197 crossmatch request forms for 1198 patients who had been admitted for medical ailments including haematological & oncological diseases, surgical and obstetrics & gynaecological procedures.

Table no.1: Socio-demographic and other characteristics of patients

Char acteristics	Number	Percentage
Gender		
Male	459	44.1
Female	581	55.9
Age		
< 65 years	842	81
> 65 years	198	19
Patients in each department		
Medical	219	21.1
Surgery & Orthopaedics	347	33.4
Obstetrics & Gynaecology	149	14.3
Hematology	230	22.1
Oncology	95	9.1
Total no. of blood units crossmatched	6197	100
Total no. of blood units transfused	1040	16.8

Table no.2: Comparison between number of patients & blood units cross matched and transfused

Department	No.of blood units		No. of patients	
	Cross matched	Trans fused	Cross matched	Trans fused
Medical	714	219	276	219
Surgery & Ortho.	3246	347	538	293
Obstetric & Gynae.	1379	149	191	117
Hematology	549	230	114	108
Oncology	309	95	79	74
Total	6197	1040	1198	811

Table no.3: Comparison of blood transfusion indices

Department	C/T Ratio	% T	TI
Medical	3.26	79.3	0.79
Surgery & Ortho.	9.35	54.4	0.64
Obstetric & Gynae.	9.25	61.2	0.78
Hematology	2.39	94.7	2.01
Oncology	3.25	93.6	1.20
Total	5.95	67.7	0.87

The Department of Surgery and orthopaedics submitted 3246 (52.38%) requests for crossmatched blood products followed by department of Obstetrics and Gynaecology, which requested for 1379 (22.25%) blood units. The blood crossmatch requests from the Department of Medicine, haematology and oncology collectively were 1572 (25.36%). 1040 transfusions (16.8%) were carried out from 6197 requests for blood units. Thereby, the remaining 5157 units (83.2%) crossmatched and ready for issue that were removed from main inventory stock was not utilized leaving a temporary vacuum in the main bloodstock. The majority of the patients who were transfused were females [581 (55.9%)] [Table 1]. The blood units prepared per patient ranged from one to eight units. Surgery and orthopaedics department had the highest number of patients crossmatched [538 (44.9%)] as well as with the highest number of units reserved [3246 (52.38%)]. 2899 requests for transfusion from the surgery department were finally not utilized having a utilization rate of 10.69%. On the other side, haematology and oncology department's requests for transfusion had 37.87% utilization rate (325 out of 858 requests). Overall, the complete blood utilization indices of the hospital were C/T ratio of 5.95, %T of 67.7% and TI = 0.87 respectively. Table no.2 & 3 shows the indices of blood utilization were different in each department.

Discussion

Blood component transfusion plays a major crucial role in patient care. As, it is a human product, the supply is limited with considerable risks of infections & reactions and costs. The practice of reserving blood leads to over ordering

of blood components, which causes ageing of blood units and reduction in main stock. The risks associated with Transfusion transmissible infections such as human immunodeficiency virus (HIV) and hepatitis B and C have to be considered, as there is residual risk of TTI if donations have been made in the window period. [6] Therefore, it is necessary to rationalize the usage of blood components.

The present study was conducted to find out the blood ordering practice of various departments, to prevent unnecessary blood transfusion in the future, and to construct a policy to optimize blood transfusion practice that regulates the blood inventory. Based on the results of the study, majority of the blood units crossmatched were not utilized for transfusion and this caused exhaustion of blood components, technical hands and money; thereby delay in issue of blood components for deserving patients.

The present study showed that 83.2% of the crossmatched blood was not utilized. This finding was consistent with the studies conducted by Vibhute et al (76.8%), Basnet et al (86.4%) and Ibrahim et al (74.8%).[8,9,10]

The CTR, %T and TI are used for assessing blood utilization in hospitals by the HTC. [8, 11-14] The CTR of the departments in our study varied from 2.39 to 9.35 revealing that there is excess requisition of blood units without utilization of the same as reported by various authors. [8,12,13,15] The explanation for the high CTR is individual expectation and expertise of predicting blood loss rather than guidelines based requirement for management of the disease. The practice of ordering and keeping the blood ready before shifting the patient for surgery maybe the reasonable factor accountable for high CTR of surgery, orthopaedics, obstetrics and gynaecology departments. In concordance with the present study, Vibhute et al[8] and Collins et al[12] reported a higher CT ratio by surgical departments in which there was up to 90% of over-ordering for a number of surgeries. The overall CTR of 5.95 observed in the present study is regarded to be indicative of unproductive blood usage. The indices of blood utilization varied between surgery departments (high CTR of 9.35) to haematology department (optimal CTR of 2.39). Similar findings had been observed from various studies. [8,13,14,16-18]

The probability of a transfusion (%T) for a given procedure was suggested by Mead et al in 1980. [5] A value of 50% and higher has been recommended as appropriate.[15] The overall transfusion probability (%T) calculated in the present study was 67.7% which is dependent on the number of patients transfused as against the number of patients crossmatched. The transfusion probability (%T) reflects the appropriateness and significance of the transfusion ordered by the department. The transfusion probability of the present study was similar to the findings reported by various studies.[13,14,16,17,19] Transfusion index (TI) indicates the appropriateness of numbers of blood unit's cross-matched. A value of 0.5 or more is suggestive of efficient blood usage.[20] The present study reported a TI value of 0.87. Ebose and Osalumese reported a TI of below 0.5.[16]

The overall blood transfusion indices [CTR of 5.95, % T of 67.7% and TI of 0.87] observed in the present study is regarded to be indicative of productive blood usage but the blood transfusion indices of surgery, orthopaedics, obstetrics and gynaecology departments were not productive in comparison to the overall indices of the hospital. Even though, the overall CT ratio is high, the %T and TI of the surgical departments reflected the anticipated emergency transfusion needs of patients with obstetric emergencies, abdominal injuries and fractures due to accidents & trauma and gynaec-oncological procedures which necessitate additional number of blood components to be crossmatched per patient than the number of blood components transfused per patient. A high CT ratio in the present study reflects temporary depression of blood inventory leading to holding of blood as reserve which in turn leads to wastage of resources such as technical hands, time, reagents, ageing of blood

units and unnecessary financial loss to patients & blood bank. This observation is similar to the findings reported by Bashawri et al, Murphy et al, and Pei et al. [14,17,18]

Based on the present study, the high CT ratio can be rationalized by the Hospital transfusion committee on implementing Maximum surgical blood order schedule (MSBOS). MSBOS using Mead's criterion (MSBOS = 1.5× transfusion index) can be formulated by the HTC. [2,3,5] The MSBOS can be structured using national transfusion guidelines, audits, data based formulae, training programs, clinicians meetings and the Hospital transfusion committee. This will help in reducing the number of unused crossmatched blood units, maintaining inventory, cut financial costs and free technical hands. On the other hand, it is impossible to predict or estimate blood loss during any surgery and requirements of blood for any haematology or oncology disease. Therefore, strict implementation of MSBOS within any hospital is technically difficult but with combined efforts from clinician and HTC, it can be adhered to maintain blood inventory and prevent wastage. [20]

Type & screen or Group & save with abbreviated crossmatch have be implemented in certain centres and they have proven to reduce CTR and improve %T & TI. The T and S is determination of the patient's ABO grouping & Rh typing and screening for unexpected, clinically significant alloantibody. If the antibody screening is negative, ABO-compatible blood from the local inventory can be used with a abbreviated crossmatch. By contrast, if the antibody screening & identification is positive, then workup is necessary to determine the target antigen and identifying antigen-negative units for transfusion.[18] The limitations in the present study were data of blood usage in critical care including IMCU & ISCU, dialysis and massive transfusions were not taken.

Conclusion

The blood transfusion indices including CT ratio, %T & TI of the present study were optimal but comparatively higher than the standard guidelines as most of the crossmatched blood was not utilized. Developing a structured blood transfusion policy by the Hospital transfusion committee with the help of regular audits of blood usage, standard transfusion guidelines and clinical programs with periodic feedbacks will pave way for better blood inventory, efficient blood utilization and financial savings.

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