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Original Research Article

Pattern of blood component cross-matching and their utilization in a tertiary care hospital of Jammu region

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ABSTRACT

Background: Transfusion of donated blood remains the mainstay of treatment for a wide range of medical and surgical conditions. Although it can save life, but transfusion of blood is not without risk. Clinicians should cautiously assess the appropriateness of indications before requesting various blood components thereby preventing misuse of blood and unnecessary exposure of patient to various transfusion transmitted infections and antibodies production. This study was conducted to determine the pattern of whole blood (WB) and blood component cross-matching and their utilization and to minimize the inappropriate use of blood and its components.
Methods: This cross-sectional prospective study was performed at SMGS Hospital Blood Bank, Jammu from April 2016 to September 2016. The requisition forms were analysed at the reception counter and inside the pre-transfusion testing laboratory for any error. The department wise utilization of blood and its components, Crossmatching to transfusion (C/T) ratio, transfusion probability (T%) and transfusion index (TI) were calculated.
Results: A total of 14376 requests for cross-matching of blood and its components were received. All the units were cross-matched. Out of these, 12766(88.8%) units of blood and its components were issued to various departments. The most common indication for using packed red cells and whole blood was anemia and bleeding (APH/PPH/Trauma). The total C/T Ratio, transfusion probability (T%) and Transfusion index(TI) of various blood components were 1.12:1, 88.8% and 0.88 respectively.
Conclusions: Our study indicates efficient usage of blood and its component. However, awareness is still needed amongst the clinicians and residents to ensure the appropriate use of blood and its components in the future as well. Hospital transfusion committee has to develop transfusion guidelines and subsequent implementation of such guidelines to assure effective blood utilization. MSBOS (maximum surgical blood ordering schedule) should be formulated for elective procedures with regular auditing, feedback, and modifications to improve blood ordering and utilization.

Keywords: Blood components, MSBOS, Pre-transfusion testing

INTRODUCTION

Blood transfusion services plays a pivotal role in the resuscitation and management of patients.[1] Blood supplies essential nutrients and removes metabolic waste products from the cells of our body. It is the liquid connective tissue composed of cells and plasma. The cellular components includes red blood cells, white blood cells and platelets. Plasma contains coagulation factors.[2] Today, blood transfusions nearly always consist of administration of one or more components of blood. The use of whole blood is restricted to some situations like massive trauma, PPH etc. the most commonly used

components are packed red blood cells (PRBCs) but other components of blood like platelets, plasma, cryoprecipitates are also used.[3] In the absence of an effective substitute of blood, transfusion of donated blood remains the mainstay of treatment for a wide range of medical and surgical conditions.[4] Although it can save life, but transfusion of blood is not without risk. The clinicians should cautiously assess the appropriateness of indication before requesting various blood components thereby preventing the misuse of various blood components and also to safeguard the health of the recipients. Irrational use of blood can lead to serious consequences for recipients including development of antibodies against a particular antigen and transmission of various infectious agents.[5] Blood component therapy has gained much interest in recent years because of its merits over whole blood transfusion like it reduces volume overload on patient, has greater shelf life and better patient management as whole blood is a mixture of cellular elements, colloids and crystalloids.

The preoperative requests of blood units especially in elective surgeries is often based on worst case assumptions, demanding large quantities of blood or overestimating the anticipated blood loss, of which little is ultimately used.[1] Unnecessary crossmatching for every patient may cause exhaustion of valuable supplies and resources of blood transfusion services. It also adds to financial burden for each patient. For reducing this, "Type and Screen" policy should be adopted by every blood bank.

Aims and Objectives this study was conducted to determine the pattern of whole blood and blood component cross-matching and their utilization by using C/T Ratio, Transfusion Probability (T%) and Transfusion Index (TI) and to minimize the inappropriate use of blood and its components.

METHODS

This cross-sectional prospective study was performed at Shri Maharaja Gulab Singh (SMGS) Hospital Blood Bank, Jammu over a period of 6 months from April 2016 to September 2016. The requisition forms were analysed at the reception counter and inside the pre-transfusion testing laboratory for any error. This includes checking of patient name, MRD number, transfusion indication, component required and sample labelling.

The department wise utilization of blood and its components, Crossmatching to transfusion (C/T) ratio, transfusion probability (T%) and transfusion index (TI) were calculated. The data was analysed using SPSS window version 17.0 and is presented in tabular and appropriate diagrammatic forms. Blood utilization indices were computed with the following equations

Crossmatch to transfusion ratio (C/T ratio) =number of units crossmatched/number of units transfused. A ratio of 2.5 and below is considered indicative of significant blood usage.

Transfusion probability (T%) = number of patients transfused /number of patients crossmatched × 100. A value of 30% and above was considered indicative of significant blood usage.

Transfusion index (TI) = number of units transfused/number of patients crossmatched. A value of 0.5 or more was considered indicative of significant blood utilization.

Maximum Surgical Blood Order Schedule (MSBOS) = 1.5 × TI.

RESULTS

A total of 14376 requests for cross-matching of blood and its components were received. All the units were cross-matched. Out of these, 12766 (88.8%) units of blood and its components were issued to various departments. A total request of 9348 units of whole blood and packed red blood cells cross-matching were received which include 7669 units of packed red blood cells and 1679 units of whole blood. Only 8430 were transfused, packed red blood cells were 7069 (83.8%) and whole blood were 1361 (16.1%).

The most common indication for using packed red cells and whole blood was anemia and bleeding (APH/PPH/Trauma). Out of 5028 units requested for fresh frozen plasma (FFP) and platelets, 4336 were transfused. Out of these, 3091(61.47%) were FFPs and 1245(24.7%) were platelets (Table 1).

The most common indications for FFP transfusion were active bleeding (APH/PPH/Trauma), snake bite, sepsis, liver diseases and burns and for platelets, the indications were APH/PPH, ALL/AML and thrombocytopenia. The department wise utilization of blood and its components is given below (Table 2,3).

In this this, the overall cross-match to transfusion (C:T) ratio was 1.12:1. The transfusion probability and transfusion index values obtained were 88.8% and 0.8 respectively. Thus, this study indicates efficient blood usage.

Table 1: Crossmatching and utilization of blood and its components.

	Whole blood	Packed red cells	FFPs	Platelets	Total
Number of crossmatching	1679	7669	3491	1537	14376
Number of transfusions	1361	7069	3091	1245	12766
C/T Ratio	1.23:1	1.08:1	1.12:1	1.23:1	1.12:1
Transfusion probability (T%)	81.0%	92.1%	88.5%	81.0%	88.8%
Transfusion Index (TI)	0.81	0.92	0.88	0.81	0.88

Table 2: Department wise cross-matching and utilization of blood units.

Departments	No. of units crossmatched	No. of units transfused	C/T Ratio
Obstetrics,Gyn.	4308	3604	1.19:1
Paediatrics	2817	2787	1.01:1
ENT	158	95	1.66:1
Medicine	1209	1146	1.05:1
Surgery	201	180	1.11:1
Orthopaedics	97	89	1.08:1
Radiotherapy	198	198	1:1
Nephrology	360	331	1.08:1
Total	9348	8430	1.10:1

Table 3: Department wise utilization of Fresh frozen plasma and Platelets.

Department	FFPs requests	FFPs transfusions	C/T Ratio	Platelets requests	Platelets transfusions	C/T Ratio
Obstetrics and Gynaecology	2160	1945	1.11:1	320	246	1.30:1
Paediatrics	347	321	1.08:1	697	622	1.12:1
Medicine	521	521	1:1	298	206	1.44:1
Surgery	301	201	1.49:1	122	92	1.32:1
Radiotherapy	51	22	2.31:1	64	58	1.10:1
Others	111	81	1.37:1	36	21	1.71:1
Total	3491	3091	1.12:1	1537	1245	1.23:1

DISCUSSION

Although blood is a life- saving fluid but irrational use of it leads to life threatening events and even death. Cost is also a serious consideration for patients in developing countries, especially in private health sector where without state support and insurance companies, expenses are born by patients themselves.[6] Effective use of blood and its components with high quality and minimum waste are important goals of blood utilization management system.[7] There are considerable variations in the pattern of blood component crossmatching and their utilization between different hospitals and various clinical specialities. In the present study, 14376 blood and blood components requests were received and 12766 were issued after proper crossmatching and screening (88.8%). Overall the C:T ratio recorded in this study was 1.12 which is quite lower than that reported from other studies conducted in Egypt (3.9), Malaysia (5.0), India (2.5), Nigeria (2.2), and Saudi (2.96).[8-12] A CT ratio of 1 or less than 2.5 indicates efficient usage of blood. The difference in CT ratio may be due to different transfusion policies at different hospitals. Indications of blood transfusion depends on clinical status of patients and their treating clinicians. Most common cause of high CT ratio includes lack of clinical audits, blood ordering policies and lack of coordination between clinicians and Head of Department of Blood Transfusion Medicine. Comparision of our study with some other studies is given in Table 4.

Among different departments of our hospital, the CT ratio was highest for ENT as 1.66 followed by obstetrics and gynaecology 1.19, surgery and radiotherapy 1.11, orthopaedics 1.08, medicine 1.05 and paediatrics 1.01 suggesting significant blood utilization in contrast to other studies world- wide and in India where CT ratio was very high ranging from 14.16 to 41.6.[13-15] The main reason behind this remains an over ordering of blood units due to estimation of anticipatory excessive blood loss during surgeries. Transfusion probability in this this

was 88.8% which indicates efficient blood utilization of blood. Transfusion probability as low as 4.9% to 8.8% and 11.15% to 47% have been reported by many authors.[1,13-17] The Transfusion Index (TI) of our study was 0.8 which is appropriate as per standards while other studies report TI as low as 0.06-0.11.[13-15,17] Study by Kaur et al, has also reported better utilization of blood and blood components with CT ratio (1.57), TI (1.18) and T% (79%).[18] Another study conducted by Devi et al, has reported even efficient blood component utilization with CT ratio (1.02), TI (0.97) and T% (97.2%).[19] These studies are comparable with our study and highlighting significant blood utilization and efficient transfusion practices (Table 5).

Table 4: Crossmatching to transfusion ratio among different studies.

Studies	CT ratio (Total)
Bashawari LA et al	2.96
Benin	2.2
Ibrahim SZ et al	3.9
Jayarancee S.	5.0
Subramanian A et al	2.5
Present study	1.12

Table 5: Quality indicators for blood utilization among different studies.

Studies	C/T Ratio	TI	T%
Kaur et al	1.57	1.18	79.0%
Devi et al	1.02	0.97	97.2%
Present study	1.12	0.88	88.8%

Balancing supply and demand is particularly challenging when a product has short shelf life and the demand varies from day to day as in the case with platelet concentrates. Because blood products are perishable, utilization management must also include an analysis of blood needs of the hospital and the available supply. Overstocking perishable products is wasteful and reduces availability for patients in other hospitals who depends on a common blood supply. Appropriate use of blood and blood components is an extremely cost effective practice but holding blood units for elective surgery and then not transfusing the requested ones add to the testing cost for a patient, fritter away reagent and overburdens a blood bank.

CONCLUSION

Based on blood utilization indices (C/T Ratio, T%, TI) MSBOS (maximum surgical blood order schedule) has been developed for different planned procedures. Our study indicates efficient usage of blood and its components. However, awareness is still needed amongst the clinicians and residents to ensure the appropriate use of blood and its components in the future as well. Hospital transfusion committee has to develop transfusion guidelines and subsequent implementation of such guidelines to assure effective blood utilization. MSBOS should be formulated for elective procedures with regular auditing, feedback, and modifications to improve blood ordering and utilization.

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REFERENCES

1. Vibhute M, Kamath SK, Shetty A. Blood utilization in elective general surgery cases: requirements, ordering and transfusion practices. J Postgrad Med. 2000;46(1):13-17.
2. Giriyan SS, Chethana HD, Smdhushree N. study of utilization of Blood and Blood Components in a Tertiary Care Hospital. J Blood Lymph. 2017;7:169.
3. Gurevitz SA. Update and Utilization of Component therapy in Blood Transfusion. Lab Med. 2010;41(12):739-44.
4. Mathew AS, Kurian SS, Sundaresan NP. Pattern of blood component utilization in a teaching hospital in South Kerela. Academic Med J Ind 2014;2:28-31.
5. Kitchen A, Corcoran P, Mvere DA. WHO Introductory Module: guidelines and principles for safe blood transfusion practices. 2009;25-34.
6. Waqas M, Shamim MS, Ujjan B, Bakhshi SK. Prospective validation of a blood ordering protocol for elective spine arthrodesis and its impact on cost reduction. Surgical neurology international. 2014;5(Suppl 7):S362.
7. Pozo EA, Rosales PM, Almeida-Neto CD et al. A comparision protocol to evaluate the use of blood and its components in Latin America and the Carribbean. Rev Panam Salud Pub. 2015;37:435-41.
8. Ibrahim SZ, Mamdouh HM, Ramadan AM. Blood utilization for elective surgeries at main university hospital of American Science. 2011;7(6):683-9.
9. Jayaranee S, Prathiba R, Vasanthi N, Lopez CG. An analysis of blood utilization for elective surgery in a tertiary medical centre in Malaysia. Malaysian J Pathology. 2002;24(1):59-66.
10. Subramanian A, Sagar S, Kumar S, Agrawal D, Albert V, Misra MC. Maximum surgical blood ordering schedule in a tertiary trauma center in northern India: A proposal. J emergencies, trauma, and shock. 2012;5(4):321.
11. Ho O, Bo B. Blood utilization in elective surgical procedures in Ilorin. Trop J Health Sci. 2006;13:15-7.
12. Bashawri LA. Pattern of blood procurement, ordering and utilization in a university hospital in Eastern Saudi Arabia. Saudi Med J. 2002;23:555-61.
13. Khoshrang H, Madani AH, Roshan ZA, Ramezanzadeh MS. Survey on blood ordering and

utilisation patterns in elective urological surgery. Blood Transfusion. 2013;11(1):123.
14. Couture DE, Ellegala DB, Dumont AS, Mintz PD, Kassell NF. Blood use in cerebrovascular neurosurgery. Stroke. 2002;33(4):994-7.
15. Rehmatullah S, Muhammad RJ, Ahmed AS. Arrangements and use of blood in elective surgical procedures. Professional Medical J. 2011;18(2):212-4.
16. 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 transfusion. 2013;2013.
17. Yazdi AP, Alipour M, Jahanbakhsh SS, Gharavifard M, Gilani MT. A survey of blood request versus blood utilization at a university hospital in Iran. Archives of Bone and Joint Surgery. 2016;4(1):75.
18. Kaur D, Kandwal M. Blood utilization and quality indicators-trend at a super speciality hospital in Northern India. Hematol Transfus Int J. 2016;2(3):00037.
19. Devi KM, Barindra Sharma A, Dorendro Singh L. Quality indicators of blood utilization in a tertiary care centre in North-eastern India. IOSR J Dent Med Sci. 2014;13(1):50-2.

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