Original Research Article

Efficiency of blood utilization and characteristics of patients receiving blood transfusion at an associated hospital in North India

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ABSTRACT

Background: Blood is the liquid connective tissue composed of cells and plasma. It is the most precious and unique gift that one person gives to another. Blood banks are not the manufacturing factories. It can only be available on replacement basis. Periodic review of blood components usage is essential to assess the blood utilization pattern in hospitals. This study was conducted to analyse the efficiency of blood utilization and to minimize the inappropriate use of blood.

Methods: A retrospective cross-sectional study was conducted in the department of blood transfusion and immunohematology, government medical college and associated hospital, Rajouri for a period of one year with effect from November 2019 to November 2020. Data was collected using blood bank record. Blood utilization was calculated using crossmatch to transfusion ratio (C/T), transfusion probability (T%) and transfusion index (TI) indices.

Results: A total of 974 patients were requested to prepare 1270 crossmatched units. Of these 1141 blood units were transfused for 664 patients. The total donations during that period were 1197. 998 donors were replacement donors and 199 were voluntary non-remunerated blood donors donated at various blood donation camps. The overall values of C/T, T% and TI were 1.1:1, 68.1% and 1.1 respectively.

Conclusions: Blood utilization indices show efficient usage of blood. However, a blood ordering policy (MSBOS) must be developed to guide the clinicians regarding blood usage which can decrease overordering of blood thereby reducing unnecessary usage of reagents, manpower and also wastage of blood due to outdating.

Keywords: Blood transfusion, Blood utilization, Anemia

INTRODUCTION

The main responsibility of blood transfusion services is to provide safe, sufficient and timely supply of blood to the patients. At the same time, blood transfusion services should ensure that blood donation is safe and causes no harm to the donor as well as to the recipient.[1,2] Blood transfusion plays a major role in the resuscitation and management of surgical patients and ordering of blood is usually a common practice in elective and emergency surgical procedures.[3,4] It is essential that the usage of blood be kept to a bare minimum and used only when absolutely necessary.[5]

The preoperative blood request is often based on worst case assumptions. Consequently, if unnecessary blood orders can be reasonably waived, it will reduce both workload and financial expenditure.[6]

The primary goal of blood utilization program is to ensure judicious use of blood and its components. All blood transfusions have risks of adverse outcomes.

In general, blood transfusion is safe, but in aggregates blood transfusions cause morbidity and mortality. The recognized risks have changed over time, in part due to increased ability to diagnose and mitigate these risks and in part due to demographic changes in donor populations. For example, an understanding of the pathophysiology of transfusion-related acute lung injury (TRALI) has led to male only plasma donor policies that have reduced the incidence of TRALI from plasma by approximately one half.[7,8] Blood utilization programs can be thought of as one component of patient blood management (PBM), a term used to describe a comprehensive approach to maximizing the need for transfusion through targeted interventions in anemia and perioperative management. successful PBM programs are multidisciplinary collaborations with a combination of haematologists, anaesthesiologists, surgeons, perfusionists, transfusion medicine specialists and nurses. An organized program is required to minimize transfusion needs longitudinally for medical patients and pre, intra and post operatively for surgical patients.[9] Hence, periodic review of blood component usage is essential to assess the blood utilization pattern in any hospital or health care set up. [10] It acts as management tool for appraisal and justification of appropriatness and efficacy of transfusion therapy.[11]

Aims and objectives of the study was carried out aiming to analyse the efficiency of blood utilization by calculating crossmatch to transfusion ratio (C/T), transfusion probability (T%) and transfusion index (TI) and to minimize the inappropriate use of blood.

METHODS

A retrospective cross-sectional study was conducted at an associated hospital blood bank of govt. medical college, Rajouri of union territory Jammu and Kashmir, India. The data was calculated from the blood bank record of last 1 year from November 2019 to November 2020. The requisition forms were analysed at the reception counter for any error. Blood utilization was calculated using cross match to C/T, T% and TI. The data was analysed using SPSS window version 17.0 and is presented in tabular and appropriate diagrammatic forms. Blood utilization indicies were calculated 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

There were a total of 1270 blood units which were crossmatched during the study period of 1 year. Out of which 1141 blood units were transfused. Whole blood utilization was calculated by using different blood utilization indices. These blood units were transfused to 974 patients, which includes 410 males and 564 females. The ratio of male:female was 0.72:1 (Table 1).

Table 1: Gender wise distribution of utilization of blood units.

Gender	No. of patients crossmatched (%)	No. of patients transfused (%)	No. of transfusions (%)
Male	410 (42.09)	260 (39.1)	445 (39)
Female	564 (57.90)	404 (60.8)	696 (60.9)
Male: Female	0.72:1	0.64:1	0.63:1
Total	974	664	1141

Majority of patients were females (57.9%) underwent surgery in elective schedule or in emergency schedule or having postpartum haemorrhage. These blood units were mostly collected from replacement donors (Table 2).

Table 2: Source of blood donation.

Type of donors	No. of donors
Voluntary	199 (16.6)
Replacement	998 (83.3)
Total	1197

Table 3: Department wise crossmatching and utilization of blood units.

Departments	No. of units crossmatched	No. of units transfused	C/T ratio
Surgery	157	147	1.06:1
Obs and gynae	398	366	1.08:1
Paediatrics	75	70	1.07:1
Dialysis unit	119	115	1.03:1
Medicine	258	201	1.28:1
Orthopaedics	109	89	1.22:1
Radiotherapy	151	151	1:1
ENT	3	2	1.5:1
Total	1270	1141	1.11:1

The most common indication for transfusion was anemia and bleeding (PPH/APH/Trauma). Out of 1270 units requested and crossmatched for 974 patients, 1141 units were transfused to 664 patients (1270/1141)1.1:1. The department wise utilization of blood is given below (Table 3).

All the departments show efficient usage of blood. Thus, the overall C/M to transfusion ratio was 1.11:1 (1270/1141). Transfusion probability (T%) was (664/974) 68.1% and Transfusion Index was (1141/974) 1.1. All the three blood utilization indices show efficient utilization of blood in our hospital.

The utilization of blood units was divided according to blood groups. The maximum used blood group was B positive (39.3%). The Rh-positive blood group predominated in the use. The least used blood group was AB neg (0.35%) (Table 4).

Table 4: Blood group wise distribution of transfusion of whole blood.

Blood group	No. of transfusion	Percentage
A positive	248	21.7
A negative	10	0.87
B positive	449	39.3
B negative	17	1.48
O positive	339	29.7
O negative	08	0.70
AB positive	66	5.78
AB negative	04	0.35
Total	1141	100

DISCUSSION

Blood is considered as drug under drug and cosmetic act, 1940. Blood and its components play a major role in the resuscitation and management of both elective and emergency surgical patient. Despite this advantage, currently there is limited supply with increasing demand and utilization of worldwide.[12] Effective use of blood and its component with high quality and minimum waste are important goals of blood utilization management system.[13]

The pattern of blood utilization varies from hospital to hospital. Boral Henry was the first and a number of authors then after used crossmatch to transfusion ratio for evaluating blood transfusion practices. Ideally, this ratio should be 1.0 but a ratio of 2.5 and below was suggested to be indicative of efficient blood usage.[14] According to this recommendation, the overall C/T ratio in our study was 1.1:1 which was considered to be indicative of efficient blood usage. This ratio was comparable with that reported by the study conducted by Kuchhal (1.8:1), Kaur (1.57:1) and Belayneh (2.3:1) et al but lower than that reported by the study conducted in Egypt (3.9) and Malaysia (5.0).[6,15-18]

Our study showed that all the departments had done efficient usage of blood which is comparable with the study conducted by Belayneh et al suggested the probability of transfusion for a given procedure (T%).[19] A value of 30% or above have been suggestive of efficient blood usage. The result of the present study revealed an overall T% of 68.1% which is comparable with the study conducted by Kuchhal (61.7%), Kaur (79.0%) and Belayneh et al (47%) but higher than the study conducted in Egypt (36.9%).[6,15,17]

Transfusion index value of 0.5 or more is indicative of efficient blood usage and signifies the appropriateness of number of units transfused. The TI in the current study was 1.1 which is comparable with the study conducted by Kuchhal (0.5), Kaur (1.18) and Belayneh et al (0.77) but higher than the study conducted in Egypt (0.69) and Indian tertiary care hospital (0.36) (Table 5).[3,6,15,17]

Table 5: Blood utilization indices among different studies.

Studies	C/T ratio	TI	T%
Ibrahim et al, 2010	3.9	0.69	36.9
Belayneh et al, 2013	2.3	0.77	47
Kuchhal et al, 2016	1.8	0.5	61.7
Kaur et al, 2016	1.57	1.18	79.0
Zewdie et al, 2019	7.6	0.29	15.3
Present study	1.1	1.1	68.1

CONCLUSION

This study indicates efficient utilization of blood. Blood ordering pattern should be developed for different planned procedures i.e., MSBOS (maximum surgical blood ordering schedule) based on blood utilization indices. The introduction of "type and screen" procedure have led to a safe, effective and economic solution to overordering of blood. It allows for a more efficient management of blood inventory. In this regard, hospital transfusion committee should be formulated which further formulate MSBOS for selected cold surgical procedures, conduct regular auditing about efficient usage of blood and offer periodic feedback to improve blood transfusion services.

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