Research Article

Clinical use of blood and its components in tertiary health care center in northwestern India

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Abstract

Background: Blood transfusion is an indispensible part of modern-day health care and there is an increase in use of blood. National guidelines for use of blood and its components are often not followed in practice.

Objective: To define the justified and appropriate use of blood and its components as a drug.

Materials and Methods: We carried out cross-sectional study on patients requiring transfusion of blood and its components from January 2012 to June 2012. Tested blood (7048 units) and its components for 2742 patients were surveyed during a period of 6 months and the indications for usage and transfusion reactions associated with its usage were recorded.

Result: Of the hospitalized patients, 11.82% received blood transfusion. A total of 7048 transfusions were performed in 2742 patients. Most of the blood transfusions were seen in age group of 18–50 years followed by ≤12 years. Blood transfusion was more common in males than in females, except in the age group of 13–17 years. Of the blood transfusions received, maximum were of packed red cell (47.15%) followed by those of whole blood (43.06%). Of 5154 components prepared, only 4353 were used. Single-unit blood transfusions were performed in 55.65% patients. Most common and rare blood groups were B+ and AB–, respectively. Maximum transfusions were performed among patients with anemia (877) followed by those with thalassemia (422) and those having bone fractures (306). Maximum transfusions were performed to children ward (765).

Conclusion: This study reinforces the importance of justified and appropriate use of blood and its components in the clinical practice. Implementation of guidelines for use of various blood products may help in decreasing inappropriate use of blood and its components.

KEY WORDS: Whole blood, blood components, clinical use

Introduction

In 1818, James Blundell, a British obstetrician, performed the first successful transfusion of human blood to a patient for the treatment of postpartum hemorrhage. He also devised various instruments for performing blood transfusions.[1]

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In 1901, Karl Landsteiner, an Austrian physician, and the most important individual in the field of blood transfusion, documented the first three human blood groups (based on substances present in the red blood cells), A, B, and O. He found out that the blood of two people under contact agglutinates, and in 1901, he found that this effect was due to contact of blood with blood serum. As a result, he succeeded in identifying the three blood groups A, B, and O, which he labeled C, of human blood. He also found out that blood transfusion between persons with the same blood group did not lead to the destruction of blood cells, whereas this occurred between persons of different blood groups.[2] Later in 1902, a fourth main blood type AB was found by Alferd von Decastello and Adriano Sturli.[3]

The Argentine doctor Luis Agote used a much less diluted solution sodium citrate as an anticoagulant in November 1914.[4]

Table 1: Hospitalized patient receiving blood transfusion

	Male	Female	Total
Hospitalized patient in 6 months	13,436	9,745	23,181
Patient receiving blood transfusion	1,554	1,188	2,742
Percentage of hospitalized patient receiving blood transfusion	11.56	12.19	11.82

Further, in the same period, Weil[5] showed the feasibility of refrigerated storage of such anticoagulated blood.

In 1937, Bernard Fantus, director of therapeutics at the Cook County Hospital in Chicago, Illinois, established the first hospital blood bank in the United States.[6] In 1943, the introduction of acid citrate dextrose solution, which reduces the volume of anticoagulant, by Loutit and Mollison[7] permitted transfusions of greater volumes of blood and longer term blood storage.

In 1950, Carl Walter and WP Murphy, Jr, introduced the plastic bag for blood collection. This replaced breakable glass bottles with rugged plastic bags. This technical development enabled the evolution of a collection system capable of safer and easier preparation of multiple blood components from a single unit of whole blood.[8] Blood component therapy began during World War II when Edwin J Cohn and his collaborators developed the cold ethanol method of plasma fractionation in 1947.[9]

Every day many lives are being saved with blood transfusion. There have been advancements in the field of transfusion medicine, but still there is no proper utilization of blood creating an artificial shortage. So, this study was conducted to define the fallacies and measures to be implemented.

Materials and Methods

Undertaking and permission was obtained from the principal and controller for conducting the study and collecting information. The requisition forms and blood issue registers were used to obtain necessary information. The details of the study were not disclosed to clinicians to prevent bias during study.

We carried out cross-sectional study on patients requiring transfusion of blood and its components from January 2012 to June 2012. Patient's details provided by the treating doctor were entered into Microsoft Office Excel for Windows. All the entries were rechecked using markers such as name, ward, blood group, age, sex, and registration number. If more than one requisition forms were received for the same patient, then all the supplied units were pooled together.

A total of 7048 units of blood and its components were transfused to 2742 patients during a period of 6 months.

Results

Table 1 shows that of 23,181 patients admitted, 2,742 received blood transfusion. Hence, 11.82% hospitalized patients received blood transfusion.

Table 2 shows that during the study total of 7048 transfusion were performed in 2742 patients and the average transfusion per patient was 2–3 units.

Table 3 shows that most of the blood transfusions were seen in the age group of 18–50 years followed by ≤12 years. The blood transfusions were more common in males than in females, except in the age group of 13–17 years where females received more blood transfusion than males. This table also shows that patient's age was not specified in 1.25% (29).

Table 4 shows the units of packed red cells supplied (47.15%) followed by whole blood (43.06%). This table also shows that blood component (56.94%) surpasses in number than whole blood (43.06%) in patient receiving blood transfusion.

Table 5 shows that of 5154 components prepared, only 4353 components were used. Units not used were sold to Reliance company for preparing antisera and immunoglobulins.

Table 2: Transfusion to patient

Total transfusion in 6 months	7048
Total patient receiving transfusion	2742
Average transfusion per patient	2.57

Table 3: Age- and sex-wise distribution of blood transfusion

Age group (years)	Male	Female	Total (%)	Male/female ratio
≤12	490	304	794 (28.95)	1.61:1
13–17	69	79	148 (5.39)	0.87:1
18–50	567	493	1060 (38.65)	1.15:1
≥50	405	306	711 (25.92)	1.32:1
Age not mentioned	20	9	29 (1.25)	2.22:1
Total	1551	1191	2742 (100)	1.30:1

Table 4: Units of whole blood and its components supplied

Blood and its components	Male	Female	Total (%)
Whole blood	2158	877	3035 (43.06)
Packed red cell	2280	1043	3323 (47.15)
Platelet concentrate	196	94	290 (4.11)
Fresh frozen plasma	299	77	376 (5.33)
Plasma	13	11	24 (0.34)
Total	4946	2102	7048 (100)

Table 5: Component preparation and supply

Components prepared	5154
Components supplied	4353

Table 6 shows that 55.65% patients received single-unit blood transfusion whereas the rest received multiple transfusions.

Table 7 shows that the most common blood group was B+ followed by O+; the rarest blood group was AB–.

Table 8 shows that maximum transfusions were performed among patients with anemia (877) followed by those with thalassemia (422) and those having bone fractures (306). Diagnosis was not specified for 107 patients.

Table 9 shows that more than half of the transfusion is performed by replacement (56.75%) and rest blood is received (43.25%) by the patients through donation.

Table 10 shows that maximum transfusions were performed in the children ward (765) followed by Medicine ward (613) and Surgery ward (514).

Of total transfusions (7048), only single patient had transfusion reaction of chills and rigor. Thus, the percentage of complication of blood transfusion was 0.014%.

During the study period, 2742 patients received blood transfusions. Thus, 11.82% hospitalized patient received blood transfusion. Total of 7048 transfusion were performed in 2742 patients (average transfusion per patient 2.57 units). Further it was observed that total blood units supplied that were 7048 in 938-bedded hospital far exceeded the actual requirement of blood in India, that is, 7 units per bed per year. Most of the blood transfusions were seen in the age group of 18–50 years followed by ≤12 years. Blood transfusion was more common in males than in females, except in the age group of 13–17 years where females received more blood transfusions than males. Of the blood transfusions given, maximum were of packed red cell (47.15%) followed by whole blood (43.06%). Blood component (56.94%) surpassed in number than whole blood (43.06%) in patients receiving blood transfusion. Of 5154 components prepared, only 4353 components were used. Single-unit blood transfusions were received by 55.65% patients.

Most common blood group was B+ followed by O+. The rarest blood group was AB–. Maximum transfusions were received by patients with anemia (877) followed by those with thalassemia (422) and those having fractures (306). For 107 patients, diagnosis was not specified. More than half of the transfusions were performed by replacement (56.75%) and rest (43.25%) were received by the patients through donation. Maximum transfusions were performed to children ward (765) followed by Medicine ward (613) and Surgery ward (514). Of total transfusions (7048), only single patient had transfusion reaction of chills and rigor.

Table 6: Sex-wise distribution of number of units of blood transfused

Units transfused	Male	Female	Total (%)
1	911	689	1600 (55.65)
2	366	275	641 (22.30)
3	152	123	275 (9.57)
>3	238	121	359 (12.49)
Total	1667	1208	2875 (100)

Table 7: Group-wise blood supply in patients

Blood group	Male	Female	Total (%)
O+	474	324	798 (29.10)
A+	354	236	590 (21.52)
B+	499	464	963 (35.12)
AB+	137	102	239 (8.72)
O–	31	20	51 (1.86)
A–	22	12	34 (1.24)
B–	33	25	58 (2.12)
AB–	4	5	9 (0.33)
Total	1554	1188	2742 (100)

Table 8: Compilation of indications of various diseases receiving blood transfusion

Indication	Total
Anemia	877
Thalassemia	422
Bone fracture	306
Other surgical diseases	178
Craniotomy	121
Exploratory laparotomy	118
Trauma	117
Undiagnosed	107
Miscellaneous	104
Cancer	91
Cholecystectomy and liver disease	72
Urologic diseases	72
Burn	64
Bleeding disorder	62
Gynecological diseases	55
Hematemesis	45
Partial resection of bowel	43
Other orthopedic problems	34
Head and neck problems	28
Tuberculosis	25
Pediatric diseases	20
Endocrinal diseases	18
Retroviral diseases	16
Respiratory diseases	13
Hemoptysis	8

Table 9: Replacement vs charity of blood

	Total	%
Replacement	1556	56.75
Charity	1186	43.25
Total	2742	100

Discussion

The average rate of blood utilization according to Gupte and Shaw[10] is 2 units per case whereas in this study it is

Table 10: Supply of blood units in various wards

Wards	Whole blood	Packed red cell	Platelet concentrate	Fresh frozen plasma	Plasma	Total
Children	110	602	33	20	0	765
Medicine	71	510	19	13	0	613
Surgery	342	96	10	59	7	514
Casualty	218	91	10	13	0	332
Orthopedics	290	11	1	3	0	305
Neurosurgery	185	0	0	1	0	186
Burn	38	15	1	7	1	62
TBCD	28	4	3	13	0	48
Urology	39	1	0	0	0	40
ICU	4	30	0	5	0	39
ENT	32	0	0	0	0	32
Pediatric surgery	10	17	1	3	0	31
CTVS	21	3	0	1	0	25
Gastrology	1	9	0	0	0	10
Post-op	5	2	0	0	0	7
Cardiology	0	5	0	1	1	7
Radiotherapy	1	4	0	0	0	5
Skin	1	2	0	0	0	3
Ward not mentioned	0	3	0	0	0	3
Prisoner	1	0	0	0	0	1

TBCD, tuberculosis and chest disease; ICU, intensive care unit; ENT, ear, nose, and throat; CTVS, cardiothoracic and vascular surgery

2.57 per case. Thus, the average rate of utilization of blood was more in this study.

Gupte and Shaw[10] found that of 4485 female patients 549 (12.24%) were given single-unit transfusion whereas of 3985 male 394 (9.88%) received the same.[10] There was significant difference in incidence of single-unit transfusion to male and female patients. Also in this study, of 1208 female patients, 689 (57.03%) were given single-unit transfusion whereas of 1667 male patients 911 (54.64%) received the same. There was significant difference in incidence of single-unit transfusion to male and female patients, which is against the rational use of blood policy and needs awareness of clinicians treating the patients.

Percentage of single-unit transfusion in this study was 55.65. However, single-unit blood transfusion practice in other studies in India (New Delhi, Saxena and Banerjee,[11] and Surat, Gupte and Shaw.[10]) as well as abroad (Hartford, Reece and Beckett[12]) had different percentage denoting that transfusion practice differs from institution to institution.

This study showed that whole blood contributed 43.06% of total transfusions, which was much lower than that found in the study by Gupte and Shaw.[10] showing better usage of blood by using components our institution.

In the study of Arewa[13] in Nigeria and in this study, the most common indication for use of blood/blood components was anemia. Hence, anemia is the sole disorder to be controlled to minimize the irrational blood usage.

According to Giri et al.,[14] the incidence of blood groups in decreasing order is B+, O+, A+, AB+, B–, O–, A–, and AB–, which was similar to that of this study.

Conclusion

This study reinforces the importance of justified and appropriate use of blood and its components in the clinical practice. Formulation and implementation of guidelines for use of various blood products may help decrease the inappropriate use of blood and its components. There is scope for improvement of blood transfusion practices by strictly following the indications for use of blood, promoting the preparation and use of blood components, use of plasma expanders for acute blood loss, avoiding single-unit transfusions, promoting the use of autologous blood during routine surgery, regular auditing of transfusion practices, and improved communication between the clinicians and laboratory physicians.

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