



Original Research Article

Observational Study in Utilization of Blood and Blood Products at Tertiary Care Centre

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ABSTRACT

The present study was carried out in the Regional Blood Bank, Department of Pathology in tertiary care hospital Aurangabad.

Transfusion of total 2000 units were issued in 1,113 patients were recorded. Out of total 2000 units of blood issued included in present study, 1514 units were of Whole blood; 318 units of packed red cells and 168 units of platelets. Whole blood was most utilized product followed by PRC and platelets.

This study provides information on blood component usage, trend of utilization of whole blood and blood products in tertiary care hospital. This study has highlighted that there is scope for improvement of blood transfusion practices by strictly following the indications for use of blood, promoting the use of blood components, use of plasma expanders for acute blood loss, avoiding single unit transfusions and promoting the use of autologous blood during routine surgery. It is important for blood bank to be able to fulfill the demands for this life saving product and at the same time evaluate and assess the existing trend of blood ordering.

Key words- Tertiary care centre, Regional blood bank, Utilization, blood and blood products

INTRODUCTION

Blood transfusion can be a life-saving intervention. However, like all treatments, it may result in acute or delayed complications and carries the risk of transfusion-transmissible infections.

Blood transfusions have emerged as an important medical therapy in the current century. From elective surgery to trauma patients, from patients with haemoglobinopathies to thalassaemics, blood transfusions are benefiting

patients in a wide spectrum of clinical settings. Soumerai et al (1993) [1] did a controlled trial to determine whether brief, face to face educational outreach visits can improve the appropriateness of blood product utilization.

Blood is an expensive, scarce resource. Before prescribing blood or blood products for a patient, it is always essential to weigh up the risks of transfusion against the risks of not transfusing. Used appropriately, blood

transfusion can save life and improve health.

However, evidence from every region of the world indicates considerable variations in patterns of clinical blood use between different hospitals, different clinical specialties and even between different clinicians within the same team. [2]

Inappropriate use of blood and blood product is costly and Koistinen J et al (1996) [3] pointed out factors affecting the cost of blood transfusion as:

- 1) Cost of Collection
- 2) Laboratory Cost
- 3) Handling Cost
- 4) Blood Administration Cost

There is a considerable shortage of blood even in the large metropolises the situation is worse with regard to the availability of blood components and plasma products. With increasing sophistication in practice of medicine and with introduction of tissue/organ transplantation, the need of blood and its products has increased still further. [4]

Use of whole blood should be discouraged. Facilities to prepare blood components should be made available in larger number of hospitals. Administration of components is safer, more effective and is a better utilization of a scarce human resource. [5]

Blood components include: Red cell concentrates, plasma (fresh plasma, FFP, cryo-poor plasma, liquid plasma), platelet and granulocyte concentrates. Other plasma products such as albumin, plasma protein fraction (PPF), immunoglobulins and factor VIII concentrates.

Auto transfusion (autologous blood transfusion) is a unique approach of providing the patients with their own

blood and it helps to avoid the use of allogenic blood.

Single unit transfusions raise the hemoglobin by 1 g/dl only, which is therapeutically insignificant. The use of a single unit of blood should therefore be strongly discouraged.

The present study demonstrates transfusion practices in tertiary care hospital and evaluates single unit transfusion & use of whole blood, packed red cells and platelets in our institute.

MATERIALS AND METHODS

Present study was carried out in Regional Blood bank; Department of pathology, in a tertiary care Hospital Aurangabad.

Type of study: Descriptive (observational) study.

Facility for component therapy (packed red cells, platelets, FFP) is available in this hospital.

During the study details of 2,000 units of Blood transfusion (Whole blood, Packed Red cells & Platelets.) was studied.

Study Methods: A blood requisition form is designed to provide details of patient, unit, ward, diagnosis, indication, Hb value, number, and number of units required and the priority of demands.

One unit of blood or blood product was considered as one transfusion.

Present study included study of transfusion of whole blood, packed red cells and platelets.

Blood or Blood product supplied outside our institute, (patient admitted in other hospitals) and F.F.P (fresh frozen plasma) was not included in study.

Random donor platelet and red cell concentrates were prepared by fractionation of whole blood using triple blood collecting bags. [6]

Children receiving regular transfusion (thalassaemics) were included in study analysis.

The study included different broad specialties of hospital i.e. Department of Medicine, Surgery, Pediatrics, Obstetrics and Gynecology (OBGY). Non surgical category included department of Medicine, Tuberculosis, and Pediatrics. Blood unit issued to department of surgery, orthopedics, Ear Nose and Throat (E.N.T.), Obstetrics and Gynecology was included under surgical category as per criteria adopted by Addo Yobo et al (1991). [7]

500 blood transfusions (whole blood, packed red cells, platelets) were studied from all four major departments.

Single unit transfusion: one unit of blood transfused which consist of approx. 350 ml of blood & 49 ml of anticoagulant. (CPDA) Citrate Phosphate Dextrose Adenine.

Multiple units: Two or more than two blood units transfused.

WHO strongly discourages single unit transfusions in adults. Most elective surgery does not result in sufficient blood loss to require blood transfusion & according to WHO there is rarely justification for the use of preoperative blood transfusion simply to facilitate elective surgery.

OBSERVATIONS AND RESULTS

The present study recorded details of total 2,000 units of transfusion given to four major departments of Medicine, Surgery, OBGY and Pediatrics.

Transfusion of total 2000 units were issued in 1,113 patients were recorded. Out of total 2000 units of blood issued included in present study 1514 units were of whole blood; 318 units of packed red cells and 168 units of platelets. Ratio of whole blood: packed red cells: platelets was [9:1.8: 1.] and ratio of whole blood: packed red cells was [4.76:1].

In present study all the episodes of blood transfusion were of allogenic blood transfusion and no episode of autologous blood transfusion.

Out of 1113 patients; 526(47.25%) patients were male and 587(52.74%) patients were female.

Patients of all age group were included in present study and youngest recipient of blood was 1 day while oldest was 86 years. We subdivided patients in six groups <10 years, 11-20 years, 21-30 years, 31-40 years, 41-60 years and > 60 years.

Most number of blood units (533) was issued in age group of 21-30 years and least (145) in age of more than 60 years. Pretransfusion Hb level was not available in 184 patients out of 1113 patients. Of these most patients (67.39%) i.e. 124 patients were of thalassaemia major requiring regular transfusion.

500 units of blood issued in each department were studied.

In the department of Medicine: 500 units of blood were issued in total of 210 patients. Out of these 210 patients; 112 patients were male and 98 were female.

Mean age group of all patients of medicine was 35 year.

351 units issued were of whole blood, 67 units of packed red cells and 82 units of platelets.

142 patients out of 210 had Hb level <7gm% and mean Hb of all patients was 5.9 gm%.

In the department of Surgery: 500 units of blood were issued to 232 patients and among these 142 were male and 90 were female. Total of 469 units of whole blood, 23 units of packed red cells and 8 units of platelets were issued to these 232 patients.

42 patients had Hb less than 7 gm% and mean Hb of all patients was 9.5 gm%.

In the department of OBGY: 500 units of blood were issued to 268 patients. Out of these 500 units; 468 units were of whole blood; 23 units of platelet and 9 units of packed red cells.

112 patients had Hb <7 gm% and mean Hb was 7.49 gm%.

In the department of Paediatrics: 500 units of blood were issued to 403 patients with mean Hb of 6 gm%.

Among these 403 patients, 272 patients were male and 131 patients were females.

Thalassaemia major was most common diagnosis (320 patients).

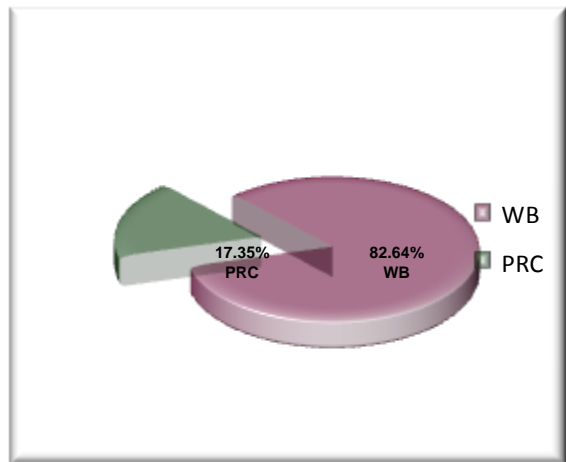
Out of 500 units of blood issued; 226 were whole blood, 219 were packed red cells, and 55 were platelets.

Whole blood and component (PRC) therapy: Out of total 2000 units of blood issued included in present study 1514 units were of whole blood; 318 units of packed red cells and total utilization of Whole Blood was 82.64% (1514 units) compared to PRC 17.35% (318 units) (excluding platelets).

Ratio of whole blood: Packed red cell was [4.76:1].

Department of Pediatrics had highest utilization of blood component (packed red cells) 49.21% and

department of OBGY had lowest utilization 1.88%.



Pie diagram showing total utilization of Whole Blood 82.64% and PRC in 17.35

There was statistically significant difference between utilization of whole blood & packed red cells $P < 0.05$. (Z TEST: $Z = 39.52$).

SINGLE UNIT TRANSFUSION:

We divided transfusion of whole blood & PRC units into single unit and multiple units (more than one unit). Total percentage of single unit transfusion was: 23.79% (excluding Pediatric patients) given in 330 patients. Total 311 units (94.2%) out of 330 single unit transfusion were of whole blood and 19 units (5.8%) of packed red cells.

Department wise incidence of single unit transfusion was as follows:

- 1) Medicine 86 units (20.57%)
- 2) Surgery 116 units (23.57%)
- 3) OBGY 128 units (26.83%)
- 4) Pediatrics 362 units. (81.34%).

Department of pediatrics had highest incidence of single unit transfusion, but due to unavailability of pediatrics bags (pedipacks) in our blood bank; we

excluded paediatric patients from analysis of single unit transfusion and amount of blood given depends on patients body weight & single unit transfusion given to these patients 362 units (81.34%) was considered adequate.

Table No. 1: Table showing department wise distribution of multiple and single units of Whole Blood/PRC transfused (excluding platelets) in adult patients.

Department	Multiple Units	Single Units	Total
Medicine	332	86 (20.57%)	418
Surgery	376	116 (23.57%)	492
OBGY	349	128 (26.83%)	477

Department wise distribution of multiple and single units in adult patients.

We categorized patients receiving single unit transfusion into four groups [8] based on pretransfusion hemoglobin concentration that is <7.5 gm%, 7.5-9 gm% and > 9 gm% and where Hb(hemoglobin) was not mentioned.

Most patients (38.78%) receiving single unit transfusion had pretransfusion Hb of < 7.5 gm%, Pretransfusion Hb was not available (not documented) in 30 patients receiving single unit transfusion.

Out of 86 single units issued in department of Medicine 35 units (40.69%) were given to patients of chronic renal failure, 11 units (12.79%) to patients of anemia under investigation and 6 units (6.97%) to the patients of thalassaemia major. Remaining 34 units that are (39.53%) were given to others.

In OBGY department 32 single units (25%) were given for Gynecological reasons, rest that is 75% single units issued for obstetric reasons.

In Surgery department 37 single units that is 31.89% were issued to neoplastic (benign/malignant) type of surgeries, of these 13 units were given

to patients of carcinoma breast undergoing modified radical mastectomy.

Transfusion in thalassaemia major:

In the department of Pediatrics, 320 patients out of 403 patients included in present study were of thalassaemia major. Of these 99 patients were female and 221 patients were male. Pretransfusion Hb level was not available in 124 patients.

Most patients were in the age group of 1-5 year (146 patients) followed by 6-10 years (120 patients). 14 patients had age less than 1 year.

Out of 196 patients in whom pretransfusion Hb was available; 81.63% (160 patients) had Hb <7.5 gm% and 3% (6 patients) had Hb >9 gm% rest of the patients 15.30% (30 patients) had Hb value between 7.5 to 9 gm%.

Out of 327 units issued in 320 patients of thalassaemia major; 165 units (50.45%) were of whole blood while 162 units (49.55%) were of packed red cells.

Due to unavailability of pediatrics bags (pedipacks) in our blood bank; we excluded pediatric patients from analysis of single unit transfusion.

DISCUSSION

Transfusion of total 2000 units issued in 1,113 patients was recorded.

Sex wise distribution of cases revealed female predominance and Out of 1113 patients 526 patients were males and 587 patients were females. Males received 45.4% of total units issued and females received 54.6% of total units issued.

We observed that most number of blood units (533) were issued in age group of 21-30 years and least (145) in age of more than 60 years. In present study all the episodes of blood

transfusion were of allogenic (homologous) blood transfusion and no episode of autologous blood transfusion.

Whole blood and component therapy:

The use of blood-component therapy allows four patients to benefit from one unit of blood collected. WHO recommends that the ratio of the use of blood components to whole blood should be 90:10, since only a limited category of clinical interventions requires whole blood. [8] In our study Ratio of whole blood: packed red cells: platelets was [9: 1.8: 1.]

Out of total 2000 units of blood issued included in present study 1514 units were of whole blood 318 units of packed red cells and total utilization of Whole Blood was 82.64%(1514 units) compared to PRC 17.35% (318 units), platelet units excluded.

In the present study out of 2000 units, 1514 units were whole blood transfusions. Since the red cell mass is the same in whole blood and PRC and considering the adverse effects due to

plasma and cellular components like white blood cells and platelets in whole blood, it is advisable to use red cell concentrate.

Ratio of whole blood: Packed red cell was [4.76:1].

We observed that Department of Pediatrics had highest utilization of blood component (packed red cells) 49.21% and department of OBGY had lowest utilization 1.88%.

Gupte SC et al (2007) [9] have analyzed Red Cell transfusions given to adults during surgery. Study included adult patients in the age group of 19 to 95 years.

They observed that majority (77.7%) of the patients received whole blood.

Bhatnagar S et al (2007) [10] carried out audit of blood transfusion in elective neurosurgery at NIMHANS Bangalore. They observed that with regard to type of blood product transfused whole blood constituted 65% of all transfused unit, packed cells 33% .

Table 2: showing total utilization of whole blood and packed red cells (comparison with different studies):

Author and year	Whole Blood (%)	Packed Red cells (%)
Gupte S et al (2007) [9]	77.7%	22.3%
Bhatnagar S et al (2007) [10]	64.88%	32.82%
Saxena P et al (1994) [11]	81%	19.81%
Gaur DS et al (2009) [12]	49.3%	24.29%
Present study	82.64%	17.35%

While comparing our results with these in contemporary literature, the findings of our study correlated well with those by Gupte S et al and Saxena P et al.

Use of whole blood should be discouraged. Whenever possible, only such components should be transfused, the lack of which is responsible for the disease symptoms.

Most blood is separated into components prior to transfusion which offers several advantages.

This study has highlighted that there is scope for improvement of blood transfusion practices by promoting use of blood components.

While comparing our results with these in contemporary literature, the findings of our study were close to Reece R L et al (1966), [13] Bhatnagar S et al (2007), [10] Kwa et al (1961). [15]

In present study in OBGY department 32 single units (25%) were given for Gynecological reasons; rest i.e. 75% single units issued for obstetric reasons.

Table 3: showing comparison of pattern of single unit transfusion with different studies.

Author & Year	% of single unit transfusion
Gupte SC et al (2007) ^[9]	38.9%
P Saxena et al (1999) ^[11]	89.9 %.
Reece R L et al (1966) ^[13]	29.27%
Arturo Jose et al (1999) ^[14]	27.84%
Bhatnagar S et al (2007) ^[10]	34%
Kwa et al (1961) ^[15]	32.92%
Present study.	23.79%

Kamani et al (1988) ^[16] studied utilization of red blood cell transfusion in obstetric setting & have opined that single unit transfusion should not be given especially to women of child bearing age and particularly during pregnancy. This is because approx. 3% of recipient of blood and blood products develop detectable antibodies to red cell antigens and relative risk of hemolytic transfusion reaction is estimated to be 1:100 such transfusion are of type specific blood without an antibody screening.

Table 4: showing department wise single unit transfusion: comparison with different authors.

Author and year	Medicine	Surgery	OBGY
Kwa et al (1961) ^[15]	31.48%	25.66%	49.19%
Gupte SC et al (2007) ^[9]	-	38.9%	-
Kamani et al (1988) ^[16]	-	-	5 %
Present Study.	20.57%	23.57%	26.83%

In our study most requests were for a single unit of blood which rarely, if at all, is of any benefit to the recipient and carries all the risks associated with blood transfusion. The use of single unit of blood should be strongly discouraged. ^[4] A Single unit of red blood cells transfusion can increase Hb by approximately 1 g in a 70 kg adult, which is therapeutically insignificant rise. Most of the patients can do without single unit transfusions. Thus a lot of blood is being wasted in hospital by giving single unit transfusion which can be considered as unnecessary transfusion. Hence single unit transfusions should be condemned as an unwarranted use of blood.

Transfusion in thalassaemia major:

In present study we observed that most patients (81.63%) of thalassaemia major (receiving repeated transfusion) had pretransfusion Hb of < 7.5 gm% and in 6% of patients had Hb >9 gm%. Rest of the patients 15.30% (30 patients) had

Hb value between 7.5 to 9 gm%. So moderate transfusion regimen ^[15] was followed in 6% of patients.

Vishwanathan c et al (1999) ^[17] carried out blood utilization review in a Department of pathology, tertiary care hospital. The transfusion practice of usage of whole blood and components were studied for period of three months in all patients, surgical / nonsurgical who received transfusion including those on repeated transfusion. Their study showed that 42.65% of patients receiving red blood cells, and 6.25% patients receiving platelets had questionable indication.

Hasley P.B. et al (1994) ^[18] reported appropriateness rates and criteria for red cell transfusions. They evaluated five studies for transfusion appropriateness. Appropriateness rates ranged from 88-99% in three studies and inappropriateness rates ranged from 0.3-57.3 % in two studies. They concluded that appropriateness rates

varied widely, in part because of marked variation in the criteria for an appropriate transfusion.

SUMMARY AND CONCLUSIONS

The present study was carried out in the Regional Blood Bank, Department of Pathology in tertiary care hospital Aurangabad.

Transfusion of total 2000 units were issued in 1,113 patients were recorded. Out of total 2000 units of blood issued included in present study, 1514 units were of Whole blood; 318 units of packed red cells and 168 units of platelets. Whole blood was most utilized product followed by PRC and platelets.

- Ratio of whole blood: packed red cells: platelet was [9:1.8:1.] Out of total 2000 units of blood issued included in present study 1514 units were of whole blood 318 units of packed red cells and total utilization of Whole Blood was 82.64%(1514 units) compared to PRC 17.35% (318 units).
- Ratio of Whole blood: Packed red cell was [4.76:1].
- We observed that Department of Pediatrics had highest utilization of blood component (packed red cells) 49.21% and department of OBGY had lowest utilization 1.88%.
- In present study total percentage of single unit transfusion was 23.79% (excluding Pediatric

patients) given in 330 patients.

Since blood transfusion is a medical intervention, there is a need for continuous evaluation of the use of hemotherapy, mainly in hospitals where no Transfusion Committee (TC) exists. Moreover, the recognition in the early 1980s that transfusion of blood components carried a risk of HIV infection demanded a reevaluation of the indications and audit of their appropriate use.

In our hospital this is the first time that audit of blood products has been carried out & thus these results starting point from which the use of medical technology must be improved . The need to design educational programme about appropriate use of blood and to encourage creation of transfusion committee are the implications of this study. Periodic assessment of blood usage is needed to prevent misuse / overuse of blood.

So present study recommends that,

- Use of blood components should be promoted.
- Appropriate indication/ guidelines should be followed.
- Use of blood substitutes (replacement fluids), pharmacological interventions should be encouraged.
- Use autologous blood (if possible) should be encouraged.
- Single unit transfusion in adults should be discouraged.

Regular audit of blood and blood components is a must so that necessary remedial measures can be taken to maximize appropriate and judicious utilization of each component.

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