



PATTERN OF UTILIZATION OF PLATLETS AND FRESH FROZEN PLASMA IN TERTIARY CARE HOSPITAL WITH REVIEW OF LITERATURE.

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ABSTRACT

Today's transfusion medicine practice aims at providing the specific component of the blood required; this process of transfusing only the portion of the blood needed by the patient is called blood component therapy. Transfusion of whole blood has become a rarity now except in certain situations. Blood component therapy has become an integral part of treatment of many diseases in all fields of medicine.¹

In many nations whole blood transfusion is reduced and instead whole blood is separated in to components. These components are then used separately, as indicated in according to patient's need.

It is important to study the pattern of utilization of blood and blood components in the hospital. It helps to find out trend of usage which decreased the cost of treatment, reduce wastage of blood components and improves the infrastructure for storage of blood components for future.

KEYWORDS : Transfusion Medicine, Platelets Transfusion, Fresh Frozen Plasma.

INTRODUCTION

Blood is an amazing fluid. Blood is the most precious and unique gift that one human being can give to another human being. The blood transfusion service is the very vital component of healthcare services used in a broad range of hospital procedures, accidents, emergency obstetric services, and other surgeries. The demand for blood is increasing day by day because of urbanization and industrialization, road traffic accidents, advancement of medical science, advancement of surgical procedure like cardiac surgery, transplant surgery.

Blood transfusion has come a long way from early 20th century when it was a complex and risky procedure. Currently transfusion medicine is a speciality in its own right. Till date we are not able to prepare blood artificially and no effective substitute is invented so blood donor is very precious.

The primary responsibility of blood transfusion services is to provide safe, sufficient and timely supply of blood and blood products. At the same time the blood transfusion services should ensure the blood donation is safe and causes no harm to the donor.^{2,3}

The whole blood which is a mixture of cells, colloids and crystalloids can be separated into different blood components namely packed cell volume (PCV), platelet (PLT) concentrate, fresh frozen plasma (FFP) and cryoprecipitate (CRYO). Each blood component is used for a different indication. The component separation has maximized the utility of one whole blood unit.⁴

The emphasis has shifted from the use of whole blood to component therapy, as blood is a scarce and precious resource. Currently Good Clinical Practice (GCP) guidelines mandate transfusion therapy for specific well established indications and use of blood components rather than whole blood.

It is important for the blood bank to be able to fulfill the demands for this life-saving product and at the same time, evaluate and assess the existing trends of blood ordering. The importance of an internal audit and education programs is that it emphasizes proper selection of blood components for patients and avoiding their overuse.^{5,6}

Hence, periodic review of blood component usage is essential to assess the blood utilization pattern in any hospital.

In addition, not many studies from India have evaluated the use of component therapy partially because components are not made available by most blood banks.

MATERIAL AND METHOD

This is observational descriptive study for 18 months (July 2014-December 2015) on pattern of utilization of FFP and Platelets was

carried out in the Blood Bank of Department of Pathology in a teaching hospital. Data regarding indication of transfusion, department and units where transfusion to be carried out etc. were noted down from the daily records of blood bank. The transfusions were also categorized according to unit of department using the blood components.

INCLUSION CRITERIA

All the transfusions of FFP and Platelets during the study period in our Hospital.

EXCLUSION CRITERIA

Units issued out-side hospitals other than our hospital for transfusion. The data was analyzed for the pattern of blood component usage by different specialities, for different indications in different patients. The results obtained were tabulated and pattern of utilization was noted.

RESULTS

There were total 10358 blood and component transfusions which were carried out during the study period of 18 months. Total FFP and Platelets transfusion were 3344. Out of those, 1674 (16.17% of total) fresh frozen plasma transfusions, 1670 (16.12% of total) platelet transfusions were done. The study was started in July 2014, since then the pattern of Component usage was calculated and analyzed till December 2015. In the study noted that, fresh frozen plasma use was increased, with decrease in platelet use. (Table No. 1)

Component transfusions were analyzed for the indications of transfusion. Bleeding was the commonest indication for FFP use, followed by shock. (Table No.2)

DEPARTMENT WISE DISTRIBUTION OF COMPONENT USAGE

MEDICINE: There were 679 were platelet transfusion and 805 were fresh frozen plasma. (Table No.3)

SURGERY: There were 310 were platelet transfusion, and 314 were fresh frozen plasma.

PEDIATRICS: Out of total component transfusions department of pediatrics, 33 were platelet transfusions, while 89 were fresh frozen plasma.

OBSTETRICS AND GYNAECOLOGY: There were 232 were platelet transfusions, and 383 were fresh frozen plasma.

ORTHOPEDICS: Orthopedics used 30 platelet transfusions and 33 fresh frozen plasma. **RADIO THERAPY:** 386 were platelet transfusions and 50 were fresh frozen plasma utilized by Radiotherapy department.

REVIEW OF LITERATURE AND DISCUSSION

There is no substitute, which has all the properties of human blood. Though Harvey's doctrine of circulation of blood was published in 1616; the first transfusion of blood in humans took place in 1667. Today's transfusion medicine practice aims at providing the specific component of the blood required; this process of transfusing only the portion of the blood needed by the patient is called blood component therapy. This approach allows for optimal use of limited community resource. Transfusion of whole blood has become a rarity now except in certain situations. Blood component therapy has become an integral part of treatment of many diseases in all fields of medicine especially in hematology, hemato-oncology and Internal Medicine practice.¹

The availability of donated blood and the demand for blood components must be balanced to provide adequate supply. At present the supply of donated blood is unable to keep up with demand. Considering this, in many nations whole blood transfusion is reduced and instead whole blood is separated into components. These components are then used separately, as indicated in according to patient's need.

It is important to study the pattern of utilization of blood and blood components in the hospital. It helps to find out trend of usage which decreased the cost of treatment, reduce wastage of blood components and improves the infrastructure for storage of blood components for future.

Blood components and fractionation of whole blood

After light spin, platelet rich plasma (PRP) is emptied into one bag and additive from other bag is added to RBCs. PRP is spun again in high spin to get platelet concentrate and platelet poor plasma. Plasma is either frozen and stored as fresh frozen plasma (FFP) or frozen and thawed at 4°C to get plasma and cryoprecipitate. Platelet concentrate has to be prepared within 6 hours of collection of whole blood. Supernatant from cryoprecipitate preparation depleted in Factor VIII and Fibrinogen is called cryo-poor or cryo-supernatant plasma.⁸

PLATELET TRANSFUSION

Platelet is a very important blood component especially in hemato-oncological practice without which the present day chemotherapy would not be possible.

Platelets are available in two forms-¹

1. Pooled random donor platelet concentrate (RDP) prepared from whole blood or buffy coat contain $5.5-7.5 \times 10^{10}$ platelet per unit.
2. Single donor platelet (SDP) collected by apheresis containing $\sim 3 \times 10^{11}$ platelet or equivalent to 6 RDPs/bag. Donors' platelet count should be more than $240 \times 10^9/L$.

Platelet units are stored at room temperature between 20 and 24°C and kept under gentle horizontal agitation to maintain viability. Recommended storage period is 5 days. Platelet should be used within 4 hours of opening. Platelet preparations are never to be kept in refrigerator. All the platelet preparations should be gamma irradiated before transfusion.

Indications:

- Platelet count is $<5000/\text{micro lit}$ regardless of clinical condition.⁹
- Platelet count is 5000-10,000 micro lit, if there is increased risk of bleeding due to hematological malignancies, sepsis, severe aplastic anemia or patient undergoing bone marrow transplant.¹⁰
- Platelet count is 10,000-20,000 /micro lit. If thrombocytopenic bleeding is present.^{11,12}
- Chemotherapy for malignancy, if platelet count $\leq 20,000/\text{micro lit}$
- DIC, if platelet count $\leq 50,000/\text{micro lit}$
- In major surgery if platelet count $\leq 70,000-80,000/\text{micro lit}$.

In addition, platelet are indicated prophylactically for patients who have platelet count

Dose¹: The dose of platelet is one RDP/10 kg of body weight i.e. 4-6 RDP (one SDP) for an adult and 10-15 ml/kg for children. The same should be transfused rapidly over 30 minutes; in pediatric patients the rate should be 20-30 ml/kg/hour.

Platelet transfusion is contraindicated in Idiopathic thrombocytopenic purpura,¹⁰ Thrombotic thrombocytopenic purpura and Hemolytic

uremic syndrome, unless there is life threatening bleeding.

Frozen Plasma

Different types of frozen plasmas are available:¹

- 1) Fresh frozen plasma (FFP): Plasma frozen at -180°C or colder within 6 hours of donation.
 - 2) F24 plasma: Plasma frozen at -180°C or colder within 24 hours
 - 3) Cryosupernatant or cryo-reduced plasma (CRP): derived when FFP thawed
 - 4) At 40°C; once collected it is refrozen at -180°C or colder
 - 5) Solvent-detergent treated plasma
 - 6) Liquid plasma: Plasma not immediately frozen as FFP or F24 and stored at 1-60°C. Used for preparation of plasma derivatives like albumin, factor concentrate and immunoglobulins.
- a. FFP can be stored at 40°C and can be used safely within 24 hours; however when kept at room temperature, must be used within 4 hours.

Indications:

Actively bleeding and multiple coagulation factors deficiency in¹³

- 1) Liver disease
 - 2) Disseminated intravascular coagulation
 - 3) Coagulopathy in massive transfusion
 - 4) TPP
 - 5) When specific disorder cannot be or has not yet been identified.
- Familial factor V deficiency

If concentrated factor V is not available, FFP can be used as a source of Factor V.

- Deficiency of factor II, VII, IX, X, XI
- Antithrombin III deficiency
- Congenital or acquired coagulation factor deficiency.

Use of FFP in conjunction with red cells has largely replaced the transfusion of fresh blood.

Dosage¹ - One unit of FFP derived from a unit of whole blood contain 200-280 ml; apheresis plasma may be as large as 800 ml. On average there is about 0.7-1 unit/ml of coagulation factor activity per ml of FFP and 1-2 mg/ml of fibrinogen. The usual dose is 8-10 ml/kg; frequency depends upon clinical response. FFP should always be ABO compatible.

The present study was conducted over 18 months period. In the past, bleeding diathesis was common indication for Platelet use. Now the use of platelets is reduced due to availability of FFP and increasing awareness about proper component use as seen in our study. (Graph No. 1). Platelets were also commonly utilized by radiotherapy department due to most patient presenting as bleeding disorder secondary to malignancies.

CONCLUSION

The pattern of utilization of blood components is relevant for quality management of transfusion practice, cost analyses and for planning local and regional blood donation programs. The study provides data regarding requirement of blood component use in this teaching hospital. It is necessary to study different component requirement so as to improve component separation to avoid wastage and shortage. Regular clinical meetings on transfusion medicine for indication of different components are necessary to achieve judicious use of components. More such studies are needed to standardize the component utilization to improve patient care.

TABLES

Table No. 1: Month wise use of FFP and Platelets

Month & year	FFP	PLT	Total
July 2014	43	114	157
Aug 2014	53	102	155
Sept 2014	61	110	171
Oct 2014	77	97	174
Nov 2014	84	95	179
Dec 2014	89	101	190
Jan 2015	82	110	192
Feb 2015	99	101	200
Mar 2015	86	113	199
Apr 2015	105	111	216
May 2015	116	67	183

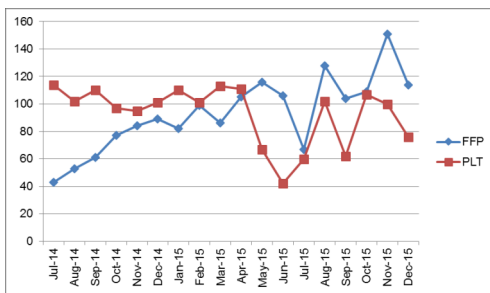
Jun 2015	106	42	148
Jul 2015	67	60	127
Aug 2015	128	102	230
Sept 2015	104	62	166
Oct 2015	109	107	216
Nov 2015	151	100	251
Dec 2015	114	76	190
Total	1674	1670	3344

Table No. 2: Indications for the use of FFP and Platelets

Indication of Transfusion	FFP	PLT	Number
Malignancy	50	386	436
Bleeding	1150	868	2018
Operative	74	416	490
Shock	400	-	400
Total	1674	1670	3344

Table No. 3: Department wise use of FFP and Platelets

Department	FFP	Platelets
Medicine	805	679
Surgery	314	310
Pediatrics	89	33
Ob- Gy	383	232
Orthopedics	33	30
Radiotherapy	50	386
Total	1674	1670

CHARTS**Graph No. 1: Pattern of utilization of FFP and Platelets in 18 months study****REFERENCES**

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