Pattern of Blood Component Utilization in a Teaching Hospital in South Kerala

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Abstract

In the absence of an effective substitute that can perform the vital functions of blood, transfusion of donated blood remains the mainstay of treatment for a wide range of medical conditions. Given the limited availability of donated blood, the aim of Blood Utilization Management System is to minimize wastage of blood resources and optimise the utilisation of blood products. Analysis of blood usage pattern can help improve the utilization of transfusion resources, can predict future blood demand and help maintain inventory levels. A comprehensive retrospective analysis of the utilization of all conventional blood components over a period of three years was performed at a tertiary care hospital. Blood components transfused were correlated with the diagnosis and indications for transfusion. A total of 4013 blood units were supplied during the studied period. RBC (42.5%) was the most utilized product, followed by frozen plasma (30%). The demand for blood products was highest from medical wards. Gender distribution showed higher requirements of platelets and frozen plasma by male patients and red cells by female patients. While the demand for red cells and plasma was more for older patients, demand for platelets did not show any age trends. Demand for platelets peaked during the months from May to August and demand for other components showed a secular trend. 

Keywords: Blood Transfusion, Blood Components, Blood Products, Transfusion Medicine, Blood Component Utilisation

Introduction

Since the first ever successful transfusion of human blood performed by British obstetrician James Blundell in 1818, the science of blood transfusion has come a long way in preserving human lives. In spite of the phenomenal developments witnessed in the field of medical technology, an effective substitute that can perform all the vital functions of blood is yet to be developed. In the absence of such a substitute, transfusion of donated blood remains the mainstay of treatment in a wide range of medical conditions. The effective use of limited blood resources and provision of high quality blood products with minimum waste are important goals of Blood Utilisation Management System. It includes policies and practices related to inventory management and blood usage review. Transfusion resources can be better utilized by collecting epidemiologic information on blood component usage, predicting blood product demand and maintaining minimum inventory levels. Observed changes in the blood utilisation pattern will help to re-evaluate inventory levels.

Objectives

To study the utilisation pattern of blood components in a tertiary care centre and to correlate component utilisation with patient factors.

Material and Methods

This is a record based descriptive study of blood components issued from July 2010 to June 2013 from the department of transfusion medicine at Dr. SMCSI Medical College, a 750 bedded teaching hospital in Thiruvananthapuram District of Kerala state, India. The department caters to the blood component needs of local hospitals as well as some hospitals across the border in the state of Tamil Nadu. Details of blood components issued are documented in the department register. The documented data contains the type of blood component issued, indications for transfusion and demographic details of the recipient.

Data compiled from the registers include age of the patient, gender, address, consultant in-charge, ward/unit where patient was admitted and diagnosis along with indications for transfusion. History of previous and present illness, including previous transfusions and transfusion reactions, if any, were noted. Reports of salient investigations like haemoglobin, platelet count and coagulation profile were recorded. Details of present usage of blood, including the number and type of components transfused were noted. The usage of blood components was correlated with the clinical diagnosis and indications for transfusion.

Results

A total of 4013 units of blood components were issued during

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the three year period, of which 42.5% were Packed Red Cells (PRC), 30% were Fresh Frozen Plasma (FFP) and 27.5% were Platelet Concentrates (PC) (Table 1). There is a significant rising trend (Chi square for linear trend; p-value 0.001) in the utilization of blood components over the years, with a four-fold rise in the utilisation of Platelet Concentrates (Figure 1).

The requirement of packed red cells and fresh frozen plasma was seen to peak at a significantly higher age than that of platelet concentrate. The mean age of patients requiring each of the components were significantly different with 48.72 (SD 18.19) for packed red cells, 46.01 (SD 19.82) for fresh frozen plasma and 36.79 (SD 17.48) for platelet concentrate (p < 0.001, ANOVA).

52.1% of patients requiring blood components were male. Component wise, red cells were needed more for females (55.7%) and platelets more for males (53.9%). The gender distribution is significantly different only for frozen plasma, where 61.5% were issued to male patients (p value-0.001) (Figure 3).

The requirement of blood was more (65.4%) for medical specialties followed by surgical specialties (19.3%). The most common overall indication for blood component transfusion was anaemia. The most common component wise indications were anaemia for packed cells, hypoproteinaemia for fresh frozen plasma and thrombocytopenia secondary to dengue infection for platelet transfusion.

Age of the patients receiving blood products varied widely. The youngest recipient of blood component was a new born who developed thrombocytopenia secondary to viral infection (Dengue) and the oldest recipient was a 98 year old person on dialysis. The age distribution of the utilisation of various blood components is shown in Figure 2.

Table 1. Utilisation of Blood Components

<table>
<thead>
<tr>
<th>Period</th>
<th>Packed Red Cells</th>
<th>Fresh Frozen Plasma</th>
<th>Platelet Concentrate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>July 1, 2010-June 30, 2011</td>
<td>978</td>
<td>51.6</td>
<td>311</td>
</tr>
<tr>
<td>July 1, 2011-June 30, 2012</td>
<td>1263</td>
<td>47.6</td>
<td>437</td>
</tr>
<tr>
<td>July 1, 2012-June 30, 2013</td>
<td>1772</td>
<td>71.5</td>
<td>456</td>
</tr>
<tr>
<td>Total No.</td>
<td>4013</td>
<td>42.5</td>
<td>1204</td>
</tr>
</tbody>
</table>

The age distribution of blood component utilisation is shown in Figure 2.

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In the month wise distribution of blood component utilisation, platelets showed increased demand in the months of June to August, consistently over all three years. The other blood components were in uniform demand throughout the year.

Discussion

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 component demand. Taking this into account, most developed nations have implemented Patient Blood Management initiatives and started retrospective status quo analysis of the flow of blood components. Data on blood transfusion pattern is sparse from developing nations. This study intended to analyse the pattern of blood requirement in this part of the country.

In general, the overall consumption and distribution of blood components such as PRCs, FFP, and PC showed a steady increase during the three year observation period. This is at par with various studies which show that the demand for blood is increasing worldwide. But Indian statistics for blood demand and supply is not easily available and there is no published data from the above study population. In our study, units issued showed a 1.5:1.1:1 ratio for PRC, FFP and PC. This is in contrast to other studies which have shown a ratio of 7.5:2.5:1. A similar study from Brazil done in 2004 showed the consumption proportion of PRC, Frozen Plasma and Platelets to be 42%, 16% and 40% respectively. High rates of inappropriate FFP transfusions are a consistent finding in audits of FFP transfusions. This points towards the need for the implementation of strict guidelines in the administration of blood components.

In our study major part of the blood products were utilised by medical specialities (65%), followed by surgical specialities (20%). This is contrary to other studies which showed that blood products are required more by surgical specialities. This can be attributed to the high prevalence of anemia and high incidence of dengue fever in the study population; both of which are admitted to medical wards.

In this study, the most common indication for PRC transfusion was anaemia, while hypoproteinemia and thrombocytopenia secondary to dengue fever were the common indication for frozen plasma and platelet transfusions respectively. Anaemia accounted for 64% of PRC transfusion. The same finding is the conclusion of two other similar studies. In the absence of a state policy, it is important to have institutional policies regarding the haemoglobin and hematocrit value at which PRC transfusion can be started.

Plasma is valuable in the management of coagulation defects, hypoproteinemia and hypovolemia. Plasma is mainly used by the cardiovascular department for volume correction as per a study conducted in Spain in 2007, but in our institution this is mainly used for the correction of protein levels. Similar observations were made in a Brazilian study. The component specific age distribution showed a significantly higher age for Packed Red cells and Frozen Plasma which is similar to the findings of various other studies.

The overall distribution of blood components between men and women is approximately equal. But male patients need significantly more Frozen Plasma than female patients which is similar to results from other studies. The higher demand of Red Cells among females could be due to higher prevalence of anaemia among women in the study population. The four month period from May to August saw the highest demand for platelets. This period has been the time of dengue fever peaks in the population. High rainfall and high levels of humidity during this period leads to increase in Aedes population and dengue outbreaks. Patients become critically ill over a short span of time and their platelet counts drop dangerously. Platelet transfusion is indicated only when the count falls below 40,000/cumm. Kurukularatne after reviewing the published clinical data on prophylactic platelet transfusion and related risks has commented that prophylactic platelet transfusion in stable dengue patients without additional bleeding risk factors may be avoided without compromising patient safety.

Conclusion

This study demonstrates the trend of utilization of blood and blood components in a teaching hospital in south Kerala. The results allow the identification of blood requisition practices that can be improved, help appraise the effects of blood safety measures and assist in planning future blood supply. Hospital transfusion committees should review the indications of transfusion and should issue strict guidelines for blood component requests. This will help to curb the shortage of blood components and also help to bring down hospital expenses. The observation of increased demand of platelets during epidemics of dengue fever will enable blood banks to prepare and stock adequate amount of platelet concentrates for this period.
End Note

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Abbreviations
PRC - Packed Red Cells
FFP - Fresh Frozen Plasma
PC - Platelet Concentrates

Conflicts of Interest - None declared

References