Original Research Article

Indian Journal of Pathology: Research and Practice
Volume 6 Number 4, October - December 2017 (Part-II)
DOI: http://dx.doi.org/10.21088/ijprp.2278.148X.6417.36

Blood Transfusion Services and Utility of Blood and its Components at Teritiary Care Center

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Abstract

Background and AIM: Blood transfusion services aim at providing adequate, safe and quality blood to meet the demands for clinical blood transfusion. The aim of the blood utilization management system is to optimize the utilization of blood products and minimize wastage of blood resources. The present study aims to highlight the services that are provided in our blood bank and special focus on utilization of blood components. *Materials and Methods:* Present study is a retrospective descriptive study. All the data related to blood donation, blood grouping and Rh (Rhesus) typing, TTI (Transfusion transmitted infections) testing, blood component separation, blood issue and discard details of 2016 were collected from the blood bank. Detail analysis of type of blood donation, TTI results, components issue and discard rates were done. *Results:* A total of 7,433 blood units were drawn, out of which 98.3% were voluntary blood donation. On TTI testing prevalence of HIV, HbsAg, HCV and Syphilis among blood donors was 0.17%, 0.87%, 0.04% and 0.12%. A total of 9,954 transfusions were done and most common component utilized was RCC (Red cell concentrate) in 46.35% followed by FFP (Fresh frozen plasma) in 29.37% cases. Discard rate was 2.89% cases. The most common reason for discard was found to be TTI positivity followed by expiry. *Conclusion*: Despite the current advances in technology in health-care delivery, access to safe blood and blood products and their judicious use remains a big challenge. The study demonstrates transfusion services and trend of utilization of blood and its components. 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.

Keywords: Blood Component; Blood Transfusion; Blood Utilization.

Introduction

Despite substantial development in the field of medicine, effective substitutes of blood and blood products have not yet been developed. In the absence of such substitutes, blood remains the mainstay of treatment for a wide range of medical condition and therefore well organized and effective blood transfusion service is vital for health care delivery system. The effective use of limited blood resources and provision of high quality blood products with minimum waste are important goals of Blood utilization management system [1]. It includes policies and practices related to inventory management and blood usage review. Transfusion resources can be better utilized by collecting epidemiological information on blood component usage, predicting blood product demand and maintaining inventory levels. Observed changes in the blood utilization pattern will help to re-evaluate inventory levels. Blood obtained from voluntary non-remunerated blood donors is a scarce and precious resource, which must be effectively managed and stocked [2]. This study was designed to highlight the transfusion services in our hospital and analyze the utilization pattern of each blood product based on disease conditions requiring transfusion.

Material and Methods

The present study is a retrospective descriptive study and data collected from January 2016 to December 2016. The study was conducted in blood bank district hospital shimoga institute of Medical

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(Received on 13.09.2017, **Accepted on** 03.10.2017)

Sciences Shimoga. The study was done after approval from ethical committee SIMS Shimoga. Blood bank is complied with Drugs and cosmetic rules in recruitment and selection of blood donors, collection, processing, storage and distribution. Every section responsible for various services will define its own quality control program including outsource services and center also participates in external quality assurance program. We aim to accept blood from voluntary non-remunerated, low risk, safe and healthy donors. Voluntaty blood donation is either camp based or hospital based. As per NACO (National AIDS control organization) guidelines following are the criteria for selection of blood donors: age, weight, hemoglobin, blood pressure, temperature, pulse and any medical history. For ensuring blood safety the blood bank will provide pre and post donation counseling services. Blood is drawn from the donor by a qualified physician or under his/her supervision by assistant trained in the procedure. Blood bags with anticoagulant solution for collection of blood should be sterile, pyrogen free and disposable with a closed system of collection as per standards provided by ISO(International standard of organization). Multiple interconnected double/triple bags are used for blood component preparation. 10ml of blood sample from donors is collected in pilot tubes (clotted and anticoagulated) and is subjected for laboratory testing. Immediately after collection the blood bags should be placed at 4^0C to 6^0C except for component preparation which is stored at 22^0C± 2^0C for 6hrs until the platelets are separated. Donated blood is tested for ABO grouping , Rh typing . If the blood is typed as D-Negative it is further subjected for Du testing . When the test for D and D^u is positive the label should read as Rh(D) positive. When the test for D and D^u is negative the label should read as Rh(D) Negative. Serum from donors is tested for unexpected antibodies using coombs method. Further blood is mandatorily tested for syphilis, Hepatitis B, Hepatitis C, HIV and malaria by serological and NAT methods. The whole blood or components should not be issued for transfusion till the mandatory tests are completed and reported as non reactive. The units which test reactive is segregated immediately and kept in separate quarantine area till sent for disposal. Whole blood amounting to 450ml is subjected for component preparation as per the needs and usage. The principle used in component preparation is differential centrifugation. Components include red cell concentrate/packed red cells(RCC), platelet concentrate(PC) and fresh frozen plasma (FFP) . Whole blood and components labeled and stored at appropriate temperature, whole blood and RCC stored at 4^0 ± 2^0C , platelet concentrate stored at 22^0 ± 2^0 C and fresh frozen plasma stored at -40^0C. When a transfusion is required request form with indication for transfusion is sent along with a sample of recipient blood, recipient sample is subjected for blood grouping and Rh typing and then compatibility testing is done. The compatible blood and its details are recorded in the register and then issued along with a transfusion reaction form.

Results

Conducted retrospective study from January 2016 till December 2016. A total of 7,433 blood units were drawn out of which 98.3%(n=7314) were voluntary blood donation and 1.7%(n=119) were replacement donation. Males accounted for 96.2% of voluntary blood donors and females accounted for 3.8%.

Out of 7,433 blood units collected, on ABO grouping and Rh typing following were the percentage of blood groups (Table 2).

Most common blood group that has been drawn was O positive and the least type was AB negative

All the 7,433 blood units were tested for TTI (Transfusion transmitted infections) by ELISA and NAT testing (Table 2).

Prevalence rate among blood donors in detection of HIV, HbsAg, HCV, Syphilis was 0.17%, 0.87%, 0.04%, 0.12%. No malaria case was detected.

Blood units which were collected were further subjected to component preparation depending on the need and a total 12,248 units were prepared in the year 2016(Table 3).

Packed red cells being the most common component available followed by platelets.

A total of 12,248 blood /component units were been made available during the year 2016 out of which 81.27% of units were issued for transfusion with in the hospital, 15.39% were issued to 6 Blood storage units that are situated at taluk levels and 2.89% were discarded due to various reasons. 0.51% units were sent for sterility testing as a part of quality control program.

Blood components/whole blood utilization in the year 2106 was as follows (Table 5).

Most common type of component that is issued for transfusion is RCC (46.35%) followed by FFP (29.37%).

A total of 12,248 units of components were prepared out of which 2.89%(n=354) units were discarded. Most common component that was discarded was FFP followed by platelets. And the most common reason

Table 1: Shows percentage of the donor blood groups

Blood group	Percentage
A Positive	20.93% (n=1549)
A Negative	1.10% (n=82)
B Positive	29.39% (n=2175)
B Negative	1% (n=74)
AB Positive	6.17%(n=457)
AB Negative	0.28% (n=21)
O Positive	39.67% (n=2936)
O Negative	1.51% (n=112)
Total	100% (n=7433)

Table 2: Shows positive TTI testing by NAT method

TTI testing by NAT	No of positive cases in the year 2016
HIV	13(0.17%)
HbsAg	65 (0.87%)
HCV	03 (0.04%)
Syphilis	09 (0.12%)
Malaria	Nil

Table 3: Showing percentage of whole blood and their components which were made available

Whole blood and Components	Percentage
Whole blood	24.2% (n=2956)
Packed red cells / Red cell concentrate	36.49%(n=4470)
Platelets	32.74%(n=4011)
Fresh frozen plasma	6.62%(n=811)
Total number of blood / components	12248

Table 4: Total expenditure of blood and its components

Total number of transfusion	81.27% (n=9954)
Total number of blood units issued to other blood banks / storage units	15.39% (n=1877)
Total number of discarded blood units	2.89% (n=354)
Total number of blood units sent for sterility check	0.51% (n=63)
Total number of blood /components	12248

Table 5: Utility of whole blood / components with respect to indications

WB/components and their utility	Percentage of units utilized	Anemia	Surger	PPH	CKD	Thalassemia	Bleeding	RTA	Burns	Live R disease	Thrombocytopenia
WB	17.08%	77.04%	11.48%	3.27%	4.91%	1.63%	1.63%	-	-	-	-
RCC	46.35%	78.88%	4.34%	1.86%	4.96%	4.96%	2.48%	2.48%	-	-	-
FFP	29.37%	24.13%	10.34%	43.10%	5.17%	-	8.62%	-	3.44%	5.17%	-
Platelet	7.28%	-	-	-	-	-	-	-	-	-	100%

Table 6: Showing percentage of various components discarded

Components	Percentage
WB	16.10% (n=57)
RCC	21.46%(n=76)
FFP	35.02%(n=124)
Platelet	27.40%(n=97)
	n=354

Table 7: Showing various reasons for the discard of blood units

Various causes for discard	Percentage
TTI positivity	40.96% (n=145)
Expiry	32.76% (n=116)
Damaged blood bags	22.88% (n=81)
Insufficient collection	2.54% (n=9)
Polycythemia	0.84% (n=3)

for discard was TTI positivity 40.96% (n=145) followed by expiry 32.76%(n=116), damaged blood bags in 22.88%(n=9) .

Discussion

In the present study we are highlighting the transfusion services that are provided in a tertiary care center SIMS Shimoga. To achieve maximum safety at an acceptable cost requires multilayered risk reduction strategies involving safe blood donors, safe blood components and safe transfusion practices [3].

Donor Services

A total of 7,433 blood units were drawn out of which 98.3%(n=7314) were voluntary blood donation and 1.7%(n=119) were replacement donation, 82% of collection was camp based and 18% was in house collection . Males accounted for 96.2% of voluntary blood donors and females accounted for 3.8%. Obtaining safe blood donors who have a low risk of carrying TTI requires effective donor selection and screening strategies. Donor selection is done by a trained physician who are assessed for age, weight, hemoglobin, blood pressure, pulse rate, temperature, asked for appropriate medical history and filled in the donors questionnaire, further donors are evaluated for accepting, temporary deferral or rejection [4]. Donor deferral might appear as discrimination and violation of a human right, but the patient's right to safer blood is more important here, as blood centers are made to help the patient rather than the donors [5]. A total of 7433 blood units were collected, all these were tested for ABO blood grouping, Rh typing, Du testing for negative blood groups and TTI testing by ELISA and NAT method. Incidence of blood groups in decreasing order were O+, B+, A+, AB+, O-, A-, B-, AB- but in study done by Giri et al [6] B+ was the commonest blood group followed by O+. In the present study TTI positivity was found in 1.21% cases, prevalence of HIV, HbSAg, HCV and syphilis in blood donors was 0.17%, 0.87%, 0.04% and 0.12% by using NAT techniques. In study done by Al-Turaifi [6] at Saudi Arabia prevalence of HIV, HbSAg, HCV in blood donors was 0.013%, 0.49%, 0.091% and similar findings were reported by Bamaga study [7].

Blood Component Utility

The present study showed that whole blood contributed 17.08% of total transfusions, which was much lower than that found in the study done by Bansod PN et al [8] (43.06%) , Gupte and Shaw [9] showing better usage of blood components at our institution. 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 as par with various studies which show that the demand for blood components is increasing worldwide [10].

In present study ratio of RCC, FFP, PC issued was 6.3:4.03:1 this is similar to studies which showed ratio of 7.5:2.5:1 [11,12]. A similar study from brazil done in 2004 showed the consumption proportion of RCC, FFP and PC to be 42%,16% and 40% respectively. Component separation is increasing in India from 33.3% in 2006-07 to 50.5% in 2011-12 [13] and NACO is supporting the installation of blood component separation units to facilitate component separation and encourage appropriate usage of blood. High rates of inappropriate FFP transfusions are a consistent finding in audits of FFP transfusions [14]. This points towards the need for the implementation of strict guidelines in the administration of blood components.

In present study RCC is the highest utilized blood component followed by FFP. Most common indication for RCC transfusion was anemia, for FFP transfusion it was PPH(Post partum hemorrhage) while for Platelet transfusion all the cases were thrombocytopenia. Anemia accounted for 78% of RCC transfusions this can be attributed to high prevalence of anemia and in the absence of state policy it is important to have institutional policy regarding the hemoglobin and hematocrit value at which RCC transfusion can be started. In recent years there is sharp increase in platelet demand during June-August due to an outbreak that saw a sharp rise in cases of dengue. The availability of donated blood and the demand for blood components must be balanced to provide adequate supply. 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.

An analysis of various causes for discarding of blood and its components revealed that TTI positivity in 40.96% cases, Expiry in 32.76% and damaged blood bags in 22.88% cases. Most common component that was discarded was FFP followed by platelets. Despite the longest expiry of FFP the lower utilization and breaking of blood bags appears to be the cause for wastage. Short expiry period of platelets and increased number of platelet preparation during monsoon, there is high possibility of wastage of platelets during this period.

Conclusion

Revamping blood transfusion system is the basic necessity to provide basic care. The challenges to overcome such hindrances may be unification of blood transfusion services to maintain the standard of services, focus on quality of service provided, adoption of newer technologies, strengthening of reporting and information system to maintain the inventory, emphasis on equitable distribution of blood and blood products and many more. These changes can be made through framing a strong policy, functional planning and setting standards.

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