

A Hospital Based Observational Assessment to Determine the Rate and Reasons for Blood and Blood Components Wastage in the Blood Bank

Fauzia Perveen¹, C.P. Jaiswal²

¹Tutor, Department of Pathology, Nalanda Medical College and Hospital, Patna, Bihar, India

²Associate Professor and HOD, Department of Pathology, Nalanda Medical College and Hospital, Patna, Bihar, India

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Corresponding author: Dr. C.P. Jaiswal

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Abstract

Aim: The aim of the study was to determine the rate and reasons for blood and blood components wastage in the blood bank of a tertiary care hospital.

Methods: This was a retrospective study involving the analyses of discarded blood and blood components data in Nalanda Medical College and Hospital, Patna, Bihar India for the period of two years which measured the outcome-based quality of discarded blood and its components.

Results: A total of 10,000 units of blood were collected. Among the total donors, 9890 (98.9%) were males and 110 (1.1%) were females. 8000 (80%) were voluntary donations, and 2000 (20%) were from replacement donations. A total of 34850 blood components were prepared from 10,000 whole blood donations during this study period. Of which 6404 (18.37%) components were discarded. Among the total discarded components, platelet concentrates (PCs) were discarded 83.24% (5331/6404), of which 95.39% (5142/5390) was due to expiry, 1.3% (70/5331) due to packed red cells contamination, and 2.7% (182/5331) due to seropositivity.

Conclusion: Implementation of proper blood transfusion policy, donor screening, and training of technical staff will help to reduce the discard rate and solve the shortage of these precious elements.

Keywords: Blood components, discarding reasons, training, transfusion policy, wastage percentage.

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Introduction

In this era of modern medicine, blood and blood components have been playing a vital role in patient management. [1] Blood is a major bodily fluid that delivers nutrients and oxygen and transports waste products away from these same cells. Majority of the medical and surgical emergency procedures depend on the

Blood Transfusion Services (BTS). Studies on developing countries reported that most of the limited blood supplies are used for complications of pregnancy and childbirth, trauma and severe anemia in childhood. [2] A well - organized and efficient BTS would contribute toward better patients care and contribute toward the

development of healthcare in the country. [3] Till date there is no substitute to human blood. [4] The demand for blood overshadows the blood supply in many countries. [5] There are multiple factors that contribute to shortfall in provision of blood including deficient donor recruitment, poor stock management and transportation. This highlights the need for appropriate utilization of blood and its components. [6]

The blood bank needs to put in enormous efforts to collect sufficient amount of safe blood from voluntary, non - remunerated, healthy, and low - risk donors. Many factors lead to wastage of blood products like broken bag, broken seal, expired units, returned after 30 min, clotted blood or miscellaneous reasons which is most importantly due to lack of proper knowledge and awareness. The efficiency of quantity and quality of blood and blood components can be achieved by BTS through the implementation of a quality management system in all phases of the collection, processing, and storage of the blood. This would further promote reduction in the amount of blood discarded to a level that is more acceptable to the set standards. Blood wastage is a worldwide economic and ethical problem, ranging between zero and 6 %. Only around 100 countries in the World have and follow national guidelines for clinical use of blood and blood products. Many internal and external factors for wastage have been identified in hospital practice. Improper containers for transport and the difficulty in ensuring that the appropriate temperature has been maintained before transfusion have been identified as major contributors to wastage. [7] Wastage of blood and blood products should never occur ideally in a good set up. Due to the essential need to have adequate and satisfactory blood stocks all the time, a very small but unavoidable amount of blood wasting in blood bank does exist. The rate of discarded blood components or

“wastage rate” is one of the indicators which has been listed third among the ten quality indicators recommended by National Accreditation Board for hospitals and health care providers. [8]

The aim of the study was to determine the rate and reasons for blood and blood components wastage in the blood bank of a tertiary care hospital.

Materials and Methods

This was a retrospective study involving the analyses of discarded blood and blood components data in Nalanda Medical College and Hospital, Patna, Bihar India for the period of two years which measured the outcome-based quality of discarded blood and its components. The study included the discarding of whole blood, red cells, platelets, fresh frozen plasma (FFP), and cryoprecipitate units. Reasons for discarding of blood products included were expiry, serology positive, red blood cells (RBCs) contamination of platelets, leakages, clots, and lipemic appearances of FFP.

Registration forms are filled by blood donors who carried important information's such as personal details, demographic details, occupational, and medical history. The donors are then screened according to the standard guidelines and finally examined by medical officers. Only the donors found to be physically fit according to blood donor selection criteria and medical examination are allowed to donate blood. Whole blood was collected, and components were separated according to the Drugs and Cosmetics Act 1940 and Rules 1945. We used citrate phosphate dextrose (CPD) as an anticoagulant and saline adenine glucose and mannitol as a preservative for RBCs. Components were separated by platelet-rich plasma method. The quality of whole blood and components was assessed as per the Drugs and Cosmetics Act 1940 and Rules 1945.

The discard policy was followed as per the norms mentioned in the standard operating procedures made by the blood bank under the NACO guidelines. Discard rate⁹ = Number of blood and blood components units wasted/total number of blood or components stored × 100.

Blood components procedure

Collected blood units are separated into components by different centrifugation methods. RBCs are stored for 42 days,

platelets for 5 days, and FFP stored for 1 year. All units that were discarded due to various reasons are documented in the discarding register, which has all relevant information's such as donor number, reason for discard, blood group, method of discard, and then total discarded units at the end of the year.

Collected data were analyzed using Microsoft Excel.

Results

Table 1: Blood donors sex and type

Type of donors	Male	Female	Total donors
Voluntary	7920	80	8000
Replacement	1970	30	2000
Total	9890	110	10000

A total of 10,000 units of blood were collected. Among the total donors, 9890 (98.9%) were males and 110 (1.1%) were females. 8000 (80%) were voluntary donations, and 2000 (20%) were from replacement donations.

Table 2: Blood components collected and discarded

Blood components	Number of components collected	Number of units discarded	Discard rate (%) among total components
Whole blood	50	3	0.008
Packed cells	12,210	430	1.27
Platelet concentrate	11,350	5323	15.3
FFP	10,690	648	1.8
Cryoprecipitates	550	0	0
Total	34,850	6404	18.37

A total of 34850 blood components were prepared from 10,000 whole blood donations during this study period. Of which 6404 (18.37%) components were discarded.

Table 3: Blood component discarded reasons

Blood components	Total discarded	Expiry	TTI positivity	Red cells contamination	Damage	Turbidity	Green plasma
Whole blood	3	3	0	0	0	0	0
Red cells concentrate	431	245	150	0	1	0	0
Platelet concentrate	5331	5142	145	70	0	0	0
FFP	639	0	154	0	319	170	5
Total	6404	5390	449	70	320	170	5

Among the total discarded components, platelet concentrates (PCs) were discarded 83.24% (5331/6404), of which 95.39% (5142/5390) was due to expiry, 1.3%

(70/5331) due to packed red cells contamination, and 2.7% (182/5331) due to seropositivity.

Discussion

Blood transfusion is an important constituent of health-care delivery system. Millions of lives are saved every year in regular and urgent situations for medical and surgical indications by the accessibility of safe blood transfusion services. [10] To deal with the necessity and supply of blood and blood components, more strict measures should be accessible and pursued for the right utilization of this insufficient reserve. [11] Along with this, a protocol for minimizing the discard of blood should be formed to save energy and human and financial resources in the developing countries. Excessive and inappropriate use of blood products poses a burden on transfusion services. Similarly, with a proper coordination between clinicians and blood bank staff, wastage owing to expiry of blood can be minimized. [12] Wastage of all blood components, including RBCs, platelets (PLT), and plasma, is an important issue for hospitals worldwide. Waste is not limited to blood products and is present throughout the health care system. [13] Studies of systemic waste have examined the importance of workflows in the health care environment [14] and have focused on minimizing operational sources of waste when issuing a variety of medications. In many of these studies, relatively simple interventions resulted in marked reductions in wastage.

In our blood bank, packed red cells concentrate were most frequently collected components followed by FFP, platelet, cryoprecipitate, and whole blood. Whole blood was the least collected blood component, and this could be because whole blood is not frequently administered to patients unless $\geq 75\%$ of blood was lost. A total of 10,000 units of blood were collected. Among the total donors, 9890 (98.9%) were males and 110 (1.1%) were females. 8000 (80%) were voluntary donations, and 2000 (20%) were from replacement donations. A total of 34850

blood components were prepared from 10,000 whole blood donations during this study period. Of which 6404 (18.37%) components were discarded. Among the total discarded components, platelet concentrates (PCs) were discarded 83.24% (5331/6404), of which 95.39% (5142/5331) was due to expiry, 1.3% (70/5331) due to packed red cells contamination, and 2.7% (182/5331) due to seropositivity. The discard rate of blood components in central India was 14.6%, which was 5% lower than our study. [15] In ten European countries, the wastage level was reported to range between 0.2 and 7.7%, with an average of 4.5% (Veihola et al., 2006). [16]

Discard rate for packed red cells concentrate in the present study was 3.5% (430/12,210). This matches with a study by Arora et al. 3.5% and Thakare et al. 3.58% [18] and higher than quoted by Morish et al. 2.3%, [19] Suresh et al. 3.3%, and Sharma et al. 3.2%. [11] The most common reason for discard of red cells concentrate was expiry 56.84% (245/431), followed by transfusion transmitted infection (TTI) positive 34.80% (150/431). One of the reasons for expiry was collecting whole blood for making random donor platelets. The discard rate of FFP in our study was 6.06% (648/10690), which is lower than Bobde et al. [21] (7.6%) and Sharma et al. [11] (6.2%). Similar to Kanani, [22] the most common reason for discard of FFP was leakage 48% (322/669), followed by TTI positive units 27% (183/609), lipemic 24% (159/609), and green plasma 1% (5/609). Leakage was the most common cause of wastage of FFP, which can be minimized using appropriate size freezers, putting FFP units in cardboard, or polystyrene protective container that minimizes the risk of breakage of product during storage, handling, and transportation. Excess FFP can be given to fractionating and this will further minimize the expiry rate of FFP. The lipemic discards can be minimized by

proper donor questioning regarding their interval between donation and time of the last meal.

PC was the most common component discarded during the study. The discard rate of PC was 46.89% (5323/11,350) which was higher than that of Bobde et al. [21] (26.2%), Kanani²² (28.39%), and Sharma et al. [11] (43.6%) and lower than that of Ghaflez et al. [23] (58.1%). Studies conducted by Kumar et al. [18] and Deb et al. [19] concluded that the most common components discarded were platelets, and the most common reason was expiry. Using platelet additive solutions, special type of storage bag and cryopreservation techniques can minimize the expiry of PC. Red cells contamination can be reduced by continuous training and monitoring on component separation and using automated cell separator. Red cells contaminated platelet can be used to same blood group individuals within 24 h of separation. Various studies have been conducted to manage PC inventory (De Kort et al., 2011). [24] Van Dijk et al. [25] designed a model to reduce PLT wastage from 15%–20% to less than 0.1%, with regards to the fact that PLT units have short expiry dates. The discard rate for whole blood in the present study was 6% (3/50), which was higher than the rates quoted by Suresh et al. [20] (5.7%), Bobde et al. [21] (6.63%), and Sharma et al. [11] (4.46%). All the three units were discarded due to expiry. Our study found expiry/outdated units to be the most common reason for discarding 84.16% (5390/6404). This is similar to the study done by Jariwala et al.²⁶ and Kurup et al. (87.7%–96.6%) [2], who also showed outdated to be the most common cause of discarding. [27]

Conclusion

Blood being an irreplaceable and important resource, needs to be properly utilized and ideally zero percent wastage should be encouraged. Common causes for discard of blood and blood components were non utilization due to Date expiry,

Seropositivity for TTI and other causes like leakage, hemolysis, etc. Training programmers for doctors on usage of blood / blood components is highly recommended. Proper maintenance of records, a proper donor selection and deferral guidelines will help in better utilization of the blood bags.

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