



A Study to Ascertain the Frequency and Causes of Discarding Blood and Blood Components in the Blood Bank of a Tertiary Care Hospital

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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 retrospective analysis examined discarded blood and components data over a 3-year period, assessing their quality based on outcomes. Whole blood, red cells, platelets, FFP, and cryoprecipitate units were discarded in the research. Expiry, serology positive, RBC contamination of platelets, leakages, clots, and lipemic FFP were reasons to reject blood products.

Results: We collected 5000 units of blood. Overall, 4945 donors were male and 55 female. 4000 voluntary contributions, 1000 replacement donations. This research generated 17625 blood components from 5000 whole blood donors. Discarded 3201 components. Platelet concentrates (PCs) were discarded 83.24%, including 95.39% owing to expiration, 1.3% due to packed red cell contamination, and 2.7% due to seropositivity.

Conclusion: Effective blood transfusion policy, donor screening, and technical staff training will minimize waste rates and alleviate the scarcity of these important materials.

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

DOI Number: 10.48047/nq.2024.22.3.NQ24038

NeuroQuantology 2024; 22(03): 355-359

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1. Introduction

Blood transfusion is a vital component of the healthcare system. The availability of safe blood transfusion services saves millions of lives annually in both routine and emergency medical and surgical cases [1]. In order to address the need and availability of blood and blood components, it is imperative to implement and actively pursue more stringent methods for the proper usage of this limited resource [2]. In addition, it is essential to establish a procedure aimed at reducing the wastage of blood in order to save energy and preserve valuable human and financial resources in developing nations. The overutilization and unsuitable use of blood products place a strain on transfusion services. By establishing effective collaboration between doctors and blood bank

personnel, the amount of blood wasted due to expiration may be significantly reduced [3]. The wastage of all blood components, including red blood cells (RBCs), platelets (PLT), and plasma, is a significant concern for hospitals worldwide. Waste permeates the whole healthcare system, extending beyond only blood products [4]. Research on systemic waste has investigated the significance of workflows in the healthcare setting and has concentrated on reducing operational sources of waste while dispensing various drugs. Several of these studies found that implementing very simple measures led to significant decreases in waste. The College of American Pathologists (CAP) suggests closely monitoring the disposal of unused blood that has not yet expired, since it not only results in financial loss for the healthcare system [5], but also



indicates a lack of control and potential danger to the patient within the care setting [6]. The excessive and incorrect use of blood products imposes a strain on transfusion services. By establishing effective collaboration between doctors and blood bank personnel, the amount of blood wasted due to expiration may be significantly reduced. The preparation of components is suboptimal in resource-constrained settings in impoverished nations. This further underscores the need of using existing facilities and labor effectively, while also minimizing waste [7]. Blood and its components are essential assets for any healthcare establishment. Managing the growing need for blood and blood products, as well as minimizing waste, is a worldwide concern [8]. Requesting whole blood or red cell concentrate without a valid reason might result in the needless usage of resources, such as reagents, and the wasting of time that could be better used for essential requests. These demands also impose a financial burden on patients, since collecting blood before surgery may lead to increased material and human resource requirements at medical facilities, resulting in higher medical costs [9].

Various metrics may be used to assess the efficient utilization of blood and blood components. The crossmatch to transfusion (C/T) ratio, first suggested by Boral Henry in 1975, has gained widespread recognition as a reliable indicator [10]. Optimally, the C/T ratio should be 1.0, however, research has shown that a ratio of 2.5 or below signifies efficient use of blood [11]. The likelihood of transfusion for a certain therapy is denoted as a percentage (T%). In 1980, Mead *et al.* first proposed the concept of transfusion probability [12]. The transfusion index (TI) is a measure of the average number of units of blood used per patient. It provides an indication of how well the number of unit's crossmatched matches the actual number utilized. Values greater than 0.5 suggest a proficient use of blood [13].

The objective of the research was to ascertain the frequency and causes of blood and blood components being discarded in the blood bank of a tertiary care hospital.

Materials and Methods

This research was a retrospective analysis of wasted blood and blood components data over a period of three years.

Results

The research included the disposal of whole blood, red cells, platelets, fresh frozen plasma (FFP), and cryoprecipitate units. The reasons for rejecting blood products included expiration, positive serology, contamination of platelets with red blood cells (RBCs), leakage, clotting, and the presence of lipemic appearances in fresh frozen plasma (FFP). Blood donors complete registration forms that include crucial information, including personal data, demographic information, employment, and medical history. Subsequently, the donors undergo a thorough evaluation based on established criteria and are ultimately assessed by medical professionals. Only those who meet the physical requirements outlined in the blood donor selection criteria and pass a medical examination are permitted to give blood.

Blood was obtained and its components were separated in accordance with the regulations outlined in the Drugs and Cosmetics Act of 1940 and its accompanying Rules of 1945. We used citrate phosphate dextrose (CPD) as an anticoagulant and saline adenine glucose and mannitol as a preservative for red blood cells (RBCs). The components were isolated using the platelet-rich plasma technique. The assessment of the quality of whole blood and its components was conducted in accordance with the regulations outlined in the Drugs and Cosmetics Act of 1940 and its accompanying Rules of 1945. The blood bank adhered to the discard policy outlined in the standard operating procedures established by the NACO standards. Discard rate [14] = $\frac{\text{Number of blood and blood components units wasted}}{\text{total number of blood or components stored}} \times 100$.

Blood Components Procedure

The collected blood units are divided into components using various centrifugation techniques. Red blood cells (RBCs) may be preserved for a period of 42 days, platelets can be stored for 5 days, and fresh frozen plasma (FFP) can be maintained for up to 1 year. The discarding record contains comprehensive information on all units that have been discarded for different reasons. This includes details such as the donor number, cause for discard, blood group, manner of discard, and the total number of units discarded at the end of the year. Collected data were analyzed using Microsoft Excel.

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Table 1: Blood donors’ sex and type

Type of donors	Male	Female	Total donors
Voluntary	3960	40	4000
Replacement	985	15	1000
Total	4945	55	5000

A grand total of 5000 units of blood were collected. Out of the whole group of donors, 4945 were men and 55 were females. 4000 contributions were made

voluntarily, whereas 1000 donations were made as replacements.

Table 2: Blood components collected and discarded

Blood components	Number of components collected	Number of units discarded	Discard rate (%) among total components
Whole blood	25	2	0.008
Packed cells	6305	215	1.27
Platelet concentrate	5675	2660	15.3
FFP	5345	324	1.8
Cryoprecipitates	275	0	0
Total	17625	3201	18.37

During the research period, 17625 blood components were derived from 5000 whole blood

donors. A total of 3201 components were eliminated.

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Table 3: Blood component discarded reasons

Blood components	Total discarded	Expiry	TTI positivity	Red cells contamination	Damage	Turbidity	Green plasma
Whole blood	2	2	0	0	0	0	0
Red cells concentrate	215	139	75	0	1	0	0
Platelet concentrate	2660	2553	72	35	0	0	0
FFP	324	0	77	0	160	85	2
Total	3201	2694	224	35	161	85	2

Out of all the components that were thrown away, platelet concentrates (PCs) accounted for 83.24% of the total. Among these, 95.39% were discarded because they had expired, 1.3% were eliminated owing to contamination with packed red cells, and 2.7% were discarded because they tested positive for certain antibodies.

DISCUSSION

The most often collected components in our blood bank are packed red cell concentrates, followed by fresh frozen plasma (FFP), platelets, cryoprecipitate, and whole blood. The collection of whole blood was the least common among all blood components. This is likely due to the fact that whole blood is not often supplied to patients until they have lost at least 75% of their blood volume. The percentage of discarding blood components in central India was 14.6%, which was 5% lower than our research [6].The wastage

level in eleven European nations was found to vary from 0.2% to 7.7%, with an average of 4.5% (Veiholaet al., 2006) [14].

The discard rate for packed red cell concentrate in the current investigation was 3.5%, with 430 out of 12,210 units being discarded. This corresponds to research conducted by Arora et al.[15], which reported a prevalence rate of 3.5%, and another study by Thakare et al., which reported a prevalence rate of 3.58% [16].Morish et al. [17] at 2.3%, Suresh et al.[18] at 3.3%, and Sharma et al. at 3.2% [2].The primary cause for the disposal of red cell concentrate was expiration, accounting for 56.84% (245/431), followed by the presence of transfusion transmitted infections (TTIs), which accounted for 34.80% (150/431). One cause for expiration was the practice of collecting entire blood to produce random donor platelets. In our research, the rate of



discarding fresh frozen plasma (FFP) was 6.06% (648 out of 10,690), which is lower than the rates reported by Bobde et al.[19] (7.6%) and Sharma et al. (6.2%)[2]. Like Kanani [20], the primary cause for the disposal of FFP was leakage, accounting for 48% (322/669) of cases. This was followed by TTI positive units at 27% (183/609), lipemic samples at 24% (159/609), and green plasma at 1% (5/609). Leakage of FFP may be reduced by using properly sized freezers and storing FFP units in protective containers made of cardboard or polystyrene. These containers help limit the danger of product breaking during storage, handling, and transportation. Surplus fresh frozen plasma (FFP) may be administered to the process of fractionation, which will subsequently reduce the pace at which FFP becomes expired. To reduce the occurrence of lipemic discards, it is important to ask donors about the time that has passed between their donation and their last meal. The survey found that the platelet concentrate (PC) was the component most often discarded. The PC discard rate was 46.89% (5323/11,350), which above the discard rates reported by Bobde et al.[19] (26.2%), Kanani[20] (28.39%), and Sharma et al.[2] (43.6%), but was lower than the discard rate reported by Ghaflez et al.[21] (58.1%). The study done by Kumar et al.[22] found that platelets were the most often discarded components, with expiration being the most prevalent cause. Platelet additive solutions, specialized storage bags, and cryopreservation procedures may effectively reduce the expiration of platelet concentrates. Continuous training and monitoring on component separation, as well as the use of automated cell separators, may effectively prevent contamination of red cells. Platelets contaminated with red blood cells may be transfused to persons of the same blood type within 24 hours after being separated. Van Dijk et al.[24] developed a model aimed at minimizing PLT waste, specifically targeting the issue of PLT units with short expiration dates. Their model successfully reduced loss from 15%-20% to less than 0.1%. In the current research, the rate of discarding whole blood was 6% (3/50), which exceeded the rates reported by Suresh et al.[18] (5.7%), Bobde et al.[19] (6.63%), and Sharma et al.[2] (4.46%). All three units were thrown since they had expired. The primary cause for discarding 84.16% (5390/6404) of the units in our analysis was their expiration or obsolete status. This finding is consistent with the research conducted by Jariwala et al.[25] and Kurup et al. [26] (87.7%-96.6%), who similarly identified outdated materials as the primary reason for discarding.

CONCLUSION

eISSN1303-5150

Given that blood is an invaluable and crucial resource, it is imperative to ensure its optimal use and strive for zero waste. The primary reasons for discarding blood and blood components are non-utilization owing to expiration, seropositivity for transfusion-transmitted infections (TTIs), and other factors such as leakage and hemolysis. It is strongly advised to provide training for clinicians on the proper use of blood and blood components. Effective record-keeping, meticulous donor selection and adherence to deferral requirements are essential for optimizing the usage of blood bags.

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