

Analysis of Discard Rates of Blood and Blood Components as A Quality Indicator to Improve the Blood Transfusion Services of a Tertiary Care Hospital in South India

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Abstract

Objective: Blood is recognized as a precious resource gifted by the blood donors to patients in need. This study was taken to understand the reasons for discard of donated blood units.

Methodology: The discard rate of blood and blood components was quantified as wastage as percentage of issue (WAPI) using last five years records. This was a retrospective study done using the past five years (2015-2019) records available with the Transfusion Medicine department of Sree Chitra Tirunal Institute for Medical Sciences and Technology.

Results: Our overall wastage as percent of issue (WAPI) over the last five years was 6.14%. WAPI for Packed red cells, Fresh frozen plasma and platelets was 4.23%, 3.56%, and 16.6% respectively.

Conclusions. Even though wastage rates were comparable with published literature from other parts of the country, this study helped identify areas of intervention to further minimise the wastage.

Keywords: Blood component, blood transfusion service, discard rate, fresh frozen plasma, quality indicator.

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Introduction

Blood is a precious resource gifted by donors for the patients. World Health Organisation (WHO) has included blood in its list of essential medicines¹ to highlight the life-saving role of blood. The demand for blood is still very high and the supply is below the demand levels.

According to the latest annual report published by the Ministry of Health and Family Welfare, India, the annual requirement for blood in India is estimated at 13 million units based on the WHO norm of 1% of the population, and our collection was 12.5 million units.² Therefore, each unit of blood should be optimally and judiciously utilized.

The AABB defines quality indicators as the specific performance measurements designed to

monitor one or more processes during a defined time and are useful for evaluating service demands, production, adequacy of personnel, inventory control, and process stability of the blood transfusion services (BTS).³ One such quality indicator for assessing the performance of BTS is the discard rate of blood and blood components.

The discard rate of blood and blood components is quantified as wastage as percentage of issue (WAPI). In an ideal situation, the discarding and wastage of precious donated blood and blood components should never occur. The discard rates of blood and blood components reflect upon the overall planning and technical efficiency of the department and its coordination with other clinical departments utilizing the transfusion services.

By analyzing the data and the reason for the discards, the blood transfusion service can develop plans to improve performance through education and training of staff and introduce new measures in order to minimize the number of discarded blood units to the minimum possible. The study was undertaken with the

Authorship Contribution: ^{1,2}Conceived and planned the idea of the study, final approval of the version to be published, ³Collecting the data, drafting the work or revising it critically for important intellectual content

Funding Source: none

Received: July 27, 2021

Conflict of Interest: none

Accepted: Jan 10, 2022

following objectives. 1) Analyse the discard rates of blood and blood components in our BTS, 2). Analyze the various reasons for discard of blood and blood components & Suggest steps to minimize the number of discarded blood units and improve the overall efficiency of BTS.

Methodology

This was a retrospective study done using the past five years' (2015-2019) records available with the Transfusion Medicine department of Sree Chitra Tirunal Institute for Medical Sciences and Technology. Institutional ethics committee clearance was obtained prior to the start of the study (SCT/IEC/1640/Dec-2020).

Statistical Analyses: Data relating to the collection and usage of blood and its components from Jan 2015 to Dec 2019, were obtained from the records of the Transfusion Medicine department. The reasons for the discard of units during this period was tabulated and analysis done. The analysis of the reasons for discard of blood units were broadly classified into donation, processing, storage, and post issue related, to determine the type of intervention required to minimize the wastage. Table I lists the reasons for discard under each category.

Table I: Categorization of reasons for discard of blood units

Donation related	Processing related	Storage related	Post issue
Under/Overcollection	Bag broken/leaking during centrifugation	Bag broken during storage/thawing	Unused after issue
Confidential unit exclusion (cue)	Cell contamination	Storage temperature not appropriate	Bag leak
Lipemia	Low volume	Expiry of shelf life	Precipitates
Antibody positive	Hemolysis during leucofiltration	Hemolysis	Cold chain not maintained
Presence of clot	Absent swirling		
TTI reactive status			

Data were used to calculate:

1) Wastage rate = Number of blood and blood components discarded/ Total number of blood and blood components issued x100

2) Percentage wastage for each reason = Number of units discarded for each reason/ Total of number units discarded for all reasons

Results

The total number of blood units collected in the five years 2015-19 together was 36,280. Of these, 304 units were discarded as whole blood. The commonest reason for discard as whole blood was insufficient volume collection (87.82%) either due to poor venous access (43.2%) or due to development of vasovagal reactions during collection (56.8%). Thirteen units (4%) were discarded due to broken/leaking bag during the processing. Eight units (2%) were discarded as confidential unit exclusion.

About 0.83% of the units had to be discarded as whole blood due to low volume collection either due to poor venous access or development of vasovagal reactions during donation. Cumulative WAPI for five years was 6.14%, which is lower than other published studies from different parts of India (Table II)

A total of 78,302 blood components were issued for transfusion during the five years, which included 48.12% packed red cells (PRC), 38.5% Plasma (including FFP and cryoprecipitate) and 13.38% platelets. 4318 units (5.51% of total issue) were discarded, of which 36.51% were PRC, 23.45% were plasma and 40.04% were platelets. Analysis of the trends in total number of blood units collected, components prepared, components issued and discarded during the preceding five years shows an

Table II: Comparison of present wastage data of blood units with published literature.

	PRC (%)	Plasma (%)	Platelets (%)	Overall discard (%)
M Morish et al ⁴ (Malaysia, 2012)	4.1%	4.5%	6%	2.3%
H J Shahshahani et al ⁵ (Iran, 2017)	2.9%	2.3%	10.5%	2.1%
Sadia Sultan et al ⁶ (Pakistan 2021)	0.7%	0.009%	4.5%	10.9%
Ryan A. Collins et al ⁷ (2015, US)	0.56%	2.81%	1.40%	1.59%
Kurup R et al ⁸ (2016, Guyana)	Not available	Not available	Not available	25.4%
S A Kafi-Abad et al ⁹ (2019, Iran)	5.7 ± 0.7%	1.4 ± 0.4%	3.2 ± 0.5%	3.4%
Kaur et al ¹⁰ (2015, North India)	6.86	7.96	56.31	10.29
Simon et al ¹¹ (2020, South India)	3.5	5.5	52%	19.3%
Kanani et al ¹² (2017, West India)	2.26	5.36	28.39	6.95
Suresh et al ¹³ (2015, South India)	3.8	5.5	16.6	7
Kumari et al ¹⁴ (2019, East India)	21.4	11.7	66.4	22.8
Present study (2021, South India)	4.23	3.56	16.6	6.14

increase in the number of blood unit prepared and issued in 2018, as compared to preceding and succeeding years, even though collection showed only a modest increase (Figure 1). This was due to increased production and utilisation of platelets. The discard rate has remained steady in the past five years.

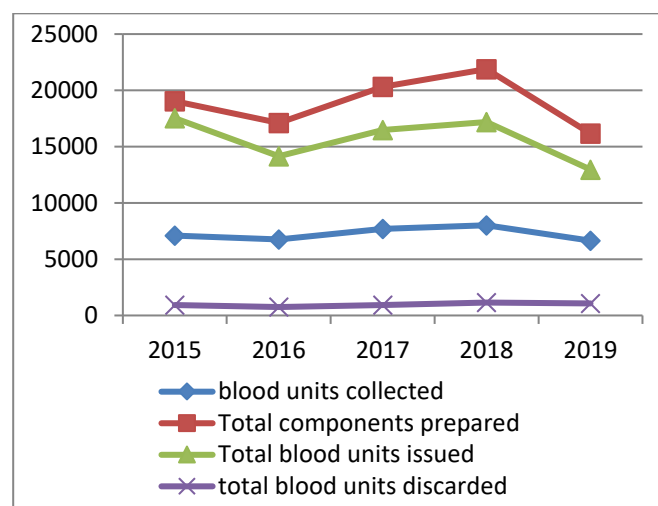


Figure 1. Trends in collection, preparation, issue and discard of blood components.

Yearly wastage as percentage of issue (WAPI) for all blood components together was 5.32, 5.30, 5.55, 6.67 and 8.22% respectively during the five years from 2015-19 and five years cumulative WAPI was 6.14%. Cumulative WAPI for packed red cells, fresh frozen plasma, and platelets was 4.23%, 3.56%, and 16.6% respectively. Figure 2 illustrates the trend of WAPI for the different blood components during the five years.

The reasons for blood unit discard were broadly categorised based on reasons listed out in table 1. Storage related (Expiry of shelf life of units) was the commonest cause of discard for PRC and platelets followed by a donation related (reactive status on transfusion transmitted infection (TTI) testing). For

plasma components, discard was most commonly due to donation related, followed by storage related (Figure 3).

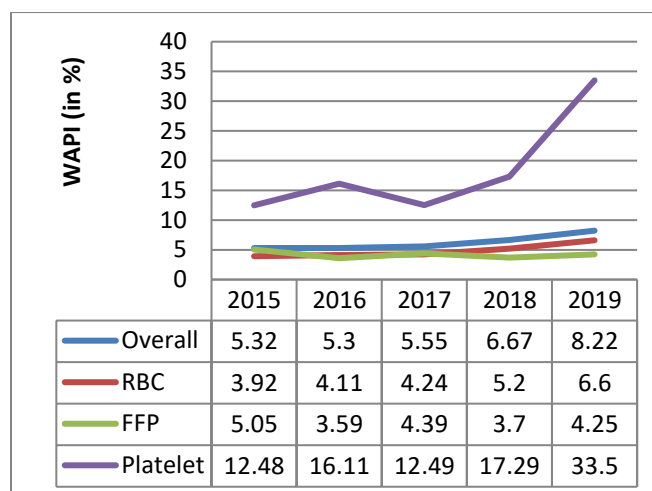


Figure 2. Trends in the WAPI rates between 2015-19

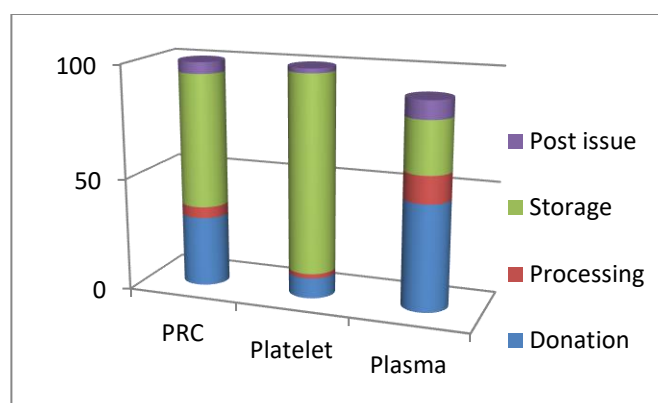


Figure 3: Analysis of discard causes category wise

About 53% of PRC was discarded due to expiry of shelf life, and 32% due to reactive status on TTI testing. The rates were 85% and 9% for platelets. For plasma components, 42% discard was due to reactive status on TTI testing, followed by bag breakage in 19%. (Figure 4)

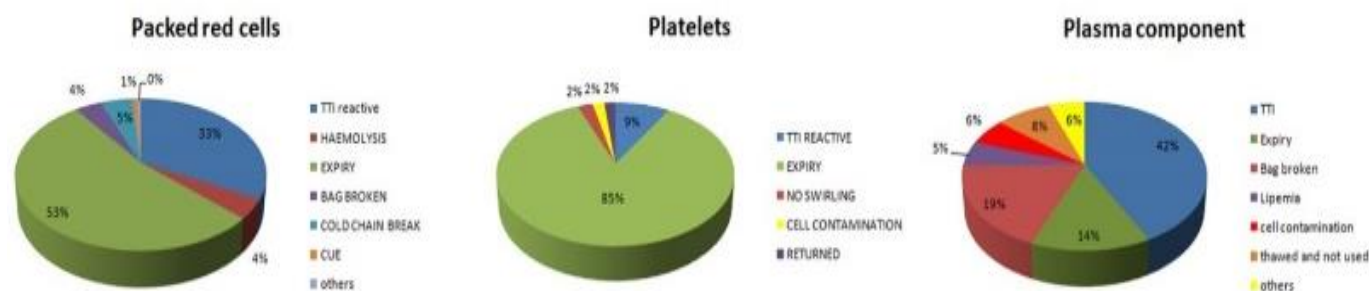


Figure 4: Reasons for discard of Blood components

Discussion

Hematopoietic stem cell transplantation (HSCT) is an Platelets were among the majority of all discarded blood components. This is similar to all other published studies except one study from north India, where the majority of donated units were discarded as whole blood (Table III). Analyzing the reasons for discard, expiry of shelf life (particularly platelets) was the commonest cause; this is due to the fact that most of our blood requests are for PRC for intra-operative use. Platelets use is restricted to cases of massive transfusion and emergency surgeries, where the patient is on dual anti-platelets. Hence, we need to keep a reserve of platelets available for such unexpected needs, which gets discarded if not used within the short shelf life. Plasma is used mainly in cases of therapeutic plasma exchange and massive transfusions.

Of the discarded blood components, 50.88% was due to expiry of shelf life, and 22.51% were due to TTI reactive status. 53% of the PRC was discarded due to shelf life expiration, and 32% due to reactive status on TTI testing. For platelets, 85% was due to expiry and 9% was due to TTI reactive status. For plasma components 42% discard was due to reactive status on TTI testing, followed by bag breakage in 19%.

During these five years, various steps were taken to minimize the wastage rates. We switched to 100% voluntary blood donation to increase blood safety and discard due to TTI reactivity.¹⁵ PRC with additive solution was introduced to increase the shelf life. Excess plasma components were given for fractionation. Studies were initiated to understand the frequency and aetiology of

massive transfusions to better prepare the inventory. Emphasis on implementing massive transfusion protocols with optimum use of platelets and plasma components was highlighted in the meetings of hospital transfusion committee.¹⁶

Conclusion

Donors, staff at blood centre, and end users of blood units are equal stakeholders to ensure an efficient blood transfusion service. Blood is a valuable resource, and wastage of blood units has a negative impact on BTS. This study helped in identifying more areas for intervention to further reduce the discard rates.

1) Donation related – timing between last food intake and donation to minimise discard due to lipemia, ensuring good venous access before venepuncture to minimize low volume collection

2) Processing related- Identify the cause for hemolysis in each PRC units (like temperature dysregulation, leucofiltration, high haematocrit etc.), training and supervision in proper loading of blood bags in centrifuge cups to prevent dent marks

3) Storage related -Networking with other neighbouring blood banks to supply the near expiry blood components to minimize discard due to expiry of shelf life, strictly following first in first out policy in case of massive transfusions, use of individual stands to store FFP to prevent sticking and bag breakage, regular checking of thermographs and temperature alarms in all blood storage equipment

4) Post issue – sensitize the clinical staff regarding rational blood use, ordering according to existing

Table III: Comparison of discard rate and reasons for discard of blood units from published literature

	Total discard	Cause -1	Cause-2	Cause-3	Most discarded
M Morish et al ⁴ . (Malaysia, 2012)	2.3%	Red cell contamination	leakage	lipemia	Platelets
H J Shahshahani et al ⁵ (Iran, 2017)	2.1%	Expiry	Processing related	Storage related	Platelets
Sadia Sultan et al ⁶ (Pakistan 2021)	10.3%	TTI reactive	expiry	Red cell contamination	Platelets
Ryan A. Collins et al ⁷ (2015, US)	1.59%	Expiry	Storage related	Returned >30 min	Platelets
Kurup R et al ⁸ (2016, Guyana)	25.4%	Expiry	Broken seal	Broken cold chain	Platelets
S A Kafi-Abad et al ⁹ (2019, Iran)	3.4%	Expiry	Reserved/returned units	Bag breakage	Red blood cells
Kaur et al ¹⁰ (2015,North India)	5.8%	Expiry	TTI reactive	Bag breakage	Whole blood
Simon et al ¹¹ (2020,South India)	19.3%	Expiry	TTI reactive	Bag breakage	Platelet
Kanani et al ¹² (2017,West India)	6.95%	Expiry	Low Volume	Bag breakage	Platelet
Suresh et al ¹³ (2015,South India)	7%	TTI reactive	Low volume	Quality control	Platelet
Kumari et al ¹⁴ (2019, East India)	22.8%	Expiry	TTI reactive	Bag breakage	Platelets
Present Study(2021,South India)	6.14%	Expiry	TTI reactive	Bag breakage	Platelet

maximum surgical blood order schedule, over the group compatible platelet use, maintenance of cold chain after issue, prompt return of unused units, transfusion audits to ensure good transfusion practices.

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