

Original Research Article

Determination of rate and analysis of reasons for discarding blood and blood components in a blood bank of tertiary care hospital: a retrospective study

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ABSTRACT

Background: The transfusion of blood and blood components has become an integral part of patient management in modern medicine. There are no substitutes for human blood. Thus, proper utilization of blood is necessary with minimal wasting.

Methods: A total of 15,333 donors donated blood during the study period of 3 years in blood bank of a tertiary care hospital, south Maharashtra from 1 st of January, 2013 to 31 st December 2015, which were screened.

Results: Of the total 3355 whole blood collection, 615 blood bags were discarded. Out of these 615 bags 544 (88.45%) were discarded because of date expired, 41(6.66%) blood bags were discarded due to seropositivity for TTI and 22 (3.5%) blood bags were due under collection and leakage and other reasons contributed for 1.3%. A total of 4026 blood components were discarded against 29,715 blood components prepared during the study period. Among blood components discarded, most common units were platelets. The most common cause of discarding the blood components was expiry of date due to non-utilization were 3475 (86.31%).

Conclusions: Properly implemented blood transfusion policies, training of staff as well as implementation of automation will also help to improve process and output of BTS. This would reduce the discarding of blood components and wastage due to non-conformance. These discarded bags, because they are unutilized are both financially as well as socially harmful to the blood bank.

Keywords: Date expired, Discard blood, Non-utilization, Seropositive, Under-collection

INTRODUCTION

Blood Transfusion Services (BTS) plays an important role and is responsible for ensuring sufficiency, quality, and safety of the blood supply. A well-organized and efficient BTS would contribute toward better patients care and contribute toward the development of healthcare in the country. Today, many modern surgical procedures could not be carried out without the use of blood and there are no substitutes for human blood.^{1,2} It has been estimated that one-third of all patients admitted to

intensive care units in the developed world receive a blood transfusion.³ So each unit of blood is precious and utilized judiciously with minimal wasting. To overcome the lack of blood supply, the performance of BTS can be increased either by increasing the level of resources used in the collection and production of blood components or by utilizing existing resources more efficiently.⁴ The BTS can reach the highest levels of efficiency in terms of quantity and quality of blood and blood components through the implementation of a quality management system in all phases of the collection, processing, and

storage of the blood. A functioning quality system would ensure all processes and procedures would adhere to quality standards and this would improve the quality and safety of blood components as well as to reduce the amount of blood discarded to a level that is more acceptable to the set standards.

By analyzing the data and the reason for the discards, the blood transfusion services can develop plans to improve performance through education and training of staff and introducing new measures in order to minimize the number of discarded blood to a reasonable rate.⁵ The aim of this study was by analyzing the data and the reason for the discards, the BTS can develop plans to improve performance through education and training of staff and introducing new measures in order to minimize the number of discarded blood to a reasonable rate.

METHODS

Study design

Retrospective study carried out in the blood bank of a tertiary care hospital involving the analyses of discarded blood and blood components data over a period from 1st of January, 2013 to 31st December 2015.

Inclusion criteria

Blood donors, fulfilling World Health Organization criteria for donor selection, were included in this study after medical history, brief clinical examination by the medical officer. The donors were either voluntary or replacement.

Data collection

Information was retrieved from the Blood Bank registers. These included the daily amount of blood collection, no. of each blood components prepared, the number of units of various components discarded and reason for the discard. A total of 3355 units of whole blood and 11978 units were collected for blood components preparation. A total of 29,715 units of components were prepared during the year of 2013 to 2015.

Data analysis

Blood bags included during this period, were screened for transfusion transmissible infections (TTIs). The blood bags, which were seroreactive (seropositive) were discarded. The blood bags, which were expired because of non-utilization, were discarded. Less amount of blood collected from the donors because of any reasons, including donor's reactions was discarded.

Blood bags leakage during centrifugation and showing any changes of either hemolysis or turbidity were also discarded. Blood and blood components are wasted as a result of inappropriate blood collection and components processing as they do not meet the specification that has been specified and defined. These non-conformant products are not issued out to hospitals or patient as they may be ineffective or unstable or show signs of abnormal physical appearance such as underweight, overweight, plasma and platelets with RBCs contamination, hemolysis, leakage, clotted, lipemia, greenish, icterus prior to its expiration date.⁶

Statistical analysis

The collected data were analyzed using descriptive statistical methods and by SPSS version 12.0.

RESULTS

Among total donors in the blood bank, 15089 (98.4%) were male and 248 (1.6%) were female. Out of total 15,337 blood bags which were collected from donors during the study period, 615(4.00%) of whole blood bags were discarded.

Table 1: Source of blood bags as per the sex of donors.

| Year | Male | Female | Total |
|------|-------|--------|-------|
| 2013 | 4361 | 81 | 4442 |
| 2014 | 5621 | 95 | 5716 |
| 2015 | 5107 | 72 | 5179 |
| | 15089 | 248 | 15337 |

Table 2: Analysis of discarded whole blood units.

| Year | Seropositive | Date Expired | leakage | Under collection | Others | Total Discard |
|-------|--------------|--------------|---------|------------------|--------|---------------|
| 2013 | 31 | 285 | 1 | 12 | 4 | 421 |
| 2014 | 10 | 252 | 1 | 8 | 0 | 271 |
| 2015 | 0 | 7 | 2 | 2 | 0 | 11 |
| Total | 41 | 544 | 4 | 22 | 4 | 615 |

Out of these 615 units, 544(88.45%) were discarded because of expiry of date due to non-utilization followed

by seropositive for transfusion transmitted diseases, constituted 6.66% as shown in Table 2. Amongst whole

blood bags discarded, expiry of date due to non-utilization (88.45%) were the most common cause followed by seropositivity for TTIs (6.66%), under collection (3.57%), leakage (0.6%) and others causes as shown in Table 2. Other causes include yellowish discoloration of plasma, signs of hemolysis noted in blood bags, issued blood bags to the patients but not used.

A total of 4026(13.54%) blood components were discarded against 29,715 blood components prepared during the study period. The most common blood components were discarded were platelets (47.73%) followed by Packed red cells (8.23%), as mentioned in Table 3. This rate of discard is derived when the number of packed RBCs, platelets, FFP, or cryoprecipitate discarded is divided by the number of whole blood, RBCs, platelets, FFP, or cryoprecipitate prepared, respectively multiplied by 100.⁷ Rates of discarded blood Overall rate of discarded blood and blood components in Krishna hospital blood bank was 14.0% (4645 of 33070). The rate of discard for platelet concentrate was the highest at 8.5% (2810). The rates of discard for whole blood were 1.6% (615) respectively. The rate of discards for packed red cells was 2.9% (981). The lowest rate of discard was for fresh frozen plasma at 1.0% (335) as shown in Table 3. A total of 4026 blood components were discarded in which the most common cause was

expiry of blood components, constituted 96.66% followed by seropositive for transfusion transmitted diseases, constituted 9.0%, due to leakage 2.3% and under-collection 1.5% as shown in Table 4 summarizes the reasons for discard of blood and blood components.

Table 3: Analysis of discarded units of blood components against total prepared components.

| Type of component | Total no. of comp. discarded | Total no. of comp. prepared | Rate of Discard(%) |
|----------------------|------------------------------|-----------------------------|--------------------|
| Packed red cells | 981 | 11914 | 8.23 |
| Platelet concentrate | 2810 | 5887 | 47.73 |
| Fresh frozen plasma | 235 | 11914 | 1.97 |
| Total | 4026 | 29715 | 13.54% |

The major cause of discard in Krishna hospital blood bank was expiry of date due to non-utilization for whole blood and for components constituted 12.1 %. Seropositive for transfusion transmitted diseases accounted for 1.2% of whole blood and components discard.

Table 4: Analysis of reasons for discarding of units of whole blood and blood components.

| Blood and Blood components | Reasons for discarding blood and blood components | | | | |
|----------------------------|---|---------|----------------------|------------------|--------|
| | Expired | leakage | Seropositive for TTI | Under collection | Others |
| Whole blood | 544 | 4 | 41 | 22 | 4 |
| Packed red cells | 736 | 7 | 146 | 61 | 31 |
| Platelet concentrate | 2739 | | 71 | 0 | 0 |
| Fresh frozen plasma | 0 | 89 | 146 | 0 | 0 |

This was followed by leakage of blood and components at 0.3% and under-collection 0.25%. The other reasons for discard of blood and components were 0.1%. These included underweight, greenish discoloration, overweight, clotted units, and icterus (Table 1).

DISCUSSION

A total of 33070 whole blood (3355) and blood components units (29715) were prepared during study period in K.H. Blood bank. Of these, 4641 (14 %) units were discarded. There were many reasons for the discard, i.e. expiry due to non-utilization, seropositivity to TTI s, leakage are the most common causes of blood and components. In a study done by Deb et al.⁸ it was observed that an average 292 (14.61%) bags from the total collection were discarded. Of the 292 units discarded, 242 (82.87%) units were due to non-

utilization. In the present study of the total units discarded, 4019(86.52%) units were due to non-utilization. The results of our study are comparable with Deb et al.⁸

Study done by Morish et al. in National blood center, Kuala Lumpur, a total of 390,634 whole blood and blood components units were prepared in 2007 in National Blood Center.⁵ Of these 8968 (2.3%) units were discarded, Platelet concentrate scored the highest at 6% when compared with the other blood components. A large-scale study conducted in 17 blood centers in 10 European countries from 2000 to 2002 reported that the mean platelet discard rates for the three years were between 6.7% and 25%. However, the annual mean discard rates from 2000 till 2004 remains at 13%. The discarded platelets included all the platelet units which were damaged during processing regardless of the

preparation method as well as those that expired.⁹ In our study Platelet concentrate scored the highest at 8.4 % when compared with the other blood components. Our study results are in correlation with the findings of study by Morish et al and study conducted in 17 blood centers in 10 European countries^{5,9}

In the same European centers, the mean for packed RBC discard rate was 4.5%, varying annually from 0.2% to 7.7%.⁷ In present study the discarded rates of packed RBCs were 3.0 %, which is comparable to European centers study results. The current study shows discarded rates of whole blood 1.8 % and Fresh frozen plasma was 0.7%. In study by Morish et al the discarded rates of whole blood and packed red blood cells (RBCs) were 3.7% and 0.6%, respectively.⁵ As compare to Morish et al discard rate for whole blood in our study is at lower side i.e. 1.8% and for packed red blood cells it is higher side i.e. 3.0%. In our study the seropositive for TTI was the second cause of discarded blood and its components, which represented 1.2% of discarded blood. In present study of the total 104 (0.3%) units discarded due to leakage, 89 (85.57%) of the fresh frozen plasma accounts for of discard were due to the leakage.

While in study by Morish et al recorded the leakage was the second cause of discarded blood units and its components, which represented 26% of discarded blood was due to the leakage.⁵

Mishandling of blood bags during collection, processing, and storage or manufacturing errors may be the major causes of defects and leakages of blood bags.¹⁰ The integrity of plastic bags is essential and precautions should be taken to prevent leakages.¹¹ The bag may be damaged during the centrifugation. This happens when the bag is forced to a sharp interior bottom/wall junction or corner, resulting in the bag material being stretched too far, causing a tear.¹² The defect and leakage at any part of the plastic blood bags can be detected by visual inspection during the processing, after pressure in a plasma extractor, before freezing, and after thawing.¹⁰ The FFP should be stored in cardboard or polystyrene protective containers that minimize the risk of breakage of brittle frozen product during storage, handling, and transportation.¹³ Another approach to decrease the leakage and contamination immediately before immersion of the frozen blood bags in the water bath is that the whole container should be placed in a sterile plastic bag.¹¹ In our study discard rate due to less volume collection was 0.25%. Low volume of collected blood may be due to several reasons including the discontinuation of donation because of donor's reactions and the blood flow from small vein during phlebotomy and the duration of the donation exceeds 15 minutes. Another reason may be due to the spring balance was not calibrated, thus was unable to measure accurately the volume of blood in the bag. Selecting a good donor, training and monitoring the staffs will help to reduce cases of the underweight blood units.

CONCLUSION

Discarding of blood units was mostly because of expiry of date due to non-utilization and positivity for different transmissible diseases (TTIs). Among blood components discarded, most commonly units were platelets. The most common cause of discarding the blood components was expiry of date due to non-utilization and positivity for TTIs. Properly implementation of blood transfusion policies will also help in discarding less number of blood bags due to expiry. These discarded bags, because they are unutilized are both financially as well as socially harmful to the blood bank. Also properly conducted donor interview, notification of permanently deferred donors will help in discarding less number of bags from collected units.

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