

Saving Blood Bags

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ABSTRACT

Objective: To reduce the number of discarded red cell concentration units by 30% in the hospital blood bank.

Study Design: Cross-sectional study (Clinical Audit).

Place and Duration of Study: Najran Armed Forces Hospital, Kingdom of Saudi Arabia, from Jan 2019 to Jun 2020.

Methodology: Data on discarded blood units was collected from Jan to Jun 2019 and Jan to Jun 2020 through non-probability convenient sampling. All blood donations made during this period were included except therapeutic phlebotomy units. Changes in the blood bank process and procedures were made from Jul to Dec 2019. Discard of red cell concentrates from Jan to Jun 2019 and Jan to Jun 2020 was compared. Net Cost Savings were calculated using the Impact Analysis Calculator.

Results: The total number of discarded Red Cell Concentrates was 174 (41.1%) of the 423 donated units from Jan to Jun 2019. After making changes in inventory management and post-implementation these changes in the blood bank, 84(29.1%) of 288 RCC units were discarded from Jan to Jun 2020 (*p*-value of 0.02). The net cost savings was SAR 72750.

Conclusion: Interventions in blood bank inventory management can prevent the loss of life-saving blood products and result in cost and resource savings.

Keywords: Cost savings, Discard, Red cell concentrates.

How to Cite This Article: Afridi NK, Zubair M, Rauf S, Awaji TH. Saving Blood Bags. Pak Armed Forces Med J 2024; 74(2): 331-334. DOI: <https://doi.org/10.51253/pafmj.v74i2.6459>

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INTRODUCTION

Blood wastage in blood banks is a worldwide problem. When a Red cell Concentrate (RCC) unit is discarded, it wastes the blood bank's costs and resources. The waste of reagents, equipment, electricity, and workforce has huge financial implications.¹ A major study focusing on reducing blood wastage by Heitmiller *et al.* demonstrated that the wastage of RCC units could be reduced by more than 60% over four years, resulting in savings of more than \$800,000.¹

In 2013, the World Health Organization (WHO) released a report on discarding blood units, including data collected from 150 countries. This report revealed the percentage of different causes of discard of blood units such as expiration of blood units (33%), Transfusion Transmitted Infections (TTIs) (32%), incomplete collection (17%), processing problems (13%), storage problems (5%) and transportation problems (0.4%).² The rate of discarded blood components or “wastage rate” is one of the ten quality indicators recommended by the National Accreditation Board for Hospitals and Healthcare Providers (NABH) in India.³

A study done in a tertiary care centre in Pakistan

showed that at least 38.9% of units were wasted.⁴ The blood bank in Najran Armed Forces Hospital used to discard more than 40% of RCC units in 2018-19. The different reasons for discard were identified as staff education in the donation area, issues in the implementation of hospital transfusion policies, incomplete collection, Quality Check issues, inventory management problems, breakage of filter/leaking of a blood bag, failure to transfer the near expiry/surplus units to other institutions requiring the units and expiration of RCC units. Therefore, this audit was performed to make necessary changes in the processes involved, from the donation of units to the end of the transfusion process, to minimise the discard rate.

METHODOLOGY

The cross-sectional study was conducted at Najran Armed Forces Hospital, Kingdom of Saudi Arabia, from January 2019 to June 2020 after Institutional Ethical Review Board (IERB) permission.

Inclusion Criteria: Healthy donors meeting the WHO criteria for blood donation were included. RCC units prepared from donations made from January to June 2019 and January to June 2020 in the Hospital blood bank were included.

Exclusion Criteria: Therapeutic phlebotomy units were excluded.

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Received: 16 Mar 2021, revision received: 22 Mar 2023; accepted: 24 Mar 2023

The donors were enrolled using a proforma, donor consent and donor history questionnaire using a non-probability convenient sampling technique. The collected blood was screened for infectious diseases, cross-matched, and stored until issuance. The dispatched blood bags were tracked inwards to determine whether they were transfused. The number of discarded RCC units due to expiration, TTIs, incomplete collection, filter/bag leakage, lipemia, and quality control issues was noted from January to June 2019. Strategies to reduce the discard rate were adopted and implemented from July to December 2019 in the blood banks, as shown in Table-I.

Table-I: Strategies to Reduce the Discard Rate

Observations	Recommendations	Time Frame
Expired units due to more donation than consumption	To stop receiving blood group which is in surplus To transfer the near expiry blood units to other facilities requiring the units	22.10.2019
Failure to transfer near expiry units to other hospital/settings		
Leakage due to filter breakage:	Using bags with filtration prior to centrifugation	30.12.2020
High Cross-matching transfusion ratio	Implement Minimum Surgical Blood Ordering Schedule (MSBOS) in the hospital	30.12.2019
Changes in maintenance of stock inventory	To check the near expiry blood units within 15 days instead of 5 days	

Maintenance of stock inventory was changed by checking the near-expiry blood units within 15 days (instead of 5 days done previously). Therefore, the Blood Bank daily inventory showed units expiring within 15 days. This gave ample time to transfer excess units to other hospital facilities in Najran, such as the Central Blood Bank, Maternity and Child Hospital, King Khalid Hospital, and Najran General Hospital. Donations were not taken from donors when sufficient quantities of RCC units were available in inventory. Blood Bank started using Blood bags, which allow filtration to be performed before centrifugation to reduce filter breakage during the centrifugation process. The high cross-matching transfusion ratio was reduced to less than 2:1 by implementing the hospital's minimum surgical blood ordering schedule (MSBOS) and changing transfusion policy guidelines. Through continuous education, staff involved in the donation

process and procedures were made aware of the donation process.

After implementing the strategies mentioned above, the data collected from January to June 2020 was analysed and compared with the data from January to June 2019. The cost per bag was estimated using an average of 750 Saudi Arab Riyal (SAR) per bag (a value of 750 SAR was estimated from studies done in the KSA region, which included the cost of a blood bag, blood grouping, antibody screening, cross-match testing, QC of a blood bag, serology, virology and Nucleic Acid Tests for screening of TTIs). Impact analysis was done using the Impact Analysis Calculator to calculate the cost savings in SAR.

Statistical Package for Social Sciences (SPSS) version 25.0 was used for the data analysis. Qualitative variables were expressed as frequency and percentages. Chi-square test was applied to explore the inferential statistics. The *p*-value of ≤ 0.05 was considered statistically significant.

RESULTS

The total number of donated units in the blood bank from January to June 2019 and January to June 2020 was 423 and 288 units, respectively, as shown in Table-II. The comparison of six monthly data sets (Jan 2019 to Jun 2020) of total donations, discarded RCC units, and expired RCC units is shown in Figure-1.

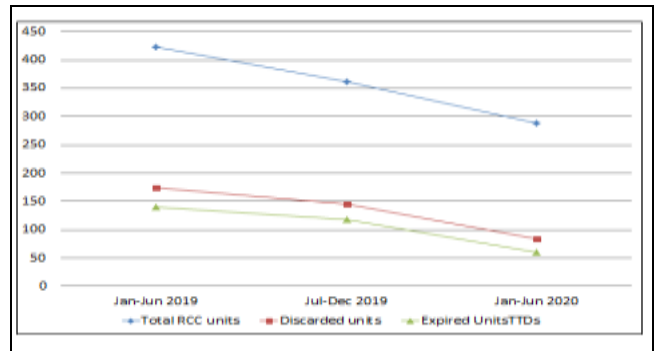


Figure-1: Comparison of Six Monthly Data of Total Donations, Discarded RCC Units and Expired RCC units

The percentage of RCC units discarded in January to June 2019 was 41.1% (174 units), while in January to June 2020, it was 29.1% (84 units). Expiration of RCC units was the major cause of the discarding of units, comprising 80.4% (140 units) of total discarded units (174 units) in January to June 2019. The breakdown in terms of numbers and percentages of discarded units, expired units, discarded due to Transfusion Trans-mitted Infections

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(TTIs), filter breakage/bag leakage, and other causes (short units, lipemic) is shown in Table-II.

outside positive TTI markers ideally should never occur. About 1% of the discard of blood units has been

Table-II: Comparison of Total Donations and Discarded Blood Units (2019-2020)

Duration	Total donations	Expired units	Transfusion Transmitted Infections	Filter breakage/leakage	Others (short units, lipemic)	Discard Rate	p-value
2019 (Jan-Jun)	423	140(33.1%)	15(3.5 %)	9(2.1%)	10(2.3%)	41.1%(174)	
2019(Jul-Dec)	362	118(32.6%)	9(2.4%)	8(2.2%)	10(2.7%)	40.05%(145)	
2020(Jan-Jun)	288	61(21.1%)	8(2.7%)	5(1.7%)	10(3.4%)	29.1%(84)	0.02

Comparison of data of total donations and discarded blood units of 2019 (Jan-Jun) with 2020 (Jan-Jun) revealed a significant reduction in discarded blood units. These results were also statistically significant with *p*-value of 0.02.

One of the measurable factors was saving in the cost. Studies from KSA revealed that the average estimated cost of a blood bag was 750 SAR (including the serology, virology and NAT tests). Therefore, the cost calculated for the discarded blood units from January to June 2019 and July to December 2019 was 1,34,250 SAR and 1,08,750 SAR, respectively, as shown in Figure-2. The cost of discarded blood units for January to June 2020 was 61,500 SAR. The average cost difference between January to June 2019 and January to June 2020 was 72,750 SAR.

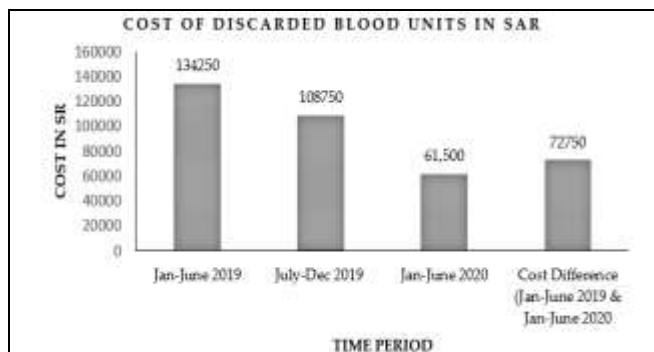


Figure-2: Cost of Discarded Blood Units in Saudi Arab Riyal (SAR)

DISCUSSION

Blood transfusion services (BTS) are integral to blood transfusion therapy and are responsible for ensuring adequate and safe blood supply.^{5,6} Wastage of blood products, especially Red cell concentrates, is a concern for any transfusion setup. World Health Organization (WHO) revealed in a report in 2013 that countries with upper middle income and high income discard blood products, ranging from 0.04-25.8% and 0.001-20.9%, respectively. Many reasons result in discarding RCC units, but discarding blood units

considered optimum in certain studies.⁷ International Society for Blood Transfusion revealed in a study on blood product wastage that the percentage of discard in low- and middle-income countries was <5-25%.⁸ In different studies, the main cause of discarding is TTIs. The studies of Anitha *et al.*, Suresh *et al.* and Thakare *et al.* revealed that the percentage of TTI-related discard was 63.6, 37.9 and 68.8 percent, respectively.⁹⁻¹¹ This may be due to the increased prevalence of Hepatitis B, C and HIV in these populations. The main reason for the wastage of RCC units in our study was the expiry of RCC units. This was similar to the study done by Jariwala *et al.* and Kurup *et al.* who also showed that the expiration of units was the most common cause of discarding.^{12,13} In other studies, the main reason for discard was the expiry of blood products (as was in our study), such as studies by Patil *et al.* (53.0%), Kumar *et al.* (57.8%) and Kanani *et al.* (43.4%).^{14,15} Studies by Kumari and Bobde *et al.* revealed low RCC discard rates compared to ours, which were at 10.20% and 2.0%, respectively.^{16,17}

Three important interventions were made in the inventory management of our blood bank, 1) Decreasing donations according to hospital requirements, 2) Management of stock inventory to know which units expire in the next 15 days, 3) Transfer of near-expiry units to hospitals requiring the units. These interventions played a major role in reducing wastage of RCC units in our study. The decrease in the total number of donated units in 2020 was due to inventory management, which calculated the inventory levels for different blood groups according to hospital requirements for transfusion. Surplus donations were not taken when ample units were in the blood bank inventory. Inventory management was found to be one of the best ways to reduce RCC wastage by Neil *et al.*⁸ There was a significant reduction (almost 50%) in terms of the cost of discarding blood units, in January to June 2020. Thus, reducing the wastage of blood units aided in cost and resource savings. According to Gupta *et al.* stress should be

properly utilised in blood and its products with minimal or no wastage.¹⁸

CONCLUSION

This study has revealed that meticulous inventory management in blood banks can decrease losses of precious RCC units. Implementing the interventions in blood bank processes not only reduced the workload of the blood bank technicians but also saved time, human resources, and material resources for the whole process. Further interventions in the blood bank are required to reduce the discard percentage to the required levels. This study will not only help save precious blood components but also save human resources and costs.

Conflict of Interest: None.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

NKA & MZ: Study design, drafting the manuscript, data interpretation, critical review, approval of the final version to be published.

SR & THA: Data acquisition, data analysis, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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