

Research Article

Analysis of discard of whole blood and its components with suggested possible strategies to reduce it

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Received: 09 December 2015

Accepted: 06 January 2016

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ABSTRACT

Background: Advances in medical technology demand more and more provision of safe blood for effective management of patients. To tackle with the demand and supply of blood and blood components, more stringent criteria should be applied for blood donations and for proper utilization of blood. The present study was designed to analyze the various reasons for the discard of whole blood and blood components. It also intended to suggest various possible strategies for optimum utilization of blood and reduction of wastage.

Methods: In this retrospective study we analyzed various causes of discard of blood and blood components from January 2013 to June 2015 (30 months) using various records available in the blood bank of Jawaharlal Nehru Medical college and Acharya Vinoba Bhave Rural Hospital, Sawangi, Wardha, Maharashtra, India.

Results: A total of 14,026 blood bags were collected during the study period of 30 months, out of which 9,785 were whole blood while components were prepared from remaining blood bags. A total of 3,944 Packed Red Cells, 2,137 Platelet Concentrate and 3,944 Fresh Frozen Plasma were prepared. Average discard rate was found to be 22.45% while discard rate for Whole blood, Packed Red Cells, Platelet Concentrate and Fresh Frozen Plasma were 07.70%, 06.74%, 61.11% and 14.24% respectively.

Conclusions: Platelets were the most commonly discarded blood component due to short shelf life and non utilization in time as demand cannot be predicted. In our study the main reason for discarding whole blood and Packed Red Cells was sero-positivity for various Transfusion Transmitted Infections while non utilization after issue, breakage/leakage were the main reasons for Fresh Frozen Plasma discard. The self audit of blood transfusion service provides insight into current blood transfusion practices prevalent in the hospital.

Keywords: Discard rate, Blood and blood components, Transfusion transmitted infections, Self audit

INTRODUCTION

Blood transfusion service is the vital part of modern health care system without which efficient medical care is impossible. The aim of blood transfusion service should be to provide effective blood and blood products, which are safe as possible and adequate to meet patient's need.¹ Advances in medical technology demand more and more provision of safe blood for effective management of patients.² To tackle with the demand and supply of blood and blood components in resource constraint setting like

ours, more stringent criteria should be applied for blood donations and for proper utilization of blood. Protocols for minimizing the wastage of blood and components should be formed in each blood bank to save human and financial resources.

The present study was designed to analyze the various reasons for the discard of whole blood and blood components in a blood bank attached to medical college in rural setup. It also intended to suggest various possible

strategies for optimum utilization of blood and reduction of wastage.

METHODS

A retrospective study of various causes of discard of blood and blood components was carried out from January 2013 to June 2015 (30 months) using records available in the blood bank of Jawaharlal Nehru Medical College and Acharya Vinoba Bhave Rural Hospital, Sawangi, Wardha, Maharashtra, India. The data from donor record, Transfusion Transmitted Infections (TTI) testing record, component preparation record and discard record was analyzed.

Blood donations were taken from voluntary and replacement/family donors in the blood bank as well as in various blood donation camps according to the selection criteria defined by WHO3.

Blood components such as packed red cells (PRC), Fresh Frozen Plasma (FFP) and Platelet concentrate (PC) were prepared regularly from 350/450 ml blood bags under all aseptic conditions according to Food and Drug

Administration (FDA) guidelines as per demand and manpower available in the blood bank.³ Occasionally saline washed PRC were prepared for renal transplant patients on demand. Blood components were not prepared in camps because of constraint of resources.

The blood bags were discarded according to standard operating procedures laid down by National AIDS Control Organization (NACO),⁴ local authorities and our blood bank.

RESULTS

We observed that total 14,026 blood bags were collected during the study period of 30 months from both voluntary and replacement/family donors. Out of 14,026 blood bags 5,894 (42.02%) bags were collected in various blood donation camps, while 8,131 (57.98%) were collected in the blood bank. Out of 14,026 donors, 13,557 (96.66%) were male and 469 (03.34%) were females. Year wise collection of blood is shown in Table 1.

Table 1: Total blood collection.

Year	Total No. of donations	In camps	In blood bank	Male	Female	First time donors	Repeat donors
2013 (Jan-Dec)	5,688	2,108 (37.06%)	3,580 (62.94%)	5521 (97.06%)	167 (02.94%)	-	-
2014 (Jan-Dec)	5,653	1,998 (35.34%)	3,655 (64.66%)	5,440 (96.23%)	213 (03.77%)	2,709 (47.92%)	2,944 (52.08%)
2015 (Jan-June)	2,685	1,788 (66.60%)	897 (33.40%)	2,596 (96.68%)	89 (03.32%)	1,302 (48.50%)	1,383 (51.50%)
Total	14,026	5,894 (42.02%)	8,131 (57.98%)	13,557 (96.66%)	469 (03.34%)	-	-

Table 2: Discard rate for Whole blood and blood components.

Year		Whole Blood	Components prepared		
			PRC	PC	FFP
2013 (Jan-Dec)	Collected	3,930	1,548	719	1,548
	Discarded	280	107	460	233
	Discard rate	07.12%	06.91%	64.81%	15.05%
2014 (Jan-Dec)	Collected	4,067	1,475	869	1,475
	Discarded	295	95	516	210
	Discard rate	07.26%	06.45%	59.37%	14.23%
2015 (Jan-June)	Collected	1,788	921	549	921
	Discarded	179	64	330	119
	Discard rate	10.01%	06.94%	60.10%	12.92%
Total	Collected	9,785	3,944	2,137	3,944
	Discarded	754	266	1,306	562
	Discard rate	07.70%	06.74%	61.11%	14.24%
Average discard rate			22.45%		

During the study period, out of 14,026 blood bags collected, 9,785 were whole blood while components were prepared from remaining blood bags. A total of 3,944 PRC, 2,137 PC and 3,944 FFP were prepared.

Discard rate was calculated by using formula;

Discard rate = Number of units discarded/ Number of units collected (for WB)/ Generated by fractionation (for components) X 100

Total number of whole blood and components discarded due to various reasons and average discard rates are shown in Table 2.

Average discard rate was 22.45%. Discard rate for WB, PRC, PC and FFP were 07.70%, 06.74%, 61.11% and 14.24% respectively.

We also analyzed various reasons of discard in detail for WB and blood components separately such as discard due to TTI positive status of donors; discard due to date of expiry and others reasons of discard. Discard rate for these reason are given in Table 3, 4 and 5 respectively.

Table 3: Total no. of units discarded due to TTI positive status of donors.

Year	Whole Blood	Components		
		PRC	PC	FFP
2013 (Jan-Dec)	193 (04.91%)	82 (05.29%)	32 (04.45%)	82 (05.29%)
2014 (Jan-Dec)	191 (04.70%)	75 (05.08%)	37 (04.26%)	75 (05.08%)
2015 (Jan-June)	77 (04.45%)	43 (04.67%)	23 (04.19%)	43 (04.67%)
Total	461 (04.71%)	200 (05.08%)	92 (04.30%)	200 (05.08%)

Table 4: Total no. of units discarded due to date of expiry.

Year	Whole Blood	Components		
		PRC	PC	FFP*
2013 (Jan-Dec)	74 (01.88%)	21 (01.35%)	426 (59.24%)	36 (02.34%)
2014 (Jan-Dec)	87 (02.14%)	18 (01.22%)	478 (55%)	41 (02.77%)
2015 (Jan-June)	95 (05.51%)	17 (01.85%)	306 (55.74%)	18 (01.95%)
Total	170 (01.73%)	56 (01.41%)	1210 (56.62%)	95 (02.4%)

*The basis for FFP discard was of previous year. The FFP collected in year 2012 and discarded in year 2013 had discard rate of 02.34%. Similarly for year 2014 and 2015; FFP discard rate was 02.77%, 01.95% respectively.

Table 5: Total No. of units discarded due to other reasons.

Year	Whole Blood	Components		
		PRC	PC	FFP
2013 (Jan-Dec)	13 (0.33%)	04 (0.25%)	02 (0.27%)	115 (07.42%)
2014 (Jan-Dec)	17 (0.42%)	02 (0.14%)	01 (0.12%)	106 (07.19%)
2015 (Jan-June)	07 (0.39%)	04 (0.43%)	01 (0.18%)	58 (06.29%)
Total	37 (0.37%)	10 (0.25%)	04 (0.18%)	279 (07.07%)

The overall prevalence of HIV, HBV, HCV and Syphilis for WB as well as components was 1.12%, 2.27%, 0.99% and 0.14% respectively.

The other reasons of discard were analyzed and divided into leakage, less quantity, clotted/haemolysed, not utilized after issue, contamination of RBCs in case of PC, FFP and lipaemic FFP. They are shown in Table 6.

DISCUSSION

Blood transfusion is an essential part of modern day health care. The need for blood and blood components is presently increasing due to improved and accurate diagnosis of complex diseases requiring transfusion, emergence of newer treatment modalities and due to increased number of ageing population with increased blood needs. Proper blood management at blood bank will reduce unnecessary wastage of blood and blood components. The self audit of whole blood and blood components discarded over a period of time gives an idea about various reasons of discard.⁵

Present study showed that average 22.45% blood bags were discarded. The average discard rate in the studies by Bobde V. et al,⁶ Suresh B. et al,⁷ Sharma N. et al,⁸ Maramazi Ghaklez B. et al⁹ and Deb P. et al¹⁰ were 6.63%, 07%, 8.69%, 12% and 14.61% respectively. Average discard rate in our study was found to be higher than these studies because of high discard rate of platelets.

Whole blood

Discard rate for WB in our study was 7.70% which was slightly higher than quoted by Suresh B. et al⁷ (5.7%), Bobde V. et al⁶ (6.63%) and Sharma N. et al⁸ (4.46%). The most common reason for discard of WB was TTI positive status of donors which comprised 04.71% of total wastage, followed by date of expiry (01.73%) and other reasons (0.37%). Other reasons of wastage of WB included leakage of blood bag, less quantity, clotted/haemolysed bags and not utilized after issue, out of which less quantity was the most common cause. Main reasons for less quantity of blood were phlebotomy failure such as collapse of vein and acute donor reaction

such as uneasiness, vomiting, hematoma formation and fainting during donation.

PRC

Discard rate for PRC in our study was 6.74% which was higher than quoted by Suresh B. et al⁷ (3.3%), Bobde V. et al⁶ (0.2%) and Sharma N. et al⁸ (3.2%). The most common reason for discard of PRC was again TTI

positive status of donors which comprised 05.08% of total wastage, followed by date of expiry (01.41%) and other reasons (0.25%). In transfusion transmitted infections, we observed overall prevalence of HBV, HIV, HCV and Syphilis in descending order of 02.27%, 01.12%, 0.99% and 0.14%. Proper donor screening and strict adherence to the donor selection guidelines would decrease the collection of such units from the donors, thereby avoiding discard of such units.

Table 6: Analysis of other causes of discard of blood and blood components.

Year		Leakage	Less quantity	Clotted/ Haemolysed	Contamination of RBCs	Not utilized after issue	Lipaemic
2013 (Jan-Dec)	Whole Blood	02	09	01	-	01	02
	PRC	-	02	01	-	01	-
	PC	-	-	-	02	-	-
	FFP	43	14	-	01	43	14
2014 (Jan-Dec)	Whole Blood	03	11	03	-	-	01
	PRC	-	-	02	-	-	-
	PC	-	-	-	01	-	-
	FFP	36	02	-	03	48	17
2015 (Jan-June)	Whole Blood	-	03	02	-	02	-
	PRC	-	03	01	-	-	-
	PC	-	-	-	-	01	-
	FFP	13	04	-	01	36	02
Total		97	48	10	08	132	36

PC

Platelet concentrate was the most common component discarded during the study period. The average discard rate for PC was 61.11% which was higher than quoted by Maramazi Ghaklez B. et al⁹ (58.1%), Sharma N. et al⁸ (43.6%) and Bobde V. et al⁶ (26.2%). The most common reason for discard of PC was date of expiry (56.62%) followed by TTI positive status of donors and other reasons (0.18%). High discard rate of PC was because of short shelf life of five days. To minimize high discard, platelets should be prepared on demand and using modern techniques like aphaeresis.

FFP

Average discard rate for FFP in our study was 14.24% higher than quoted by Bobde V. et al⁶ (7.6%) and Sharma N. et al⁸ (6.2%). The most common reason for discard of FFP was other reasons (07.07%) followed by TTI +ve status of donors (05.08%) and date of expiry (2.4%). Other reasons of discard comprised leakage, not utilized after issue, lipaemic plasma and RBC contamination, out of which not utilized after issue was most common in our study. Reasons for not utilized after issue were death of patients, transfer of patients to higher centre, wrong product ordered, excess no. of units ordered. Leakage

was the second most common cause of wastage of FFP which can be minimized by putting FFP bags in a cardboard or polystyrene protective container that minimizes the risk of breakage of product during storage, handling and transportation.⁵ The lipaemic discards can be minimized by proper donor questioning regarding their interval between donation and time of last meal. Avoidance of fatty meal prior to donation may prevent the lipaemic collection of blood units.¹¹

Suggested strategies that would maintain discard of blood as low as possible are as follows:

1. Wastage due to date expired
 - I. Blood group wise voluntary donor registry, proper scheduling of blood donation camps and active involvement of camp organizers.
 - II. Blood donation camp organizers should be informed about the need of blood bank as per stock available in blood bank.
 - III. Sharing of data between the blood banks in vicinity.
 - IV. Use of advance software in blood bank and hospital wards for proper coordination between clinicians and blood bank staff.

- V. Encouragement of scheduled blood donations for elective operative procedures.
 - i. Increased use of instrumentation such as aphaeresis technique to prevent wastage of components like platelets whose demand cannot be predicted.
2. Wastage due to reactive TTI status
 - I. Strict adherence to donor selection criteria's, proper pre-donation history taking and counseling.
 - II. Biometric identification of TTI positive donors and suspected professional donors.
 - III. Pre-donation screening of voluntary donors using rapid and cost effective kits.
3. Wastage due to other causes
 - I. Proper handling of blood bags and stringent storage conditions to prevent hemolysis, clotting, bacterial contamination.
 - II. Precautions during thawing of FFP to prevent leakage such as use of polystyrene protective containers.
 - III. Technical expertise in component preparation to prevent RBC contamination.
 - IV. Continued medical education for technical staff and creation of proficient manpower for blood bank.

CONCLUSIONS

Present study revealed that average 22.45% blood bags were discarded which comprised discard rate of whole blood- 7.70%, PRC- 6.74%, PC- 61.11% and FFP- 14.24% due to various reasons. Platelets were the most commonly discarded blood component due to short shelf life and non utilization in time as demand cannot be predicted. In our study the main reason for discarding whole blood and PRC was sero-positivity for various TTI while non utilization after issue, breakage/leakage were the main reasons for FFP discard.

To minimize wastage of blood there should be proper implementation of blood transfusion policies and coordination between hospital and blood bank staff. The discard rate for whole blood and components should be targeted to minimize economical burden and optimum utilization of available manpower in resource constraint setting. The self audit of blood transfusion service provides insight into current blood transfusion practices prevalent in the hospital.

ACKNOWLEDGEMENTS

We would like to acknowledge Mr. Vicky Bhagat (Technician blood bank) and Mrs. Swati Ingole (Staff Nurse blood bank) for helping us with data acquisition.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Patil P, Bhake A, Hiwale K. Analysis of discard of whole blood and its components with suggested possible strategies to reduce it. Int J Res Med Sci 2016;4:477-81.