Original Article:

Reasons for discarding whole blood and its components in a tertiary care teaching hospital blood bank in South India

B. Suresh, K.V. Sreedhar Babu, R. Arun, P. Chandramouli, D.S. Jothibai
Department of Transfusion Medicine, Sri Venkateswara Institute of Medical Sciences, Tirupati

ABSTRACT

Introduction: Each unit of blood is precious and has to be utilized properly with minimal discards. The aim of this study was to find out the reasons for discarding blood and blood components.

Materials and Methods: We retrospectively studied all whole blood and blood components collected during January 2013 to June 2014 at our tertiary care teaching hospital blood bank in South India.

Results: Of the 5261 whole blood bags, 298 (5.7%) were discarded. Of these, 146 (49%) were discarded because of seroreactivity for transfusion transmitted infections (TTI). Of the 19586 blood components prepared, 1449 (7.4%) were discarded. Among blood components discarded, most common units were platelets (16.3%). The most common cause of discarding the blood components was due to expired date (36.9%).

Conclusion: A properly conducted donor screening, notification and counselling of permanently deferred donors will help in discarding less number of bags which are positive for different TTI. Properly implemented blood transfusion policies will help to utilize the blood components in a proper way resulting in discarding the less number of blood bags due to expiry.

Key words: *Rate of discards, Whole blood, Blood components, Seroreactivity*

Suresh B, Sreedhar Babu KV, Arun R, Chandramouli P, Jothibai DS. Reasons for discarding whole blood and its components in a tertiary care teaching hospital blood bank in South India. J Clin Sci Res 2015;4:213-9. DOI: http://dx.doi.org/10.15380/2277-5706.JCSR.14.052.

INTRODUCTION

Blood donation is one of the most noble gestures a human can make to save life. It has been estimated that every two seconds someone needs blood;[1] one-third of all patients admitted to intensive care units (ICUs) in the developed world receive a blood transfusion.[2] Much of the medical and surgical specialties depend on the steady supply of blood from healthy, caring individuals. Each unit of blood is precious and has to be utilized properly with minimal wastage. The aim of this study was to find out the reasons for discarding blood and blood components so that component preparation and use of blood and components can be optimized through education and training of staff.[3] This can help in formulating proper guidelines for donor screening, component preparation and storage.

MATERIAL AND METHODS

We retrospectively studied all the whole blood (WB) and blood components collected from suitable healthy donors as per the selection criteria laid down by Drugs and Cosmetics Act, 1940 and Rules 1945[4] and discarded during the period January 2013 to June 2014 in the Department of Transfusion Medicine of a tertiary care teaching hospital blood bank. A detailed analysis of reason for discarding blood and blood components was conducted.

RESULTS

Of the 12,753 collections in the study period, 5261 WB units were collected in a single blood

Received: November 09, 2014; Revised manuscript received: December 26, 2014; Accepted: April 13, 2015.

Corresponding author: K.V. Sreedhar Babu, Associate Professor, Department of Transfusion Medicine, Sri Venkateswara Institute of Medical Sciences, Tirupati, India.
e-mail: kinneravsb@gmail.com

Online access
http://svimstpt.ap.nic.in/jcsr/Jul-Sep15_files/4oa15.pdf
DOI: http://dx.doi.org/10.15380/2277-5706.JCSR.14.052

bag and 7492 were collected in top and bottom quadruple blood bags which were used to prepare components like packed red cells (PRBC), fresh frozen plasma (FFP) and platelet rich concentrates (PRC). Of the 24847 blood components prepared (Table 1), 1747 (7%) units were discarded. Discard rate was high for PRC (16.3%), followed by WB (5.7%), FFP (5.5%) and PRBC (3.3%).

Out of 298 discarded WB units, 146 (49%) units were discarded due to seroreactivity to transfusion transmitted infections (TTI) followed by units used for quality control check (n=74;24.8%), among others (Table 2). Suboptimal volume collected (n=28;9.5%) occurred in units collected at voluntary blood donation camps due to discontinuation of donation because of donor's disapproval/ phlebotomy failure. Among 146 seroreactive units, hepatitis B surface antigen (HBsAg) positivity (64.4%) was the most common cause for discarding the units (Table 3). None of the units tested positive for malarial parasite.

Of the 1449 components that were discarded, 749 were PRCs, 414 were FFP and 286 were PRBCs. The reasons for discarding blood components are shown in Table 4. Seroreactive units was the most common cause of discard of PRBCs and FFPs whereas outdated units was the most common cause for PRCs. Analysis of blood component discards due to seroreactivity is shown in Table 5. A comparison of data from the present study with various published studies is shown in Table 6.[5-7]

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.[8] Like any therapeutic intervention, blood used correctly and judiciously can save life. Proper blood management at blood bank will reduce

Table 1: Discard rate of whole blood units and blood components

Blood component	Collections (No.)	Discards (No. %)
Whole blood	5,261	298 (5.7)
Packed red blood cells	7,492	286 (3.8)
Platelet rich concentrate	4,602	749 (16.3)
Fresh frozen plasma	7,492	414 (5.5)
Total	24,847	1,747 (7.0)

Table 2: Reasons for discarding 298 whole blood units

Reason for discarding	No. (%)
Seropositive for TTI	146 (49.0)
Units sent for quality control	74 (24.8)
Indeterminate seroreactive	35 (11.7)
Suboptimal volume collected	28 (9.5)
Breakage	9 (3.0)
Lipaemia	3 (1.0)
Haemolysed	2 (0.7)
Shelf-life expired	1 (0.3)

TTI = transfusion transmitted infections

Table 3: Reasons for discarding 146 whole blood units due to serological positivity for TTI

TTI	No. (%)
HBsAg	94 (64.4)
Anti-HIV 1 and 2	28 (19.2)
Anti-HCV	21 (14.4)
RPR	3 (2.0)

HBsAg = hepatitis B surface antigen; HIV = human immunodeficiency virus; HCV = hepatitis C virus;
TTI = transfusion transmitted infections;
RPR = rapid plasma reagin test (for syphilis)

Table 4: Reasons for discard of blood components

Blood component	Reason for discards					Total
	Sero reactivity for TTI	Quality control	Breakage/ leakage	Shelf-life expired	Others (haemolyzed/ lipaemia/ indeterminate seroreactivity)	
	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	
PRBC	194 (67.8)	78 (27.3)	3 (1.1)	3 (1.0)	8 (2/0/6) (2.8)	286
PRC	129 (17.2)	82 (10.9)	0 (0)	530 (70.8)	8 (0/2/6) (1.1)	749
FFP	194 (46.9)	77 (18.6)	119 (28.7)	2 (0.5)	22 (0/16/6) (5.3)	414
Total	517 (35.7)	237 (16.4)	122 (8.4)	535 (36.9)	38 (2/18/18) (2.6)	1,449

PRBC = packed red blood cells; PRC = platelet rich concentrate; FFP = fresh frozen plasma
TTI = transfusion transmitted infections

Table 5: Reasons for discarding blood component due to seroreactivity

Blood component	Anti-HIV 1 and 2 No. (%)	HBsAg No. (%)	Anti-HCV No. (%)	Syphilis No. (%)	Total No. (%)
	27 (13.9)	148 (76.3)	18 (9.3)	1 (0.5)	194
	20 (15.5)	93 (72.1)	16 (12.4)	0 (0)	129
	27 (13.9)	148 (76.3)	18 (9.3)	1(0.5)	194
Total	84 (16.2)	386 (74.7)	45 (8.7)	2 (0.4)	517

Anti-HIV 1 and 2 = antibodies to human immunodeficiency virus 1 and 2; HBsAg = hepatitis B surface antigen;
Anti-HCV = antibodies to hepatitis C virus

Table 6: Comparison of reasons for discarding whole blood units and components: in various published studies with present study

Study	Study period	Place of the study	No. of units collected	No. of units discarded	Reasons for discarding					
					Sero logical evidence of TTI	Quality control	Breakage/ eakage	Out-dated	Suboptimal volume	Others*
			(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Studies from other parts of the world										
Morish et al[3]	January to December 2007	Kuala Lumpur	390,634	8968 (2.3)	-	-	2306 (25.7)	-	353 (3.9)	6309 (70.4)
Kora et al[5]	January 2009 to December 2010	Bagalkot Karnataka	6,129	263 (4.3)	220 (83.6)	-	-	38 (14.4)	5 (2)	-
Kumar et al[6]	November 2009 to May 2011	Sevagram, Wardha, Maharashtra	10,582	888 (8.4)	300 (33.8)	-	27 (3)	513 (57.8)	18 (2)	20 (3.4)
Thakare et al[7]	2005 to 2007	Aurangabad, Maharashtra	24,547	879 (3.6)	604 (68.86)	-	-	275† (31.3)	-	-
Present study	January 2013 to June 2014	Tirupati, Andhra Pradesh	248,47	1747 (7)	663 (37.9)	311 (17.8%)	28 (1.6)	131 (7.5)	536 (30.7)	78 (4.5)

* Haemolysed/lipaemia/indeterminate seroreactivity
† Includes all remaining reasons apart from sero reactivity
TTI = transfusion transmitted infections

unnecessary wastage of blood and blood components.

In the present study 1747 (7%) of the 24847 WB and blood components that were prepared were discarded. The various reasons for the discard are seroreactivity for TTI, outdated units, breakage/leakage units, undercollected units, haemolysed / lipemic / indeterminate seroreactive blood units and units sent for quality control. One study[7] reported that about 3.6% of blood units were discarded. In another study[9] the mean PRBC discard rate was 4.5%, varying annually from 0.2% to 7.7%. In other studies[10, 11] the discard rate of PRBC and FFP ranged from 0.1% - 0.7%; and 2% -2.5% respectively.

In our study, 49% of WB discards and 35.7% of component discards were due to seroreactivity to TTI. Seroreactivity was the most common cause of discarding whole blood units and blood components. Among 146 WB units which were discarded due to TTI, HBsAg seroreactivity (64.4%), presence of antibodies to human immunodeficiency virus (HIV) 1 and 2 antibodies (19.2%); hepatitis C virus (HCV) (14.4%), were common causes. In one study[7] 68.9% of units were discarded due to seroreactivity; 49.8% being reactive for HBs Ag, 10% for HIV and 9% for HCV while no unit was reactive for syphilis. 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.

Under collection accounted for 9.4% of WB discards. In one study[3] under collection (52%) was the main reason for discarding the WB.[3] Suboptimal amount of blood collected would be unsuitable for transfusion and the ratio between volume of blood collected and volume of anticoagulant in the blood bags should be corrected. In our centre, most of the suboptimal amounts of blood units were collected at voluntary blood donation camps. The reasons for collection of low volume of collected blood may be due to discontinuation of donation because of donor's disapproval during procedure or due to phlebotomy failure. Selecting a good donor and proper counselling would decrease donor reactions thereby preventing under collection. Proper training to the phlebotomist will help in reducing the under collection due to failed phlebotomy.

Haemolysed / lipaemic / indeterminate seroreactive causes accounted for 13.4% of WB units and 2.6% of blood components (Table 2, 4). The discard rate of lipemic units was 25% and haemolysed units was 0.1% that included both WB and components in another study.[3] 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. Proper cold chain maintenance right from collection, processing and storage will decrease the incidence of haemolysis.

In our study 3% of WB and 1.1% of PRBC were discarded due to breakage/leakage. Mishandling of blood bags during processing, and storage were the major cause for breakage and leakages of blood bags.[12] The integrity of plastic bags is also essential and precautions should be taken to prevent leakages.[13] 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.[11] This can be prevented by proper visual inspection of the blood bag during the processing, after pressure in a plasma extractor and during storage.[12]

The breakage/leakage was the second main cause of FFP discards accounting for 28.7%. The bag may be damaged during the verification of stock by an accidental fall. The

defect and leakage at any part of the plastic blood bags can only be detected after thawing. This can be prevented by storing the FFP in cardboard or polystyrene protective containers that minimize the risk of breakage of brittle frozen product during storage, handling, and transportation.[14] In a study[3] the main reasons for discarding FFP were lipaemia (44%) and leakage (35%).

In the present study 0.3% of WB discards, 1% of PRBC, 0.5% of FFP and 70.8% of PRC discards were due to shelf-life expiration. The reason for expiry of shelf-life of whole blood and PRBC was due to failure in proper implementation of first-in-first out (FIFO) policy. This could be prevented by continuous monitoring and proper implementation of FIFO policy. Shelf-life expiry of PRCs were due to short expiry dates. However, PRCs can be prepared according to the need taking emergency requirements also into consideration, so that wastage can be reduced. In a study[15] 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.[15]

In the present study 24.8% of WB discards, 27.3% of PRBC, 18.6% of FFP and 10.9% of PRC discards were due to units that were sent for quality control which is being carried out as per the Drugs and Cosmetics Act, 1940 and Rules 1945.[1] This has to be carried out in all blood banks and hence this could not be prevented.

In our study the main reasons for discarding blood and blood components except for PRC was due to seroreactivity for various TTI. The main reasons for discarding PRC are due to its short expiry. Breakage/leakage was one of the main reasons for FFP discards. A properly conducted donor screening, notification and counseling of permanently deferred donors will help in discarding less number of bags which are positive for different TTI. Properly implemented blood transfusion policies will help to utilize the blood components in proper way resulting in discarding the less number of blood bags due to expiry. Proper visual inspection and storage facilities will decrease the breakage/leakage of the FFP.

REFERENCES

1. Blood transfusion safety. Available at URL: http://www.who.int/bloodsafety/en/Blood_Transfusion_Safety.pdf. Accessed on June 16,2015.
2. Saxena S, Weiner JM, Rabinowitz A, Fridey J, Shulman IA, Carmel R. Transfusion practice in medical patients. Arch Intern Med 1993;153:2575-80.
3. Morish M, Ayob Y, Naim N, Salman H, Muhamad NA, Yusoff NM. Quality indicators for discarding blood in the National Blood Center, Kuala Lumpur. Asian J Transfus Sci 2012;6:19-23.
4. Malik V. Law relating to drugs and cosmetics. 22nd edition. Lucknow: Eastern Book Company, 2011.
5. Kora SA, Kulkarni K. Blood wastage in a blood bank in an analysis of donor rural Karnataka. J Clin Diagn Res 2011;5:1393-6.
6. Kumar A, Sharma SM, Ingole NS, Gangane N. Analysis of reasons for discarding blood and blood components in a blood bank of tertiary care hospital in central India: a prospective study. Int J Med Public Health 2014;4:72-4.
7. Thakare MM, Dixit JV, Goel NK. Reasons for discarding blood from blood bank of Government Medical College, Aurangabad. Asian J Transfus Sci 2011;5:59-60.
8. Appropriate clinical use of blood. Available at URL: http://www.health.gov.bt/downloads/clinicalblooduse.pdf. Accessed on June 16,2015.
9. Veihola M. Technical efficiency of blood component preparation in blood centres of 10 European countries. Academic dissertation. Helsinki: Department of Public Health, Faculty of Medicine, University of Helsinki;2008.p.5.

10. Novis DA, Renner S, Friedberg RC, Walsh MK, Saladino AJ. Quality indicators of fresh frozen plasma and platelet utilization. Arch Pathol Lab Med 2002;126:527-31.

11. Novis DA, Renner S, Friedberg R, Walsh MK, Saladino AJ. Quality indicators blood utilization three college of American pathologists Q-probes studies of 12-288-404 red blood cell units in 1639 hospitals. Arch Pathol Lab Med 2002;126:150-6.

12. Guide to the preparation, use and quality assurance of blood component. 12th edition. France: Council of Europe Publishing; 2006.p.242-8.

13. Guidelines for the blood transfusion services in the United Kingdom. 7th edition. London: The stationery office; 2005.p.18-77.

14. World Health Organization. Quality systems for blood safety: introductory module guidelines and principles for safe blood transfusion practice. Geneva: World Health Organsization;2002.p.65-75.

15. Veihola M, Aroviita P, Linna M, Sintonen H, Kekomäki R. Variation of platelet production and discard rates in 17 blood centers representing 10 European countries from 2000 to 2002. Transfusion 2006;46:991-5.