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Research Article

DISCARD AUDIT AT A TERTIARY CARE BLOOD BANK: CAUSES AND RECOMMENDATIONS

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ABSTRACT

Introduction: Blood is the most important connective tissue in human body. Its importance can be stressed by the varied indications requiring blood transfusion. The ever increasing demands for blood makes it all the more precious to collect and store. Blood donation remains a humanitarian gesture and is the only way to ensure adequate blood in the blood banks. The discard of blood bags however is a harsh reality in blood banks which should be properly scrutinised and adequately dealt with.

Materials and methods: This study was conducted at blood bank attached to a tertiary care center over a period of 5 years and 8 months. It is a retrospective study carried out since January 2013 to August 2018. All the Whole blood & blood components such as packed RBC (PRBC), fresh frozen plasma (FFP) & platelet concentrate (PC) discarded during this period were included in the study. Multiple ways to reduce the rates of discard have also been evaluated.

Results: The total number of blood bags collected during our study period was 64,337 and the total number of components prepared was 42,848. The overall discard rate for whole blood, PRBCs, FFP & PC was 2.78%, 1.68%, 5.63% and 28.55% respectively.

Conclusion: The commonest cause for whole blood discard was sub optimal amount of blood being collected, TTD positivity for PRBC, leakage for FFP, expiry for Platelets. Regular audits in blood bank can help in reducing discard rate & quality assurance.

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INTRODUCTION

Blood is the largest connective tissue in human body. The diseases caused by the defective synthesis or abnormal functioning of the blood components gives rise to the need to replenish stores in addition to the losses caused by road traffic accidents. Blood donation remains a humanitarian gesture and so the machinery to properly procure and store the collected blood should be in place. Awareness regarding donation and eligibility of donors is limited by many factors and so every bag of blood collected becomes very precious. The requirement for blood is ever increasing. Various research projects have aimed to create substitutes for blood but still no fruitful results have been obtained.^{1,2} This emphasizes the need for judicious use and storage of blood. The increasing demands of blood for transfusion require more dedicated efforts to collect, prepare and deliver whole blood as well as various blood components. This remains the onus of the blood bank. The aim of this study was to audit the number of blood bags being discarded. We also aimed to find out the reasons for the same and suggest the measures that would be helpful in reducing the wastage rate.

MATERIALS AND METHODS

This study was conducted at blood bank attached to a tertiary care centre over a period of 5 years and 8 months. It is a retrospective study carried out since January 2013 to August 2018. Whole blood & blood components such as packed RBC (PRBC), fresh frozen plasma (FFP) & platelet concentrate (PC) were prepared regularly from 350/450 ml blood bags under all aseptic conditions according to Food and Drug Administration (FDA) guidelines and were included in this study. All the blood bags, PRBCs, FFP, Platelets discarded in this period were due to transfusion transmitted disease positivity, expiry, low blood volume, hemolysis, clots in the blood bags, leakage, lipaemia & FFP or Platelet concentrate contaminated by RBCs, etc. All blood bags were tested for transfusion transmitted infections by using third generation Enzyme-linked immune sorbent assay (ELISA). Only seronegative products meeting the quality parameters were issued. Whole blood and PRBCs were stored at 4-6°C, FFPs were stored at < -20°C and platelets were stored in platelet agitator at 22°C.

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RESULTS

The data from January 2013 to August 2018 was collected & analyzed.

Table 1 Total number of blood and components prepared and discarded

	Collected & prepared	Discarded	Discard rate %
Whole blood	64337	1793	2.78
Packed red cells	17566	298	1.69
FFP	17566	990	5.63
Platelets	7716	2203	28.55

Table 2 Various causes of discard

	Less bleed	TTD positivity	Haemolysed/clotted/ RBC contaminated	Expired	Leakage	others
Whole blood (n = 1793)	693 (38.65%)	447 (24.93%)	109 (6.07%)	419 (23.36%)	120 (6.69)	5 (0.27%)
PRBC (n = 298)	-	134 (44.96%)	10 (3.35%)	130 (43.62%)	19 (6.37%)	5 (1.67%)
FFP (n = 990)	-	134 (13.53%)	80 (8.08%)	34 (3.43%)	733 (74.04%)	9 (0.90%)
Platelets (n = 2203)	-	62 (2.81%)	28 (1.27%)	2087 (94.73%)	26 (1.18%)	0 (0)

DISCUSSION

The quest for finding cure of ailments crippling human life have been on since ages and with increasing technology and research the arena is expanding dynamically. Blood forms the most essential component for the very survival, as it is responsible for oxygenating the entire system as well as removal of toxins and used by products.

Whole blood is collected from the donor under all aseptic precautions and one bag of blood can be effectively separated into various components and individually used. The components we prepare at our centre are PRBC, FFP and PC. The machine used for the preparation of component is the cryofuge 6000i. Therefore one bag of blood can be successfully used for three patients. However there remain some unforeseen and unavoidable causes which make the blood bag unfit for transfusion and liable for discard. ‘Wastage rate’ is an important criteria laid down by the NABH as one of the quality indicators.³ Monitoring the wastage rate can help in quality control. The potential harmful diseases which are transmitted through blood transfusion form an important cause for discard.⁴ However apart from these; there are a number of causes which can be effectively dealt with, if additional precautionary measures are taken. It is therefore the responsibility of those employed at the blood bank to regularly conduct audits and identify the causes for wastage of blood & blood component. Subsequently the methods to combat the wastage of blood should also be taken up actively.

The study was conducted with an aim to audit the number of blood bags being discarded and find out the reasons for the same. We also aimed to suggest the measures that would be helpful in reducing the wastage rate.

The total number of blood bags collected during our study period was 64,337 and the total number of components prepared was 42,848. This included packed red cells, fresh frozen plasma and platelet concentrate. The overall discard rate for whole blood, PRBCs, FFP & PC was 1793 (2.78%), 298

(1.69%), 990 (5.63%) and 2203 (28.55%) respectively. Suresh et al in their study found the discard rates to be 5.7% for whole blood, 3.3% for PRBC, 5.5 % for FFP and 16.3% for platelets.⁵ In another study by Kumar et al the discard rates for whole blood, RBC, FFP and platelets were 7.70%, 6.74%, 14.24% and 61.11% respectively.⁶ In both the studies the discard rate for platelet concentrate was the highest followed by that of fresh frozen plasma which is similar to our study.^{5,6} The causes for such variable rate of discard were also evaluated. In our study the most common cause for whole blood discard was less amount of blood being collected in the bag i.e. 38.65%. The reason for this is, in our setup the staff comprising of BTO, nursing staff & interns collect blood which changes periodically. The initial one or two days when they are under training, chances of error increase. Lakum et al and Morish et al reported discard rates of 27.18% and 52% respectively due to suboptimal volume of blood collected in bags.^{7,8} Morish also stated improperly trained phlebotomist as a major cause for this error.⁸ Conducting regular phlebotomy workshop with hands on training will reduce such error.

Transmission of transfusion transmitted diseases like HIV infection, HCV, HBsAg, Malaria and syphilis is well known.⁹ TTD positivity was a cause for discard of 447(24.93%) bags in our study. In a study by Patil et al TTD positivity was the commonest reason for discard (4.71%).¹⁰ Mahapatra et al reported as high as 58.34% rate for discard due to seropositivity this may be due to high regional prevalence.¹¹ The only thing that can be done to reduce this number is by spreading awareness about a healthy donor. People who are aware of their seropositivity should know their ineligibility to donate blood. Voluntary donors should be encouraged to donate blood since they have less chances of having TTD positivity. In replacement donors chances of missing professional donors during donor screening procedures, which carry a relatively higher risk of transfusion transmitted diseases is possible. So blood from replacement donors should be accepted only in cases of emergencies when there is acute shortage of blood in the blood bank.⁹ Awareness programs like lectures, street plays will be helpful in promoting voluntary blood donation.

Presence of haemolysis/clots in the bag has also led to the discard 6.07% of bags in our study. Improper mixing of blood while collection can lead to clot formation. This can be rectified by proper training of staff and using blood collection monitor.

Leakage from the bag also led to the discard of 6.67% whole blood. The cause for this can be attributed to the damage that happens while centrifugation. Exercising caution can be the only remedial measure.

Another cause which we encountered in our study was the expiry of blood bags. The percentage of expired whole blood bags in our study was 23.36 %. In a study by Arora et al the discard rate was very high i.e. 51.4%.¹² Sometimes negative group blood bags, due to lack of demand, get expired. When blood bags are transferred in from other centres, these bags are of near expiry & when we are unable to use them before expiry, it leads to discard. Other causes of discard of whole blood are short tube 5(0.27%). Short tube doesn't allow sampling for cross matching.

Packed red cells were also similarly discarded for transfusion transmitted disease positivity (44.96%). This was the commonest cause for their discard. Mahapatra et al reported much higher rates of TTI for PRBC (65.02%).¹¹ Formation of clots lead to discard of 5 (1.67%) PRBC bags. Sometimes excessive removal of plasma while preparing FFP can lead to increased viscosity of the PRBC leading to blockage of BT set & hence discard of bag. This can be avoided by training the technicians & expressing exactly 3/4th - 4/5th of the plasma into the satellite bag.

Fresh frozen plasma is prepared from whole blood after centrifugation within 6 hours of collection.^[13] FFP is a rich source of clotting factors and therefore its requirement in bleeding disorders is indispensable. Most common cause of discard of FFP bags was leakage. The total number of FFP bags discarded due to this reason was 733 (74.04 %). Morish et al reported the discard rate for FFP owing to leakage as 35% and that for apheresis plasma as 57%.⁸ The high percentage in our study can be attributed to improper handling of FFP bags. FFP bags can be stored at any temperature below -18 ° c.¹⁴ In our centre it is stored at -20° c. At this temperature plasma gets solidified. If bags are not properly stored in deep fridge then, an angle is formed which is prone for pressure, breakage & thereby leading to leakage. Careful handling of bags is therefore imperative. The bags might also get damaged during centrifugation by sharp interior edges.⁸

The measures which can be taken to avoid this problem are by keeping tested / untested FFP, serially & group-wise separated by slots. Specialized bags made up of polystyrene should be used as they are sturdier. Storage can also be done in cardboard boxes.¹ If proper storage procedures are practiced, it can help to greatly reduce the chances of leakage and bring down the discard rate substantially. Presence of RBCs in FFP also leads to discard of FFP bags. The reason for such contamination is improper handling and overexpression of plasma after centrifugation. Sometimes blood from the tubing if not emptied completely, before centrifugation, can return back and contaminate the plasma. Other causes of discard of FFP were short tube 6 (0.61%), lipemia 2(0.20%) & hyperbilirubinemia 1 (0.10%). Short tube will not allow sampling for cross matching. Donor having a fatty meal before donation of blood can lead to lipemia. Morish reported 25% discard rate due to lipaemia.⁸

Platelets are prepared after separating them from platelet rich plasma. Expiry of platelet concentrate is the most common cause of discard. The number of platelet bags discarded in our study due to expiry was 94.73%. In a study by Shah et al 29% platelets & in a study done by Kumar et al 56.62% platelets were discarded due to expiry as platelets have short life span of 5 days.^{15,6} If not used by that time they lose their potency. Prior preparation of platelets without request can sometimes lead to underutilization. To reduce the number of platelet discard, a system of displaying the stock along with expiry dates should be there in blood bank and proper communication with the clinicians is necessary. When large numbers of platelet concentrates are required then it should be prior informed to the blood bank. Preparing platelets in bulk irrespective of the demand leads to discard.

CONCLUSION

The present study helped in identifying the causes for discard in our set up. The commonest cause for whole blood discard was sub optimal amount of blood being collected, TTD positivity for PRBC, leakage for FFP, expiry for Platelets. The functioning of a blood bank requires a lot of expertise and technical knowhow. Precious blood which is collected should always be put to use with minimal wastage. The reasons for discard are peculiar for a particular set up and so conducting audits can help in reducing discard rate & quality assurance. Proper training to improve the skills of the workforce right from collection to preparation and storage of blood and its components is the need of the hour. It requires lot of vigilance and sincerity on the part of the staff involved. A good coordination between the clinicians and the blood bank personnel can help in bringing down the wastage rate in the blood bank.

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