

Analysis of the Total Wastage of Blood Bags and Various Blood Components in a Blood Bank of a Tertiary Care Hospital

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ABSTRACT

BACKGROUND AND OBJECTIVES

Majority of the medical and surgical emergency procedures being dependent on Blood and blood components, it has played a vital role in patient management. This enlightens the importance and need of proper utilization of blood and its components by ensuring minimal wastage. The main objective of the study is to determine the percentage and causes of blood and blood component wastage out of the total blood collected.

METHODS

A retrospective cross - sectional study with convenience sampling of donors from January 2015 to December 2020 was done in a blood bank of a tertiary care hospital located in western Maharashtra.

RESULTS

Out of the total blood bags collected, 411 (0.028 %) blood bag units were discarded due to seropositivity. After segregation of the collected blood bags, a total of 373 whole blood bags discarded and 2588 platelet bags had to be discarded. The most common reason for discard of platelet bags were due to expiry. A total of 1789 FFP bags were disposed due to various reasons, while, only 131 bags of PCV and 85 bags of plasma were discarded, the main reasons of discard being expiry of the PCV bags (74.8 %) and cryo - poor plasma respectively (98 %). Cryoprecipitate bags that were discarded consisted of a total of 235, out of which 150 (63.8 %) bags were disposed due to expiry of the cryoprecipitate bags.

INTERPRETATION AND CONCLUSION

Blood being an irreplaceable and important resource, needs to be properly utilized and ideally zero percent wastage should be encouraged. Training programmers for doctors on usage of blood / blood components is highly recommended.

KEYWORDS

Blood, Blood components, Empty bags, Expiry, Seropositivity, Wastage

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INTRODUCTION

In this era of modern medicine, blood and blood components have been playing a vital role in patient management.¹ Blood is a major bodily fluid that delivers nutrients and oxygen and transports waste products away from these same cells. Majority of the medical and surgical emergency procedures depend on the Blood Transfusion Services (BTS). Studies on developing countries reported that most of the limited blood supplies are used for complications of pregnancy and childbirth, trauma and severe anemia in childhood.² A well - organized and efficient BTS would contribute toward better patients care and contribute toward the development of healthcare in the country.³ Till date there is no substitute to human blood.⁴ The demand for blood overshadows the blood supply in many countries.⁵ There are multiple factors that contribute to shortfall in provision of blood including deficient donor recruitment, poor stock management and transportation. This highlights the need for appropriate utilization of blood and its components.⁶ The blood bank needs to put in enormous efforts to collect sufficient amount of safe blood from voluntary, non - remunerated, healthy, and low - risk donors. Many factors lead to wastage of blood products like broken bag, broken seal, expired units, returned after 30 min, clotted blood or miscellaneous reasons which is most importantly due to lack of proper knowledge and awareness. The efficiency of quantity and quality of blood and blood components can be achieved by BTS through the implementation of a quality management system in all phases of the collection, processing, and storage of the blood. This would further promote reduction in the amount of blood discarded to a level that is more acceptable to the set standards. Blood wastage is a worldwide economic and ethical problem, ranging between zero and 6 %. Only around 100 countries in the World have and follow national guidelines for clinical use of blood and blood products. Many internal and external factors for wastage have been identified in hospital practice. Improper containers for transport and the difficulty in ensuring that the appropriate temperature has been maintained before transfusion have been identified as major contributors to wastage.⁷ Wastage of blood and blood products should never occur ideally in a good set up. Due to the essential need to have adequate and satisfactory blood stocks all the time, a very small but unavoidable amount of blood wasting in blood bank does exist. The rate of discarded blood components or "wastage rate" is one of the indicators which has been listed third among the ten quality indicators recommended by National Accreditation Board for hospitals and health care providers⁸ The objectives of this study were to determine the percentage of blood and blood component wastage out of the total blood collected, to identify the various causes of discard of blood and its components and to determine the percentage of discarded empty blood bags due to various unavoidable defects in the blood bags before blood collection.

MATERIALS AND METHODS

A retrospective cross - sectional study was conducted involving the analyses of discarded blood and blood components data in a blood bank of a tertiary care hospital located in western Maharashtra. Convenience sampling was done of the donors from January 2015 to December 2020, whose blood and blood components were discarded due to various causes. The study included both voluntary and replacement donors. The present study includes blood units

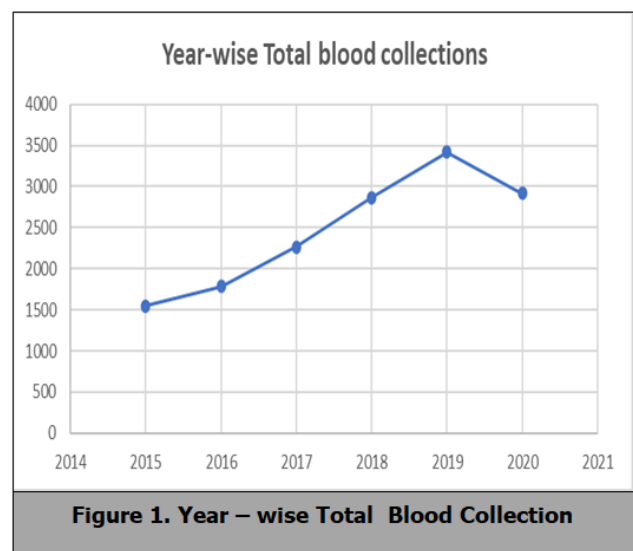
discarded for different reasons, which include Transfusion Transmitted Infection (TTI) positivity, expired, suboptimal volume, leakage, clotted, haemolyzed, contamination of RBCs, not utilize after issue, lipemic and icteric blood units discarded during the study period. Data which have not been properly maintained or missed data in the respective registers have been excluded from the study.

Data Analysis

Data were collected after obtaining informed consent and ethical clearance before the study, respectively. Data collection and analysis was done through Microsoft Excel spreadsheet (Microsoft Corporation, Redmond, WA, USA). Percentage distribution was computed for discrete data.

RESULTS

Before discussing the reasons for discard of collected blood bags, this study revealed the discard of the empty blood bags, before even the collection of blood. One hundred and eighty - eight empty blood bags were discarded from January 2015 to December 2020, which consisted of 52 empty single bags, 36 empty double bags, 75 empty triple bags and 25 empty quadruple blood bags. The main reason of discard for all the varieties of blood bags were leakage of the anticoagulants pre - filled in the blood bags, mainly due to manufacturing error. Total number of blood bags collected (from both voluntary and replacement donors) from January 2015 to December 2020, were 14799 blood bags, out of which 16 bags were discarded due to low quantity. Maximum donations were in the year of 2019, as seen in the (Figure 1).



Out of the total blood bags collected, 411 (0.028 %) blood bag units were discarded due to seropositivity. A low rate of seropositivity was seen in the collected blood bags as the donors are already screened for known seropositivity before donating blood. HBsAg positivity (256 blood bags) was the most prevalent cause of blood bag disposal due to seropositivity, followed by HCV positivity (72 bloods bags), HIV positivity (63 blood bags) and lastly followed by VDRL (16 blood bags). The collected blood bags were segregated according to the guidelines published by Ministry of Family welfare, Government of India.⁹ After segregation of the collected blood bags, total whole blood bags discarded were 373 whole blood bags. Various reasons pertained for discard, ranging from discard due to expiry of 331 (88.74 %) whole

blood bags, followed by, and discard due to clotting of 42 (11.26 %) whole blood bags. Out of the segregated platelet bags, 2588 platelet bags had to be discarded. The most common reason for discard of platelet bags were due to expiry. Being the most prevalent and unavoidable situation, expiry of platelet bags consisted of 2571 (99.34 %) unused, expired bags. The rest 17 platelet bags were discarded due to RBC contamination. Though a total of 1789 FFP bags were disposed due to various reasons from January 2015 to December 2020, the maximum discard of FFP bags were seen in the year 2018 (575 discarded FFP bags) and 2019 (529 discarded FFP bags). FFP bag disposal consisted of a spectrum of reasons for discard, the most common being expiry of FFP bags (47.8 %), followed by cracked FFP (27.1 %), RBC contamination of FFP bags (16 %) and followed by leakage (4.14 %), thawed but not used (4.08 %) and various other reasons (0.88 %) (Figure 2).

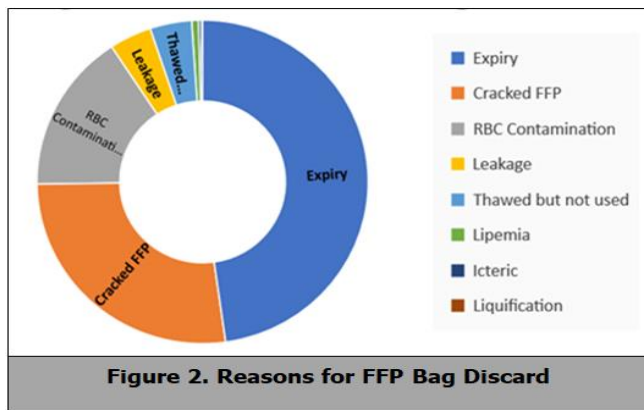


Figure 2. Reasons for FFP Bag Discard

Only 131 bags of PCV and 85 bags of plasma were discarded, the main reasons of discard being expiry of the PCV bags (74.8 %) and cryo - poor plasma respectively (98 %). The other causes of PCV discard were polycythemia and intercity of the PCV. Cryoprecipitate bags that were discarded consisted of a total of 235, out of which 150 (63.8 %) bags were disposed due to expiry of the cryoprecipitate bags. The other common reason for discard of cryoprecipitate was due to leakage of the cryoprecipitate bags.

DISCUSSION

Blood is an essential component of human beings. Blood transfusion has played an important role in saving lives in the medical field since ages. The importance of blood transfusion and collection is known to all, but the quality of blood bags in which blood bags are collected is often neglected. On 15th February 2017, Government of India along with technical committee conducted a meeting to review specifications of blood bags for use in blood banks, after which guidelines were set for manufacture of blood bags. Various specifications of blood bag had been stated along with the importance of blood bag tubing's to be leak proof.¹⁰ If slight manufacturer's error could have been reduced, the wastage of leaking blood bags would have reduced. Discarding of collected blood units is an important cause of wastage of precious resources in a transfusion center. Indian blood bankers have been paying relatively less attention to these facts.¹¹ According to a study done from January 2012 to December 2016, in a Regional Blood Transfusion Centre in Western India, discard due to positive infectious disease serology varied between 202 and 360 bags / year.¹² In another study from South India, the calculated discard rate as widely acceptable WAPI *i.e.* wastage as percentage of issues

then the wastages (Discard rate), was 5.7 % of 5261 units collected and a large amount was related to seropositivity (49 % of the discarded bag) and only one - third of the discarded bag is due to expiry.¹³ In this study 0.028 % of the total discarded blood bag units were discarded due to seropositivity. These inferences that proper history before the collection of blood may it are voluntary or replacement would drastically reduce the seropositivity rate of the collected blood bags. It would in fact also reduce the discard rate, saving the finance and resources. Collected blood bags (both voluntary and replacement) in this study after various tests, were then processed and segregated to various blood components. The discarded blood components mostly consisted of expired blood and blood components. Out of 373 whole blood bags, discard due to expiry were 331 (88.74 %) whole blood bags. Two thousand five hundred and seventy - one (99.34 %) platelet bags out of total 2588 discarded platelet bags were discarded due to expiry. Expiry was the most common cause of disposal for FFP (47.8 %), PCV (74, 8 %) and Cryoprecipitates (63.8 %). A retrospective study done in a blood bank of a tertiary care hospital from the data collected from the blood donations by the voluntary donors from January 2014 to May 2017, stated that main reason for overall discard of whole blood and components was non utilization due to expiry 41.9 % (165 / 393).¹⁴ Department of Blood Bank of Pt. Jawaharlal Nehru Govt. Medical College, Chamba (H.P) conducted a retrospective study over a time period of one year from 1st January 2017 to 31st December 2017. The study found expiry / outdated units to be most common reason for discard (51.4 %). Similar study was done who also showed outdated and expiry of the blood and blood components to be most common cause of discard in their studies.^{15,16} This kind of wastage may be reduced by better management of blood bag collection, storage and utilization before expiry of the product. Proper maintenance of records regarding the expiry of the products can also help in timely utilization of the blood and blood components, which will be indirectly beneficial to the patients as well as to the blood bank. FFP discard in this study had a broad spectrum of reasons ranging from expiry (47.8 %), cracked FFP (27.1 %), RBC contamination of FFP bags (16 %) and followed by leakage (4.14 %), thawed but not used (4.08 %) and various other reasons (0.88 %). This study revealed the main cause of FFP discard as expiry of the FFP bags, whereas a study done in National blood center, Kuala Lumpur, stated the most important reasons for discarded FFP (total 2839 discarded FFP bags) were lipemia at 44 % (1242 of 2839) and leakages at 35 % (1001 of 2839). Various studies stated different reasons as their most common cause of FFP bag disposal. A prospective study done in the blood bank of a tertiary care hospital in central India over a period of 19 months from 1st of November 2009 to 31st May 2011, revealed a different reason of discard of FFP bags. According to that study, the frozen blood components that were discarded consisted of 43 % and 27 % of discarded FFP and cryoprecipitate, respectively, and the most common reason for the discard were due to the leakage.¹⁷ Since the current study states expiry to be the main cause of discard in FFP, it highlights on the need of proper handling and utilization of the FFP in this center. In studies conducted the most common components with various reasons of discard were platelets and similar was found in this study. This study showed discard of 131 bags of PCV out of which 98 PCV bags were discarded due to expiry. Eighty - five bags of plasma were discarded in this study, mainly due to cryo - poor plasma. While discarded cryoprecipitate bags (total of 235) consisted maximum of expired cryoprecipitate bags (150). According to AABB blood

survey report of 2013, the overall percentage of outdated components for WB/RBCs were 3.4 %, platelets concentrates 23.7 %, plasma 1.8 % and CRYO 2.6 %.

CONCLUSION

Blood being an irreplaceable and important resource, needs to be properly utilized and ideally zero percent wastage should be encouraged. Common causes for discard of blood and blood components were non utilization due to Date expiry, Seropositivity for TTI and other causes like leakage, hemolysis, etc. Training programmers for doctors on usage of blood / blood components is highly recommended. Proper maintenance of records, a proper donor selection and deferral guidelines will help in better utilization of the blood bags.

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