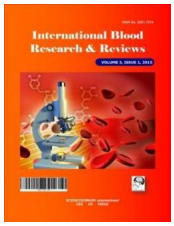

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Blood Wastage Rate in a Sub-Saharan African Hospital Based Blood Bank

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Authors' contributions

This work was carried out in collaboration between all authors. Authors SWA and FFA designed the study and wrote the protocol. Author FFA wrote the first draft of the manuscript, managed the literature searches and analyses of the study. All authors read and approved the final manuscript.

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ABSTRACT

Background / Aims: Efforts are put into making blood safe for the recipient and non-injurious to the donor, and to avoid wastage of blood but blood is oftentimes wasted. This pilot study assessed the rate and reasons for blood wastage in the hospital blood bank of a developing country.
Methods: Questionnaires were administered to doctors from paediatric wards to assess the pattern of blood use and the response of the blood bank to their requests. The blood bank records were also examined for discarded blood units and reasons for discarding were sought. A wastage rate was calculated
Results: The volume of blood requested for ranged from 60 mls to 420 mls. The minimum volume of blood supplied was either 250 mls of packed cells or 500 mls of whole blood. Residual blood was either discarded or returned to the blood bank. Of 5,797 safe blood units for transfusion, 106 units were discarded giving a wastage rate of 1.8%.
Conclusion: The rate of blood wastage might have been underestimated because of substandard record keeping. The wastage of blood through supply of excess blood to paediatric patients was highlighted. The aliquot of blood into 2-4 satellite blood bags at the production unit will greatly reduce wastage.

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1. INTRODUCTION

Blood transfusion is a critical part of clinical care. In many countries the demand for blood outstrips the supply. World Health Organization (WHO) data indicated that 87.5% of developing countries collect less than half of the blood needed to meet the transfusion requirements of their populations [1]. Therefore, many patients requiring blood transfusion do not get access to safe and adequate blood units at the right time. This is mostly due to low blood donation rate. The WHO attributed most of the blood wastage to poor stock management, inadequate storage and transportation. This wastage is responsible for the loss of at least five million blood units every year [2]. Reducing blood wastage through optimal blood management and good blood utilization practice may therefore reduce the impact of low blood donation rates. Physicians, nurses and laboratory personnel are responsible for the wastage, with physicians being responsible for most of the wastages [3].

Blood wastage in developed countries is reported to be between 0.1 and 6.7% [4].While there is limited information on blood wastage in Sub-Saharan African countries. Most times, blood wastage monitoring is not a priority in Sub-Saharan African countries because of other overwhelming problems such as blood borne infection and low blood donor rate. Efforts directed into monitoring avenues of blood wastage can yield benefits when addressed by increasing the number of patients that can be transfused from the limited resources. Blood centers which take measures to identify the causes of wastage and also apply measures to reduce them noticed a significant reduction from 4% to less than 1% [5].

Since there is a wide variation in blood utilization practice, information is required to identify aspects of blood management that could be improved upon so as to reduce blood wastage in the developing countries. Obstetrics and gynaecology and paediatrics teams make the highest request for blood in our hospital [6]. The blood request from paediatrics team is often less than a unit of blood. Therefore this pilot study was carried out to create awareness on the degree of blood wastage in the midst of limited supply of blood units and identify areas where appropriate intervention could be employed to prevent such wastage.

2. MATERIALS AND METHODS

This is a cross-sectional descriptive study carried out in a hospital based blood bank in Nigeria. Two research instruments were employed. Questionnaires were administered to consecutive doctors who requested for blood and blood products from the paediatric ward over a one month period. The questions were designed to assess the reasons for the request of blood transfusion, type of crossmatch requested, the pretransfusion haematocirt and later the post-transfusion haematocrit. In addition, the number of units or volume of blood requested for and supplied; the type of blood product requested and what was supplied were noted. Information was obtained from the blood bank records on discrepancies between number of units requested for and the number of units supplied and utilized. The handling of blood outside the blood bank was assessed by asking for the number of blood units ordered but unused and the reason for non-utilization.

Information on the amount of blood collected each month, number of blood units negative for transfusion transmitted infections (TTI), number of blood units discarded and reasons for discarding them were obtained from the blood bank record. Blood units that were discarded because its maximum allowable storage time was reached were recorded as expired or outdated units. Wastage rate for safe blood was calculated as follows:

> (Number of TTI seronegative blood units that were discarded / Total number of TTI seronegative blood units) X 100

The data were entered into SPSS version 15 and analyzed using descriptive statistical method.

3. RESULTS

There were 31 respondents, who were mainly junior doctors (house physicians and Registrars). The commonest reason for blood request in the paediatric ward was anaemia in 29 (93.6%) of 31 patients. The average haematocrit (hct) was 16.4% (range 9-28%). A full crossmatch was requested for in 24 (77.4%) of peadiatric patients while uncrossmatched blood was administered to 7 (22.6%). Whole blood was requested in 21 (67.7%) of cases while 10 (32.3%) of the requests were for red cell concentrate. Blood

requirement for children were calculated based on the patients weight hence the volume of blood requested ranged from 60 mls to 420 mls (Fig. 1). The minimum volume of blood supplied from the blood bank irrespective of the requested volume was 250 mls of packed cells and 500 mls of whole blood. Blood in excess of the requested volume was returned to the blood bank by 7 of the paediatricians. There was no record of what was done the returned blood unit in the blood bank record. The blood in excess of the requested volume that was not returned to the blood bank was discarded on the ward by the nurse in charge of monitoring of the transfusion. The blood units discarded on the wards were discarded according to ethical guidelines for discard of blood units in the hospital. Febrile non-haemolytic transfusion reaction was observed with one unit and thus returned to the blood bank.

Of the 5,797 screened blood, 106 were discarded as expired blood units hence wastage rate was 1.83%. No other unit of blood was recorded to have been discarded prior to its expiration date.

A breakdown of the discarded units of blood is shown in Fig. 2. Reasons for expired blood units include blood reserved for patients but unutilized and units crossmatched for surgery which was rescheduled and eventually was not used for the particular patient, such units were usually kept until the requests were cancelled by the surgeon. Record was not found of Units of blood returned to the blood bank and were discarded because it was out of blood bank for longer than allowable duration, return unused units after their temperatures exceeded allowable limits and improperly handled.

4. DISCUSSION

In this study, we observed that over 9 months period, blood wastage rate was 1.8%. This observed wastage is lower than that observed in the South Eastern part of the same country [7] but high when compared with the report from Uganda, where blood wastage was zero [8].A blood center in Kuala Lumpur in Malaysia recorded 2.3% of whole blood unit wasted and the main reasons for discarding blood were due to technical specifications [9]. Beckwith et al reported 3% wastage in United Kingdom [10], while in India the blood discard rate was between 0.6 and 14.6% [11]. In most cases the wastage was attributable to expiration of the platelet concentrate and not red cell units. The reason for the discard of red cell units in India was seropositivity for transfusion transmitted infections. This suggests that there is a need to appraise the blood inventory and data management. Although there is a proportion of discarded blood that is inevitable in practice, but the blood stock rarely reaches its expiry date [12]. The maintenance of the cold chain which adversely affects storage of blood is an issue of concern in many blood banks in sub-Saharan Africa but this is not the case in this study. It shows that in situations where cold chain is not an issue, efforts should be channeled into the efficient use of blood. In view of a correlation between blood stock level and wastage [13], the wastage of 1.8% of safe units of blood could be improved upon considering the fact that reasons for the wastage can be easily rectified by concerted effort by all concerned and provision of adequate blood is a challenge. The reason for blood wastage in another blood center in Nigeria was expiration of the blood units [14]. It is imperative to address blood stock management and reasons for keeping blood until expiratory date. It has been suggested that training of blood bank staff in blood bank management and transparency of inventory can help minimize blood wastage [15].

An Iranian hospital reported that blood group B+ was the most frequently discarded group [16]. In this study, the blood groups of the commonly discarded expired blood was not documented which also is a poor auditing system. However, the blood bank data showed similarities of blood group pattern between patients and donors. Another reason given for the expiration of blood was indefinite reservation of blood which resulted from incessant cancellation of surgery due to other factors not within the control of the blood bank. The repeated rescheduling of the surgery eventually results in blood wastage after the expiration of the reserved unit of blood. This practice was thought to reduce cost of re-processing the blood after each rescheduled surgery. Prompt re-allocation of the reserved but unutilized blood units within a 24 hours period will increase availability of blood to patients and reduce wastage [13] which is the regulation in our blood bank. The fact that this policy is often not adhered to is also a result of poor blood management. In addition, by combining the cross-matching with an expiry date, the "cross-match expires" but not expired from the product side. The blood units are then recycled in the blood bank. A trusting cooperation between

surgeon/anesthesiologist and blood bank could allow cross-matched blood units to be kept in the blood bank for urgent delivery in case of complications/post-surgical bleeding.

The cost of collection, processing, testing and distribution of blood and blood products is enormous even when blood donation is voluntary. The technicality of providing safe blood in addition to its cost is considerable in sub-Saharan where blood units are provided by patient -recruited donors [17,18]. Though it is reported that a unit of blood collected through a centralized system is more expensive than replacement donation [19,20] this may not be true when the cost of scouting for a donor by the patient, is added to other charges for processing the blood. This is not taking into consideration that the donor might have even surreptitiously being paid to donate blood. This transferred cost to patients is often not appreciated.

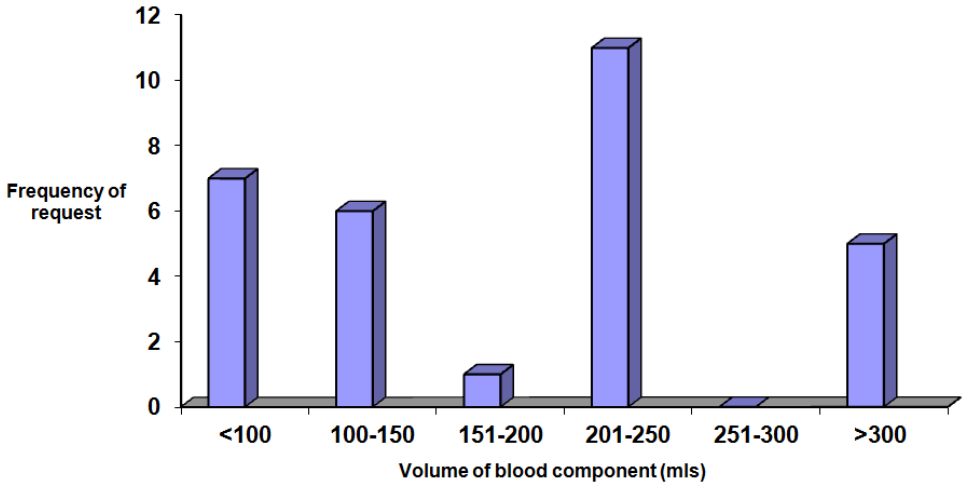

Fig. 1. Frequency of requested volume of blood component in peadiatrics

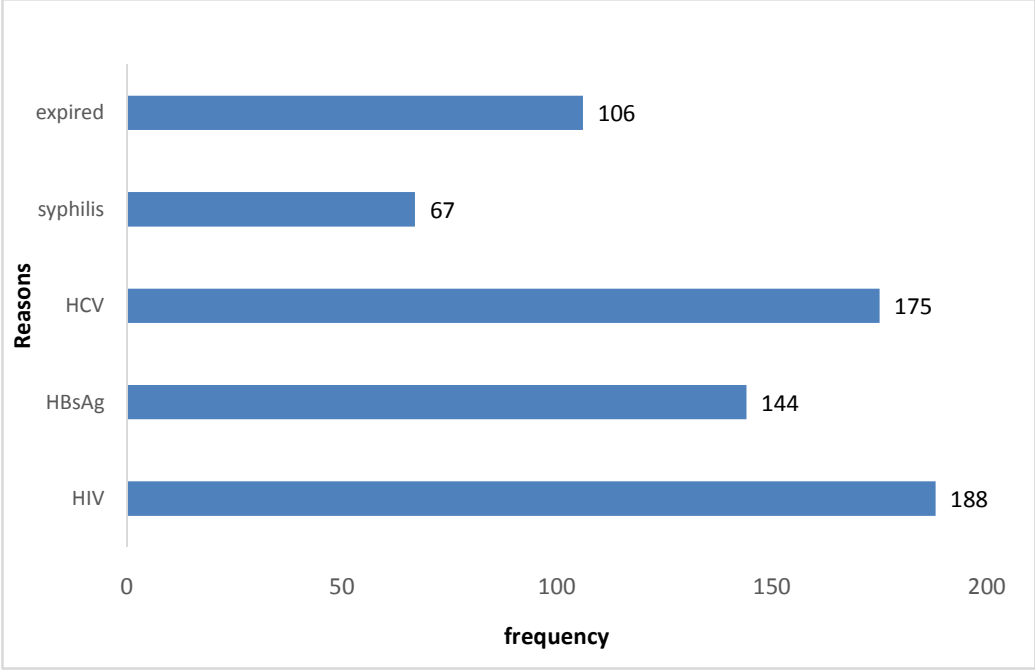

Fig. 2. Reasons for discarded blood units

There is no evidence that the paediatric team request for blood is in excess of that required. This report is in contrast to a study in United State that showed that most of the blood ordered in the peadiatric ward was not utilized [21]. In this study, the supply of blood by the blood bank to paediatric patients was in excess of that required due to the use of adult blood donor bag for children, particularly in neonate who might need just 60mls of blood. The request for whole blood are often made to carry out exchange blood transfusion. In some hospitals, a unit of blood is shared among two or three children and are transfused simultaneously or in succession. This practice is employed when two or three children are of the same blood group [22]. This system is prone to the risk of blood contamination. In our opinion, the use of paediatric blood bags or the dispensing of 500 mls of blood into 3-4 satellite bags at the production unit is the way forward.

Unlike in other reports, there was no record of the discard of unexpired screened blood due to reasons such as leakage from blood bag, out of blood bank for longer than allowable duration, overweight, underweight and haemolysis or clot in blood bag [10,23,24]. Other authors have also documented improper handling, and failure to return unused units before their temperatures exceeded allowable limits, cancelled orders, death of the patient, the patient not ready for the transfusion [25]. Approximately 11% of blood units dispatched from the blood bank are returned [26] but the proportion of these that are discarded were not documented. Even though, all these were not recorded in this study, this does not rule out their occurrences which would suggest therefore that the present estimate of blood wastage might be an underestimation. It is therefore imperative that a structure be put in place to monitor systemic wastage of blood.

5. CONCLUSION

The technical and financial resources of providing safe blood are enormous, and besides, this is a scarce and precious commodity. Therefore avoidable blood wastage should be addressed. Some avenue of wastage may have been overlooked and possibly undocumented. The unfortunate wastage through the supply of excess blood to paediatric patients needs urgent attention. Poor record keeping may also account for underestimation of the blood wastage. This study should hopefully increases awareness of the need to regularly monitor blood utilization and wastage.

CONSENT

It is not applicable.

ETHICAL APPROVAL

The project was approved by the Chairman Medical Advisory Committee (CMAC) and Director of Clinical Services and Training at the time this study was conducted. It was conceived under the auspices of the Hospital Transfusion Committee.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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