Cost effectiveness of autologous blood transfusion – A developing country hospital's perspective

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Summary

An autologous blood donation program was set up at National Orthopaedic Hospital, Igbobi Lagos in 1992 in response to the rising sero prevalence of HIV observed in our "relative replacement" donors. A retrospective batch analysis of patients who received autologous transfusion and those who received homologous blood in our hospital in 1997 was carried out.

Based on hospital charges, the mean charge (from the day of operation and excluding the cost of surgery) was $116 (±$7), median $102 for those who donated and used their own blood compared to the mean charge of $259.7 (±116.3), median $224, for homologous blood recipients (P=008). This was found to be due to a significant difference in the means of length of hospital stay of 21 days for autologous blood recipients, 34 for homologous blood recipients (P=0.009). The rate of infection was 85.7% for homologous blood recipients and 14.3% for autologous blood recipients.

There was no significant difference in the means hospital charges, length of hospital stay and rate of infection in the entire population of patients who received blood transfusion when analysed by ward and consultant. We conclude that homologous blood transfusion in this hospital is significantly more expensive than autologous transfusion mainly due to greater infective morbidity in homologous blood recipients.

Keywords: ***Autologous blood transfusion, Cost effectiveness.***

Resumé

Un programme sur la donation du sang autologous a été organisé à l'Hôpital National d'Orthopédique. Igbobi - Lagos en 1992 suite à l'augmentation de zéro prévalence de VIH remarquée chez nos donateurs "remplacement relatif". une analyse lot rétrospectif des patients qui ont reçus une transfusion autologous et ceux qui ont reçu du sang homologous dans notre hôpital en 1997, a été effectuée.

D'après le frais prélevé par l'hôpital, le frais moyen (à partir du jour d'opération et à l'exclusion du coût de la chirurgie) était $116(±$7) médiane $102 pour ceux qui sont les donateurs et qui ont utilisé leur propre sang par rapport au moyen prélevé de $259.7 (±$116,3)médiane, $224, pour les receveurs du sang homologous (P=008). On a remarqué qu'il est attribuable à une difference importante dans la durée moyenne de séjour d'hospitalisation de 21 jours pour les receveurs du sang autologous, 34 pour les receveurs du sang homologous (P=0,009). Le taux d'infection était 85,7% pour les receveurs du sang homologous et 14,3% pour les receveurs du sang autologous.

Il n'y avait aucune différence importante en matière de moyens de frais prélevés d'hôpital, durée d'hospitalisation et le taux d'infection chez la population de tous les patients qui ont reçu la transfusion sanguine quand on a fait une analyse par rapport à la salle et Consultant.

Autant que nous sachons, nous concluons que la transfusion sanguine homologous dans notre hôpital est sensiblement plus chère que la transfusion autologous principalement attribuable au niveau élevé de la morbidités d'infection chez les receveurs du sand homologous.

Introduction

The past decade has witnessed a worldwide evolution in surgical transfusion practices driven by the recognition of new risks of transfusion. Advances in technology and changing demands for blood products due to a better understanding of the body's physiological processes and increasing use of haemopoietic cytokines contributed immensely to changes in surgical practices. Additionally, pharmacological agents are employed to reduced blood loss during surgery. There is increasing use of autologous blood in orthopaedic surgery[1-3]

Cost considerations of autologous blood donation and transfusion has been an issue in the transfusion medicine arena in the past five years[1-8]. While the cost of donation and handling appear to be higher in regional collection centres, the experience in some hospital blood banks in Europe, the United States and some developing country appear to be otherwise[5,9-10]. This higher cost is mainly due to the cost of handling and discarding of unused units. The cost of transfusion has not been clearly evaluated.

The increased cost of autologous donation has been attributed to the additional time required for scheduling donor interviews, record keeping and to the fact that patients are not reimbursed by insurance for this procedure[7,11]. Using mathematical models assuming low probability of infection by transfusion transmissible infections, some authors[1,12] have concluded that the gains achieved by autologous transfusion are small compared to the increased cost of the procedure.

This is a report of a pilot study to compare the actual cost of transfusion outcome inpatients who received autologous blood with those who received homologous blood.

Patients and methods

This was a retrospective batch analysis of patients who received autologous transfusion and those who received homologous blood at the National orthopaedic Hospital, Igbobi, Lagos in 1997. Patients presenting in our hospital for major or intermediate surgical procedures likely to require blood transfusions were counselled using a fact sheet developed to educate patients about autologous blood. After physical examination, scheduling for donations were done upon payments of assessment fees. The number of units of blood collected from each patient was determined according to the hospital's maximum surgical blood order schedule. The dates for the operations were

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fixed and 72 hours allowed for collection one unit of blood, 10 days for 2 units, 17–21 days for 3 units. The haematocrit level had to be greater than 30% each time. Eligible patients were both males and females aged between 15 –70 who did not have hypertension, cardiac disease, sickle cell disease, chest infection. Those for surgery for malignancy and those for surgery not likely to require blood transfusion were excluded.

The patients were placed on haematinics (Fersolate 200mg three times daily for four weeks, Folic acid 5mg daily for four weeks and vitamin C 200mg three times daily for two weeks) after donations and the blood collected had a unique identification label indicating the patient's full name, date of birth, date and time of collection, expiry date of the blood unit, hospital number, autologous donor number and sex, which each patient was required to sign. ABO and Rhesus grouping were performed in each case and the units were stored separately from homologous blood. Immediate spins with samples from the patients were performed before issuing the blood. Both the autologous and homologous blood were stored in CPDA – 1 bag for a maximum period of 35 days.

Patients who received homologous blood were required to bring replacement donors. These were subjected to appropriate screening tests (HIV I & II, Hepatitis BsKg and VDRL) and blood was issued out after performing the usual blood grouping and compatibility tests. HIV screening was done by ELISA, (Capillus, Cambridge Diagnostics Ireland Ltd) and (Recombigen, Cambridge Biotech Corporation). VDRL and hepatitis screening were by latex method (LDP Biotech laboratories Ipswich, Suffolk, UK).

Patients who pre-donated and received autologous blood were matched with those receiving an equivalent number of homologous bloods according to the age group, sex, type of surgery, date of surgery and consultant. The duration of hospital stay was calculated from the date of surgery. Infection rate was obtained from the clinical notes with confirmatory laboratory reports. The hospital charges excluded the cost of operations, implants, and any charges paid prior to the date of operation as well as the cost of drugs procured from outside.

A comparison was made between those who received homologous blood and those who pre-donated and were transfused with their own blood. Data was entered, edited and analysed using the EPI INFO (Ver 6) statistical software. Frequency tables were generated for categorical variables. Means and standard deviations were computed for quantitative variables. For comparison of means the analysis of variance technique was employed while the Chi-square test was used for the comparison of proportions. Differences were said to be statistically significant where the P-values were equal to or less than 0.05.

Results

There were 21 autologous blood donors and recipients, 19 males, 2 females mean age 28.6, age range 16 – 41, compared to 18 homologous blood recipients, 9 males, 9 females, mean age, 34.8, Age range 17 – 50. Table 1 shows the type of surgical operations performed on the patients who received autologous blood transfusion or homologous transfusion. The mean number of units transfused were 1.8 units for for autologous blood 2.1 units for homologous blood. Fourteen (14) of the subjects studied had post-operative wound infection (klebsiella, proteus species. Staphylococcus aureus were the organisms most frequently isolated). 2 out of this number had autologous transfusion while 12 had homologous transfusion. Twenty five (25) did not have postoperative infection and 19 of them had autologous transfusion while 6 had homologous transfusion. The relative risk of infection for autologous patients was 5.06.

The patients who received autologous blood had a mean length of hospital stay of 21 $\pm$ 12.3 days compared to a mean length of stay of 34.6 $\pm$ 15.1 days for those who received homologous blood. This difference was significant, (P=0.009). The mean hospital charge for autologous = r recipients was \$116 ($\pm$78.2) compared to \$249.7 ($\pm$116.3) for homologous blood recipients (P=0.008).

Table 1 Type of operation and blood received

Type of operation	No of patients receiving Autologous blood	Homologous blood
Ligation and excison of Saphenous vein	1	–
ORIF with plate and screw	5	6
Putti-Platt Op for recurrent dislocation of the shoulder	1	1
Extensive split skin grafting	3	2
Removal of implant	4	1
Angle-blade plating	2	2
K nail insertion	3	4
A/K, B/K Amputation	2	2
Total	21	18

Discussion

From this study, the cost of transfusion of homologous blood is significantly higher than that of transfusing autologous blood. This is due to the increased infective morbidity in homologous recipients leading to increased length of hospital stay. The cost-effectiveness of autologous pre-donation and transfusion in developed countries remains controversial[1-8]. Increased cost has been mainly due to the discarding of units that were pre-donated but not transfused as well as a more labour intensive donation process. This is particularly so where blood has not been collected in the hospital where it is used thus attracting shipping and handling charge not covered by insurance[7]. The cost considerations in studies from developed countries take into consideration the rather low probability of the risk of acquiring HIV, Hepatitis B and C infections due to stringent, voluntary donor screening and rigorous testing of every unit of blood[1,12]. There is also a universal practice of obliging every patient who wants to donate for himself. Other studies support our finding of increased hospital costs of homologous

transfusion when compared with autologous transfusion.

In one study, the incremental cost is about $100 – $150 per unit of homologous blood transfused when compared to similar patients receiving no transfusions or 1.5 units of autologous blood[5]. Autologous transfusion has been shown to reduce the short-term morbidity associated with homologous transfusion[13,14].

The observed increased incidence of post-operative infection in our patients who received homologous transfusion is well documented[5,11,15]. This has been attributed to clinically significant immunomodulatory effects involving altered immune regulation, including altered function of macrophages, abnormal migration of cells, suppression of the lymphocytic response to antigens and a decreased ratio of helper to suppressor T cells. The homologous transfusion increases humoural immunity and decreases cell-mediated immunity. In patients undergoing hip replacement or spine surgery, there is a 7–10 fold increase in infection rate in homologous blood recipients when compared to autologous recipients. The use of homologous blood was associated with a significantly increased length of hospital stay, resource consumption and attendant hospital charges. Multiple linear regression analysis demonstrated that the number of units of homologous blood rather than surgeon and type of surgery was the most statistically significant predictor of length of hospital stay and hospital charges[16]. This is in keeping with our finding of no significant difference in type of consultant and means of hospital charges in both groups.

Conclusion

In this pilot study homologous blood transfusion in our hospital appears to be significantly more expensive than autologous blood transfusion. This is due to increased infective morbidity and increased length of hospital stay in patients who received homologous blood compared to patients who received their own blood.

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