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ONE YEAR CLINICAL AUDIT OF THE USE OF BLOOD AND BLOOD COMPONENTS AT A TERTIARY HOSPITAL IN NIGERIA

OP Arewa
Department of Haematology and Immunology, College of Health Sciences, Niger Delta University, Nigeria.

ABSTRACT

Background: The appropriate use of blood and blood components remains a formidable challenge faced by clinicians particularly in a developing country like Nigeria. The inadequate supply of safe blood implies that measures aimed at ensuring judicious use of the available supply should be continually identified and explored.

Study design: A prospective study to evaluate all blood and blood component transfusions over a period of one year from January to December 2004 was done. The appropriateness of the transfusion with respect to the clinical state and the transfusion needs of the recipient was assessed by a Haematologist.

Results: A total of 682 transfusion episodes were reviewed and analyzed. The commonest indication for use blood/blood component was severe anaemia in 38% of cases. Twenty nine percent of transfusions for moderate anemia, and 36% of fresh frozen plasma transfusions were found to be unnecessary. Inappropriate transfusion is most marked in the setting of platelet transfusion with 81% of platelet transfusion being inappropriate.

Conclusion: Enhanced capacity for component preparation, regular auditing of transfusion practices as well as improved communication between the clinicians and laboratory physicians will lead to more judicious use of blood component therapy. The need for the development of guidelines for blood component use in hospitals in line with the national blood transfusion policy is highlighted.

Key Words: Clinical audit; Blood components; inappropriate transfusion. *(Accepted 5 December 2008)*

INTRODUCTION

Blood transfusion therapy has evolved remarkably over the years since its introduction into clinical practice. It has also become an indispensable life saving measure in patient care. The use of blood and blood components in clinical practice has nonetheless continued to face challenges demanding sustained efforts aimed at improvement in its use. Prominent among such challenges is the issue of transfusion transmitted diseases as well as the unavailability of a reliable safe donor pool particularly in developing nations. The goal of modern transfusion therapy is to provide appropriate replacement therapy with blood components (red cells, platelets, fresh frozen plasma, cyoprecipitate etc) as opposed to whole blood for patients with specific haematologic deficiencies. [1] Appropriate use of components avoids some of the hazards associated with the use of whole blood, and at the same time makes maximal use of this valuable resource. Whenever indicated, blood must be used in such ways as to minimize patient exposure to potential hazards, conserve a limited resource and to contain costs. The appropriate use of safe blood and blood components however remains a formidable challenge faced by clinicians globally and in particular, the developing nations. In Nigeria, the advent of the National Blood Transfusion Service (N.B.T.S) with zonal centres in the six geo-political zones of the Country in the last three years offers much hope of improvement in the situation. Assessment of the impact of the N.B.T.S on the overall use of blood components and blood transfusion services in the country is however still in its early stages. Two audit methods most widely used in assessing the effectiveness of transfusion service are a systems audit and a medical practice (clinical) audit. [2] Clinical audits are performed to assess the appropriateness of transfusion practices while systems audit assesses the operational aspects of transfusion service. A one year clinical audit of the use of blood and blood components at the Obafemi Awolowo University Teaching Hospital Ile-Ife, southwest Nigeria is presented.

Correspondence: Dr O P Arewa,
Email: oladimejiarewa@yahoo.com

STUDY DESIGN

Over a period of one year between January 2004 to December 2004, blood and blood episodes carried out in the hospital were prospectively evaluated. A transfusion episode being the interval in patient care from the time of the prescription and ordering of a

Defined number of units of whole blood or blood components for a patient and the time of completion of administration of these blood components to that patient.[3] Transfusion 'episodes' are characterized in terms of only one blood unit or blood component type.[3] Component preparations in this study were done through standard procedures.[4] Fresh frozen plasma is prepared by centrifuging freshly donated whole blood (within 6 hours of collection) collected in double bag in a cold centrifuge at a speed of 3000g for 20minutes and the plasma supernatant separated in a pilot bag using plasma expressor. Platelet concentrate preparation is done by double a centrifuge of fresh whole blood; at 1000g for 6-9mins and then after the separation of the supernatant into a satellite bag, at 3000g for 20mins. The supernatant is discarded and the platelet resuspended in 50-60mls of plasma.

However in the preparation of platelet concentrates, non availability of multiple bags resulted in the use "partial platelets concentrates; PPC" (Author generated). Freshly collected whole blood is allowed to settle under gravity or slightly centrifuged using a bench centrifuge and a large fraction of the supernatant plasma is then discarded to obtain the "partial platelets concentrates". The age, sex, ward of admission, primary diagnosis, indication for transfusion as well as the blood component transfused was summarized for each patient. The measured outcome is the appropriateness of the transfusion with respect to the clinical state and need of the transfusion recipient as assessed by a Haematologist in the absence of specific hospital guidelines.

The clinical and laboratory data assessed include; Red cells: Haemoglobin level and clinical parameters (pulse rate and blood pressure); Platelets: Platelet count and presence or absence of bleeding; Fresh frozen plasma (FFP): Results of coagulation tests (prothrombin time [PT] or international normalized ratio [INR] and activated partial thromboplastin time [APTT]). Coagulation time prolongation by more than 50% was taken as reference[5]. In view of the potentially devastating effects of minor haemorrhage associated with neurosurgical procedures, these were exempted from the criteria for FFP use.[5]

RESULTS

A total of 682 transfusion episodes were reviewed and analysed. The distribution of the various blood component types used for the duration of the study is shown in table1, while the distribution of blood component transfused per ward is shown in table 2. Red cell transfusion constituted 67.7% of the total component use. Of this, the Paediatrics wards accounted for 33.3% while the Adult Medical,

Obstetrics and Gynaecology, and the Surgical Wards accounted for 26.1%, 18.6% and 21.8% respectively. Platelet preparations including the use of partial platelets concentrate in lieu of platelet concentrates accounted for 15.9% of the total component use. Use of whole blood accounted for 5.7% of total transfusions while fresh frozen plasma (FFP) transfusion accounted for the remaining 10.5% of the transfusions carried out during the study period. The indications for use of the various blood/blood components are summarized in table 3. Overall, the commonest indication for use of blood/blood component was severe anaemia in 38.5% of cases. Moderate anaemia with symptoms and surgery accounted for 9.9% and 17.6% respectively.

Inappropriate transfusion is most marked in the setting of platelet transfusions in this audit as 81% of such was with partial platelet concentrate. Red cell transfusion is the least inappropriately used blood component in this study with an overall incidence of 3.4%.

Table 1:**Table Showing Distribution of Components Transfused.**

Component	No	%
Packed cells	462	67.8
*Partial platelet concentrates	88	12.9
Platelets	21	3.1
Whole blood	39	5.7
Fresh frozen plasma	72	10.5
Total	**682**	**100%**

* Used in lieu of platelet transfusion.

Table 2: **Summary of Transfusion Episodes for the Different Clinical Wards of Use.**

	Blood Component				
Ward	**Whole blood n=39**	**Red cells n=462**	**Plasma n=72**	**Platelets n=21**	**Partial Platelets Concentrates n=88**
Adult Medical	10(25.6%)	121(26.2%)	21(29.2%)	12(57.1%)	28(31.8%)
Adult Surgical	14(35.8%)	101(21.9%)	19(26.4%)	nil	16(18.2%)
Paediatrics	9 (23.1%)	154(33.3%)	24(33.3%)	9(42.9%)	32(36.4%)
Obst. & Gyn	6 (15.5%)	86(18.6%)	8(21.1%)	nil	12(13.6%)

Table 3: **Transfusion Episodes of Whole Blood, Red Cells, Platelets and Fresh Frozen Plasma.**

Indication	Total No	Inappropriate	Appropriate
Whole blood			
Acute blood loss	21(53.8%)	0	100%
Surgery/Perioperative	14(46.2%)	100%	0
Red cells			
Anaemia Hb<7g/dl	178(38%)	0	100%
Anaemia Hb7-10g/dl	62(13.4%)	16(29%)	71%
Surgery	106(22.9%)	0	100%
Haemodialysis	89(19.1%)	0	100%
Non-regenerative marrow	27(6.4%)	0	100%
Platelets and partial platelet concentrate			
Therapeutic for bleeding	78(71%)	63(80.7%)	19.3%
Prophylaxis for thrombocytopenia	11(29%)	25(80.6%)	19.4%
Fresh Frozen Plasma			
Prophylaxis in operative period	28(39%)	10(36%)	64%
Therapeutic for Bleeding			
Correction of coagulopathy e.g			
Liver disease, DIC.	39(54.1%)	0	100%
Correction of single factor			
Deficiencies (suspected Haemophilics)	5(6.9%)	?	?

Sixteen cases out of 64 transfusion episodes (29%) were deemed inappropriate as such cases were not symptomatic. Ten of the twenty eight peri-operative transfusions using FFP (37%) were deemed inappropriate as they did not meet the study criteria.

DISCUSSION

The use of whole blood for transfusion accounted for 5.7% of total transfusions in this study. A similar study in 1996 reported that 60% of transfusion requests by clinicians over a five year period at Ilorin, Kwara State North central Nigeria were for whole blood. [6] The present study may be a preliminary indicator that there may be a better awareness and appreciation of component transfusion by clinicians over the period. Unfortunately, the increased awareness of clinicians of the need to use component transfusion as against whole blood transfusion has not been met by a corresponding enhanced capacity of our blood banks towards the provision of blood components for clinical use. The inauguration of the National blood transfusion service (N.B.T.S) in 2005 expectedly brought a renewed hope of improvement in the state of blood transfusion service in Nigeria. However preliminary assessments show that the N.B.T.S is still saddled with the immediate problem of the recruitment of a reliable donor pool, thus the provision of a regular supply of safe blood components to hospitals across the length and breadth of the Country as at when needed from the zonal transfusion centers is yet to be realized. In contemporary transfusion practice, there is little justification for whole blood transfusion. An area of current debate in the area of transfusion for trauma patients relates to the management of trauma patients with massive bleeding as a result of the risk of coagulopathy. [7,8] In developed transfusion centers where component therapy is the rule, it has been proposed that coagulopathic trauma patients be primarily resuscitated with FFP in a ratio of 1:1:1 to red blood cells and platelets, virtually receiving "reconstituted whole blood." Thus transfusion of fresh whole blood is justified in such circumstances.

However none of the whole blood transfusions given peri-operatively in this audit could be justified and were thus adjudged inappropriate.Red cell transfusion is the least inappropriately used blood component in this study, however the situation can still be improved upon. Anaemia (reduction in haematocrit for the age and sex in a patient) is described as mild if the packed cell value isgreater than or equal to (>) 30% and physicians should be discouraged from routinely transfusing patients with mild anaemia.[4] The "optimal" haemoglobin concentration for pre and post operative patients depends on the patient and the belief that a haemoglobin value <10g/dl (haematocrit <30%) indicates a need for red cell transfusion has been challenged. This is because cardiac output does not change significantly until the Hb decreases <7g/dl. [9,10] Tissue oxygenation is generally maintained at haematocrit levels as low as 30% as long as the blood volume remains normal.[4]

Between the limits of haematocrit levels 18%-30%, (moderate anaemia), the decision to transfuse should be based on a consideration of the patient's age, cardiovascular and respiratory status, activity level, symptoms, underlying diagnosis and the state of the bone marrow activity. [4] Many anaemic patients at or above haematocrit of 25% (Hb 8g/dl) do not need transfusion. [4] However, the physiologic adjustments to chronic anaemia have a limit and particularly in the elderly patients with myocardial or vascular disease,

compensated. The risks of bleeding in surgical and obstetric patients are determined by the extent and type of surgery, the ability to control bleeding, the actual and anticipated rate of bleeding and the consequences of uncontrolled bleeding.[11] Severe anaemia (haematocrit =18%, Hb =6g/dl) is usually an indication for blood transfusion as the risk of cardiac decompensation is high.[11]

In about a third of cases (29%) of packed cell transfusion for moderate anaemia in this study, the transfusion was not necessary as such recipients were well compensated and there was no dire need for it in the clinical circumstance. This reflects a two fold value of inappropriate use of red cells over the reported incidence by Tuckfield et al in Australia prior to the institution of prospective monitoring of transfusion requests with the aim of reducing inappropriate use of blood products.[5]Platelet transfusion is usually indicated in patients with increased risk of bleeding from thrombocytopaenia. Prophylactic platelet transfusion is however ineffective when thrombocytopenia is due to increased platelet destruction. Surgical and obstetric patients with microvascular bleeding usually require platelet transfusion if the platelet count is less than 50 x109/l.11 Platelet component transfusion in this study is largely inappropriate. This is mainly due to the non-availability of multiple blood bags necessary for the separation of the blood collected. The non availability of multiple bags and equipment such as cell separators is the most important single factor limiting component preparation from the collected whole blood in this centre. A modified form of component transfusion used in lieu of platelet concentrate transfusion is what is referred to in this study as partial platelet concentrate. This results in wastage of large volumes of plasma that would otherwise have been prepared as fresh frozen plasma but is discarded. This waste is even further appreciated when considered in the context of the non serviceable requests for FFP received during the same period of study as a result of the "non-availability" of FFP.

Furthermore low manpower capacity for component preparation is another major factor responsible for the inappropriate use of blood components. [12] Fresh-frozen plasma is indicated for urgent reversal of warfarin therapy, correction of known coagulation factor deficiencies for which specific concentrates are unavailable, and correction of microvascular bleeding when prothrombin and partial thromboplastin times are >1.5 times normal. [5, 11] Due to the potential case fatality of microhaemorrhages for neurosurgical procedures however, they are usually an exception to this rule. [5] The use of FFP by clinicians in this study was often left to empirical reasoning, mainly as a result of inability of the laboratory to carry out coagulation studies; PT (with INR) and APTT due to lack of reagents to perform these tests. In such circumstance, it is difficult to comment on the appropriateness of FFP transfusion.

A limitation to this study is in the context of the assessment of the appropriateness of FFP transfusion for single factor deficiency states. This is because factor assays are not done routinely on suspected Haemophiliac patients, making the judgment on volume of plasma to be administered largely empirical. In all, thirty six percent of FFP transfusion was deemed inappropriate.

This value compares closely with the value of 30.2% reported by Makroo et al for FFP requests in patients who had normal coagulation parameters.[13] Prospective monitoring of transfusion requests by Haematologists has been advocated as a measure to reduce the incidence of inappropriate transfusion of blood components and has been largely successful in reducing inappropriate use of red cells and platelets in centers where this has been introduced. [5] Partial successes have also been recorded for FFP use. This probably reflects uncertainty about the appropriate clinical guidelines for FFP use. [5, 14-16] The institution of a pre-transfusion approval program requires that Haematologists agree on blood components indications preferably through the instrument of a consensus document on this subject. [17] A rational approach for improvement on blood component use is the development of a framework, a working document on blood component usage which is widely accessible to clinicians. Blood is a scarce resource and ensuring its clinical effectiveness requires investment-both human and financial. The present study corroborates the fact that appropriate use of blood and blood components in most blood banks in Nigeria as in many developing countries is a real and present challenge.

The establishment of effective and functional transfusion committees in each hospital in which transfusion takes place and the establishment of a blood transfusion policy to monitor and evaluate blood usage is indispensable to the correct and appropriate use of blood and blood components.[18] The World Health Organization recommends that each transfusion centre develops a policy/document in accordance with the National Blood Transfusion policy.[18] The policy/procedure document refers to a document that is for hospital wide use and that is authorized in accordance with hospital clinical policy/procedure processes for such documents. The rational use of blood and blood products is challenge for which the National Blood Transfusion Service is well positioned as a central coordinating unit for such committees in Nigerian hospitals. The absence of a Hospital guideline for blood transfusion in the centre of the present study is a major constraint at ensuring the judicious use of blood and blood components.

In addition to the provision of consumables and equipment necessary for component preparation, regular audits, ppropriate training of medical staff, conducting regular CMEs to rationalize the use of blood components would serve to improve on the current situation of inappropriate use of blood component

anaemia is poorly tolerated and the physician must decide when the patient is approaching this limit. Therefore in clinical situations of moderate anaemia, such as anaemia of chronic illnesses, the decision for transfusion should be taken in context of the patient, and transfusion may not be necessary if the patient is well therapy. A regular audit of blood request forms by the Haematologists as is introduced in some centers[13] will further improve on optimization of blood transfusion practices.

In conclusion, the study highlighted the inappropriate use of blood component therapy in the centre of study. The non-availability of cell separators, multiple blood bags (double, triple bags and quadruple bags) for component preparation, coupled with low manpower capacity for component preparation in addition to a lack of a clear policy on blood component use constitute major constraints.

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