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ORIGINAL ARTICLE

Assessment of the clinical transfusion practice at a regional referral hospital in Uganda

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SUMMARY. The aim of this study was to determine the indications for transfusion, blood ordering practices and post-transfusion complications, and to assess the clinical transfusion practice at Mbarara Regional Referral Hospital (MRRH) in Mbarara, Uganda. There are no guidelines on the appropriate use of blood at MRRH. Therefore, there was a need to assess the local clinical transfusion practice. Patients' hospital files were studied for evidence of blood transfusions in 2008. All five wards were reviewed and details on the transfusion process were recorded. A total of 1730 patients (median age, 19·0 years; range, 1 day to 88 years; female-to-male ratio, 1·4), for whom blood was cross-matched, were studied. Of these, 1674 (96·8%) patients actually received transfusions, which were as whole blood in 58·4% of recipients. The mean number of units per recipient was 1·7 and the cross-match-to-transfusion ratio was 1·3. The three most frequent indications for transfusion were malaria (38·8%), bleeding (27·1%) and other infections (16·1%). There were no records for pre-transfusion haemoglobin, compatibility testing, transfusion start-times and vital signs in 30·2, 51·8, 21·5 and 97·6% of the recipients, respectively. Transfusion reactions were recorded for 10 (0·6%) patients. Although there was no evidence of blood wastage, inadequacies were noted in the documentation of the transfusion process. There is a need to train staff in blood transfusion and to design a 'blood transfusion form' for easy monitoring and evaluation. A hospital transfusion committee and guidelines on the appropriate use of blood should be put in place at MRRH.

Key words: appropriate use, clinical transfusion practice, documentation, Hospital Transfusion Committees, Uganda.

According to the World Health Organization (WHO), Transfusion Medicine is defined as that part of the health care system which undertakes the appropriate provision and use of human blood resources (WHO, 1992). Transfusion Medicine practitioners must maintain quality and work to increase the safety of blood and blood products. The specialty is unique because it links one sector of the community (the donors) with another (the patients) in an altruistic and potentially life-saving activity. The transfusion process includes a series of events comprising ordering of blood or blood components for transfusion, taking pre-transfusion blood samples, laboratory practices, collection and administration of blood or blood components, monitoring of the transfused patient, managing adverse events and documenting the transfusion events and outcomes.

Blood transfusion is an essential and integral part of patient care: when used correctly, it saves lives and improves health. However, transfusion carries a potential risk of acute and/or delayed transfusion reactions and transfusion-transmitted infections. WHO recommends that national health programs should develop policies and strategies to reduce the need for blood transfusion, minimise unnecessary transfusions and ensure the safe and appropriate use of blood and blood components (WHO, 2002). The effective development and maintenance of satisfactory standards of Transfusion Medicine practice requires an organization-wide approach and adoption of a quality management system. In the absence of a quality infrastructure, errors will occur with potential outcomes such as wastage of blood, hypoxia or

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coagulopathy as a result of delays or incompatible transfusions that may be fatal (Knowles, 2001). Safe transfusion therapy depends on a complex process that requires integration and coordination among multiple hospital services, including laboratory medicine, nursing, anaesthesiology, surgery, clerical support and transportation. The multidisciplinary hospital transfusion committee has been traditionally charged with oversight of transfusion safety. Transfusion errors are usually rooted in the failure to follow clerical or technical procedures and/or in the breakdown in professional practice or judgement (Dzik *et al.,* 2003).

In Uganda, regional blood banks of the Uganda Blood Transfusion Service (UBTS) collect blood from voluntary non-remunerated donors; routinely screen the donated blood for HIV, syphilis, hepatitis B and C viruses; perform ABO/Rh D typing and distribute the blood to hospitals free of charge in accordance with the national transfusion policy (National Blood Transfusion Policy, 2005). So far, only the Central regional blood bank at the UBTS headquarters in Kampala is able to produce blood components for transfusion. The Ministry of Health, with assistance from the United States President's Emergency Plan for AIDS Relief (PEPFAR) project, meets the financial needs of the UBTS. Even in times of increased demand for blood products, e.g. during malaria seasons, the UBTS does not recruit paid or replacement donors. However, there are no specific written guidelines on the appropriate use of blood in hospitals. The aim of this study was to assess the clinical transfusion practice at a regional referral hospital in Uganda.

STUDY DESIGN AND METHODS

Study setting and design

A 1-year retrospective study was conducted at Mbarara Regional Referral Hospital (MRRH), the teaching hospital for Mbarara University of Science and Technology (MUST) Medical School. MRRH is a 330-bed hospital and serves as the regional referral centre for South Western Uganda. The hospital transfusion laboratory receives its blood supply from the Mbarara Regional Blood Bank located about 2 km away. The study was approved by the Research and Ethics Committee at MUST.

Patients and methods

Medical records of patients admitted at MRRH in 2008 were reviewed for evidence of having received blood transfusion(s). Patients of both gender and all ages admitted to the five main wards at MRRH [i.e. Paediatric, Accident and Emergency (A&E), Surgical, Obstetric and Gynaecological (OBGY) and Medical], for whom blood was ordered and cross-matched, were included in the study. The medical and transfusion histories were studied and the following data collected: age and gender of the recipient; ward of admission; date of transfusion; clinical diagnosis; pre-transfusion haemoglobin level; indication(s) for blood transfusion; number of units of blood ordered; number of units of blood transfused; number of transfusion episodes; type of blood component transfused; presence of compatibility form(s) in the patient's file; record of times for the beginning of the transfusion; record of vital signs during the transfusion and a record of any adverse events. Laboratory practices were not included in this review.

Statistical analysis

The information on the patients' transfusion history and laboratory tests was recorded using data collection forms. Statistical software package Excel 5·0 (Microsoft, Redmond, WA) and Statistical Package for the Social Sciences 12·0 (SPSS Inc., Chicago, IL) were used for data management and analysis, respectively. The χ^2 test was used to test the differences in frequencies between groups of recipients. Groups were assumed to differ significantly when the P values were less than 0·05.

RESULTS

A total of 1730 patients (median age, 19·0 years; range, 1 day to 88 years; female-to-male ratio, 1·3), for whom blood was ordered and cross-matched, were studied. Of these, 1674 (96·8%) patients were actually transfused. Table 1 shows the number of patients for whom blood was cross-matched and transfused in the five wards at MRRH. No autologous blood transfusions were recorded in the whole year. A total of 109 (6·5%) patients received emergency blood transfusions at the A&E ward due to surgery or trauma. The three most

Table 1. Patients whose blood was cross-matched and those who received transfusions in each ward at MRRH in 2008

Number of patients	Paediatric	Medical	OBGY	A&E	Surgical	Total
Cross-matched	726	453	346	180	25	1730
Transfused (%)	724 (99·7)	453 (100)	318 (91·9)	158 (87·8)	21 (84·0)	1674

Table 2. Indications for blood transfusion with the respective CT ratios at MRRH in 2008

Indication for transfusion	Patients (*n*, %)	Units cross-matched (*n*, %)	Units transfused (*n*, %)	CT ratio
Malaria	672 (38·8)	1022 (27·8)	918 (33·1)	1·1
Bleeding	468 (27·0)	1245 (33·9)	823 (29·6)	1·5
Non-malarial infections	278 (16·1)	715 (19·5)	533 (19·2)	1·3
Cancer	115 (6·6)	287 (7·8)	217 (7·8)	1·3
Organ disorders (kidney, heart, liver)	56 (3·2)	155 (4·2)	118 (4·2)	1·3
Trauma	50 (2·8)	101 (2·7)	63 (2·3)	1·6
Surgery	48 (2·7)	97 (2·6)	55 (1·9)	1·8
Malnutrition	35 (2·0)	39 (1·1)	39 (1·4)	1·0
Sickle cell disease	8 (0·5)	12 (0·3)	11 (0·4)	1·1
Total	1730	3673	2777	1·3

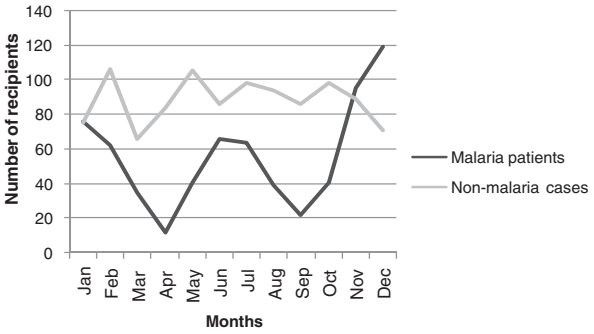

Fig. 1. Patients at MRRH for whom blood transfusions were ordered because of severe malarial anaemia ($n = 672$) and other non-malarial indications ($n = 1058$) in each month of 2008. Two malarial seasons in the months of May–August and November–February are shown.

frequent indications for blood transfusion were malaria (38·8%), bleeding (27·1%) and other infections (16·1%). The indications for blood transfusion at MRRH in 2008 are shown in Table 2. There were 672 recipients with malaria, 556 (82·7%) of whom were children admitted to the Paediatric ward. Figure 1 shows the number of patients with severe anaemia due to malaria and other non-malarial indications who received blood transfusions in each month of 2008. Obstetric haemorrhage accounted for 55·7% of all bleeding patients at MRRH who received transfusions and for 75·4% of all recipients at the OBGY ward. Table 3 shows a breakdown of the types of haemorrhage for the 468 recipients at MRRH whose indication for transfusion was *'bleeding'*. The most frequent bacterial infections among transfused patients were tuberculosis (3·9%) and septicaemia (3·5%). A total of 109 (24·1%) recipients in the Medical ward had acquired immunodeficiency syndrome (AIDS) and 48 (44·0%) of them presented with severe anaemia following anti-retroviral therapy (ART) regimens containing the nucleoside analogue reverse transcriptase inhibitor, zidovudine (AZT). All the 453

Table 3. Nature of haemorrhage for the 468 patients at MRRH whose indication for blood transfusion was *'bleeding'*

Type of bleeding	Patients (*n*, %)
Obstetric haemorrhage	261 (55·7)
Gastrointestinal bleeding	99 (21·2)
Penetrating soft tissue injury	31 (6·6)
Epistaxis	27 (5·8)
Umbilical cord bleeding	22 (4·7)
Cephalhaematoma	15 (3·2)
Others (including purpura, haemoptysis, tooth bud [*'false teeth'*] extraction)	13 (2·8)

transfused patients in the Medical ward received whole blood transfusions. There were 5 additional units of random donor platelet transfusions in two recipients (0·4%). No other platelet transfusions were given in other wards. Overall, 58·4% of all recipients at MRRH were given whole blood transfusions. Approximately 97·0% of the Paediatric ward recipients were transfused with packed red blood cells (RBCs).

Overall, a total of 3673 units of whole blood and RBCs were ordered and out of these, 2777 units

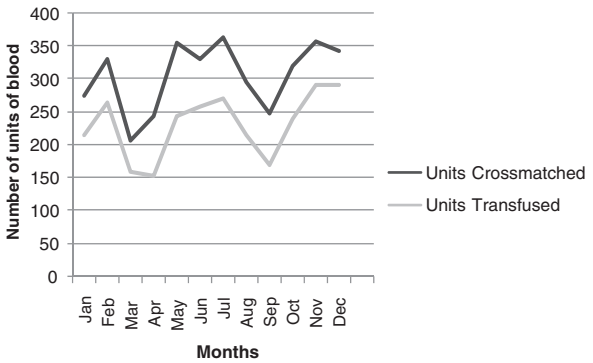

Fig. 2. Blood utilisation at MRRH in each month of 2008. Total units ordered and cross-matched = 3673; total units transfused = 2777.

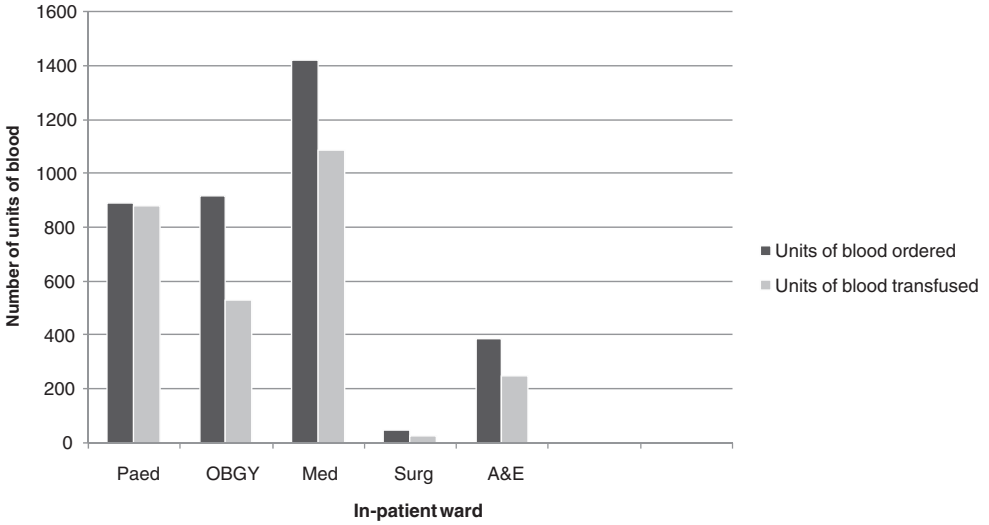

Fig. 3. Blood ordering and transfusion practices in five wards at MRRH (OBGY, Medical, Surgical and A&E) in 2008. Total units of blood ordered = 3673; total units transfused = 2777; overall CT ratio = 1·3.

Table 4. Transfusion practices and outcomes in the five wards at MRRH in 2008

Variables assessed in patients' files	OBGY ($n = 346$)	Medical ($n = 453$)	Surgical ($n = 25$)	Paediatric ($n = 726$)	A&E ($n = 180$)
Mean units of blood ordered (range; total)	2·7 (1–13; 920)	3·1 (1–20; 1421)	2·0 (1–3; 50)	1·7 (1–7; 893)	2·2 (1–10; 389)
CT ratio	1·7	1·3	1·8	1·0	1·5
Compatibility form present in file (*n*, %)	167 (48·3)	266 (58·7)	16 (64·0)	271 (37·3)	114 (63·3)
Record of pre-transfusion haemoglobin (*n*, %)	181 (52·3)	371 (81·9)	19 (76·0)	544 (74·9)	93 (51·7)
Record of patients' vital signs (*n*, %)	1 (0·3)	25 (5·5)	1 (4·0)	14 (1·9)	0 (0)
Record of transfusion start-times (*n*, %)	241 (69·7)	440 (97·1)	14 (56·0)	526 (72·3)	137 (76·l)
Record of adverse events (*n*, %)	2 (0·6)	5 (1·1)	0 (0)	2 (0·3)	1 (180)
Additional transfusions after ≥48 h (*n*, %)	15 (4·3)	62 (13·7)	0 (0)	98 (13·5)	5 (2·8)

(75·6%) were transfused. The mean number of units given per recipient was 1·7 and the overall cross-match-to-transfusion (CT) ratio was 1·3. A total of 367 (38·6%) adult transfusion patients received only 1 unit of blood. Figure 2 shows the utilisation of blood at MRRH in each month of 2008. There were no records for compatibility testing and monitoring of vital signs in 51·8 and 97·6% of the recipients' files, respectively. Transfusion start-times were documented in 78·5% of the patients. In 1208 patients (69·8%), pre-transfusion haemoglobin levels had been estimated and recorded in the hospital files. Absence of pre-transfusion haemoglobin records was strongly associated with transfusions in states of acute blood loss (i.e. bleeding, surgery and trauma) compared with other indications ($P < 0{\cdot}0001$) and with surplus ordering of blood, i.e. CT ratios greater than unity (385/1208 vs. 217/522 patients; $P = 0{\cdot}0001$). Acute transfusion reactions were observed in 10 patients (0·6%) in 12 months. In 180 recipients (10·4%), additional blood transfusions were given 48 h or more after completion of the initial transfusion episode and this was not significantly associated with any transfusion indication. A comparison of the transfusion practices and outcomes in the five wards at MRRH is shown in Fig. 3 and Table 4.

DISCUSSION

In a period of 12 months, 2777 units of whole blood and RBCs were transfused to 1674 patients in the five major wards at MRRH. Records at MRRH showed that approximately 16 000 patients were admitted in 2008. Therefore, 10·5% of all in-patients at MRRH received blood transfusion support as a part of their treatment and care. Of these, 42·0% were children admitted with severe anaemia largely due to malaria

(76·6%). Rates of blood transfusion for malaria were highest in the two malaria seasons of May–August and November–February (Fig. 1). The overall CT ratio was 1·3, indicating that there was no significant wastage of blood resources at MRRH in 2008. However, there might have been shortages of blood for transfusion because 367 (38·6%) adult patients received only 1 unit of blood. Due to the absence of records for post-transfusion haemoglobins and/or haematocrits, we were unable to determine rates of under-transfusion or over-transfusion. The lower number of blood recipients in the surgical ward is explained by the fact that 109 (6·5%) patients received blood transfusions at the A&E ward following surgery or trauma.

Our data indicate that a significant number of children received blood transfusions because of severe malarial anaemia compared with adult patients. This was expected because malaria is a leading cause of morbidity and death in childhood in sub-Saharan Africa (WHO, 2009). In contrast to children, adults were transfused mainly because of bleeding and bacterial or viral infections ($P < 0{\cdot}0001$). While the CT ratios for both the Medical and Surgical sections of MRRH were within normal limits (Table 4), surgeons (CT ratio; 1·8) and obstetricians (CT ratio; 1·7) ordered significantly more units of blood that were not transfused ($P < 0{\cdot}0001$). However, more patients in the Medical ward received additional transfusions 48 h or more after completion of the initial transfusion episodes compared with those in all the other wards combined ($P < 0{\cdot}0001$). The fact that a total of 180 patients (10·4%) at MRRH received additional blood transfusion(s) 48 h or more after completion of the initial transfusion episode(s) may partly suggest that there could have been shortage of blood for immediate additional transfusions, that there might have been delays in post-transfusion evaluation by the clinical and/or laboratory staff, or that the patients could have experienced delayed haemolytic transfusion reactions. As no pre- or post-transfusion alloantibody detection tests are carried out at MRRH (and in the whole of Uganda), it is difficult to examine the occurrence of haemolytic transfusion reactions in this setting. However, 33 (18·3%) of such patients had been transfused primarily because of bleeding problems and the bleeding might have recurred.

There were inadequacies regarding the documentation of pre-transfusion tests and bedside monitoring of the transfused patients: there were no records for pre-transfusion haemoglobin levels, compatibility testing, transfusion start-times and vital signs in 30·2, 51·8, 21·5 and 97·6% of all recipients, respectively. Missing pre-transfusion haemoglobin records were strongly associated with transfusions in states of acute blood loss, i.e. following bleeding, trauma and surgery, compared with other indications ($P < 0{\cdot}0001$) and with surplus ordering of blood, i.e. CT ratios $> 1{\cdot}0$ ($P = 0{\cdot}0001$). Thus, in the absence of haemoglobin results, clinicians decided to transfuse based on clinical symptoms and signs. However, Bates *et al*. (2001) reported that when clinicians relied entirely on clinical judgement to guide transfusion practice, significant numbers of inappropriate transfusions were observed at a district hospital in Malawi. Our data also indicate that there were limitations on the availability of blood components (apart from packed RBCs) for transfusion at MRRH. This was illustrated by the finding that in the Medical ward, e.g. all recipients were given whole blood transfusions except two patients (0·4%) who received additional 5 units of random donor platelets. Yet in the same ward, 7·7 and 23·4% of the recipients, respectively, had haematological malignancies and bleeding problems and might have required transfusions with platelet concentrates and/or fresh frozen plasma if available. Almost half of the blood recipients with AIDS in the Medical ward had AZT-related anaemia. This underscores the important role of blood transfusions in this category of patients, given a 5·4% national prevalence of HIV infection among adults (UNAIDS, 2008) plus the increasing availability and use of ART. Ten patients (0·6%) were reported to have developed immediate transfusion reactions during transfusion. Apart from the entry recorded in the case notes that *'the patient reacted and blood was stopped'*, there were no details on the nature of these transfusion reactions and on their management. Although we did not have comprehensive data from other hospitals in Uganda, the inadequacies herein outlined most likely apply to other clinical settings in the country. Similarly, Kajja *et al*. (2008) and de Graaf *et al*. (2009) have, respectively, observed poor blood ordering practices and lack of appropriate guidelines for blood transfusion at Mulago National Referral Hospital in Kampala, Uganda.

In conclusion, there is a need to improve the clinical practice of Transfusion Medicine in Uganda. It is therefore recommended that an in-hospital quality management system for blood transfusion be developed through the creation of awareness on appropriate clinical use of blood. A standard form (a 'blood transfusion form') for documenting the entire transfusion process should be designed. This would be incorporated in patients' hospital files to allow easy monitoring and evaluation of blood transfusions and to provide a basis for the development of evidence-based clinical transfusion practice in Uganda. To increase the availability of platelets and other blood components, arrangements should be made to process whole blood locally at the regional blood banks. Currently, platelets are only processed and supplied from the UBTS headquarters – about 300 km

away – in Kampala. The UBTS should encourage the design and implementation of clinical guidelines for the appropriate use of blood as well as the set up of Hospital Transfusion Committees or clinical review groups. The latter will monitor and evaluate the usage of blood and transfusion outcomes so as to improve the overall quality of clinical transfusion practice in Uganda. Above all, there is a need to train nursing, biomedical and medical students and clinical staff on the significance of safe and appropriate blood transfusions in the management and care of patients.

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DECLARATIONS OF INTEREST

The authors certify that they have no affiliation with or financial involvement in any organization or entity with a direct financial interest in the subject matter or materials discussed in this manuscript.

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