

## The Problem of Blood Transfusion in Bangui, Central African Republic

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### Abstract

**Objectives:** Describe the problems related to the supply and use of blood products in Bangui, Central African Republic

**Methods:** It was a cross-sectional study, conducted from 1 August to 1 October 2013 in three public hospitals in Bangui, on the practical modalities of blood transfusion in patients whose clinical condition required blood transfusion.

**Results:** 300 patients were included, of which 169 (56.3%) were female (sex ratio = 0.77). The mean age of the patients was 30.5 years (range: 5 months and 64 years). The main indications for transfusion were medical (70% of cases), gynecological or obstetrical (19% of cases) and surgical (11% of cases). Whole blood was used in all patients. The transfused volume was 500 ml in 64.4% of cases. In 75% of cases, the transfused blood came from voluntary donors. The transport of the blood bags to hospitals was provided by a relative of the patient. The time interval between prescription and blood transfusion was reasonable for the Pediatric Complex hospital closer to the national blood transfusion center compared to the other two hospitals where it could take more than an hour. Determination of blood group and Rhesus factor prior to blood transfusion was only performed in 189 patients (63%). A single blood bag (500 ml) was transfused in 196 (64.4%) patients and in 48.7% of cases transfusions were done with O + blood. Only 25 patients (8.3%) were tested for compatibility in the patient's bed.

**Conclusions:** To ensure transfusion safety, the authors recommend strengthening the capacity of the CNTS in equipment and logistical means for the preparation of products and blood distribution, decentralization of blood product storage and recycling of blood transfusion safety practitioners.

**Keywords:** Blood Transfusion; Whole Blood; Transfusion Safety; Compatibility Test; Central African Republic

### Introduction

Blood transfusion is the intravenous administration of blood, blood products or their derivatives from a donor to a recipient. Blood transfusion is not a reflex act but the culmination of a medical reflection on the real needs of the patient. In the absence of an etiological diagnosis justifying it, transfusion is a serious medical fault that engages the responsibility of the doctor.

In theory, it is possible to transfuse blood directly from subject to subject, but hospital practice is usually to use blood collected and then stored in blood banks. After checking the good health of the donor and eliminating contraindications, it is taken from 0.4 to 0.5 liters of blood. In parallel, a sample will be used to determine the blood type and to carry out tests for infectious agents that can

be transmitted through blood [1,2]. In the Central African Republic, the supply of labile blood products for the needs of care for patients in emergencies poses problems. In CAR, there is only one blood transfusion centre, the National Blood Transfusion Centre (CNTS) located in Bangui. This center can only provide whole blood because it has no means to split the blood collected and provide, for example, red blood cells. Our study aimed to describe the problems related to the supply and use of blood products in Bangui in the Central African Republic.

**Patients and Methods**

This was a cross-sectional study conducted from August 1 to October 1, 2013 in 3 public hospitals located in Bangui (the Community Hospital, the Friendship Hospital, and the Pediatric Complex). The study population consisted of the first 100 patients who received a blood transfusion during this period in each of the three selected sites, i.e. 300 patients in total. All patients whose clinical condition motivated an indication for blood transfusion were included.

A pre-established survey sheet allowed the collection, anonymously, of epidemiological variables (age, provenance, occupation, distance between the study site and the centre supplying the blood product), clinical (diagnosis, indication of transfusion, time between prescription and administration, blood product used, volume transfused) and biological (ABO and Rhesus blood groups, carrying out the compatibility test at the patient’s bed). The data collected was processed and analyzed with Epi Info software version 3.5.3.

**Ethical considerations**

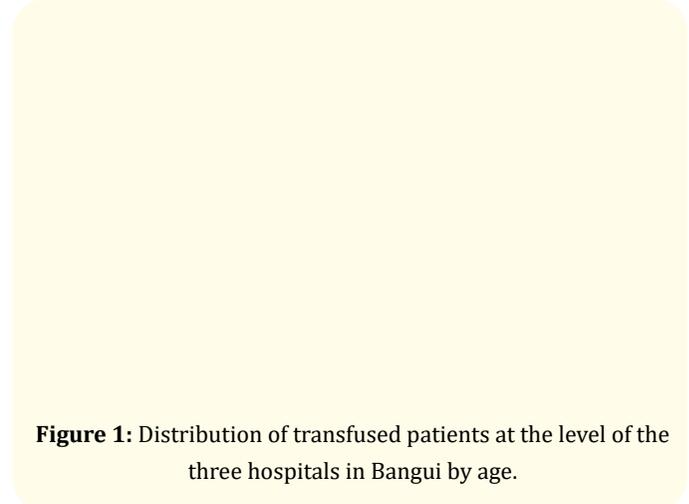
The data collected as part of this work was used to defend a Doctorate in Medicine thesis. As such, the work was submitted and approved by the Scientific and Ethics Committee of the Faculty of Health Sciences of the University of Bangui before its realization. The study sheets were anonymous and were used only as part of this work.

**Results**

**Epidemiological aspects**

Of the patients in whom a transfusion was performed, 169 (56.3%) were female and 131 (43.7%) were male (Sex ratio m/f = 0.7).

The average age of patients was 30.5 years (ranges: 5 months and 64 years). Blood transfusions were performed mainly in children under 5 years of age and young adults aged 24 to 48 years (Figure 1).



**Figure 1:** Distribution of transfused patients at the level of the three hospitals in Bangui by age.

Emergency and medical resuscitation (107 cases), internal medicine (60 cases), gynaecology-obstetrics (58 cases) were the main prescribers of blood transfusion (Table 1).

Services	Hospitals			Total
	Communal	Friendship	Pediatrics	
Internal Medicine	32	0	28	60
Hepato-gastroenterology	0	25	0	25
Surgery	0	10	5	15
Obstetric gynecology	27	31	0	58
Emergencies and medical resuscitation	20	20	67	107
Neurology	0	4	0	4
Infectious diseases	0	10	0	10
Orthopedic traumatology	21	0	0	21
Total	100	100	100	300

**Table 1:** Distribution of transfused patients by hospital center and Department.

**Clinical aspects**

The main conditions that motivated blood transfusion in patients were malaria, postpartum haemorrhage, post-traumatic haemorrhage and accounted for 59.7% of the workforce (Table 2).

Diagnostic	Number	Percentage
Malaria	98	32,7
Postpartum hemorrhage	41	13,7
Acute post-traumatic hemorrhages	40	13,3
Inflammatory anemia on HIV+ T1D	25	8,3
Extrauterine pregnancy	25	8,3
Surgical resuscitation	15	5,0
Decompensated cirrhosis	13	4,3
Sickle cell syndromes	11	3,7
Affection Pleuropulmonary	10	3,3
Peptic ulcer	9	3,0
Cancer Colorectal	1	0,3
Other causes	12	4,0
Total	300	100.0

**Table 2:** Distribution of patients according to the reasons of transfusion requests.

**The safety of blood transfusion**

The determination of blood type and Rhesus factor before blood transfusion was only performed in 189 patients or 63%.

Twelve (12) patients or 4% had an attestation of their blood type, 79 patients (26.3%) had the blood groups and Rhesus mentioned in their health records. These were the patients of the obstetric gynecology department whose blood type is determined during prenatal consultations. Twenty other patients (6.7%) had no written evidence of their blood type determination but had verbally declared their blood types and were transfused without prior verification.

The compatibility test at the patient’s bed before transfusion was performed in only 25 patients, or 8.3%. A single blood bag (500 ml) was transfused in 196 (64.4%) patients. All the others received two pockets. In 25% of cases the blood donor was a member of the patient’s family. In this case, the blood sample was taken at the CNTS, serogrouping and safety tests are carried out before releasing the bag.

Direct donor/recipient transfusion is not performed. The blood bags were most often transported by a family member who picks them up at the CNTS and brings them back to the ward where the patient to be transfused is hospitalized. Hospitals have neither a blood bank nor means of transporting blood products.

Près half of the transfusions were made with O+ blood. The other common groups were A+, B+ and AB+. Only a small number of patients (11.3%) were Rhesus negative (Table 3).

Blood type	Actual	Percentage
A-	2	0,7%
A+	60	20%
B-	3	0,8%
B+	48	15%
O-	2	0,7%
O+	146	48,7%
AB-	4	1,10
AB+	35	13,%
Total	300	100%

**Table 3:** Blood groups (ABO and Rhesus) of the 300 blood transfused.

**Time between prescription and transfusion**

Due to the proximity of the paediatric complex and the CNTS, the time interval between prescription and transfusion was reasonable, whereas for the other two hospitals it could take more than an hour (Table 4).

Time limit	Friendship Hospital	Community Hospital	Pediatric Complex
Distance hospital/ CNTS	4 km	3,5 km	100 m
Interval between the prescription and its arrival at the CNTS	Average: 50 ‘ Median: 35’	Average: 30’ Median: 20’	Average: 5’ Median: 3’
Interval between prescription and start of transfusion	Average: 125’ Median: 70’	Average: 90’ Median: 60’	Average: 30’ Median: 18’

**Table 4:** Time between the prescription of the transfusion and the arrival of the blood at the patient’s bed according to the hospitals.

## Discussion

The hospitals in our study were the largest prescribers of blood transfusion compared to health centres and provincial facilities with a lower blood transfusion volume. The latter were not the subject of this study.

The age profile of transfused patients (average 30.5 years with extremes of 5 months and 64 years) is close to that reported by Sharma, *et al.* [3] while in Bamako (Mali) the population was younger with an average age of 21 years [4]. Transfusion affects women more than men, as reported by Mitha, *et al.* [5] due to obstetric problems.

In our case, the main indications of blood transfusion were medical (70% of cases), obstetrical (22% of cases) and surgical (8% of cases) to be compared with the results of the Mahajanga University Hospital in Madagascar, where these indications represented 78%, 17% and 5% of cases respectively [6]. Among the medical causes, malaria and sickle cell disease were pathologies due to frequent hemolytic seizures requiring transfusions especially in children.

The only blood product available in Bangui was whole blood, while this represents only 1.4% of prescriptions in Brazzaville where globular concentrates are widely used (98.3% of cases) [7]. This is due to the lack of means of blood treatment at the CNTS in Bangui. Since the indications for the use of labile blood products vary according to the causes of anaemia [8], each transfusion centre should be able to make available to the medical profession at least the products of blood fractionation.

In addition, practitioners must ensure the safety of blood transfusion. In addition to the analyzes done for the removal of blood bags containing a pathogen and the verification of the blood type, a compatibility test must be carried out in the patient's bed before any transfusion; This is to avoid transfusion accidents that are always possible [8]. In Bangui this last test is almost never carried out which is a serious fault. But to our knowledge, no transfusion accidents were observed among the population of our study.

Depending on the amount of blood transfused, it was noted in our work that 34.4% of patients received two blood bags. In Madagascar more than half of the patients transfused (55%)

received two blood bags [6]. In practice, it takes an average of 1 concentrate of red blood cells in adults to increase the hemoglobin level by 1 g/dl. This amount varies according to weight and sex, i.e. 1.4 g/dL in a 50 kg woman and 0.7 g/dL for a 70 kg man [9]. The reduced number of blood bags given to patients shows that the management of severe anemia is not up to standard. Indeed, 62 patients (20.7%) with anemia with a hemoglobin level between 5 and 6 g/dl each received only one bag of blood. This could be related to financial problems for families. At the CNTS in Bangui a blood bag costs 4000 F CFA or the equivalent of 6.15 Euros. The costs are borne by the patient or his family and they can't always ensure such expenses.

Also, the blood administered came from voluntary donors in only 75% of cases. Donations made by a family member may be chosen for reasons of economy. In Senegal [10], almost all blood donors (99%) were volunteers. Thus, a secure blood supply can only be ensured in a sustainable manner through regular donations by voluntary, unpaid and loyal donors. These represent safer resource persons because the prevalence of blood-borne infections is lower than in the general population as shown by a study carried out in the Democratic Republic of Congo [1].

The transport and availability of blood products is an integral part of transfusion safety. As such, the transport of labile blood products must be provided by the Emergency Medical Service under highly regulated conditions of safety and temperature. In Bangui, the transport carried out by the patient's family members lengthens the time between prescription and transfusion except for the pediatric hospital because of its proximity to the CNTS. In France, Lagneau, *et al.* [11] had reported that during the management of polytraumatized, the average time to make labile blood products available in clinical departments was 5 min with extremes of 0 to 45 min. The delays of more than an hour, observed in Bangui, are linked to the fact that the CNTS and hospitals do not have means of transport and that the latter do not have a blood bank. In Yaoundé, Cameroon, 85% of hospitals have a blood bank [12]. A hospital blood bank, which requires a suitable structure, must work in collaboration with the transfusion center and be regularly supplied with blood from the main groups in order to avoid supply disruptions [3]. The system as it exists in Bangui is therefore detrimental to the care of patients requiring transfusion. Since this work some hospitals have equipped themselves and have

a blood bank. Otherwise, donations can be made by the family and, to do this, equipment and tests are provided by the CNTS as long as the hospital has a laboratory technician.

### Conclusion

Blood transfusion is part of the current medical practice that international regulations and recommendations have made very safe. Our study reports on the difficulties of blood supply in the Central African Republic in general and particularly at the level of the CHU in Bangui. It appears that external hospitals can't benefit from the CNTS service in real time for reasons of distance. The existence of a single Blood Transfusion Centre without modern equipment for the production of different blood products makes it possible to supply health facilities only with whole blood. Our study also highlights the problems related to transfusion safety, which is not optimal, exposing to the occurrence of serious transfusion accidents. The attention of decision-makers is drawn to the improvement and strengthening of the technical platform of the CNTS with a view to producing, at least initially, all cell and plasma fractions adapted to the main transfusion indications as well as the establishment of services for the transport of blood products under good hygiene and temperature conditions. Finally, practitioners should benefit from awareness-raising programmes on the importance of transfusion safety, haemovigilance and the organisation of blood donations.

### Conflict of Interest

"The authors declare that they have no links of interest".

### Authors' Contributions

- Doc tor NGOUYOMBO Ange Donatien conducted the initial study (data collection and writing) that led to the defense of a Doctoral Thesis in Medicine. He then contributed to the writing of the manuscript.
- PAMATIKA Christian Maucler read and approved the final version of the manuscript.
- Professor Doui Doumgba Antoine initiated and revised the manuscript.
- Professor LE FAOU Alain was the Director of the thesis then reviewed the manuscript, and approved the version that is submitted.

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