Published in final edited form as:

Transfusion. 2011 July ; 51(7PT2): 1613–1618. doi:10.1111/j.1537-2995.2011.03222.x.

Poor procedures and quality control among non-affiliated blood centers in Burkina Faso: an argument for expanding the reach of the national blood transfusion center

Koumpingnin Nèbié¹, Siaka Ouattara¹, Mahamoudou Sanou¹, Youssoupe Kientega¹, Honorine Dahourou¹, Lassina Ky¹, Kisito Kienou¹, Samba Diallo¹, Françoise Bigirimana², Catherine Fretz³, Edward L. Murphy⁴, and Jean-Jacques Lefrère^{5,6}

¹*Centre National de Transfusion sanguine du Burkina Faso* (National Center for Blood Transfusion in Burkina Faso), Avenue Kumda Yonré, 01 BP 5372 Ouagadougou 01

² WHO office, Burkina Faso

³*Etablissement Français du Sang* (French Blood Agency), Ile-de-France, 122/130 Rue Marcel Hartmann, Léapark, 94200 Ivry-sur-Seine

⁴ University of California San Francisco and Blood Systems Research Institute, San Francisco, USA

⁵ Department for the Study of Blood-born Agents, *Institut National de Transfusion Sanguine* (National Blood Transfusion Institute), Paris, France

⁶ Laboratory of Hematology, University Teaching Hospital, Amiens, France

Abstract

Introduction—The World Health Organization (WHO) recommends the creation of national blood transfusion services. Burkina Faso has a CNTS (*Centre national de transfusion sanguine* - National Blood Transfusion Center) but it currently covers only 53% of the national blood supply versus 47% produced by independent hospital blood banks.

Study design—To evaluate blood collection, testing, preparation and prescription practices in the regions of Burkina Faso that are not covered by the CNTS, we conducted a cross-sectional survey.

Methodology—Data were collected by trained professionals from May to June 2009, at 42 autonomous blood centers not covered by the CNTS.

Results—Blood collection was supervised in all sites by laboratory technicians without specific training. There was no marketing of community blood donation nor mobile collection. Donation was restricted to replacement (family) donors in 21.4% of sites. Pre-donation screening of donors was performed in 63.4% of sites, but some did not use written questionnaires. Testing for HIV, hepatitis B virus and syphilis was universal, although some sites did not screen for hepatitis C virus. In 83.3% of the sites blood typing was performed without reverse ABO typing. In 97.6% of the sites, nurses acted alone or in conjunction with a physician to order blood transfusions.

Conclusion—Shortcomings in non-CNTS blood centers argue for the development of a truly national CNTS. Such a national center should coordinate and supervise all blood transfusion

Contacts: Koumpingnin Nèbié, CNTS, 01 BP 5372 Ouagadougou 01, <nebie_yacouba@hotmail.com>.

Conflicts of Interest

The authors declare no conflict of interest.

activities, and is the essential first step for improving and institutionalizing blood transfusion safety and efficacy in a developing country.

Keywords

Blood transfusion; Blood donors; HIV; HBV; HCV–Africa; Burkina Faso

INTRODUCTION

Blood transfusion is an essential treatment but it carries an increased risk of transfusion transmitted infections in sub-Saharan Africa because of the high prevalence of blood-borne viruses in the general population from which donors are recruited. This is the reason why the World Health Organization (WHO) for many years has recommended the creation of National Blood Transfusion services, so that an efficient and structured organization can reduce such risks [1]. In accordance with this recommendation, in 2000 Burkina Faso undertook a reorganization of its blood transfusion system, resulting in the creation of a CNTS (*Centre national de transfusion sanguine* - National Blood Transfusion Center) as the single operator for collecting and distributing blood in the country.

With the support of the *Coopération luxembourgeoise* (Luxembourg Agency for Development Cooperation), four CRTS (*centres régionaux de transfusion* - regional blood transfusion centers) dependent upon the CNTS have been set up: one in the capital and three in the country's major cities (Figure 1). Medical and paramedical staff who received their training in blood transfusion overseas (in France, Belgium and Tunisia) now run the CRTS, where quality control and reference material systems have been set up to meet international norms and standards. The CNTS supplies the three CHU (*centres hospitaliers universitaires* - university hospital centers), two of the nine CHR (*Centres hospitaliers régionaux* - regional hospital centers) and 20 of the 60 CMA (*Centre médicaux avec antennes chirurgicales* - medical centers with surgical units). These four CRTS produce about 53% of the country's blood products but only cover a part of the nation. The health agencies not supplied by the CRTS continue to collect, test and distribute the blood that they need on their own.

The aim of this study was to evaluate the organization of the blood transfusion chain in Burkina Faso's health organizations that are not covered by the CRTS by means of a cross-sectional survey conducted in 2009 over the entire nation.

METHODS

The survey concerned 42 health agencies that produce blood for seven CHR's and 35 CMA. In 2008, these 42 health agencies's collected 32,587 units of blood; that is, 46.3% of the 70,348 units collected in the country. The data was collected using a standardized questionnaire drawn up by the CNTS and completed by researchers conducting the survey during interviews with stakeholders in the field and inspections of premises and equipment. The questionnaire concerned all the stages and critical points in the blood transfusion chain. The data collected were analyzed using EPI-Info software, version 6fr.

RESULTS

Premises, Organization and Staff dedicated to Blood Transfusion Activities

With the exception of one CHR (the one in Kaya) which used a specific building, all the health agencies visited housed their blood transfusion activity within a medical laboratory and only eight had a room dedicated to blood banking. In one case, the collection and testing

of blood donations was carried out in the same space as examinations of septic biological fluids, such as bacteriological examination of sputum or parasitological examination of stool. In terms of work organization, only 3 health agencies respected good blood transfusion practices. In thirteen other cases, the space allotted was nevertheless enough to put a system in place that is compatible with these good practices (donor system and product system), with a private space for confidential pre-donation screening, a dedicated laboratory bench for cross matching and space for storing and distributing blood products.

The staff was made up solely of laboratory technicians, who alone implemented the blood transfusion chain from collection to distribution. Only one CHR was using nurses from time to time for pre-donation screening and phlebotomy. Pharmacists, when there were any in the organization, contributed little to blood transfusion activity, being essentially responsible for the hospital pharmacy or medical analyses. In 90% of the health agencies, there was no medical officer specifically allocated to blood transfusion activity. However, a manager had been designated for this activity in 16 of the health agencies. No medical officer had benefitted from blood transfusion training, not even through a training course at the nearest CRTS.

The Blood Transfusion Chain

Table 1 shows the diversity of collection practices in the health agencies. Nearly two-thirds of them only collected blood at a fixed site. None carried out activities to raise public awareness among the general population to promote voluntary blood donation, and all called on family donors (21.4%, moreover, took blood exclusively from family donors).

Table 2 details the practices for infectious marker testing of the donation. Testing for HIV, hepatitis B virus and syphilis was systematic. However, testing for hepatitis C virus was not. The confirmation of a positive result for HIV screening test result was not carried out in the majority of cases. The health agencies that did carry out this confirmation followed the algorithm recommended by the Ministerial Committee for the Prevention of AIDS, which consists of testing each positive sample using a second rapid test, followed by a confirmatory test if the second test is positive. More than half of the health agencies had resorted to a sequential screening of viral markers, starting with HBsAg (the most frequent marker in the country's general population), then by carrying out the three others (HIV, viral hepatitis C and syphilis), however the specific order of testing varied from one center to another. This sequential technique was applied most often pre-donation, so that the candidate donors with positive serology were excluded from the taking of a blood unit. The majority of the health agencies carried out ABO blood typing solely using forward ABO typing, carried out by a single technician and without appropriate controls. Only 7 health agencies (16.7%) used reverse ABO typing. Health agency officers who did not carry out reverse ABO typing reported the difficulty of preparing and keeping red cell reagents (16 health agencies), habit (8 health agencies), lack of staff or work load (5 health agencies), the not very "practical" nature of the test (4), or no explanation was given (2 health agencies).

Continuity of activity in the various health agencies was evaluated: 21 (50%) had been subject to interruptions in activity because of lack of reagents and/or consumables (serology and blood typing reagents, blood sampling kits). The average duration of these breaks was 16 days (1 day – 4 months).

Only whole blood was available in the health agencies. No center had the use of a centrifuge to prepare cellular blood products. The labeling of the units was anonymous in 81% of cases. In 8 health agencies, the last name and first name of the donor and/or the recipient (or his/her initials) were recorded on the unit itself. The date blood was taken or its expiration date was not systematically noted on the unit.

Ten health agencies had refrigerators suitable for preserving blood units. Thirty only had domestic-type refrigerators. In two health agencies, there was no refrigerator and therefore no storage of blood products: there, blood transfusion was only carried out in emergencies using family donors. In 15 health agencies, tested and untested blood products were stored in the same enclosure, although on different shelves. In 26 health agencies, the transportation of blood products to clinical departments was carried out by the patient's family.

Prescription of Labile Blood Products (LBP), Record-keeping and Traceability

Table 3 details the parameters for ordering LBPs. Prescription was exclusively by physicians only in a single health agencies. A minority of health agencies had a specific registry of prescriptions in accordance with the recommendations of the Ministry of Health. In other health agencies that resorted to using a form, it was a case of using paper medium normally reserved for the prescription of medications (blank paper or paper which only included the center's letterhead).

The existence, completion and relevance of the content of the collection, testing and distribution records were evaluated, and all health agencies had separate registry for these three activities. But only 22 (52.4%) and 24 (57.1%) had collection and testing registries respectively with content that complied with CNTS recommendations. No health agencies had written standard operating procedures or blood transfusion procedures. The only records made were the pre-donation questionnaire and the temperature chart for pregnant women. The notion of a quality approach was not familiar to the stakeholders.

DISCUSSION

Since the CNTS was created in 2000, blood transfusion in Burkina Faso has coped with the coexistence of two levels of organization: regions covered by the CRTS and regions not yet covered. The current survey shows that in the latter, current practices were not compatible with good blood transfusion safety. They relied almost exclusively on family donors who are regarded to be more risky than voluntary donors [2–4]. Yet during the same period, the CNTS activity report indicated 100% voluntary donations in three CRTS's and 88% in the fourth [5]. A lack of trained staff and inadequacy of equipment and premises certainly play a major role in this state of affairs: laboratory technicians who find themselves solely responsible for blood transfusions have not been prepared for this task in their initial training.

We do note one positive point: all the health agencies in Burkina Faso carried out HIV and viral hepatitis B screening. This is a significant advance in the prevention of transfusion-transmitted infections in the country since according to WHO, blood products are not yet 100% screened for HIV throughout the African continent [6]. In Burkina Faso, this screening is all the more important because the prevalence of infection remains high in the general population [7,8]. On the other hand, a number of health agencies do not carry out reverse ABO typing for cross-matching. The difficulty of preparing red cell reagents was noted by half of these centers. In order to resolve this situation, the inclusion of all health agencies under the aegis of the CNTS could allow them to receive red cell reagents prepared by the mother organization and the health agencies could in turn supply the local medical analysis laboratories. It is true that making labile reagents so regularly available would impose certain logistical and budgetary constraints on the CNTS.

Be that as it may, observation and analysis of the health agencies' blood transfusion practices indicated three main areas of departure from good blood transfusion practices.

The first area concerns regulations. Blood transfusion seems to have remained on the margins of the health systems of numerous sub-Saharan African countries, despite the fact that it has been practiced there for many years. Initiatives to modernize this sector of health, under the leadership of WHO which has recommended the creation of national blood transfusion services, are relatively recent [1,9], and the regulations which would have been needed to support practical implementation of these reforms have not always been promulgated. In Burkina Faso, the CNTS was created under a Public Health Law which does little to tackle blood transfusion questions. Just before this, a “national policy document” for blood transfusion had been drawn up, but it was not distributed widely enough and therefore did not have an effect on all stakeholders. After the CNTS was created, the responsibility for suggesting the regulations needed for proper operation of the whole blood transfusion system fell to this national organization. Two pieces of reference material were drafted and adopted by ministerial decree in 2007: the “National Directives for good Blood Transfusion practice” and the “Document concerning Blood Product standards in Burkina Faso”. Although each health organization collecting and distributing blood units had received these guides, a number of these organizations did not apply them, and the CNTS truly did not have the resources to compel them. One of the reasons for which the health agencies not covered by the CRTS did not feel that they were really covered by these documents (which nonetheless had a national scope) may have been the lack of instruction, awareness-raising and training for health officers following the distribution of these reference materials. Because of a lack of financial resources to organize such training, the CNTS had to be content with sending these documents to the organizations concerned, where they often remained unheeded. Such a situation conveyed both the difficulties for public authorities to apply the rules established by them – whether this was a question of a weakness of ministerial authority or professional authority – and the persistent and growing need for training and awareness-raising of blood transfusion stakeholders.

The second area, which follows partly from the last one, relates to funding, as the CNTS’s lack of financial resources plays a significant role. As it was not able to supply the health agencies with blood transfusions reagents or consumables, and not being in a position to provide training for stakeholders on the ground, the CNTS could only leave each center to conduct its blood transfusion policy as it intended with the resources at its disposal. Such resources were often very scarce, as blood transfusion is considered to be unprofitable by hospital administrations because blood products are given free-of-charge to recipients. In effect, for-profit and even non-profit health organizations tend to put blood transfusion in the background in favor of sectors of activity which are more “profitable”. When there are financial difficulties, they feel at liberty to stop blood transfusion activity for a while, or to impose certain restrictions, like the suspension of screening for one or another infection marker. This particularly pernicious situation could be ameliorated by a centralized supply of reagents and blood transfusion consumables from the national CNTS.

The third area, which is equally crucial, is that of training. In industrialized countries such as France, government decrees have defined the training needed to carry out professional blood transfusion activities [10], based on initial training programs which have been modified from time to time to take account of developments in the discipline. Furthermore, according to the principles of quality assurance which are widely applied in industrialized nations, blood transfusion organizations and their stakeholders are obliged to provide continuous training and to provide proof that this has been carried out. In Burkina Faso, initial training of prescribing physicians does not take the subject of blood transfusion into consideration. The same applies for nurses, who receive just four hours of teaching on blood transfusion practices, as well as for laboratory technicians who are called on to be responsible for blood testing laboratories. In order to remedy this situation, Burkina Faso’s CNTS has undertaken a review, in partnership with the *École nationale de santé publique* (National School of

Public Health), concerning the creation of a nurse's course specializing in blood transfusion, similar to those already given in anesthesia, pediatrics or surgery.

The deficiency of blood transfusion safety in sub-Saharan Africa is multifactorial: almost all of the countries in this part of the continent have shortfalls in blood transfusion practices [11], and Burkina Faso has not escaped this reality. However, this country can count on some assets: it is one of the rare countries in sub-Saharan Africa where numerous personnel have received high-level training in blood transfusion in first-class institutes, and the aim of its CNTS is in the medium term to become truly the only blood transfusion operator, by extending its activity progressively until all national activity is covered. Under a strategic plan for 2010–2015 drawn up for this purpose, this will put an end to the current “two-tier” situation of the country's blood transfusion system. This plan includes negotiations with universities and nurses' and laboratory technicians' colleges for training the future stakeholders in the country's blood transfusion.

In conclusion, we hope that the deficiencies revealed by the current survey will make political authorities and other stakeholders in blood transfusion aware that a change towards a truly national CNTS is essential in Burkina Faso. Such a transition to CRTS- and CNTS-type entities that coordinate and supervise all blood transfusion activities is the essential first step towards improving and normalizing blood transfusion efficiency and safety in our developing country.

Acknowledgments

The authors would like to thank the WHO organizations in Burkina Faso for allowing this study to be carried out, as well as Jean-Jacques Fournel for his advice and the *Coopération du Luxembourg* (Luxembourg Agency for Development Cooperation) for its support in blood transfusion reform (project BKF 13).

Funding

Supported by the National Heart, Lung and Blood Institute (NHLBI) of the National Institutes of Health (NIH) K24-HL-075036-07.

References

1. World Health Organization. Aide-memoire for national blood programmes. World Health Organization; Geneva:
2. Ejele OA, Nwauche C, Erhabor O. Seroprevalence of HIV infection among blood donors in Port Harcourt, Nigeria. *Nigerian Journal of Medicine*. 2005; 14:287–9. [PubMed: 16350699]
3. Diro E, Alemu S, Yohannes A. Blood safety and prevalence of transfusion transmissible viral infections among donors at the Red Cross Blood Bank in Gondar University Hospital. *Ethiopian Medical Journal*. 2008; 46:7–13. [PubMed: 18711984]
4. Batina A, Kabemba S, Malengela R. Marqueurs infectieux chez les donneurs de sang en République Démocratique du Congo. *Rev Brux Med*. 2007; 28:145–149.
5. CNTS. Rapport d'activité. Ouagadougou; 2008.
6. Tapko, JB.; Sam, O.; Diarra-Nama, AJ. Status of blood safety in the WHO African region: report of the 2004 survey. World Health Organization; Brazaville:
7. Meda N, Sangare L, Lankoande S, Compaore IP, Catraye J, Sanou PT, Van Dyck E, Cartoux M, Soudre RB. The HIV epidemic in Burkina Faso: current status and the knowledge level of the population about AIDS, 1994–1995. *Revue d'Epidemiologie et de Sante Publique*. 1998; 46:14–23. [PubMed: 9533230]
8. Meda N, Zoundi-Guigui MT, Van de Perre P, Alary M, Ouangre A, Cartoux M, Mandelbrot L, Viens P, Dabis F. HIV infection among pregnant women in Bobo-Dioulasso, Burkina Faso: comparison of voluntary and blinded seroprevalence estimates. *International Journal of STD & AIDS*. 1999; 10:738–40. [PubMed: 10563562]

9. OMS. Don de sang et sécurité transfusionnelle: perspective mondiale. Aide-mémoire; 2005.
10. Cabaud JJ. Training, skill and competences' follow-up. *Transfusion Clinique et Biologique*. 2007; 14:152–156. [PubMed: 17524697]
11. Tagny CT, Banya DM, Tapko JB, Lefrère JJ. Blood safety in sub-saharan Africa: a multi-factorial problem. *Transfusion*. 2008; 48:1256–61. [PubMed: 18713111]

Biography

Dr. Koumpingnin Nebie is a physician and hematologist with a Masters degree in public health who is currently the Director of Research and Quality Assurance at the National Blood Transfusion Center of Burkina Faso. He is responsible for putting in place a system wide quality improvement project at the national blood service, including the coordination of medical and scientific activities, quality assurance, training and hemovigilance.

Figure 1.
Geographical coverage of the territory of Burkina Faso by the four CRTS's.

Table 1

Blood Collection Practices in health agencies not covered by a CRTS in Burkina Faso.

Parameters	Health Agencies	
Type of collection		
Fixed only	26	61.9 %
Fixed and mobile	16	38.1 %
Type of donors		
Family members only	9	21.4 %
Family members and voluntary	33	78.6 %
Collection register		
Present	40	95.2 %
Missing	2	4.8 %
Pre-donation screening		
Carried out*	26	63.4 %
Not carried out	15	36.6 %
Screening method		
Written	19	73.1 %
Oral	7	26.9 %
Snack offered		
Never	12	29.3 %
Occasionally	17	41.4 %
Always	12	29.3 %

Table 2

Testing for infectious disease markers: number Burkina Faso health agencies not covered by a CRTS which routinely perform each test.

Screening	Health Agencies	
HIV *	42	100 %
HIV confirmation test	23	54.8 %
Viral hepatitis B	42	100 %
Viral hepatitis C	36	85.7 %
Syphilis	42	100 %
Results returned		
Never	13	30.9 %
Yes	29	69.1 %

* Rapid test.

Table 3

Transfusion orders in health agencies not covered by a CRTS.

Parameters	Health Agencies	
Prescription method:		
Specific prescription form	22	52.4 %
Verbal prescription only	15	35.7 %
Written prescription with no specific form	5	11.9 %
Prescriber's qualification:		
Only doctors	1	2.4 %
Only paramedical personnel	10	23.8 %
Doctors and paramedical personnel	31	73.8 %