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Customized Strategies to Improve Blood Safety and Availability in Sub-Saharan Africa

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Learning Objectives

- State the transfusion safety challenges that blood enterprises in resource-poor situations face.
- Describe the range of restrictions leading to poor performance of blood services in financially constrained environments.
- Make the interventions proposed applicable to modify operations elsewhere.

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The authors have disclosed no conflicts of interest.

- Propose strategies that may be useful in other countries for improving the fitness-for-purpose of the blood service in those countries.

Introduction

A FIRST REPORT ON BLOOD SAFETY IN AFRICA APPEARED IN 1920, before which the record is silent.¹ Several approaches for the provision of safe blood for transfusion have been initiated in sub-Saharan Africa (SSA) with a primary focus on emergencies and availability. But some major advances in blood safety in Africa have been noted during the last three decades, with the increase in donation rates and proportion of voluntary nonremunerated blood donation (VNRBD), the regional increase in the number of donors whose blood is tested, the regional decrease in donor infectious disease seroprevalence, numerous educational initiatives, and the regional increase in funding sources.²⁻⁴ Despite recent improvements, millions of children and mothers are still dying every year from anemia due to inadequate blood supply, and safe and reliable blood services remain largely unavailable to the poorest populations.^{5,6} Sociopolitical and cultural issues that are specific to African countries engender economic and financial challenges that influence the efficacy of the blood safety programs. Blood services are often characterized by limited financial and logistical resources and inadequately qualified and competent support staff, and they often face low educational attainment among their donors. Donor education, awareness, and recruitment programs tend to be lacking, impacting the availability of blood. However, there are also opportunities, including access to international technical support, the low median age of the donor population, availability of fit-for-purpose and cost-effective equipment and reagents, and access to increasingly knowledgeable African experts and professional associations that could implement development projects with significant impact,^{7,8} provided resources are available and the systems are sustainable.

Using Africa as a case study, this chapter will discuss situationally appropriate strategies to improve the safety and availability of blood components and derivatives as well as the quality of blood service operations, considering cultural and economic realities. The proposed strategies are based on evidence from peer-reviewed papers, recommendations from well-known organizations, and input from recognized experts. Some suggestions still require validation, as only pilot studies or isolated observations are currently available.

Mandatory and Critical Conditions for an Efficient Blood Safety Program in Resource-Limited Areas

Several assumptions for success (see Chapter 4) are mandatory for a successful blood safety program, and their absence, even with a full supply of resources, will hamper the sustainability of any quality program. The most important element is commitment and investment by the government to provide enough safe blood for its population. Most African countries are running their blood programs under the authority and regulation of their governments.⁴ Blood safety programs are generally managed under the auspices of the local ministry of public health in order to assure the epidemiologic control of blood-borne diseases, reduce mortality and morbidity related to lack of blood and blood components, and manage ethical issues related to blood donation and blood transfusion. Government involvement should include the development and implementation of appropriate blood regulations and policy, as well as appropriate governance, financial support, and flexible collaboration in solving ongoing technical and financial issues.

An accurate blood safety and availability assessment, based on reliable current information, is an essential first step, because all strategies and their implementation and monitoring need to be based on current needs and resources. Several countries require more than the current number of blood collections. The disparity between need and supply varies from one country to another, ranging from 1% to 75%, underscoring the fact that the World Health Organization (WHO) guideline target of 10 to 20 donations per 1000 population is seldom achieved for many African countries. Indeed, the estimation based on the “needs-to-supply model” reveals a need two to three times higher than the WHO estimate.^{9,10} Each country must analyze the gaps, customize its plans to meet its needs, and plan accordingly.

Blood services need to conduct strong and high-level public advocacy, supported with evidence-based data from operational research. Because blood donation relies exclusively on the willingness of the population, the participation of all stakeholders involved in population mobilization and education is essential, including the commitment of social leaders, political authorities, blood safety ambassadors (celebrities and sports stars), and civil society.

An Adapted Organizational Model

WHO’s response to an inadequate supply of blood and blood components is a strategy focused on centralizing blood services (ie, national coordina-

tion, not a single source of supply), the exclusive use of volunteer donors, donor blood testing, and transfusion stewardship. If not carefully implemented in a stepwise manner, this strategy may unintentionally decrease the availability of blood and components for patients as shown in Malawi in 2014. Indeed, voluntary donation added significantly to the cost of a unit of blood and made transfusion services unaffordable for a number of patients.¹¹ For several parts of Africa, the centralized blood system has been reported as the most expensive model compared to the hospital-based blood system, especially regarding blood donor recruitment and blood collection activities. With some exceptions like South Africa and Namibia, a centralized, volunteer-based system in SSA is four to eight times more expensive per unit of blood than a hospital-based system.^{12,13} This model may not be economically viable in cases of restricted health budgets, limited population coverage, and lack of facilities and skills. The absence of established blood distribution networks is a significant limitation to the effective establishment of a centralized blood safety systems approach, because all blood collections are transported by road to a main testing facility, usually located hundreds of kilometers from the collection sites. A centralized system might face difficulties regarding communication and hospital accessibility to fulfill the urgent transfusion needs of the majority of populations living in rural regions. It appears that a fully centralized system is impractical and unsustainable for the delivery of blood for emergency and elective surgical services, particularly when family members are available and willing to donate blood locally. Here again, examination of the assumptions for success is relevant (see Chapter 4).

Thus, progressive installation of a fully centralized system needs to be a stepwise approach adapted to low-resource settings. Health-care systems need to start with a hybrid approach that maintains the establishment of centralized blood banking infrastructure, centralized technical and administrative management, regulation, and quality assurance, while simultaneously supporting regional and local hospital transfusion facilities in their collection, testing, and distribution activities. A hybrid model gives time for the system to acquire more resources and flexibility to move progressively to a 100% centralized system, as well as for the collection of accurate data. This approach allows the hospital blood services to contribute, within their budget, to meeting local needs. In 2013, Bugge et al¹⁴ found a reliable and readily available blood supply at a Malawian district hospital that was using both centralized volunteer blood and local family replacement donations, effectively using a natural hybrid model.

Table 12-5. The Severity and Impact of Events on the Blood Supply

Sample Scale	Category	Definition
5	Critical	Widespread national event. The available blood and component stocks are probably enough for less than 3 days, and widespread mortality and morbidity may occur due to lack of blood and components.
4	Major	National-level event. The available blood and components stocks are probably enough for less than 5 days. Morbidity is expected due to unavailability of blood and components.
3	Moderate	Regional event. The available blood stocks are probably enough for less than 7 days. Cold surgeries are postponed. Minor morbidity may be expected.
2	Minor	Local event. The available blood stocks are probably enough for less than 10 days. Mitigation strategies are sufficient to manage the situation with minor impacts on clinical practice. No morbidity is expected.
1	Residual	Local event. Business as usual. Stock is enough for at least 14 days.

Communications Plan

An emergency communications plan (ECP) is a document that provides guidelines and procedures pertaining to how information should be shared during all phases of an unexpected event that requires immediate action.⁴⁴ Clear and effective communication can improve the response to an emergency situation and optimize outcomes.

While preparing an ECP, the following should be considered:

- Hierarchy of communication or sequence of communication.

Table 12-6. Risk Factor Scoring Index

Score	1-5	6-12	15-25
Risk Factor	Low Risk Undertake the activity with the existing controls in place.	Medium Risk Additional controls may need to be in place.	High Risk Consider alternatives to the activity. Significant control measures will need to be implemented to ensure safety.

- List of key contacts (facilities, authorities, and individuals).
- Mode of communication (land lines, mobile phones, emails, text message, or other communication system).
- The “trigger” to activate the plan and how and when to end it.
- Testing of the communication plan periodically.
- Media and public communication key contacts.

In each facility, the emergency and disaster plan should be clearly and effectively communicated at all the following levels:

- The blood facility leadership team and employees of the same facility.
- The blood facility and relevant authorities (higher management, disaster management office, department of public health, etc).
- The blood facility and stakeholders [eg, police, civil defense, utility companies (eg, water and electricity), etc].
- The blood facility and other blood facilities (eg, other blood suppliers, alternative facilities).
- The blood collection facility with its donor base and the public (to increase donation).

During a disaster, backup lines of communication need to be in place in case landlines, computers, cell phones, the Internet, and other means of contact fail. It is also important to have ready access to phone numbers, email addresses, and other contact information of key personnel (in both paper and digital formats) who should be contacted before, during, and after a disaster in each required department and agency.⁴⁵

AABB requires that blood banks and transfusion services test their communication systems at defined intervals, under emergency preparedness standards.⁴⁰ This highlights the importance of communication procedures.

Table 12-7. Risk Assessment Matrix and Mitigation

HAZARD IDENTIFICATION		RISK EVALUATION			RISK CONTROL	
Work Activity	Hazard	Person in Danger	Probability	Impact	Risk Factor	
Failure of blood and component storage equipment Disruption of service	Power outage	Patients	Rare 1	Major 4	Low 4	<ul style="list-style-type: none"> • Availability of electricity generator and UPS units for the blood storage equipment and critical equipment • Allocate an alternative facility
	Fire	Donors Patients Employees Visitors	Unlikely 2	Moderate 3	Medium 6	<ul style="list-style-type: none"> • Ensure facility is equipped with smoke detectors and a fire alarm panel • Availability of fire blanket • Have fire drills for staff annually • Install public announcement system • Ensure emergency procedures are well communicated and emergency codes are known

(Continued)

Table 12-7. Risk Assessment Matrix and Mitigation (Continued)

HAZARD IDENTIFICATION			RISK EVALUATION			RISK CONTROL
Work Activity	Hazard	Person in Danger	Probability	Impact	Risk Factor	Mitigation
Blood collection and blood supply	Infectious disease outbreak (pandemic)	Donors Patients Employees Visitors Suppliers	Likely 4	Major 4	High 16	<ul style="list-style-type: none"> • Availability of emergency and disaster response plan • Availability of blood supply contingency plan • Availability of business continuity plan • Develop a response plan for an infectious disease outbreak • Follow WHO and AABB guidance

UPS = uninterruptible power supply; WHO = World Health Organization.