OPEN ACCESS
NIJBAS
ONLINE ISSN: 2992-5797
Publications 2025
PRINT ISSN: 2992-6122

NEWPORT INTERNATIONAL JOURNAL OF BIOLOGICAL AND APPLIED SCIENCES (NIJBAS)

Volume 7 Issue 1 Page 35-39, 2026

https://doi.org/10.59298/NIJBAS/2026/7.1.3539

Strengthening Anemia Management in African Hospitals: The Impact of Non-Governmental Organizations in Uganda and Nigeria

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ABSTRACT

Anemia remains a pervasive public health and clinical challenge across sub-Saharan Africa, driving substantial morbidity, mortality, and health-system costs. In hospital settings, anemia complicates obstetric, pediatric, surgical, and medical care, often interacting with malaria, helminth infections, nutritional deficiencies, hemoglobinopathies, chronic kidney disease, and inflammatory conditions. Non-governmental organizations (NGOs) have played a pivotal role in closing policy-practice gaps through program financing, technical assistance, supply-chain support, workforce training, patient blood management (PBM), and community engagement. This narrative review synthesizes the landscape of NGO contributions in Uganda and Nigeria, two countries with high anemia burdens and distinct health-system contexts. We summarize common intervention domains screening and diagnostics, blood safety and availability, iron and folate supplementation, infection control, peripartum hemorrhage prevention, pediatric and sickle-cell services, nutrition, and quality improvement-and discuss implementation strategies, health-system enablers, and barriers. We highlight promising models (integrated obstetric bundles, point-of-care testing, PBM pathways, and digital supply tracking) and outline a practice-oriented framework for hospital leaders and NGO partners. Finally, we identify research and policy priorities, including standardized hospital anemia indicators, cost-effectiveness of PBM and IV iron, equitable blood allocation, and stronger NGO-government compacts for sustainable scale-up.

Keywords: Anemia; Patient Blood Management; Non-Governmental Organizations; Uganda; Nigeria; Blood Transfusion.

INTRODUCTION

Anemia remains one of the most pressing public health challenges worldwide, affecting over 1.6 billion people, with a disproportionate burden in low- and middle-income countries (LMICs), particularly in sub-Saharan Africa [1]. Defined by a reduction in the hemoglobin concentration or red blood cell count below age- and sex-specific thresholds, anemia is both a disease entity and a marker of underlying pathology. Clinically, it contributes to increased morbidity and mortality, especially among vulnerable populations such as pregnant women, children under five years, and patients undergoing surgery or chronic medical treatment [2]. In hospital settings, anemia often complicates care across multiple specialties, including obstetrics, pediatrics, surgery, internal medicine, and emergency medicine. Its multifactorial etiology, which includes nutritional deficiencies, infections such as malaria and helminthiasis, hemoglobinopathies, chronic kidney disease, and inflammatory conditions, underscores the complexity of diagnosis and management in resource-constrained environments [3].

Sub-Saharan Africa continues to bear a significant burden of anemia, with prevalence rates exceeding 40% in many countries. Uganda and Nigeria exemplify the region's challenges, each with unique yet overlapping health system

contexts [4]. In Uganda, anemia prevalence among women of reproductive age is estimated at 32%, while the prevalence in children under five approaches 50%. Nigeria reports similar high rates, with over 60% of preschool children and 50% of women experiencing some form of anemia (National Demographic and Health Survey. Key contributors in these countries include iron and folate deficiencies, malaria, hookworm infections, sickle cell disease, and complications from obstetric hemorrhage [5]. These underlying factors are compounded by weak diagnostic capacity, limited access to safe and timely blood transfusions, inadequate supply chains for essential medications and supplements, and workforce shortages.

Non-governmental organizations (NGOs) have emerged as crucial actors in bridging gaps between policy and practice in anemia management. By providing program funding, technical assistance, workforce training, supply chain support, and community engagement, NGOs complement government efforts in strengthening hospital care [6]. Their interventions range from the provision of essential medical supplies, implementation of patient blood management (PBM) programs, establishment of screening and diagnostic platforms, integration of nutrition and supplementation programs, to the training of health professionals in evidence-based anemia care protocols. In contexts where public health systems are overburdened or under-resourced, NGO initiatives often represent the only feasible pathway to improved clinical outcomes.

Despite extensive efforts by governments and NGOs, anemia continues to exert a heavy toll on health outcomes in Uganda and Nigeria. Hospitals often struggle with inadequate diagnostics, irregular blood supply, limited iron and folate supplementation coverage, and insufficient capacity for managing peripartum hemorrhage, pediatric anemia, and sickle cell crises. The fragmented nature of NGO interventions, coupled with insufficient integration with national health systems, often leads to uneven coverage and sustainability challenges [7]. Moreover, there is limited evidence regarding the effectiveness, cost-efficiency, and scalability of specific NGO-led programs in hospital-based anemia management. Without systematic evaluation and coordinated strategies, efforts remain fragmented, and the potential benefits of NGO contributions may not be fully realized. Understanding the scope, strategies, and outcomes of NGO initiatives is therefore critical for optimizing anemia management in hospital settings. This study seeks to synthesize and critically analyze the contributions of non-governmental organizations (NGOs) to hospital-based anemia management in Uganda and Nigeria, two countries where anemia continues to pose a significant public health challenge with far-reaching clinical and socio-economic implications. The review specifically aims to examine the current epidemiological landscape of anemia, its etiologies, and existing hospital management practices, while systematically identifying and categorizing NGO-led interventions such as screening programs, diagnostic support, supplementation initiatives, transfusion services, infection control measures, and workforce training. Beyond cataloging these interventions, the study also evaluates the strategies employed by NGOs, the enabling factors that facilitate successful implementation, and the barriers that undermine program effectiveness. Central to this analysis is an assessment of the impact of NGO-supported initiatives on patient outcomes, hospital efficiency, and the overall quality of patient-centered care. The study is guided by research questions that explore the determinants and prevalence of anemia, the range and scope of NGO involvement, and the extent to which NGO interventions influence clinical and operational outcomes. Moreover, it examines the challenges related to sustainability, integration with government health systems, and equitable access to services, while offering evidence-based recommendations for improvement. By consolidating lessons and highlighting best practices, this review provides actionable insights for policymakers, hospital administrators, and development partners. Ultimately, the study underscores the critical role of NGOs in bridging systemic gaps in anemia management and emphasizes the need for strong partnerships, standardized hospital indicators, and scalable, sustainable approaches to strengthen health systems in sub-Saharan Africa.

Burden and Etiologies of Anemia in Uganda and Nigeria

Anemia remains a major public health and clinical challenge in Uganda and Nigeria, with high prevalence reported at both community and hospital levels. Population-based surveys consistently show significant burdens among children under five and women of reproductive age, groups particularly vulnerable to the long-term consequences of anemia [8]. In hospitals, patients frequently present with moderate to severe forms, most commonly driven by malaria, nutritional deficiencies, hemoglobinopathies such as sickle cell disease, chronic infections like HIV and tuberculosis, and obstetric blood loss. The consequences are profound: anemia significantly increases demand for blood transfusions, raises the need for intensive care, heightens perioperative risks, and contributes substantially to maternal and neonatal mortality. Seasonal surges in malaria transmission exacerbate these pressures, often overwhelming blood bank stocks. Within clinical settings, obstetric and gynecological wards face high risks due to antepartum iron deficiency and peripartum hemorrhage, compounded by limited access to life-saving interventions such as uterotonics, tranexamic acid, rapid blood cross-matching, and escalation protocols. Pediatric wards frequently contend with severe malaria, nutritional anemia, hemolysis, and sepsis, where gaps in timely hemoglobin measurement and safe transfusion practices complicate care. Internal medicine and surgical units struggle with

anemia associated with chronic kidney disease, HIV/TB, gastrointestinal bleeding, and perioperative blood loss, further constrained by insufficient preoperative optimization [9]. At the health system level, challenges include poor diagnostic capacity due to limited point-of-care testing and reagent shortages, weak blood donation and distribution systems, frequent stock-outs of essential anemia therapies, workforce turnover with gaps in patient blood management competencies, and fragile data systems with inadequate indicators for monitoring anemia burden and outcomes. Collectively, these factors underscore anemia's complex burden in Uganda and Nigeria, demanding integrated, system-wide interventions.

NGO Roles and Value-Adds in Hospital Anemia Management

Non-governmental organizations (NGOs) play a critical role in strengthening hospital-based anemia management across low-resource settings such as Uganda and Nigeria, contributing both at the service delivery level and in broader systems transformation [10]. Their interventions span a wide continuum, beginning with technical assistance through the co-development of national or subnational anemia management guidelines and clinical pathways tailored to obstetric, pediatric, and surgical contexts [11]. Capacity building is another cornerstone, with NGOs delivering short courses, bedside mentorship, and simulation-based training, particularly in obstetric emergencies and transfusion medicine. To bridge diagnostic gaps, they often facilitate access to hemoglobin analyzers, microcuvettes, and point-of-care testing, while also ensuring staff are trained in quality control. On the supply chain front, NGOs support procurement and last-mile delivery of essential commodities such as oral and intravenous iron, folate, tranexamic acid, and blood bags, often piloting digital stock-tracking systems. They also strengthen blood services by mobilizing donors, supporting blood banks with screening and cold-chain logistics, and improving inventory management. Additionally, NGOs integrate anemia interventions with broader disease programs, including malaria, deworming, and maternal-child health. Their innovative service delivery models, such as preoperative anemia clinics and pediatric severe anemia pathways, complement robust monitoring, evaluation, and learning systems. Beyond clinical care, NGOs promote sustainability through performance-based financing, advocacy, community education, and donor engagement [12].

Intervention Domains and Illustrative Hospital Models

Intervention domains in hospital settings encompass a comprehensive range of strategies designed to prevent, diagnose, and manage anemia and related complications, often with active support from non-governmental organizations (NGOs). In the domain of screening and diagnostics, NGOs typically procure point-of-care hemoglobin devices, implement triage algorithms in emergency units, antenatal clinics, and preadmission surgery areas, and embed rigorous internal quality control measures [13]. These efforts aim to reduce diagnostic delays, minimize missed cases of severe anemia, and ensure targeted iron therapy and transfusion. Iron therapy, both oral and intravenous, benefits from standardized dosing protocols, introduction of IV iron for moderate to severe deficiency when transfusion is not urgent, and enhanced counseling to improve adherence to oral supplementation. Hospitals implementing these measures often observe shorter preoperative optimization periods, fewer transfusions, and improved peripartum hemoglobin levels. Patient Blood Management (PBM) integrates preoperative anemia correction, restrictive transfusion thresholds, surgical hemostasis techniques, antifibrinolytic use such as tranexamic acid, cell salvage where feasible, and postoperative optimization, supported by NGO-led pathway development, training, audits, and transfusion review processes [14]. Obstetric hemorrhage bundles, incorporating active management of the third stage of labor, early tranexamic acid administration, bedside hemoglobin checks, uterine balloon tamponade, rapid referral systems, and emergency blood access, aim to reduce postpartum hemorrhage-related transfusions and maternal mortality. Pediatric and sickle cell services include rapid Hb testing, malaria treatment, deworming, folate supplementation, careful transfusion thresholds, hydroxyurea access, newborn screening, stroke prevention, and patient registries, with NGOs providing mentorship, standard operating procedures, and caregiver education. Lastly, interventions in blood safety and availability, alongside nutrition and infection control, focus on voluntary donor mobilization, safe blood screening, component preparation, cold chain management, nutrition counseling, micronutrient supplementation, malaria prevention, and treatment of chronic infections. Together, these integrated efforts lead to improved maternal and child hemoglobin, fewer transfusions, reduced readmissions, and enhanced overall hospital outcomes [15].

Implementation Strategies That Work

Effective implementation of hospital improvement strategies requires a multifaceted and context-sensitive approach. One of the most critical elements is co-design with hospital leadership, ensuring that service gaps are jointly prioritized and that interventions are aligned with Ministry of Health policies as well as the hospital's broader strategic and business plans. This collaborative approach promotes ownership, sustainability, and relevance of the interventions [16]. Complementing this, a phased pilot and scale-up approach allows hospitals to focus initially on high-yield wards such as maternity, theater, and pediatrics, where impact is likely to be immediate and measurable. Lessons learned from these pilots can then inform hospital-wide adoption, ensuring that scaling is evidence-based

and adaptive. Central to this process is data-driven improvement, utilizing simple, practical dashboards that track key metrics such as hemoglobin testing rates, transfusion appropriateness, postpartum hemorrhage (PPH) bundle adherence, stockouts, and clinical outcomes. These dashboards enable real-time monitoring and targeted adjustments [17]. Additionally, task sharing and mentorship strategies empower nurses, midwives, and clinical officers to lead specific protocols, with embedded mentors providing hands-on guidance for three to six months before transitioning to remote support. This approach builds capacity while reinforcing clinical best practices. Finally, supply chain realism ensures that protocols are feasible by matching them to the actual formulary, logistical capacity, and procurement realities of the facility [18]. By integrating co-design, phased implementation, data monitoring, capacity building, and pragmatic supply chain considerations, hospitals can achieve sustainable improvements in service delivery and patient outcomes.

CONCLUSION

In conclusion, non-governmental organizations have proven indispensable in strengthening hospital-based anemia management in Uganda and Nigeria, bridging critical gaps in policy implementation, clinical practice, and health system capacity. Through targeted interventions spanning screening, diagnostics, supplementation, patient blood management, infection control, and nutrition, NGOs have enhanced the quality, safety, and timeliness of anemia care across maternity, pediatric, surgical, and medical wards. Their contributions are amplified by strategies that emphasize co-design with hospital leadership, phased implementation, data-driven monitoring, task sharing, mentorship, and pragmatic supply chain alignment, ensuring that programs are both feasible and sustainable. Despite these gains, challenges remain, including fragmented service coverage, limited integration with national systems, and variable sustainability. Strengthening NGO–government collaboration, standardizing hospital anemia indicators, and scaling evidence-based, contextually adapted interventions are essential to maximize impact. Ultimately, sustainable improvements in anemia management require coordinated, system-wide efforts that leverage NGO expertise while reinforcing resilient hospital and health system infrastructures.

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CITE AS: Mugo Moses H. (2026). Strengthening Anemia Management in African Hospitals: The Impact of Non-Governmental Organizations in Uganda and Nigeria. NEWPORT INTERNATIONAL JOURNAL OF BIOLOGICAL AND APPLIED SCIENCES, 7(1):35-39. https://doi.org/10.59298/NIJBAS/2026/7.1.3539