

Hemovigilance and Blood Transfusion Challenges in Low- and Middle-Income Countries (LMICs)

A global, safe blood supply is crucial for life-saving medical care, necessitating the incorporation of hemovigilance into blood systems worldwide. Hemovigilance encompasses surveillance throughout the transfusion process—from blood collection to recipient follow-up—aiming to identify and prevent adverse effects associated with blood products. According to the International Hemovigilance Network, Hemovigilance is 'a set of surveillance procedures covering the whole transfusion chain (from the collection of blood and its components to the follow-up of recipients), intended to collect and assess information on unexpected or undesirable effects resulting from the therapeutic use of labile blood products, and to prevent their occurrence or recurrence' (Hans-Gert and Taleghani, 2018). There are risks involved with blood donations and transfusions, especially in regions where blood systems do not have the resources or technology to ensure adequate checks have been done consistently across the blood transfusion chain (Ayob, 2010). Many Low-and-middle-income countries (LMICs), such as Liberia, Malawi, and Rwanda, face unique challenges in establishing these systems but it is essential for building trust in blood transfusion services and enhancing overall public health (Ayob, 2010; Nwabuko, 2021).

Blood Transfusions in LMICs

In LMICs, timely access to screened blood is vital for surgical and obstetric care, with transfusion demographics differing significantly from high-income countries. Notably, many transfusions in LMICs are for children under five, often due to pregnancy-related complications (WHO, 2023). The effectiveness of blood supply depends on adequate volume, safety protocols, and regulations (Jenny et al., 2017). Despite WHO recommendations favoring voluntary, non-remunerated donors (VNRD), over 50% of blood supplies in many LMICs come from paid or family donors, increasing the risk of transfusion-transmitted infections (TTIs) (Jenny et al., 2017). Innovative strategies, such as Malawi's 'Open Days,' have shown promise in improving donor recruitment. These strategies, which adapt to local conditions and needs, are crucial in addressing the challenges of blood donor supply in developing countries like Malawi. However, they still face challenges like seasonal supply gaps and donor eligibility issues. In this approach, the National Blood Transfusion Service (MBTS) goes into the community to collect blood in community trading centers and villages. This approach has been found to be beneficial to the blood supply - in 2022/2023, open days contributed to 16 percent of the target total blood collected for MBTS. Recruitment is arguably the most important part of the transfusion process. For developing countries like Malawi, where a consistent blood donor supply remains challenging, leveraging unique populations like students in school ensures a consistent population. This approach is not without its challenges; there are gaps in supply when school is not in session and students are off campus. One of the ways the blood supply is reduced is wastage. Ensuring that the donors undergo preliminary screening further prevents blood wastage along the transfusion supply chain. Donors who do not meet the eligibility criteria also need to be informed of their ineligibility and, in some cases, referred for treatment.

On the blood donation side, when it is donated, the blood is taken to the lab for screening and storage. For facilities that do not have the infrastructure to store large quantities of blood, alternate means of storage must be employed to avoid wastage. The ideal blood storage conditions may be resource-intensive in cost and sufficiently trained staff. In addition to lacking the infrastructure to store blood, some LMICs use manual labeling options for test tubes during the testing process. Errors made in labeling ultimately lead to wastage of blood, resources, and time, as well as skewed reporting results. Utilizing "Zero Defect" methodologies like DMAIC (Define, Measure, Analyze, Improve, and Control) is helpful in these settings to reduce the effects of human error on the blood transfusion chain (Jindal, 2022).

Access to blood supply has been cited as another challenge in LMICs – tailored innovations in blood transportation are essential to ensuring the population gets the blood they need. In Rwanda, for example,

autonomous drones are used to carry blood from blood banks to hard-to-reach locations in a timely, efficient manner. Further along the transfusion chain, as you approach the blood transfusion, capacity building is critical in lower resource settings. When there aren't enough skilled personnel in the facility, there is a likelihood that patients are not able to get transfusions when they need them, especially in emergencies. This underscores the crucial role of all healthcare personnel in ensuring timely and safe blood transfusions. All healthcare personnel must be well-versed in transfusion medicine. This way, patients are not losing their lives while waiting for a doctor or hematologist to arrive. Following the blood transfusion, reports detailing every step of the transfusion chain should be collated and sent to the necessary stakeholders. In addition to the number of successful transfusions, pints of blood donated, and donor/ recipient demographics, the reports should also include the adverse effects of transfusion. This should be well documented and thoroughly investigated to determine the batch origin and cause of the reaction and reported to the NBTS to prevent further complications with blood transfusions down the line.

Challenges with Blood Transfusions in LMICs

Many LMICs have established national blood transfusion services, yet comprehensive hemovigilance systems are often lacking. While some countries have made strides in implementing basic monitoring systems, they typically collect limited data, focusing primarily on the number of donations and the prevalence of transfusion-transmitted infections (TTIs). Many LMICs have established national blood transfusion services, yet comprehensive hemovigilance systems are often lacking. While some countries have made strides in implementing basic monitoring systems, they typically collect limited data, focusing primarily on the number of donations and the prevalence of transfusion-transmitted infections (TTIs).

The challenges LMICs face are (1) resource limitations: Many LMICs struggle with insufficient funding, inadequate infrastructure, and a shortage of trained personnel, hindering the effective implementation of hemovigilance practices; (2) cultural barriers: Cultural perceptions of blood donation and transfusion can influence participation rates and the reporting of adverse events; and (3) data management issues: The absence of robust data collection and management systems limits the ability to analyze trends and implement necessary improvements. The risks of blood transfusion can be high if there is no quality system. High reliance on paid or family replacement donors increases the risk of TTIs and complicates the safety of blood products. Ensuring voluntary, non-remunerated blood donations is critical to improving the safety of the blood supply.





Best Practices and Innovations

1. **Tailored Approaches:** Some countries have adapted global hemovigilance guidelines to fit local contexts, employing culturally specific methods to enhance community engagement and awareness.
2. **Technological Innovations:** Advancements such as mobile apps for reporting adverse events and drones for blood transportation in remote areas are emerging as promising solutions to overcome logistical challenges.
3. **Capacity Building:** Training healthcare professionals in transfusion medicine and hemovigilance principles is essential for fostering a culture of safety and accountability.

Firstly, hemovigilance starts at the local institutions and facilities. The blood establishments, transfusion laboratories, hospitals' clinical departments, and hospital transfusion committees. These services are directly responsible for some or all the steps in the transfusion chain, and the detection and management of adverse events. Surveillance can be active (proactive, systematic search for safety issues), passive (retrospective, spontaneous recognition of transfusion-associated adverse events by clinical staff), or both. The local institutions report to a regional or national body. Establishing a national hemovigilance scheme enables a coordinated review of adverse event reports and data consolidation above the level of individual hospitals and blood banks.

Other best practices include reporting, which should be mandatory, where there is a statutory requirement to submit reports. Or, reporting should be voluntary, relying on the willingness of the professionals involved in the transfusion process to participate. However, reports should be confidential, with shared accountability for both individuals and the organization. The relevant findings, feedback, and recommendations from the reported cases should be communicated to the healthcare professionals to enhance engagement and transparency. The recommendations taken forward should drive the education of all involved in the transfusion chain, preventive measures, and quality procedures and form a basis for the regulatory authorities to establish or improve regulations and guidelines.

Recommendations

	Develop Comprehensive Policies: Establish national hemovigilance policies that outline clear procedures for monitoring, reporting, and responding to adverse events.
	Enhance Training Programs: Invest in training for healthcare workers on hemovigilance practices and reporting adverse events.
	Promote Public Awareness: Launch community awareness campaigns to educate the public about the importance of blood safety and encourage voluntary donations.
	Strengthen Data Systems: Implement robust data collection and management systems to facilitate accurate reporting and analysis of transfusion-related incidents.

Conclusion

Effective hemovigilance is vital for ensuring safe blood transfusions in LMICs. By addressing the unique challenges faced in these regions and leveraging innovative strategies, countries can enhance their blood safety systems, ultimately improving patient outcomes and fostering public trust in healthcare services. Investing in hemovigilance is a public health imperative and a commitment to the safety and well-being of patients in need of transfusions. By focusing on these recommendations, LMICs can strengthen their hemovigilance systems and improve blood safety and availability for their populations.

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