CLINICAL GUIDELINES, RECOMMENDATIONS, AND COMMENTARY

blood global hematology

International expert opinion on challenges and perspectives in sickle cell disease and equitable access to care: place of automated red cell exchanges

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Sickle cell disease (SCD) is the most common inherited blood disorder worldwide, leading to severe complications, reduced life expectancy, and impaired quality of life. Standard treatments, including hydroxyurea, infection prevention, and transfusion therapies, aim to prevent complications. Automated red blood cell exchange (aRBCX) is an efficient and well-tolerated modality that rapidly and sustainably reduces hemoglobin S levels. However, its implementation remains limited because of challenges like blood supply, vascular access, cost, and logistics constraints. To explore these issues, Terumo Blood and Cell Technologies convened an expert workshop during the 19th Annual Sickle Cell and Thalassaemia Conference in October 2024. The objective was to collect insights from experts and patient associations from several countries to understand clinical practice and identify key barriers and actionable strategies to optimize aRBCX access for patients with SCD. The workshop gathered 20 experts and 2 representatives from patient associations across 8 countries. Four roundtable discussions focused on equity in aRBCX access, transition of care, and implementation and operation of apheresis units. Experts identified centralization of apheresis services, economic constraints, limited evidence generation, vascular access and blood supply challenges, and gaps in transition of care and sexual health as major barriers. Proposed solutions included decentralizing apheresis capacity, strengthening care coordination and national guidelines, supporting data generation, and improving blood supply and vascular access strategies. The essential role of patient associations was also emphasized. This white paper summarizes unmet needs and proposes actionable strategies to enhance equitable access to aRBCX and improve long-term outcomes for patients with SCD worldwide.

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Introduction

Sickle cell disease (SCD) is the most prevalent inherited blood disorder worldwide, affecting millions of people,[1] with an estimated 515 000 infants born with the condition each year.[2] Caused by a single mutation in the *β-globin* gene, SCD leads to the production of abnormal hemoglobin S (HbS), which results in misshapen red blood cells (RBC). Globally, individuals with SCD face premature mortality and debilitating chronic complications that significantly impair quality of life.[3-5] Indeed, patients experience frequent vaso-occlusive episodes, chronic pain, fatigue, and emotional distress, leading to significant limitations in education, employment, and social participation.

In addition, SCD continues to be associated with reduced survival and ranks among the top 50 leading causes of death from noncommunicable diseases worldwide, particularly in sub-Saharan Africa.[6] In this region, up to 90% of affected children die before the age of 5 because of limited access to early diagnosis and effective care.[7,8] Even in high-income countries, disparities persist. A landmark study in the United States reported median age at death of 42 years for males and 48 years for females with SCD.[9] Interestingly, more recent modeling studies estimate the current life expectancy at birth to be ~54 years, 2 decades shorter than in the general population.[10]

Standard therapeutic options for managing SCD include prevention of pneumococcal infections through preventive penicillin and immunization, transfusion therapies, and hydroxyurea. Transfusion approaches comprise simple transfusion (ST), manual red blood cell exchange (mRBCX), and automated red blood cell exchange (aRBCX), the latter using an apheresis device.[11-13] The primary objective is to prevent and control SCD-related complications by increasing tissue oxygenation and diluting HbS levels to maintain them under a targeted threshold.

Among these transfusion modalities, ST is the easiest to perform and is primarily used to correct anemia, leading to improvement in patient comfort. However, ST reduces HbS levels more slowly than the other procedures and is associated with an increased risk of iron overload and hyperviscosity, particularly when repeated transfusions are required. mRBCX represents an intermediate strategy that allows partial removal of HbS-containing RBC while limiting the rise in hematocrit and does not require specialized apheresis equipment. However, this technique is more time-consuming for health care professionals (HCPs) compared to aRBCX.[14-16] Based on the literature, mRBCX appears to provide better control of iron accumulation and hyperviscosity compared with ST, although it may be technically challenging to maintain strict isovolemia and achieve consistent HbS targets.[17-19]

According to several studies, aRBCX has emerged as a rapid, effective, and well-tolerated option in comparison to ST and mRBCX.[14,20] aRBCX is particularly indicated in acute and chronic management of severe complications, such as stroke, acute chest syndrome, and high-risk pregnancy, where rapid and sustained reduction of HbS is critical.[21] However, challenges such as limited blood compatibility, cost, infrastructure, and workforce shortages hinder its widespread implementation, contributing to global inequities in access to care.[20] In addition, critical points in the patient care pathway, such as the transition from pediatric to adult care and the associated shift toward greater self-responsibility in disease management, can result in treatment discontinuation or withdrawal, further complicating overall disease management and increasing the risk of complications.

In October 2024, Terumo Blood and Cell Technologies (Terumo BCT) hosted a dedicated workshop during the 19th Annual Sickle Cell and Thalassemia Conference. This prominent congress brings together HCPs, patient associations, and key industry stakeholders, serving as a major platform for sharing innovative research as well as clinical and societal insights into SCD. The objective of the side event was to gain a deeper understanding of patient care pathways and clinical practices, to strengthen education through the collection of expert insights, and to identify actionable solutions to improve access to care for individuals living with SCD.

This white paper aims to present the key insights gathered during these discussions, highlight unmet needs, and propose potential actions to promote equitable access to care for patients with SCD in countries with high prevalence of the disease, especially regarding aRBCX, and explore how quality of life can be improved.

Terumo BCT workshop

The workshop, organized by Terumo BCT, was held on 3 October 2024 in London alongside the Academy for Sickle Cell and Thalassemia conference. Key opinion leaders (KOLs) and representatives from patient associations across several European, Middle Eastern, and African countries and beyond were invited to participate in the event and share their strong expertise on critical topics related to SCD.

The event was structured around a series of 20- to 30-minute roundtable discussions moderated by Terumo BCT medical affairs representatives, facilitating peer-to-peer exchange and the sharing of clinical experiences across countries. Each roundtable brought together experts from different countries to encourage cross-border perspectives. At the end of each session, KOLs from the various tables reconvened to synthesize their insights and align on key observations and future strategies.

Discussions focused on pressing challenges, such as equity and access to transfusion therapies for patients with SCD, the transition of care from pediatric to adult services, and the implementation and operation of apheresis units. In total, 20 KOLs and 2 patient association representatives from France, Kenya, Senegal, Spain, Italy, United Kingdom, Portugal, and Brazil attended the event. In addition, follow-up meetings were held with leading experts from Saudi Arabia to incorporate their perspectives into the overall discussion.

Finally, the insights and conclusions generated from the workshop were compiled into the present white paper, which was drafted by the Terumo BCT Medical Affairs team, and was reviewed and validated by the participating experts.

Insights

SCD prevalence

Although SCD is classified as a rare disease, its prevalence in certain regions gives it major public health significance. In high-income countries, such as France, the United Kingdom,

Portugal, and Italy, thousands to tens of thousands of individuals are affected. For instance, France is estimated to have between 19 800 and 32 400 patients, whereas the United Kingdom reports ~17 000.[22,23] In contrast, Spain, Italy, and Portugal each report a smaller burden, with ~1000 to 2000 diagnosed individuals.[24]

In low- and middle-income countries, the prevalence tends to be higher. In Kenya, ~0.9% of the population lives with SCD, and in Senegal, the figure reaches 0.5%.[25] In Saudi Arabia, data from the National Premarital Screening Program have identified an SCD prevalence of 0.26%.[26] However, it is important to note that this prevalence percentage for SCD in Saudi Arabia is based solely on data from couples undergoing premarital screening during a specific period.[26] Therefore, this figure should be interpreted as representative if that screened cohort only. Brazil represents one of the countries with the highest burden outside sub-Saharan Africa, with an estimated 60 000 to 100 000 individuals affected.[27]

This global distribution largely reflects the evolutionary relationship between the sickle cell trait, which provides partial protection against malaria, and regions where malaria is endemic. This connection explains the higher prevalence in sub-Saharan Africa. In addition, demographic changes related to migration from high-prevalence regions have contributed to an increasing number of cases reported in several European countries, including the United Kingdom, Portugal, and Spain.

Newborn screening: target population, benefits, and needs

Newborn screening enables earlier diagnosis of SCD and more effective management of the disease. Indeed, early identification through newborn screening allows prompt initiation of prophylactic measures, parental education, and comprehensive follow-up, all of which are essential to prevent severe complications and early mortality.[28]

However, the roundtable discussions offered a comprehensive overview of the current status of newborn screening implementation for SCD across participating countries, revealing some disparities in its application across countries and underscoring the need for systematic implementation in countries with a high prevalence of the disease.

For instance, newborn screening for SCD is fully implemented nationwide in Brazil, the United Kingdom, Spain, and more recently, Saudi Arabia and Portugal. In France, screening was previously targeted to high-risk populations but has been generalized to all newborns since November 2024. In contrast, countries such as Italy and Kenya currently implement targeted screening, focusing on high-risk populations and specific regions. Notably, Kenya participates in the Consortium on Newborn Screening in Africa, which supports pilot programs to expand newborn screening in selected regions with high prevalence.[29] However, in Senegal, only 1 pilot study has been conducted in a single region, and no national newborn screening program exists, despite the high prevalence of the disease in the country.[30]

Beyond early detection, the organization and accessibility of apheresis units play a crucial role in ensuring that aRBCX can be used effectively and equitably in the management of SCD.

Transfusion units: organization and inequity in access to care

The roundtable discussions revealed interesting points on transfusion unit organization across the different countries represented.

First, it appears that in countries like France, Portugal, Spain, the United Kingdom, and Saudi Arabia, where red cell exchange therapy is predominantly offered in major urban centers, apheresis units, which enable aRBCX procedures, are mainly centralized in large cities. This observation highlighted that this organization could lead, in some countries, to some patients with SCD living outside these cities having to travel to access this transfusion therapy, creating inequities in access to transfusion therapies for patients with SCD, particularly regarding aRBCX procedures. However, it is important to note that when aRBCX is not possible, mRBCX is used in these countries.

Moreover, geographic and socioeconomic factors also play a significant role. In countries like France and Portugal, the rising cost of living is prompting some patients to relocate away from major urban centers. This relocation can result in reduced access to care, particularly for those requiring aRBCX, because apheresis units and specialized reference centers are typically concentrated in main urban areas.

In addition, although in Italy aRBCX appears to be the most used transfusion technique for treating patients with SCD requiring transfusion therapy, in other countries like the United Kingdom, France, Brazil, and Portugal, experts revealed that aRBCX is preferred but not available in all centers, nor is it offered around the clock in those that perform it. Interestingly, in Saudi Arabia, aRBCX remains underused and restricted to a limited number of specialized centers, despite its recognized benefits, based on literature data.[31] As an alternative, it is interesting to note that in France, Italy, the United Kingdom, and Saudi Arabia, some centers offer on-call aRBCX procedures, enabling emergency access to this therapy across hospital departments, as exemplified by Necker Hospital in France. In addition, certain centers operate mobile apheresis units, which help expand access in underserved regions.

In Kenya, however, only private hospitals perform red cell exchanges, further limiting access for patients with SCD. More centers are expected to begin the procedures in 2025 for patients requiring this transfusion therapy.

To help address access challenges for aRBCX, experts have emphasized the importance of promoting decentralized care for patients with SCD and establishing new apheresis units. Strengthening the skills of first-line HCP, including general practitioners, hematologists, and nurses, through continuous specialized training is a key lever to improve patient pathways and optimize referral processes. Implementation experiences illustrate diverse challenges and solutions: as exemplified at the Qatif Health Network in Saudi Arabia, a clinical hematologist successfully led the establishment of an apheresis unit in the absence of transfusion specialists, demonstrating that nontraditional leadership can effectively drive such projects.

The roundtable discussions revealed that successful establishment of apheresis units requires careful upstream planning and consideration of multiple organizational, clinical, and economic factors. These include assessing capacity-related needs, such as

the number of patients to be treated, human resources, training requirements, and the availability of beds and apheresis machines, as well as defining and disseminating standardized operating protocols. Coordination between HCPs from different services and centers also appears to be critical and could be facilitated by digital tools, like telemedicine, registry, and shared patient dossier, as well as documents or apps containing patient pathway information for emergency settings. Taken together, these measures can significantly facilitate both the creation and the sustainable operation of new apheresis units.

A concrete example comes from Centro de Hematologia e Hemoterapia do Ceará in Brazil, where a coordinated organization of care integrates protocol-driven management of each step of aRBCX, rigorous selection of eligible patients, securement of transfusion resources (including compatibility, blood product availability, and vascular access), and a specialized training program. This experience demonstrates the feasibility of aRBCX even in resource-limited settings.[32]

Finally, when discussing apheresis unit implementation, participating experts agreed that the most effective approach is to locate these units where patients are, meaning hosting apheresis centers in reference centers.

Limitations to an equitable access to care for patients with SCD: the specific case of aRBCX

All participating countries identified the same key limitations to equitable access to aRBCX care for patients with SCD, including cost, training needs, lack of standardized guidelines, vascular access challenges, and blood availability. These barriers are summarized in Table 1.

Economic burden. The participating experts discussed the cost of aRBCX procedures and the challenges associated with implementing and operating apheresis units.

A primary barrier identified was the reimbursement of aRBCX. In some high-income countries, such as France, Saudi Arabia, Spain, and Portugal, the procedure is covered by national health systems. Similarly, in the United Kingdom, routine SCD treatments are supported by the National Health Service. In contrast, in low-income countries, like Senegal, patients are required to pay the full cost of treatment out of pocket, whereas in Kenya a partial reimbursement exists. This financial burden can severely limit access to essential care, particularly for treatments requiring regular administration, such as transfusion therapy and aRBCX, thereby increasing the risk of complications. Improved reimbursement models for apheresis procedures accounting for the full cost of the session, including consumables (eg, blood bags and dedicated materials) and patient transportation, could help mitigate part of the economic burden associated with these interventions. To support reimbursement revision, the development of real-world–based cost-effectiveness models comparing aRBCX with mRBCX for patients receiving chronic transfusion programs and capturing clinical benefits, adverse events, and effects on patients' quality of life will be valuable. For instance, recent UK cost-effectiveness modeling evidence shows that lifetime aRBCX for clinically eligible patients with SCD delivers substantial cost savings while improving clinical outcomes and patients' quality of life compared with mRBCX.[33]

In conclusion, resolving the financial burden of SCD management by aRBCX for both patients and apheresis centers by improving reimbursement could facilitate SCD management by aRBCX for all patients requiring it. Supporting staff education by appropriate, continuing, and standardized training could also be an effective lever to enable equitable access to aRBCX for patients with SCD.

Training. A key component of improving patient with SCD care lies in ensuring that HCPs are well equipped with the knowledge and skills needed to manage this complex disease effectively. The workshop discussions revealed significant knowledge gaps, particularly regarding the role of aRBCX in SCD management. Addressing these gaps through targeted training is essential. Indeed, by providing HCPs with up-to-date knowledge of SCD and transfusion strategies, we can enhance both the accuracy and the timeliness of patient care. Furthermore, ongoing education ensures that HCPs remain adaptable to therapeutic advances, thereby improving long-term outcomes. Training modules should include both disease-specific content and detailed transfusion protocols, with particular emphasis on ensuring safe and compatible blood supplies for patients with SCD. Importantly, continuous education also promotes better coordination across health care systems, ensuring that patients with SCD receive comprehensive and high-quality care.

In parallel to logistics barriers and training needs, the organization and accessibility of apheresis units could be supported by the

Table 1. Main barriers to aRBCX implementation

Barriers	How to improve it
Universal newborn screening in some countries, but targeted or no national screening program dedicated to it in others	Make newborn screening universal in countries like Kenya and Senegal
Centralization of apheresis units, leading to inequity in access to aRBCX care	Improve apheresis unit organization by decentralizing it
	Education
Existing guidelines not up-to-date or adopted in all centers in countries where they already exist	National guideline update/elaboration
Absence of specific national guidelines (Kenya, Senegal, Portugal, Saudi Arabia)	National standardization in their implementation in all centers
Lack of standardized training on crucial topics regarding SCD, among them the disease and its complications (notably for emergency physicians and general practitioners), transfusion therapies and aRBCX, blood supply, and vascular access	Initial training of HCP with up-to-date knowledge on SCD and transfusion therapies
	Ongoing training
Issues in blood supply, compatibility, and safety depending on the countries	Blood donation campaigns/awareness
Issues in vascular access options and related risks	HCP training

development and implementation of clear, standardized, evidence-based, and regularly updated national guidelines. Such frameworks may help promote more access and support consistent quality of care across regions.

Guidelines and data generation. The roundtable discussion pointed out a lack of standardized national guidelines in many of the countries represented, contributing to disparities in clinical practice. Several needs were identified across settings.

Primarily, in Kenya, Senegal, Saudi Arabia, and Portugal, no specific national transfusion guidelines for SCD currently exist; in practice, clinicians rely on local protocols or center-specific standards of care, typically available within specialized institutions.

In the absence of national guidelines, HCPs in Saudi Arabia refer to internationally recognized recommendations from the American Society of Hematology and the American Society for Apheresis guidelines in their clinical practice.[18,21] Conversely, Brazil has recently updated its national guidelines, now integrating aRBCX as a modality of transfusion available for SCD management.[34]

In France, guidelines on transfusion for SCD management in children and adolescents have been freshly updated, whereas the recommendations for adults with SCD, currently dating back to 2010, are in preparation.[35] Similarly, Italy updated its national guidelines on transfusion strategies for hemoglobinopathies in 2025.[36] In Spain, some designated reference centers appointed by the Ministry of Health provide specialized care with recognized expertise on aRBCX along with local guideline.[37]

Beyond the existence of guidelines, ensuring their alignment with clinical practice remains challenging, with variabilities driven by HCPs' experience, logistical constraints, and the degree of awareness and adoption of recommendations. This heterogeneity also reflects the insufficiency of high-quality comparative trials in some indications, which limits international standardization. Accelerating evidence generation, particularly through randomized trials, will help consolidate recommendations and further align practices.[31,38] In addition, 1 solution proposed during these roundtable exchanges is to strengthen training initiatives across centers, particularly in smaller facilities treating only a few patients with SCD.

The United Kingdom has been cited as a positive example, where HCPs are familiar with National Institute for Health and Care Excellence guidance[39,40] and aligned with these recommendations in clinical practice. National Institute for Health and Care Excellence guidance is regularly updated and covers SCD and all available treatment options, including transfusion therapies and aRBCX. In addition, regular audits support consistent application across hospitals.

Overall, discussions emphasized an urgent need for updated and standardized national guidelines on transfusion therapies in the management of SCD. Generating high-quality evidence through randomized controlled trial and ensuring uniform implementation across all centers will be crucial in improving access to aRBCX for patients with SCD.

However, even with well-established apheresis units and national guidelines in place, the success of aRBCX therapy depends on adequate, safe, and compatible blood supply, particularly for patients of African descent.

Blood supply. Experts highlighted that, because of transfusion therapies, patients with SCD account for a significant portion of needs for labile blood product. This high demand for blood products raises important questions about the organization and availability of blood supply in different countries.

In most countries represented at the workshop, including France, Portugal, the United Kingdom, Italy, Kenya, and Senegal, blood supply systems are national and centralized. In contrast, in Saudi Arabia and Spain, blood supply is managed regionally. In Saudi Arabia, each major center operates its own blood bank under the Blood Bank Cooperation Health Cluster system, whereas the Ministry of Health provides national standards, policies, and quality control mechanisms. Similarly, Brazil's blood supply system is state based.

Critically, nearly all HCPs reported shortages of compatible blood. Achieving the target HbS percentage with aRBCX may require a high number of RBC units, depending on the clinical indication and target level. These shortages can result in the postponement of procedures, and some centers may opt for manual RBC exchange instead. However, mRBCX often fails to achieve desired HbS targets, which underscores the clinical advantage of aRBCX. In emergency situations, physicians may need to use universal O^{-} blood.

To mitigate these challenges, HCPs emphasized the importance of raising awareness on blood donation and its crucial role in SCD management through campaigns and dedicated blood donation programs. In addition, encouraging individuals with sickle cell trait to donate blood, when eligible, could help alleviate blood shortages. Interestingly, Brazil exhibits a diverse approach: some states rely primarily on voluntary donations, whereas others continue to depend on replacement donors.

Some patient associations and HCP working groups have been established in several countries, including the United Kingdom and France, to specifically address blood supply challenges affecting patients with SCD. In parallel with efforts to increase blood donation through targeted awareness campaigns, optimizing transfusion and aRBCX protocols represents an essential long-term strategy to improve blood resource use.

The depletion-exchange (or isovolemic hemodilution) technique appears to be a promising approach to reduce donor RBC requirements while remaining safe, well tolerated, and effective in maintaining HbS targets for patients enrolled in chronic aRBCX programs. However, the current body of evidence remains limited, and larger, well-designed studies are needed to better define the role of depletion exchange in both chronic and acute settings, including indications such as acute chest syndrome.

In addition, standardizing aRBCX procedural objectives using validated algorithms could meaningfully reduce blood use, directly mitigating blood supply constraints. Buban et al demonstrated that algorithm-based selection of aRBCX goals, particularly by individualizing the fraction of cells remaining, significantly reduced RBC consumption without compromising clinical outcomes in chronically transfused adults with SCD.[41] Although these findings

strongly support the role of algorithm-driven planning as a blood management strategy, further multicenter validation is required to support broader implementation.

Together, these approaches highlight the potential role of protocol optimization as a complementary lever to mitigate blood shortages and support more equitable access to aRBCX for patients with SCD.

Related to blood supply, all HCPs agreed that it is crucial to take into consideration that transfusion therapies are associated with high risks regarding the safety and compatibility of transfused blood, leading notably to alloimmunization and delayed hemolytic transfusion reactions. To prevent these life-threatening complications, pretransfusion RBC phenotyping is strongly recommended, especially given the ethnic mismatch between donors and recipients. Indeed, although in European countries patients with SCD are of African heritage, most donors are of European descent; this mismatch increases alloimmunization risk.[42,43] Experts importantly noticed that, in African and Caribbean nations, where donors and recipients are generally of similar ethnic background, extended phenotype matching is often not performed because of limited testing availability and costs. They agreed that the benefit of extended matching in such settings remains uncertain, but patients with SCD are expected to be at a higher risk of complications, which may justify its use even when donors and recipients are ethnically related.

In line with this recommendation, discussions among participating HCPs reported that extensive RBC phenotyping is performed before transfusion in most of the countries represented, like in Brazil, United Kingdom, France, Portugal, Spain, Italy, and Saudi Arabia. An additional risk, particularly in low-income settings, is the transmission of infections, such as HIV, during transfusion therapies.

Importantly, addressing sociocultural barriers, such as fears of needles, misconceptions, and cultural or religious concerns, through cultural mediation, community education, and tailored campaigns could improve the representation of donors from Afro-descendant communities.

Alongside blood supply considerations, vascular access issues play a pivotal role in determining the feasibility and sustainability of aRBCX.

Vascular access. Vascular access remains a major limitation to the use of aRBCX for patients with SCD.

The roundtable discussion provided an opportunity to identify key challenges and share practical solutions used in different countries.

Based on both literature and discussion among the HCPs attending the workshop, peripheral venous access (PVA) is preferred when performing aRBCX because it typically causes fewer complications compared to central venous access (CVA).[44] However, PVA requires good-quality veins for the successful puncture and completion of the procedure. This can be challenging because of the compromised vein conditions in patients with SCD and the venous damage associated with repetitive aRBCX procedures. When PVA is not possible, CVA may be used. However, this more invasive option is associated with greater risks, including infections, bleeding, vessel collapse, and thrombosis, but remains a viable option.[44,45] Table 2 summarizes the main advantages and disadvantages of PVA and CVA.

Another major challenge highlighted by HCPs is the limited availability of suitable vascular access devices. For example, Vortex AngioDynamics ports are no longer available in Europe (except in Spain), and no viable alternatives have been identified. This is particularly problematic for pediatric patients because alternative ports provided by PakuMed are too large for use in children. This concern was raised specifically by HCPs from France and Portugal. It is therefore essential to develop alternative vascular access approaches for these patients.

Interestingly, some centers in countries such as France, Saudi Arabia, and Portugal offer ultrasound-guided (USG) PVA as an alternative to CVA. At Necker Hospital, this procedure has been performed by trained nurses for the past 18 months with demonstrated benefits, including fewer punctures, reduced pain, and avoidance of central venous catheter use. Similarly, at the Qatif Health Network in Saudi Arabia, USG-PVA enables rarely needing CVA for difficult cases, facilitating safer aRBCX procedures.

However, the implementation of USG-PVA requires dedicated training for HCPs. Several studies have shown that structured programs combining focused theoretical instruction with supervised hands-on practice improve procedural success and safety.[46,47]

Another alternative worth considering in promoting PVA use is the single-needle technique, which allows both blood withdrawal and return through the same vascular access. This approach, implemented in some centers in most countries represented during the workshop, can be especially valuable in cases of limited vascular

Table 2. Comparison of PVA and CVA for aRBCX*

	PVA	CVA
Advantages	Preferred when feasible Less invasive Lower risk of complications (eg, infection and thrombosis) Minimal impact on daily activities Minimal requirement for care and maintenance Possibility to use single-needle access	Required in case of inadequate PVA Suitable for use in emergencies Suitable for long-term use Supports higher and more stable flow rates
Disadvantages	Requirement for good-quality peripheral veins Restriction in use in emergencies because of vein quality or patient condition Risk of vein collapse under negative pressure Not ideal for frequent or long-term use	Higher risk of infection, thrombosis, and bleeding Requires regular maintenance Higher cost and procedural complexity Requires flushing and careful handling Restrictions on patient's activity (eg, bathing and swimming) with external catheters

*Inspired on Otrock et al[44]

access, for instance, in pediatric patients or those with venous scarring because of repeated procedures. Although procedure duration may be slightly longer compared to the dual-needle technique, the single-needle approach offers a practical and safe solution to maintain treatment continuity in challenging access situations.[32,48]

Patient associations

Attendees emphasized the critical role of patient associations in promoting equitable access to care for patients with SCD across countries. Across all countries, patient associations share common goals and activities, such as launching awareness campaigns (on blood donation, for example), organizing training sessions, contributing to the development of health care protocols, and advocating for improved access to care. However, their number and structure vary by country. Although the United Kingdom (Sickle Cell Society), Portugal (Associação Portuguesa de Pais e Doentes com Hemoglobinopatias), and Spain (Asociación Española de Enfermedad Falciforme) benefit from a single and well-organized national association, France and Brazil host multiple groups with sometimes fragmented initiatives. Efforts such as France's annual patient association day and recent coordination initiatives in Brazil aim to foster synergy between associations. In Saudi Arabia, multiple provincial associations actively support national patient-focused events.

Beyond coordination, there is an important need to empower patient voices and strengthen their role in improving access to care. This can be achieved by supporting national coalitions of patient associations, providing therapeutic education sessions to build knowledge and capacity, and reinforcing collaboration and support from institutions, industry, and government services. Furthermore, involving patient associations in national advocacy efforts and ensuring that policies, guidelines, and care pathways reflect real-world patient needs and experiences could further enhance their collective influence and support equitable access to aRBCX.

Conclusion: unmet needs and potential next steps to improve access to care of patients with SCD

More than an exchange of knowledge, this event served as a call to action aiming to identify critical barriers and explore scalable solutions to improve access to aRBCX, a therapy that can significantly transform the lives of many patients with SCD. Structured roundtables enabled peer-to-peer dialog and cross-country comparisons, bringing forward several areas for improvement.

Centralization of apheresis units in large urban centers creates access disparities, particularly for patients in rural areas. Proposed solutions include establishing new units through coordinated organization of care that consider logistics, capacity-related needs, standardized protocols, and specialized training. Mobile apheresis units (United Kingdom and France) and intercenter networks (Italy) were also suggested to enhance access. In addition, cost, staffing, machine availability, and evidence-based national guidelines, alongside ongoing clinical research, are essential to define the role of aRBCX within transfusion strategies.

Vascular access and blood shortage were also identified as crucial barriers. Addressing these challenges requires coordinated strategies, including the alignment of aRBCX implementation with national blood donation policies, the promotion of extended RBC phenotyping, and targeted awareness initiatives to improve both compatibility and availability of blood products. Beyond increasing supply, emerging evidence suggests that optimizing aRBCX protocols may contribute substantially to blood management.[41] Interestingly, even if more studies are needed to strengthen the evidence base, the literature suggests that techniques such as isovolemic hemodilution before aRBCX can save some blood units while maintaining safety and therapeutic efficacy in treated patients.[49,50] However, these approaches require further validation before widespread implementation.

Preserving vein integrity for patients with SCD is essential for long-term use of aRBCX for patients requiring it,[44] with USG-PVA and single-needle options emerging as promising strategies.[46,48,51]

Equitable access also depends on HCP's expertise in SCD management and transfusion therapies, reinforced through targeted training. Coordinating aRBCX implementation with national blood donation strategies and adapting clinical practice across patient age groups are additional key factors.

Finally, to evaluate and support the successful implementation of aRBCX, key performance indicators could include the proportion of eligible patients receiving aRBCX, procedural effectiveness and safety, adherence to HCP training, clinical impact (eg, crises, hospitalizations), and center-level compliance with standardized protocols.

This workshop highlighted both the urgency and the opportunity to act. Collaboration between HCPs and patient associations has produced a road map of short- and long-term strategies, from improved access to apheresis to harmonized national guidelines, enhanced training, and blood donation awareness.

The strength of this event lies in its international scope and the shared commitment to advancing equitable care for patients with SCD worldwide. The next critical step is translating these discussions into concrete actions to ensure that all patients with SCD, regardless of geography or socioeconomic status, can access lifesaving therapies. Moreover, the rapid global adoption of emerging therapies, particularly gene therapy, often requires transfusion support as part of patient preparation, further reinforcing the need for equitable access to aRBCX to enable all eligible patients to safely benefit from these innovative treatments.

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