

VIEWPOINT

SMARTER Education for a Global Transplant Workforce

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Received: 21 July 2025 | **Revised:** 17 October 2025 | **Accepted:** 29 October 2025

SMARTER Initiative Integrity Statement: SMARTER Initiative content is created and reviewed by the IPTA Education Committee. All educational material is peer-reviewed for accuracy and relevance. Both the editorial and SMARTER have no industry funding and all contributors disclose any potential conflicts of interest.

ABSTRACT

IPTA created the SMARTER Initiative to address persistent gaps in pediatric transplant education worldwide. Through webinars, podcasts, case discussions, and interactive resources, SMARTER provides trainees and allied professionals with accessible, peer-reviewed content across all major organ systems. The program is designed for global reach, with downloadable modules, mobile compatibility, and recorded sessions to accommodate different regions and time zones. Since its launch, SMARTER has shown strong engagement, with fellows reporting that the platform helps them prepare for board exams, improve clinical decision-making, and connect learning directly to patient care. Survey feedback highlights high satisfaction and identifies opportunities for further growth, such as expanded case-based modules, procedural videos, and simulation exercises. By reducing disparities in transplant training and supporting collaboration, SMARTER is positioned to strengthen existing curricula and promote a better-prepared, more globally connected transplant workforce.

Since the International Pediatric Transplant Association (IPTA) was founded in 1998, it has played a key role in advancing education in pediatric transplantation. While the organization has made meaningful progress, significant disparities in training and education remain, particularly in regions with limited resources [1]. Trainees frequently identify key gaps across foundational transplant topics and competencies due to working in small teams within pediatric subspecialties. The topics previously highlighted by trainees included pre- and post-transplant evaluations, immunosuppression management, recognition

and treatment of complications, follow-up care, and navigating multidisciplinary coordination, ethics, and communication with families (Table 1) [2–5]. To help address these challenges, the IPTA Education Committee launched the Social Media for International Pediatric Transplantation Education and Research (SMARTER) Initiative, a global effort to enhance access to pediatric transplant education. The SMARTER Initiative aims to utilize digital platforms, including webinars, podcasts, and interactive learning tools, to share expert knowledge and provide an educational resource to trainees (Figure 1).

TABLE 1 | Knowledge gaps among pediatric transplant trainees. These areas can receive standardized support from SMARTER.

Knowledge gap	Likely consequence	SMARTER solutions
Little/no awareness of routine pre-transplantation assessments	Delays in identifying transplant eligibility and increased preoperative complications	SMARTER's webinars and MCQ banks cover transplant workflows
Unaware of vaccination requirements pre- and post-transplantation	Higher risk of preventable infections	SMARTER includes infection prevention content
Lack of knowledge on genetic conditions leading to end-stage organ damage	Missed opportunities for early intervention and family counseling	SMARTER highlights genetic considerations for transplant patients
Belief that genetic diagnoses have little/no impact on prognosis	Neglected risk assessment and counseling of patients	Evidence-based prognosis tools and case studies can enhance reach
Little/no education on different post-transplant immunosuppressant regimens	Suboptimal immunosuppression management and increased risk of rejection	SMARTER covers core pharmacology
Little/no education on side effects of immunosuppressant regimens	Poor management of adverse effects, potentially leading to non-adherence	Existing modules can be supplemented with simulations and case studies
No education on common post-transplant infections	Increased morbidity due to delayed recognition and treatment	SMARTER's infection control modules provide foundational education
Rarely/never able to identify graft rejection symptoms	Delayed diagnosis of rejection, potentially leading to graft loss	Symptom recognition training and simulations can help with identification
Lack confidence managing graft rejection symptoms	Hesitancy in starting treatment, leading to more rejection episodes	Integrating scenario-based learning modules can bolster confidence in decisions
No familiarity with post-transplant ICU protocols	Poor coordination of ICU care leading to adverse events	SMARTER can be expanded with ICU modules to build knowledge on care protocols
Unaware of long term-effects of organ transplant	Insufficient counseling on chronic complications	SMARTER provides long-term care principles, and can be expanded more to cover survivorship
No knowledge of potential fertility or obstetric complications	Inadequate family counseling and increased pregnancy-related risks	Dedicated reproductive health modules would help close this gap
Unaware of transition protocols post-transplantation	Gaps in care during transition from pediatric to adult services	SMARTER's education on pediatric transplant care can be supplemented with transition-of-care training
No familiarity with re-transplantation eligibility criteria	Missed referrals and delays in re-transplantation	SMARTER could expand content to include re-transplantation guidelines

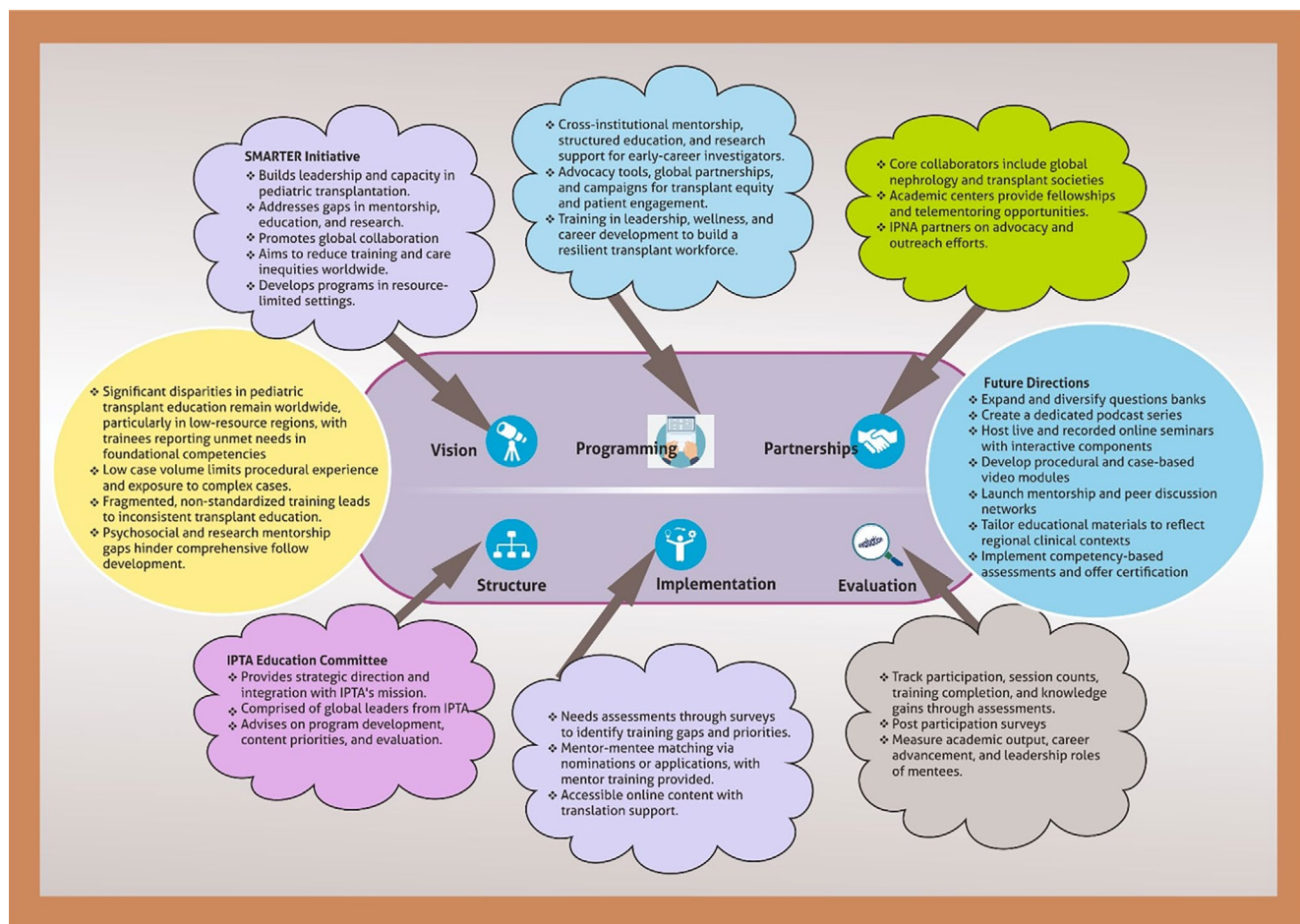


FIGURE 1 | Schematic of the SMARTER Initiative's emphasis on digital learning and competency-based evaluation to foster a resilient and skilled transplant workforce, particularly in low- and middle-income countries.

The SMARTER platform is a digital hub developed to reduce worldwide disparities in pediatric transplant training. The program contains material on most major organ transplants, including heart, lung, kidney, pancreas, and many more, as well as featuring non-specific content, such as immunobiology seminars. The main formats for learning materials are videos, podcasts, and slide decks, often featuring specialized techniques such as case-based scenarios and real examples. SMARTER also often hosts live events, allowing for real-time learner interaction. Modules typically range from 30 min to 1 h in length, and all content is available to every member of IPTA without any specific costs. The materials are curated by the IPTA Education Committee, ensuring validity and relevance of the content as well as consistent updates and new releases.

As an online-only program, the SMARTER Initiative requires an internet connection to access. However, much of the content is downloadable, allowing for use in low-bandwidth zones. Additionally, the platform is optimized for mobile use, allowing for a seamless transition between devices. Webinars and other live events are recorded, and most modules are learner-paced, ensuring global time-zone availability for content. The webpage is fully compatible with device accessibility settings, allowing for automatic accommodation and integration with third-party assistance software such as screen readers. SMARTER is committed to ensuring equitable access to all, currently aiming to

add translations into languages beyond English for better global access to the educational content.

Over the past five years, the SMARTER Initiative has grown to multiple solid organ transplant disciplines and has demonstrated strong engagement and consistently positive reception from its target audience. A survey of 237 transplant fellows (57% response rate, 416 invited) from August 1st to November 15th, 2024 had more than 80% of respondents giving positive feedback, with overall participant satisfaction at 76% [6]. The SMARTER initiative includes a multiple-choice question bank to support board preparation, which has been downloaded over 900 times, showing widespread and growing use.

Learners have consistently reported that the program helps them identify and address their individual learning needs. The digital format, which allows professionals to learn from their homes, has been widely praised for its accessibility. SMARTER reaches around the globe, with users on every continent (Figure 2). Many participants note that the content closely ties with the real-world clinical challenges they face, offering relevant training for both board preparation and clinical decision-making. Users also show strong support for the inclusion of advanced topics, interactive case simulations, mentorship opportunities, and other improvements to the program. These findings suggest that SMARTER can not only fill any gaps in existing education

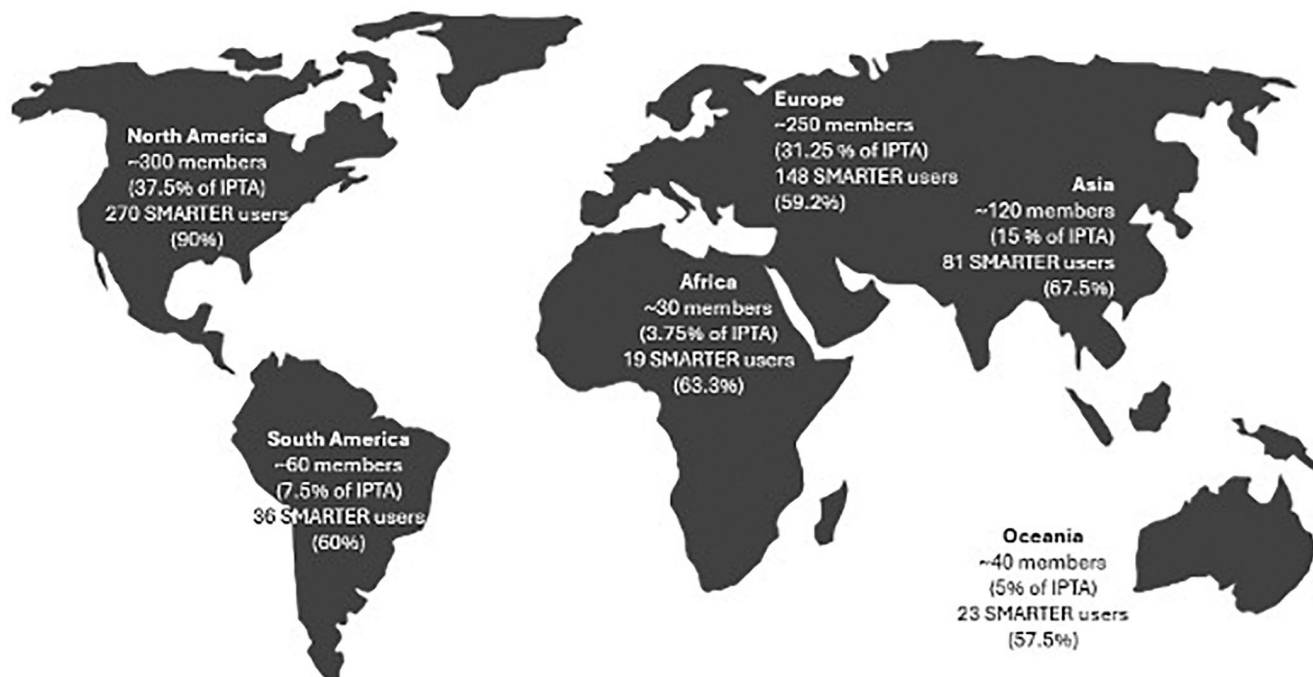


FIGURE 2 | The global reach of IPTA and the SMARTER Initiative, which is utilized by IPTA members on every continent.

but also offer a strong foundation for building a more structured, globally accessible training framework. Most participants would recommend the initiative to colleagues and have expressed interest in the expansion of material for ongoing learning.

The SMARTER Initiative is a resource for both transplant trainees and a broader audience involved in pediatric care. Its content is designed to be useful and relevant for general pediatricians, specialists and members of the adjacent care team alike. Nurses, pharmacists, physician assistants, nurse practitioners, dietitians, and social workers can also benefit from the material SMARTER offers. In addition, this teaching format also allows access for programs in countries with fewer resources, where adult professionals may also be caring for children and adolescents in the absence of pediatric health care providers.

In pediatric transplant hepatology, for example, variability in fellowship size, lecture availability, and clinical exposure presents challenges to standardized training. In response, as reported by Feldman et al., the Society of Pediatric Liver Transplantation virtual lecture series was developed to harmonize educational experiences across programs and support fellowships through shared access to established expertise [7]. Similarly, by delivering high-quality education in a digital format, SMARTER supports trainees in emerging programs, including those in low- and middle-income countries, where access to specialized transplant training remains limited. The initiative's alignment with the core domains of established pediatric transplant curricula also makes it well suited for integration into formal fellowship training programs.

Looking ahead, SMARTER is poised to grow into a more comprehensive and structured educational platform. Ideally, all levels of pediatric transplant care will benefit from the ongoing education the system provides. The 2024 survey of transplant

fellows ($n=237$) highlights several areas of improvement in the overall knowledge of transplantation care. Reported gaps in training included poor handling of pre-transplantation care, lack of education on the impact of genetic factors on outcomes, inadequate prevention and handling of infection or rejection, and the inability to provide long-term adequate care through the patient's stages of life [6]. The SMARTER program offers educational solutions to many of the most common shortcomings through lessons and seminars, and there is room to expand further. The initiative aims to expand its scope to include advanced, case-based modules, procedural videos, and interactive simulations that promote clinical reasoning and decision-making to cover the disparities. Future plans involve aligning content more closely with standardized curricula, likely allowing for integration into fellowship and institutional training programs. SMARTER also plans to include developing assessments and certification pathways to help learners demonstrate progress and mastery. Accreditation for Continuing Professional Development is another avenue SMARTER could grow into. Pre- and post- module knowledge checks, case-based assessments, regularly spaced quizzes, and other knowledge checks would be an excellent way to sustain engagement and model educational growth beyond learner satisfaction. To further enhance its impact, SMARTER will continue building opportunities for peer discussion, mentorship, and region-specific content tailored to the needs of both high-resource and low-resource environments. These efforts aim to ensure the platform remains accessible while offering dynamic education to every user in the world.

Together, these developments highlight not only the strong reception of the SMARTER Initiative but also the need for more equitable and comprehensive approaches to pediatric nephrology and transplant education worldwide. To prepare the next generation of pediatric transplant specialists, perfecting

programs like SMARTER will be essential. In addition, the SMARTER Initiative aligns and will strengthen other IPTA initiatives including both the Outreach Fellowships and the Outreach Programs with the resulting publication of the success of these combined programs in the Global Forum section of the IPTA journal *Pediatric Transplantation*.

Disclosure

Statements and Declarations: Rupesh Raina (R.R.) currently serves as an IPTA Council Member (2023–2027) and has been actively involved with the SMARTER Initiative, including presenting on transplant education programs. C.E. is a past President of IPTA (2019–2021). J.N.J. serves on the IPTA Membership Communications Committee, while M.M. is also a Past President of IPTA (2015–2017). J.O. is Co-Chair of the IPTA Education Committee. L.P. recently completed his term as IPTA President (2023–2025). C.A.B. has no listed IPTA or SMARTER role. S.B. serves as Ex-Officio Journal Representative for IPTA and is affiliated with *Pediatric Transplantation*, the society's journal. S.D.M. does not currently hold an IPTA or SMARTER position. K.T. is the current President of IPTA (2025–2027).

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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