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Letter to the Editor

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Joining forces in paediatric cardiology: from fragmented expertise to shared learning systems

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To the Editor,

Paediatric cardiology is rich in expertise but constrained by the limited scalability of clinical experience. Across Europe and internationally, highly specialised centres deliver advanced clinical care, multimodality imaging, catheter-based and surgical treatment, and high-quality education. The next challenge for our discipline is not simply to generate new knowledge, but to ensure that clinical experience, patient-level information, and scientific evidence become cumulative, transferable, and accessible across centres and across generations of clinicians. This is the practical ambition of a learning health system: routine care contributes to knowledge generation, and new knowledge is rapidly returned to practice through continuous learning cycles.[1,8,9]

This challenge reflects the structural characteristics of paediatric and congenital cardiology. Many conditions are rare, anatomically heterogeneous, and physiologically complex. The same diagnostic label may encompass different anatomical substrates, treatment histories, haemodynamic consequences, and long-term outcomes. Clinical decision-making therefore depends on the integration of clinical assessment, multimodality imaging, catheterisation and surgical information, intensive care data, genetics, functional status, and longitudinal follow-up. Each patient may be information-rich, while the number of comparable cases often remains low within each centre for specific diagnoses, interventions, and clinical scenarios.[3,4]

This imbalance has direct implications for evidence generation and quality improvement. In higher-volume areas of cardiovascular medicine, repeated exposure to comparable cases supports benchmarking, refinement of practice, and rapid learning. In paediatric cardiology, even large expert institutions may encounter only small numbers of similar patients, particularly in relation to rare anatomies, advanced interventions, and long-term complications. Local expertise may be excellent, yet opportunities to compare outcomes, harmonise practice, and learn systematically from uncommon events remain limited. Multicentre networks are therefore essential for addressing clinically important questions that cannot be answered by individual institutions alone.[2,4]

The same structural limitation has important educational consequences. Training depends heavily on exposure, but the full spectrum of congenital and paediatric cardiovascular disease is not evenly distributed across institutions, countries, or training pathways. Some trainees repeatedly encounter complex anatomies, rare complications, and advanced decision-making scenarios, while others have limited access to them during formal training. This variability matters because expert judgement in rare and complex situations is built through repeated exposure to patterns, complications, and longitudinal consequences. It reflects not a lack of educational commitment, but the reality of a highly specialised field in which valuable experience is often concentrated within particular centres or individual experts.[5–7]

Fragmentation is therefore not only a data-related challenge but also an educational and organisational one. Strong professional networks already exist across paediatric cardiology; however, clinical information remains distributed across hospitals, imaging archives, registries, surgical databases, digital platforms, and follow-up systems. This limits its reuse for education, research, benchmarking, and continuous quality improvement. Differences in clinically meaningful endpoints, longitudinal data capture, and local implementation further reduce comparability between centres, despite available coding frameworks. Consequently, the

discipline remains rich in expertise but relatively poor in mechanisms that transform individual experience into collective learning.[1,2,8,9]

We therefore argue that paediatric cardiology should move from isolated repositories and locally held experience towards connected shared learning systems. Several components of this vision already exist through the European Association for Paediatric and Congenital Cardiology, European Reference Networks, national societies, disease-specific registries, research networks, and collaborative educational programmes. International coding systems and specialist coding groups, including the European Association for Paediatric and Congenital Cardiology Coding Committee, have already advanced standardisation. The next challenge is not to replace these initiatives, but to connect, harmonise, and scale them so that their educational and scientific value becomes more widely available.[2,5–7]

Practical next steps could include curated multicentre educational case libraries, structured digital multidisciplinary discussions, shared multimodality imaging repositories, common core data elements, longitudinal datasets linked to clinically meaningful outcomes, and federated or distributed models that allow learning across centres while preserving local data governance. These elements should not remain separate projects. Together, they could form the foundation of a learning health system in which routine care generates knowledge, and knowledge is translated back into practice through repeated learning cycles. Such systems could support earlier recognition of rare complications, more consistent interpretation of multimodality imaging, more meaningful benchmarking of long-term outcomes, and broader educational access to cases beyond local institutional exposure.[1,2,5,8,9]

Emerging digital infrastructures, including artificial intelligence-assisted analytical tools, may further facilitate knowledge extraction, pattern recognition, and clinical decision support. Technology alone, however, is insufficient. Its value depends on high-quality data, interoperability, transparency, robust governance, ethical oversight, and continued expert clinical interpretation. Data protection should be designed into collaborative infrastructures from the outset rather than treated as a downstream administrative requirement. Sustained patient and public trust will depend on proportionate safeguards, transparent governance, and a clear demonstration of clinical and educational value.[8,9]

This vision should not be interpreted as an attempt to replace expert judgement. On the contrary, its purpose is to make expert reasoning more visible, transparent, and teachable. Much of the most valuable knowledge in paediatric cardiology is tacit: how experienced clinicians interpret uncertainty, weigh imperfect information, recognise patterns across multimodal data, and anticipate the long-term consequences of early decisions. If this expertise remains confined to local environments, its educational and scientific value is limited. If it is captured, contextualised, and shared responsibly, it can strengthen training, research, quality improvement, and patient care.

Professional societies are well positioned to facilitate this transition. The European Association for Paediatric and Congenital Cardiology, together with European Reference Networks, national societies, working groups, educational committees and collaborative research networks, can provide trusted governance, common terminology, and a neutral framework for multicentre collaboration. The European Association for Paediatric and Congenital Cardiology Education Committee, working alongside these partners, could help catalyse multicentre case-based learning, promote common educational standards, facilitate cross-centre teaching, and connect educational initiatives with existing research infrastructures. Practical priorities could include defining minimum standards for multicentre educational case libraries, agreeing shared core data elements for case discussion, and piloting governance-preserving models for cross-centre learning. Priority areas may include rare congenital anatomies, complex catheter or surgical reinterventions, inherited cardiac conditions, multimodality imaging interpretation, and lifelong follow-up after childhood interventions.[5–7]

Paediatric cardiology does not lack expertise; it lacks systems that allow expertise to become cumulative. The next generation of paediatric cardiologists should not depend solely on the experience available within a single institution, but should benefit from the collective knowledge of the wider community. Developing shared learning systems is therefore not merely an educational ambition. It is a strategic investment in better clinical care, stronger research, continuous quality improvement and more equitable access to expertise. In a discipline where rarity limits individual experience but not collective knowledge, transforming fragmented experience into shared intelligence may become central to improving outcomes across the lifespan.[1,4,8,9]

Yours sincerely,
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