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Perfusion Practice in Pediatric Aortic Arch Reconstruction: Results of a Survey Among Centers in Austria, Germany, and Switzerland

Niklas Sturm[1], Fabian Edinger[2], Ronja Beran[1], Johannes Meuser[1], Hakan Akintürk[1], Matthias F. Müller[2], Thomas S. Zajonz[2]

Affiliation addresses are listed at the end of the article.

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ABSTRACT

Introduction Organ-protective perfusion strategies have improved outcomes in pediatric aortic arch reconstruction, yet no consensus exists on cerebral, cardiac, and lower-body perfusion techniques. We surveyed DACH pediatric cardiac surgery centers (Germany, Austria, and Switzerland) to assess current practices.

Materials and Methods In March 2026, a 41-question online survey was emailed to all clinical perfusion departments at pediatric cardiac surgery centers in Germany, Austria, and Switzerland, identified via national professional association websites. Each center received a unique, anonymous hyperlink; three reminders followed at 14-day intervals over 6 weeks. Items included yes/no, multiple-choice, and free-text questions, pilot-tested by perfusionists, anesthesiologists, and surgeons. A pediatric perfusion team was defined as staff dedicated exclusively to pediatric/ACHD patients, separate from adult cardiac surgery staff; an aortic arch perfusion team is a subgroup managing arch reconstruction.

Results All 26 centers responded (100%; 96.2% completion); all perform arch reconstruction. Specialized pediatric perfusionists existed at 80.8% of centers, but dedicated arch teams at only one (3.9%); half lacked procedure-specific standard operating procedures. Selective antegrade cerebral perfusion was near-universal (96.2%), with moderate (50%) and deep (42.3%) hypothermia predominating. Lower-body perfusion was used in 52%, mostly retrograde femoral. Monitoring varied widely. Though 72% were satisfied, training (60%) was the top priority.

Conclusion This survey shows consensus on selective antegrade cerebral perfusion and moderate hypothermia, alongside heterogeneity in targets, lower-body strategies, and standardization, with dedicated arch teams and SOPs remaining exceptional. Despite high satisfaction, training and coordination emerged as priorities, underscoring the need for guidelines and research.

Keywords perfusion, cardiac surgery, aortic arch, reconstruction, pediatric, bypass

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Correspondence Fabian Edinger, MD, Pediatric Cardiac Anesthesiology Service, Department of Anesthesiology Intensive Care Medicine, Pain Therapy, University Hospital Giessen and Marburg GmbH, Campus Giessen, 35392, Giessen, Germany, Email: fabian.edinger@chiru.med.uni-giessen.de

Introduction

In past decades, pediatric aortic arch reconstructions benefitted from continuous progress and the implementation of new technologies.[1,2] Initially performed under deep hypothermic circulatory arrest (DHCA), surgical, anesthesiological, and perfusion techniques advanced to progressively safeguard cerebral, cardiac, and abdominal integrity and function. Selective cerebral perfusion (SCP) is now considered a standard strategy to protect the brain from deleterious effects of circulatory arrest besides DHCA.[3,4] Selective cardiac perfusion was subsequently integrated into the perfusion management as a cardio-protective measure in selected patient groups.[5,6] Implementation and optimized outcomes made it possible to gradually reduce the degree of hypothermia and thereby minimize associated comorbidities—particularly hemostatic disorders.[7–9]

More recently, the perfusion of abdominal organs has increasingly reached the focus of management and outcome considerations, with particular emphasis on renal protection, regarding the phase of clamping of the descending aorta. Strategies include cannulation and perfusion of umbilical vessels, direct cannulation of the descending aorta, and retrograde perfusion of the abdomen via femoral arterial catheters.[10,11]

To date, there are no uniform recommendations from national or international professional societies regarding perfusion in the context of pediatric aortic arch reconstructions.[12,13] The published literature shows considerable heterogeneity with regard to strategies employed and reported outcomes.

Table 1 Availability of specialized perfusionists, aortic arch teams, and standard operating procedures (SOPs)

Parameter	*n*	%	Total respondents (*n*)
Centers with 3–5 perfusionists providing neonatal/infant support	18	69.2%	26
Centers with specialized pediatric perfusionists	21	80.8%	26
Centers with a formally defined aortic arch perfusion team	1	3.8%	26
Centers with part-time aortic arch team availability	8	30.8%	26
Centers with specified SOPs for aortic arch reconstruction	9	34.6%	26
Centers with SOPs currently in development	4	15.4%	26

Abbreviation: SOP, standard operating procedure.
Note: Data are presented as percentages.

To conduct the first systematic assessment of current care standards in German-speaking countries, a structured online survey was therefore designed for relevant treatment centers in the DACH region, with the aim of determining the status quo and identifying existing trends in perfusion practice for pediatric aortic arch reconstruction.

Methods

In March 2026, an online link was sent via email to all scientific clinical perfusion departments of pediatric cardiac surgery centers of Germany, Austria, and Switzerland (for detailed information on the contacted societies: please see **Supplementary Material**, available in the online version only). Contacted departments received three recalls, starting 2 weeks after initiation of the survey, at 2-week intervals, with the survey being terminated after 8 weeks. The participants provided anonymous reporting of the survey data via a global online survey platform (SurveyMonkey, Dublin, Ireland).

The survey consisted of 41 questions, addressing organizational and procedural aspects of perfusion practice, including team structures, staffing, and standardized operating procedures, as well as technical parameters of cardiopulmonary bypass (CPB) management such as priming strategies, hemodynamic targets, hypothermia protocols, and blood gas analysis. Additional topics encompassed cannulation and adjunctive perfusion techniques—including selective cerebral, coronary, and lower body perfusion (LBP)—alongside perfusion monitoring methods and institutional satisfaction with current practices (the entire survey [-German/English] is available in **Supplementary Material**, available in the online version only). During the writing process of this paper, the authors used Claude Opus 5.5 (Anthropic, 2026, https://claude.ai) to refine language and spelling checks. The authors reviewed and edited the text and take full responsibility for the content of the paper.

Data were expressed as counts and percentages or medians, with interquartile ranges where appropriate.

Results

Out of the pediatric perfusion departments at the 26 centers (Germany: 22, Austria: 3, and Switzerland: 2) that were contacted, 26 returned questionnaires. This resulted in a response rate of 100%. Fully completed questionnaires were returned in 96.2% ($n = 25$). Due to the anonymous character of the survey, no data on national participation rates can be provided. Detailed information's on the scope of surgical procedures performed is presented in **Supplementary Material** (available in the online version only). The number of neonatal and infant heart–lung machines per year presented a peak at 51 to 149 (51–100: 23.08% and 101–149: 23.08%) and another peak at >250 (23.08%). Surgical aortic arch repair is performed in all of the responding centers.

Survey respondents reported that three to five perfusionists primarily provide neonatal/infant support in their centers ($n = 18$, 72%); no center provides fewer than three perfusionists.Specialized pediatric perfusionists were available at the large majority of centers. In contrast, a formally defined aortic arch perfusion team existed at only one center, with part-time availability at a further subset (**Table 1**).

Specific SOPs for aortic arch reconstruction were established at roughly a third of centers, with development underway at a few others (**Table 1**).

The majority of centers modify CPB priming based on patient weight ($n = 18$, 69.2%). The target cardiac index (CI) during CPB was favored by respondents between 3.0 ($n = 19$, 73.1%) and 2.8 L/minute/m^2 ($n = 10$, 38.5%), with no mention of CIs <2.4 L/minute/m^2. (**Fig. 1**)

The predominantly used priming volume in neonates (<3 kg bodyweight) ranges between 100 and 150 mL ($n = 7$, 26.9%) and 150 to 200 mL ($n = 8$, 30.8%), priming volumes >350 mL were only mentioned once (3.9%; **Fig. 2**). Red blood cells (RBCs) were added to the priming volume of neonates in the majority of centers ($n = 16$, 61.5%), with a further subset adding RBCs depending on the clinical situation ($n = 7$, 26.9%).

Regarding the CPB priming volume in infants (≤ 10 kg bodyweight), most centers favor a volume of 150 to 200 mL ($n = 9$, 34.6%) and 200 to 250 mL ($n = 9$, 34.6%; **Fig. 2**). RBC addition to the priming volume was practiced in nine centers (34.6%), while the remaining centers based this decision on the specific clinical situation (53.9%).

Hypothermia during aortic arch reconstruction is primarily performed in the moderate (28–32°C; $n = 13$, 50%) and deep sector (24–28°C; $n = 11$, 42.3%). Very deep hypothermia (<24°C; $n = 4$, 15.4%) or DHCA ($n = 4$, 15.4%) are less frequent. Aortic arch reconstruction is performed using the beating heart technique in 34.5% ($n = 9$). Ischemia with blood cardioplegia is less common

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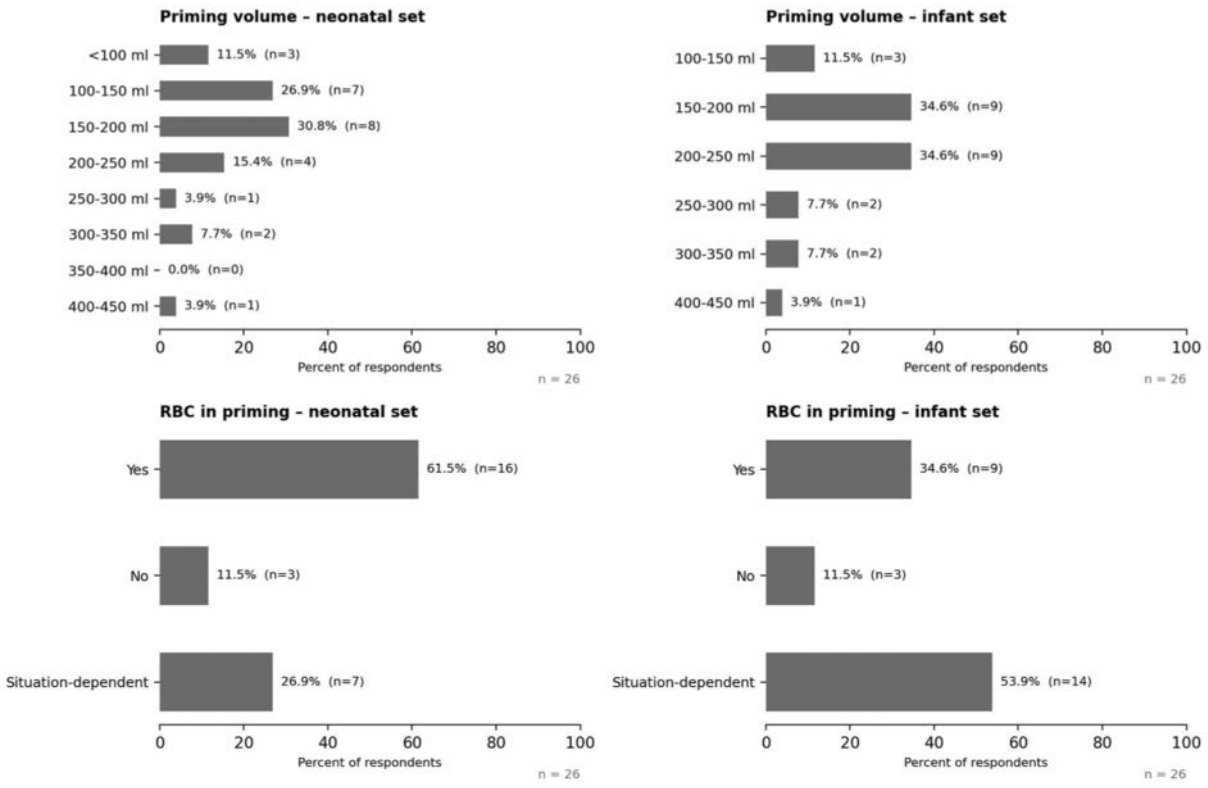


Fig. 1 Target cardiac index (CI) on CPB during neonatal/infant perfusion. Data are presented as percentages. CI, cardiac index.

($n=9$, 34.6%) than crystalloid cardioplegia ($n=15$, 57.7%), followed by combinations ($n=7$, 26.9%). Venuous cannulation is primarily performed via the bicaval approach ($n=20$, 76.9%); single-stage cannulation represents the secondary approach ($n=10$, 38.5%).

All replies, except one, stated that SCP is used ($n=25$, 96.2%), with the favored inflow over the brachiocephalic truncus ($n=25$, 96.2%) via a prosthesis—two clinically distinct cannulation techniques for antegrade cerebral perfusion: direct cannulation, in which the cannula is inserted directly into the brachiocephalic (innominate) artery, and indirect cannulation, in which a small vascular graft is first sutured onto the artery and the cannula is then inserted into the graft,[14–16] while other SCP inflow strategies are seldom (carotic arteries, subclavian arteries, and Blalock–

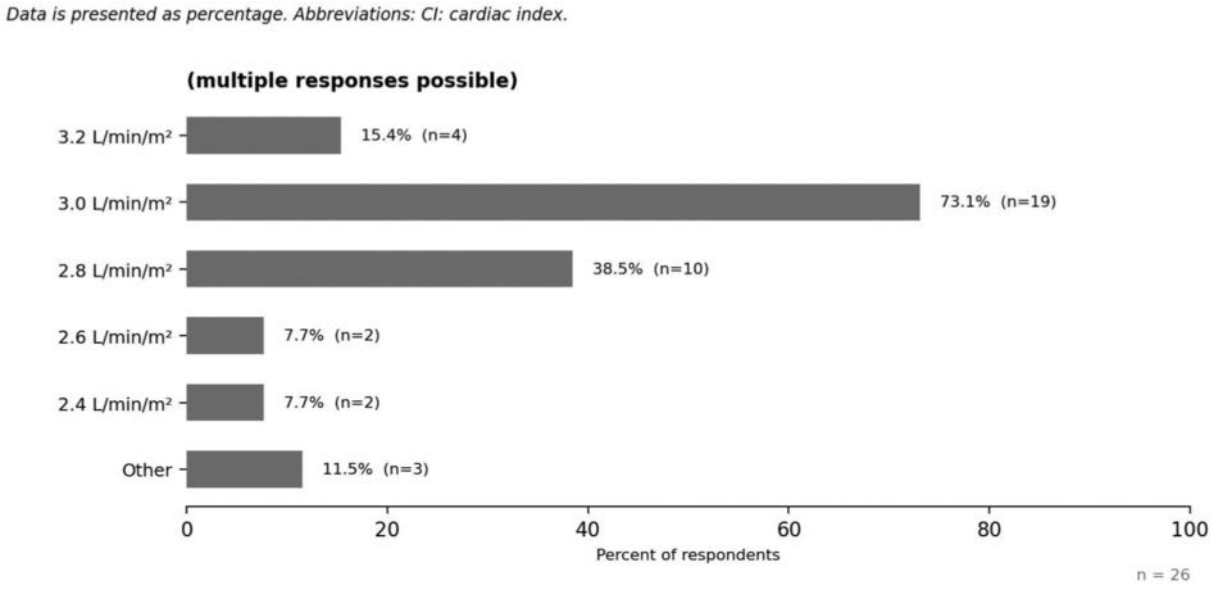


Fig. 2 Priming volumes and RBC addition in neonatal and infant CPB sets. Data are presented as percentages. RBC, red blood cell concentrates.

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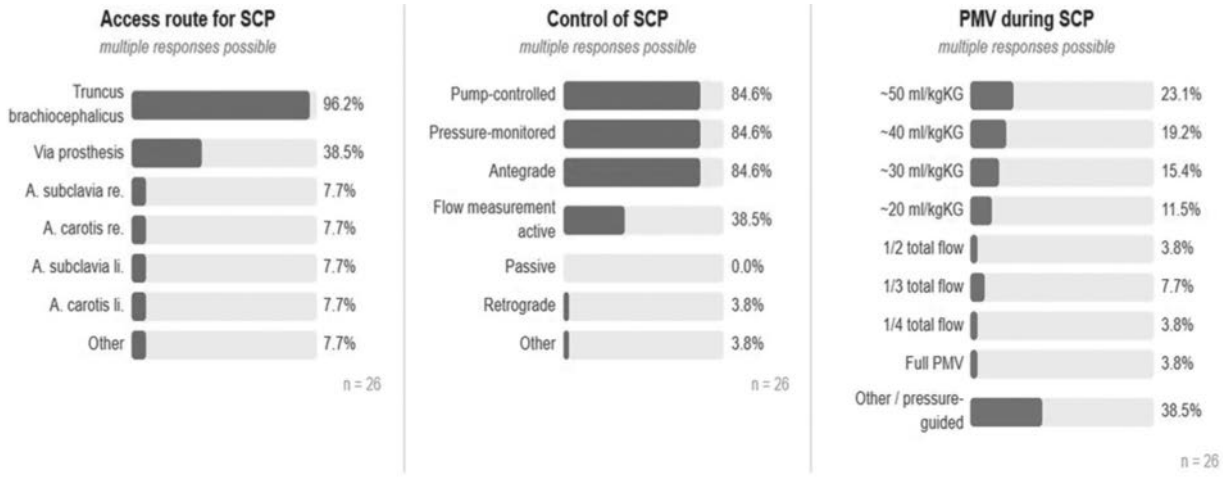


Fig. 3 Access, control, and flow of SCP; data are presented as percentages. PMV, pump minute volume; SCP, selective cerebral perfusion.

Tausig-shunt). SCP is primarily controlled by a CPB pump ($n = 22$, 84.6%), with additional pressure ($n = 22$, 84.6%) and flow control ($n = 10$, 38.5%) in antegrade flow ($n = 22$, 84.6%). Replies presented various results regarding CPB flow (mL/minute) during SCP, with 50 mL/kg bodyweight representing the most frequently reported answer ($n = 6$, 23.1%) and 25% of calculated total CPB flow ($n = 7$, 26.9%; see **Fig. 3**). Hemoglobin levels (g/dL) are primarily not modified during SCP ($n = 22$, 88%).

Selective coronary perfusion was used in 19.2% of centers ($n = 5$), with a further 38.5% ($n = 10$) reporting this as procedure-dependent; the remaining 42.3% ($n = 11$) did not use selective coronary perfusion. Replies regarding the control of selective coronary perfusion were analogous to SCP (pump controlled: $n = 12$, 85.7%; pressure controlled: $n = 11$, 78.6%; antegrade: $n = 12$, 85.7%). Perfusion flow (mL/minute) for selective coronary perfusion ranges primarily from 10 to 50 mL/minute. LBP is applied in more than half of the centers ($n = 13$, 52%), with retrograde perfusion via a femoral arterial cannula as the primary inflow strategy ($n = 10$, 76.9%); additional cannulation of the descending aorta is less common ($n = 7$, 53.9%). LBP is primarily pump-controlled ($n = 10$, 76.9%), with pressure ($n = 10$, 76.9%) and flow control ($n = 5$, 38.5%). Inflow (mL/minute) for LBP varied across centers, with a high proportion of free-text responses (see **Fig. 4**).

Results of the query regarding frequencies of blood gas analysis during CPB showed that predetermined intervals and individualized intervals with subsequent continuous analysis of blood parameters are common in the DACH area. Hemoglobin targets (g/dL) are primarily in the range between 8 and 12 g/dL (8–10 g/dL: $n = 15$, 60%; 10–12 g/dL: $n = 7$, 28%). The hematocrit target is mostly set at 25 to 30% ($n = 19$, 76%).

Perfusion during aortic arch reconstruction is controlled by bifrontotemporal near-infrared spectroscopy ($n = 24$, 96%), continuous blood gas monitoring (arterial: $n = 18$, 72%; venous: $n = 15$, 60%), and discontinuous blood gas analysis ($n = 16$, 64%). Transcranial Doppler (TCD) sonography is only used in $n = 3$ (12%; discontinuous) centers (see **Fig. 5**).

Gas blender control is favored using electronic systems ($n = 18$, 72%); mechanical systems are used in $n = 4$ (24%) centers. Most participants answered that additional carbon dioxide (CO_2) input to the oxygen/gas blend depends on the individual case ($n = 12$, 48%).

Seventy-two percent of respondents reported being very satisfied or satisfied with the current approach to aortic arch

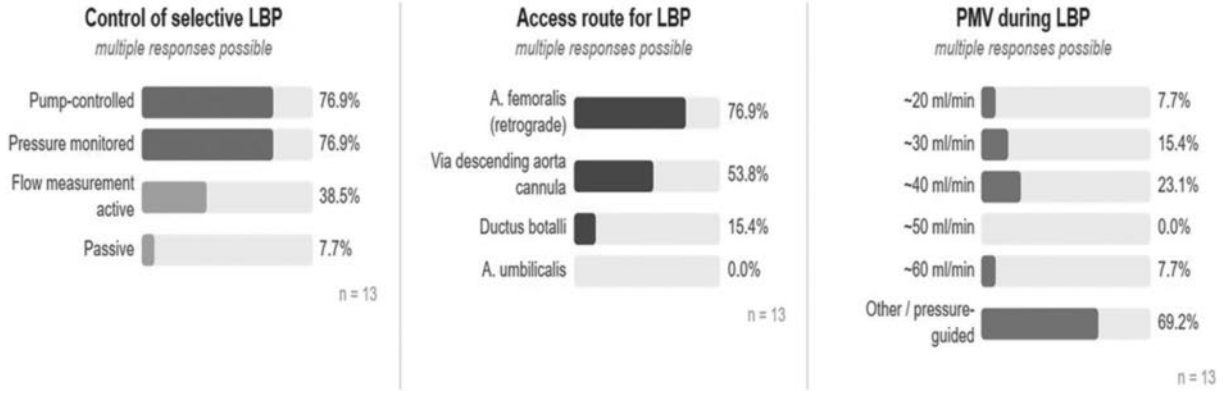


Fig. 4 Access, control, and flow of LBP; data are presented as percentages. LBP, lower body perfusion; PMV, pump minute volume.

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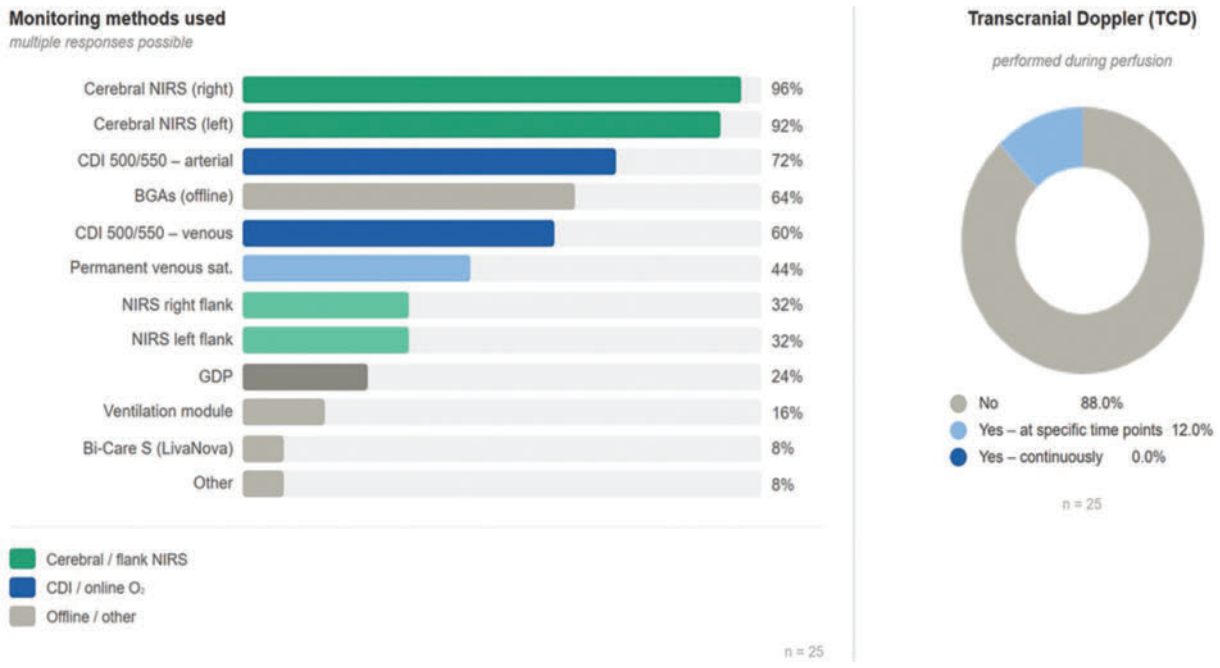


Fig. 5 Methods of perfusion monitoring during aortic arch reconstruction. Data are presented as percentages. BGA, blood gas analysis; CDI 500/550, continuous blood gas analysis; GDP, goal-directed perfusion; NIRS, near-infrared spectroscopy; TCD, transcranial Doppler sonography.

procedures (very satisfied: $n = 20$, 20%; satisfied: $n = 13$, 52%), while 16% reported being dissatisfied or very dissatisfied (dissatisfied: $n = 1$, 4%; very dissatisfied: $n = 3$, 12%) and 12% were neutral ($n = 3$). The area identified as most in need of improvement was training ($n = 15$, 60%), followed by technology and SOPs (both: $n = 11$, 44%), and finally team structure ($n = 10$, 40%). Free-form responses identified coordination with surgeons and anesthesiologists, communication, and improvements in whole-body perfusion as areas for optimization.

Discussion

This survey provides the first systematic, region-wide assessment of perfusion practice in pediatric aortic arch reconstruction across German-speaking countries (DACH area). With a response rate of 100 and 96.2% fully completed questionnaires—indicating a high level of interest in participation, support, generation of information, and the corresponding interaction—the data offer a picture of current management and institutional variability within this specialized pediatric perfusion sector. Aortic arch reconstruction was performed at all responding centers, with the great majority embedded in programs performing more than 50 neonatal or infant CPB procedures annually.

Despite the high technical expertise of centers in the DACH region, results reveal considerable practice heterogeneity, an absence of standardized protocols in a significant proportion of centers, and a widespread recognition of the need for further structural and educational development.

Specialized Teams and Standard Operating Procedures

Aortic arch reconstruction represents a highly demanding procedure, especially for clinical perfusion teams. Selective perfusion strategies, protection of organ integrity—often centered around the heart, brain, liver, and kidneys—as well as multiple modifications of flow and temperature require expertise, experience, and prompt, efficient interaction with surgeons and anesthesiologists. These procedures frequently involve extended periods of intense focus due to the continuous need for reassessment of flow, temperature, and hematocrit targets, in response to the evolving surgical field and hemodynamic status. While standards and guidelines for pediatric and congenital perfusion have previously been published,[17,18] they lack specific information and recommendations on perfusion practice during aortic arch reconstruction. Interdisciplinary programs in other high-risk congenital heart defect populations, such as single ventricle pathologies, have been associated with reduced mortality and improved outcomes[19]; however, comparable structured programs have not yet been established for aortic arch reconstructions. The results of our survey reflect this gap in the literature. While nearly all queried centers employ dedicated pediatric perfusion teams, only one center reported a defined aortic arch perfusion team. Notably, more than 65% of respondents indicated that, at the time of the survey, no SOPs regarding aortic arch reconstruction in neonates and infants were available. The absence of specialized teams and formalized protocols represents a relevant structural finding in a procedure characterized by high complexity, narrow time windows, and a particularly vulnerable patient population. The coexistence of high case volumes and low standardization across a substantial proportion of centers suggests that clinical experience has not uniformly translated into institutional formalization. This finding should not be interpreted as a direct indicator of care quality, as our survey did not assess clinical outcomes; institutional experience and individual expertise may substantially influence practice in ways not captured by structural indicators such as team

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designation or SOP availability. Nevertheless, the results of this survey may serve as an impetus for national and international professional societies to prioritize the development of SOP frameworks, structured training pathways, and specialty-specific standards for aortic arch perfusion. Participation in benchmarking initiatives and multicenter collaborative learning programs—such as National Pediatric Cardiology Quality Improvement Collaborative or Cardiac Neurodevelopmental Outcome Collaborative[20]—may further support this process and facilitate knowledge-sharing across institutions.

Priming

Our survey found that RBC-based priming was more common in neonates than infants, likely reflecting greater hemodilution at comparable priming volumes.[21] This heterogeneity mirrors two national surveys of German/Swiss pediatric perfusion centers—on priming composition[22] and ECC hardware[23]—both reporting no unified strategy. Our results also align with Münch et al,[24] who found no clinical disadvantage of electrolyte-based over blood-based priming in 219 infants < 10 kg, and with a database analysis by Bateson et al, where RBC-free priming was associated with shorter ventilation, shorter stay, and fewer complications[25]—together suggesting blood-conservation strategies remain under-adopted relative to current evidence.

Hypothermia

Our survey shows that moderate (28–32°C) and deep (24–28°C) hypothermia together account for the majority of reported practice, while very deep hypothermia and DHCA are each used by only 15.4% of centers; subdivided data for neonates versus infants were not captured. This distribution contrasts with a recent United Kingdom and Ireland survey by McDevitt et al,[12] in which deep hypothermia (18°C) remained common practice as of 2025. DHCA and deep hypothermia were historically the cornerstone of organ protection during aortic arch reconstruction; sustained regional perfusion during aortic clamping subsequently enabled a gradual shift toward less aggressive cooling.[26,27] The comparatively moderate temperatures favored in our cohort likely reflect the near-universal adoption of SCP in the DACH region, which decouples cerebral protection from systemic temperature and makes moderate hypothermia a viable, increasingly preferred alternative,[3,4] potentially at the cost of the additional neuroprotective margin that deeper cooling may offer against acute kidney injury (AKI) and coagulopathy risk.

Selective Perfusion

SCP was used by 96.2% of responding centers, confirming its status as the de facto standard of neuroprotection in the DACH region. This near-universal adoption, combined with pronounced heterogeneity in flow targets and control mode, is the central finding of this section and frames the following comparison with the literature. The introduction of selective perfusion strategies, more than 30 years ago,[16] made it possible to reduce DHCA or deep hypothermia. Reduction of metabolic demands and oxygen consumption aimed at the prevention of ischemic injury and protection of organ function and integrity. However, hypothermia and its intensity may involve harmful side effects, for example, interference with oxygen and glucose uptake in the pediatric brain, cellular membrane stability, ATP production and utilization, and may lead to serious thrombocytic and coagulation dysfunction.[28,29] Benefits of implementing SCP resulted in shorter CPB time, higher nasopharyngeal temperature, lower rates of neurologic complications, less 24-hour chest drainage, shorter duration of postoperative mechanical ventilation, and shorter stay in the intensive care unit.[3,30] At present, there is no uniform international guidance on selective perfusion strategies for pediatric aortic arch procedures, but clear trends in clinical practice are emerging, notably, the widespread use of selective antegrade cerebral perfusion and targeted whole-body perfusion.[31–33] The literature highlights the wide variety of methods and emphasizes the need for standardization.[34] The variety of SCP management was also present in our survey results. SCP represents a current standard in the DACH region; taking the survey results into account, pronounced variations and heterogeneity exist regarding inflow access, control and monitoring of SCP and flow selections, as well as flow measurement. We observed a striking lack of consensus regarding the quantitative parameters of SCP, particularly flow targets in the survey results. The two most commonly reported approaches—25% of calculated total CPB flow and 50 mL/kg body weight—reflect fundamentally different dosing philosophies and may yield substantially different perfusion pressures depending on patient size and temperature. The near-universal use of NIRS in the DACH region (96%) as a monitoring tool for cerebral perfusion during aortic arch reconstruction has to be discussed in this context. A review of the literature reveals that the principle "the higher the flow, the better" does not hold true in animal models and human studies. In neonatal piglets, SCP at 25 mL/kg/minute provided better cerebral perfusion and oxygenation than 0 or 50 mL/kg/minute; while 25 mL/kg/minute was judged "most appropriate" for protection.[35] In human observational data, 6 to 10 mL/kg/minute restored baseline NIRS values, as a surrogate for cerebral perfusion, but increasing flows above 8 to 10 mL/kg/minute did not further improve rSO_2.[36,37] The reasons behind this clinical luxury perfusion in the DACH region, which contrasts with the literature, remain unclear. NIRS can track changes in cerebral oxygen delivery.[38,39] However, NIRS represents an indirect estimate, is affected by extracranial signals, and does not measure flow directly.[40–42] Changes may reflect altered extraction rather than perfusion, as described by different investigators; additional modalities, such as TCD, can refine cerebral flow assessment.[43,44] The limited use of TCD in our cohort—used discontinuously by only 12% of centers—warrants comment given the existing evidence base for aortic arch reconstruction specifically. Because NIRS cannot register oxygen saturation above 95%, it is unable to detect cerebral hyperperfusion, whereas TCD-guided flow adjustment can maintain cerebral blood flow velocity within a defined range of baseline, reducing the risk of hyperperfusion-related complications such as cerebral edema.[45,46] In a broader pediatric cardiac surgery cohort, an intervention algorithm incorporating TCD alongside NIRS and processed EEG was associated with a substantial reduction in postoperative neurologic sequelae, with TCD responsible for over a third of detected perfusion abnormalities.[47] However, TCD-detected embolic counts specifically do not appear to correlate directly with

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postoperative neurological injury,[44] and the technique's benefit is best understood as complementary within a multimodal monitoring strategy rather than as a standalone predictor. Against this background, the limited uptake of TCD observed in our cohort may reflect an underused complementary tool rather than a redundant one. While LBP was long a secondary goal in aortic arch reconstructions, postoperative renal and hepatic dysfunctions, primarily AKI and hepatic dysfunction, led to increasing efforts to protect visceral integrity. Studies on SCP and additive LBP or whole-body perfusion report improved kidney function, fewer neurological complications, and shorter ICU stays, but they are mostly single-center and nonrandomized.[10,33,48,49] In this context, it was notable that only half of the respondents reported using an LBP, and that the approach to LBP varied widely among them. Among centers that do employ LBP, the heterogeneity of strategies—retrograde femoral perfusion, direct aortic cannulation, and combinations thereof—and the widespread range of reported inflow targets further impede any meaningful comparison of outcomes across institutions. This methodological fragmentation is itself an obstacle to evidence generation: without a degree of technical harmonization, multicenter outcome studies in this domain will remain difficult to interpret. The development of a prospective DACH-wide registry for LBP, with prespecified technical and outcome parameters, would be a meaningful step toward closing this evidence gap.

Satisfaction and Areas for Improvement

The national interdisciplinary position statement by German professional societies defines the clinical perfusionist's responsibility for the practical implementation of ECC management as guided by institutional SOPs, or by internal hospital guidelines where no SOPs exist.[50] This framework directly implicates our own findings: the absence of SOPs in half of the surveyed centers means that, for aortic arch reconstruction specifically, this implementation responsibility often lacks the institutional guidance the position statement presumes to be in place. Despite generally high case volumes and technical experience, 72% of respondents reported being satisfied or very satisfied with their current approach to aortic arch procedures, while 16% reported dissatisfaction. Training was the most frequently cited priority for improvement (60%), followed by SOP development and technology/materials (44% each) and team structure (40%). These priorities align closely with the structural gaps identified above: the near-absence of dedicated aortic arch teams and formal SOPs, and the heterogeneity in technical practice. To our knowledge, no published data exist on procedure-specific perfusionist satisfaction in pediatric cardiac surgery, precluding direct comparison; the finding nonetheless suggests that targeted investment in training and protocol development may address a substantial share of the dissatisfaction reported in this survey.

Limitations

This survey is subject to several inherent limitations. The anonymous design, while promoting candid institutional self-reporting, precludes independent verification of the data provided and prevents any center- or country-specific comparison within the DACH region. Consequently, national participation rates cannot be disaggregated. The cross-sectional study design captures practice at a single point in time, and longitudinal follow-up will be necessary to monitor evolving trends. Survey-based self-assessment is susceptible to reporting and recall bias, and responses reflect institutional perceptions rather than directly measured performance metrics. Further, the responses utilized predefined numerical intervals rather than capturing the exact numbers. Finally, the geographic scope is limited to German-speaking countries, and generalizability to other healthcare systems or regions cannot be assumed without further comparative data. As with most self-developed surveys, the questionnaire's content validity was supported by multidisciplinary pilot testing but was not formally validated using established psychometric methods; residual bias in item selection by the study authors cannot be fully excluded. This survey captured the perspective of clinical perfusionists exclusively, by design, to ensure a homogeneous respondent group and comparability across centers; the perceptions and practices of surgeons and anesthesiologists involved in the same procedures were not assessed and may differ from those reported here. The questionnaire did not capture specific priming additives beyond RBC use and weight-dependent adjustment; the use of agents such as tranexamic acid, albumin, or other colloids was not separately assessed and therefore cannot be reported. Priming volumes are known to depend substantially on oxygenator type, tubing configuration, and circuit setup, none of which were captured by this survey; reported priming volumes should therefore be interpreted with this technical context in mind.

Future work could complement these findings through parallel surveys among surgeons and anesthesiologists, allowing direct comparison of perspectives across the interdisciplinary aortic arch team.

Conclusion

This first region-wide survey of perfusion practice in pediatric aortic arch reconstruction across the DACH area demonstrates that selective antegrade cerebral perfusion has achieved near-universal adoption and that moderate hypothermia is increasingly favored over deep or very deep cooling. At the same time, the survey reveals substantial heterogeneity in quantitative perfusion targets, lower-body perfusion strategies, and the degree of institutional formalization—with defined aortic arch perfusion teams and procedure-specific SOPs remaining the exception rather than the rule.

Despite high overall case volumes and a high level of technical expertise, the majority of respondents identified training, protocol development, and interdisciplinary coordination as priority areas for improvement—findings that reflect a broader structural gap in a procedure characterized by high complexity and a particularly vulnerable patient population.

These results establish the first systematic baseline for perfusion practice in this domain and provide a clear direction for

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quality improvement efforts. They underscore the need for coordinated, society-led initiatives to develop evidence-based training pathways, standardized perfusion protocols, and prospective multicenter registries—within the DACH region and beyond.

Author Affiliations

1 Department of Pediatric Cardiac Surgery, Pediatric Heart Centre, Pediatric Heart Centre, University Hospital Giessen and Marburg GmbH, Giessen, Germany

2 Pediatric Cardiac Anesthesiology Service, Department of Anesthesiology Intensive Care Medicine, Pain Therapy, University Hospital Giessen and Marburg GmbH, Giessen, Germany

Statements and Additional Information

Conflict of Interest The authors declare that they have no conflict of interest.

Declaration of GenAI Use During the writing process of this paper, the authors used Claude Opus 5.5 (Anthropic, 2026, https://claude.ai) in order to refine language and spelling checks. The authors reviewed and edited the text and take full responsibility for the content of the paper.

Contributors' Statement N.S.: conceptualization, data curation, investigation, methodology, project administration, supervision, validation, and writing—original draft. F.E.: conceptualization, formal analysis, investigation, validation, visualization, and writing—review and editing. R.B.: conceptualization, data curation, and writing—review and editing. J.M.: data curation and writing—original draft. H.A.: project administration, supervision, and writing—review and editing. M.F.M.: resources and writing—review and editing. T.S.Z.: conceptualization, data curation, formal analysis, investigation, methodology, project administration, supervision, validation, visualization, and writing - original draft.

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