



Pediatric Perfusion in the '90s:
Emerging Issues

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PEDIATRIC PERFUSION IN PERSPECTIVE

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The practice of pediatric perfusion is evolving. The question as to whether perfusionists are participating in this evolution needs further examination. There would be close to unanimous agreement that the extracorporeal principles and practices involved with treating patients with congenital heart disease differs significantly from those utilized in the adult population. The sheer diversity of cardiac congenital lesions, and variations within, challenge even the most versed in anatomical and physiologic conditions. In adult extracorporeal circulation (ECC), the perfusion devices of varying manufacturers may differ only slightly in appearance with no real functional variance, while significant component differences are seen as the size of the pediatric patient changes. Indeed, the importance of understanding the medical and clinical management of pediatric patients with heart defects is well evidenced through the literature that is amassing on the subject. Even with all the attention focused on this changing population of patients, formal emphasis on pediatric perfusion education is sadly lacking.

In the past two years there have been several national and regional symposia dedicated solely to the study of trends and concepts of pediatric perfusion. Attendance at these meetings has been good, and the quality of these meetings has been rated high by participants. Publications on

pediatric perfusion and cardiac surgery are well represented in the surgical and perfusion journals. In the past two years there have been 15 articles concerning pediatric perfusion or long term support in the journal *Perfusion*, and 4 in the *Journal of Extracorporeal Technology*. From an observational viewpoint it seems that the clinical interest in the management of ECC in pediatric patients warrants further evaluation.

The debate as to whether the discipline of ECC needs a speciality in pediatric perfusion continues to loom. In the profession of perfusion there may be a total of 3,000 practitioners in North America. Such health care worker numbers are minuscule when compared to the professions of nursing, respiratory therapy or physician assistants, which may support as many individuals in a single state. The concern, therefore, of promoting the development of a separate specialization of individuals devoted to pediatric perfusion becomes an issue of declining numbers, with diluting support on regional or local levels. Secondly, the changing health care attitude in this country has undoubtedly altered the methods by which resource allocation is directed. Manufacturers are already 'crunching' numbers in an unprecedented fashion to determine the profitability of research and development of devices that may preferentially support pediatric patients. Epidemiological estimates on the prevalence of congenital cardiac disease states that approximately 0.8% of live births result in patients with congenital heart defects.¹ In times of economic

reassessment, justification on allocation of resources to this population becomes difficult, and the production of health related devices are evaluated from ethical, as well as monetary views. And finally, perfusionists evaluate closely the cost/benefit aspects of belonging to a new organization that, although impressive because of its mission, may represent additional expense that is monetarily prohibitive.

In contrast, the establishment of an organization or group specifically for the study of treatment modalities for a specific class of patients has good precedent. The Extracorporeal Life Support Organization (ELSO) was established as an extension of the national ECMO registry, and is made up of individuals concerned with the study and application of respiratory and long term extracorporeal support. The pediatric survey by Groom and associates queried cardiac surgical centers performing pediatric perfusion.² They identified 243 centers as performing pediatric perfusion, and from a response rate over 80%, reported that 14,473 procedures were performed by the respondent 125 hospitals. Although these numbers do not outwardly seem significant, the diversity of the procedures performed is impressive.

It is well appreciated that the anatomical development of the cardiovascular system is controlled by the flow dynamics of *in utero* circulation. The abnormal embryological structures of and around the congenitally defected heart creates shunts that alter the normal

hemodynamics. Many of these shunts have specific functions such as aortopulmonary collaterals to increase pulmonary blood flow, or intercostal dilatation in the presence of aortic coarctation to increase systemic flow. In addition, the pathophysiology associated with severe cyanotic lesions alters acid base and chemical homeostasis, which in turn, affects flow patterns. Various capillary beds in different organs and tissues respond to these alterations differentially, resulting in autoregulatory patterns specific to the function of the organ. To make matters even more complex, patients with similar cardiac lesions may have different anatomical and physiological responses to the lesion.

As perfusionists, we understand the complexity of performing 'normal' cardiopulmonary bypass on adult patients. In children, this complexity is compounded by numerous physical and biochemical changes that are not consistent from patient to patient. Knowledge of these complexities, and methods of treating them, should come from continuing education programs that emphasize the unique nature of the extracorporeal effects of pediatric perfusion. Fundamental education in embryology, physiology and biochemistry of the developing organism should be emphasized in perfusion education programs above the minimum standards outlined in the Essentials and Guidelines.¹ Practicing perfusionists should continue their growth in the medical community by

¹ Accreditation Committee - Perfusion Education, Committee on Allied Health Education and Accreditation. 1989.

attending cardiac diagnostic conferences with cardiologists, intensivists and surgeons, and participate in morbidity discussions enabling them to constantly strive to improve upon their performance by outcome assessment. Peer review should be emphasized through the attendance of regional and national meetings that foster the collegiality amongst individuals devoted to a similar mission.

In summary, the practice of pediatric perfusion is a challenge that should be met only with fervor and dedication. All efforts to expand the knowledge and research in methods and techniques of pediatric extracorporeal circulation should be critically evaluated for their efficacy, and when justified, supported with the allocation of resources. Critical thinking and prospective evaluation of techniques should be reported in peer reviewed publications that reach expanded audiences. The establishment of sub-specializations on pediatric perfusion should be supported when they are seen as non-exclusionary and dedicated to the goals of disseminating information on patient management. Through these efforts the role of the perfusionist in this critical area of medicine can be expanded, with a resultant improvement in patient care and outcome.

REFERENCES

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