Guest Editorial

Facts and Myths Surrounding Pediatric Mechanical Cardiovascular Circulatory Support Research: A Personal Perspective

The objective of this article is to inform the public, the pediatric cardiovascular research community, and the members of the International Society for Pediatric Mechanical Cardiopulmonary Support on recent developments in translational research, new devices for chronic support, and the impact of industry on this underserved research area.

FACTS

The following are well-known facts about congenital heart defects in our small but dedicated research community: (i) approximately one out of 100 babies are born with a congenital heart defect in the USA; (ii) early detection with intervention results in increased survival and improved quality of life for these fragile patients; and (iii) the annual cost for inpatient services is over $2.2 billion (1). However, the following facts may be unknown not only to the public but also to our community (extracted from http://www.itsmyheart.org) (1):

Fact #1: In the US, twice as many children die from congenital heart defects each year than from all forms of childhood cancers combined. Yet, funding for pediatric cancer research is five times higher than for congenital heart defects (source: Children’s Heart Foundation) (1)

Fact #2: For every dollar provided by the National Institutes of Health, only one penny is allocated towards pediatric research. This means that only a fraction of that one penny will be directed towards congenital heart defect research (source: Children’s Heart Foundation) (1)

Based on these two lesser known facts, the focus of this article is to share my personal experiences with the academia, the industry, and the government on pediatric mechanical cardiopulmonary support research.

Although there are much better devices for acute and chronic cardiovascular patients compared to 5 to 10 years ago, morbidity and mortality for high-risk patients are still serious problems that clinicians face daily (2–5). As the problem is multifactorial, then the solution should be multidisciplinary as well. This was the main reason why we have built an international multidisciplinary research center, international conference, and, finally, an international society (6–10).

TRANSLATIONAL RESEARCH

Our philosophy at Penn State Hershey Children’s Hospital is that if there is more than one device for the same procedure, we should compare them and make our selection based on the scientific evidence. Every component of our cardiopulmonary bypass (CPB) or extracorporeal life support (ECLS) circuitry has been evaluated in our center prior to using them in our patients (11,12). We also share our clinical and experimental protocols with other centers (13–18). During the past 14 months, members of our clinical team have trained over 150 clinicians from 10 outside centers with our custom-made Penn State Hershey pediatric ECLS system using a piglet model (Fig. 1, [19]). The results of this particular project made a significant impact on education and training of clinicians as well as cost savings for the hospital. Simply changing the disposable centrifugal pump head to a lower-priced pump head with better hemodynamic performance saved our institution over $600 000 in 14 months (18,19). In addition, Penn State Hershey Research Team reached out to Istanbul, Turkey to share the latest ECLS technology and outcomes with 182 Turkish clinicians from 44 centers located throughout Turkey (20). Therefore, I believe that translational research not only helps to minimize the injury to these fragile high-risk patients, but also creates significant savings for hospitals and institutions around the globe.
COMMON MYTH

The most common myth surrounding new pediatric circulatory devices is that the industry has very limited interest for pediatric devices due to the small population of pediatric cardiac patients compared to adult patients and the low profit potential. What I see every day is in direct contradiction to this myth. Several new pediatric as well as neonatal CPB and ECLS products are available in the market (11,12,21), and several new pumps for pediatric cardiac patients are in the pipeline (22).

GOVERNMENT SUPPORT

Based on Facts #1 and #2, the first question that should be asked is: Why do pediatric patients with worse outcomes receive less research funds from the government? I have no answer to that question, but I would personally ask how these limited funds from taxpayers are used for pediatric cardiac patients. It is my opinion that every new device developed using government funds must show clear objectives how these devices will be better than what we currently use. If an investigator would develop a new oxygenator, ECLS system, or ventricular assist device, comparisons should be made with the state-of-art devices we use every day rather than making comparisons to outdated examples without any scientific rationale (19–24).

CONCLUSIONS

As a scientist, it is my obligation to be 100% independent, to search for the truth, and to share the results of our investigations with other investigators around the globe. I do research for the public. In order to achieve the best possible outcome for pediatric cardiac patients, research must be supported by the academia, the government, and the industry. I have no doubt that an overwhelming majority of these three entities do their best everyday to improve the lives of future pediatric cardiac patients.

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REFERENCES


