

Highlights of the 18th International Conference on Pediatric Mechanical Circulatory Support Systems and Pediatric Cardiopulmonary Perfusion

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Abstract

The 18th International Conference on Pediatric Mechanical Circulatory Support Systems and Pediatric Cardiopulmonary Perfusion was held in Milwaukee, WI, USA, on May 9 and 10, 2024. The conference was hosted by the Herma Heart Institute of Children's Wisconsin at the Pfister Hotel in downtown Milwaukee. This communication provides the highlights of the proceedings.

Keywords

international collaboration, circulatory assist devices, heart failure, cardiopulmonary bypass, congenital heart surgery, ECMO (extracorporeal membrane oxygenation), pediatric, neonate and infant

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Introduction

The 18th International Conference on Pediatric Mechanical Circulatory Support Systems and Pediatric Cardiopulmonary Perfusion was held in Milwaukee, WI, USA, on May 9 and 10, 2024. The conference was hosted by the Herma Heart Institute of Children's Wisconsin at the Pfister Hotel in downtown Milwaukee. Robert Niebler and Akif Undar co-chaired the event by developing a scientific program that continued the tradition of the Society in bringing clinical specialists in the fields of pediatric cardiology, cardiothoracic surgery, critical care, as well as bioengineers together to discuss the challenges of the field. We were excited to get back together in person for the first time since the pandemic as a stand-alone conference, and this report will summarize the event. Five countries, 17 states, and over 35 different institutions were represented among the speakers and participants.

The primary objective of the International Society for Pediatric Mechanical Cardiopulmonary Support is to focus on the current problems associated with pediatric cardiac patients during and after acute or chronic cardiac support. The annual meeting aims to accomplish this by bringing together as many distinguished clinicians, bioengineers, and basic scientists as possible to define the current problems and suggest solutions with novel approaches. The 18th meeting met these goals by bringing representatives from across the world and showcasing the many challenges of the field.

18th International Conference Event Details

The scientific program details are presented in Supplemental Table 1. The program included two keynote lectures,

22 invited lectures, nine mini-oral presentations from submitted abstracts, and a session of four rapid-fire presentations highlighting current research in pediatric cardiac surgery from centers across the globe.

The first session of invited lectures focused on the topics of data acquisition and integrity in pediatric circulatory support and perfusion. The challenge of the dissemination of data from a large and growing learning network was discussed with particular attention to advocating for the support of academic career advancement. The mission of insuring data integrity through adjudication of registry data was described. Future advancements of utilizing the electronic health record to ease the burden of manual data abstraction were presented in addition to future software development which has the possibility to revolutionize how data are collected and analyzed in the field. The session finished with lectures contrasting the power of utilizing a mature registry database in the Extracorporeal Life Support Organization with that of a developing platform for pediatric cardiopulmonary perfusion data in the PediPERForm learning network.

The first keynote lecture was given by Dr Angela Lorts titled "Taking ACTION: Accelerating New Therapies for Children."

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Dr Lorts presented an overview of how the Advanced Cardiac Therapies Improving Outcomes Network (ACTION) has impacted the field of pediatric mechanical circulatory support and the future outlook of this game changing organization. The amazing work that ACTION has accomplished in a short period of time is highlighted by the impact on clinical outcomes such as stroke, pediatric labeling of devices, support of current/future device trials, and global support of clinicians to collaborate within the field so we can all continue to learn from each other. Steal shamelessly, share seamlessly!

The second session of invited lectures focused on pediatric device development and the challenges faced. Dr Adachi gave a great overview of the PumpKIN trial including highlights of what went well and what lessons we can learn from this experience. Industry representatives from Abbott and Abiomed gave presentations on how the pediatric population and market can influence their thought process of device development and how we as a community can work together to move toward development of more pediatric labeled devices. This session was highlighted by the continued development of potential new devices which could be utilized in pediatrics including the continued development of the Jarvik 2015, the PediaFlow pump, the mini-HeartMate3, and the "Pedipella" pump. The session concluded with a summarization of the challenges by Dr Deshpande who highlighted the need for clinicians to work with industry and to think globally to help overcome the challenges presented by pediatric device development.

In the afternoon of the first day, participants were treated with four 15-min presentations by surgeons representing programs in Brazil, Italy, Japan, and the United States. These presentations showcased current research efforts within each institution including instituting quality improvement initiatives as a means of developing a world class congenital heart surgery program, novel techniques to assess right ventricular function in the operating room, utilization of stem cells to stimulate myocardial recovery, and the novel use of total cell-free DNA as a marker of injury and predictor of outcomes in neonatal and pediatric cardiac surgery.

Oral presentations of abstracts were interspersed throughout the program. The need for the development of a pediatric definition of cardiogenic shock was advocated for through use of a survey of pediatric providers. Outcomes of the use of circulatory support in Brazil and what impact it has had on survival for patients awaiting transplant was presented. A summary of the data from the first five years of the ACTION VAD registry was shown. The first day concluded with abstracts showing the development of a high-fidelity simulator for the Berlin Heart to train bedside staff as well as two illustrative case reports demonstrating the innovative techniques utilized within the field to support patients who likely would not have had any options a decade ago.

The first session of the second day focused on the challenges of palliation and circulatory support of patients with single ventricle anatomy. The session opened with a presentation of novel cardiopulmonary bypass techniques to preserve myocardial perfusion during first-stage palliation. Ventricular assist device

(VAD) use across the stages of palliation was then reviewed in depth. Included in these presentations was a case report on the novel use of 3D modeling to facilitate implantation of a device in a complex anatomical situation. The progress of the field was shown with movement away from just single center experiences to the presentation of multicenter data. The presentation of multicenter data is still limited by the diverse anatomical challenges posed by individual patients and the need for customization of support leading to difficulty in comparing outcomes. Overall, the outcomes continue to improve and collaboration to define what helps and where the limits of support are defined are important as the field progresses.

The second keynote lecture was given by Dr Shunji Sano. Dr Sano described his amazing and innovative career progress, highlighting how his career has tracked the progress of pediatric cardiac surgery as well as the development and optimization of cardiopulmonary bypass techniques. Dr Sano's impact on the field of pediatric cardiac surgery cannot be overstated and it was a pleasure to see his presentation on what he felt were the most important aspects of his experiences.

The final oral abstract session contained presentations on a computational flow model assessment of connectors within an ECMO circuit, the external validation of a novel risk assessment tool in pediatric patients with a VAD, and the results of a cervical approach to implantation of the Impella 5.5 in pediatric patients.

The final session of the conference provided a forum for the cardiopulmonary perfusion teams to showcase their experiences. The measurement of IL-6 and its potential target for therapeutic intervention was presented. Novel techniques in cardiopulmonary bypass including hypobaric oxygenation to eliminate microgaseous emboli and domino partial heart transplantation to maximize the utilization of the limited donor hearts were highlighted. The development of and current practices of cardiopulmonary bypass in Asia demonstrated the vital role well-trained pediatric perfusionists play in the support of all pediatric cardiac surgery patients.

Young Investigator Awards

Two young investigator awards were given out based on full manuscripts submitted to the conference committee before the event. Dr Aaron Heaps received an award based on his manuscript entitled "Use of a Temporary Percutaneous RVAD to Provide Pediatric BiVAD Support." Dr Heaps is currently a pediatric cardiology fellow at the University of Iowa in Iowa City, IA, USA. Dr Meaghan Reaney received an award based on her manuscript entitled "External Validation of a Risk Score Assessment for Pediatric Ventricular Assist Device Mortality." Dr Reaney is currently a pediatric critical care fellow at the Medical College of Wisconsin in Milwaukee, WI, USA.

Conclusion

Consistent themes throughout the conference were the importance of getting together as clinicians and researchers to share

our experiences in person. This experience was optimized by the ability to interact with representatives from industry in a relaxed environment conducive to sharing among both senior leaders and young investigators in the field. For those interested in video recordings of the conference please visit the event website at: “www.childrenswi.org/ismcs.” In summary, the 18th International Conference on Pediatric Mechanical Circulatory Support Systems and Pediatric Cardiopulmonary Perfusion met its objective with representatives from Brazil, China, Italy, Japan, Saudi Arabia, and the United States and we look forward to future programs to continue sparking innovation and development in our field. If the course of just one child’s life is improved as a result of this organization, we have reached our goal!

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Supplemental Material

Supplemental material for this article is available online.