The 15th International Conference on Pediatric Mechanical Circulatory Support Systems & Pediatric Cardiopulmonary Perfusion

May 9-11, 2019
NewYork-Presbyterian/Columbia University Irving Medical Center
New York City

Conference Co-Chairs:
Paul J. Chai, MD
Sabrina Law, MD
Akif Ündar, PhD
Welcome to the fifteenth international conference on pediatric mechanical circulatory support systems and pediatric cardiopulmonary perfusion

NEW YORK-PRESBYTERIAN MORGAN STANLEY CHILDREN’S HOSPITAL

We are honored to welcome you to the 15th International Conference on Pediatric Mechanical Circulatory Support Systems and Pediatric Cardiopulmonary Perfusion at NewYork-Presbyterian/Columbia University Irving Medical Center in conjunction with NewYork-Presbyterian Morgan Stanley Children’s Hospital in New York, NY, USA; May 9-11, 2019. NewYork-Presbyterian Morgan Stanley Children’s Hospital offers the best available care in every area of Pediatrics in a family-friendly and technologically advanced setting. Building a reputation for more than a century as one of the nation’s premier children’s hospitals, Morgan Stanley Children’s Hospital is affiliated with the Department of Pediatrics at Columbia University College of Physicians and Surgeons, one of the largest providers of children’s health services in the tristate area with a long-standing commitment to its community. It is also a major international referral center, meeting the special needs of children from infancy through adolescence worldwide. NewYork-Presbyterian is the #1 hospital in the New York metropolitan area, according to U.S. News & World Report, and is consistently named to the magazine’s Honor Roll of best hospitals in the nation.

At the Congenital Heart Center—a combined program of NewYork-Presbyterian/Morgan Stanley Children’s Hospital and NewYork-Presbyterian Komansky Children’s Hospital—a fully integrated approach is taken to the treatment of complex heart conditions in people of all ages, from newborns to adults. Ours is one of the first and most preeminent Pediatric Cardiology and heart surgery centers in the country and one of the nation’s major Pediatric Transplant centers. With more than 13,000 echocardiograms performed each year and over 1200 diagnostic and interventional cardiac catheterizations, we offer decades of experience and the highest quality of care available in the world. We have the highest survival rate in New York State for pediatric heart surgery, and one of the highest nationwide—even though our surgeons routinely treat some of the most complex cases, with many patients referred from other institutions.

We have a distinguished roster of highly skilled and experienced pediatric heart surgeons, including national leaders specializing in complex surgery in newborns, hybrid heart surgery, heart transplantation, and mechanical assist devices. Each year, pediatric heart surgeons at the NewYork-Presbyterian Congenital Heart Center perform more than 700 heart operations, including over 25 heart transplants, 175 newborn heart repairs, and 100 adult congenital heart disease (CHD) repairs. Since its inception in 1984, we have performed over 600 heart transplants and over 200 pediatric patients have been supported with ventricular assist devices (VADs) and an additional 260 with extracorporeal membrane oxygenation (ECMO) since 2010.

FIFTEENTH EVENT DETAILS

Mechanical support in CHD is becoming standard of care, with 30% of children bridged to transplant with ECMO, VADs, or a combination of both. In referral hospitals this number approaches 50%. Particularly challenging are single ventricles in terms of their varying combinations of anatomy and physiology, multiple surgeries and comorbidities, as well as their smaller size. This conference focuses on bringing together experts in the field to discuss innovations, foster collaboration, and share support strategies, so that as a community we can enhance the care of this challenging group of patients.

This conference will promote knowledge and understanding of new advances in the field and effective ways to utilize the armamentarium of support strategies available. CHD patients are complex to support and clinicians are forced to innovate. A platform that promotes collaboration and brings these innovations to the bedside is necessary to bridge the gap between theory and practice.

Attendees can expect to be exposed to effective ways to bring mechanical support strategies for complex CHD
patients to the bedside, as well as how best to manage the therapies once they are instituted. We seek to provide a deeper understanding of complications and interventions that are available, and to enhance the comfort level of clinicians taking care of these patients.

The scientific program will start on Thursday, May 9, 2019 and will continue until Saturday, May 11, 2019. Paul Chai, MD, Sabrina Law, MD and Akif Undar, PhD are the scientific cochairs for the 15th Conference. The scientific program will include 4 keynote lectures, 24 invited lectures, and over 30 additional slides and posters selected from submitted abstracts, along with ECMO and VAD simulation sessions and guided tours of Morgan Stanley Children’s Hospital. All of the details including an updated scientific program are presented in Table 1.

ARTIFICIAL ORGANS

Cochairs of the past 14 events believe that one of the most impactful outcomes of this conference is the peer-reviewed publications based on invited lectures, slide and poster presentations. Artificial Organs is the official journal of the International Conference on Pediatric Mechanical Circulatory Support Systems & Pediatric Cardiopulmonary Perfusion and The International Society for Pediatric Mechanical Cardiopulmonary Support (ISPMCS) https://www.ispmcs.org/annual-conference. To date, more than 500 peer-reviewed publications, including original articles, editorials, special reports, letters, and case reports have been published in Artificial Organs by the 3400 past participants from 41 countries.

<table>
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<tr>
<th>TABLE 1</th>
<th>Details of the 15th International Conference on Pediatric Mechanical Circulatory Support Systems and Pediatric Cardiopulmonary Perfusion</th>
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<tr>
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<tr>
<td>7:00-8:00 a.m.</td>
<td>Registration, Breakfast &amp; Vendor Exhibits</td>
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<tr>
<td>8:00-8:05 a.m.</td>
<td>Welcome Remarks</td>
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<tr>
<td>Emile Bacha, MD, FACS (New York, NY)</td>
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<tr>
<td><strong>8:05-10:00 a.m.</strong></td>
<td><strong>PLENARY SESSION #1:</strong> Pediatric Mechanical Support Systems: What’s New on the Menu in 2019?</td>
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<tr>
<td>Moderators: Paul J. Chai, MD (New York, NY) &amp; Marc E. Richmond, MD (New York, NY)</td>
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<tr>
<td>8:05-8:20 a.m.</td>
<td>PumpKIN Trial Updates</td>
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<td>Christopher Almond, MD (Palo Alto, CA)</td>
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<td>8:20-8:35 a.m.</td>
<td>HeartMate 3 in the Pediatric Patient</td>
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<td>Katsuhide Maeda, MD (Palo Alto, CA)</td>
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<td>HeartWare: What Constitutes a Tight Squeeze? How Small is Too Small?</td>
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<td>8:50-9:05 a.m.</td>
<td>An Introduction to ACTION</td>
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<td>Angela Lorts, MD (Cincinnati, OH)</td>
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<td><strong>10:45-11:15 a.m.</strong></td>
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<td>What’s Really Changed in 35 Years? A Brief History of Time</td>
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<td>Linda J. Addonizio, MD (New York, NY)</td>
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<tr>
<td><strong>11:15-11:45 a.m.</strong></td>
<td><strong>Key Note Lecture #2</strong></td>
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<tr>
<td>The Economics of Mechanical Support, Heart Failure and Transplantation</td>
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<tr>
<td>Joseph Rossano, MD, MS, FAAP, FACC (Philadelphia, PA)</td>
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<tr>
<td>11:45 a.m.-12:00 p.m.</td>
<td>Presentation of Young Investigators’ Awards</td>
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<tr>
<td>12:00-1:00 p.m.</td>
<td>Lunch &amp; Vendor Exhibits</td>
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| 1:00-3:00 p.m.| **PLENARY SESSION #2:** ECMO  
|               | Moderators: Eva Cheung, MD (New York, NY) & William Middlesworth, MD (New York, NY) |
| 1:00-1:15 p.m.| Current ECPR (Extracorporeal Membrane Resuscitation)  
|               | Eva Cheung, MD (New York, NY) |
| 1:15-1:30 p.m.| Extracorporeal Membrane Oxygenation in Single Ventrices  
|               | Ravi Thiagarajan, MD, MPH (Boston, MA) |
| 1:30-1:45 p.m.| Veno-Venous ECMO in Single Ventricles  
|               | Scott I. Aydin, MD, FAAP (New York, NY) |
| 1:45-2:00 p.m.| Ambulatory Extracorporeal Membrane Oxygenation  
|               | Koji Takeda, MD, PhD (New York, NY) |
| 2:00-2:15 p.m.| ELSO (Extracorporeal Life Support Organization): Using Registry Data to Refine Outcomes in Single Ventricles  
|               | D. Michael McMullan, MD, FACS (Seattle, WA) |
| 2:15-2:30 p.m.| Columbia ECMO Program  
|               | William Middlesworth, MD (New York, NY) |
| 2:30-3:00 p.m.| Panel Discussion |
| 3:00-3:45 p.m.| Break, Vendor Exhibits & Digital Posters |
| 3:45-5:00 p.m.| **REGULAR SLIDE PRESENTATIONS #1**  
|               | Moderators: Warren Zuckerman, MD (New York, NY) & Damien J. LaPar, MD, MSc (New York, NY) |
|               | Five slide presentations—15 min each. (Selected from submitted abstracts) (10 min. presentation + 5 min discussion) |

**Friday, May 10, 2019**

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| 7:55-8:00 a.m.| Welcome Remarks  
|               | Linda J. Addonizio, MD, (New York, NY) |
| 8:00-10:00 a.m.| **PLENARY SESSION #3:** VAD in Single Ventricles  
|               | Moderators: Iki Adachi, MD (Houston, TX) & Sabrina Law, MD (New York, NY) |
| 8:00-8:15 a.m.| Heart Failure in Single Ventricles  
|               | Jack F. Price, MD (Houston, TX) |
| 8:15-8:30 a.m.| Support Strategies for Stage 1 & Stage 2 Single Ventricle Palliation  
|               | Jonathan M. Chen, MD (Philadelphia, PA) |
| 8:30-8:45 a.m.| Support Strategies for Stage 3 Single Ventricle Palliation  
|               | Yoshifumi Naka, MD, PhD (New York, NY) |
| 8:45-9:00 a.m.| What Constitutes the “Ideal” Fontan Pump?  
|               | Mark D. Rodefeld, MD (Indianapolis, IN) |
| 9:00-9:15 a.m.| Dual Organ Transplant in Single Ventricles  
|               | Sharon Chen, MD, MPH (Palo Alto, CA) |
| 9:15-9:30 a.m.| Destination Therapy  
|               | Angela Lorts, MD (Cincinnati, OH) |
| 9:30-10:00 a.m.| Panel Discussion |
| 10:00-10:45 a.m.| Break, Vendor Exhibits & Digital Posters |
| 10:45-11:20 a.m.| **Key Note Lecture #3**  
|               | Virtual Fit Technology  
|               | David L.S. Morales, MD (Cincinnati, OH) |

(Continues)
countries of the conference during the past 14 years. All accepted abstracts from the 15th Conference for slide and poster presentations are included in the April 2019 issue of Artificial Organs. In addition, the January 2020 issue will be dedicated to our conference manuscripts (all peer-reviewed). Special thanks to Carol Malchesky, Editorial Assistant, Angela T. Hadsell, Executive Editor, and Paul Malchesky, D.Eng, Editor-in-Chief, for making this issue possible and for their continued support year after year.
4 | YOUNG INVESTIGATOR AWARDS

The following Young Investigator Awards will be given based on the quality of the original manuscripts, not abstracts:

1. The John A. Waldhausen, MD Young Investigator Award.
2. The William S. Pierce, MD Young Investigator Award.

5 | SOCIAL PROGRAM

The event will host a dinner for all participants, the evening of Friday, May 10, at New Leaf restaurant. Tucked away in upper Manhattan’s stately Fort Tryon Park, housed in an impressive fieldstone cottage built by John D. Rockefeller in the 1930s, the restaurant is just steps from the Cloisters museum and gardens. The Met Cloisters, located on four acres overlooking the Hudson River is the branch of the Metropolitan Museum dedicated to the art, architecture, and gardens of medieval Europe.

6 | FURTHER INFORMATION

Further details regarding this event, including the scientific and social programs, guidelines for the Young Investigator Awards, and conference registration, can be accessed via the Conference Website available at: http://www.ColumbiaSurgeryCME.org.

ACKNOWLEDGMENTS

Special thanks go to Jessica Mead, Director of Special Events, at Columbia University Irving Medical Center, and Hearan Choo, MD, Director of CME, Department of Surgery, Columbia University Irving Medical Center, for their assistance in the coordination of this event.

Sabrina Law1  Paul Chai2,3  Akif Ündar4

1Division of Pediatric Cardiology, Program for Pediatric Cardiomyopathy, Heart Failure and Transplantation, Morgan Stanley Children’s Hospital, Columbia University Medical Center, New York, NY
2Division of Cardiac, Thoracic & Vascular Surgery, Columbia University Medical Center, New York, NY
3Pediatric Cardiac Surgery, Morgan Stanley Children’s Hospital and NewYork-Presbyterian Hospital, New York, NY
4Department of Pediatrics, Surgery, and Bioengineering, Penn State Pediatric Cardiovascular Research Center, Penn State College of Medicine, Penn State Health Children’s Hospital, Hershey, PA, USA

Correspondence

Sabrina Law, Pediatric Ventricular Assist Device Program, Pediatrics, Program for Pediatric Cardiomyopathy, Heart Failure and Transplantation, Division of Pediatric Cardiology, Morgan Stanley Children’s Hospital, Columbia University Medical Center, New York, NY, USA.

Email: sl3118@cumc.columbia.edu

ORCID

Akif Ündar https://orcid.org/0000-0003-3334-2886

REFERENCES

Overview
Mechanical support in congenital heart disease (CHD) is becoming standard of care, with 20% - 30% of children bridged to transplant with extracorporeal membrane oxygenation (ECMO), ventricular assist devices (VAD) or a combination of both. In referral hospitals this number approaches 50%. Particularly challenging are single ventricles (SV) in terms of their varying combinations of anatomy and physiology, multiple surgeries and co-morbidities, as well as their smaller size. This conference focuses on bringing together experts in the field to discuss innovations, foster collaboration and share support strategies, so that as a community we can enhance the care of this challenging group of patients.

Target Audience
An international symposium for cardiothoracic surgeons, cardiologists, perfusionists, ECMO specialists, bioengineers, basic scientists and other healthcare professionals. This meeting will give attendees the opportunity to network with over 200 healthcare providers. The overall objective of the conference is to collaborate and discuss effective ways to bring mechanical support strategies for complex CHD patients to the bedside, as well as, how best to manage the therapies once they are instituted. There will also be a focus on the deeper understanding of complications, interventions that are available and ways to enhance the comfort level of clinicians taking care of these patients.

Accreditation Statement
In support of improving patient care, this activity has been planned and implemented by Columbia University Department of Surgery and Amedco LLC. Amedco LLC is jointly accredited by the Accreditation Council for Continuing Medical Education (ACCME), the Accreditation Council for Pharmacy Education (ACPE), and the American Nurses Credentialing Center (ANCC), to provide continuing education for the healthcare team.

Credit Designation Statement
PHYSICIANS
Amedco LLC designates this live activity for a maximum of 17.50 AMA PRA Category 1 Credits™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

PHYSICIAN ASSISTANTS
AAPA accepts certificates of participation for educational activities certified for AMA PRA Category 1 Credits™ from organizations accredited by ACCME or a recognized state medical society. PAs may receive a maximum of 17.50 AMA PRA Category 1 Credits™ for completing this activity.

NURSE PRACTITIONERS
The American Academy of Nurse Practitioners Certification Board (AANPCB) recognizes the Accreditation Council for Continuing Medical Education (ACCME) and the American Nurses Credentialing Center (ANCC) as approved accreditors and allow reciprocity for AANPCP continuing education credit.
American Board of Cardiovascular Perfusion

This course has been awarded 18.70 American Board of Cardiovascular Perfusion (ABCP) CEU’s. In order to receive your credits, you must sign in each day you attend. You will be given a letter of certification prior to your departure which you are required to submit to the ABCP. Credit breakdown is as follows:

Thursday, May 9 = 7.40
Friday, May 10 = 6.20
Saturday, May 11 = 5.10

Satisfactory Completion

Learners must complete an evaluation form to receive a certificate of completion. Your chosen sessions must be attended in their entirety. Partial credit of individual sessions is not available. If you are seeking continuing education credit for a specialty not listed above, it is your responsibility to contact your licensing/certification board to determine course eligibility for your licensing/certification requirement.

Participants must sign in once a day to verify attendance.

Support

We received support for this program through grants from medical device and pharmaceutical companies.

Course Organizers

Hearan Choo, MD
Director of CME
Columbia University Irving Medical Center
Department of Surgery, CME Office

Jessica Mead
Director of Special Events
Columbia University Irving Medical Center
Department of Surgery, CME Office
Phone: 212.304.7817
E-mail: jas2134@cumc.columbia.edu
Program Agenda

Wednesday, May 8, 2019
2:00pm – 5:00pm  On-site Registration (only if space is available) & Exhibit Set-up

Thursday, May 9, 2019
7:00am – 8:00am  Registration, Breakfast & Vendor Exhibits
8:00am – 8:05am  Welcome Remarks
    Emile Bacha, MD, FACS (New York, NY)
8:05am – 10:00am  PLENARY SESSION #1: Pediatric Mechanical Support Systems: What’s New on the Menu in 2019?
    Moderators: Paul J. Chai, MD (New York, NY) & Marc E. Richmond, MD, MS (New York, NY)
    8:05am – 8:20am  PumpKIN Trial Updates
    Christopher Almond, MD (Palo Alto, CA)
    8:20am – 8:35am  Heartmate 3 in the Pediatric Patient
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    8:35am – 8:50am  Heartware: What Constitutes a Tight Squeeze? How Small is Too Small?
    Christina J. VanderPluym, MD (Boston, MA)
    8:50am – 9:05am  An Introduction to ACTION
    Angela Lorts, MD (Cincinnati, OH)
    9:05am – 9:20am  Syncardia in Pediatrics
    David L.S. Morales, MD (Cincinnati, OH)
    9:20am – 9:35am  Anticoagulation: Are DTI’s the Magic Bullet?
    Jennifer Conway, MD (Edmonton, Alberta)
    9:35am – 10:00am Panel Discussion
10:00am – 10:45am  Break, Vendor Exhibits & Digital Posters
10:45am – 11:15am  Key Note Lecture #1
    What’s Really Changed in 35 Years?
    A Brief History of Time
    Linda J. Addonizio, MD (New York, NY)
11:15am – 11:45am  Key Note Lecture #2
    The Economics of Mechanical Support, Heart Failure and Transplantation
    Joseph Rossano, MD, MS, FAAP, FACC (Philadelphia, PA)
11:45am – 12:00pm Presentation of Young Investigators’ Awards
12:00pm – 1:00pm Lunch & Vendor Exhibits
1:00pm – 3:00pm  PLENARY SESSION #2: ECMO

Moderators: Eva Cheung, MD (New York, NY) & William Middlesworth, MD (New York, NY)

1:00pm – 1:15pm  Current ECPR (Extracorporeal Membrane Resuscitation)
Eva Cheung, MD (New York, NY)

1:15pm – 1:30pm  Extracorporeal Membrane Oxygenation in Single Ventricles
Ravi Thiagarajan, MD, MPH (Boston, MA)

1:30pm – 1:45pm  Veno-Venous ECMO in Single Ventricles
Scott I. Aydin, MD, FAAP (New York, NY)

1:45pm – 2:00pm  Ambulatory Extracorporeal Membrane Oxygenation
Koji Takeda, MD, PhD (New York, NY)

2:00pm – 2:15pm  ELSO (Extracorporeal Life Support Organization): Using Registry Data to Refine Outcomes in Single Ventricles
D. Michael McMullan, MD, FACS (Seattle, WA)

2:15pm – 2:30pm  Columbia ECMO Program
William Middlesworth, MD (New York, NY)

2:30pm – 3:00pm  Panel Discussion

3:00pm – 3:45pm  Break, Vendor Exhibits & Digital Posters

3:45pm – 5:00pm  Regular Slide Presentations #1

Moderators: Warren Zuckerman, MD (New York, NY) & Damien J. LaPar, MD, MSc (New York, NY)

Regular Slide Presentations #1

S1. Post-Transplant Outcomes in Pediatric Patients Receiving Mechanical Circulatory Support: A Multicenter Study from the International Society for Heart and Lung Transplantation (ISHLT) Registry

Jonathan B. Edelson¹, Yuan-shung Huang², Heather Griffis², Christopher E. Mascio³, Jonathan M. Chen³, Danielle S. Burstine¹, Kimberly Y. Lin¹, Matthew J. O’Connor¹, Joseph W. Rossano¹

¹Children’s Hospital of Philadelphia, Philadelphia, PA, Department of Pediatric Cardiology, ²Children’s Hospital of Philadelphia, Philadelphia, PA, Healthcare Analytics Unit, ³Children’s Hospital of Philadelphia, Philadelphia, PA, Division of Cardiothoracic Surgery
S2. **4-Factor Prothrombin Complex Concentrate Use in Pediatric Patients with Ventricular Assist Device Presenting for Cardiac Transplant**
Matthew D. Amidon DO\(^1\), Ke Yan PhD\(^2\), Jian Zhang PhD\(^2\), Robert A. Niebler, MD\(^1\)

*Medical College of Wisconsin, Department of Pediatrics, \(^1\)Division of Pediatric Critical Care and \(^2\)Division of Quantitative Health Sciences; Milwaukee, Wisconsin, USA*

S3. **Paving a road to home: Developing education for a pediatric home VAD program**
Vicky Duffy RRT, Matt Deitemyer RN BSN, Deipanjan Nandi MD, Ashely Hodge MBA CCP FPP, Janet Simsic MD

*The Heart Center at Nationwide Children’s Hospital, Columbus, Ohio, USA*

S4. **Bivalirudin administration in pediatric ventricular assist devices**
Chiara Giorni, MD\(^1\), Isabella Favia, MD\(^1\), Alessandra Rizza, MD\(^1\), Simona Benegni, MD\(^1\), Eleonora Marinari, MD\(^1\), Francesca Giovanna Iodice, MD\(^1\), Cristiana Garisto, MD\(^1\), Valeria Raggi, MD\(^1\), Alessio Franceschini, MD\(^1\), Leonardo Vallesi, MD\(^2\), Daniele Selvaggio, MN\(^3\), Antonio Amodeo, MD\(^4\), Luca Di Chiara, MD\(^1\), Zaccaria Ricci, MD\(^1\)

\(^1\)Pediatric Cardiac Intensive Care Unit, Department of Cardiology and Cardiac Surgery, Bambino Gesù Children’s Hospital, IRCCS, Rome, Italy
\(^2\)Pharmacy, Bambino Gesù Children’s Hospital, IRCCS, Rome, Italy
\(^3\)VAD Coordinator, Department of Cardiology and Cardiac Surgery, Bambino Gesù Children’s Hospital, IRCCS, Rome, Italy
\(^4\)MCS unit, Department of Cardiology and Cardiac Surgery, Bambino Gesù Children’s Hospital, IRCCS, Rome, Italy

S5. **Evaluation of centrifugal blood pumps in terms of hemodynamic performance using simulated neonatal and pediatric ECMO circuits**
Morgan K. Moroi BS\(^1\), Shigang Wang, MD\(^1\), Allen R. Kunselman, MA\(^1\), John L. Myers, MD\(^1\), Akif Undar PhD\(^1,2\)

\(^1\)Penn State Health Pediatric Cardiovascular Research Center, Department of Pediatrics, \(^2\)Department of Surgery and Department of Bioengineering, Penn State Milton S. Hershey Medical Center, Penn State College of Medicine, Penn State Health Children’s Hospital, Hershey, PA, USA.
Friday, May 10, 2019

7:00am – 7:55am  Registration, Breakfast & Vendor Exhibits
7:55am – 8:00am  Welcome Remarks
  Linda J. Addonizio, MD, (New York, NY)

8:00am – 10:00am  PLENARY SESSION #3: VAD in Single Ventricles
  Moderators: Iki Adachi, MD (Houston, TX) & Sabrina Law, MD (New York, NY)

8:00am – 8:15am  Heart Failure in Single Ventricles
  Jack F. Price, MD (Houston, TX)

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  Jonathan M. Chen, MD (Philadelphia, PA)

8:30am – 8:45am  Support Strategies for Stage 3 Single Ventricle Palliation
  Yoshifumi Naka, MD, PhD (New York, NY)

8:45am – 9:00am  What Constitutes the “Ideal” Fontan Pump?
  Mark D. Rodefeld, MD (Indianapolis, IN)

9:00am – 9:15am  Dual Organ Transplant in Single Ventricles
  Sharon Chen, MD, MPH (Palo Alto, CA)

9:15am – 9:30am  Destination Therapy
  Angela Lorts, MD (Cincinnati, OH)

9:30am – 10:00am  Panel Discussion
10:00am – 10:45am  Break, Vendor Exhibits & Digital Posters

10:45am – 11:20am  Key Note Lecture #3
  Virtual Fit Technology
  David L.S. Morales, MD (Cincinnati, OH)

11:20am – 11:55am  Key Note Lecture #4
  Pediatric Specific Modifications for Device Implantations
  Iki Adachi, MD (Houston, TX)

11:55am – 1:00pm  Lunch & Vendor Exhibits

1:00pm – 3:00pm  Regular Slide Presentations #2
  Moderators: David M. Kalfa, MD, PhD (New York, NY) & Arthur J. Smerling, MD (New York, NY)
S6. **Safety of inter-hospital ECLS transport in pediatric patients**
Kalpana Singh MD¹, Jorge Ojito CCP FPP², Jun Sasaki MD²

¹ Department of Pediatric Intensive Care Unit, ² Department of Cardiology, Nicklaus Children’s Hospital, Miami, Florida

S7. **Ten-year-experience of interhospital extracorporeal membrane oxygenation transport for pediatric patients**
Ruey-Hung Tai, Ching-Chia Wang, Hen-Wen Chou, Chien-Hen Lai, Yih-Sharng Chen, En-Ting Wu, Shu-Chien Huang

Department of Pediatrics, Department of Surgery, National Taiwan University Children’s Hospital College of Medicine, National Taiwan University

S8. **Pediatric Ventricular Assist Device Therapy for Advanced Heart Failure-A Single Center Experience**
Wing-Kuk Timmy Au¹, Barnabe Antonio Rocha¹, Nicholoson Yam¹, Kin-Shing Lun², Tak-cheung Yung²

¹Department of Cardiothoracic Surgery, Queen Mary Hospital, Hong Kong
²Department of Pediatric Cardiology, Queen Mary Hospital, Hong Kong

S9. **Development of a pulsatile ventricular assist device designed to operate within physiologic parameters**
Stevan K Martins MD¹, Edison E dos Reis BSc ², Luis Henrique V Fonseca BSc ², Patricia M Dodd DVM ³, and Rodrigo Machado DVM ³

¹ Cardiovascular Surgery, Hospital do Coração HCor - Sao Paulo, Brazil, ² Zammi Industrial - Rio de Janeiro, Brazil, ³ Laborcor Laboratories - Belo Horizonte, Brazil

Morgan Moroi, BS*, Shigang Wang, MD*, Allen R. Kunselman, MA†, and Christoph E. Brehm, MD‡, Akif Ündar, PhD‡

*Department of Pediatrics, Penn State Health Pediatric Cardiovascular Research Center; †Department of Surgery and Bioengineering; ‡Department of Public Health and Sciences; and §Heart & Vascular Intensive Care Unit, Penn State Milton S. Hershey Medical Center, Penn State College of Medicine, Penn State Health Children’s Hospital, Hershey, PA, USA.
S11. **Perioperative blood product transfusion of two different perfusion strategies on pediatric patients undergoing aortic arch surgery**

Yuanyuan Tong\(^1\), MD, Jinping Liu\(^*\), PhD, Shoujun Li\(^2\), PhD, Jun Yan\(^2\), PhD, Peiyao Zhang\(^1\), MD, Zhengyi Feng\(^1\), MD, Ju Zhao\(^1\), PhD

\(^1\) Department of Cardiopulmonary Bypass, National Center for Cardiovascular Disease and Fuwai Hospital, Chinese Academy of Medical Sciences and Peking Union Medical College Fuwai Hospital, Beijing, China.\(^2\) Pediatric Cardiac Surgery Center, National Center for Cardiovascular Disease and Fuwai Hospital, Chinese Academy of Medical Sciences and Peking Union Medical College Fuwai Hospital, Beijing, China.

S12. **In-vitro Evaluation of Vacuum-assisted Venous Drainage and Kinetic-assisted Venous Drainage in a Simulated Pediatric Circuit - a pilot study.**

Daniel P. Guimaraes MD\(^1\), Luiz F. Caneo PhD\(^1\), Gregory S. Matte CCP LP FPP\(^2\), Luciana P. Carletto CCP\(^1\), Matheus H. C. Miranda CCP\(^1\), Priscila S. Costa CCP\(^1\), Marcelo B. Jatene PhD\(^1\), Idágene Cestari PhD\(^1\), and Fabio B. Jatene PhD\(^1\)

\(^1\) Cardiovascular Surgery Division, Instituto do Coração, Hospital das Clinicas da Faculdade de Medicina da Universidade de São Paulo (InCor-HCFMUSP), São Paulo, SP, Brazil. \(^2\) Department of Cardiac Surgery, Boston Children’s Hospital, Boston, MA, USA.

S13. **In vitro comparison of two neonatal ECMO circuits using a roller or centrifugal pump with three different in-line hemoconcentrators for maintaining hemodynamic energy delivery to the patient**

Madison Force, BS\(^1\), Morgan Moroi, BS\(^1\), Shigang Wang, MD1, David A. Palanzo, CCP\(^1\), Allen R. Kunselman, MA\(^2\), and Akif Undar, PhD\(^1,3,4\)

\(^1\) Penn State Health Pediatric Cardiovascular Research Center, Department of Pediatrics, \(^2\) Public Health and Sciences, \(^3\) Department of Surgery, \(^4\) Department of Bioengineering, Penn State Milton S. Hershey Medical Center, Penn State College of Medicine, Penn State Health Children’s Hospital, Hershey, PA, USA.

3:00pm – 3:45pm Break, Vendor Exhibits, Digital Posters & Hands-on Demonstrations

3:45pm – 5:45pm Parallel Sessions

(Advanced Registration is Required for Both Sessions)

3:45pm – 5:45pm Hands-on Demonstrations

Moderators: Michael P. Brewer, MS, CCP, FPP (New York, NY) & Dana Apsel, MS, CCP, LP (New York, NY)

Simulation Experience with the Pediatric ECLS Systems

3:45pm – 5:45pm Hospital Tours

6:00pm Cocktail Reception & Dinner at New Leaf Restaurant
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>7:00am – 8:00am</td>
<td>Registration, Breakfast &amp; Vendor Exhibits</td>
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<tr>
<td>8:00am – 10:00am</td>
<td><strong>PLENARY SESSION #4:</strong> Perfusion and Potpourri</td>
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<tr>
<td></td>
<td>Moderators: Akif Ündar, PhD (Hershey, PA), Teresa M. Lee, MD, MS (New York, NY) &amp; Michael P. Brewer, MS, CCP, FPP (New York, NY)</td>
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<tr>
<td>8:00am – 8:15am</td>
<td>Everything and the Kitchen Sink: Multimodal Mechanical Support in Two Unique Patients</td>
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<td><em>Michael P. Brewer, MS, CCP, FPP (New York, NY)</em></td>
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<tr>
<td>8:15am – 8:30am</td>
<td>Temporary Devices in Single Ventricles</td>
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<td><em>Alejandro J. Torres, MD (New York, NY)</em></td>
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<tr>
<td>8:30am – 8:45am</td>
<td>Impella Use in the Adolescent Population</td>
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<td><em>Dafne Chianella, CCP (Charleston, SC)</em></td>
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<td>8:45am – 9:00am</td>
<td>Neuro Protection on CPB: What “Matters”</td>
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<td><em>Tami M. Rosenthal, BS, MBA, CCP, LP, FPP (Philadelphia, PA)</em></td>
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<tr>
<td>9:00am – 9:15am</td>
<td>Percutaneous and Surgical Options for RV in LVAD Patients</td>
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<td><em>Melana Yuzefpolskaya, MD (New York, NY)</em></td>
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<tr>
<td>9:15am – 9:30am</td>
<td>Weaning, End of Life Care &amp; the Ethics of Ventricular Assist Devices</td>
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<td><em>Roxanne Kirsch, MD, MBE (Toronto, Canada)</em></td>
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<tr>
<td>9:30am – 10:00am</td>
<td>Panel Discussion</td>
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<tr>
<td>10:00am – 10:45am</td>
<td>Break, Vendor Exhibits &amp; Digital Posters</td>
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<td><strong>10:45am – 1:00pm</strong></td>
<td><strong>Regular Slide Presentations #3</strong></td>
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<tr>
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<td>Moderators: Tarif A. Choudhury, MD (New York, NY) &amp; Ganga Krishnamurthy, MD (New York, NY)</td>
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**Regular Slide Presentations #3**


Shengwen Guo MD¹, Jinping Liu MD¹, Xin Duan MD¹

¹ Department of Cardiopulmonary Bypass, State Key Laboratory of Cardiovascular Disease, Fuwai Hospital, National Center for Cardiovascular Diseases, Chinese Academy of Medical Sciences and Peking Union Medical College

S15. **Postpartum Pulmonary Arterial Hypertension in Twin Mothers at the Similar Time but with Different Outcomes**

Kanyarad Boonthim

Perfusion division, Department of surgery, King Chulalongkorn Memorial Hospital (the Thai Red Cross Society), Bangkok, Thailand
S16. **Bloodless Repair of Total Anomalous Pulmonary Venous Connection in a 3.4-kg Neonate**
Paul Kerins CCP, Daniel Duncan CCP FPP, and Christian Pizarro MD
The Nemours Cardiac Center, Nemours Alfred I Dupont Hospital for Children, Wilmington Delaware

S17. **Evaluation of Pulsatile Frequency of a Diagonal Pump on Circuit Pressure, Pressure Drop, and Hemodynamic Energy Transmission in a Simulated Neonatal ECLS System**
Madison Force, BS1, Shigang Wang, MD1, Morgan K. Moroi, BS1, Allen R. Kunselman, MA2, Akif Ündar, PhD1,3
Penn State Health Pediatric Cardiovascular Research Center, Department of Pediatrics1, Public Health and Sciences2, Department of Surgery and Bioengineering3, Penn State Milton S. Hershey Medical Center, Penn State College of Medicine, Penn State Health Children’s Hospital, Hershey, PA, USA.

S18. **Impella Use for Left Heart Decompression While on ECMO in a Pediatric Patient**
Ashish A. Ankola, MD
Columbia

S19. **Evolution of Ventricular Assist Devices and their complications - a 24-year single center experience**
Benjamin S. Mantell, MD, PhD1,2. Paul J. Chai, MD3, Emile Bacha, MD3, David M. Kalfa, MD, PhD3, Warren A. Zuckerman, MD1, Teresa M. Lee, MD1, Marc E. Richmond, MD, MS1, Linda J. Addonizio, MD1, Sabrina P. Law, MD1
1: Division of Pediatric Cardiology, Department of Pediatrics, 2: Pediatric Cardiology Fellowship Program, 3: Division of Cardiothoracic Surgery, NewYork-Presbyterian Hospital, Columbia University Irving Medical Center, Morgan Stanley Children’s Hospital, New York, NY 10032

S20. **Title to come**
Author(s) to come
Institution to come

S21. **Title to come**
Author(s) to come
Institution to come

S22. **Evidence-based research using a multi-disciplinary team approach for optimization of neonatal CPB circuitry**
Akif Ündar PhD
Penn State Pediatric Cardiovascular Research Center, Department of Pediatrics, Surgery and Bioengineering, Penn State College of Medicine, Penn State Health Children’s Hospital, Hershey, PA, USA

1:00pm - 1:05pm Closing Remarks
Paul J. Chai, MD, Sabrina Law, MD and Akif Ündar, PhD
P1. In-vitro Hemodynamic Evaluation of Neonatal Arterial Cannulae and Arterial & Venous Tubing in Simulated CPB Circuits

Akif Ündar, PhD, Shigang Wang, MD, and Allen R. Kunselman, MA

Pediatric Cardiovascular Research Center, Department of Pediatrics, Public Health Sciences, Surgery and Bioengineering. Penn State Milton S. Hershey Medical Center, Penn State Hershey College of Medicine, Penn State Hershey Children’s Hospital, Hershey, PA, USA


Shigang Wang, MD, Allen R. Kunselman, MA, Akif Ündar, PhD

Penn State Health Pediatric Cardiovascular Research Center, Department of Pediatrics, Department of Public Health and Sciences, Surgery & Bioengineering. Penn State Milton S. Hershey Medical Center, Penn State College of Medicine, Penn State Health Children’s Hospital, Hershey, PA, USA.

P3. A Novel 5D Bioprinting System and its Expected Application of Artificial Organs

DuckHee Lee MS, SeungJoon Song Ph.D, Seongjun Kim MS, Chibum Ahn PhD, Jaeyoung Kim Ph.D, Sanghoon Jung Ph.D, Jaesoon Choi Ph.D, Kyung Sun MD, PhD

1Medical Engineering R&D Center, Asan Institute for Life Sciences, Asan Medical Center, University of Ulsan, College of Medicine, 2Biomedical Research Center, Korea University Ansan Hospital, 3Department of Molecular Medicine, Gachon University, 4Department of Thoracic and Cardiovascular Surgery, College of Medicine, Korea University

P4. The Preliminary Study of Buckling for Blood Flow in Arteries Using Finite Element Method

Duck Hee Lee MS, Seoung Joon Song PhD, SeongJun Kim MS, and Jaesoon Choi PhD

1Medical Engineering R&D Center, Asan Institute for Life Sciences, Asan Medical Center, 2College of Medicine, University of Ulsan, 3Korea Artificial Organ Center, College of Medicine, Korea University, 4Biomedical Research Center, Korea University Ansan Hospital

P5. Biomechanics Studies of 3D Printed Scaffolds for the Artificial Trachea

Chi Bum Ahn Ph.D, Sung Ho Lee MD, Ph.D, Jea-Ik Lee MD, Ph.D, Jin Woo Lee Ph.D, Kuk Hui Son, MD, Ph.D

1Department of Molecular Medicine, Gachon University, Incheon, Korea, 2Department of Health Science and Technology, GAHIST, Gachon University, Korea, 3Department of Thoracic and Cardiovascular Surgery, Gachon University Gil Medical Center, Incheon, 4Department of Thoracic and Cardiovascular Surgery, College of Medicine, Korea University
P6. **In Vitro Comparison of Pediatric Oxygenators with and without Integrated Arterial Filters in Maintaining Optimal Hemodynamic Stability and Managing Gaseous Microemboli**

Morgan Moroi, BS¹, Madison Force, BS¹, Shigang Wang, MD¹, Allen R. Kunselman, MA², and Akif Ündar, PhD¹,³

¹Penn State Health Pediatric Cardiovascular Research Center, Department of Pediatrics, ²Public Health and Sciences, ³Department of Surgery and Bioengineering, Penn State Milton S. Hershey Medical Center, Penn State College of Medicine, Penn State Health Children’s Hospital, Hershey, PA, USA.

P7. **In Vitro Evaluation of ECG-Synchronized Pulsatile Flow using i-Cor Diagonal Pump in Neonatal and Pediatric ECLS Systems**

Morgan Moroi, BS¹*, Madison Force, BS¹*, Shigang Wang, MD¹, Allen R. Kunselman, MA², and Akif Ündar, PhD¹,³

¹Penn State Health Pediatric Cardiovascular Research Center, Department of Pediatrics, ²Public Health and Sciences, ³Department of Surgery and Bioengineering, Penn State Milton S. Hershey Medical Center, Penn State College of Medicine, Penn State Health Children’s Hospital, Hershey, PA, USA. *Both authors contributed equally to this work.

P8. **In vitro Hemodynamic Evaluation of ECG-synchronized pulsatile flow using i-cor pump as short-term cardiac assist device for neonatal and pediatric population**

Madison Force, BS¹*, Morgan Moroi, BS¹*, Shigang Wang, MD¹, Allen R. Kunselman, MA², and Akif Ündar, PhD¹,³

¹Penn State Health Pediatric Cardiovascular Research Center, Department of Pediatrics, ²Public Health and Sciences, ³Department of Surgery and Department of Bioengineering, Penn State Milton S. Hershey Medical Center, Penn State College of Medicine, Penn State Health Children’s Hospital, Hershey, PA, USA. *Both authors contributed equally to this work.

P9. **Hemodynamic Characteristics of Femoral Arterial Cannulae with Different Perfusion Modes in a Simulated Adolescent & Adult ECLS Circuit**

Madison Force, BS¹*, Shigang Wang, MD¹, Allen R. Kunselman, MA³, Christoph Brehm, MD₂, Akif Ündar, PhD¹,³

Departments of Pediatrics¹, Public and Health Sciences³, Surgery and Bioengineering⁴; Penn State Hershey Pediatric Cardiovascular Research Center, Penn State Hershey College of Medicine, Hershey, PA. §Heart and Vascular Institute, Penn State Milton S. Hershey Medical Center, Hershey, PA

P10. **Hemodynamic Performance Evaluation of VV-ECLS and VA-ECLS Cannulae**

Shigang Wang, MD¹, Madison Force, BS¹, Allen R. Kunselman, MA², David Palanzo, CCP³, Christoph Brehm, MD⁴, Akif Ündar, PhD¹,³

Penn State Health Pediatric Cardiovascular Research Center, Department of Pediatrics¹, Public Health and Sciences¹, Perfusion³, Heart and Vascular Institute⁴, Surgery and Bioengineering⁵; Penn State Milton S. Hershey Medical Center, Penn State College of Medicine, Penn State Health Children’s Hospital, Hershey, PA, USA.
Impact of different perfusion modalities on coronary and carotid blood flow velocities in an ECLS swine model

Akif Ündar, PhD, Shigang Wang, MD, Sunil Patel, MBBS, Jenelle M. Izer, DVM, MS, Joseph B. Clark, MD, Allen R. Kunselman, MA, Ronald P. Wilson, VMD, MS

Penn State Hershey Pediatric Cardiovascular Research Center, Department of Pediatrics, Comparative Medicine, Surgery, Public Health and Sciences, and Bioengineering, Penn State Milton S. Hershey Medical Center, Penn State Hershey College of Medicine, Penn State Hershey Children’s Hospital, Hershey, PA, USA.

Effects of Pulsatile Control Algorithms for Diagonal Pump on Hemodynamic Performance

Shigang Wang, MD, Madison Force, BS, Morgan K. Moroi, BS, Sunil Patel, MD, Allen R. Kunselman, MA, and Akif Ündar, PhD

Penn State Health Pediatric Cardiovascular Research Center, Department of Pediatrics, Department of Public Health and Sciences, Surgery & Bioengineering, Penn State Milton S. Hershey Medical Center, Penn State College of Medicine, Penn State Health Children’s Hospital, Hershey, PA, USA.

In-Vitro Evaluation of Capiox FX05 and RX05 Oxygenators in Neonatal Cardiopulmonary Bypass Circuits with Varying Venous Reservoir and Vacuum-assisted Venous Drainage Levels

Shyama Sathianathan, BS, Rafay Nasir, Shigang Wang, MD, Allen R. Kunselman, MA, and Akif Ündar, PhD

Pediatric Cardiovascular Research Center, Department of Pediatrics, Public Health and Sciences, Surgery and Bioengineering, Penn State Milton S. Hershey Medical Center, Penn State College of Medicine, Penn State Health Children’s Hospital, Hershey, PA, USA.

Evaluation of hemodynamic performance of a combined ECLS and CRRT circuit in seven configurations with a simulated neonatal patient

Elizabeth Profeta, BS, Kaitlyn Shank, BS, Shigang Wang, MD, Allen R. Kunselman, MA, John L. Myers, MD, and Akif Ündar, PhD

Penn State Health Pediatric Cardiovascular Research Center, Department of Pediatrics, Public Health and Sciences, Department of Surgery, Department of Bioengineering, Penn State Heart and Vascular Institute, Penn State Milton S. Hershey Medical Center, Penn State College of Medicine, Penn State Health Children’s Hospital, Hershey, PA, USA.
Conference Co-Chairs:

Akif Ündar, PhD
Professor of Pediatrics, Surgery, and Bioengineering, Penn State College of Medicine, Penn State Children’s Hospital, Founder & Director, Penn State Hershey Pediatric Cardiovascular Research Center, Founder & President, International Society for Pediatric Mechanical Cardiopulmonary Support

Paul J. Chai, MD
Surgical Director, Pediatric Cardiac Transplantation and Mechanical Assistance Programs, NYP/Morgan Stanley Children’s Hospital; Associate Professor of Surgery at CUIMC, NYP/Columbia University Irving Medical Center

Sabrina Law, MD
Medical Director of the Pediatric Ventricular Assist Device (VAD) Program, NYP/Morgan Stanley Children’s Hospital; Assistant Professor of Pediatrics at CUIMC, NYP/Columbia University Irving Medical Center

Key Note Lecturers:

Iki Adachi, MD, Texas Children’s Hospital
Linda J. Addonizio, MD, NYP/Morgan Stanley Children’s Hospital
David L.S. Morales, MD, Cincinnati Children’s Hospital Medical Center
Joseph Rossano, MD, MS, FAAP, FACC, Children’s Hospital of Philadelphia

Invited Speakers:

Christopher Almond, MD, Stanford Children’s Health
Scott I. Aydin, MD, FAAP, Kravis Children’s Hospital at Mount Sinai
Jonathan M. Chen, MD, Children’s Hospital of Philadelphia
Sharon Chen, MD, MPH, Stanford Children’s Health
Dafne Chianella, CCP, Medical University of South Carolina
Jennifer Conway, MD, University of Alberta
Roxanne Kirsch, MD, MBE, Hospital for Sick Children
Angela Lorts, MD, Cincinnati Children’s Hospital Medical Center
Katsuhide Maeda, MD, Stanford Children’s Health
D. Michael McMullan, MD, FACS, Seattle Children’s Hospital
Jack F. Price, MD, Texas Children’s Hospital
Mark D. Rodefeld, MD, Indiana University School of Medicine
Tami M. Rosenthal, BS, MBA, CCP, LP, FPP, Children’s Hospital of Philadelphia
Ravi Thiagarajan, MD, MPH, Boston Children’s Hospital
Christina J. VanderPluym, MD, Boston Children’s Hospital
Local Faculty:
Dana Apsel, MS, CCP, LP, NYP/Columbia University Irving Medical Center
Emile Bacha, MD, FACS, NYP/Morgan Stanley Children's Hospital
Michael P. Brewer, MS, CCP, FPP, NYP/Columbia University Irving Medical Center
Eva Cheung, MD, NYP/Morgan Stanley Children’s Hospital
Tarif A. Choudhury, MD, NYP/Morgan Stanley Children's Hospital
David M. Kalfa, MD, PhD, NYP/Morgan Stanley Children's Hospital
Ganga Krishnamurthy, MD, NYP/Morgan Stanley Children’s Hospital
Damien J. LaPar, MD, MSc, NYP/Morgan Stanley Children’s Hospital
Teresa M. Lee, MD, MS, NYP/Morgan Stanley Children’s Hospital
William Middlesworth, MD, NYP/Morgan Stanley Children’s Hospital
Yoshifumi Naka, MD, PhD, NYP/Columbia University Irving Medical Center
Marc E. Richmond, MD, MS, NYP/Morgan Stanley Children's Hospital
Arthur J. Smerling, MD, NYP/Morgan Stanley Children's Hospital
Koji Takeda, MD, PhD, NYP/Columbia University Irving Medical Center
Alejandro J. Torres, MD, NYP/Morgan Stanley Children’s Hospital
Melana Yuzefpolskaya, MD, NYP/Columbia University Irving Medical Center
Warren Zuckerman, MD, NYP/Morgan Stanley Children’s Hospital
The 15th International Conference on
Pediatric Mechanical Circulatory Support Systems & Pediatric Cardiopulmonary Perfusion