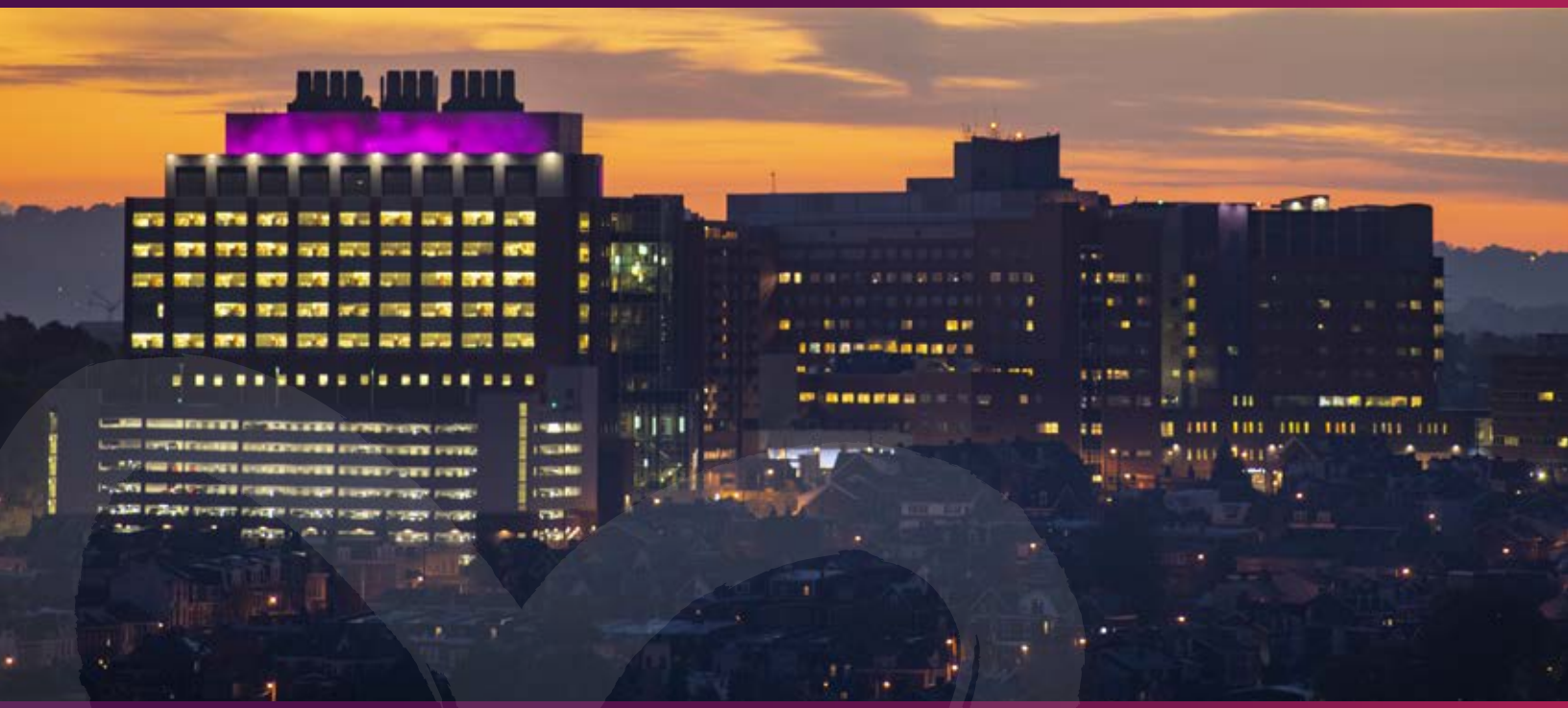

The 2026 Midwest Pediatric Cardiology Society Meeting

Hosted by the
UPMC Children's Hospital of Pittsburgh
Heart Institute

September 10 to 11, 2026

UPMC CHILDREN'S
HEART INSTITUTE

WELCOME

On behalf of the Heart Institute at UPMC Children's Hospital of Pittsburgh, we formally welcome you to the 2026 Midwest Pediatric Cardiology Society annual meeting. Throughout this two-day event, experts from leading institutions across the Midwest will share emerging research, complex case experiences, innovations in clinical practice, and evolving technologies in pediatric cardiology and cardiovascular surgery. Sessions will include invited lectures, abstract presentations, case discussions, and multidisciplinary panels.

Following the meeting, participants will have the knowledge and understanding to:

- Describe recent advancements in the diagnosis and management of congenital heart disease in pediatric and adult patients.
- Apply current best practices in cardiac catheterization, interventional cardiology, and electrophysiology to clinical decision-making.
- Interpret new imaging techniques and technologies in echocardiography and other non-invasive modalities for improved diagnostic accuracy.
- Evaluate emerging surgical approaches and perioperative strategies in pediatric cardiovascular surgery.
- Collaborate more effectively across multidisciplinary teams to enhance continuity and quality of care in pediatric cardiology.
- Integrate recent research findings and case-based insights into clinical practice to optimize patient outcomes.

We look forward to an engaging and insightful event to foster collaboration, innovation, and advancements in the field of pediatric and congenital heart disease.

Sincerely,

Mark DeBrunner, MD
Associate Professor of Pediatrics
Division of Pediatric Cardiology
UPMC Children's Hospital of Pittsburgh

Christopher Follansbee, MD
Assistant Professor of Pediatrics
Division of Pediatric Cardiology
UPMC Children's Hospital of Pittsburgh

Elizabeth Caris, MD
Assistant Professor of Pediatrics
Division of Pediatric Cardiology
UPMC Children's Hospital of Pittsburgh

ABOUT THE HEART INSTITUTE AT UPMC CHILDREN'S

The Heart Institute is a destination center for the treatment and management of congenital and acquired heart disease. Bringing together internationally recognized experts in cardiac surgery, cardiology, cardiac imaging, and heart and lung transplantation, the program delivers the full scope of care for traditional to complex heart conditions. Through close collaboration with UPMC Magee-Womens Hospital and the UPMC Heart and Vascular Institute, our team ensures a seamless transition of care from fetal diagnosis through childhood and into adulthood. We consistently achieve outstanding surgical outcomes that earn our program recognition from prestigious national forums, including the Society of Thoracic Surgeons (STS) and *U.S. News and World Report*.

Led by Victor Morell, MD; Jacqueline Kreutzer, MD; and Avihu Zalman Gazit, MD; the Heart Institute team remains at the forefront of clinical excellence and patient care.

- UPMC Children's Hospital of Pittsburgh consistently ranks among the top programs in the nation for cardiology and heart surgery by *U.S. News & World Report*.
- Led by Victor Morell, MD, our Department of Cardiothoracic Surgery has advanced expertise in treating all types of congenital heart disease. Our team achieves outstanding surgical outcomes recognized by the Society of Thoracic Surgeons (STS).
- We are home to the Da Silva Center for Ebstein's Anomaly, where the creator of the cone procedure, José da Silva, MD, alongside Luciana da Fonseca da Silva, MD, director of the Da Silva Center for Ebstein's Anomaly, care for patients from around the world with Ebstein's anomaly.
- The Heart Institute is a member of the Pediatric Heart Network (PHN), an international consortium of nine congenital heart programs across North America.
- The Adult Congenital Heart Association (ACHA) has accredited the UPMC Adult Congenital Heart Disease Program for its excellence in clinical care and patient support.

Central to the Heart Institute's mission is its commitment to education and the development of future leaders in pediatric heart care. Our highly competitive cardiology fellowship programs continue to attract outstanding applicants from leading institutions across the country. The Heart Institute promotes a culture of mentorship and professional growth that empowers junior faculty and trainees to excel and, ultimately, to shape the next generation of pediatric cardiologists.

2026 MWPCS KEYNOTE SPEAKER:

Sylvia Owusu-Ansah, MD, MPH, FAAP

Associate Vice Chair of Engagement
Assistant Professor of Pediatrics and Emergency Medicine
EMS Medical Director, UPMC Children's Hospital of Pittsburgh

This year, we are honored to welcome Dr. Sylvia Owusu-Ansah as the MWPCS keynote speaker. Dr. Owusu-Ansah is a board-certified pediatrician, and board-certified in pediatric emergency medicine. She is currently the medical director of Prehospital and EMS at UPMC Children's.

She has spent much of her career developing curriculums and providing education for EMS personnel in both urban and suburban environments, including Washington D.C., Baltimore, and Pittsburgh, as well as government agencies such as the United States Secret Service. She has co-authored the Pediatric Education for Prehospital Providers recent edition textbook, otherwise known as PEPP, as well as the EMS Textbook's next edition. Dr. Owusu-Ansah is also co-author and first author for the Pediatric Prehospital Readiness for EMS Systems Policy Statement and Technical Report and is currently on the National Committee for Pediatric Prehospital Readiness. She also serves on the board for the National Registry of EMTs (NREMT), for which she serves as chair of the research committee.

Dr. Owusu-Ansah now more recently focused her career on promoting engagement in multiple academic areas, currently serving as the Associate Vice Chair of Engagement. She inspired and co-authored the first anti-racism statement for UPMC Children's Hospital of Pittsburgh, and co-authored statements for the National Association of EMS Physicians, the largest organization of EMS Medical Directors in the country, as well as the NREMT. She is on the engagement committee for the Department of Pediatrics at UPMC Children's Hospital of Pittsburgh and co-leads the hospital's first ever pipeline program for local underserved middle school students and underrepresented students in medicine.

Dr. Owusu-Ansah also serves as a medical adviser on the Max drama, "The Pitt". Her expertise ensures that each scene accurately represents the experiences of emergency medicine providers. As a medical advisor, she has shared real-life experiences with the team that have been written into episodes, including treating patients with sickle cell disease whose pain is often overlooked and the moment of silence she and her colleagues observe when a patient dies in their emergency room. Dr. Owusu-Ansah's goal is to highlight health disparities in emergency medicine that aren't commonly shown in the media.

2026 MWPCS AGENDA - DAY 1

Thursday, Sept. 10, 2026
Noon to 5 p.m.
University Club

123 University Pl,
Pittsburgh, PA 15213

11:30 a.m. to noon	**Registration/Breakfast**
Noon to 12:10 p.m.	**Opening remarks**

Session 1: Ebstein's Anomaly

12:10 to 12:30 p.m.	**Multimodal Imaging of Ebstein's Anomaly** Elizabeth Caris, MD
12:30 to 12:50 p.m.	**Electrophysiology Considerations in Ebstein's Anomaly** Phil Wackel, MD
1 to 1:30 p.m.	**Surgical Management of Ebstein's Anomaly** Luciana da Fonseca da Silva, MD
1:35 to 1:50 p.m.	**Q & A session**
1:50 to 2 p.m.	**Break**

Session 2: Program Development with Allied Health Professionals

2 to 2:20 p.m.	**Development of an APP Fellowship Program** Amy Donaldson, CRNP
2:20 to 2:40 p.m.	**Outpatient Complex Feeding Program** Liz Pratt, CRNP, and Stacey Green, PA-C
2:40 to 3 p.m.	**Implementing a Second Opinion Program** Erin Colvin, CRNP
3 to 3:20 p.m.	**Quality Improvement Initiatives in Acute Care Cardiology** Sara Bunyaratapan, PA-C
3:20 to 3:30 p.m.	**Q & A session**
3:30 to 3:40 p.m.	**Break**

Session 3: Future Trends in Pediatric Cardiology

3:40 to 4 p.m.	**Advances in Cardiac Cross-Sectional Imaging** Adam Christopher, MD
4 to 4:20 p.m.	**Digital Twins in Medical Imaging** Matthew Bramlet, MD
4:20 to 4:40 p.m.	**Pacing the Future: Innovation in Pacing for Congenital Heart Disease** Adam Kean, MD
4:40 to 5 p.m.	**Q & A session**
5 p.m.	**Adjourn**
6 to 10 p.m.	**Dinner at Carnegie Museum** 4400 Forbes Ave Pittsburgh, PA 15213

2026 MWPCS AGENDA - DAY 2

Friday, Sept. 11, 2026

8 a.m. to 5 p.m.

John C. Rangos Auditorium

4401 Penn Ave
Pittsburgh, PA 15224

6:30 a.m.	**Shuttle arrives at The Oaklander Hotel**
6:45 a.m.	**Shuttle departs The Oaklander Hotel**
7 a.m.	**Arrival at UPMC Children's Hospital of Pittsburgh**
7 to 8 a.m.	**Breakfast and networking**
8 a.m.	**Welcome and introductions**
8:10 to 8:30 a.m.	**Echocardiographic Speckle-Tracking, Fractional Area Change, and Subjective Right Ventricular Function as Predictors of Adverse Outcomes After Fontan Palliation in Hypoplastic Left Heart Syndrome** Ahmed Chmaisse, MD
8:30 to 8:50 a.m.	**Relationship Between EKG Characteristics and Post-Operative Echocardiogram Findings in Ebstein's Anomaly Patients Following Cone Repair** Molly Carney, MD

8:50 to 9:10 a.m.	**Novel Cardiac Phenotypic Expansion in EXOSC3-Related Pontocerebellar Hypoplasia Type 1B: Implications for Cardiac Surveillance** Alaa Mohamed, M.B., B.Ch
9:10 to 9:30 a.m.	**A Survey of Initial Testing for Common Referrals to Outpatient Pediatric Cardiology Clinic** Lauren Tice, DO
9:30 to 9:50 a.m.	**Fifteen Years of Outpatient Pediatric Cardiology: Trends in Referrals, Diagnoses, and Cardiac Imaging Testing From 2010–2025** Sophia Liu, BS
9:50 to 10 a.m.	**Break**
10 to 10:20 a.m.	**Prenatal Ductus Arteriosus Tortuosity and the Development of Postnatal Coarctation of the Aorta** Caitlin Pook, MD
10:20 to 10:40 a.m.	**Measured but Not Documented: Obesity in Outpatient Pediatric Cardiology** Elise Hokanson, MD
10:40 to 11 a.m.	**Predictors of Morbidity and Mortality after Heart and Combined Heart-Liver Transplant in Adult Congenital Heart Disease** Dhruvil Patel, MD
11 to 11:20 a.m.	**Simple Clinical Parameters Outperform Serum-Based Fibrosis Scores for Assessment of Advanced Liver Fibrosis in Adults with Fontan Physiology** Priya Nair, MD
11:20 to 11:40 a.m.	**Utilization of Elucis VR System for Complex Cardiac and Combined Transplant Evaluation** Priya Nair, MD
11:40 a.m. to 1 p.m.	**Lunch break and poster walk**
1 to 1:20 p.m.	**Association of the Child Opportunity Index with Remote Monitoring and Clinical Outcomes in Patients with Cardiac Implantable Electronic Devices** Vijay Arora
1:20 to 1:40 p.m.	**Neonatal Management of Ebstein Anomaly: An Institutional Review** Yolandee Bell-Cheddar, MD
1:40 to 2 p.m.	**Genotype-Phenotype Correlation in Pediatric Patients with Titin-Gene Variants: A Single-Institution Study** Honora Navid

2 to 2:20 p.m.	**Coarctation of the Aorta: Long-Term Outcomes of Reverse Subclavian Flap Repair** Jared Smith
2:20 to 2:40 p.m.	**Mid-Term Recovery of Right Ventricular Function and Improvement of Left Ventricular Function after the Da Silva Cone Operation for Ebstein Anomaly** Krithika Sundaram, MD
2:40 to 3 p.m.	**Incidence and Predictors of Atrial Tachyarrhythmia in Fontan Patients from the Fontan Outcome Registry Using Clinical Examinations (FORCE)** Sydney Rooney, MD
3 to 3:20 p.m.	**Break and refreshments**
3:20 to 3:40 p.m.	**All 1R Heart Transplant Biopsies Are Not the Same: Grade 1B/2 is More Commonly Associated Antibody Mediated Rejection and Elevated dd-cfDNA** Jacob Convissar, DO
3:40 to 4 p.m.	**Long-Term Outcomes After Sano Conduit Versus Blalock-Taussig-Thomas Shunt Among Fontan Survivors: A FORCE Registry Analysis** Kei Kobayashi, MD, PhD
4 to 4:20 p.m.	**SVP vs BVR in DORV: Outcomes by Anatomic Complexity** Kei Kobayashi, MD, PhD
4:20 to 4:40 p.m.	**Donor-Derived Cell Free DNA-Led Surveillance in Pediatric Heart Transplantation: Single-Center Mid-Term Outcomes** Collin Kramer, MD
4:40 to 5 p.m.	**Closing remarks**
5 p.m.	**Adjournment**
5:30 p.m.	**Shuttle to The Oaklander Hotel**

TRANSPORTATION

Shuttle services will be available to transport attendees to and from The Oaklander to UPMC Children's on Friday, September 11.

ORAL PRESENTATION HIGHLIGHTS

We are pleased to share selected oral presentations from researchers, providers, fellows, and residents representing leading institutions from across the Midwest.

Coarctation of the Aorta: Long-Term Outcomes of Reverse Subclavian Flap Repair

Jared Smith

Introduction: Coarctation of the aorta represents 4-8% of all congenital heart defects and is defined by a discrete narrowing of the aorta that most commonly occurs just distal to the left subclavian artery. In 5-9% of cases, this lesion is accompanied by distal arch hypoplasia and a wide spectrum of cardiac anatomic abnormalities. The reverse subclavian flap, combined with extended end-to-end anastomosis (EETE), allows for augmentation of the distal transverse arch and relief of coarctation without cardiopulmonary bypass. Clearer selection criteria for the technique and characterization of long-term outcomes are still needed. This study examines the outcomes of the reverse subclavian flap with EETE, evaluating the rate of mortality, reintervention, and conversion to the single-ventricle pathway.

Methods: This is a retrospective, single-center study of 36 neonates undergoing reverse subclavian flap with EETE via left thoracotomy without cardiopulmonary bypass at Children's Wisconsin from 1999 to 2025. At the time of operation, the median age was 7 days, and the average weight was 3 kg.

Results: Maximum follow-up was 25 years (average, 8 years). Four deaths (11%) have been reported, occurring an average of 383 days after coarctation repair. One of the 4 deaths was an operative mortality. Re-intervention on the aortic arch occurred in 9 patients (25%). Four patients underwent conversion to a single-ventricle pathway (11%). One patient died following the Glenn procedure, and the remaining 3 patients survived and subsequently underwent the Fontan procedure.

Conclusions: The reverse subclavian flap procedure with EETE offers relief to patients with distal transverse arch hypoplasia and coarctation at the isthmus. Patients with more complex preoperative arch anatomy were more susceptible to reintervention and single-ventricle conversion. There was an acceptable operative, intermediate, and long-term survival rate.

Relationship Between EKG Characteristics and Post-Operative Echocardiogram Findings in Ebstein's Anomaly Patients Following Cone Repair

Molly Carney, MD

Introduction: Ebstein's anomaly is associated with several EKG abnormalities which are likely secondary to abnormal electrical features of the atrialized right ventricle (RV) myocardium. Prior studies show an association between EKG characteristics and pre-op structure and function. Small case studies have demonstrated improvement in QRS fragmentation (QRSf) after tricuspid valve (TV) repair, but no study has examined additional EKG features including QRS prolongation (QRSp) or the relationship with post-op structure and function.

Question: To examine the relationship between pre and post-op EKG characteristics with post-op outcomes.

Methods: Retrospective TTE and EKG data was collected on patients with Ebstein's anomaly who underwent Cone procedure at our center between February 2016 and June 2025. Baseline characteristics and post-op echo outcomes were compared across EKG groups using the Wilcoxon Mann-Whitney test or Kruskal–Wallis test for continuous variables and the chi-square test or Fisher exact test for categorical variables. Within-patient changes in EKG were assessed using the Wilcoxon signed-rank test for continuous variables and McNemar test for paired categorical variables. Multivariable linear and logistic regression models were used to estimate odds ratios (OR), and 95% confidence intervals (CI), after accounting for age at operation.

Results: We identified 152 patients with an average follow-up of 44 days (IQR 35). Patients with pre-op QRSf had higher post-op rates of ≥ moderate tricuspid regurgitation (TR) (8.7% vs. 1.0%, p=0.0370) and severe post-op qualitative RV dilation (19.6% vs. 6.5%, p=0.0380). Additionally, pre-op QRSf had higher LV E/e' (9.8 vs. 8.2, p=0.0281), while LVEDVi (37.1 vs. 46.3 mL/m2, p=0.0035) and LVSVi (23.9 vs. 29.0 mL/m2, p=0.0403) were significantly lower. QRSf had nearly 11 times higher odds (OR=10.95; 95% CI: 1.17-102.84; p=0.0362) of ≥ moderate TR and 4 times greater odds (OR=4.15; 95% CI: 1.34-12.86; p=0.0137) of severe RV dilation. Patients with improvement in post-op QRSf were significantly more likely to have normal post-op RV dilation (p=0.0386). Patients with pre-op and post-op QRSf had the highest rate of severe post-op RV dilation (p=0.0393). Patients with pre-op QRSp were significantly more likely to have severe post-op qualitative RV dilation (16.0% vs. 3.8%, p=0.0290), ≥ moderate post-op RV dysfunction (67.1% vs. 36.4%, p=0.0005), and ≥ moderate post-op qualitative right atrial (RA) dilation (42.7% vs. 21.8%, p=0.0388).

Conclusions: Pre-op QRSf and QRSp are both strongly associated with worse post-op RV dilation and dysfunction, however QRSf was additionally associated with worse post-op TR and decreased LV diastolic function. Resolution of QRSf was associated with improved post-op RV dilation suggesting these characteristics potentially represent useful clinical predictors of post-op function.

All 1R Heart Transplant Biopsies Are Not the Same: Grade 1B/2 is More Commonly Associated Antibody Mediated Rejection and Elevated dd-cfDNA

Jacob Convissar, DO

Background: The current histological grading system for cellular rejection after heart transplantation (HT) was adopted in 2004, grouping together the 1990 classifications 1A, 1B, and 2 into a single grade 1R. While this change was made for perceived treatment and prognostic similarities between the groups, some continue to use the 1990 grading scheme clinically out of concern that these grades are not prognostically equivalent.

Hypothesis: Endomyocardial biopsies (EMB) grades 1B or 2 are more likely than those grade 1A to be associated with antibody-mediated rejection (ABMR) by histology and by molecular gene expression profile (MMDx) and greater levels of circulating donor derived cell-free DNA (dd-cfDNA), a validated biomarker of graft injury.

Methods: All EMBs at our center that were also analyzed by MMDx were reviewed. EMBs graded 1B/2 were compared to those graded 1A for the presence of ABMR. Contemporaneous dd-cfDNA (within 60 days prior to EMB) was also compared between the groups. Analyses were performed by logistic regression with cluster-robust standard errors to account for repeated EMBs on the same allografts over time. dd-cfDNA were log-transformed for analysis due to a skewed distribution. A two-sided p-value <0.05 was considered significant.

Results: We identified 491 EMBs that were assessed by clinical histological grading and MMDx among 149 allografts (mean of 1.76 EMBs per allograft) in 146 unique HT recipients: 42% female, 46% with congenital heart disease, 9% positive donor-specific crossmatch, median age at HT 6.1 years (IQR 1.0-12.8). ABMR was more commonly associated with grades 1B/2 versus grade 1A on MMDx (RR 1.82, 95% CI: 1.11-2.96; p=0.016) but did not reach significance by standard histology (RR 1.71 (95% CI: 0.97-3.04; p=0.063). In a subset of 164 EMBs that had contemporaneous dd-cfDNA, median dd-cfDNA was 0.64% (IQR 0.29-1.40%) for the grade 1B/2 group and 0.40% (IQR 0.19-0.76%) for the 1A group. dd-cfDNA levels (geometric mean) for grade 1B/2 EMBs were 1.62 times higher (95% CI: 1.11-2.36; p=0.013) than for grade 1A EMBs, after accounting for repeated EMBs from the same allograft and for the presence of ABMR on MMDx. MMDx-defined ABMR correlated more strongly with dd-cfDNA than histologic ABMR (R2 = 0.219 vs 0.150). The number of unique donor specific antibodies (DSAs) and highest DSA strength were similar between the groups.

Conclusions: Histologic grade 1B/2 rejection is associated with antibody mediated rejection and, independently, with concurrent allograft injury as measured by dd-cfDNA. With prior work demonstrating an association of grade 1B EMBs with allograft vasculopathy, our data supports ABMR-mediated graft injury as a possible mechanism. Grade 1B/2 and grade 1A are biologically distinct and should not be grouped together into a single grade 1R as is currently recommended.

Incidence and Predictors of Atrial Tachyarrhythmia in Fontan Patients from the Fontan Outcome Registry using Clinical Examinations (FORCE)

Sydney Rooney, MD

Background: The Fontan procedure has significantly extended the lifespan of patients with single-ventricle congenital heart disease. Atrial tachyarrhythmias (AT) are known to be associated with an increased risk of morbidity and mortality in this population. Understanding the anatomic, surgical, and clinical elements associated with AT is essential for risk stratification and guiding quality care.

Research Question: What is the prevalence of AT in the Fontan population? What are the clinical, imaging, and surgical risk factors for AT development?

Methods: The Fontan Outcomes Registry Using CME Examinations (FORCE) was utilized for the analysis, which contains retrospective clinical and imaging data of Fontan patients from 42 centers. Cardiac MRI (CMR) data spanned 3/1999-1/2025 at time of analysis. Patients were included if they had at least one CMR prior to AT diagnosis, and the latest CMR assessment served as the starting point for modeling. AT was defined as atrial fibrillation, atrial flutter, or atrial tachycardia. Differences in characteristics between AT groups were assessed using Wilcoxon-Mann-Whitney or Chi-square/Fisher's exact tests, as appropriate. Cox proportional hazards regression models were used to estimate hazard ratios for the relationship between predictors and risk of AT. Kaplan-Meier survival curves were used to compare freedom from AT across time between differing risk factor groups.

Results: The study included 2,534 patients (42% female) with an average age at CMR of 15.7 years old. At a median follow-up of 2 years (IQR: 0.8-4.1 years) post CMR, 266 (9.3%) developed AT with an overall incidence of 32.0 per 1000 person-years. Patients were 93.8%, 88.4%, and 78.3% free from AT at 2, 4, and 8 years, respectively. In the multivariable model, older age at CMR assessment, atrial-pulmonary or lateral tunnel Fontan, >3 cardiac surgeries, higher BMI, and higher single-ventricle end diastolic volume index (EDVi) were significantly associated with AT. Kaplan-Meier analysis demonstrated that increased number of the above risk factors led to progressively worsened risk of AT.

Conclusion: Fontan type, number of surgeries, age, and BMI increase the risk of AT development in the Fontan population. Elevated single-ventricle EDVi was identified as a novel imaging risk marker for AT that underscores the utility of CMR in this population. Incorporating CMR into clinical risk stratification provides the opportunity to identify patients at risk for AT development post-Fontan.

SVP vs BVR in DORV: Outcomes by Anatomic Complexity

Kei Kobayashi, MD, PhD

Objective: Surgical management of double outlet right ventricle (DORV) is highly variable and depends on anatomic features. The study aimed to characterize outcomes according to biventricular repair (BVR) or single ventricle palliation (SVP) pathway and to define the clinical trajectory of complex DORV.

Methods: Consecutive patients with DORV who underwent surgical intervention from 2004-2025 were included. Patients were categorized by final pathway (BVR vs SVP) and by anatomic complexity (complex defined as atrioventricular septal defect [AVSD]-type, remote VSD-type, or any DORV associated with heterotaxy). The primary endpoint was transplant-free survival (TFS).

Results: Among 112 patients, 96 underwent BVR and 16 underwent SVP; 19 had complex DORV. Median follow-up was 6.5 years (IQR, 2.5-11.9). Among patients managed with SVP, AVSD-type was the most frequent subtype (37.5%, p<0.001). Compared with patients with BVR, SVP patients had more mitral valve (MV) hypoplasia/dysplasia (37.5% vs 13.5%, p=0.021), hypoplastic ventricle (43.8% vs 1.0%, p<0.001), and complex DORV (43.8% vs 12.5%, p=0.002). TFS was lower in SVP than BVR (log-rank p<0.001), whereas reintervention did not differ significantly. Complex DORV had higher heart transplantation incidence than non-complex DORV (21.1% vs 2.2%, p=0.007). SVP (SHR 8.42, 95%CI 1.55-45.65;

p=0.013) and MV hypoplasia/dysplasia (SHR 6.19, 95%CI 1.08-35.56; p=0.041) was associated with heart transplantation, while hypoplastic ventricle (OR 53.45, 95%CI 6.24-457.81; p<0.001) and complex DORV (OR 6.95, 95%CI 1.69-28.63; p=0.007) were associated with SVP.

Conclusions: SVP was associated with worse TFS than BVR. Complex DORV had higher heart transplantation incidence than non-complex DORV. Anatomic features strongly influenced SVP pathway selection.

A Survey of Initial Testing for Common Referrals to Outpatient Pediatric Cardiology Clinic

Lauren Tice, DO

Background: Murmurs, chest pain, syncope, and palpitations are common reasons for referral to pediatric cardiology clinics. The initial diagnostic workup for each referral can vary due to factors including providers' training and experience, triage protocols, and scheduling flexibility. In 2014, Appropriate Use Criteria were created to guide clinicians' decisions to obtain echocardiography (echo) as an initial diagnostic tool in the outpatient pediatric setting. Clinical guidelines for electrocardiography (ECG) exist for some situations such as syncope, however, the value of ECG in evaluating a heart murmur is less clear. These criteria are not age specific and are based on the results of the cardiologist's history taking and physical examination. However, in many clinical practices, echo and ECG are ordered prior to the cardiologist's evaluation. The aim of this study is to explore common practices and factors that influence a cardiologist's decision to obtain echo and ECG prior to the initial consultation in the outpatient pediatric cardiology clinic.

Methods: An IRB approved anonymous survey link was sent to members of the American Academy of Pediatrics Section on Cardiology and Cardiac Surgery and the PediHeartNet community. Respondents were asked what testing they would order prior to their initial history taking and physical examination given a murmur, chest pain, syncope, or palpitations at various ages (neonate, infant, toddler, school age, and adolescent). Respondents rated their likelihood of obtaining an echo or ECG prior to evaluation.

Results: In the case of echo and ECG ordered prior to clinical evaluation, the need for a study is determined by 66% of respondents themselves. 40% of respondents reported it was very easy to obtain a same day echo after their assessment. ECGs are used frequently in all scenarios for all age groups. The presence of symptoms with exertion increases the likelihood of obtaining an echo before evaluation of chest pain, syncope, and palpitations but does not appear to increase the likelihood of obtaining an ECG. In the case of a heart murmur, the likelihood an echo will be ordered before evaluation is inversely related to age. In that setting, there's no significant difference in the number of cardiologists who would always order an echo before an evaluation based on their ability to obtain a same day echo.

Conclusion: ECG is used frequently by pediatric cardiologists prior to their initial consultation in all situations assessed. The likelihood of ordering an echo in the context of a murmur is inversely related to age. Symptoms associated with exertion increased the likelihood that a cardiologist would order an echo prior to their assessment. Those providers who could very easily defer echocardiography until after their assessment were equally likely to order an echo prior to their assessment.

Echocardiographic Speckle-Tracking, Fractional Area Change, and Subjective Right Ventricular Function as Predictors of Adverse Outcomes After Fontan Palliation in Hypoplastic Left Heart Syndrome

Author: Ahmed Chmaisse, MD

Background: Right ventricular (RV) dysfunction is a major determinant of morbidity and mortality in hypoplastic left heart syndrome (HLHS). Speckle-tracking echocardiography-derived strain has emerged as a quantitative tool for RV assessment; however, its prognostic value after Fontan completion remains uncertain.

Objectives: We hypothesized that abnormal post-Fontan strain-derived indices of systemic RV function would be associated with increased risk of death, heart transplantation, and Fontan-associated complications. Secondary aims

included identifying cutoff values for strain and fractional area change (FAC) and determining whether strain metrics improve the prognostic utility of subjective RV systolic function assessment.

Materials and methods: We performed a retrospective cohort study of patients with HLHS born between 2000 and 2024 who underwent Fontan palliation at a large tertiary care center and had an outpatient echocardiogram performed within 12 months after Fontan completion. Baseline measures included subjective RV function, global longitudinal strain (GLS), GLS rate (GLSR), global circumferential strain (GCS), GCS rate (GCSR), and FAC.

Results: During follow-up of 70 included patients, 6 (8.6%) experienced death or transplantation, and 21 (30.0%) experienced at least one adverse event. Across all strain parameters, patients with adverse outcomes demonstrated directional trends toward worse ventricular performance, although none reached statistical significance. GLSR and GCSR showed the strongest associations with adverse outcomes. FAC was significantly lower in group comparison analyses and demonstrated the highest discriminatory performance (AUC 0.605).

Conclusions: Post-Fontan echocardiographic measures of systemic RV function demonstrated directional associations with adverse outcomes in HLHS, but no strain-derived parameter independently provided robust prognostic discrimination. FAC was the strongest conventional signal and may remain a pragmatic screening measure.

Long-Term Outcomes After Sano Conduit Versus Blalock-Taussig-Thomas Shunt Among Fontan Survivors: A FORCE Registry Analysis

Kei Kobayashi, MD, PhD

Purpose: The Norwood procedure remains the standard Stage 1 palliation for a single ventricle lesion with systemic outflow tract obstruction, using either a Sano conduit or Blalock-Taussig-Thomas shunt (BTTS). We compared a long-term outcome among patients who achieved Fontan completion after Norwood procedure with Sano or BTTS.

Methods: The FORCE (Fontan Outcomes Registry using Clinical Examinations) registry was queried for patients who underwent Norwood procedure with either Sano or BTTS. Propensity score matching (1:1) was performed based on age at Fontan, cardiac diagnosis, ventricular morphology, genetic diagnosis, Fontan type, and fenestration. Kaplan-Meier analysis and Cox regression were used to compare freedom from a composite outcome (death, transplant listing, protein losing enteropathy, plastic bronchitis, atrial/ventricular tachyarrhythmia, or pulmonary artery (PA) reintervention) and individual components between matched groups. Cardiac magnetic resonance and echocardiographic variables were compared using generalized linear and logistic regression. Secondary analyses compared clinical and imaging characteristics between patients with and without the composite outcome in the unmatched cohort.

Results: Of 1,023 patients, 145 with pre-Fontan outcomes were excluded, leaving 878 for unmatched analyses. In the unmatched cohort, 362 (41.2%) patients experienced the composite outcome. Compared with those without adverse outcomes, these patients more frequently had NYHA class III/IV symptoms (16.2% vs 1.9%, p<0.0001), renal dysfunction (7.2% vs 0.6%, p<0.0001), and at least mild-moderate atrioventricular valve regurgitation (32.3% vs 22.8%, p=0.0042), and had greater end-diastolic (123 vs 111 mL/m^2, p<0.0001) and end-systolic volume index (66.5 vs 57.5 mL/m^2, p=0.0003). Sano patients had worse freedom of adverse outcomes (p=0.045).

Propensity matching yielded 540 patients (270/group). Median follow-up after Fontan was 11.1 years (IQR, 6.6-14.8). The freedom from composite outcome was 80.4%, 68.6%, and 56.3% for Sano compared to 86.3%, 76.6%, and 61.4% for BTTS at 5, 10, and 15 years, respectively (HR for Sano 1.42, 95%CI 1.004-2.00, p=0.0472). Sano had 66% increased hazard of PA reintervention (HR1.66, 95%CI 1.07-2.57, p=0.024), and two times increased hazard of atrial tachyarrhythmia (HR2.00, 95%CI 1.03-3.89, p=0.041) compared to BTTS. Mortality and transplant listing did not differ. Sano was also associated with lower single-ventricle stroke volume (MD-16.51, 95%CI -21.77 to -11.26, p<0.0001) and ascending aortic flow (MD-0.66, 95% CI -0.96 to -0.36, p<0.0001) compared to BTTS.

Conclusions: Among patients who achieved Fontan completion, prior Sano was associated with a greater long-term risk of the composite outcome, driven largely by PA reintervention and atrial tachyarrhythmia, without a difference in survival or transplant listing. Patients with adverse outcomes demonstrated greater ventricular dilation, atrioventricular

valve regurgitation, and clinical disease burden. These findings suggest that among patients who survive to Fontan, initial shunt strategy may be associated with later morbidity, and support continued long-term surveillance.

Donor-Derived Cell Free DNA-Led Surveillance in Pediatric Heart Transplantation: Single-Center Mid-Term Outcomes

Collin Kramer, MD

Background: Acute rejection (AR) is a significant source of morbidity and mortality following pediatric heart transplant (HT). Quantification of donor derived cell-free DNA (dd-cfDNA) with serum laboratory testing provides an alternative to traditional endomyocardial biopsy (EMB) which is invasive and expensive. However, there is limited peer-reviewed published data about outcomes of dd-cfDNA-led surveillance as an alternative to EMB-led surveillance in pediatric and young adult heart transplant (HT) recipients. Here, we report on our single center 6-year experience implementing a dd-cfDNA-led rejection surveillance protocol

Methods: We performed a retrospective chart review. Patients were divided into two cohorts of all patients treated at our center 6 years before and after implementation of the dd-cfDNA-led protocol. We compared outcomes including number of biopsies and rates of rejection and graft loss between the groups.

Results: There were 217 HT patients in the dd-cfDNA cohort compared to 198 patients in the EMB-led cohort with no significant differences in demographics between cohorts. There were significantly fewer biopsies performed per patient-year in the dd-cfDNA-led era (0.9, IQR 0.4-1.7) compared to the EMB-led era (1.8, IQR 1.2-3.8) ($p<0.01$). There were also fewer EMBs performed within the first year after HT adjusted for patient-years in the dd-cfDNA-led cohort (5.6, IQR 3.0-6.0) versus the EMB-led cohort (7.0, IQR 6.0-9.0) ($p<0.01$). There were no differences in rates of treated rejection events between the dd-cfDNA-led era (0.35) and the EMB-led era (0.4) ($p=0.51$). There was also no difference in the death rate adjusted for patient-years between the dd-cfDNA-led era (0.025) vs the EMB-led era (0.026) ($p=0.83$).

Conclusions: A dd-cfDNA-led protocol reduced the number of EMBs and appears to be a safe alternative to EMB-led AR surveillance.

Fifteen Years of Outpatient Pediatric Cardiology: Trends in Referrals, Diagnoses, and Cardiac Imaging Testing From 2010–2025

Sophia Liu, BS

Background: Outpatient pediatric cardiology has evolved over time, and clinics have experienced increasing patient volumes, raising concerns about wait times, potential over-utilization of diagnostic testing, and delays in diagnosis and treatment. However, longitudinal data describing changes in referral patterns and diagnostic testing remain limited.

Methods: We performed a retrospective cross-sectional analysis of 18,565 first outpatient pediatric cardiology clinic visits at a tertiary care center from January 2010 through December 2025. Electronic medical record data included patient demographics, referral diagnoses, visit dates, final diagnoses, and timing of initial studies performed (ECG, chest X-ray, echocardiogram (Echo), exercise test, cardiac MRI, and cardiac CT). Primary final diagnoses were prioritized by the most clinically relevant cardiovascular diagnosis. 846 ICD codes were identified and grouped into ten categories: congenital heart disease (excluding isolated PFO), acquired heart disease, arrhythmias/abnormal ECGs, palpitations, murmur, syncope/orthostatic hypotension, chest pain, preventive cardiology, increased risk for heart disease, and other.

Results: Congenital heart disease (CHD) was the most common primary final diagnosis for a first cardiology visit (3807 visits, 20.5%), followed by murmurs without structural cardiac disease (3003, 16.2%) and syncope/orthostatic hypotension (2308, 12.4%).

The annual proportion of visits for CHD, heart murmurs, and arrhythmias/abnormal ECGs decreased ($p<0.05$) over this 15-year period. The annual proportions of visits for syncope, chest pain, and preventative cardiology demonstrated significant increases ($p<0.05$) over this same period. Total referral volume increased from 775 visits in 2010 to 1,529 visits in 2025. When comparing initial studies performed, a total of 61.3% of patients had an Echo, and 53.9% had an EKG. 3.1% had an exercise test, 0.69% had a cardiac MRI, and 0.38% had a cardiac CT. Echo utilization decreased significantly ($p<0.001$) from 73.4% of visits in 2010 to 58.9% in 2025. Echo was performed in 93.7% of patients aged 0-6 months in comparison to 46.9% of patients at age 17 years old. Conversely, EKGs were obtained from 70.6% of 16-year-olds compared to 33.5% of 0-6 months.

Conclusion: Outpatient pediatric cardiology referrals increased substantially over 15 years, while the distribution of primary diagnoses shifted. The number of patients with syncope demonstrated the most growth over the study period, while the number of patients diagnosed with a murmur without any specific cardiac diagnosis decreased. Utilization of echocardiography decreased over time but was used very frequently in infants throughout. These findings provide a foundation for future efforts to optimize workflow and resource utilization in outpatient pediatric cardiology clinics.

Association of the Child Opportunity Index with Remote Monitoring and Clinical Outcomes in Patients with Cardiac Implantable Electronic Devices

Vijay Arora

Background: The Child Opportunity Index (COI) 3.0 is a validated metric that uses a composite index of 44 indicators of social determinants of health based on neighborhoods linked to the US Census. There are known disparities with cardiac implantable electronic devices (CIED) in adults, but limited data exists on disparities in pediatric and adult congenital patients with CIEDs. We hypothesized that COI is inversely associated with CIED remote transmissions (RT) and resource utilization and is directly associated with adverse clinical outcomes.

Methods: A retrospective study of patients with CIEDs at Texas Children's Hospital from January - December 2025 was performed. Patient demographics (age, sex, race/ethnicity, primary language, insurance type), device-related data (CIED type, RT within the last 3 months, total RTs in last year), and resource utilization (ambulatory cardiology visits, cardiac-related emergency department visits, unplanned cardiac-related admissions, unplanned CIED interventions, antiarrhythmics, CIED shocks) were collected. Patients were grouped as low COI (COI r score < 50) or high COI (COI r score > 51) based on ZIP code data.

Results: Over the study period, 517 CIED patients were studied. Baseline demographics differed for race/ethnicity ($p < 0.0001$), primary language ($p = 0.02$), and insurance type ($p < 0.001$). COI did not differ for RT rates. Cardiac-related admissions (low 21% vs high 14.2%; $p = 0.05$) and unplanned CIED interventions (low 6.9% vs high 2.4%; $p = 0.02$) were significantly higher. CIED shocks (total and inappropriate therapies) did not differ.

Conclusion: COI was not associated with CIED RT rates. Low COI was associated with increased cardiac admissions and unplanned CIED interventions. This suggests that disparate outcomes in CIED patients still exist and further investigation is required to address these barriers.

Prenatal Ductus Arteriosus Tortuosity and the Development of Postnatal Coarctation of the Aorta

Caitlin Pook, MD

Background: The Ductus Arteriosus (DA) is a critical source of blood flow in the fetus arising from the pulmonary artery and carrying approximately 75% of the right ventricular output into the descending aorta to supply systemic circulation. It has been shown that there is a significant increase in DA curvature with increasing gestational age with the majority of fetuses in the late third trimester having a configuration of a sharply angled "C" or "S" shaped ductus.1 Along with increasing curvature, the DA length and angle at which the DA deviates from the main PA also increase with gestational age.2 Neonatal coarctation of the aorta (CoA) is defined as narrowing of the aorta that occurs most commonly just distal to the left subclavian artery, often at the level of the DA. Prenatal diagnosis of CoA is historically poor with only ~20% of isolate CoA cases identified accurately prior to birth and there are consistently high false positive and negative rates.3 Many factors have been investigated and risk stratification/scoring systems developed to improve prediction of critical postnatal CoA, however, there remains no clear single factor that can be detected on prenatal echocardiography that can predict development of COA.4,5,6 We aim to further investigate fetal ductal tortuosity to incorporate or exclude it from considerations in predictions of the aorta and in our prenatal counseling.

Methods: Our study is a retrospective case-control study of fetuses that underwent screening prenatal echocardiograms from January 2020-August 2025. The study group (n=92) was identified to have a tortuous ductus arteriosus while control fetuses were followed for aortic arch concern due to left right ventricular size discrepancy during the same period (n=34) and 2 postnatally diagnosed infants with CoA included that had fetal echocardiograms available for review. DA tortuosity was graded numerically as 1: straight, 2: mild curve ("C shape" < 90 degrees from straight), 3: marked curve ("C shape" > 90 deg), or 4: multiple curves or "S shape". Our novel tortuosity score along with a total of 16 variables were recorded; ductal and aortic arch peak velocities, mitral and aortic valve Z-scores, mitral to tricuspid valve diameter ratio, aortic to pulmonary valve diameter ratio, aortic isthmus and transverse arch Z-scores, isthmus ductal angle, left to right diastolic ventricular ratio, ascending aorta to pulmonary artery diameter ratio, aortic isthmus to ductal diameter ratio, ascending to descending aorta angle, and the presence of a posterior shelf or foramen ovale/aortic arch flow reversal. We obtained all variables from both the first and last available fetal echocardiogram to account for changes across gestational age.

Results (preliminary): Ultimately 31 of the 92 control fetuses were originally referred solely for their tortuous ductus arteriosus with the remaining 61 found to have tortuous DA but referred for other indications including in vitro fertilization, inadequate cardiac views, twin gestation, maternal diabetes, fetal arrhythmia, single umbilical artery, extracardiac anomalies, and family history of or fetal concern for congenital heart disease. Of the 92 control patients with tortuous ductus, 0 infants were diagnosed with aortic coarctation while 11 of the 36 coarctation controls underwent surgical repair in infancy. We are currently validating all fetal ductal tortuosity scores with a second reviewer for inter-reader reliability after which we will utilize multiple logistic regression models using stepwise model selection (with varying p-values for entry/exit being 0.05, 0.1, and 0.2) for all collected variables. Following our final data analysis, we will have a unique scoring system to use for prenatal prediction of aortic coarctation.

Discussion: Prior to this study at our institution, we did not use a set scoring system to determine post-natal CoA risk. We anticipate the production of such a scoring system following our final data analysis similar to past studies. Maskatia et al reviewed many factors and created a fetal risk stratification pathway in which they broke down fetuses at mild, moderate, and high risk for postnatal CoA.8 Mild risk included aortic isthmus or transverse arch z -score <-2 and >-3 and isthmus:ductus ratio < 0.7. Moderate risk included Aortic isthmus z -score <-3 or aortic isthmus z -score <-2 or isthmus:ductus ratio <0.7 with one of the following: combined aortic and mitral valve z -score <-4, right ventricular/left ventricular width ratio >2, main pulmonary artery/ascending aorta diameter ratio >2, carotid subclavian index <0.7, or identifiable posterior shelf. High risk included Moderate-risk criteria as well as any retrograde flow in the aortic arch or left-to-right patent foramen ovale flow. Gómez-Montes et al suggested a gestational age specific scoring system including increased risk of postnatal coarctation in fetuses less than 28 weeks gestation TV:MV ratio above 1.27, while fetuses over 28 weeks gestation risk was increased with ratio above 1.48.10 It has been repeatedly shown that no single measure is enough for fetal diagnosis of CoA but with our study we have shown fetal ductal tortuosity is likely not a predictive variable. With repeat studies, we hope predictions of CoA can improve our prenatal counseling and reduce unnecessary referrals therefore reducing costs and family anxiety.

Conclusion: Fetal ductus arteriosus tortuosity alone is not a predictive variable for development of postnatal aortic coarctation. We will ultimately have an optimized predictive model to be used in our fetal echocardiography department to assist in determining both prenatal and postnatal follow up.

Novel Cardiac Phenotypic Expansion in EXOSC3-Related Pontocerebellar Hypoplasia Type 1B: Implications for Cardiac Surveillance

Alaa Mohamed, M.B., B.Ch

Background: EXOSC3-related pontocerebellar hypoplasia type 1B (PCH1B; OMIM #614678) is a rare, autosomal recessive neurodegenerative disorder caused by biallelic pathogenic variants in EXOSC3, a core structural subunit of the RNA exosome complex. The condition is classically characterized by cerebellar and pontine hypoplasia, spinal anterior horn cell degeneration, profound hypotonia, and severe global developmental delay. Unlike EXOSC5-related disease in which cardiac arrhythmias, sinus node dysfunction, and sudden cardiac death have been well-described, cardiac manifestations have not been reported in EXOSC3-related PCH1B. Emerging evidence suggests that EXOSC3 mutations may cause secondary mitochondrial dysfunction, including mitochondrial DNA depletion and respiratory chain complex deficiencies, providing a plausible mechanistic link to cardiac conduction system pathology.

Methods: This study was approved by the institutional review board. We retrospectively identified five patients with molecularly confirmed EXOSC3-related PCH1B at Mayo Clinic. Clinical data including genotype, cardiac history, arrhythmia findings, and interventions were abstracted from medical records.

Results: Among five patients with confirmed biallelic pathogenic EXOSC3 variants, four had documented cardiac evaluations and all four patients demonstrated cardiac arrythmias or conduction disease of variable degree in the absence of structural cardiac abnormalities. One patient died from non-cardiac causes at nine days of life without cardiac investigations. Patient 1 (homozygous p.D132A) exhibited decade-long progressive atrioventricular (AV) block from first-degree to intermittent 2:1 conduction, complicated by atrial flutter requiring cardioversion and ventricular tachycardia, in the context of documented mitochondrial dysfunction including 52% mitochondrial DNA depletion and severe coenzyme Q10 deficiency. Patient 2 (compound heterozygous p.D132A/c.475-12A>G) had frequent junctional premature complexes with a peak Holter burden of 27.2% and runs up to 20 consecutive beats. Patient 3 (compound heterozygous p.D132A/c.626+3_626+6del) developed transient QTc prolongation and premature atrial complexes during acute gastroenteritis, which resolved with electrolyte repletion. Patient 4 (homozygous p.G31A, PCH type 1) developed atrial tachycardia with variable conduction, first-degree AV block, sinus bradycardia with heart rates in the 30s and right bundle branch block, ultimately requiring permanent pacemaker implantation.

Conclusions: This series represents, to our knowledge, the first systematic report of cardiac involvement in EXOSC3-related PCH. The phenotypic spectrum ranges from benign ectopy to high-grade AV block necessitating permanent pacing, with secondary mitochondrial dysfunction as a probable mechanistic contributor. Baseline ECG and echocardiograms at genetic diagnosis, followed by annual Holter monitoring in longer-surviving patients may be a reasonable surveillance strategy.

Simple Clinical Parameters Outperform Serum-Based Fibrosis Scores for Assessment of Advanced Liver Fibrosis in Adults with Fontan Physiology

Priya Nair, MD

Introduction: Fontan-associated liver disease (FALD) is a universal consequence of Fontan circulation. Liver biopsy remains the diagnostic gold standard but carries risks. Non-invasive imaging modalities and serum-based fibrosis scores have limited accuracy in predicting fibrosis severity in FALD. We aim to correlate serum-based fibrosis scores (APRI, FIB-4, ELF), MELD 3.0 and VAST (varices, ascites, splenomegaly, thrombocytopenia) scores, liver stiffness measurements (LSM) on magnetic resonance elastography (MRE) and simple clinical characteristics (diuretic dependence, arrhythmias, age) with advanced fibrosis in FALD.

Methods: Amongst 152 adult Fontan patients evaluated in our ACHD Program over the last year, 23 had undergone non-invasive screening protocol for FALD and liver biopsy. A retrospective review was performed to compare the clinical and laboratory characteristics within our non-invasive screening protocol to the presence of advanced fibrosis (bridging fibrosis or cirrhosis) on liver biopsy.

Results: The cohort (52% male, median age 31 yrs, median follow-up from Fontan 26 years) included predominantly older types of Fontan connections: 43% lateral tunnel and 30% atriopulmonary connections. Advanced liver fibrosis was present in 39%. The strongest predictors of advanced liver fibrosis were simple clinical characteristics: history of diuretic dependence ($p<0.04$), atrial arrhythmias ($p<0.01$), longer Fontan duration ($p<0.04$), and need for reoperation after Fontan ($p<0.05$). Neither serum-based fibrosis scores nor MELD 3.0 scores were predictive of advanced liver fibrosis but VAST scores >2 ($p<0.03$) and average LSM on MRE correlated with advanced liver fibrosis ($p<0.04$).

Conclusion: Simple clinical characteristics such as diuretic dependence, longer Fontan duration, and need for reoperation after Fontan outperformed serum-based fibrosis scores for detection of advanced liver fibrosis. Combining these parameters with LSM from MRE is a promising approach for identifying advanced liver fibrosis in this complex population.

Utilization of Elucis VR System for Complex Cardiac and Combined Transplant Evaluation

Priya Nair, MD

Background: Pre-transplant planning in complex congenital heart disease (CHD) is hindered by altered anatomy, prior surgical hardware, and size mismatch. While cardiac CT provides high-resolution imaging, standard two-dimensional review often fails to convey critical spatial relationships. Virtual reality (VR) segmentation allows immersive, patient-specific 3D visualization, which enhances planning efficiency and surgical confidence in other disciplines. However, the utility of a combined CT/VR workflow in CHD transplantation remains underexplored.

Methods: We evaluated a single-center case series of eight patients with CHD and end-stage heart failure undergoing heart or heart–liver transplant evaluation. All patients received contrast-enhanced cardiac CT with abdominal/pelvic CTA. Image segmentation was performed using the Elucis platform, and 3D reconstructions were reviewed in virtual reality (VR) via Meta Quest Pro headsets by a multidisciplinary transplant team. Primary outcomes included feasibility, workflow integration, and specific planning decisions informed by VR versus standard CT review.

Results: Eight patients (aged 2–48 years) were evaluated, including failing Fontan (n=4; 3 with Fontan-associated liver disease), heterotaxy, repaired coarctation, HLHS, ccTGA with situs inversus, and dilated cardiomyopathy. CT mapped vessel patency, venous return, hardware, and thoracic dimensions. VR review provided distinct additive value: simulating surgical re-entry planes, virtual donor-recipient size matching, cannulation planning, and joint cardiac–hepatology review. Segmentation and VR review were feasible in all cases without extra imaging. Two patients successfully underwent transplantation (one heart-liver at 1-year post-op; one bloodless heart) with favorable outcomes; six remain listed or under evaluation.

Conclusion: Integrating cardiac CT with 3D virtual reality modeling is feasible and readily enhances multidisciplinary pre-transplant evaluation in complex CHD. While CT provides the anatomical foundation, VR adds critical spatial comprehension, surgical rehearsal, donor size matching, and cross-specialty communication. Prospective studies are needed to evaluate its impact on operative time, transfusion needs, and perioperative outcomes.

Predictors of Morbidity and Mortality after Heart and Combined Heart-Liver Transplant in Adult Congenital Heart Disease

Dhruvil Patel, MD

Background: Heart transplant (HT) and combined heart-liver transplant (CHLT) in adults with congenital heart disease (ACHD) are increasing, with failing single ventricle (SV) physiology among the most common indications. Series report aggregate survival and frequently pool SV with other congenital heart disease (oCHD) recipients, yet the pre- and intra-operative characteristics associated with early post-transplant adverse events in these groups remain poorly characterized.

Methods: From 2018 to 2026, 26 ACHD patients underwent HT (N=13) or CHLT (N=13) at our center: 17 with SV anatomy (Fontan N=15, bidirectional Glenn N=2) and 9 with oCHD (TGA N=5, TOF N=3, truncus arteriosus N=1). Firth-penalized univariate logistic regression estimated odds ratios for mortality, AKI, and post-transplant mechanical circulatory support (MCS).

Results: Median age at transplant was 35 years; 13/17 SV recipients underwent CHLT. 30-day mortality was 12% (3/26) and did not differ between groups (11.8% SV vs 11.1% oCHD, p=1.000), whereas AKI occurred in 76% of SV vs 33% of oCHD recipients (p=0.046). Across the cohort, cardiopulmonary bypass (CPB) duration (per 30 min) was associated with AKI (OR 1.48, 95% CI 1.02–2.51, p=0.036) and MCS (OR 2.04, 1.28–4.74, p<0.001), and cross-clamp duration with

MCS (OR 2.21, 1.25–5.02, p=0.004). Higher pre-transplant creatinine (per 0.1 mg/dL, OR 1.44, 1.06–2.58, p=0.012) and INR (per 0.1, OR 1.51, 1.12–2.46, p=0.003) were associated with AKI. Within the SV group, creatinine (per 0.1 mg/dL, OR 2.36, 1.02–12.19, p=0.041) was associated with AKI, and CPB duration (OR 1.77, 1.03–4.33, p=0.038) and pulmonary capillary wedge pressure (per 1 mmHg, OR 1.32, 1.02–2.24, p=0.030) with MCS. Bilirubin, AST, and ALT were associated with 30-day mortality (all p<0.05), although the estimates were based on 3 deaths.

Conclusions: SV recipients sustained a greater burden of early morbidity than oCHD recipients despite comparable 30-day mortality. In both groups, cumulative operative exposure and pre-transplant renal and hepatic indices of organ dysfunction were associated with early adverse events. Effect estimates are imprecise at this sample size and require multicenter validation but support the value of identifying these metrics for risk stratification.

Neonatal Management of Ebstein Anomaly: An Institutional Review

Yolandee Bell-Cheddar, MD

Background: Ebstein anomaly (EA) is considered one of the more complex, rare, and heterogenous congenital heart diseases described. Once thought of, in its most severe form, to be a sure antecedent to death, we now have robust pathways for the management of some to the most severe cases. Much of the prior neonatal research has focused on optimizing candidate selection for surgical repair, often excluding complex patients who have been successfully managed non surgically initially. We sought to characterize our institutional experience in managing neonates with Ebstein anomaly.

Methods: A retrospective cohort study was used to identify all patients seen at our institution with a diagnosis of EA between January 2014 to January 2026 whose first echocardiogram at our institution was performed at < 4 weeks of age. Those with concomitant congenitally corrected transposition of the great arteries and those without a neonatal cardiac intensive care stay were excluded. Demographic, anatomic, and clinical variables were collected. Patients were stratified by those with and without cardiac intervention in the index neonatal hospitalization. Primary outcomes were cardiac intensive care length of stay, cardiothoracic index (CTI), need for extracorporeal membrane oxygenation (ECMO), and death. Descriptive statistics are reported using Chi-square, Fisher's exact, and Wilcoxon-Mann-Whitney tests.

Results: Of 225 patients with EA seen at our institution during that period, 33 had neonatal echocardiograms. Five patients with concurrent congenitally corrected transposition of the great arteries were excluded from the thirty-three. Among the 28 patients remaining, we included 26 who were admitted to the cardiac intensive care unit. Only 12 (46.2%) of the hospitalized infants required early surgical, catheter, or hybrid interventions, of which 8 underwent a Starnes procedure (66.7%). Median age at intervention was 6 days (3, 21). Median hospital length of stay was significantly greater in the intervention group (49.5 days (33.5, 114.5) vs 10 (6, 16), pmoderate (p=0.02) and CTI ratio (p=0.01) were associated with significantly greater requirement for intervention during neonatal hospitalization. Half of the patients in the cohort had pulmonary atresia (either functional or structural), and not surprisingly, most of these patients required neonatal intervention. Among those with pulmonary atresia, 11/13 (84.6%) had extreme rotation of the tricuspid valve into the right ventricular outflow tract (RVOT). However, there was no association between extreme rotation of the tricuspid valve into the RVOT with those that required neonatal intervention (p=0.29). ECMO was only required among those in the intervention group (7/12 (58.3%) vs 0, p=0.001), of which 2/12 (16.6%) were placed on ECMO pre-intervention and 6/12 (50.0%) required ECMO post intervention. Death was similar between the two groups with 2 (7.7%) deaths in the intervention group vs 3 (11.5%) who were not (p=1.00).

Conclusion: Management of neonates with EA requires an individualized approach. Initial CTI ratio as well as tricuspid valve insufficiency greater than moderate to severe were identified as parameters that increased the need for surgical intervention.

Mid-Term Recovery of Right Ventricular Function and Improvement of Left Ventricular Function after the Da Silva Cone Operation for Ebstein Anomaly

Krithika Sundaram, MD

Introduction: The Da Silva Cone procedure has improved outcomes in Ebstein Anomaly. While excellent valve outcomes are well established, longitudinal recovery of biventricular function post-procedure remains less defined. This study evaluated ventricular function following cone procedure.

Methods: A retrospective review was performed of 134 patients undergoing Cone repair for Ebstein's anomaly. Echocardiograms were analyzed preoperatively (Time 1), at discharge (Time 2), and ≥6 months postoperatively (Time 3). RV parameters included fractional area change (FAC), tricuspid annular plane systolic excursion (TAPSE), and tricuspid S'. LV parameters included left ventricular ejection fraction (LVEF), end-diastolic volume indexed to body surface area (LVEDVi), left ventricular stroke volume (LVSVi), and mitral E/E'. Paired t-tests compared serial measures.

Results: Median surgical age was 7.8 years (IQR: 2.3-17.7). All patients had discharge echocardiograms; 70 had follow-up studies at ≥6 months. RV function declined postoperatively with reductions in FAC (35% to 21%), TAPSE (2.0 to 0.8 cm), and S' (13 to 5 cm/s) ($p < 0.001$). By Time 3, these measures improved (FAC to 29%, TAPSE to 1.3 cm, S' to 7 cm/s) but remained below baseline. LVEDVi and LVSVi increased significantly by Time 3 (LVEDVi: 47 to 54 mL/m2; LVSVi: 30 to 34 mL/m2; $p < 0.001$), while LVEF remained unchanged.

Conclusions: The Da Silva Cone procedure leads to early postoperative RV dysfunction with partial mid-term recovery and improved LV filling and stroke volume.

Genotype-Phenotype Correlation in Pediatric Patients with Titin-Gene Variants: A Single-Institution Study

Honora Navid

Introduction: Truncating variants (tv) in TTN, encoding titin, cause ~15-25% of familial dilated cardiomyopathy (DCM), typically in adulthood. Pediatric TTN variant manifestations, prevalence in pediatric-onset DCM, and childhood genotype-phenotype correlations remain poorly characterized.

Methods: IRB approved, single-institution retrospective case-series of TTN variant-positive (Pathogenic [P], Likely Pathogenic [LP], or Variant of Uncertain Significance [VUS]) pediatric (0-21y) patients, followed at UPMC Children's Hospital (2016-2025), and identified via cardiovascular and medical genetics databases, while DCM patients (2017-2025, n=185) were identified via cardiomyopathy database. Phenotype-Genotype data collected in REDCap. Variants were converted to TTN 'Meta' transcript (NM_001267550.2) annotation for analysis.

Results: Twenty-three TTN variants were identified in 23 children (2 P, 14 LP, 7 VUS) via proband -diagnostic / familial-predictive testing. All P/LP variants were truncating/frameshift; all VUSs were missense. Of 16 P/LP subjects, 13 (81.3%) were DCM phenotype-negative, 2 unknown phenotype, and 1 DCM-positive (1/185, 0.5% of pediatric DCM), indicating TTNtv/fs-associated pediatric DCM is rare. Of 7 VUS subjects, 6 were phenotype-positive (5 DCM, 1 HCM) with infantile-onset cardiomyopathy and had additional variants in other genes. TTN missense variants were identified primarily on diagnostic testing in phenotype-positive infantile-onset DCM probands, suggesting possible oligogenic enrichment in this age. A positive family history was present in 9/23 (39.1%) and was associated with A-band in P/LP variants.

Conclusions: TTNtv/fs-associated DCM is uncommon in children; most pediatric TTN P/LP carriers are phenotype-negative. Missense TTN VUSs may be enriched in infantile-onset DCM, potentially acting as oligogenic modifiers. Larger datasets are needed for corroboration.

Measured but Not Documented: Obesity in Outpatient Pediatric Cardiology

Elise Hokanson, MD

Background: The increasing prevalence of obesity in the United States is well documented, as is the connection between obesity and cardiovascular disease. Obesity and associated cardiometabolic risk factors have important implications for patients with childhood-onset heart disease, yet the extent to which they are identified and documented in pediatric cardiology practice remains unknown

Objective: To determine how documentation of obesity and other cardiometabolic risk factors at outpatient pediatric cardiology encounters compares to historical documentation, as well as to rates of obesity defined by measured body mass index.

Methods: This was a retrospective cross-sectional analysis of patients with at least one outpatient cardiology visit at a single quaternary pediatric referral center between January 1, 2023 and December 31, 2025. Body mass index (BMI), blood pressure, and visit-associated diagnoses were extracted from the electronic health record. Obesity was defined as BMI at or above the 95th percentile for ages 2 to 17 years and at or above 30 kg/m^2 for ages above 18. Prevalence of additional relevant diagnoses was recorded, as was documentation capture, defined as the proportion of previously coded diagnosis during the study period that were also coded at a cardiology encounter. These proportions were compared using chi-square tests and trends across age groups were assessed using the Cochran-Armitage trend test.

Results: Of 36,941 patients (51.7% female, 42.2% under the age of 12), 32.2% of visits were related to congenital heart disease, 3.8% cardiomyopathy, 3.1% pulmonary hypertension. BMI was recorded at >97% of visits. Based on BMI, obesity prevalence in children was 25.5% , but only 7.4% of patients carried an obesity diagnosis. Obesity prevalence in adults was 31.2%, with 14.5% carrying obesity diagnosis. Documentation capture for total study population was notably higher for elevated blood pressure at 66.8% and dyslipidemia at 63.3% compared to 40.4% and 19.7% for obesity and overweight, respectively. Capture in both weight related diagnoses were lower in pediatric than adult patients ($p<0.001$). Capture did not differ by sex, race, or preferred language.

Conclusions: Children seen in outpatient pediatric cardiology have a higher prevalence of obesity than the general pediatric population, yet fewer than one third have the diagnosis documented; recognition of adult obesity in the same setting is also low. Cardiology encounters more consistently documented conditions central to cardiovascular care than routinely measured cardiometabolic risk factors, suggesting a potential target for improving preventive cardiovascular care.

POSTER PRESENTATION HIGHLIGHTS

A Unique Solution for a Unique Case: The Utility of 3D Printing and Visualization
Or Givol, MD
Corewell Health, Helen DeVos Children's Hospital

Shake, Shake It Off – Inappropriate Shocks for Myopotentials during Rigors in a Fontan Patient with a Subcutaneous Implantable Cardioverter-Defibrillator
Brock Karolcik, MD
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Fluoroscopy-Free Transbaffle Puncture in Adult Congenital Patients of Great Complexity for Percutaneous Catheter Ablation
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Utilizing Sotatercept and CardioMEMS in the Treatment of Severe Idiopathic Pulmonary Arterial Hypertension and Repair of an Atrial Septal Defect in a Pediatric Patient
Andrew Nguyen, DO, M.Eng
University of Nebraska Medical Center (UNMC) - Children's Nebraska

Left Main Coronary Artery Ostial Atresia Diagnosed After Sudden Cardiac Arrest in a 17-Year-Old Male
Jorge A. Monserrate Marrero, MD
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Designing and Implementing an APP Fellowship Program for Acute Care Cardiology
Amy Donaldson, MSN, RN, CPNP-AC
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Transjugular Bilobar Liver Biopsies Accurately Measure Fibrosis in Fontan Associated Liver Disease: Comparison of Liver Biopsy Pre-Combined Heart and Liver Transplant and Liver Explant
Priya Nair, MD
Chicago Medicine Comer Children's Hospital

Rapid Hematologic and Nutritional Optimization Enabling Bloodless Ventricular Septal Defect Repair in an Infant of the Jehovah's Witness Faith with Trisomy 21 and Pulmonary Hypertension
McKenna Robinette, APN
University of Chicago Medical Center

Redo Dual Semilunar Valve Partial Heart Transplant after Failed Truncal Valve Repair in a Toddler
Zahra Tara
SSM Health Cardinal Glennon Children's Hospital

Atrial Arrythmia as an Unrecognized Marker of Interventional Need: Reverse Electrical and Structural Remodeling after Transcatheter Pulmonary Valve Replacement in a Late Referred Adult with Repaired Tetralogy of Fallot
Zahra Tara
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Successful Use of Lower Dose Trametinib in Shorter Course for Refractory Multifocal Atrial Tachycardia in Noonan's Syndrome
Seth Mommsen, DO
Children's Nebraska/UNMC

Improving Echocardiograms for Patients Status Post Orthotopic Heart Transplant
Ananya Vadhera, MD
St. Louis Children's Hospital

Successful Percutaneous Closure of Multiple Atrial Septal Defects with Inferior Rim Deficiency using Real-Time Three-Dimensional Transesophageal Echocardiography
Elizabeth Copp, MD
UPMC Children's Hospital of Pittsburgh

Left Ventricular Apical Aneurysm in an Adolescent with Shone Complex: Exploring The Cause Before Affect
Dhruvil Patel, MD
University of Chicago Medical Center

Glenn Anastomosis with Anterior Patch Enlargement for Stage 2 Palliation in Hypoplastic Left Heart Syndrome
Jorge Monserrate-Marrero, MD
UPMC Children's Hospital of Pittsburgh

Long-Term Outcomes and Residual Lesion Score in 40 Years of Repair of Complete Atrioventricular Canal Defects
Jacob C Swanson
Children's Wisconsin Department of Surgery

Chylous Diet Cookbook
Bunyaratapan, S.
Children's Hospital of Pittsburgh, UPMC, Pittsburgh, PA, United States

Validation of Pulmonary Perfusion by Photon Counting CT in Pediatric Heart Disease: A Pilot Study
Matthew Belch
University of Pittsburgh School of Medicine

SPEAKERS

Invited Faculty

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Children's Hospital of Illinois
Associate Professor of Pediatrics
University of Illinois College of Medicine at Peoria

Adam Kean, MD, MPH, FHRS
Pediatric Cardiologist
Riley Children's Health
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