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# How I Do It: Tips, Tricks, and Techniques – How I Close Systemic-to-Pulmonary Artery Collaterals Using Microparticles?

*A PICS Society Education Series*

*Sarosh P. Batlivala, MD, MSCI, FPICS*

## Introduction

Pediatric and congenital interventional cardiologists deal with many patients who have systemic-to-pulmonary artery collaterals (SPC). These SPCs are common in patients with single-ventricle physiology and chronic hypoxemia. Though the SPCs increase pulmonary blood flow, they are also volume loading because much of the flow is ineffective. Since these networks arise from normal arteries (e.g., internal mammary, intercostals, etc.), traditional treatment has involved coil occlusion of the feeding vessel. However, SPCs can redevelop from those vessels, distal to the coils, which makes ongoing treatment difficult, if not impossible. Further, a general principle for optimal vessel closure is to occlude as distally as possible. Particle occlusion can, therefore, be a strong alternative since the feeding vessel remains patent and the particles occlude the distal SPC connection to the PAs.<sup>1</sup>

## Anticipated Challenges of the Procedure

Given the flow-directed nature of particle delivery, the catheter must be securely positioned well into the feeding vessel. Back flow of particles into a major systemic or CNS-supplying artery can have devastating consequences. As above, common feeding arteries arise from:

- Subclavian system = Internal mammary, Thyrocervical trunk, Lateral thoracic
- Coronary arteries
- Thoracic Aorta = Intercostal, Bronchial
- Abdominal aorta = phrenic, celiac plexus branches

The artery of Adamkiewicz is particularly noteworthy. This vessel is the primary arterial supply for the thoracolumbar spinal cord, so occlusion can lead to spinal cord ischemia and paraplegia. Moreover, this vessel can arise from any of the intercostal arteries so interventionalists need to obtain clear angiograms of intercostal arteries to ensure this artery is not arising from a vessel intended for particle occlusion.

## Tip 1 – Planning and Preparation

- Know your patient's anatomy (obviously!)
- Understand how to grade SPC flow:
  - Pre-catheterization MRI can provide quantitative data



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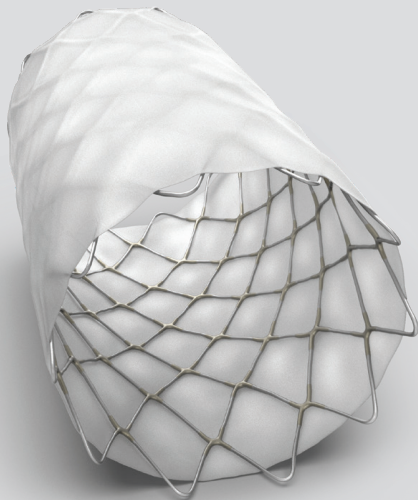
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# Medtronic

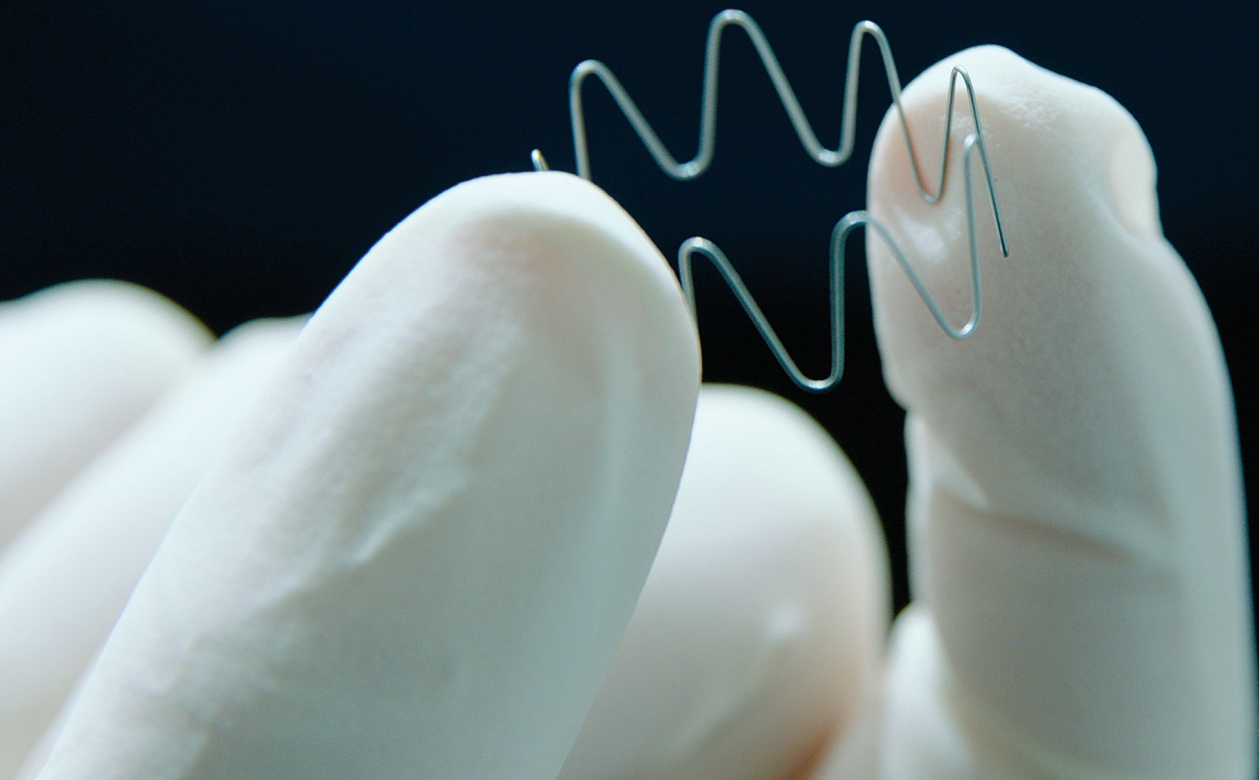
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## Indications

The Harmony™ transcatheter pulmonary valve (TPV) system is indicated for use in the management of pediatric and adult patients with severe pulmonary regurgitation (i.e., severe pulmonary regurgitation as determined by echocardiography and/or pulmonary regurgitant fraction  $\geq 30\%$  as determined by cardiac magnetic resonance imaging) who have a native or surgically-repaired right ventricular outflow tract and are clinically indicated for surgical pulmonary valve replacement.

## Contraindications

The following are contraindications for the use of this device: active bacterial endocarditis or any other active infections, known intolerance to Nitinol (titanium or nickel), or an anticoagulation/antiplatelet regimen.

## Warnings

General: Implantation of the Harmony TPV system should be performed only by physicians who have received Harmony TPV system training. The transcatheter pulmonary valve (TPV) is to be used only in conjunction with the Harmony delivery catheter system (DCS). This procedure should only be performed where emergency pulmonary valve surgery can be performed promptly. Do not use any of the Harmony TPV system components if any of the following has occurred: it has been dropped, damaged, or mishandled in any way, or if the use-by date has elapsed.

Transcatheter pulmonary valve (TPV): This device was designed for single use only. Do not reuse, reprocess, or resterilize the TPV. Reuse, reprocessing, or resterilization may compromise the structural integrity of the device and/or create a risk of contamination of the device, which could result in patient injury, illness, or death. Do not resterilize the TPV by any method. Exposure of the device and container to irradiation, steam, ethylene oxide, or other chemical sterilants renders the device unfit for use. The device is packaged with a temperature sensor. Do not freeze the device. Do not expose the device to extreme temperatures. Do not use the device if the arrow on the sensor points to the symbol that indicates that the temperature limit has been exceeded. Do not use the device if any of the following have occurred: the tamper-evident seal is broken, the serial number tag does not match the container label, the arrow on the sensor points to the symbol that indicates that the temperature limit has been exceeded, or the device is not completely covered by the storage solution. Do not contact any of the Harmony TPV system components with cotton or cotton swabs. Do not expose any of the Harmony TPV system components to organic solvents, such as alcohol. Do not introduce air into the catheter. Do not expose the device to solutions other than the storage and rinse solutions. Do not add or apply antibiotics to the device, the storage solution, or the rinse solution. Do not allow the device to dry. Maintain tissue moisture with irrigation or immersion. Do not attempt to repair a damaged device. Do not handle the valve leaflet tissue or use forceps to manipulate the valve leaflet tissue. Do not attempt to recapture the device once deployment has begun. Do not attempt to retrieve the TPV if any one of the outflow TPV struts is protruding from the capsule. If any one of the outflow TPV struts has deployed from the capsule, the TPV must be released from the catheter before the catheter can be withdrawn. Do not attempt post-implant balloon dilatation (PID) of the TPV during the procedure, which may cause damage to or failure of the TPV leading to injury to the patient resulting in reintervention.

Delivery catheter system (DCS): This device was designed for single use only. Do not reuse, reprocess, or resterilize the DCS. Reuse, reprocessing, or resterilization may compromise the structural integrity of the device and/or create a risk of contamination of the device, which could result in patient injury, illness, or death. Do not reuse or resterilize the DCS. If resistance is met, do not advance the guidewire, DCS, or any other component without first determining the cause and taking remedial action. Do not remove the guidewire from the DCS at any time during the procedure.

## Precautions

General: Clinical long-term durability has not been established for the Harmony TPV. Evaluate the TPV performance as needed during patient follow-up. The safety and effectiveness of Harmony TPV implantation in patients with pre-existing prosthetic heart valve or prosthetic ring in any position has not been demonstrated. The Harmony TPV system has not been studied in female patients of child-bearing potential with positive pregnancy.

Before use: Exposure to glutaraldehyde may cause irritation of the skin, eyes, nose, and throat. Avoid prolonged or repeated exposure to the chemical vapor. Use only with adequate ventilation. If skin contact occurs, immediately flush the affected area with water (for a minimum of 15 minutes) and seek medical attention immediately. The TPV and the glutaraldehyde storage solution are sterile. The outside of the TPV container is nonsterile and must not be placed in the sterile field. The TPV and DCS should be used only in a sterile catheterization laboratory (cath lab) environment. Ensure that sterile technique is used at all times. Strictly follow the TPV rinsing procedure. For TPV 25: Ensure that all green sutures have been removed from the attachment suture loops on the TPV before loading onto the DCS. Prevent contamination of the TPV, its storage solution, and the DCS with glove

powder. Verify the orientation of the TPV before loading it onto the DCS. The inflow end of the TPV with attachment suture loops must be loaded first. Do not place excessive pressure on the TPV during loading. Inspect the sealed DCS packaging before opening. If the seal is broken or the packaging has been damaged, sterility cannot be assured. Proper functioning of the DCS depends on its integrity. Use caution when handling the DCS. Damage may result from kinking, stretching, or forceful wiping of the DCS. This DCS is not recommended to be used for pressure measurement or delivery of fluids. Carefully flush the DCS and maintain tight DCS connections to avoid the introduction of air bubbles.

During use: The TPV segment is rigid and may make navigation through vessels difficult. Do not advance any portion of the DCS under resistance. Identify the cause of resistance using fluoroscopy and take appropriate action to remedy the problem before continuing to advance the DCS. Careful management of the guidewire is recommended to avoid dislodgement of the TPV during DCS removal. Once deployment is initiated, retrieval of the TPV from the patient is not recommended. Retrieval of a partially deployed valve may cause mechanical failure of the delivery catheter system or may cause injury to the patient. Refer to the section below for a list of potential adverse events associated with Harmony TPV implantation. During deployment, the DCS can be advanced or withdrawn prior to the outflow struts protruding from the capsule. Once the TPV struts contact the anatomy during deployment, it is not recommended to reposition the device. Advancing the catheter forward once the TPV struts make contact with the anatomy may lead to an undesired deployment or may cause damage to or failure of the TPV and injury to the patient. Refer to the section below for a list of potential adverse events associated with the Harmony TPV implantation. Physicians should use judgment when considering repositioning of the TPV (for example, using a snare or forceps) once deployment is complete. Repositioning the bioprosthesis is not recommended, except in cases where imminent serious harm or death is possible (for example, occlusion of the main, left, or right pulmonary artery). Repositioning of a deployed valve may cause damage to or failure of the TPV and injury to the patient. Refer to the section below for a list of potential adverse events associated with the Harmony TPV implantation. Ensure the capsule is closed before DCS removal. If increased resistance is encountered when removing the DCS through the introducer sheath, do not force passage. Increased resistance may indicate a problem and forced passage may result in damage to the device and harm to the patient. If the cause of resistance cannot be determined or corrected, remove the DCS and introducer sheath as a single unit over the guidewire, and inspect the DCS and confirm that it is complete. If there is a risk of coronary artery compression, assess the risk and take the necessary precautions. Endocarditis is a potential adverse event associated with all bioprosthetic valves. Patients should make their healthcare providers aware that they have a bioprosthetic valve before any procedure. Post-procedure, administer appropriate antibiotic prophylaxis as needed for patients at risk for prosthetic valve infection and endocarditis. Prophylactic antibiotic therapy is recommended for patients receiving a TPV before undergoing dental procedures. Post-procedure, administer anticoagulation and/or antiplatelet therapy per physician/clinical judgment and/or institutional protocol. Excessive contrast media may cause renal failure. Preprocedure, measure the patient's creatinine level. During the procedure, monitor contrast media usage. Conduct the procedure under fluoroscopy. Fluoroscopic procedures are associated with the risk of radiation damage to the skin, which may be painful, disfiguring, and long term.

## Potential Adverse Events

Potential risks associated with the implantation of the Harmony TPV may include, but are not limited to, the following: • death • valve dysfunction • tissue deterioration • hematoma • heart failure • cerebrovascular incident • perforation • rupture of the right ventricular outflow tract (RVOT) • compression of the aortic root • compression of the coronary arteries • sepsis • pseudoaneurysm • erosion • stent fracture • arrhythmias • device embolization or migration • pulmonary embolism • occlusion of a pulmonary artery • laceration or rupture of blood vessels • device misorientation or misplacement • valve deterioration • regurgitation through an incompetent valve • physical or chemical implant deterioration • paravalvular leak • valve dysfunction leading to hemodynamic compromise • residual or increasing transvalvular gradients • progressive stenosis and obstruction of the implant • hemorrhage • endocarditis • thromboembolism • thrombosis • thrombus • intrinsic and extrinsic calcification • bleeding • bleeding diathesis due to anticoagulant use • fever • pain at the catheterization site • allergic reaction to contrast agents • infection • progressive pulmonary hypertension • progressive neointimal thickening and peeling • leaflet thickening • hemolysis. General surgical risks applicable to transcatheter pulmonary valve implantation: • abnormal lab values (including electrolyte imbalance and elevated creatinine) • allergic reaction to antiplatelet agents, contrast medium, or anesthesia • exposure to radiation through fluoroscopy and angiography • permanent disability.

Please reference the Harmony TPV system instructions for use for more information regarding indications, warnings, precautions, and potential adverse events.

**CAUTION:** Federal law (USA) restricts these devices to the sale by or on the order of a physician.

# Medtronic

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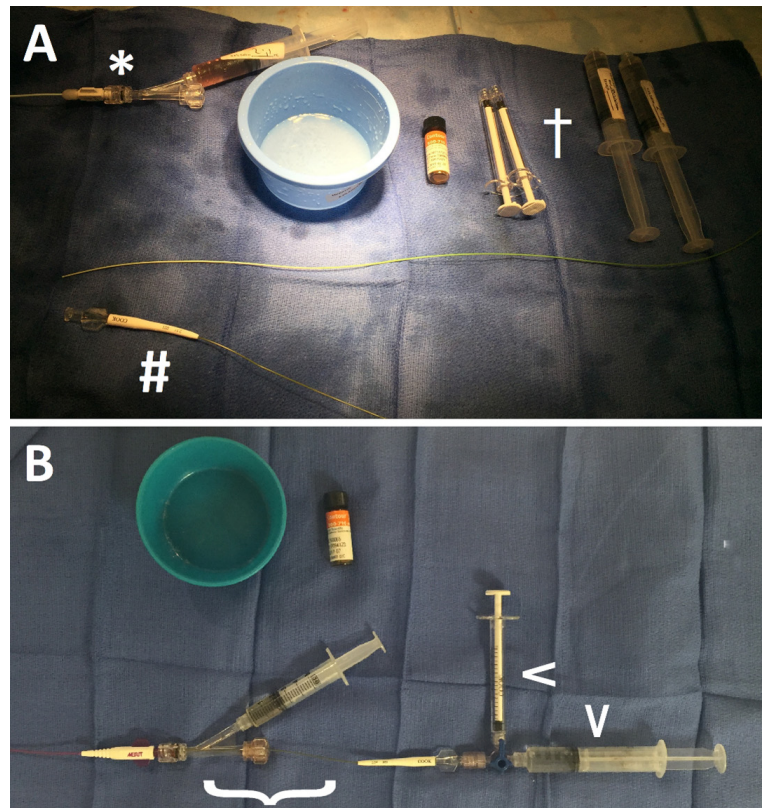
- Angiography<sup>1</sup>:
  - o mild = only the segmental PA branches opacified
  - o moderate = proximal PA (i.e., RPA or LPA) opacified
  - o severe = contrast refluxes back into MPA or contralateral PA
- Develop an algorithm/treatment protocol to establish thresholds for SPC occlusion. Such an algorithm can take the following factors into account:
  - o Threshold % of aortic outflow (e.g., 30% or 40% SPC flow)
  - o Angiographic grade
  - o Systemic ventricular EDp
  - o Cardiac chamber dilation
  - o Planned operation(s) and timing
  - o Systemic saturation
  - o Hemoptysis (often an independent indication)
- Histopathologic data demonstrated SPC diameter (median) in Fontan patients  $\approx 160 \mu\text{m}$ .<sup>1</sup>
- Occlusion induces an inflammatory response, which triggers ongoing SPC development; SPC flow may return to baseline and even exceed it approximately 6-8 weeks after embolization. So if performing SPC occlusion as part of a pre-operative assessment and preparation (e.g., pre-Fontan), the surgery should ideally be scheduled within a month of the particle occlusion procedure.<sup>2</sup>

size of  $500 \mu\text{m}$  (we use  $500\text{-}710 \mu\text{m}$ ). Sizes  $>1000 \mu\text{m}$  may be challenging to deliver given larger requisite microcatheter.

- Tris-acryl gelatin = precisely engineered microspheres; care must be taken as agitation can disrupt/destroy the particles.
- Other Equipment (**Figure 1**)
  - Fresh sterile towels
  - Hemostatic Y-adaptor (model of operator preference)
  - Three-way stopcock (low or high pressure)
  - Syringes: 10mL (suggest at least four - two for angiography and two as particle slurry "reservoirs"), two 1 or 3mL syringes for particle delivery
  - Three bowls/sterile cups – one each for flush, contrast, and the particle slurry
  - Flush and contrast ( $\sim 50\text{mL}$  to start) specifically for the additional procedural table

## Tip 2 – Tools Needed

- A separate cart for all the particle equipment is recommended. This will ensure that stray particles do not contaminate the primary procedural and supply tables, minimizing the risk of inadvertently injecting particles into the patient non-selectively.
- Catheters:
  - "Guide" catheter – a standard 4Fr catheter, 0.038" lumen (e.g., Bentson/JB, JR, Glide, etc.). This catheter engages the feeding artery for angiography and is a guide for the microcatheter through which the particles are delivered. If this catheter is engaged deeply enough, particles can be delivered directly through this catheter as well.
  - Microcatheter – Various options, need to ensure the lumen diameter is able to accept the specific microparticles (see particle manufacturer website, which often recommends appropriate microcatheters). We do not endorse a particular product, but the 2.8Fr Cantata (Cook®, Bloomington, IN USA) and Renegade Hi-Flo (Boston Scientific®, Marlborough, MA USA) microcatheters work well.
- Particles (two types)
  - Polyvinyl alcohol = Irregular shape, grouped by sizes (produced by pulverizing PVA then passing through sifts of different sizes). Suggest minimum



**FIGURE 1 Particle Occlusion Equipment**

**A)** The equipment is all separated. A hemostatic adapter has been attached to the 4Fr guiding catheter (\*). The microcatheter (#) is prepared for insertion through the guiding catheter and into the feeding vessel. A 10mL "reservoir" and either 1 or 3 mL injector syringes are present and marked (†).

**B)** Fresh sterile towels have been placed under this coaxial catheter system. The microcatheter is coaxially loaded through the guiding catheter ({}). A 3-way stopcock, with the reservoir and injector syringes attached (arrowheads), is affixed to the microcatheter.



# The Congenital Heart Collaborative

University Hospitals  
Rainbow Babies & Children's  
Nationwide Children's Hospital

## General Pediatric Cardiologist

The Congenital Heart Collaborative (TCHC), an affiliation between University Hospitals Rainbow Babies & Children's Hospital (Cleveland OH) and Nationwide Children's Hospital (NCH, Columbus OH) heart programs, seeks candidates in **Pediatric Cardiology** for a faculty position in our expanding group at UH Rainbow Babies & Children's Hospital. The successful candidate will join a group of physicians that model teamwork, collaboration and dedication to their patients and partners and be a part of an innovative clinical and educational program, representing the section in the community, nationally, and internationally. The Section consists of nine board-certified pediatric cardiologists including interventionalists, electrophysiologist, advanced imaging cardiologists, fetal cardiologists, general cardiologist, and 2 cardiovascular surgeons. This position is to replace a vacancy created by a relocating faculty member. The candidate will have opportunities to participate in quality improvement initiatives, clinical research, education of medical students, residents, and fellows and clinical time devoted to imaging, outpatient and inpatient care, including outreach clinic sessions.

Qualified applicants must have an MD, DO or MD/PhD degree, be BE/BC in Pediatric Cardiology. The rank and appointment will be commensurate with the candidate's credentials and experience.

The successful candidate will be well-supported at a world-class children's hospital that has over 60 years of experience in the care of pediatric and ACHD patients; an outstanding educational and research enterprise at Case Western Reserve University School of Medicine, and an internationally recognized program partner with the NCH Heart Center. TCHC is a dedicated service line with a common executive administration and functions as one program on two campuses with the commitment to expand access to high-quality comprehensive cardiac care along with a scholarly and educational mission. TCHC provides excellent cardiothoracic surgical, interventional, electrophysiologic, and non-invasive services.

Please send letter and curriculum vitae to **Harinder Singh, MD**, Section Chief, Pediatric Cardiology at Rainbow Babies & Children's Hospital, [harinder.singh@uhhospitals.org](mailto:harinder.singh@uhhospitals.org). In employment, as in education, Case Western Reserve University is committed to equal opportunity and diversity. Women, veterans, members of underrepresented minority groups and individuals with disabilities are encouraged to apply.

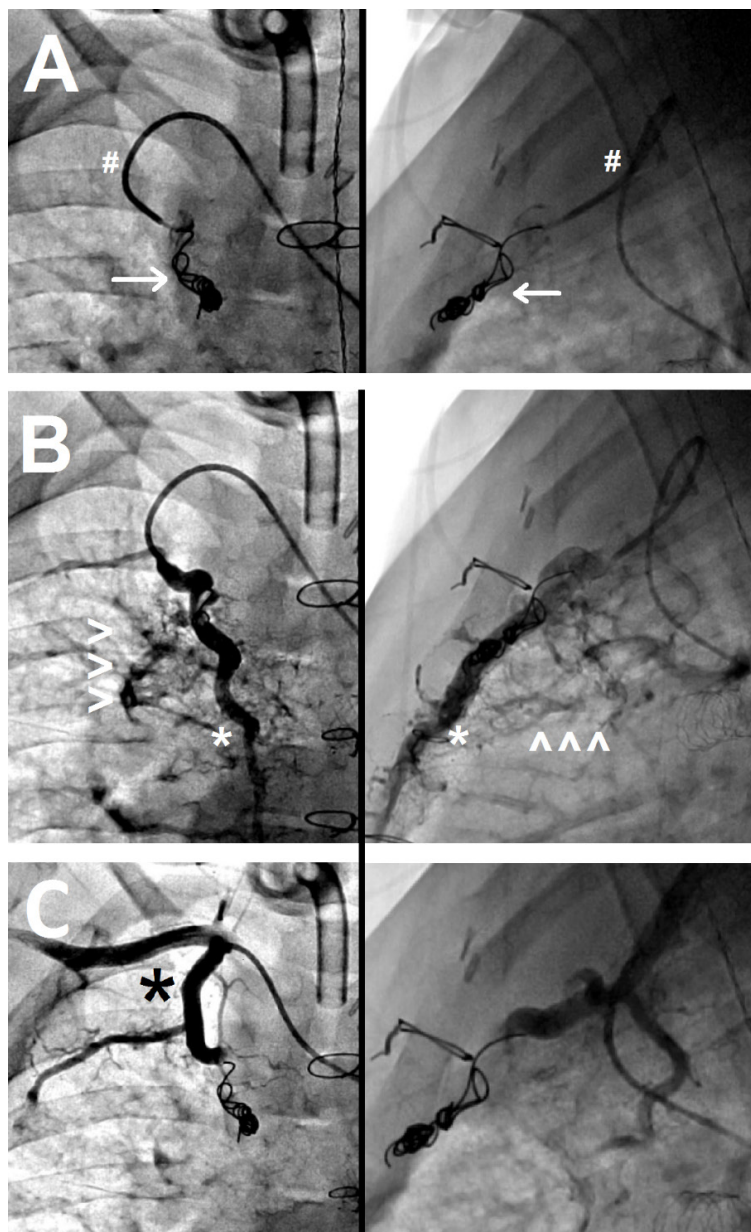
Among the nation's leading academic medical centers, University Hospitals Case Medical Center is the primary affiliate of Case Western Reserve University School of Medicine, a nationally recognized leader in medical research and education.



### Tip 3 – How I Do It

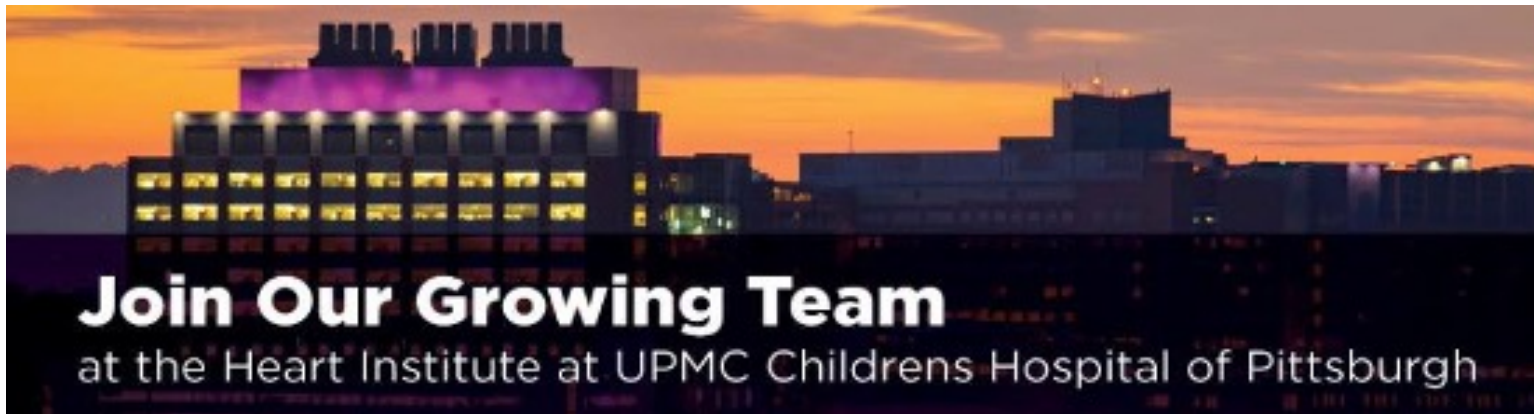
- Once baseline, non-selective angiography demonstrates a significant degree of SPCs, and the decision is made to occlude them after the diagnostic assessment, obtain all requisite equipment so that occlusion can be performed expediently.
- Set up the particle table. Obtain flush and contrast as above. Label two 10mL syringes for contrast injection, two 10mL syringes to serve as particle reservoirs, and two 1- or 3mL syringes for particle delivery. Obtain a vial of particles. Empty the particles into a clean sterile cup and add 20mL of contrast and 2mL of flush. Stir the mixture and withdraw 5-10mL into a reservoir syringe. Hold the syringe steadily in a vertical position for at least 10 seconds and observe for particle aggregation. The goal is to achieve a suspension. If the particles begin to float, the injectate is too dense and if the particles sink then the injectate is not dense enough. In those cases, empty the contents back into the particle slurry cup and add 1-2mL of contrast (to make the injectate more dense if the particles were sinking) or 1-2mL of flush (to thin the injectate if the particles were floating). Repeat this process as many times as necessary until a suspension is achieved.
- Fill the reservoir syringe with the 8-9mL of particle slurry and attach to a 3-way stopcock (position per operator comfort). Attach an empty 1 or 3mL syringe to the other port.
- Obtain microcatheter and prepare for use.
- Selective angiography in the feeding vessel(s) should be performed first. This angiogram is typically performed with the guiding catheter (noted above). Save a select frame as a roadmap; this frame should demonstrate the origin of the feeding vessel from the major systemic artery (e.g., the internal mammary and subclavian artery junction) (**Figure 2**).
- If the guiding catheter is sufficiently deep in the vessel intended for occlusion, particles can be delivered directly through the 4Fr catheter into the main feeding vessel. Great care must be taken to monitor for reflux of the injectate as infusion should cease before the injectate refluxes back into the main systemic artery.
- If using the microcatheter for particle delivery, consider flushing the guiding catheter with 1000 units/mL of unfractionated heparin given the higher potential for thrombosis. This decision may depend on the specific microcatheter, estimated duration of use during the case, patient's ACT etc.). Attach the Y-adaptor to the guiding catheter and introduce the microcatheter. Place clean sterile towels under this coaxial catheter system; these will be used to contain and ultimately wrap the particle delivery catheters to prevent contamination of the catheterization table with stray microparticles.
- Advance the tip of the guiding catheter, ideally, at least 1-2 cm deep into the feeding vessel (**Figure 2a**). The tip of this guiding catheter is an important landmark. Advance the microcatheter distally into the feeding vessel.

- Particle slurry injection: Attach the stopcock to the microcatheter and gently agitate the particle slurry between the reservoir and delivery syringes (use similar technique as for contrast-enhanced echocardiograms [i.e., bubble studies]). De-air the microcatheter, then slowly inject the slurry under fluoroscopic guidance, ensuring that only the distal vessel opacifies. Flow through the vessel will become increasingly sluggish as the particles occlude the distal branches. Continue the process until the slurry



**FIGURE 2** Reconstituted SPCs After Prior Coil Embolization of the Feeding Vessel

- A)** The tip of the guiding catheter is ~2cm deep into the internal mammary artery (IMA) (#). Note multiple coils (arrow) in the mid-IMA after previous coil occlusion.
- B)** The IMA distal to the coils has reconstituted (\*), giving rise to additional SPC networks (arrowheads).
- C)** Post-particle injection shows no residual SPC flow with a patent IMA (\*).



### UPMC CHILDREN'S HOSPITAL OF PITTSBURGH

The Division of Cardiology at UPMC Children's Hospital of Pittsburgh / University of Pittsburgh School of Medicine, one of the premier pediatric cardiology programs in the country, is currently recruiting two excellent candidates for the faculty positions of Adult Congenital Heart Disease and Electrophysiology.

The Heart Institute provides comprehensive pediatric and adult congenital cardiovascular services including CT surgery, interventional cardiology, cardiac intensive care, electrophysiology, advanced imaging (MRI/CT), heart failure, transplant, pulmonary hypertension, adult congenital, fetal, and preventative cardiology programs, among others. Our program serves pediatric and adult congenital heart patients within central and western Pennsylvania, and surrounding states, as well as national and international locations. Our group consists of 35 pediatric cardiologists, 5 pediatric cardiothoracic surgeons, 8 pediatric cardiac intensivists, and 11 cardiology fellows along with 24 advanced practice providers and a staff of more than 300. We are honored to be ranked **#8 nationally** and **#1 in Pennsylvania** for pediatric cardiology and heart surgery by U.S. News and World Report. The Heart Institute at UPMC Children's is continually recognized by the Society of Thoracic Surgeons (STS) for excellence in congenital heart surgery. Our surgical program, led by Dr. Victor Morell, achieves the highest possible rating by the STS, which places UPMC Children's among the top institutions in the U.S. and Canada for patient care, CT surgery outcomes, and congenital heart surgery. UPMC is a nationally ranked medical center that serves as the regional referral center for multiple specialties providing a growing collaborative environment for quality care.

### ADULT CONGENITAL HEART DISEASE FACULTY

- The well-established ACHD program is currently supported by 3 ACHD physicians (including one ACHD Director), 2 advanced practice providers, 2 dedicated RNs, a research coordinator, and a social worker. We are currently seeking an applicant who has expertise in the management of adult congenital heart disease with prominent clinical, teaching, and research skills. He or she will be working closely with the division chief, the ACHD director, and hospital leadership to support program expansion. Candidates must be board-eligible/certified in pediatric cardiology or adult cardiovascular diseases and in adult congenital heart disease.

### ELECTROPHYSIOLOGY FACULTY

- We are seeking a full-time pediatric electrophysiologist at the Assistant or Associate Professor level. Candidates should be board-eligible/certified in pediatric cardiology, and subspecialty trained in pediatric electrophysiology (EP). Certification from IBHRE for electrophysiology or cardiac devices is recommended though not mandatory.
- Candidates should be clinically excellent and have demonstrated academic productivity. The role would include responsibilities for inpatient and outpatient EP care, including cardiac device management. Experience in invasive EP (ablations and device implantation) is preferred though candidates with an interest in non-invasive EP would be considered. Experience in adult congenital heart disease electrophysiology is desirable. Teaching of multi-disciplinary learners (medical students, residents, fellows, advanced practice providers and nurses) would be expected. The candidate would be joining an EP team consisting of 2 full time invasive electrophysiologists, an EP PA and 2 EP nurses.

UPMC Children's Hospital of Pittsburgh has been named one of the top U.S. News & World Report's Best Children's Hospitals. Consistently voted one of America's most livable cities, Pittsburgh is a great place for young adults and families alike.

This position comes with a competitive salary and faculty appointment commensurate with experience and qualifications at the University of Pittsburgh School of Medicine. The University of Pittsburgh is an Equal Opportunity/Affirmative Action Employer. Interested individuals should forward a letter of intent curriculum vitae, and three letters of reference. Informal inquiries are also encouraged.

#### Contact information:

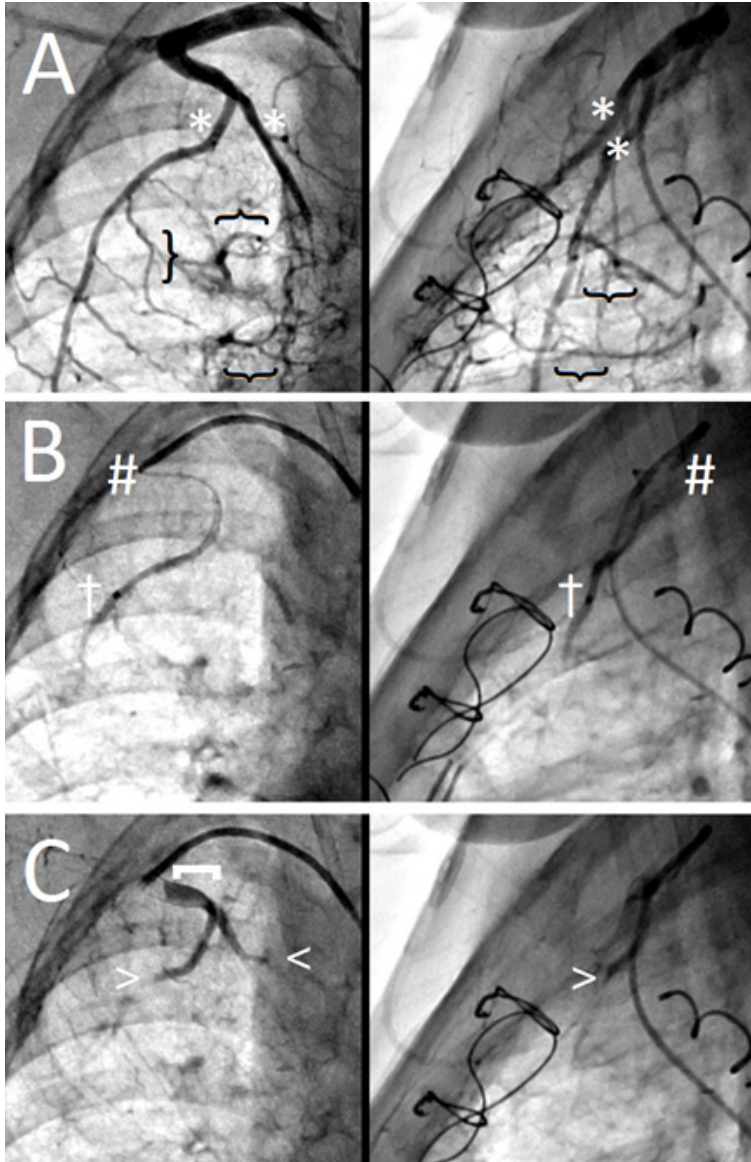
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412-692-6903, [Jacqueline.kreutzer@chp.edu](mailto:Jacqueline.kreutzer@chp.edu)





begins to backwash toward the feeding vessel. Particle injection should cease when the slurry backwashes to the tip of the guiding catheter (**Figure 2c**). Ceasing injection at this point ensures that particles do not reflux into the feeding artery/systemic circulation.

- Remove the microcatheter, flush with saline (ideally cover end with gauze to contain the particles) and wrap the catheters in the sterile towels. Perform a follow-up angiogram through the guiding catheter to assess SPC occlusion. If needed, repeat the procedure.



**FIGURE 3** Occlusion Of "Complex" Systemic-To-Pulmonary Collaterals

**A)** Note the two large branches ( \*) of the internal mammary artery (IMA) that give rise to multiple SPC networks ( {} ).  
**B)** The two large feeding branches are individually engaged with the microcatheter for selective particle delivery ( † ); the guiding catheter tip remains ~1-2cm in the IMA as a landmark ( # ).  
**C)** Post-particle injection shows no residual SPC flow (arrowheads) with a patent IMA origin ( [ ] ).

## Tip 4 – Potential Complications and How to Deal with Them

1. Most important is ensuring that the particle slurry does not reflux into the major systemic artery from which the feeding vessel arises (e.g., subclavian artery, aorta, etc.). This is accomplished as detailed above. Systemically embolized particles cannot be retrieved.
2. Microcatheter occlusion – As previously described, delivery of PVA particles is optimized when the particles are in a suspension (i.e., not sinking or floating in the injectate). The operator needs to regularly inspect the reservoir and delivery syringes to ensure the particles remain suspended. If the particles are significantly aggregated, start by re-agitating the two syringes and then observe. As above, if the particles sink or float in the reservoir syringe, then follow the steps above to reestablish a suspension. The syringes and microcatheter will become occluded with particles if they are in an aggregate clump.
3. Perform close and repeated neurologic examinations after the procedure. Have a very low threshold to obtain advanced imaging if any CNS abnormalities are detected.

## Summary

Particle occlusion is an effective technique to occlude SPCs. The technique is particularly important in patients with complex SPC networks or recurrent SPCs, as outlined in **Figures 2 and 3**. The operator must have knowledge of the patient's anatomy and ensure that all appropriate equipment is available. The critical aspects of the procedure relate to understanding the arterial anatomy and ensuring particle delivery in the intended vessel is safe. The methods outlined above will minimize the risks of complications such as systemic embolization of particles.

## Figures

Reproduced (per journal rights of authors) from Batlivala SP, Briscoe WE, Ebeid MR. "Particle embolization of systemic-to-pulmonary collateral artery networks in congenital heart disease: Technique and special considerations." *Ann Pediatr Card* 2018;11:181-6.

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**SAROSH P. BATLIVALA, MD, MSCI, FPICS**

*Editor, PICS Tips and Tricks  
Associate Professor, Cardiology  
Cincinnati Children's Hospital Medical Center  
Cincinnati, Ohio, USA*



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**Children's Hospital**  
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## Pediatric Cardiologist (MRI)

The Department of Pediatrics, Section of Pediatric Cardiology at Tulane University School of Medicine in New Orleans, in partnership with the Children's Hospital of New Orleans (CHNOLA), is seeking a full-time academic Pediatric Cardiologist with expertise in advanced non-invasive cardiac imaging in CT and MRI technologies to join our faculty group. The Heart Center Faculty includes a team of 23 physicians including six cardiac intensivists, two cardiac surgeons, and 5 cardiac anesthesiologists. Subspecialty care in the Heart Center includes non-invasive imaging, interventional cardiology, electrophysiology, expertise in Fontan management, home-monitoring, neurodevelopment, pulmonary hypertension, pediatric coronary artery disease, and heart failure. Currently, approximately 340 heart catheterizations (75% interventional) and over 300 cardiothoracic surgeries, and 10,000 ambulatory visits are performed each year at Children's Hospital New Orleans.

The Heart Center is based at CHNOLA and includes not only Tulane faculty but also faculty in the LSU Health Sciences Center. The selected candidate must have demonstrated excellence in advanced non-invasive imaging involving CT and MRI modalities as well as echocardiography. Incumbent on the applicant will be developing and leading a comprehensive state of the art cardiac CT and MRI program at CHNOLA.

The Department of Pediatrics at Tulane is committed to providing excellence in education, clinical care, and research. The selected candidate will become actively involved in all aspects of teaching including training medical students and residents.

As a University employed faculty member, you will receive a negotiable salary commensurate with experience, a fully comprehensive benefits package, and relocation allowance. Academic appointment will be at the rank of Assistant, Associate or Full Professor determined by the candidate's credentials and experience.

Qualified applicants must be board certified/eligible in Pediatrics and be licensed to practice medicine in Louisiana by the start date. He or she must possess excellent interpersonal and communication skills. Fluent and conversational skills in Spanish is desirable. Successful candidates will have outstanding patient care skills, a strong desire to share their knowledge with students and residents and participate in advancing the quality of care at Children's Hospital. Faculty members are expected to contribute to the advancement of scholarly or educational activities in the department.

**If you are interested, send an updated copy of your CV and references to:**

**Andrea Jones**

[Andrea.Jones@lcmchealth.org](mailto:Andrea.Jones@lcmchealth.org)

504.896.9400

Or [apply here](#).

New Orleans is a cultural melting pot. Life in the Big Easy can be as fast or as slow paced as you make it. Blessed with an abundance of festivals, sports, fine arts, not-so-fine arts, eating, drinking, and parading can become a daily part of your life.

Children's Hospital New Orleans is a 257-bed, not-for-profit pediatric medical center offering a complete range of healthcare services for children from birth to 21 years. With over 40 pediatric specialties and more than 600 pediatric providers, Children's Hospital is the first and largest full-service hospital exclusively for children in Louisiana and the Gulf South, nationally ranked by U.S. News & World Report as a Best Children's Hospital.

In 2021, Children's Hospital New Orleans completed its most significant expansion project in the hospital's history. This unprecedented, \$300 million investment made by our Board of Trustees and LCMC Health brings together infrastructure, technology, and unmatched expertise to deliver a healthier, happier future for Louisiana's children.



# Matters of the Heart and Mind

## On Pyrrhic Victories: A Very Precious Baby

Neil Wilson, MBBS, DCH, FRCPC, FSCAI

We have all had Pyrrhic victories with our work in the Catheter Lab. Unpromising complex substrate, hours of difficult catheter manipulation, device positioning, blood loss, device retrieval, patient instability, but after all that, a rewarding haemodynamic / angiographic anatomical result. And then...despite the hours of toil by the teams in the lab and CICU...a critical incident in CICU or on the floor perhaps not directly related to the substrate or the intervention... leads at best to a prolonged stay in intensive care and at worst to death.

I remember as a junior neonatal fellow (in both senses!) being given the heads up by midwives when called to the delivery rooms to standby for resuscitation. Prolonged dips in heart rate, forceps deliveries, C section, twins. The lot. One very experienced midwife, Mary, took no prisoners from junior medical staff. In short, when Mary called saying 'You need to be here', you went, no point in asking details. Mary would often call asking for standby resuscitation for reasons of 'This is a very precious baby.' Is there ever a 'non-precious' baby? We knew what she meant, of course, and greatly respected her experience and judgement but in the way that medical humour can become dark, we junior fellows would mimic: 'Fancy a very precious cup of coffee?' 'Wow, that's a very precious X Ray.' Naughty, I admit, but long hours taking their toll, if a bit of dark humour could alleviate some of the stress then it's an acceptable trade-off. Mary knew we were mimicking her, but I vouch she quite enjoyed her notoriety.

Stephanie was indeed a "very precious" baby in that she was the result of the six or seventh pregnancy of a couple who had struggled to conceive and, until now, when pregnancy did ensue, it had ended in miscarriage. Imagine that roller coaster of emotions. Happiness, euphoria even, then disaster... things can only get better. And they did. Stephanie was very much alive albeit at 34 weeks and 2.2kg. Mum and dad at 39 radiated smiles and relief. Well, this being Stephanie, she has a systolic heart murmur and saturations reaching 90%... she has Tetralogy of Fallot. But she's pink, feeding okay with a nasogastric tube, let's just hang on for a few days and hopefully get her home and see how she goes. All good, within a week she's 2.5kg, saturations high 80's. Say what you like about early repair but this is 1999 in Scotland and we were not thinking on those lines. What would you do today?

A few days later 2.6kg she's home. Parents live only a couple of miles from the hospital, easy to keep an eye on things. At three weeks of age a colleague sees Stephanie in clinic, she's doing ok, as I would say small o small k but saturations just about hitting 80%. The outflow obstruction looks almost exclusively valvar. She's very precious. She's admitted and by the time we've done a couple of ward rounds she's saturating 77% and we think at 2.7kg pulmonary balloon valvoplasty is appropriate. What would you have done? So to the Cath lab, some desaturation on induction of anaesthesia but,

thanks to a 6mm Tyshak balloon (How did they get that name?), all went well. Saturations up to mid 80s %, overnight stay and home she goes. Colleague sees her quite often, she's small but making good progress. Good progress that is until about ten weeks of age. She's blue again, 3.9 kg, echo shows very obvious dynamic right ventricular outflow tract obstruction. No point in repeating a balloon procedure. She goes for a right-modified Blalock Taussig shunt 5mm GoreTex. What would you have done in 1999? All goes smoothly, she doesn't touch the sides, saturations into the 80s again. Home.

Parents and colleagues very happy. And everyone stays happy for six or seven months. Good growth, development, saturations. But life's not fair. Stephanie gets an intercurrent illness of modest fever, goes off her feeds, some rhinorrhoea. Her family practitioner sits on her nervously, but 24 hours later... she's shut down, tachycardic at 180, pale, grey, becoming unresponsive. So... into hospital, virtually straight to CICU. Saturation probe is not registering. Intubated, metabolic acidosis, pH 7.18 so off we go with resuscitation fluids, antibiotics (blood cultures were repeatedly negative). Echo showed intracardiac anatomy as before, flow out of the right ventricle looks appropriate, but we can't see flow down the shunt and the lumen of the right pulmonary artery, as I would say, is about as narrow as a gnat's urethra. So the shunt is blocked in a very sick baby 6.7 kg. I hope you agree with our decision to go to the lab and see what is going on with a view to revascularizing the shunt and the right pulmonary artery. So off we go.

It is quite late on a Wednesday night around 9 o'clock. ICU and Anaesthesia somehow manage to efficiently and effectively treat the acidosis and saturations miraculously are in the mid 60s. Access is straightforward, right femoral vein and artery. Venous catheter into the right ventricle easily, arterial catheter positioned just proximal to the shunt in the right subclavian artery. Angiography is astounding. There is a hairsbreadth of flow down the shunt but very little opacification of the pulmonary arteries from the shunt. MPA angio shows small LPA with flow distally and normal pulmonary venous return. But the RPA... OMG it is full of thrombus and resembles a piece of string tied in knots. Big knots. So...we need flow into the RPA. Flow will beget flow. That's a great Chuck Mullins mantra right? Would you balloon retrograde up the shunt from the RPA catheter and risk dislodging thrombus northwards into the right common carotid? Or...Would you balloon from the arterial side and risk dislodging thrombus and it embolising when you withdraw the Tyshak balloon catheter from the shunt? Having telephonic guidance from haematology to institute iv heparin and tPA (Alteplase) infusion dosage the plumbing side of things went quite well. We approached things simultaneously 'and at the same time' as I might have said in an attempt to take a bit of heat off. The shunt revascularised nicely, with good flow and few nubbets (my invention) of thrombus hugging the wall



**Children's Hospital**  
New Orleans  
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## ACHD Cardiologist

The Division of Pediatric Cardiology at the Louisiana State University Health Sciences Center and the Heart Center of the Children's Hospital of New Orleans (CHNOLA) is seeking a Cardiologist with expertise in adult congenital heart disease (ACHD) to join its growing ACHD program. The applicant should have specific expertise in adult congenital heart disease and be board certified/eligible in ACHD. We are striving to become ACHD accredited and will be the only accredited program in the state of Louisiana. The candidate would be expected to grow this expanding program by performing clinical ACHD duties in both the outpatient and inpatient settings. CHNOLA is the founding member of a 6-hospital health system titled LCMC (Louisiana Children's Medical Center). Our program has formed relationships with all of these five other adult hospitals but particularly strong ACHD partnerships with two – Touro Infirmary and University Medical Center. In addition, LCMC recently announced a merger with Tulane University Medical Center. We are conducting conversations which explore ACHD partnership with Tulane. Additional opportunities exist in pulmonary hypertension, exercise physiology, our Fontan clinic, coronary artery disease/anomalies, imaging and other Heart Center programs depending on the candidate's expertise and interest. Academic appointment will be at the rank of Assistant, Associate or Full Professor.

The Heart Center Faculty includes a team of 23 physicians including six cardiac intensivists, two cardiac surgeons, and 5 cardiac anesthesiologists. Subspecialty care in the Heart Center includes non-invasive imaging, interventional cardiology, electrophysiology, expertise in Fontan management, home-monitoring, neurodevelopment, pulmonary hypertension, pediatric coronary artery disease, and heart failure. Currently, approximately 340 heart catheterizations (75% interventional) and over 300 cardiothoracic surgeries, and 10,000 ambulatory visits are performed each year at Children's Hospital New Orleans.

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**If you are interested, send an updated copy of your CV and references to:**

**Andrea Jones**

[Andrea.Jones@lcmchealth.org](mailto:Andrea.Jones@lcmchealth.org)

504.896.9400

**Or apply by visiting:**

[Louisiana State University Health Sciences Center Portal | ASSISTANT PROFESSOR / ASSOCIATE PROFESSOR / PROFESSOR, CLINICAL - PEDIATRIC CARDIOLOGIST - ADULT CONGENITAL HEART DISEASE \(peopleadmin.com\)](#)



of the shunt. The RPA knotted string appearance improved, but despite repeated balloon angioplasty, there was significant residual thrombus. Stephanie was stable, saturations were much better, no acidosis. So, a microcatheter was left in the RPA from the right femoral vein approach and a miniscule dose of tPA was continued through it with the plan to repeat angiography in 24 hours and think again. Stephanie had frequent echoes which appeared to show better calibre and flow down the RPA. She was unbelievably 'well behaved' in CICU where nobody took an eye off her. You name the recommended blood tests to monitor thrombolysis and she had them. Saturations in the mid 80s. Marvellous.

Early Friday morning, back to the lab, angiography of the shunt and RPA shows that they were completely thrombus free. Unbelievable. You could feel the release of anxiety in the lab and the faces of the CICU team in the viewing area said "Relief!". Catheters out. Back to CICU with the plan to continue iv tPA for 24 hours and move to intubation over the weekend. I had a big clinic on that Friday afternoon, but it seemed to pass extremely quickly and uneventfully...marred only by one family whose car had been jacked up in one of the hospital car parks and had its wheels stolen. Yup. Not funny but thank goodness their son had had a pulmonary balloon valvoplasty a month before and was doing very well with a negligible gradient. What a facer for them trying to get a new set of wheels on a Friday late afternoon.

I'm on call Saturday morning dribbling coffee onto the newspaper at the breakfast table. The phone goes. Its CICU. 'Neil, sorry but Stephanie's neuro obs have gone haywire she's got fixed dilated pupils, we're taking her for a CT scan just now'. I didn't finish the coffee and arrived at the hospital just as the CT pictures were coming up. You've guessed. She has huge bilateral haemorrhages, complete obliteration of the cerebral ventricles and herniation. Stephanie's parents had constantly been at her side, but as I walked into the room at the entrance to CICU to speak to them...they knew. They knew. The worst, cruellest most unfair Pyrrhic outcome. Those were perhaps the hardest and perhaps most silent minutes I've ever endured with parents. What would you have said?...



**NEIL WILSON, MBBS, DCH, FRCPCH, FSCAI**

*Formerly Professor of Pediatrics  
University of Colorado School of Medicine  
Formerly Director Cardiac Catheter Laboratory  
Children's Hospital Colorado  
Colorado, USA  
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## Introducing Shelley Miyamoto, MD, Chair of Pediatric Cardiology

Children's Hospital Colorado and the University of Colorado School of Medicine are pleased to announce Shelley Miyamoto, MD as the Co-Director of the Heart Institute and Section Head of Cardiology, Department of Pediatrics, University of Colorado School of Medicine. Dr. Miyamoto holds the inaugural Jack Cooper Millisor Chair in Pediatric Heart Disease at Children's Colorado. Through basic and translational research, she studies dilated cardiomyopathy and congenital heart disease. As a member of multiple industry associations, Dr. Miyamoto has been awarded several patents and has played a critical role in the Heart Institute's recent acceptance into the Pediatric Heart Network.

## Career Opportunities

### MEDICAL DIRECTOR, CARDIOVASCULAR IMAGING

The Medical Director of Cardiovascular Imaging will provide overarching leadership for all non-invasive cardiovascular imaging activities. The Director will be empowered to promote advancements in cardiac imaging techniques, provide mentorship and career development of faculty, and promote the education and training of fellows.

- Imaging team includes 14 faculty, 28 sonographers and technicians trained in obtaining cardiac MRI and CT images
- Advanced fellowship in cardiac imaging and cardiac echo research core laboratory capability
- High volume multimodality imaging program (25,000+ echos, 1,700+ fetal echos and 600+ cardiac MRIs performed annually)
- Robust telehealth capabilities across 7-state referral region
- Faculty with expertise and research interests in 3D echo, strain imaging, cross-sectional imaging (including fetal cardiac MRI) and intracardiac echo (ICE)
- Active echo QI program

### MEDICAL DIRECTOR, SINGLE VENTRICLE PROGRAM

The inaugural Medical Director of the Single Ventricle Program at Children's Colorado will provide leadership of established single ventricle outpatient clinics and will be encouraged to develop a vision for how to optimize and advance the inpatient transition of single ventricle patients across all surgical stages.

- Team includes 6 physicians, an APP and dedicated nurse coordinator
- Performed the 2nd most Norwood procedures in the country in 2022
- Existing Complex Congenital Heart Disease Clinic for interstage patients that includes a home monitoring program and a Single Ventricle Continuity Clinic for patients stage II and beyond
- A Fontan Multidisciplinary Clinic that includes expertise in pediatric and ACHD cardiology, hepatology, pulmonology, neuropsychology and nutrition

### MEDICAL DIRECTOR, FETAL CARDIOLOGY

The Medical Director of Fetal Cardiology will have critical leadership responsibilities with respect to strategic planning, and advancements of medical education, research, and QI initiatives in both the Heart Institute and the Colorado Fetal Care Center.

- Fetal cardiology team includes 4 cardiologists, 2 sonographers and a dedicated nurse coordinator
- Over 240 deliveries with 105 attributed to cardiac abnormalities
- High volume fetal echo telehealth program
- Membership in the Fetal Heart Society
- 7-state referral center for fetoscopic laser photocoagulation treatment in twin-twin transfusion syndrome, fetal arrhythmias, heart block, cardiomyopathies, complex congenital heart disease and more

### ACUTE CARE HOSPITALIST

Responsibilities will include providing intermediate level cardiac care in the Cardiac Progressive Care Unit (CPCU), a dedicated telemetry unit with a favorable nurse to patient ratio and a supporting cardiology consultative service throughout Children's Colorado.

- Team supported by APPs, cardiology fellows, as well as dedicated nutritionists, pharmacists, social workers and discharge coordinators
- Over 700 cardiac surgeries performed in 2023
- Averaged nearly 1,400 CPCU admissions annually for the past 3 years
- Opportunities to contribute to medical education, QI projects, and clinical protocol development
- Participation in the Pediatric Acute Care Cardiology Collaborative (PAC3)

#### To apply, please contact:

#### SHELLEY MIYAMOTO, MD

Chair, Pediatric Cardiology, University of Colorado School of Medicine  
Co-Director, Heart Institute, Children's Hospital Colorado



Shelley.Miyamoto@childrenscolorado.org



# InfoBionic Receives FDA 510(k) Clearance for Its Next Generation MoMe® ARC Solution

*InfoBionic, the virtual telemetry company focused on the efficiency and economics of cardiac remote patient monitoring, announces FDA 510(k) clearance for its MoMe® ARC solution that encompasses our next generation remote ECG monitoring device and initial Bluetooth diagnostic 6-lead sensor designed to aid physicians in their diagnosis of cardiac arrhythmias.*

InfoBionic, Inc. announced that it received 510(k) clearance from the U.S. Food and Drug Administration (FDA) for MoMe® ARC, their 3rd Generation remote ECG monitoring device paired with their inaugural Bluetooth diagnostic 6-lead sensor designed to aid physicians in their diagnosis of cardiac arrhythmias in patients with a demonstrated need for cardiac monitoring. "We're thrilled to announce FDA 510(k) clearance to market the MoMe® ARC solution, which supports our mission to create superior patient monitoring solutions for arrhythmia detection and virtual care and chronic disease management," said Dave MacCutcheon, Regulatory and Chief Operating Officer at InfoBionic.

MacCutcheon further points out that: "MoMe® ARC is a solution that includes a 4-in-1 Gateway device that seamlessly transitions between 2-day in addition to Extended Holter tests, Event and MCT modes remotely, streamlining patient monitoring time and minimizing delays. In addition, MoMe® ARC leverages a comprehensive cloud-based proprietary platform to deliver on-demand, actionable data and analytics directly to the clinicians. Further, it incorporates our initial sleek body worn Sensor in a new lightweight form factor which is decoupled from the device Gateway communicating through the latest implementations of

Bluetooth connectivity and ushers in a new era of wearability convenience yet maintains the ECG quality of a multi-lead tracing, thus bringing convenience and quality together for the first time. The MoMe® ARC is designed so patients can wear it discretely and comfortably during monitoring using standard electrodes. The Sensor is paired to the ARC Gateway which leverages a cellular connection to the MoMe® Software Platform empowering physicians to transform the efficiency with which they manage cardiac arrhythmia detection and monitoring processes for their patients."

This next generation device builds on the market success of innovative MoMe® Kardia II by providing a decoupled 2-channel – 6-Lead Sensor. Added foundational technologies make the device capable of connecting to other Bluetooth-enabled health monitoring devices. K230265 is cleared for use under Product Code DSI - Arrhythmia Detector and Alarm (Including ST-Segment Measurement and Alarm). The ECG data is transmitted in near-real time and analyzed by the MoMe® software platform via a suite of robust server-based algorithms; and when indicated, data identified by these algorithms is flagged for clinician review. MoMe® ARC requires no patient intervention to capture or analyze data, however it does provide

a patient event trigger and symptom description selection through a new screen similar to that of a smart watch.

InfoBionic expects to begin shipping the new generation MoMe® ARC Device in Q4 2023.

## About InfoBionic

InfoBionic's digital technology has transformed the efficiency and economics of cardiac remote patient monitoring. The company's MoMe ARC platform vision is to remove the roadblocks hindering remote diagnosis and decision-making. The Massachusetts-based team of seasoned entrepreneurs have had successful careers in healthcare, IT, medical devices, and mobile technology and bring specific expertise in remote monitoring and cardiology.

Visit <https://InfoBionic.com/>.



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**PennState Health**  
Children's Hospital

# Outpatient Pediatric Cardiologist

Penn State Health Children's Heart Group is seeking a dedicated outpatient pediatric cardiologist who has the desire to develop a community-based practice that will align itself with local hospitals and neonatology practices, provide personalized services to pediatricians and family practice providers in these communities, and grow the practice in these cities. The intention is for the successful applicant to reside in one of the following cities, or a nearby community: Lancaster, York, or Reading.

Join our Division of Pediatric Cardiology now! We are committed to excellent clinical care, teaching, and research. **Interested applicants, [please apply here](#) and send CV and Cover Letter to John P. Breinholt, MD Professor and Chief, Pediatric Cardiology [jbreholt@pennstatehealth.psu.edu](mailto:jbreholt@pennstatehealth.psu.edu)**

Our team of providers consists of 12 board-certified pediatric cardiologists, 6 adult congenital cardiologists, 5 advanced practice providers and support staff. Our cardiologists have expertise in pediatric cardiology, adult congenital heart disease (ACHD), interventional cardiology, cardiac imaging and MRI, fetal cardiology, electrophysiology, preventive cardiology, and telemedicine.

We have state of the art facilities in these communities, supported by APPs, echo sonographers, and close alignment to the specialized services provided at the medical center, including: exercise physiology, electrophysiology, interventional cardiology, and cardiac surgery. We are closely aligned with the ACHA accredited Adult Congenital Heart Disease program who provide outreach services to these areas. There is an ACGME accredited fellowship program that accepts one fellow per year.

- The ideal candidate has at least one to three years of clinical experience and demonstrated excellence in outpatient pediatric cardiology care
- Supported by on-site clinical support staff and sonography services
- Academic position as an assistant or associate professor of pediatrics at Penn State College of Medicine
- The Echocardiography laboratory at Penn State Children's Hospital is accredited in pediatric transthoracic, TEE and fetal echocardiography
- Fetal cardiology abilities are desirable, but not required. Fetal cardiologists provide services to these areas at present, however a cardiologist with this skill set would be able to utilize it in this practice location.
- Opportunity to participate in the inpatient service is optional, based on applicant preference.

#### What we're seeking:

- We are seeking someone BC/BE trained in Pediatric Cardiology.
- M.D., D.O., or foreign equivalent
- Candidates must be board certified or board eligible in pediatric cardiology and able to obtain an unrestricted PA license.
- BLS and PALS certification is required.

#### Opportunity highlights:

- Competitive salary and benefits
- Sign on bonus and Relocation assistance,
- CME time and funds,
- LTD and Life insurance, and so much more!
- Penn State University tuition discount for employees and dependents

#### Area highlights:

Penn State Health has opened new pediatric outpatient centers in Lancaster and York in 2022. We are looking to open a new clinic in Reading. The Lancaster Pediatric Center (47,000 sq feet) houses more than 40 exam and consultation rooms. It includes 20 medical and surgical pediatric specialty and sub-specialty services. It also offers consultations with psychiatrists and behavioral health specialists. The York Leader Heights Center (5600 sq feet) houses pediatric sub-specialties, reproductive endocrinology and fertility. It provides a wide spectrum of care for children including 5 medical and surgical pediatric sub-specialty services.

*Forbes* magazine describes Lancaster as a "newly hip Victorian city—just three hours from New York City—is still one of the U.S.'s best kept secrets. The center of Amish country is bucolic but boasts a bustling food scene and is quickly becoming a cultural hotbed. The architecture is the real star, so explore the alleys and cobblestone streets by foot, checking out the many repurposed old warehouses that house thriving businesses... The arts are central to Lancaster's growth, notably the stunning Fulton Theatre and neighboring Prince Street, Lancaster's gallery row, which pulses with art on summer first Fridays."

Founded in 1741, the city of York is considered by many as the first capital of the United States. The Articles of Confederation were signed by the Second Continental Congress here in 1777. Its beautifully restored historic district is an architectural treasure. While York retains its farming and manufacturing heritage, at its heart York is a thriving cultural community that has attracted creative talent and innovative entrepreneurial investors from across the nation. Life in York County offers affordable housing, options for higher education, a thriving arts and cultural community, historical attractions, parks and recreational resources, a semiprofessional baseball team, fine dining and more — within an easy drive of major East Coast cities, including Baltimore, Washington D.C., and Philadelphia. It is also near the scenic Pocono Mountains to the north.

This is an opportunity to direct program growth in one of our population centers, and tailor a practice to your expertise and interests. Neighboring cities are also potential areas of growth.

**About Penn State Health:** Penn State Health is a multi-hospital health system serving patients and communities across 29 counties in central Pennsylvania. It employs more than 18,000 people systemwide.

The system includes Penn State Health (PSH) Milton S. Hershey Medical Center, Penn State Health Children's Hospital and Penn State Cancer Institute based in Hershey, Pa.; PSH Hampden Medical Center in Enola, Pa.; PSH Holy Spirit Medical Center in Camp Hill, Pa.; PSH Lancaster Medical Center in Lancaster, Pa.; PSH St. Joseph Medical Center in Reading, Pa.; Pennsylvania Psychiatric Institute in Harrisburg, Pa., and 2,450+ physicians and direct care providers at 225 outpatient practices. Additionally, the system jointly operates various healthcare providers, including PSH Rehabilitation Hospital, Hershey Outpatient Surgery Center and Hershey Endoscopy Center.

In 2017, Penn State Health partnered with Highmark Health to facilitate creation of a value-based, community care network in the region.

Penn State Health shares an integrated strategic plan and operations with Penn State College of Medicine, the University's medical school. With campuses in State College and Hershey, Pa., the College of Medicine boasts a portfolio of more than \$150 million in funded research and more than 1,700 students and trainees in medicine, nursing, other health professions and biomedical research.



# Laguna Tech USA Announces Newly Designed Heart Valves with Advanced Engineering Successfully Implanted in First-in-Human Clinical Trial

- *New heart valves, ALPHA and ZETA, designed to provide flexibility and optionality regardless of high, low or zero calcification status*
- *Patients with aortic regurgitation achieve complete resolution of regurgitation immediately following procedure*
- *First-in-class, Aortic Valve Systems offer self-expanding or balloon-expanding versatility based on physician preference and patient case dynamics*
- *Versatile designs expected to significantly broaden patient eligibility for implant*

Laguna Tech USA, a privately-held medical technology company dedicated to innovations in structural heart solutions to broaden useability and applicability for patients, announced that the first-in-human clinical case was completed with the Zeta Balloon Expandable Aortic Valve System and additional patients have been successfully treated in the feasibility clinical study of its investigational ALPHA Self-Expanding Aortic Valve system to treat aortic regurgitation. To date, two patients have been successfully treated in the Alpha Aortic Valve study, with both achieving complete resolution of aortic regurgitation immediately following the procedure, which has been maintained at the 30-day follow-up examination.

The ALPHA system is a uniquely designed one-piece self-expanding transcatheter valve engineered with a low profile valve and delivery system, with six support arms for simpler, better positioning within the aortic annulus and cusps. The ZETA system is a novel balloon-expandable transcatheter valve with six expanding arms and a low profile covered delivery system. The six expanding arms allow for simple positioning of the valve into the aortic annulus and cusps.

The feasibility study is being conducted at the Instituto Nacional de Torax in

Santiago, Chile, and Tbilisi Heart and Vascular Clinic in Georgia.

The lead primary investigator, Dr. Scott Lim, a cardiologist from the University of Virginia noted, "The Laguna Tech USA Alpha Self Expanding Aortic Valve and Zeta balloon Expandable Aortic Valves performed as designed, allowing us to successfully and percutaneously treat these first patients at high surgical risk with severe aortic regurgitation, and in one case, with concomitant significant calcific aortic stenosis. I look forward to these novel transcatheter aortic valves being further investigated in larger studies, as this initial experience is quite encouraging toward helping us address a significant unmet patient need in those with complex aortic valve disease."

Dr. Cristian Dauvergene, Chief of Interventional Cardiology, Instituto Nacional de Torax, added, "We were able to successfully implant the Zeta Aortic Valve very simply and efficiently aided by the low profile and straightforward transcatheter implantation allowing for advantageous placement in the heart. We are excited to be a part of the success of the first procedure of this important next-gen TAVI system, and we look forward to participating in Laguna Tech USA's clinical study."

"With this successful groundbreaking first in human clinical experience with the ZETA valve and the additional successful ALPHA valve implants, we have a growing body of evidence supporting the promise of our next-gen, differentiated aortic valves, which represent much-needed advancement in the field," said Gilbert Madrid, chief executive officer of Laguna Tech USA. "Specifically, our valve designs are intended to address an unfortunate, longstanding gap in the applicability of heart solutions because of rigid and unyielding technology designs that eliminate many patients as prospective candidates. With two varying valve designs, each leveraging advanced technology and engineering of existing products on the market, we look forward to the potential of our technology to significantly expand the number of patients with aortic valve regurgitation who may be treated with our minimally invasive treatment options."





## Pediatric Cardiologist

Opportunity in the South Bay Area - Capitola, California

Packard Children's Health Alliance / Stanford Children's Health is actively recruiting a Cardiologist to join our group in [Capitola](#).

### Position details/qualifications:

- MD or DO
- BC/BE in Pediatric Cardiology
- Current license to practice medicine in the state of California

### Our location:

- Close proximity to Santa Cruz, known for its beaches, redwood forests, and unique surf and arts culture
- Breathtaking views of Monterey Bay
- Enjoy our mild weather where the sun shines 300 days/year

### We offer:

- \$325,000-\$375,000 plus annual productivity incentives
- Full benefits package, including relocation bonus for qualified moves

At Stanford Children's Health, we are focused on bringing world-class, family-centered care to communities throughout the San Francisco Bay Area. A rapidly growing medical foundation, developed in partnership with Lucile Packard Children's Hospital Stanford and the Stanford School of Medicine, we are bringing together some of medicine's premier talent to meet the health challenges faced by today's children and expectant mothers. If you'd like to be part of an organization that's establishing new standards of care—and helping children and their families grow stronger every step of the way—consider joining us today.

To find out more about how you can make an impact on our growing organization, please send your resume with "**Pediatric Cardiologist**" in the subject line of your email to: [mlipman@stanfordchildrens.org](mailto:mlipman@stanfordchildrens.org).



# Abbott and Stereotaxis Technologies Used in First Integrated Procedures in the United States

GLOBE NEWSWIRE -- Stereotaxis (NYSE: STXS), a pioneer and global leader in surgical robotics for minimally invasive endovascular intervention, today announced the first patients in the United States have been treated successfully utilizing Abbott's EnSite™ X EP System integrated with Stereotaxis' Robotic Magnetic Navigation System.

The integration of Abbott's leading cardiac mapping system and Stereotaxis' advanced robotic technology, first announced at Heart Rhythm 2023, combines highly detailed real-time diagnostic information with the unprecedented precision and stability of robotics during therapy delivery. The first integrated procedures in the US were completed by physicians at Weill Cornell Medical Center, Mount Sinai Morningside, Banner University Medical Center Phoenix, and Overland Park Regional Medical Center.

"We are very pleased with how well these initial procedures went and the progress toward open interoperability with robotics in electrophysiology," said Dr. Dhanunjaya Lakkireddy, Electrophysiologist and Executive Medical Director of Kansas City Heart Rhythm Institute at Overland Park Regional Medical Center. "Combining Abbott's leading cardiac mapping system with Stereotaxis' advanced robotic technology enhances precision and streamlines procedure workflow, ultimately benefiting the patients we are dedicated to treating."

"Abbott and Stereotaxis have each played leading roles in advancing care for the most complex and difficult to treat arrhythmia patients," added Dr. Jim Cheung, Associate Director of Cardiac Electrophysiology at Weill Cornell Medical Center. "We are delighted to be able to use both technologies in an integrated fashion, leveraging the combined benefits in diagnosis and therapy for our patients."

"As long-term users of both Abbott and Stereotaxis technology, we appreciate the ability to use these technologies together with a smooth integrated workflow," said Dr. Ranjit Suri, Professor of Medicine at the Icahn School of Medicine at Mount Sinai. "Increased physician choice and technology interoperability benefits patients, physicians and providers."

"The success of these procedures demonstrates the unmatched potential and importance of increased collaboration in the field of electrophysiology," added Dr. J. Peter Weiss, Director of Ventricular Arrhythmia Management and Robotics at Banner University Medicine Heart Institute. "The combined benefits of advanced mapping and robotic technologies allows us to envision a new era of cardiac care where personalized therapy is designed and delivered to each individual patient. It's a game-changer for the field."



## About Stereotaxis

Stereotaxis (NYSE: STXS) is a pioneer and global leader in innovative surgical robotics for minimally invasive endovascular intervention. Its mission is the discovery, development and delivery of robotic systems, instruments, and information solutions for the interventional laboratory. These innovations help physicians provide unsurpassed patient care with robotic precision and safety, expand access to minimally invasive therapy, and enhance the productivity, connectivity, and intelligence in the operating room. Stereotaxis technology has been used to treat over 100,000 patients across the United States, Europe, Asia, and elsewhere. For more information, please visit:

[www.stereotaxis.com](http://www.stereotaxis.com).

This press release includes statements that may constitute "forward-looking" statements, usually containing the words "believe," "estimate," "project," "expect" or similar expressions. Forward-looking statements inherently involve risks and uncertainties that could cause actual results to differ materially. Factors that would cause or contribute to such differences include, but are not limited to, the Company's ability to manage expenses at sustainable levels, acceptance of the Company's products in the marketplace, the effect of global economic conditions on the ability and willingness of customers to purchase its technology, competitive factors, changes resulting from healthcare policy, dependence upon third-party vendors, timing of regulatory approvals, the impact of pandemics or other disasters, and other risks discussed in the Company's periodic and other filings with the Securities and Exchange Commission. By making these forward-looking statements, the Company undertakes no obligation to update these statements for revisions or changes after the date of this release. There can be no assurance that the Company will recognize revenue related to its purchase orders and other commitments because some of these purchase orders and other commitments are subject to contingencies that are outside of the Company's control and may be revised, modified, delayed, or canceled.





## Pediatric Cardiologist Heart Transplant and Advanced Heart Failure

Phoenix Children's - Division of Cardiology, is actively seeking up to 3 full-time faculty to join the Advanced Heart Failure – Cardiac Transplant Team at the level of Instructor, Assistant, or Associate Professor of Clinical Pediatrics and Child Health. There is an opportunity for the right candidate to join as or develop into the role of Director of Mechanical Circulatory Support depending on experience. The program performs an average of 12-15 heart transplants annually, follows heart failure patients in both the inpatient and outpatient setting and supports a mechanical circulatory support program offering the full range of pediatric and adult devices. Applicants must have an M.D. or equivalent degree, be board certified or board eligible in Pediatric Cardiology by the American Board of Pediatrics and eligible for medical licensure in the State of Arizona. Candidates will have already completed an ACGME accredited 3-year fellowship in Pediatric Cardiology, with additional 1-2 years of advanced subspecialty training in pediatric advanced heart failure including management of cardiac transplant patients and mechanical circulatory support. This position is not currently accepting J1 visa candidates.

Candidates should demonstrate a rigorous academic focus preferably in clinical and/or translational research, however, basic science opportunities are also available. Academic clinical faculty appointments will be facilitated at the University of Arizona College of Medicine – Phoenix and Tucson, Creighton University School of Medicine, and Mayo Clinic School of Medicine – Scottsdale. Additional research collaborations exist with the Translational Genomics Research Institute (tGen) and the Arizona State University, Department of Bioengineering.

The Division of Cardiology currently hosts a fellowship training program in general pediatric cardiology with 9 fellows distributed over 3 years. The Phoenix Children's Center for Heart Care also hosts subspecialty fellowships in pediatric cardiac critical care, advanced cardiac imaging, and interventional cardiac catheterization. The inpatient service includes a 48-bed CV intensive care unit and transition care unit. Patient care is interdisciplinary involving transplant cardiology, cardiovascular surgery, and dedicated cardiac NP and PA providers. The provision of both workplace based and didactic teaching to fellows, residents, medical students, and nurses is an expectation in this role. The successful candidate(s) will join our program with 24 cardiologists, 13 cardiac intensivists, 3 cardiovascular surgeons, and 25 advanced practice providers. Inpatient pediatric cardiac care is centered at the Phoenix Children's Hospital while adult congenital inpatient care and procedures are also provided at St. Joseph's Hospital and Medical Center. Ambulatory cardiac services are centered at the Center for Heart Care – Thomas Campus and satellite offices are located throughout the Phoenix metropolitan area. Additional general cardiology outreach offices are in Tucson, Prescott, and Yuma AZ.

The Phoenix metropolitan area is the 5th largest metropolitan area in the United States with a population of ~1.6M and an estimated pediatric population of 1M in Maricopa county alone. Phoenix Children's is one of the largest freestanding children's hospitals in the nation with 433 licensed beds and a faculty of over 1200 employed / affiliated physicians. Phoenix is consistently ranked among the Best Places to live in the United States and boasts over 300 sunny days per year and convenient access to ocean and mountain attractions.

**Interested candidates should send a curriculum vitae with a cover letter of introduction to:**

**David Blaha**  
Physician Talent Acquisition Partner  
[dblaha@phoenixchildrens.com](mailto:dblaha@phoenixchildrens.com)

**Interested candidates can also contact the program director directly:**  
**Steve Zangwill, MD**  
[szangwill@phoenixchildrens.com](mailto:szangwill@phoenixchildrens.com)



# APRIL

06<sup>TH</sup>-08<sup>TH</sup>

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17<sup>TH</sup>-20<sup>TH</sup>

**PICS-IPC Istanbul 2024**

Istanbul, Turkey

<https://picsistanbul.com/en>

18<sup>TH</sup>-19<sup>TH</sup>

**EPIC 2024**

Virtual

<https://wondrmedical.net/ch/EPIC>

# MAY

02<sup>ND</sup>-04<sup>TH</sup>

**SCAI 2024**

Long Beach, California, USA

<https://scai.org/scai-2024-scientific-sessions>



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# Program Directory 2023-2024

*Published Mid-August*

Directory of Congenital & Pediatric  
Cardiac Care Providers in North  
America

Contact information at each program  
for Chief of Pediatric Cardiology &  
Fellowship Director

Lists each program's  
Pediatric Cardiologists &  
Cardiothoracic Surgeons

Lists Pediatric Cardiology  
Fellowships

Distributed to  
Division Chiefs by mail

Electronic version available on  
CCT's website:

[CongenitalCardiologyToday.com/  
Program-Directory](http://CongenitalCardiologyToday.com/Program-Directory)

Need to update your listing?

Contact Kate Baldwin

[kate.f.baldwin@gmail.com](mailto:kate.f.baldwin@gmail.com)



# General Pediatric Cardiologist

## Tampa Bay, Florida

Pediatric Cardiology Associates, located in Tampa Bay on Florida's beautiful Gulf Coast, is seeking a board-certified or board-eligible **General Pediatric Cardiologist**. We are a large, experienced, and well-established team of 15 pediatric cardiologists and 3 NPs with multiple offices and clinics located throughout the Tampa/St. Petersburg area.

### Primary Responsibilities

- Covering the various general pediatric cardiology outpatient clinics in the Tampa Bay area
- Inpatient visits and TEEs in the pediatric cardiac OR for approximately one week out of every 4-6 weeks

### Practice Details

- Large, experienced, well-established team of 15 pediatric cardiologists and 3 NPs with 9 offices and clinics located throughout the Tampa/St. Petersburg area
- Offer comprehensive congenital cardiac care from fetal life through adulthood
- The team includes members of all pediatric cardiology sub-specialties including: fetal, advanced imaging (CT, MRI, 3D echo), intervention, electrophysiology, cardiomyopathy/heart failure, preventive, and adult congenital cardiology
- The interventional team performs over 400 catheterizations per year, about 60% of which are interventions
- Recent interventional team accomplishments include:
  - Implanting their 250th transcatheter pulmonary valve, Spring 2023
  - First program in Tampa Bay and second in Florida to implant Alterra adaptive pre-stent and Sapien valve, Summer 2022
  - First program in Florida to implant Harmony valve, Fall 2021
  - PDA stenting largely replaced surgical shunt placement in Spring 2020 for neonates with diminished pulmonary blood flow
  - First program in Florida to implant the Gore Cardioform ASD Occluder, Fall 2019
  - First program in Tampa Bay to offer PDA device closure for premature newborns, first implant, Winter 2016
- Sub-specialty clinics include general pediatric cardiology, interventional, fetal, pulmonary hypertension, cardiomyopathy, ACHD, electrophysiology, and preventive cardiology
- Our ACHD program is the ONLY certified Adult Congenital Heart Association program in north and central Florida
- This position also offers 24/7 collaboration with our excellent pediatric cardiac surgical and pediatric cardiac intensive care teams at St Joseph's Children's Hospital
- Our center offers a unique depth of hospital infrastructure:
  - Two state of the art 1000+ square foot hybrid capable catheterization labs/ORs (one biplane, one single plane)
  - Two additional biplane catheterization labs
  - Two EP labs
  - Dedicated congenital cardiac OR
  - Comprehensive pediatric cardiac intensive care unit with in-house 24-hour cardiac intensivists coverage
- We have the added benefits of a children's hospital inside a large tertiary adult hospital, which is attached to a dedicated women's hospital. The women's hospital includes a Level IV NICU. This simplifies care across all patient ages with easy access to consultants from all pediatric and adult specialties
- Pediatrix, as a national pediatric cardiology group with over 125 pediatric cardiologists, provides opportunities for quality initiatives that can have national impact
- We offer an attractive schedule allowing freedom to enjoy a great quality of life
- Generous compensation and benefits package offered

### About the Area

Tampa Bay's warm weather affords plenty of opportunities to relish the great outdoors year round. You will live in a region others only get to enjoy on vacation. Golf at one of nearly 100 courses or relax on one of the many pristine white-sand beaches. The area offers an assortment of family venues such as zoos, aquariums, theme parks, and state parks. Additionally Tampa Bay offers access to world-class museums, professional sporting events and the performing arts. There is a wide range of residential choices to fit every budget and lifestyle – whether you are looking for big city downtown living, golf course communities, waterfront lifestyle, majestic horse farms or historic neighborhoods. There is no state income tax.

### Qualifications

- Ideally seeking candidates with TEE and cardiac ICU experience and at least 3 years of experience post-fellowship
- BC/BE in Pediatric Cardiology

### Benefits and Compensation

Our clinicians enjoy a competitive compensation package with many locations offering sign on bonuses, relocation and tuition reimbursement. Benefits for Full Time employee and qualified dependents:

- Health Insurance including prescription drugs
- Dental Insurance
- Vision Insurance
- Life Insurance
- Short- and Long-Term disability options
- Employee stock purchase program – 15% discount\*
- 401k with company match\*\*
- Long Term Care (LTC)
- Pre-tax Health Savings Account (HSA)
- Pre-tax Flexible Spending Accounts (FSA)
- Aflac Hospital, Critical Illness and Accident plans
- Identity Protection
- Employee Assistance Program (EAP)

\*Part Time Regular employee classifications also receive this benefit

\*\* Available to part-time regular and part-time casual employees age 21 and over

### About Us

Pediatrix® Medical Group, Inc. (Pediatrix) is the nation's leading provider of physician services. Pediatrix-affiliated clinicians are committed to providing coordinated, compassionate and clinically excellent services to women, babies and children across the continuum of care, both in hospital settings and office-based practices. Specialties include obstetrics, maternal-fetal medicine and neonatology complemented by more than 20 pediatric subspecialties, as well as pediatric primary and urgent care clinics. The group's high-quality, evidence-based care is bolstered by significant investments in research, education, quality-improvement and safety initiatives. The physician-led company was founded in 1979 as a single neonatology practice and today provides its highly specialized and often critical care services through more than 5,000 affiliated physicians and other clinicians in 37 states. *Please Note: Fraudulent job postings/job scams are becoming increasingly common. All genuine Pediatrix job postings can be found through the Pediatrix Careers site: [www.pediatrix.com/careers](http://www.pediatrix.com/careers).*

### Pediatrix is an Equal Opportunity Employer

All qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, disability or veteran status.

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# Pediatric Cardiologist

## Southern California Permanente Medical Group

Los Angeles, California

**I am a PERMANENTE PHYSICIAN.**

**A skilled practitioner who seeks to create high-quality outcomes through integrated care.**

Every physician who is part of the **Southern California Permanente Medical Group** shares a passion for advancing the practice of medicine. We fuel that passion by creating a culture of innovation and collaboration—one where the quality of care we deliver is elevated by the accelerated resources we provide.

### PEDIATRIC CARDIOLOGIST

#### Opening in Los Angeles, California

Opportunity to join an established Pediatric Cardiology clinical practice comprised of ambulatory clinic, inpatient consultation/rounding, fetal/transsthoracic echo performance/interpretation, and limited cardiac catheterization responsibilities. The Pediatric Cardiology staff at the Southern California Permanente Medical Group currently consists of 12 full-time and 1 part-time per diem Pediatric Cardiologist across the Southern California region.

We are recruiting a full-time Pediatric Cardiologist to join our group in Los Angeles. The Kaiser Permanente Los Angeles Medical Center (LAMC) is a member of the Children's Hospital Association and is one of three tertiary medical centers in the Kaiser Permanente Pediatric Care (KPPC) network. LAMC is the flagship tertiary/quaternary care center for Kaiser Permanente in Southern California and is the site of the regional cardiac catheterization laboratories as well as all other highly complex subspecialty services in Southern California. As the referral center for all of Southern California, LAMC houses a 16-bed PICU, a 32-bed NICU, and a 32-bed inpatient Pediatric floor staffed 24/7 with hospitalists/intensivists.

Clinical responsibilities include call one day/week and one weekend every 6 weeks. We place great emphasis on fostering a strong culture of collaboration and support among pediatric medical and surgical specialties across the KP Southern California region. In addition, we play a very active role in training the next generation of physicians, both by teaching resident physicians/fellows and as a designated clerkship site for the Kaiser Permanente Bernard J. Tyson School of Medicine.

Potential clinical roles include:

- Outpatient consultation and follow-up care
- Inpatient consultation and rounding
- Performing/interpreting transthoracic echo – limited fetal echo duties
- Cardiac Catheterization Lab – function as an assistant (never solo) 6 days/month
- Providing virtual medical care
- Physician-physician advice via telephone and electronic advice communication tools
- Shared call schedule with other KP pediatric Cardiology physicians
- Opportunity for mentorship and clinical teaching of KP School of Medicine students.
- Bimonthly Regional Cardiac conference and discussion

#### SCPMG is proud to offer its physicians:

- An organization that has served the 4.9 million Kaiser Permanente members throughout Southern California for more than 70 years
- A physician-led, physician-owned, and physician-operated practice that equally emphasizes professional autonomy and cross-specialty collaboration
- Comprehensive administrative support
- An environment that promotes excellent service to patients
- A fully implemented electronic medical record system
- An excellent salary, comprehensive benefits, and partnership eligibility after 3 years

Pay range for full-time openings is \$273,111.00 - \$372,375.00. Minimum salaries are inclusive of premium pay and incentives depending on skills and competencies and geographic location. Annual Salary will be based on longevity with the Group and FTE work schedule/effort.

For consideration or to apply, please visit our website at: <https://southerncalifornia.permanente.org/jobs/type/pediatrics>.

For questions or additional information, please contact **Glenn Gallo** at: 877-608-0044 or [Glenn.Gallo@kp.org](mailto:Glenn.Gallo@kp.org). We are an AAP/EEO employer.

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