Upper Extremity Vascular Access for Invasive Pulmonary Hypertension Assessment in the Pediatric Population

Jess Randall, MD; Jenny Zablah, MD; Ryan Leahy, MD; Megan Albertz, MD; Ben Frank, MD; Dunbar Ivy, MD; Gareth J. Morgan, MD, BaO, BCh

Index words: Vascular access, pulmonary hypertension, pediatric, adolescent, basilic vein

Abstract

Introduction

The aim of this study was to compare access in either the basilic or brachial vein (BVA) to other access sites for invasive assessment of pulmonary hypertension in the cardiac catheterization laboratory in patients under 18 years of age.

Methods

A retrospective review was performed on five patients between 12 and 18 years of age who had undergone cardiac catheterization via upper extremity venous access with a previous cardiac catheterization recorded via traditional femoral access at a single institution between July 2019 and April 2020. Medical records were reviewed for data related to pulmonary hypertensive therapy, catheterization, anesthesia care, recovery and hospital duration.

Results

Five patients underwent six catheterizations via BVA. Access was successful in all cases via either the right basilic or brachial vein and the right radial artery for blood pressure monitoring. All catheterizations with BVA were performed without intubation or airway adjuncts and with spontaneous respiration. Mean doses of fentanyl (4.2 vs 85mcg) were lower with BVA, with patients in 3/6 BVA procedures receiving only local anesthesia, though midazolam administration was slightly higher in the BVA group (1.3 vs 1.2mg). Diagnostic catheter time (37 vs 57 min), time to hemostasis (7 vs 10 min), and time from sheath removal to the recovery room (14 vs 20 min) was lower in the BVA group. In patients with same-day discharge, time from procedure conclusion to hospital discharge was lower in the BVA group (89 vs 187 min). There were no complications in either group.

Conclusions

Brachial or basilic venous access for catheter-based hemodynamic assessment in patients over 12 years of age allows accurate diagnostic assessment under physiologic conditions with decreased need for vasoactive medications and decreased time to ambulation and discharge following catheterization.
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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 ≥ 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 other active infections, known intolerance to Nitinol (titanium or nickel), or an anticoagulant/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. Do not reuse, reprocess, or resterilize 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 reterilize 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. This leads to injury to the patient.

Delivery catheter system (DCS): This device was designed for single use only. Do not reuse, reprocess, or resterilize the DCS. Do not use the device if any component of the device is damaged, 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 Harmony TPV implantation. Physicians should use judgment when considering repositioning of the TPV (for example, using a snare or forceps) once deployment is complete. Re-positioning the bioprostheses 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). Re-positioning 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 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 force 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. Pre-procedure, 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, hemorrhage, 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: abnormally lab values (including electrolyte imbalance and elevated creatinine), allergic reaction to anticoagulation of the TPV, contrast agents, 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.
UPPER EXTREMITY VASCULAR ACCESS FOR INVASIVE PULMONARY HYPERTENSION

Introduction

Pulmonary arterial hypertension is a relatively common indication for invasive assessment in the pediatric cardiac catheterization laboratory, with more than five percent of catheterizations at our institution performed purely to evaluate or diagnose pulmonary hypertension. Venous access for catheterization in children is often performed either via a femoral or internal jugular approach, with arterial access obtained at the discretion of the operator. Upper extremity venous access for adult right heart catheterization is well-described, though reports in patients under the age of 18 are rare.1,2 The aim of this study was to compare brachial or basilic venous access (BVA) with minimal sedation to the more traditional femoral or jugular access sites for invasive assessment of pulmonary hypertension in the cardiac catheterization laboratory in patients under 18 years of age.

Methods

This was a retrospective case control study analyzing medical records of patients who underwent cardiac catheterization from July 2019 through April 2020 at the Children's Hospital of Colorado. Approval was provided by the University of Colorado Institutional Review Board. The medical records of all patients who underwent catheterization for assessment of pulmonary hypertension via basilic or brachial venous access were then reviewed for any previous catheterization at an age greater than 12 years. All previous catheterizations were performed via non-upper extremity sites and used as a control group for analysis. Medical records for all catheterizations were retrospectively reviewed for: demographic information, baseline pulmonary hypertension therapy, information related to cardiac catheterization (vascular access, hemodynamic, and radiographic information), anesthetic and vasoactive medication administration during catheterization, and information related to hospital and procedure duration.

Patient Preparation and Vascular Access Technique

Vascular access was obtained in all patients via the right arm in either the basilic or brachial vein (Figure 1). The basilic vein was the primary site for access, with use of the brachial vein as an alternative access point if the basilic vein was not easily cannulated or felt to be inadequate on ultrasound assessment. The right arm was abducted and supported at 60-90° from the patient’s flank with the wrist extended and supported to facilitate radial arterial access. All procedures were performed with a cardiac anesthesiologist in attendance in case of patient emergency and/or need for advanced airway management or conversion to higher level of anesthesia care. Prior to draping and skin cleansing for the procedure, ultrasound was used to identify the right brachial artery, brachial vein, and basilic vein (Figure 2). The venous access site was then marked with a non-sterile marking pen that resists fading with skin cleansing and a tourniquet loosely positioned near the axilla. Similarly, the right radial and ulnar arteries were assessed by ultrasound prior to patient draping. The skin and subcutaneous tissues were infiltrated with 1% buffered lidocaine and the tourniquet tightened on the upper arm. Ultrasound-guided modified Seldinger technique was then used to access the target vein using a Cook Medical Micropuncture needle and 0.018” wire (Cook Incorporated, Bloomington, IN). Once the wire was placed, the tourniquet was removed and wire position verified by fluoroscopy. A 6Fr, 10cm Terumo Pinnacle Precision sheath (Terumo Medical Corporation, Somerset, NJ) was then introduced over the wire in standard fashion (Figure 3). Radial access was then obtained via ultrasound guidance utilizing a modified 21 Gauge winged butterfly needle and the micropuncture wire. Once radial arterial access was obtained, a 20 Gauge leader catheter was inserted for continuous hemodynamic monitoring and sampling. The arterial catheter was secured with transparent dressings and the pressure tubing and flush were clipped and supported along the length of the patient’s arm to minimize tension and risk of accidental removal. The right heart catheterization was then performed with a 6Fr Swan-Ganz thermodilution catheter.
Results

Baseline patient demographics are detailed in Table 1, with five patients undergoing six catheterizations in the BVA cohort. Baseline hemodynamic measures are summarized in Table 2. Vascular access in the BVA group was successful in all cases in either the right brachial (4/6) or basilic (2/6) vein and right radial artery (6/6). Access in the control studies was obtained in the femoral vein in four patients and right internal jugular vein in one, with four of these patients receiving femoral arterial access. In one control group patient, femoral arterial access was obtained and displayed an accurate waveform, but blood could not be withdrawn. Baseline traditional access catheterizations were performed at a mean age of 13 years and 8 months of age (11yrs 6mo - 16yrs 11mo), with BVA catheterizations performed at 15yrs 11mo (14yrs-18yrs 11mo). There was a mean difference of 23 months between traditional and BVA catheterizations (3-40). All patients in both groups received monitored care by a cardiac anesthesiologist even if spontaneously ventilating without airway adjuncts. Four of five patients in the traditional access group underwent general anesthesia, with two of five patients undergoing endotracheal intubation and three of five receiving a laryngeal-mask airway (LMA). All patients with an LMA were spontaneously breathing during their catheterization (Table 3).

Midazolam was prescribed in 2mg doses along with fentanyl in multiples of 25mcg. These were administered as needed until the desired effects were achieved. Half of the catheterizations in the BVA group did not require any anxiolytic or pain medication for sedation. In one case, 4mg of midazolam was administered, with 2mg of midazolam in two procedures. One patient in the BVA group received 25mcg of fentanyl. Half of the patients in the BVA group received isotonic fluids at an average volume of 217mL (150-300mL). Doses of sedative and analgesic medications were significantly higher in the traditional access group, with three of five patients receiving 2mg midazolam and all patients receiving fentanyl at a mean dose of 65mcg; four of five patients receiving propofol, two of five receiving ketamine, four of five receiving an inhalational anesthetic, and two of five receiving rocuronium as a paralytic agent. Crystalloid administration was generally higher in the traditional access group, with an average of 410mL of fluid administered (0-1000mL).

All patients in the BVA group underwent diagnostic catheterization without angiography or intervention. Four of five patients in the traditional access group underwent catheterization as their primary diagnostic study, with all four patients undergoing pulmonary

<table>
<thead>
<tr>
<th>TABLE 1</th>
<th>Demographics – mean (min, max)</th>
</tr>
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<tbody>
<tr>
<td>Patients (n)</td>
<td>5 (5)</td>
</tr>
<tr>
<td>Catheterizations (n)</td>
<td>5 (6)</td>
</tr>
<tr>
<td>Age (mo)</td>
<td>164 (138,203) (191,227)</td>
</tr>
<tr>
<td>Time from traditional to BVA cath (mo)</td>
<td>23 (3,40)</td>
</tr>
<tr>
<td>Female (n)</td>
<td>4 (4)</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>52 (34,73) 62 (55,78)</td>
</tr>
<tr>
<td>Venous Access Site</td>
<td></td>
</tr>
<tr>
<td>Arm</td>
<td>0 (6)</td>
</tr>
<tr>
<td>Femoral</td>
<td>4 (0)</td>
</tr>
<tr>
<td>Internal Jugular</td>
<td>1 (0)</td>
</tr>
<tr>
<td>Arterial Access Site</td>
<td></td>
</tr>
<tr>
<td>Radial</td>
<td>0 (6)</td>
</tr>
<tr>
<td>Femoral</td>
<td>4 (0)</td>
</tr>
<tr>
<td>PH Therapy</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>3 (0)</td>
</tr>
<tr>
<td>Oxygen</td>
<td>0 (1)</td>
</tr>
<tr>
<td>Ca Channel Blocker</td>
<td>0 (2)</td>
</tr>
<tr>
<td>PDE5 Inhibitor</td>
<td>2 (6)</td>
</tr>
<tr>
<td>ERA</td>
<td>1 (3)</td>
</tr>
<tr>
<td>Prostanoid Therapy</td>
<td>2 (5)</td>
</tr>
<tr>
<td>Total Sheath Time (min)</td>
<td>114 (84,131) 47 (34,58)</td>
</tr>
<tr>
<td>Total Time in Cath Lab (min)</td>
<td>161 (136,193) 97 (86,109)</td>
</tr>
<tr>
<td>Sheath Out to Lab Out Time (min)</td>
<td>20 (18,21) 14 (14,15)</td>
</tr>
<tr>
<td>Sheath Out to Discharge Time (min)</td>
<td>206 (190,242) 103 (75,135)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TABLE 2</th>
<th>Baseline Hemodynamics – mean (min, max)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RV Systolic Pressure (mmHg)</td>
<td>55 (27,105) 50.5 (34,93)</td>
</tr>
<tr>
<td>RV End Diastolic Pressure (mmHg)</td>
<td>6 (5,8) 10 (7,23)</td>
</tr>
<tr>
<td>Systemic Systolic Pressure (mmHg)</td>
<td>88 (65,102) 106 (97,118)</td>
</tr>
<tr>
<td>Systemic Mean Pressure (mmHg)</td>
<td>64 (52,74) 75 (66,87)</td>
</tr>
<tr>
<td>%RV Pressure vs Systemic</td>
<td>60% (40,100) 50% (30,100)</td>
</tr>
<tr>
<td>PA Systolic Pressure (mmHg)</td>
<td>55 (26,105) 52 (33,107)</td>
</tr>
<tr>
<td>PA Mean Pressure (mmHg)</td>
<td>39 (18,81) 37 (22,82)</td>
</tr>
<tr>
<td>Pulmonary Artery Wedge Pressure (mmHg)</td>
<td>8 (7,10) 10 (7,17)</td>
</tr>
<tr>
<td>Transpulmonary Gradient</td>
<td>31 (9,74) 27 (13,65)</td>
</tr>
<tr>
<td>PVRi</td>
<td>12.4 (2.1,30.3) 8.8 (3.2,22.6)</td>
</tr>
<tr>
<td>Rp/Rs</td>
<td>0.5 (0.2,1.1) 0.4 (0.2,1.2)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TABLE 3</th>
<th>Anesthetic Care – mean (min, max)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASA Status</td>
<td>3.3 (3,4) 2.8 (2,3)</td>
</tr>
<tr>
<td>Anesthetic</td>
<td></td>
</tr>
<tr>
<td>General</td>
<td>0 (4)</td>
</tr>
<tr>
<td>Monitored Anesthesia</td>
<td>6 (1)</td>
</tr>
<tr>
<td>Care</td>
<td></td>
</tr>
<tr>
<td>Airway</td>
<td></td>
</tr>
<tr>
<td>Own Airway</td>
<td>6 (1)</td>
</tr>
<tr>
<td>LMA</td>
<td>0 (2)</td>
</tr>
<tr>
<td>Endotracheal Intubation</td>
<td>0 (2)</td>
</tr>
<tr>
<td>Spontaneous Respiration</td>
<td>6 (3)</td>
</tr>
<tr>
<td>Propofol Administered</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>0 (4)</td>
</tr>
<tr>
<td>No</td>
<td>6 (1)</td>
</tr>
<tr>
<td>Paralytic Administered</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>0 (2)</td>
</tr>
<tr>
<td>No</td>
<td>6 (3)</td>
</tr>
<tr>
<td>Crystalloid Volume Administered (mL)</td>
<td>108 (0,300) 410 (0,1000)</td>
</tr>
<tr>
<td>Midazolam Dose (mg)</td>
<td>1.33 (0.4) 1.2 (0.2)</td>
</tr>
<tr>
<td>Fentanyl Dose (mcg)</td>
<td>4.17 (0.25) 65 (0.125)</td>
</tr>
<tr>
<td>Ephedrine Administered</td>
<td>0 (1)</td>
</tr>
<tr>
<td>Phenylephrine Administered</td>
<td>0 (1)</td>
</tr>
</tbody>
</table>
Immediate Opportunity for Pediatric Cardiologist to Join Thriving Practice in South Florida

Nicklaus Children’s Hospital, a 309-bed freestanding children’s hospital and Level I trauma center, and Nicklaus Children’s Pediatric Specialists, the physician multispecialty group practice of Nicklaus Children’s Health System, have an exceptional opportunity for a BC/BE fellow-trained pediatric cardiologist.

Join a thriving and expanding group in Florida’s Broward County area. The candidate will provide comprehensive outpatient and inpatient consultative services and should be highly skilled in noninvasive imaging, including fetal cardiology. This role presents a unique and exciting opportunity for a motivated candidate to flourish in a burgeoning market and reside in one of the most sought-after neighborhoods in Florida.

Nicklaus Children’s Hospital is an affiliate of the Florida International University Herbert Wertheim College of Medicine. Our state-of-the-art Advanced Care Pavilion houses a 34-bed cardiac in-patient unit with an adjustable acuity model that allows all rooms to accommodate critically ill patients with heart disease. The Heart Institute offers a full range of services, including the management of patients following congenital heart surgery, interventional catheterization and invasive electrophysiology. Our cardiac surgical program, led by Dr. Redmond Burke, is one of the most transparent in the world. It remains the only cardiovascular surgical program to offer real-time outcomes reporting (https://rto.nicklauschildrens.org).

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NicklausChildrens.org/NCPS
DFW
The presence of two distinct fascial compartments of the upper extremity without a ligamentous or tendinous sheath crossing the plane of the vessel permits significant movement of the vein during access. To overcome this, we prefer using the Cook Micropuncture needle and wire due to its easy visualization by ultrasound, sharp needle point, and ease of wire introduction. Use of the ultrasound probe to apply compressing pressure at the time of access can help stabilize the vein and ease access. An ipsilateral radial arterial line was placed in all patients to ensure adequate systemic pressure assessment and appropriate blood gas measurements, including: measured oxygen saturation, pO2, pH, and CO2 levels. Given their importance in pulmonary vascular resistance calculations, assumed values from a pulse oximeter and other non-invasive means can lead to errors in measurement, particularly if the patient is hypoxic.

Once access is obtained, the right heart catheterization is performed in a standard fashion, with patients in the BVA group demonstrating a reduction in diagnostic catheter duration by nearly 50% when compared to the traditional access group. An important intraprocedural consideration was the method of supplemental oxygen and nitric oxide (NO) delivery. Pulmonary vasoreactivity testing using NO delivered via a tight-fitting face mask has previously been described.9,10 Our standard practice for oxygen delivery has been via face mask, with the delivery of NO achieved by the addition of nasal cannula within the face mask connected to the nitric oxide circuit. With administration of 100% oxygen at 5LPM and administration of 40ppm inhaled nitric oxide via nasal cannula, we have measured an effective fractional inspired oxygen concentration of 0.6. Standards for assessment of oxygen consumption in spontaneously breathing patients in the cardiac catheterization laboratory remains controversial, so our approach for hemodynamic calculations has been to utilize assumed oxygen consumption via LaFarge tables to permit Fick calculation and also to assess the resistance and flow using thermodilution cardiac outputs.11,12

By providing an encounter where the patient is alert with minimal painful stimulus and with pre-procedural and intra-procedural support from behavioral therapists and catheterization staff, we believe that BVA offers improved patient safety and patient experience. Patients can be provided with distracting technologies through the duration of the procedure, including music via headphones, movies via mounted tablets, and virtual reality headsets. After sheath placement, there is minimal/no painful stimuli, and the patient can determine their level of engagement with the procedure. Once the procedure is completed, application of manual pressure is applied with short time to hemostasis and ambulation. Patients in our study demonstrated shorter time to hemostasis and post-procedural time to hospital discharge when compared to femoral venous access. Without need for a “lay-flat” time and quick hemostasis, the only limits to ambulation and discharge relate to completion of necessary discharge paperwork and post-procedural consultation with the catheterization and pulmonary hypertension teams. Selection of candidates for basilic access is currently limited to those who are likely to cooperate with the procedure, and we estimate that a developmentally typical child could tolerate the procedure at a minimum age of 12 years. We have continued to expand this approach and have now performed more than 50 BVA diagnostic catheterizations in children;
other key patient populations in whom the risk benefit profile of this strategy is favorable are patients following cardiac transplant presenting with acute rejection and patients with poorly compensated heart failure. To date, our youngest basilic access patient was 12 years of age at the time of catheterization. Though we did not perform a cost analysis on our cohort, it is anticipated that the decreased anesthetic care and hospital resource utilization translates to a net cost savings for both the patient and hospital system.

This study has multiple limitations, including its retrospective design and small patient population, which limit true statistical assessment of the impact of basilic venous access when compared to traditional forms of access.

Conclusion
Access via the basilic or brachial vein is an easy and reliable method for diagnostic cardiac catheterization in older children with pulmonary hypertension. Rapid turnover, and time to ambulation and discharge have widespread beneficial effects. It also facilitates assessment of the pulmonary vascular bed under awake physiological conditions compared with catheterization techniques which require general anesthesia or deep sedation. This in turn allows avoidance of the pitfalls of induction of anesthesia which can be fraught in populations with tenuous hemodynamics.

Declarations
Funding
No external funding was provided for this study.

Conflict of Interest
No authors have any conflicts of interest to declare related to this study.

Ethics Approval
This study was reviewed by the University of Colorado IRB and found to be exempt from review.

References
UPPER EXTREMITY VASCULAR ACCESS FOR INVASIVE PULMONARY HYPERTENSION

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Hospital Directory 2021-2022

Published Mid-August

• Hospitals that Offer Open Heart Surgery for Children in North America

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

• Lists each hospital’s Pediatric Cardiologists & Cardiothoracic Surgeons

• Lists Pediatric Cardiology Fellowships

• Distributed to Division Chiefs by mail

• Hard copies are available at CCT’s booth at PICS 2021

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Hospital Directory

Published Mid-August

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CAREER OPPORTUNITY

Assistant, Associate and Professor Level Positions in Fetal Imaging, Heart Failure/Transplant, General, Inpatient, and Interventional Cardiology

Join the University of Maryland School of Medicine, Department of Pediatrics, Division of Pediatric Cardiology. As we grow our nationally ranked pediatric heart program, we are seeking Assistant, Associate and Professor level candidates in the following areas: fetal imaging, heart failure/transplant general, inpatient, and interventional cardiology.

The successful applicant must have a MD or MD and PhD degrees, or their equivalent. Candidates should have clinical training in Pediatrics and Pediatric Cardiology (completed fellowship and be board eligible or board certified).

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Applicants should contact:
Geoffrey L. Rosenthal, MD, PhD
Director, University of Maryland Children’s Heart Program
grosenthal@som.umaryland.edu

UMB is an equal opportunity/affirmative action employer. All qualified applicants will receive consideration for employment without regard to sex, gender identity, sexual orientation, race, color, religion, national origin, disability, protected Veteran status, age, or any other characteristic protected by law or policy.
In last month’s CCT column we started a dialogue with you about ADVOCACY—how our community can advocate for policies to improve our ability to care for patients with Congenital Heart Disease. As a global organization, are there fundamental policy goals we all share? How can we learn from—and help—one another? Do we have Power in Numbers through our unified global voice?

This month let’s bring the patient perspective into our dialogue. Is our advocacy voice stronger when we partner with like-minded, highly motivated patients and parents?

To answer that question, we held a roundtable including one patient advocate, Natalie Poli, Ed.S (Itasca Illinois, USA) along with PICS Society President Ziyad M. Hijazi, MD, MPH, FPICS; PICS Advocacy Chair John P. Cheatham, MD, FPICS; and PICS Executive Director Norm Linsky.

**Highlights**

Tell us about life before your CHD diagnosis, Natalie: Since childhood I have always been very active. I exercised often, played sports and was pretty much symptom-free. I was even a dancer for the elite Chicago Bulls ‘Luvabulls’ squad, performing at professional sports events. At age 29 I had a stroke! Occasionally my chest felt heavy when I was performing, but my CHD remained undiagnosed. I was nine weeks postpartum when one minute I was fine and the next minute I hit the floor. I lost my speech and feeling in the right side of my body. After stabilization at the hospital, they identified two PFO’s and an atrial septum aneurysm. I went to multiple hospitals for second opinions. One friend knew someone who previously had a similar condition treated by Dr. Hijazi, so I made the call. Dr. Hijazi carefully evaluated me, then closed my defects with two ASD devices. Thankfully, I made a full recovery. Without knowing it then, I had started my journey as a patient advocate, in this instance advocating for me!

What did you learn from that experience, Natalie? I was lucky. Many aren’t. We can change that! I learned never to take “no” for an answer, but rather to ask questions. I wasn’t knowledgeable about my CHD, but I learned fast. I became my own advocate—that’s so important! Working together we can advocate for better public education, funding, screening and device development.

Do you agree with that, Dr. Hijazi? Absolutely. I would advocate that everyone should undergo an echocardiogram, ideally during childhood where CHD can be effectively diagnosed and treated before symptoms such as Natalie’s stroke happen. That is the gold standard test to say ‘yes’ or ‘no’ as to whether you have a congenital heart condition. As Natalie said, she went to many doctors, at times symptomatic, but her condition remained undetected. Unfortunately, holes between the upper chambers of the heart often remain undetected unless the physician is specifically looking for this defect. That’s why 50% of my patients are adults with previously undetected Atrial Septal Defects. This type of CHD is very difficult to diagnose without highly specialized training and technology. Many areas of the world have mandatory pulse ox screening at birth, which detects some—but not all—types of CHD. An early screening echocardiogram must become essential for everyone. We must advocate for this!

“\textit{I became my own advocate—that’s so important. I was lucky. Many aren’t. We can change that!}” – Natalie Poli, Ed.S.

**Did your life change?** Oh yes. I like to say my stroke chose ME, but after being treated I chose how to move forward and what my missions in life would be. I’m aiming high!

- Family: an amazing husband and children who support me 100%.

**Dr. Cheatham:** Dr. Hijazi brings up a vital point. An Atrial Septal Defect is one of the most common forms of CHD, yet often is undetected. Echo is the one definitive diagnostic test. Our Advocacy Committee must stress this to governments and insurers, showing with solid data that echo screening for CHD should be a covered exam available for all children.
CAREER OPPORTUNITY

Pediatric Cardiologist – Outpatient Focus
Division of Pediatric Cardiology, Department of Pediatrics
University of Utah School of Medicine

This is an excellent opportunity to join a vibrant and collegial academic environment. The Division of Pediatric Cardiology at the University of Utah School of Medicine has immediate openings for additional full-time, pediatric cardiologists with expertise and interest in general cardiology. Experience and or expertise in non-invasive cardiac imaging is highly desired. Clinical responsibilities will be carried out at Intermountain Healthcare’s Utah Valley Hospital, Primary Children’s Hospital (PCH), and a second PCH campus in Lehi, Utah that is scheduled to open in 2024. (The Lehi campus is a 30-minute drive from Salt Lake City.) Inpatient responsibilities will take place in the newly opened 15-bed Cardiac Care Unit (CCU) at PCH, and will include consulting in other units throughout the PCH and Lehi Campuses. The ideal candidate will be capable of managing all aspects of acute care cardiology and will have expertise as a consultant in the cardiac intensive care unit and other intensive and acute care units throughout the hospital. Inpatient work at PCH is supported by advanced practice providers (NPs and PAs), cardiology fellows, and pediatric residents. Outpatient responsibilities will be dedicated to outreach. Academic productivity in quality improvement, research, teaching, and advocacy is expected and supported by the division.

The Division has a very active research program with a strong support infrastructure and supporting team. The Division has been a core site of the Pediatric Heart Network of the National Institutes of Health (NIH) since its inception, and participates in the NPC-QIC and all the major registries including PC4, PAC3, and IMPACT. In addition, the Division is a core site for the Scientific Focus Research Network of the American Heart Association (AHA). Numerous opportunities for collaborative research exist within the Division, as well as throughout the Department, School of Medicine and University.

Qualified candidates must be Board Eligible/Board Certified in Pediatric Cardiology, and must have expertise in General Pediatric Cardiology. Experience and/or expertise in non-invasive cardiac imaging is strongly desired. Selected candidates will receive a faculty appointment in the Department of Pediatrics on the Clinical or Tenure Track at the academic rank commensurate with experience and qualifications.

The Department and University offers a competitive salary and an unmatched benefits program, including non-contributory retirement contributions of 20.2% of annual salary that vest immediately. The Department offers a faculty development and mentoring program designed to help faculty succeed in translational or basic research.

Salt Lake City is a rapidly growing, vibrant city in the Intermountain West, with a nationally recognized Broadway theater, ballet, symphony, and several professional sports teams. The Salt Lake International Airport is a hub for Delta Airlines and has direct flights to many North American cities and daily direct flights to multiple European cities. Outdoor activities are unparalleled: the city is a ski destination and a gateway to the state's renowned red rock landscapes. In addition to its 14 ski resorts, Utah boasts five national parks (with five more within a half-day's drive), a variety of golf courses allowing for year-round play, hundreds of miles of hiking and biking trails, and numerous other outdoor activities.

Interested individuals can apply for the position at https://utah.peopleadmin.com/postings/121536. Cover letter and curriculum vitae are required.

For additional information about the position, please contact:
Antonio Cabrera, M.D., Division Chief, at antonio.cabrera@hsc.utah.edu

The University of Utah Health (U of U Health) is a patient focused center distinguished by collaboration, excellence, leadership, and respect. The U of U Health values candidates who are committed to fostering and furthering the culture of compassion, collaboration, innovation, accountability, diversity, integrity, quality, and trust that is integral to our mission.

The University of Utah is an Affirmative Action/Equal Opportunity employer and does not discriminate based upon race, national origin, color, religion, sex, age, sexual orientation, gender identity/expression, status as a person with a disability, genetic information, or Protected Veteran status. Individuals from historically underrepresented groups, such as minorities, women, qualified persons with disabilities and protected veterans are encouraged to apply. Veterans’ preference is extended to qualified applicants, upon request and consistent with University policy and Utah state law. Upon request, reasonable accommodations in the application process will be provided to individuals with disabilities. To inquire about the University’s nondiscrimination or affirmative action policies or to request disability accommodation, please contact: Director, Office of Equal Opportunity and Affirmative Action, 201 S. Presidents Circle, Rm 135, (801) 581-8365.
Dr. Hijazi: You’re so right, John. Failure to do this can be tragic; I have seen this myself. I am hopeful that hospitals, governments and insurers can agree that echo can be priced affordably. The small investment would be worth ten times as much, so we could tell a parent “your baby has a normal heart” or “we found something called an ASD but we can correct it.” The joy, the ease you give to the family, you can’t put a price tag on that. Natalie is living proof, so we must advocate together!

Natalie: We have already started. As I was preparing for my recent pageant, I connected with my own elected Congressperson—I prepared my “ask” succinctly, which was basically “we need legislation to improve access to CHD screening and make it affordable to all.” I explained my survival and success story. He was very supportive, so stay tuned!

How Has the FDA’s Review Process For Interventional Devices Evolved?

Dr. Hijazi: For many years, FDA approval of CHD devices lagged behind the rest of the world, but recently that changed very positively in the US. While much remains to be done, we worked closely with the FDA. They listened and responded in a constructive dialogue. For many years, the FDA had required large clinical trials for CHD interventional devices, with trial population requirements impossible to meet—our patient populations are relatively small compared to larger medical specialties. One example among many: For the Amplatzer device for ASD closure in 1997, the FDA insisted the clinical trial had to be randomized against open heart surgery. Of course, trial enrollment was impossible. We went back to the FDA and after much effort on our part, FDA accepted alternative rigorously collected metrics to properly review these devices. The result? Thousands of lives have been dramatically improved through persistent advocacy!

Dr. Cheatham: Correct! Years ago, devices were developed in the United States but were first approved outside the US since the review process here was so slow. That severely limited our treatment options. Where previously “first in human” was rarely if ever performed in the US, the FDA changed that completely. Now the situation has been reversed, presenting challenges to our colleagues outside the US: the device approval process in many other countries has become more challenging. Our Advocacy Committee and the PICS Society overall has much to do in this area. There are encouraging signs on the horizon. For example, the Japanese equivalent of the FDA, has begun a project called “Harmonization,” in which my colleague and Advocacy Committee Co-Chair Dr. Hideshi Tomita is playing a major role. (Editor’s Note: Interviews with Dr. Tomita and Dr. Bharat Dalvi of India will be in the next issue of CCT). Similar efforts are underway by other colleagues to streamline device approval while maintaining safety and effectiveness.

Final Thoughts

Dr. Hijazi: The PICS Society is THE dedicated society for interventional treatment of CHD and is the voice of our community. We will continue to support our members’ efforts globally as they work with legislators, policymakers, payers and others towards the best possible patient care. We collaborate with other professional societies that share our values and look forward to partnering with excellent patient advocates such as Natalie.

“Years ago, it was very, very, VERY difficult to get the FDA to consider interventional devices & techniques to treat CHD. Back then FDA said, ‘We are here to protect the people.’ We said, ‘So are we!’ And we proved it with real data.” – Dr. John P. Cheatham

Dr. Cheatham: This will not be easy, but it is so important. We encourage our colleagues—wherever they live and work—to join our committee and move forward together. The Advocacy Committee (Co-Chaired by Dr. Tomita and by Dr. Cliff Kavinsky) welcomes new members—email us at info@CHDInterventions.org.

Natalie: Doctors, thank you for all you do. It’s going to take real life stories such as mine and so many others, working with amazing physicians and nurses, to move the policy needle. We’re not numbers, we are real-life individuals of all ages, able to accomplish so much IF we have access to the right diagnosis and treatment. Ready to roll up our sleeves!
**THE PICS SOCIETY ADVOCACY PROGRAM: POWER IN NUMBERS**

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**ZIYAD M. HIJAZI, MD, MPH, FPICS**

*PICS Society President*
*Professor of Pediatrics & Medicine*
*Weill Cornell Medicine*
*Chief Medical Officer*
*Executive Chair, Medicine*
*Director, Sidra Heart Center*
*Medical Director, International Affairs Office*
*Honorary Professor, University of Jordan*

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**JOHN P. CHEATHAM, MD, FPICS**

*Interventional Cardiology*
*The Heart Center, Nationwide Children’s Hospital Professor Emeritus*
*Dept of Pediatrics, Cardiology*
*The Ohio State University*
*Columbus, OH, USA*

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**NATALIE POLI, Ed. S.**

*PICS Society Senior Patient Advocate*
*Public Education Professional*
*Successfully treated interventionally for CHD, 2006*
*Mrs. Illinois International 2021 1st Runner Up*
*Former Captain of the NBA Chicago Bulls Dance Team*

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WE SHARE YOUR COMMITMENT TO PEDIATRIC AND CONGENITAL INTERVENTIONAL CARE.
Book Review: A Multidisciplinary Approach to Perinatal Cardiology (Volumes 1 & 2)

John Moore, MD, MPH

Edited by P. Syamasundar Rao, MD & Dharmapuri Vidyasagar, MD
Cambridge Scholars Publishing
Lady Stephenson Library, Newcastle upon Tyne, NE6 2PA, UK; Copyright 2021

Dr. P. Syamasundar Rao and Dr. Dharmapuri Vidyasagar are Professors Emeritus of Pediatrics; Rao most recently from the University of Texas, Houston, and Vidyasagar from the University of Illinois, Chicago. Both professors had long distinguished clinical careers and were leaders in their fields: Dr. Rao as a pediatric cardiologist and Dr. Vidyasagar as a neonatologist. Both also had extensive academic careers as authors and as educators.

Rao and Vidyasagar have collaborated with forty-two of their former trainees and colleagues to put together these 700-page volumes, which together comprise a comprehensive textbook in Perinatal Cardiology. Doctors Rao and Vidyasagar correctly point out that excellent care of the fetus, the neonate and the infant with Congenital Heart Disease requires a big team approach; involving coordinated input and contributions from perinatologists, neonatologists, pediatric cardiologists, cardiology intensivists, pediatric cardiac and general surgeons, as well as primary care physicians and practitioners.

Over the course of 43 chapters, the editors and contributing authors provide up-to-date reviews of nearly all aspects of the pathogenesis, physiology, evaluation and comprehensive care of perinatal cardiac patients. As is often the case with textbooks covering a field having a broad array of related topics, organization can be difficult. In this text, Rao and Vidyasagar have devoted much of the first volume to a section entitled “Diagnosis and Management,” and much of the second volume is a section called “Individual Cardiac Defects.” The Diagnosis and Management Section includes chapters covering a diverse array of topics including diagnosis of cyanotic infants by primary care providers, echo and MR evaluation of neonatal heart disease, management of sick infants with congenital heart disease, neonatal cardiac emergencies, genetics, persistent pulmonary hypertension in the newborn, neonatal dysrhythmias, single ventricle physiology, catheter interventions, in utero interventions, and surfactant therapy. This section also continues in Volume 2 to include chapters on neonatal cardiac anesthesia and cardiac surgery, cardiac transplantation, post-operative care, and feeding strategies. The Cardiac Defect Section provides chapters covering the most common cardiac defects including the “5 T’s”, HLHS, Pulmonary Atresia with ITVS, Ebstein’s Anomaly, Heterotaxy Syndromes, Coarctation of the Aorta, and PDA. These Defect chapters are traditional in most respects, except they focus on the perinatal patient.

The volumes contain other significant sections as well. In Volume 1, there are sections on Perinatal Circulation, The Fetus, Ethics, and newborn screening. In Volume 2 there are additional sections on Cardiomyopathies and Hypertension. The final section entitled Conclusions is essentially a compendium of individual chapter abstracts.

In the digital era, most physicians caring for patients with heart disease are not purchasing and shelving textbooks. This fact calls to question what roles this book will have in medical education, as a reference, and in the literature in general. In my view, this text is a treasure-trove of excellent information focusing on the perinatal patient with heart disease. Most other sources do not include the important chapters and collaborations with other specialties and disciplines, especially with neonatology. For this reason, I believe A Multidisciplinary Approach to Perinatal Cardiology deserves to have an important online presence which is accessible to students, trainees, and practitioners.

A final note: This textbook was published in April 2021. Volume 1 is currently available on Amazon.com. Both Volumes are available at the Publisher’s website: www.cambridgescholars.com

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CAREER OPPORTUNITY

Outstanding Opportunity for a BC/BE Pediatric Cardiac Intensivist in Miami

The Heart Program at Nicklaus Children's Hospital, a 309-bed freestanding children's hospital, and Nicklaus Children's Pediatric Specialists, the physician multispecialty group practice of Nicklaus Children's Health System, have an exceptional opportunity for a BC/BE pediatric cardiac intensivist.

Our Cardiac Intensive Care Unit (CICU) was the first in the Southeast and provides care for newborns and children receiving treatment for congenital heart defects. With a longstanding tradition of excellence, our cardiac critical care team is currently comprised of six full-time attending physicians and six full-time nurse practitioners. We have an illustrious cardiology fellowship and have offered advanced training in cardiac critical care medicine for more than 20 years. The desired candidates should be board certified or eligible in pediatric critical care medicine or pediatric cardiology. Preference will be given to individuals with dual training in pediatric critical care and cardiology or those board eligible in either cardiology or pediatric critical care who have completed a minimum of one year of advanced training in cardiac intensive care medicine. Applicants should exhibit a strong interest in clinical care, education and academics. Nicklaus Children's Hospital is an affiliate of the Florida International University Herbert Wertheim College of Medicine. Candidates possessing all levels of experience shall be considered.

Our state-of-the-art Advanced Pediatric Care Pavilion houses a 34-bed cardiac in-patient unit with an adjustable acuity model that allows all rooms to accommodate critically ill patients with heart disease. The Heart Program offers a full range of services, including the management of patients following congenital heart surgery, interventional catheterization and invasive electrophysiology. Our cardiac surgical program, led by Dr. Redmond Burke, is one of the most transparent in the world. It remains the only cardiovascular surgical program to offer real-time outcomes reporting (https://rto.nicklauschildrens.org).

Founded in 1950, the rebranded Nicklaus Children’s Hospital is renowned for excellence in all aspects of pediatric medicine and has numerous subspecialty programs that are ranked among the best in the nation. It is also home to the largest pediatric teaching program in the southeastern U.S. Our organization consistently appears on employer award lists such as Fortune magazine’s “Best Workplaces In Health Care,” Becker’s “150 Great Places to Work in Healthcare” and People magazine’s “50 Companies That Care.” Join a phenomenal team that brings lifelong health and hope to children and their families through innovative and compassionate care.

The Heart Program at Nicklaus Children’s, a world leader in pediatric cardiology and cardiovascular surgery for the care of children with congenital heart disease, serves as a beacon to families confronting the reality of a child or newborn with a heart defect.

Competitive compensation and benefits package.

Qualified candidates please contact:

Juan Bolivar, MD  
Director, Cardiac Intensive Care Unit  
Juan.Bolivar@nicklaushealth.org

Joyce Berger  
Physician Recruiter  
Joyce.Berger@nicklaushealth.org  
786.624.3510

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www.CongenitalCardiologyToday.com
NuMED Receives US Clearance on Z-6™ Atrioseptostomy Catheter

Meeting the increased needs of pediatric cardiologists where the Z-5™ was the only balloon atrioseptostomy catheter available in the US, NuMED Inc. announces that the Z-6™ has received 510(k) clearance providing interventionalists a second option when treating patients requiring balloon atrioseptostomy. Leveraging the same proven materials used in construction of the Z-5™, the new Z-6™ features design enhancements which include a short distal tip and catheter tip angulation modifications. Designed for easier insertion through the septum and improved rewrapping allowing for easier removal into the introducer, the addition of a short distal tip provides a feature some clinicians may have been accustomed to in the past. To facilitate passage of the catheter into the left atrium, the 35 degree tip angulation was moved closer to the balloon.

The Z-6™ utilizes a non-compliant balloon which maintains its shape during pullback. The Z-6™ is available in 9.5mm and 13.5mm diameters on a 5 French shaft with an inner catheter lumen for utilization of a guidewire.

“The Z-6 septostomy balloon catheter finally is here! You complained and NuMED delivers! The new balloon has all the new features to enable you to perform safe septostomy!! Short distal tip and 35 degree angle enabling easier access to the left atrium! Still over the wire advantage, a 6fr introducer and two sizes!!! Kudos to NuMED!” said Ziyad Hijazi, MD, MPH, FACC, MSCAI; Chair, Department of Pediatrics, CEMC Director, Sidra Cardiovascular Center of Excellence, Doha, Qatar.

Balloon septostomy is a minimally invasive heart procedure in which an interventional pediatric cardiologist uses a balloon catheter to widen congenital heart defects such as foramen ovale, patent foramen ovale, or atrial septal defect. Thousands of these life-saving procedures are performed annually worldwide.

“With input from interventional pediatric cardiologists around the world, our R&D, Regulatory, and Production teams were able to apply 30+ years of balloon catheter expertise resulting in product enhancements and ultimately helping the lives of countless patients requiring balloon atrioseptostomy,” stated Al Tower, President of NuMED.

About NuMED Inc.

NuMED Inc., develops and manufactures high quality medical devices for diagnosing and treating congenital heart conditions or peripheral vascular disease. Through the help of our worldwide network of partners, we have improved the lives of patients in more than 100 countries by supplying the most comprehensive portfolio of innovative products, including the TYSHAK® and Z-MED™ balloon catheters and CP Stent®, with a focus on pediatrics.

For more information, visit NuMED Inc. website at www.numedforchildren.com and connect with NuMED Inc on LinkedIn, www.linkedin.com/company/numed-for-children/.

About B. Braun Interventional Systems

B. Braun Interventional Systems is the exclusive US distributor of the NuMED Z-6™ atrioseptostomy catheter.

B. Braun Interventional Systems offers interventional solutions designed with the patient in mind. Many of the products offered have been developed in response to the needs of physicians, technicians, and nurses. The company is committed to delivering safety, precision and convenience to interventional procedures. Globally, the B. Braun Group of Companies employs more than 64,000 employees in 64 countries. Guided by its Sharing Expertise® philosophy, B. Braun continuously exchanges knowledge with customers, partners and clinicians to address the critical issues of improving care and lowering costs.

CAREER OPPORTUNITY

The Johns Hopkins University School of Medicine is seeking an experienced pediatric cardiologist to be the Director of Outpatient Cardiology. Applicants should be at least five years after fellowship training and have extensive experience as an active pediatric cardiologist in the outpatient setting.

The rank of this position will be based on clinical and academic achievements. The Bloomberg Children's Center of Johns Hopkins Hospital has ten outpatient clinic sites located across the state of Maryland servicing the needs of patients of all ages with congenital and acquired heart conditions. The successful applicant will direct the structure of the outreach sites, develop collaborations, and participate in pediatric cardiology fellow education.

Our pediatric and congenital cardiology program is medium-sized with excellent support in noninvasive imaging, electrophysiology, catheterization, heart failure, adult congenital heart disease, fetal cardiology, pulmonary hypertension, and full range of pediatric and adult subspecialties.

Our goal is to recruit a talented individual with strong interpersonal and communication skills who is committed to excellence in patient care, education, and scholarly advancement. The ability to work effectively with faculty members from a variety of clinical disciplines is particularly important.

Interested candidates should forward their CV to: skutty1@jhmi.edu

Shelby Kutty, MD, PhD, MHCM
Director, Pediatric and Congenital Cardiology

Johns Hopkins School of Medicine
Taussig Heart Center – M2315
1800 Orleans Street, Baltimore, MD 21287
Innovative Cardiovascular Ultrasound Solutions Showcased at ASE’s 32nd Annual Scientific Sessions

The virtual Exhibit Hall at ASE 2021 Scientific Sessions Virtual Experience will featured over 30 companies and organizations highlighting the latest vendor technology and other services. Demonstrations of artificial intelligence software and intracardiac echocardiography technologies, how to incorporate strain and ultrasound enhancing agents (UEAs) into lab procedures, and more were available to explore, June 18-21, 2021, during the world’s premier meeting for cardiovascular ultrasound practitioners.

Highlights from the virtual exhibit hall, included:

ARDMS
You can now take select ARDMS examinations from your own home. ARDMS has created resources to help you to make the decision to either take your examination at a test center or online. We hope this new option helps you to meet your credentialing and career goals.

Biosense
Biosense Webster featured intracardiac echocardiography technologies for visitors to its virtual booth. The SOUNDSTAR® Ultrasound Catheter with the CARTOSOUND® Module delivers real-time intracardiac echocardiography imaging and navigation to enable workflow efficiencies, such as real-time monitoring of the ablation catheter tip to reduce radiation exposure and improve confidence.


Canon Medical Systems
Canon is Making Echo Easier with imaging clarity and definition with significantly enhanced resolution alongside excellent penetration, automating tedious measurements like EF and Strain, and addressing sonographer comfort with Healthy Sonographer Platforms™. Learn more at the Canon Medical Systems virtual exhibit at the ASE 2021 Virtual Experience. Canon Medical Systems USA, Inc., headquartered in Tustin, Calif., markets, sells, distributes and services CT, MR, ultrasound, X-ray and interventional X-ray equipment. For more information, visit Canon Medical Systems’ website at https://us.medical.canon.

Caption Health
With a focus on solving the issues of accessibility in ultrasound and empowering more healthcare workers to use this diagnostic tool, Caption Health offers the first FDA-cleared AI-powered guidance software in Caption AI and is a member of this year’s FierceMedtech Fierce 15 class. Its booth at this year’s ASE Scientific Sessions showcased Caption AI’s ability to democratize both capture and analysis of cardiac ultrasounds. Caption Health staff are available to answer questions and provide additional information on how to leverage this technology for your institution. CaptionHealth.com

CardioVillage
Do you need 15 CE hours of echocardiography content? You asked, and we listened! CardioVillage now makes it easier to customize your educational options. The Echocardiography Bundle consists of general and focused echocardiography content selected to meet the echocardiographer’s 15-hour annual CE requirement. By completing all of the courses in the Bundle, you will earn certificates totaling 15 hours of CE credit. You can also purchase single courses or build your own bundle. The classic annual subscription is still available providing access to every course for one year.

GE Healthcare
Visit the GE Healthcare virtual exhibit booth to learn about the latest AI-based technology with Vivid™ Ultra Edition designed to help reduce tedious tasks and improve workflow efficiency. Download our new whitepaper, The Role of AI in Streamlining Echocardiography Quantification, which shows how AI-based tools reduce exam time, minimize operator fatigue with up to 80% less clicks to get 2D measurements, and diminish inter-observer variability. And watch a presentation from Dr. Praveen Mehrotra, Director of Echocardiography at Thomas Jefferson University, on Echocardiography’s Important Role in Structural Heart Interventions. Vivid Ultra Edition is Powered by AI. Elevated by You.

Epsilon Imaging
Epsilon Imaging is further improving quality, standardization, and workflow in echo analysis with its newest solution, Echolnsight Zero Footprint (ZF). By making it easy to incorporate echo strain imaging into routine clinical practice, Echolnsight ZF provides user-friendly functionality enabling a highly efficient workflow for clinicians to analyze studies at any CVIS workstation with a web-browser. Additionally, no software is required to be loaded on client workstations with this new zero footprint architecture. Echolnsight is a vendor neutral platform with clinical strain imaging applications, automated cardiac function measurements based on ASE guidelines and seamless integration for any size echo program.

Lantheus Medical Imaging, Inc.
Echocardiography is a portable and real-time imaging modality that helps clinicians diagnose cardiac abnormalities. Lantheus Medical Imaging sponsored a symposium during the
Join Our Growing Team
at the Heart Institute at UPMC Children’s Hospital of Pittsburgh

Three Positions Currently Available

**Director of Pediatric Non-Invasive Imaging (Echocardiography Laboratory)**
For this leadership level position, we are seeking an outstanding board-certified pediatric cardiologist with strong expertise in non-invasive imaging including all forms of echocardiography and/or cardiac MRI & cardiac CT. Applicants should be at the Associate Professor level (or above). In addition, evidence of solid leadership skills to take the Director role and help build up the Non-Invasive Imaging Program, working closely with division chief and hospital leadership. Candidates must have completed a 4th year pediatric imaging advanced fellowship and demonstrated an academic commitment in the field of imaging, with dedication to teaching, research and quality improvement. Candidates must be Board Certified in Pediatric Cardiology.

**Expert Pediatric Electrophysiologist**
The applicant should be experienced in the management of pediatric EP and adult congenital heart disease electrophysiology with excellent clinical, teaching and research skills. Clinical skills should include radiofrequency/cryoablation, transvenous pacemaker/AICD insertion, ventricular tachycardia ablation and complex congenital heart disease EP cases. The well-established pediatric electrophysiology program is currently staffed by two experienced EP physicians and two dedicated EP RN. The EP team also works in close conjunction with the Heart-Vascular Institute of UPMC-Presbyterian adult hospital. According to academic rank and seniority candidate may be eligible to leadership position.

**Adult Congenital Heart Disease Faculty**
The Division of Cardiology at UPMC Children’s Hospital of Pittsburgh / University of Pittsburgh School of Medicine is recruiting faculty to join the Adult Congenital Heart Disease (ACHD) program. This well-established program is currently supported by 2 ACHD physicians (including one ACDH Director), 2 advanced practice providers, a dedicated RN, research coordinator and social worker. The applicant should have expertise in the management of adult congenital heart disease with prominent clinical, teaching and research skills. He or she will work closely with division chief, 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.

All positions come with a competitive salary and faculty appointment commensurate with experience and qualification requirements at the University of Pittsburgh School of Medicine.

Submit Your Interest or Learn More
Interested individuals should send a letter of intent, curriculum vitae, and three (3) letters of references to the following individual. Informal inquiries are also encouraged.

Jacqueline Kreutzer, MD, FSCAI, FACC – Chief, Division of Pediatric Cardiology
UPMC Children’s Hospital of Pittsburgh, 4401 Penn Avenue, Pittsburgh, PA 15224
Telephone: 412-692-3216 and e-mail: Jacqueline.kreutzer@chp.edu

About Us
Regionally, nationally, and globally, UPMC Children’s Hospital of Pittsburgh is a leader in the treatment of childhood conditions and diseases, a pioneer in the development of new and improved therapies, and a top educator of the next generation of pediatricians and pediatric subspecialists. UPMC Children’s is ranked on the *U.S. News & World Report* Honor Roll for Best Children’s Hospitals for 2020–2021.

Every year, more than 17,000 patients with congenital heart disease choose the Heart Institute at UPMC Children’s Hospital of Pittsburgh when they need the most advanced, experienced, and comprehensive cardiac care available. The Heart Institute was named to *U.S. News & World Report* list of top Pediatric Cardiology and Heart Surgery programs, ranking #2 nationally. For four consecutive reporting periods, UPMC Children’s pediatric cardiovascular surgery program was awarded a 3-star rating by the Society of Thoracic Surgeons. Learn more at chp.edu/our-services/heart.
ASE 2021 Virtual Experience entitled Improving Quality and Efficiency in Echocardiography. Dr. Omar Husseini and Gina Conigliaro-Brito discussed how ultrasound enhancing agents (UEAs) can improve quality and efficiency in echocardiography. They provided practical insights into the implementation of UEAs to improve overall quality patient care.

**National Board of Echocardiography (NBE)**

Save the Exam Dates for 2022!
www.echoboards.org/EchoBoards/Content/Verify_Physician.aspx

**Trillium Technology**

The ShowCase Image Center Bundle provides an inexpensive and scalable medical image storage and review solution, with pricing starting at $3,800 including the first year of phone support. ShowCase Image Center receives images via DICOM for storage and networked study review using the ShowCase Premier image viewer. Both in office and remote viewing are supported.

In addition to these vendor spotlights, the organization also hosted its own booths. The ASE Headquarters featured all the latest educational products, including two new textbooks, ASE’s Comprehensive Echocardiography 3rd Edition and ASE’s Comprehensive Strain Imaging. The show included a sales incentive, as most ASE products will be 10% off during the Scientific Sessions.

In the ASE Foundation (ASEF) Booth, participants viewed the Hope and Resilience in Action photo exhibit, signed up for the Cardiovascular Challenge, and supported the 2021 Annual Appeal by purchasing raffle tickets for a chance to win some great prizes including a table for 10 at the 2022 Research Awards Gala!

**About ASE**

ASE is the Society for Cardiovascular Ultrasound Professionals™. ASE is the largest global organization for cardiovascular ultrasound imaging serving physicians, sonographers, nurses, veterinarians, and scientists and as such is the leader and advocate, setting practice standards and guidelines for the field. The Society is committed to advancing cardiovascular ultrasound to improve lives. For more information about ASE, visit: ASEcho.org and follow us @ASE360. For more information about the ASE 2021 Scientific Sessions Virtual Experience visit: ASEScientificSessions.org.

**Contact**

Angie Porter, 919.297.7152, aporter@asecho.org

**OCTOBER**

01-03
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Echo in Congenital Heart Disease: Adult and Pediatric Cases, Including Multimodality Imaging
Rochester, MN, USA
https://cveducation.mayo.edu/store/echo-in-congenital-heart-disease-adult-and-pediatric-cases-including-multimodality-imaging

07-09
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The Genetics of Heart & Vascular Disease
Nashville, TN, USA
https://cveducation.mayo.edu/store/the-genetics-of-heart-vascular-disease

13-15
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31st International Symposium on ACHD
Virtual
https://torontoachd2021.com/

16
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11th Annual Fetal Echocardiography Symposium at UCLA: Clinical Tips and Pearls from the Experts
Virtual
https://www.cme.ucla.edu/courses/fetalecho21

20-23
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Morphology and Echocardiography in Neonates and Children Hands-on Interactive Morphology and Echo Course
Birmingham, AL, USA
https://www.congenitalecho.co.uk/

20-23
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Cases in Echocardiography, Cardiac CT, and MRI
Napa, CA, USA
https://cveducation.mayo.edu/store/cases-in-echocardiography-cardiac-ct-and-mri
CAREER OPPORTUNITY

The Congenital Heart Center at Atrium Health Levine Children’s Hospital seeks to recruit both a Pediatric Imaging Cardiologist and a Pediatric Electrophysiologist to join their existing faculty.

- **Imaging candidates** will have completed an ACGME accredited fellowship in pediatric cardiology and be BC/BE by the American Board of Pediatrics; with expertise in echocardiography for congenital heart disease, including transesophageal, transthoracic, and fetal echocardiography. Responsibilities will include both outpatient and inpatient cardiology. A minimum of 5 years of experience and 4th year imaging fellowship are preferred. Leadership opportunities within the echocardiography program are available. Call/weekend coverage on a rotating basis including echo backup call with 4 other imaging physicians.

- **Electrophysiology candidates** will have completed an ACGME accredited fellowships in pediatric cardiology and pediatric electrophysiology and should be BC/BE by the American Board of Pediatrics and will be expected to accomplish pediatric electrophysiology certification by the International Board of Heart Rhythm Examiners. Candidate should be skilled in outpatient and inpatient congenital electrophysiology with experience and interest in transcatheter ablations and device implantation/management. Days will be split between the EP lab and clinic. Responsibilities will include attending on-site/satellite EP outpatient clinics including pacemaker/ICD clinics, providing inpatient/consult service coverage, remote device management and cardiology/EP call/weekend coverage on a rotating basis. The Pediatric/Adult Congenital Electrophysiology program has grown in procedural volume over 40% in each of the last two years, and is currently staffed by a single electrophysiologist and dedicated EP APP.

- ACHD board certification will be welcomed for either position but not essential.

- Team includes: 12 cardiologists, 3 congenital heart surgeons, 5 cardiac intensivists, 4 pediatric cardiac anesthesiologists, 2 pediatric cardiac radiologists, 19 ACPs (includes 2 surgical ACPs), 13 sonographers, 3 nurse navigators and 4 dedicated RNs

The Atrium Health Levine Children’s Congenital Heart Center, established in 2010, has been ranked as one of the top-50 pediatric heart centers in the country by U.S. News and World Report for the last nine years. Our comprehensive services include cardiac imaging, diagnostic and interventional catheterization, electrophysiology, dedicated cardiovascular intensive care staff, and regional referral programs in heart failure / transplantation, adult congenital heart disease, and fetal echocardiography. Surgical and cardiac catheterization volume have been growing at a rate of 10-15% per year. Our state of the art two lab cardiac catheterization and electrophysiology suite opened in February of 2017, with dedicated staffing and anesthesia teams. Our new outpatient office complex opened in December 2020 and is designed to treat all from fetal cardiology to ACHD. We have one of the most comprehensive Cardiac Neurodevelopment programs in the region, providing a multitude of specialty services to our congenital heart population in the same office suite. Participation in investigator initiated and multi-center industry sponsored studies is ongoing within the Heart Center, with the support of an active clinical research department.

Atrium Health Levine Children’s Hospital (LCH) has 4 pediatric hospitalist teams, a 20-bed PICU (including cardiac ICU), an 85-bed NICU, and an inpatient pediatric rehabilitation facility. LCH hosts a premier Pediatrics Residency Program, serves as a teaching hospital for students of the UNC Chapel Hill School of Medicine, and offers excellent support for clinical research and quality improvement. Additionally, Atrium Health and Wake Forest Baptist Health, including Wake Forest School of Medicine, officially joined together as a single enterprise, Atrium Health. Wake Forest Baptist Health and Wake Forest School of Medicine will become the academic core of Atrium Health, building a second campus of the school of medicine in Charlotte, which is currently the largest city in the U.S. without a 4-year medical school. The growth of the school of medicine will expand existing academic research capabilities in a way that expands opportunities for clinical trials across a large, diverse market with some of the nation’s leading medical experts.

LCH has repeatedly been ranked among the Best Children’s Hospitals in the nation by U. S. News & World Report, most recently in eight pediatric specialties for 2021-2022 including Neonatology, Pulmonology, Cancer, Gastroenterology and GI Surgery, Cardiology and Heart Surgery, Nephrology, Neurology and Neurosurgery and Orthopedics.

**For more information or to submit a CV for review, please contact:**

Sarah Foster
Physician & APP Recruiter
Sarah.Foster@atriumhealth.org
https://careers.atriumhealth.org/

www.CongenitalCardiologyToday.com  ♥  25
Circle Cardiovascular Imaging Announces Partnership with DiA Imaging Analysis to Deliver All-in-One Comprehensive AI-Based Cardiovascular Imaging Solutions

PRNewswire – Circle Cardiovascular Imaging Inc. and DiA Imaging Analysis Ltd. are excited to announce a multi-year partnership that leverages the companies’ synergies in cardiac AI and data analytics.

As a global leader in cardiovascular imaging reading and reporting for Cardiac MR and Cardiac CT, Circle CVI has now expanded its rich product offering to a complete cardiovascular imaging portfolio, with the addition of DiA’s FDA-cleared and CE-marked LVivo™ Toolbox - a line of innovative AI-based cardiac ultrasound solutions. This collaboration will deliver expanded state-of-the-art multi-modality imaging solutions to Circle CVI’s customers, while providing new opportunities for physicians, patients, and hospitals worldwide.

"By adding DiA’s solutions, Circle CVI is broadening its extensive portfolio of cardiovascular MR and CT, to include ultrasound imaging functionality, offerings that are unparalleled in the market," said Greg Ogrodnick, CEO of Circle Cardiovascular Imaging.

Circle CVI will offer its customers DiA’s LVivo Toolbox, as set of cardiac ultrasound AI solutions which will include LVivo Seamless™ – a unique system that runs "behind the scenes," automatically selecting the optimal cardiac ultrasound views and generating automated quantifications and indications of both left and right ventricles. The system then immediately extracts these results to the echo reports.

The solutions of both companies are vendor-neutral, running on any scanner, and they can easily integrate into hospital and enterprise sites, with deployments that work with any IT infrastructure.

"Joining forces with Circle CVI will accelerate our mission to rapidly deploy health providers with our most advanced and most accurate cardiac ultrasound AI solutions, which will simplify workflows and improve patient outcomes," said Hila Goldman-Aslan, CEO of DiA Imaging Analysis.

DiA spotlighted its AI-enabled solutions across its imaging portfolio at the American Society of Echocardiography (ASE) 2021 virtual event.

About Circle Cardiovascular Imaging Inc.

Circle Cardiovascular Imaging Inc. develops world-class, advanced reading and reporting solutions for cardiac imaging. Circle CVI is a prominent company in the global cardiac imaging community, bringing together an experienced and dedicated team of over 150 people and offering multilingual support around the globe. Circle CVI’s imaging platform, cvi42, is the best-in-class cardiovascular imaging reading and reporting solution for cardiac MR, cardiac CT, cardiac interventional planning and electrophysiology. Annually, millions of cardiac exams – in over 1,000 hospitals and in more than 50 countries – are interpreted using cvi42.

About DiA Imaging Analysis Ltd.

DiA Imaging Analysis is a leading provider of AI-powered ultrasound analysis solutions that make the use and analysis of ultrasound images smarter, faster and more accessible to all. The company’s FDA- cleared and CE-marked LVivo™ product line for automated cardiac and abdominal analysis enables clinicians with various levels of ultrasound experience to use and analyze ultrasound images on their ultrasound devices or healthcare IT systems with increased speed, efficiency and accuracy. DiA currently serves thousands of end users worldwide.

For additional information, please visit www.circlevi.com or contact: marketing@circlevi.com

For additional information, please visit www.dia-analysis.com or contact: info@dia-analysis.com.
Pediatric Cardiac Opportunities at HCA Hospitals

HCA Healthcare is one of the nation’s leading providers of healthcare services with over 185 hospitals and approximately 2,000 ambulatory sites of care in 20 states and the UK.

Pediatric Cardiac Anesthesiology
Methodist Physician Practices - San Antonio, Texas

Pediatric (cardiac) anesthesiologist to join our growing congenital heart program. Candidates must be BC/BE in Anesthesiology with Pediatric Fellowship. Experience in Pediatric Cardiac Anesthesia preferred, but mentorship and training are available to someone with a passion for cardiac cases. New Grads/experienced both welcome. MD/DO with ACGME anesthesia program required.

Congenital Cardiac Surgeon
Methodist Physician Practices - San Antonio, Texas

Surgeon must be B/C in Cardiothoracic and Congenital Heart Surgery and have a vast experience with neonatal surgery. 2+ years of experience minimally with demonstrated, exceptional surgical and interpersonal skills and proven success as a collaborator.

Pediatric Cardiologist
Kidz Cardiology - Wichita, Kansas

Private Practice seeks BC/BE candidate from an ACGME accredited program. Experience is preferred but fellows are also welcome. Excellent interpersonal and team skills a must, best fit is a physician hungry to build a thriving practice. J-1 visa waivers welcome for our Wichita location.

Pediatric Interventional Cardiologist
Mednax - Denver, Colorado

Adult Congenital Heart disease or pediatric interventionalist with adult congenital training. Ideal candidate is BE/BC Pediatric Interventional Cardiologist with ACHD certification-Inquiries welcome from Adult Cardiologists with same.

For more information on these and other Pediatric Cardiac Opportunities with HCA Hospitals, please contact:

Kathy Kyer
937.235.5890
Kathleen.Kyer@HCAHealthcare.com
CROSSWORD HEART PUZZLE #1

Across

2. Syndrome associated with elfin appearance.

4. Syndrome associated with Bicuspid Aortic Valve and Coarctation of the Aorta.

8. Slower than normal heart rate.

9. Birth defect in which great arteries fail to separate completely.

10. Anti-coagulant that interacts with plasminogen to result in plasmin complex.

14. Most common kind of primary cardiac tumor in adults.


Down

1. Syndrome associated with Truncus Arteriosus.

3. Company which made the first pacemaker.

5. Stimulates myocardial Beta 1 and Beta 2 Receptors stimulating positive chronotrophy.

6. Kind of Aortic Valve with 5 Cusps.

7. Rapid influx of this ion in the myocytes causes rapid depolarization.

11. Disease that causes inflammation in the walls of blood vessels.

12. Austrian Radiologist and medical device inventor.

13. Type of Shunt which is often first step in the Norwood Procedure.

CONGENITAL CARDIOLOGY TODAY

Publish

• Written by doctors and their team
• Case studies, articles, research findings
• Submit on your schedule
• Print and electronic
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• No fees

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