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Why Low-Field Imaging is Expected to Boost Interventional CMR Procedures

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Despite the numerous drawbacks to x-ray fluoroscopy for cardiac catheterization, including poor soft tissue visualization, need for repeated injections of iodinated contrast to depict the anatomy, inability to visualize the anatomy during interventions, harmful effects of radiation, and the need for lead protection that can induce orthopedic injuries, it continues to be the mainstay for catheterization imaging. The adverse effects of radiation are even worse in children, as tissue in growing children is particularly sensitive to the detrimental effects of radiation because of greater mitotic activity. In addition, congenital heart disease (CHD) patients need repeated cardiac catheterizations and radiation-based imaging throughout their lives, sometimes receiving accumulated lifetime doses that are associated with a detectable increased risk of cancer.[1,2] Children also have longer lifespans than adults, thereby having more time to develop radiation-induced cancer.

With its exceptional soft tissue imaging in multiplanar views in arbitrary directions and dynamic imaging of cardiac function, cardiac magnetic resonance (CMR) eliminates all the disadvantages of x-ray, but it comes with its own challenges for real-time interventional imaging. The field of interventional CMR (ICMR) has been slow to progress, due to radiofrequency-induced heating of catheterization equipment during scanning, inability to see standard catheters with MR, and large metallic artifacts from interventional wires that obstruct the imaging. The many faults of x-ray imaging, however, continue to be the impetus behind pursuing ways to overcome these limitations in the field of ICMR.

To date, the vast majority of the ICMR work has been performed in 1.5 Tesla scanners. Clinician investigators at the National Institutes of Health used real-time MR guidance to perform right heart catheterizations (RHC) in adults,[3] and Ratnayaka and colleagues were the first to move ICMR into the pediatric hospital on a large scale, reporting 50/50 successful RHC in children.[4] As the field progressed, specific MR equipment was developed for catheterization to make wires and catheters conspicuous. Nano4Imaging (Dusseldorf, Germany) has been a leader in this field and produced the first FDA-approved guidewire (EmeryGlide MRWire) for ICMR by placing passive markers on the distal tip of the wire, which is made of glass fibers and polymers and protected by a high-strength aramid fiber mantle covered with a Teflon sleeve. The markers create signal voids in MR, which provide their visibility, and they are also seen on x-ray, which allows for use in both settings. This technology helped to bring ICMR to CHD, allowing the successful completion of right or left heart catheterization (LHC) in 23/25 patients with CHD, to measure pressure gradients across stenoses with MR guidance,[5] and in 31/34 children and adults with CHD, including for Fontan fenestration test occlusion.[6]

While diagnostic catheterizations with MR guidance are being performed on a regular basis at some institutions, interventional procedures, such as angioplasty, stenting, and septal defect closures, are not part of clinical practice today, due to the lack of equipment that is both visible and safe in the MR environment, the absence of supporting software, and uncertainty about reimbursement. Early work is pointing to low-field (0.55T) MR scanners having great potential to overcome some of these long-standing problems,

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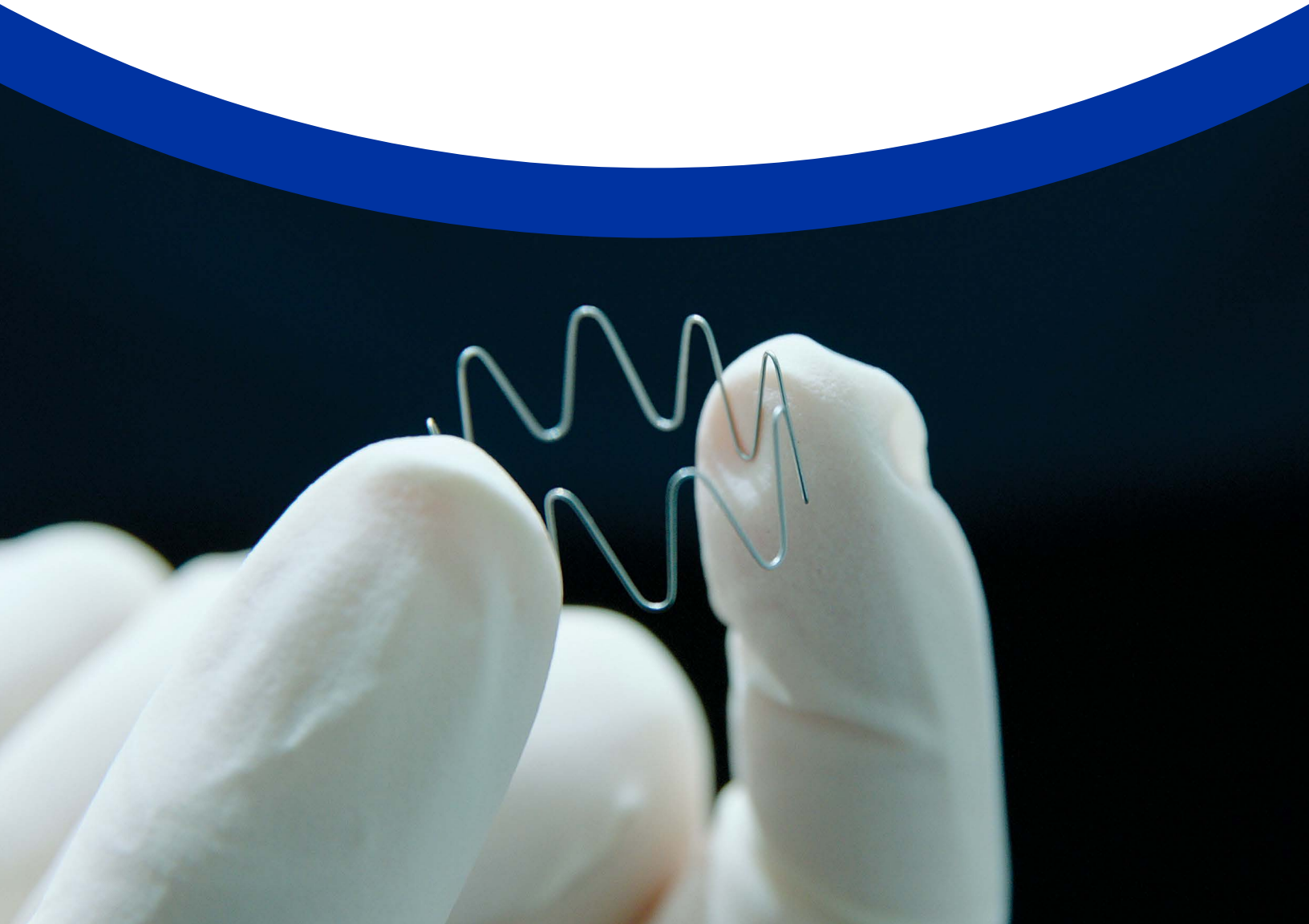

Indications
The Harmony™ transcatheter pulmonary valve (TPV) system is indicated for use in the management of pediatric and adult patients with severe pulmonary regurgitation (i.e., severe pulmonary regurgitation as determined by echocardiography and/or pulmonary regurgitant fraction ≥ 30% as determined 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 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.

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however. They may allow the use of commercially available catheterization equipment since radiofrequency-induced heating of interventional devices is reduced at low field strength (theoretical 7.5-fold difference in heating between 0.55T and 1.5T).[7] Campbell-Washburn and colleagues showed that two types of nitinol non-exchange length glidewires and two types of stainless-steel braided catheters were safe at 0.55 T (<1°C heating) during two minutes of continuous scanning.[7] They then performed low field MR-guided RHC successfully in 7/7 patients using a commercially available nitinol glidewire (180 cm 0.035" Micro J-tip Glidewire, Terumo, Tokyo, Japan) without complication or evidence of heating.[7] These studies were performed on an investigational, modified commercial MRI system (1.5T MAGNETOM Aera; Siemens Healthineers, Erlangen, Germany) that operated at 0.55 T but retained the gradient performance of the original 1.5T system (maximum gradient amplitude 45 mT/m, maximum slew rate 200 T/m/sec).

FIGURE 1 *CMR still frame from a real-time interactive scan showing CO2-filled wedge catheter balloon in IVC after 2 mg/kg ferumoxytol (red arrow).*

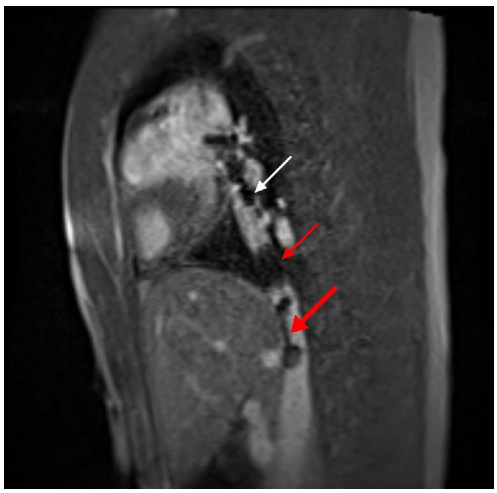

FIGURE 2 *CMR still frame showing platinum-iridium covered CP stent (red thin arrow) implanted in proximal IVC, causing significant artifact, and a 316L stainless steel 36 mm long Mega LD stent crimped on a 20 mm x 3 cm Z-Med balloon with 1 mm MagnaFy® MRI markers (stent edge cannot be distinguished from markers) (red thick arrow) over EmeryGlide® guidewire (white arrow shows EmeryGlide MR markers)*

Since these studies were performed, a low-field scanner has become commercially available (0.55T MAGNETOM FREE. Max MRI System, Siemens Healthineers, Erlangen, Germany), but it has limited gradient performance (maximum gradient amplitude 26 mT/m, maximum slew rate 45 mT/m/ms), which requires compromises in spatial resolution and frame rates. Stronger, faster gradient performance would come at a significantly higher cost due to the large 80 cm diameter bore of this system. The wide bore is ideal for patients with large body habitus and for adults and children who have claustrophobia and offers greater patient access for in-magnet procedures. The system is more affordable than high Tesla scanners, as it is less expensive to manufacture, transport, install, and operate. Susceptibility artifacts are reduced at lower field, and thus this system can provide improved imaging at the air-tissue boundaries like in the lungs and sinuses. Most importantly for interventionalists, it may be the breakthrough that is needed to allow MR-guided interventional procedures, because of the decreased RF-induced heating that can allow the use of standard equipment, improved access to the patient in the wider bore, and multiple simpler safety and maintenance features. With FDA approval of the MAGNETOM Free.Max and multiple installations around the world, there seems to be a renewed energy in ICMR by clinicians and industry alike, which was clearly visible during a live case at the Pediatric Interventional Cardiac Symposium (PICS) in Chicago in September 2022.[8] The current platform still needs considerable development, such as imaging techniques and pulse sequences required for cardiovascular imaging, but is expected to make the difference for interventional MRI in cardiology and interventional radiology.

Armstrong, Simonetti, and colleagues were the first to test the feasibility of performing R&LHC, inferior vena cava (IVC) angioplasty, and IVC stenting with real-time imaging in the 0.55T MAGNETOM Free.Max. While many types of standard catheterization equipment can be used safely at low field, they need to be made conspicuous, and this can be done by adding MR-visible markers to the standard equipment. Three different sizes of proprietary MagnaFy MR-visible markers (Nano4Imaging GmbH, Dusseldorf, Germany) were evaluated on Z-Med balloons (NuMED Inc., Hopkinton, NY) in nine juvenile Yorkshire pigs (62.4 ± 9.5 kg).[8]

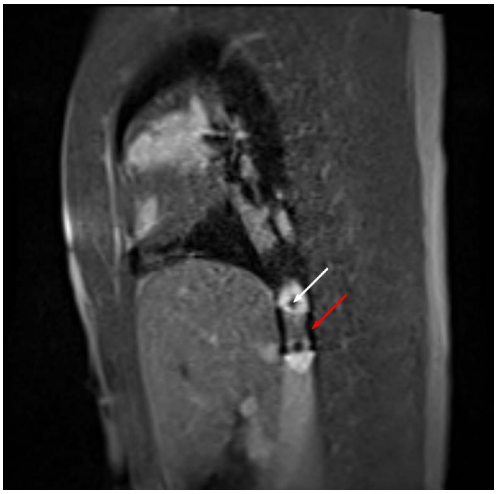

FIGURE 3 *CMR still frame showing 20 mm x 3 cm Z-Med balloon from Figure 2 inflated with 1% gadolinium provided with 1 mm MagnaFy® MRI markers (white arrow) well distinguished from implanted Mega LD stent (red arrow)*

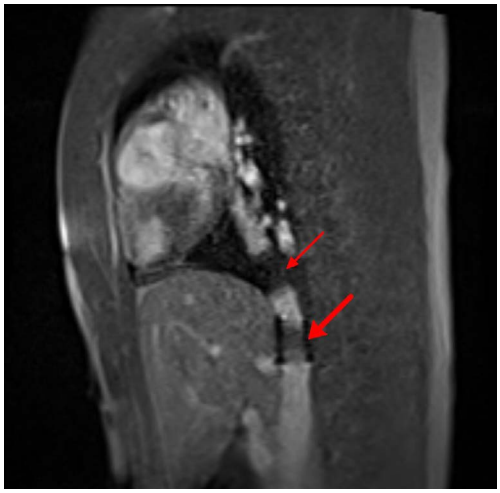

FIGURE 4 *CMR still frame showing implanted platinum-iridium stent with significant artifact (red thin arrow) and implanted 316L stainless steel Mega LD stent with good wall apposition demonstrated (red thick arrow)*

One of these cases was performed during a live case for PICS 2022. The pigs were under general anesthesia and had sheaths placed in the femoral vein and artery via cutdown. Arrow balloon wedge catheters (Teleflex, Wayne, PA) with CO2- or air-filled balloons were used for RHC, and Judkins Right catheters (Cook Medical, Bloomington, IN) were used for LHC. The 0.035" EmeryGlide® guidewires were used for both R&LHC. The first three pigs were imaged before and after infusing varying doses of ferumoxytol. Subsequent pigs were imaged after infusing 2 mg/kg ferumoxytol over 20 minutes to enhance blood pool signal and visualization of markers. Trade-offs between temporal and spatial resolution were investigated using the following spoiled gradient echo MRI sequences for real-time visualization of devices: high temporal resolution: 7 frames/sec, TE/TR = 2.8ms/6.0ms, Rate 3 GRAPPA, 3.5 x 3.5 x 10mm voxels; high spatial resolution: 2.2 frames/sec, TE/TR = 2.8ms/6.2ms, Rate 2 GRAPPA, 1.8 x 1.8 x 9.5mm voxels. In seven pigs, IVC angioplasty and/or stenting was performed using 20 mm x 3 cm Z-Med balloons with two MR markers of varying widths (0.25 mm, 0.5 mm, 1 mm) and 1% gadolinium in the balloon. Mega and Max LD 316L stainless steel stents (Medtronic, Dublin, Ireland) were deployed on Z-Med balloons, and a Covered Mounted CP stent (NuMED) was deployed in the IVC. In three of the stenting procedures, a custom-made 14French Flexor® sheath with proprietary markers on the tip of the dilator and sheath (Cook Medical) was used.

Yorkshire swine have known sensitivity to ferumoxytol; one pig expired during infusion, but catheterization was still performed. RHC was successful in all pigs with the balloon tip seen well in all MRI sequences **(Figure 1)**. LHC was attempted and successful in two pigs; the EmeryGlide guidewire entered the left ventricle retrograde easily. IVC angioplasty was attempted in four pigs and was successful in all. Implantation of seven stainless steel stents and one platinum-iridium stent was attempted and successful in all **(Figures 2 & 3)**. MagnaFy® MR markers were finetuned by different width and number of layers **(Figure 2 & 3)** on the Z-Med balloons. The 0.5 mm- and 1 mm-wide were more easily seen than 0.25 mm-wide markers. The platinum-iridium stent caused significant artifact, leading to inability to assess wall apposition **(Figure 4)**. The 316L stainless steel Mega and Max LD stents were seen well, however, before and after deployment, and wall apposition was assessed **(Figure 4).** Markers placed at the ends of the tapered tips of the balloons were more easily distinguished from the stent compared to the typical marker location on the shoulders of the balloons **(Figure 5)**. The markers on the Flexor® dilator and sheath were well seen in all cases and allowed proper placement of the sheath in relationship to the stent during implantation. Ferumoxytol 2 mg/kg led to superior imaging of all MR markers, balloons, and stents, compared to no contrast and to 1 mg/kg. Balancing spatial and temporal resolution for the anatomy and intervention was important. For IVC stenting, a higher resolution (144/192 matrix) lower frame rate (~5/2 fps) image yielded optimal visualization.

If low-field MRI is going to be used for ICMR in the future, cardiovascular imaging needs optimization under the conditions of low signal-to-noise ratio and limited gradient performance. Fortunately, pre-clinical and clinical testing has demonstrated that a comprehensive CMR imaging protocol is feasible, including compressed-sensing 2D phase-contrast cine, dynamic contrast-enhanced imaging for myocardial perfusion, 3D MR angiography, and late gadolinium-enhanced tissue characterization.[9]

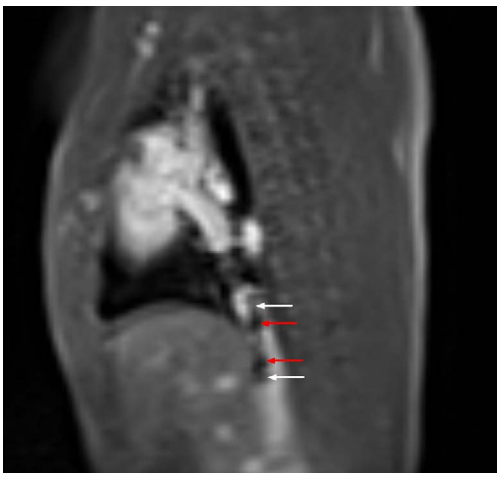

FIGURE 5 *CMR still frame showing 0.5 mm MagnaFy ®markers (white arrows) placed at the ends of the tapered tips of the 20 mm x 3 cm Z-Med balloon well distinguished from ends of crimped 26 mm long Mega LD stent (red arrows) compared to markers on the shoulders of the balloons, which are not well distinguished, seen in Figure 2*

The past 12 months have shown how a dedicated collaboration of clinical and industry partners is able to make big steps forward in bringing low-field MRI to the interventional space. The Ohio State University functioned as a field-lab to bring in devices and software from Siemens Healthineers, Nano4Imaging, Cook Medical, and NuMED to start performing the pre-clinical work necessary to bring interventional procedures with real-time MR-guidance to the bedside. Future studies will further optimize tools, software, and contrast to close the gap to routine clinical applications.

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From left to right:
Dr. Joseph Forbess,
Dr. Redmond Burke and
Dr. Lourdes Prieto

Our World-Renowned Heart Team Doesn't Miss A Beat

The Heart Institute at Nicklaus Children's Hospital welcomes Dr. Joseph Forbess as Chief of Cardiovascular Surgery. He joins our esteemed team of cardiac specialists, which includes Dr. Lourdes Prieto and Dr. Redmond Burke. Together, they advance Nicklaus Children's Heart Institute's global leadership in cardiovascular surgery and fetal and pediatric cardiology, in a care environment where your child matters most.

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Leadership and the Female Interventional Cardiologist on behalf of the Lead Skirts

Shabana Shahanavaz, MD; Laurie Armsby, MD; Holly Bauser-Heaton, MD-PhD; Audrey C. Marshall, MD, MPH; Jaqueline Kreutzer, MD, FACC, FSCAI; Sarah Badran, MBBCh, MACM, FSCAI, FPICCS; Howaida El-Said, MD, PhD, FPICS; Sara M. Trucco, MD, FSCAI, FACC, FPICS

Introduction

In recent years, significant strides have been made in diversifying the medical field, with more women pursuing careers in various specialties. However, despite these advancements, female pediatric interventional cardiologists continue to face a concerning lack of leadership representation within their field. This article aims to shed light on the issue and explore potential solutions to promote gender equality and empower women in pediatric interventional cardiology.

The Gender Disparity

Pediatric interventional cardiology, a highly specialized branch of medicine, focuses on diagnosing and treating heart conditions in children with heart disease as well as adults with Congenital Heart Disease using minimally invasive procedures. While an increasing number of women are entering the field, they often encounter significant barriers when it comes to advancing their careers into leadership roles. Approximately half of first-year pediatric cardiology trainees in 2020 were women, a substantial increase from the past decade (53.4% women [n=163] in 2020 versus 39% [n=119] in 2007–2008).[1] The increased percentage of women in pediatric cardiology training reflects the overall field of pediatrics (72.3% pediatrics versus 42.3% in Internal Medicine).[1,2] Despite this positive trend, the gender disparity becomes evident in the post-training career in various aspects, including research opportunities, committee memberships, and administrative positions. Even with half of the pediatric cardiology trainees being female, only 17% of division chiefs and 19% of editorial board members are women.[3] Although there has been an increase in the number of women recognized as subspecialty directors, this has not translated to an increase in representation at national meetings and committees with differences being more pronounced for high-profile talks (as defined by conference organizers) among invasive specialties.[4]

Barriers and Challenges

Several factors contribute to the lack of female representation in pediatric interventional cardiology leadership roles. One major challenge is the prevailing unconscious biases that permeate the medical profession.[5] These biases can manifest in subtle ways, such as underestimating a woman's capabilities or assuming traditional gender roles.[6] Such biases may affect decisions related to promotions, committee appointments, and research funding, hindering women from reaching leadership positions.[7] [8] Bumenthal et al studied adult female cardiologists in 2014 and found that women faculty were younger than men (mean age, 48.3 years versus 53.5 years, P<0.001), had fewer total publications (mean number: 16.5 publications versus 25.2 publications; P<0.001), were similarly likely to have National Institutes of Health funding (proportion with at least one National Institutes of Health award, 10.8% versus 10.4%; P=0.77), and were less likely to have a registered clinical trial (percentage with at least one clinical trial, 8.9% versus 11.1%; P=0.10).[9]

Given the data above along with stereotypic assumptions of leaders within society, it is not surprising to find that there is deficient mentorship and sponsorship. Mentorship plays a vital role in career advancement--providing guidance, support, and opportunities for professional growth. Female pediatric interventional cardiologists often struggle to identify mentors and particularly, sponsors, to help them navigate the complex landscape of academic medicine and advocate for their career development, promoting them to achieve higher goals.[10,11]

Despite the challenges, there have been female interventional cardiologists who have successfully navigated the challenges and have conquered different leadership positions. Below is their perspective within academic leadership positions.

Leadership in National Organizations

One of the most rewarding aspects of my career has been the opportunity to serve in leadership positions within national organizations. In many ways the work is similar to leadership within your institution; it involves creating a vision, developing a team, supporting the team members, cultivating a culture, accomplishing goals, and managing communication. But for me there have been additional, unique aspects to leading at a national level that have yielded significant rewards. It has been energizing to look up from the intensity of direct patient care to work on issues that shape the field and impact patients, providers and systems. In addition, I have loved the opportunity to either reconnect or maintain connections with peers or mentors that I became close to during training or early in my career. These renewed or enriched friendships over the span of my career epitomize the sense of pediatric cardiology as a relatively small, cohesive and supportive community. In addition, working at a national level offers a chance to get to know and work with some of the most inspiring, productive and creative leaders in pediatric cardiology. Once I gained leadership positions myself I was able to provide opportunities to junior colleagues, and experience the immeasurable rewards that come from supporting the career development of others. Finally, these opportunities are extremely important in supporting one's own professional goals. Work at a national level is a requirement in most institutions to achieve academic promotion to the level of professor.

So how do you get involved in this? One pathway to leadership at a national level (such as AAP-SOCCS, AHA, ACC, ABP, ACGME), is to first get involved at the committee level. Once there, it is important that you do the work that supports and expands the committee. If you earn the reputation as someone who is reliable, engaged and adds value, you will eventually be given an opportunity to rise to leadership positions on those committees. In person meetings are still priceless, but the movement toward virtual meetings in the current era have significantly enhanced the frequency, engagement and productivity of national committees. I've found that this has made the work not only more successful, but more enjoyable as well.

Finally, I have found this work to be extremely rewarding, however like all things, it comes at a cost. The work takes time, requires your best efforts, and supplementary resources. In following this path you'll need to volunteer for work and complete it quickly and well. Because these activities don't directly serve your institution, you will do much of the work

after normal work hours. To meet people and participate in key meetings you will still need to attend the national conferences. Your CME funds will likely not cover all your expenses. However, in my experience the cost pales in comparison to the enjoyment, impact and reward that these opportunities have yielded.

Leadership in the Catheterization Lab

Leadership experiences come in infinite varieties. Often, what comes to mind is a person, usually male, sitting commandingly at the head of a table in a board room, or maybe a brilliant individual, again often male, rapidly devouring the data at a lab meeting. One of my favorite leadership experiences is getting a cath lab team through a difficult and rapidly moving case in the lab. Each member of the team comes into the case with their own expectations, variable experience, and level of comfort with others on the team. Some may be anticipating the most stressful three hours of the week, while others may simply be expecting an unremarkable last case before the start of a long weekend. When everyone starts to share the feeling that this is not just going to be "a routine diagnostic cath," but instead, that the patient may be unstable, or the intervention may be very high risk, you feel the team respond to the tension by upping their performance level. At this point, when uncertainty begins to permeate the room, a team-leader dynamic starts to take shape amongst a group of coworkers. As the primary operator, I love helping to orchestrate this transition. Acknowledging anticipatory moves by the techs, communicating with the anesthesiologists, and calling out events and orders that the team members will expertly respond to, can be such a rewarding experience. Engendering confidence in my leadership by providing my own best technical performance and judgement, I can appreciate the bilateral nature of this type of leadership experience. It doesn't escape my notice that often, in the cath lab, much of the team is female. While we've had a few great male nurses and techs, the teams in both cath labs I've led have been largely dominated by X chromosomes. My experience has been that female leaders with predominantly female teams seem to get to the "shared mental model" in a unique way. The camaraderie that we share in the locker room, the break room, makes leading easier and more intuitive. When sinus rhythm is re-established, or the device slips right into place, we share equally in the sense of a job well-done. I quietly savor the satisfaction leading a group of highly skilled women, and I hope they also take pride in being part of the female-led team.

Non-Traditional Leadership

In addition to conventional leadership roles (Division Chief, Subsection Director, Department Chair, Hospital Administrator) there are many non-traditional forms of leadership. These positions may or may not come with an official title and include roles that are appointed in addition to those that one more naturally falls into. Unlike positions of formal power, non-traditional leadership roles often arise when an interest becomes a passion, or an innate talent is brought to light. One can be an expert in a particular area, the authority in a specific niche, rendering them the leader in that field. Another might be exceptionally skilled in performing a procedure, which over time yields to a large referral base. An individual who is an enthusiastic and effective teacher, may be asked to direct a course or design a curriculum. A person that can build meaningful rapport and form positive connections, could ultimately start an organization or form a collaborative. There are those who carefully assess situations, determine the fundamental problems, and thereby guide effective programmatic change. These are just some examples of forms of non-traditional leadership, as the range is so vast a complete list would be impossible to generate.

Although men and women can equally fill such roles, it is where these endeavors eventually lead that often differs by gender. All these tasks require time and effort; not always do they generate payment or advancement. Where historically women may have been satisfied with just the knowledge of having done a job well, men are more likely to seek acknowledgement and payment for their efforts. Women in medicine, just as in any other professional career, need to be confident in their worth, and advocate for appropriate recognition and compensation.

Women in Research

The field of cardiology has several areas of disparate inclusion of women in research. It is well known that clinical trials are highly weighed toward male involvement as patients, but in addition, there have been no major clinical trials run by a women primary investigator. In this regard, representation does matter for recruitment and the women-led clinical trial must be a goal for improved equity. We have been quite fortunate to have strong leaders in outcomes research that are women, but this has yet to proven fruitful in other areas. Our research in basic science continues to reveal significant areas of improvement in equity. While much of our research falls into the realm of biomedical engineering, the base representation of females is quite poor in academic positions. Public funding continues to be discrepant as well with only 31% of grantees being women. We are aware female applicants receive less funding than males, often due to differences in amounts requested by males versus females. Despite achieving parity in biomedical degrees, we see that in recent years there has been a decline in percentage of females receiving R01 and renewal grants. It remains no mystery, therefore, that women representation in leadership in basic science continues to be few and far between. As others have pointed out, the role of editor of major journals continues to be held mostly by males, creating a bias for published science. As we continue to investigate the role of women leaders in our field, we continue to uncover the bias that exists at a leadership level in research. At every turn, recruitment, retention, and promotion of women within the research arena is anemic. Despite our gains in representation of females in pediatric cardiology, we do not see promotion of women to pursue these much-needed academic efforts within research. Protection of time and encouragement of women in these fields of research is paramount to increased success and to avoid attrition throughout one's career. It remains unclear in current research the cause for the discrepancies noted above, however, as research is often noted in our field to be an additional task without time provided in many circumstances, the additional burdens placed on women may prevent continuation in this arena. With fewer academic appointments, lower rates of funding applications, decreased awarded dollar amounts and the recent decline of females receiving high level public funding, leadership will continue to suffer in this research arena.

Leadership Training and Support

Throughout my career I had the opportunity to receive formal leadership training several times. These were most valuable programs, which helped me learn about group dynamics, biases, negotiation, conflict resolution and much more. Certainly, such training is most advisable and helpful. However, I recognize that every time I had to make a major decision with regards to undertaking a significant new leadership role, I felt very much alone and unprepared. I did not know how much to ask, how demanding to be, what I deserved, what was reasonable or what would be regarded as crazy. It was thanks to the generosity of two other successful women leaders who provided guidance and advice, that I could develop the strength to advocate for myself as they had done. The lesson to all of us is that we should lean on each other and seek advice from those who have already driven the same road.

Pediatric Cardiologist Faculty Position

UC Davis Children's Hospital, School of Medicine, Department of Pediatrics Cardiology

The Department of Pediatrics at the University of California, Davis School of Medicine is recruiting a full-time Pediatric Cardiologist. We are recruiting at the Assistant, Associate, or Full Professor ranks in the Clinical Pediatrics or Health Sciences Clinical Series in the Division of Pediatric Cardiology.

The candidate's primary clinical duties include: 1) general outpatient pediatric cardiology in our local clinics as well as our outreach clinics, 2) in-patient consult service, 3) supervise and interpret pediatric electrocardiograms and transthoracic, transesophageal, and fetal echocardiograms. Required skillsets include ability to perform and interpret transesophageal and fetal echocardiograms. It is expected that the candidate will share in the on-call and weekend/holiday coverage schedule.

In addition to the clinical responsibilities, the ideal candidate will be expected to participate in teaching of medical students, residents and fellows, research activities of the Department of Pediatrics, and serve on departmental committees. A background and/or interest in research or quality improvement is preferred.

Candidates must have the following experience/qualifications:

- M.D. or D.O.
- Successful completion of an approved pediatric residency training program
- Successful completion of an approved Pediatric Cardiology fellowship training program at this hire
- Board certification/eligibility in Pediatric Cardiology
- Eligibility for a California Medical License
- Ability to foster collegiality and work collaboratively in a diverse environment
- An additional year of advanced pediatric echocardiography training is preferred

The Pediatric Heart Center at UC Davis Children's Hospital is inland Northern California's only full-service facility for children and young adults with congenital and acquired heart disease offering the most advanced testing and treatments for a range of congenital or acquired cardiovascular conditions. Our integrated multidisciplinary team of 2 CHD surgeons, 9 Pediatric Cardiologists and 6 Nurse Practitioners/PAs along with other pediatric subspecialists and researchers offer Northern California's most sophisticated and specialized expertise in cardiac imaging, diagnostic, interventional, hybrid procedures and cardiac surgery. Other specialized cardiac services of the Program include echocardiography (including fetal, transesophageal, IVUS, and intracardiac), exercise stress testing, electrophysiology testing, radiofrequency and cryoablation and pacemaker services. The CHD program also has an advanced interventional/hybrid fellowship. Other advanced subspecialty cardiac clinics offered include cardiomyopathy and heart failure, pulmonary hypertension, adult congenital heart disease, and interstage for single ventricle infants. To provide more flexibility, accessibility, and timely care for pediatric cardiology patients, the Pediatric Heart Center treats patients in both Sacramento and throughout Northern California at various outreach sites.

Completed applications include CV, Cover Letter, Statement of Teaching, Statement of Contributions to Diversity, Equity, and Inclusion and contact information for 3-5 references. Candidates should submit their application online at: https://recruit.ucdavis.edu/apply/JPF05614.

The salary range for this position is $235,628 - $396,166. This position includes membership in the **Health Sciences Compensation Plan**.

With more than 120 physicians in 33 pediatric subspecialties, the Children's Hospital is a 121- bed hospital housed within the 619-bed University of California, Davis Medical Center. It is the only designated Children's Hospital in the Sacramento region, and is known for offering comprehensive, compassionate, family-centered care. UC Davis Children's Hospital is distinguished for its outstanding congenital heart program and its internationally recognized telemedicine programs. UC Davis Children's Hospital has a 49-bed level 4 Neonatal Intensive Care Unit and a new 24-bed Pediatric Intensive Care Unit/Pediatric Cardiac Intensive Care Unit. UC Davis Medical Center is a Baby-Friendly designated birth center.

The UC Davis Children's Hospital is based on the UC Davis Health campus in Sacramento, California and serves a population of over 1 million children in the Northern California, Central Valley and Western Nevada regions. Sacramento is an easily accessible, family-oriented city in close proximity to the San Francisco Bay area, Lake Tahoe and the Sierra Nevada Mountains, the California coast, and Napa Valley.

UC Davis commits to inclusion excellence by advancing equity, diversity and inclusion in all that we do. We are an Affirmative Action/Equal Opportunity employer, and particularly encourage applications from members of historically underrepresented racial/ethnic groups, women, individuals with disabilities, veterans, LGBTQ community members, and others who demonstrate the ability to help us achieve our vision of a diverse and inclusive community. For the complete University of California nondiscrimination and affirmative action policy see: **http://policy.ucop.edu/doc/4000376/NondiscrimAffirmAct**. If you need accommodation due to a disability, please contact the recruiting department.

Under Federal law, the University of California may employ only individuals who are legally able to work in the United States as established by providing documents as specified in the Immigration Reform and Control Act of 1986. Certain positions funded by federal contracts or sub-contracts require the selected candidate to pass an E-Verify check. More information is available **http://www.uscis.gov/e-verify**.

UC Davis is a smoke & tobacco-free campus (**http://breathefree.ucdavis.edu/**).

Concluding Remarks

There is still work to be done both on a systematic basis within academic institutions and, importantly, within society to bring about consistent change within leadership positions for females. Institutions will need to work on the professional development of women cardiologists, flexible work pathways, provide interim gap funding for research, and offer sponsorship to professional societies. Professional societies' journals should ensure a better balance in editorial boards and better representation among their invited speakers to improve the visibility of women in cardiology.

Lean into yourself and lead with kindness.

To emulate a respected leader, don't simply copy their behaviors without considering the impact. It may result in feeling uncertain, unworthy, or experiencing imposter syndrome. Instead, take a step back and observe the leader's unique beliefs and attitudes, which, combined with their circumstances, skills, and timing, manifest as specific behaviors. By understanding the various paths between beliefs and achievements, you can confidently forge your own authentic path. Don't suppress parts of yourself in the professional realm. Embrace your heart, personality, skills, abilities, and preferences. Identify what makes you uncomfortable, acknowledge your limitations, and seek out multiple avenues of fulfillment. Be proud of your unique style, whether it's enjoying diverse interests or pursuing traditionally gendered activities. Remember, you can't compete with compassion if you are trying to imitate someone else. Find many happy places and figure out how YOU can get there without being shamed into trying to out-man the men. Revel shamelessly in the style that is uniquely yours, from bars to breast feeding, baseball to ballet. You can't compete compassionately as anyone else.

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Children's Mercy KANSAS CITY

Pediatric General Cardiologist

The Ward Family Heart Center at Children's Mercy Hospital, Kansas City, is seeking a general pediatric cardiologist to cover clinics in the Kansas City Metroplex, regional clinics, and some inpatient service. The successful candidate would join an existing group of 30 cardiologists (28 in Kansas City, 1 in Wichita, KS and 1 in Topeka, KS), 4 CV surgeons, and over 30 APNs.

Our Heart Center serves a population of over 5 million in the heart of the U.S.A. We perform over 500 cardiac operations, 600 cardiac catheterizations including over 200 invasive EP procedures, 18,000 outpatient visits, and more than 20,000 echocardiograms annually. Our two state-of the art catheterization labs are both hybrid labs and equipped with the latest 3D imaging and EP technology. Telehealth is regularly used to provide care to our families in the region.

Our Kansas City-based super-specialty resources include Electrophysiology (which includes Clinical EP, pacing and Genetic Arrhythmia), Cardiac Transplantation/Heart Failure, Interventional Cardiology and Advanced Cardiac Imaging (fetal echo, 3D echo, trans-esophageal echo, CT, MRI and 3D printing). We also provide specialized, team-based care in Fetal Cardiology (with on-site delivery services for high-risk neonates in Kansas City), Interstage Monitoring (CHAMP), Preventive Cardiology, Cardiac Genetics, Cardio-oncology, Single Ventricle Survivorship, Pulmonary Hypertension, a dedicated POTS clinic and Cardiac Neurodevelopmental Services. In 2022, the Ward Family Heart Center program was ranked # 19 nationally by USNWR.

Board eligibility in Pediatric Cardiology is required. Flexibility, strong communication and collaborative skills are key. There are opportunities for clinical research and teaching medical students, residents and fellows. Salary and academic rank are commensurate with experience.

Please submit CV and cover letter to:
https://faculty-childrensmercykc.icims.com/jobs/22725/physician/job

For more information:
Aliessa Barnes MD
Co-Director, Ward Family Heart Center; Chief, Section of Cardiology
816.983.6225, apbarnes@cmh.edu

For more information about Children's Mercy Kansas City and about Kansas City itself, visit cmkc.link/TakeYourPlace.

Kansas City is a thriving cultural and economic city with more than 2 million residents. Our city's long list of attractions includes world class museums, a vibrant arts scene, professional sports, superb shopping, great jazz clubs, and the best places to enjoy barbeque! For more information about activities in Kansas City go to www.visitkc.com

CAREER OPPORTUNITY

UT Health San Antonio
The University of Texas Health Science Center at San Antonio

Pediatric Heart Center Pediatric Cardiologist

The Pediatric Heart Center of UT Health San Antonio in the Joe R. and Teresa Lozano Long School of Medicine and University Health System is seeking a full-time pediatric cardiologist. Candidates with interests in general cardiology, echocardiography and advanced cardiac imaging, pediatric heart failure, or adult congenital heart disease are encouraged to apply.

The Pediatric Heart Center of UT Health San Antonio has been providing care to the children and adults in San Antonio and South Texas for over 30 years and is the only academic Heart Center in San Antonio serving Bexar county, as well as South and West Texas with a catchment area of over 6 million people. San Antonio is one of the fastest growing cities in the US and is a family friendly city with picturesque neighborhoods, affordable housing and local attractions including the Alamo, River Walk, Sea World and a vibrant food scene.

The pediatric cardiology division is growing and has a strong and collegial relationship with our cardiothoracic surgeons. We have a committed cardiac critical care team, congenital cardiac unit and a growing pediatric transport program. There is growth potential with the building of a new Women's and Children's Hospital scheduled to open 2023. Cardiology faculty appointments are engaged in the training of medical students, 35 pediatric residents and fellows from five pediatric fellowships including neonatology and critical care.

Qualifications for this position include:

- Candidates should be Board Certified or Board Eligible in Pediatric Cardiology
- Meet the requirement for medical licensure to practice in the State of Texas

UT Health San Antonio offers a competitive salary, comprehensive insurance package, and generous retirement plan. Academic appointment and salary will be commensurate with experience.

Interested individuals should apply online at https://uthscsa.edu/hr/employment.asp Requisition ID: 22000645

UT Health San Antonio is an Equal Employment Opportunity/Affirmative Action Employer including protected veterans and persons with disabilities.
All faculty appointments are designated as security sensitive positions.

Pediatric Heart Transplant and Heart Failure Cardiologist / Open Rank

The Pediatric Heart Center of UT Health San Antonio, Joe R. and Teresa Lozano Long School of Medicine, is seeking a full-time medical director of pediatric heart failure, transplant and mechanical circulatory support to develop a pediatric heart failure and heart transplant program.

The Pediatric Heart Center has been providing care to the children and adults in San Antonio and South Texas for over 30 years and is the only academic Heart Center in San Antonio serving Bexar County as well as South and West Texas with a catchment area of over 6 million people. San Antonio is one of the fastest growing cities in the US and is a family friendly city with picturesque neighborhoods, affordable housing and local attractions including the Alamo, River Walk, Sea World and a vibrant food scene.

The pediatric cardiology division is growing and has a strong and collegial relationship with our cardiothoracic surgeons. We have a committed cardiac critical care team, congenital cardiac unit and a growing pediatric transport program. There is growth potential with the building of a new Women's and Children's Hospital scheduled to open 2023. Cardiology faculty appointments will be engaged in the training of medical students, 35 pediatric residents and fellows from five pediatric fellowships including neonatology and critical care.

The ideal candidate would have experience in pediatric heart failure and transplant and the desire to build and grow a heart failure program. The position encompasses responsibilities in patient care including heart failure, pre- and post-transplant and VAD patients, all forms of mechanical circulatory support and ECMO and will work closely with the University Health Transplant Institute. Education and research are strongly encouraged and supported with access to a dedicated statistician and research team.

Qualifications for this position include:

- Successful completion of training in an accredited pediatric cardiology fellowship and pediatric heart failure fellowship or equivalent pediatric heart failure experience.
- Preference will be given applicants qualified to serve as an Organ Procurement and Transplant Network Primary Pediatric Heart Transplant Physician.
- Candidates should be Board Certified or Board Eligible in Pediatric Cardiology
- Meet the requirement for medical licensure to practice in the State of Texas

UT Health San Antonio offers a competitive salary, comprehensive insurance package, and generous retirement plan. Academic appointment and salary will be commensurate with experience.

Interested individuals should apply online at https://uthscsa.edu/hr/employment.asp Requisition ID: 22000298

UT Health San Antonio is an Equal Employment Opportunity/Affirmative Action Employer including protected veterans and persons with disabilities.
All faculty appointments are designated as security sensitive positions.

Please send curriculum vitae and letters of recommendation to:

Ginnie Abarbanell, MD
Professor of Pediatrics; Chief, Division of Pediatric Cardiology
University of Texas Health - San Antonio
abarbanell@uthscsa.edu

Heart of a Champion Day Offers Life-Saving Screening for Student Athletes

Atrium Health Partnered with the Carolina Panthers to Provide Free Sports Physicals at Bank of America Stadium

HEART OF A CHAMPION DAY
Where Every Undefeated Season Starts

Atrium Health
Now part of ADVOCATEHEALTH

Atrium Health partnered with the Carolina Panthers and hosted Heart of a Champion Day at Bank of America Stadium in Charlotte, North Carolina. The event provided student-athletes with a free general sports screening, musculoskeletal check and a vision examination. Unlike typical athletic screenings, Heart of a Champion Day also included electrocardiograms to detect genetic heart abnormalities that could lead to sudden cardiac arrest during competition – a rare, but catastrophic event.

Heart of a Champion Day began in 2008 with the goal of ensuring high school athletes could safely compete in sports. The program has since expanded and now screens thousands of students at more than 90 schools across the Carolinas. Volunteers completed more than 1,000 screenings throughout this year's event.

Some of the volunteers were: Dr. David Price, Sports Medicine Physician with Atrium Health Musculoskeletal Institute and a founding member of Heart of a Champion Day; Dr. Gonzalo Wallis, Interim Chief of Pediatric Cardiology with Atrium Health Levine Children's; and Kenny Moore, Carolina Panthers legend and Butler High School alumni.

Children's Hospital of Philadelphia®
Cardiac Center

Penn Medicine Clinician/Attending Pediatric Cardiologist

St. Peters University Hospital and Princeton offices

New Brunswick, New Jersey

Provides health care services on a full-time or part-time basis in an owned or affiliated health care entity of Penn Medicine or The Children's Hospital of Philadelphia. Provides inpatient hospital services as required and fulfills all medico-administrative duties associated with membership on each hospital medical staff of which clinician is a member. May participate in a minimum of 50 hours per year of active and high-quality teaching or equivalent service. Performs prompt, courteous and competent professional services in accordance with generally accepted professional standards for such services and with the standards established from time to time. Maintains license to practice medicine without restriction or limitation in Pennsylvania or location of affiliates, if applicable.

Provide patient care at CHOP Satellite locations of St. Peters University Hospital and Princeton offices.

Pediatric Cardiologist/Attending physician at St. Peters University Hospital and Princeton Specialty Care Satellite Office will provide direct patient care affiliated with the Children's Hospital of Philadelphia.

Requirements

- MD; License to practice medicine without restriction or limitation in Pennsylvania and New Jersey
- DEA Licensure
- Must be board certified in Pediatrics & Pediatric Cardiology
- At least 0-1 year of work experience related in Pediatric Cardiology
- Position available is a community based pediatric cardiologist at Saint Peters University Hospital
- The candidate will be expected to provide outpatient services and inpatient consultations at Saint Peters University Hospital
- Didactic teaching to fellows, residents, medical students and nurses
- Community hospital call for regional hospitals and nurseries
- Position is primarily based at Children's Hospital of Philadelphia's Saint Peters University Hospital and Princeton Specialty Care Center
- Experience in fetal echocardiography preferred but not required

Responsibilities

- St. Peters Pediatric Cardiologist /Attending Physician
- Provide patient care at CHOP Satellite locations of St. Peters University Hospital and Princeton offices
- St. Peters University Hospital and Princeton Specialty Care Satellite
- As a Pediatric Cardiologist/Attending physician at St. Peters University Hospital and Princeton
- Specialty Care Satellite Office will provide direct patient care affiliated with the Children's Hospital of Philadelphia

To Apply please visit:

https://wd1.myworkdaysite.com/recruiting/upenn/careers-at-penn/job/CHOP-Princeton-Specialty-Care/Penn-Medicine-Clinician--Department-of-Pediatrics-_JR00073555

ACTION Develops Registry to Close Gaps Amongst the Pediatric Heart Failure Patient Population

A leading pediatric heart failure organization ACTION, the Advanced Cardiac Therapies Improving Outcomes Network (Cincinnati, OH), has developed a registry to close gaps amongst the pediatric heart failure patient population.

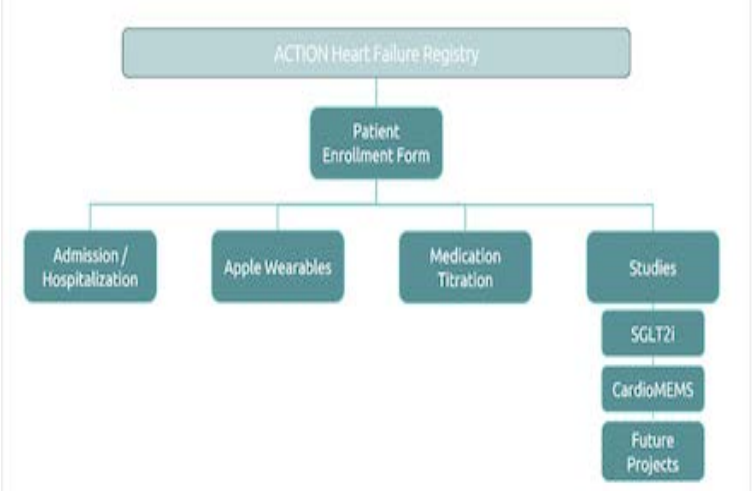
Background

ACTION started with a focus on patients supported with a Ventricular Assist Device (VAD), and while ACTION's efforts were very successful for improving access to and outcomes for children on a VAD, the group observed a lack of data about the use of heart failure medications in children. This is an important opportunity to improve outcomes for all children at risk for or living with heart failure.

"Now is the time to improve outcomes for children with heart failure," said Joseph Spinner, MD, Texas Children's Hospital. "ACTION has the experience and success with our VAD registry to lead the way and take on this very important problem affecting children. Through the ACTION HF registry, we now have the infrastructure to learn from one another and rapidly acquire and disseminate information to improve outcomes for children with heart failure."

HF Registry

The Heart Failure database began with limited patient data entry. ACTION's intent was to analyze and share the findings from learning and implementing quality improvement strategies to enhance care practices. Initiatives derived from data learnings required additional data entry to substantially support findings, which led to database expansion and to the HF Registry. The registry is designed as a single-entry point to optimize and increase the data entry volume and efficiency. The innovative centralized structure allows for new initiatives to be rapidly added with limited data burden.



HF Registry Initiatives

Its initial pilot ACTION HF database and the feedback it received helped ACTION identify several initiatives to focus its efforts on: 1). an inpatient acute decompensated heart failure registry; 2). standardization of heart failure medication usage and dose titration; 3). understanding the use and side effect profile of Sodium-glucose Cotransporter-2 (SGLT2) inhibitors; 4). determining the feasibility of using Apple wearables for real time data and tracking; and 5). understanding the use and safety of CardioMEMS in children and adults with congenital heart disease with heart failure. There are many medications and advanced therapies which have been studied for adults with heart failure, but ACTION does not have evidence for them in its pediatric heart failure patients --- the HF registry aims to close those gaps.

1. Inpatient Acute Decompensated Heart Failure Registry Acute decompensated heart failure in children is associated with significant morbidity, mortality, and resource utilization. However, previous attempts to better characterize pediatric heart failure hospitalizations are limited by an inability to capture accurate underlying diagnoses and long-term outcomes, and granular data pertaining to heart failure medication usage are lacking. The ACTION Inpatient Acute Decompensated Heart Failure Registry will better characterize all pediatric heart failure hospitalizations, including among children with congenital heart disease, and better capture granular heart failure medication use to help ACTION better understand if and how heart failure medications are associated with pediatric heart failure short-term and longer-term outcomes.

2. Meds Titration The pediatric heart failure population has considerably fewer drug studies to support medication usage than the adult heart failure population. Thus, heart failure medication options for children are limited, and decisions on how to use and adjust medications are less well-informed. The medication titration initiative aims to facilitate titration of heart failure medication doses among ACTION center patients using telephone, telehealth, and in-person visits. The HF registry collects information illustrating what medicines are being used and at what time points to develop consensus-driven medical therapies amongst pediatric heart failure providers. The ability to deliver care in accessible ways and understand the use of

MaineHealth
Physician
Recruitment Center

Pediatric Cardiologist with Subspecialty Focus in Imaging

Maine Medical Partners and Maine Medical Center are seeking a board eligible/board certified pediatric cardiologist with a subspecialty focus in imaging to join their group. The ideal candidate should have additional subspecialty training or significant experience in cross-sectional imaging. Responsibilities would include both inpatient and outpatient pediatric cardiology attending services along with overseeing the Congenital and Pediatric Cardiac MRI/CT program. The current pediatric and congenital volume is ~200 studies annually with a rapidly growing adult congenital population. Different amounts of research, administrative, and educational time may be available depending on the candidate, their experience, and their career goals.

The Congenital Heart Program at Maine Medical Center provides comprehensive services including congenital heart surgery, interventional cardiology and invasive electrophysiology. Maine Medical Center has provided surgical care in the state for over 25 years and congenital interventional services for over 20 years. The Congenital Heart Program currently participates in STS, PC4, PAC3, CNOC, VPS, and IMPACT registries. Integrated across both the Pediatric and Cardiovascular Services Lines at the Barbara Bush Children's Hospital and Maine Medical Center, the Congenital Heart Program provides cohesive care across disciplines and collaborates closely with both pediatric and adult subspecialists.

Maine Medical Partners is Maine's largest multi-specialty medical group serving the healthcare needs of patients locally and throughout northern New England. This high quality team of 600+ physicians and 350+ advanced practice professionals provides a wide range of hospital based, primary, specialty, and sub-specialty adult and pediatric care delivered throughout a network of 54 locations across the State and acts as a regional referral network. Maine Medical Center has 700 licensed beds and is the state's leading tertiary care hospital and Level One Trauma Center, with a full complement of Residencies and Fellowships and an integral part of Tufts University Medical School.

Situated on the Maine coast, Portland offers the best of urban sophistication combined with small-town friendliness. The Old Port area receives tourists from around the world with nationally recognized restaurants, breweries, and hotels. The area provides four-season recreational opportunities, such as skiing, hiking, sailing, and miles of beautiful beaches. Just two hours north of Boston, this is an exceptionally diverse and vibrant community.

Interested candidates may submit a CV and cover letter to:
Gina Mallozzi, Physician Recruiter
gina.mallozzi@mainehealth.org

consensus driven medical therapies may be an ideal advancement to improve the care of this pediatric population.

3. SGLT2i The SGLT2i study is an example of a new project that needed specific data entry in addition to the Meds Titration project. The use of SGLT2i in children is based on very little pediatric data, though literature strongly supports the use of SGLT2i in adults with heart failure. ACTION hope to understand how SGLT2i medications are used in pediatric centers and rapidly disseminate data in order to potentially add these medications as potential therapies for children with diastolic or systolic heart failure.

4. Wearables In addition to the lack of data supporting pediatric heart failure therapies is the lack of remote monitoring and assessment tools available for children with heart failure. Adult heart failure assessments are supported by studies that have demonstrated that biomarkers received through technology have been useful to identify signs and allow for early treatment of heart failure symptoms. ACTION does not yet know if technology can be utilized to improve heart failure care in pediatric populations. The wearables project aims to understand the usefulness of collecting real time biometric health data in pediatrics by using Apple technology.

5. CardioMEMS™ Implantable hemodynamic monitors (IHMs) have been utilized to measure pulmonary artery pressures to provide earlier and more accurate detection of filling pressures and volume status to help clinical management of adults with heart failure. The existing CardioMEMS™ HF System trials excluded patients with Congenital Heart Disease (CHD) and of pediatric age. This prospective registry will collect use and safety data of CardioMEMS™ device implantations in children or adults with CHD and heart failure who meet the appropriate indications. This study aims to understand the feasibility of implantation, safety, and clinical outcomes of CardioMEMS™ in pediatric heart failure patients and will ultimately allow for additional indications and benefit a larger patient population.

"ACTION is trying to use the very latest technology such as sensors and wearables to improve our understanding, treatment, and outcomes in heart failure," said David Peng, MD, CS Mott Children's Hospital. "We can only do this because of our community's extraordinary collaboration, open-mindedness, and commitment."

Goals and Next Steps

The heart failure registry expansion launched in July 2022 within ACTION. As of May 2023, 156 patients from 13 pediatric centers have been enrolled into the registry. ACTION plans to include as many pediatric heart failure patients and centers as possible to best understand variability and feasibility of its studied initiatives. ACTION strives to get new therapies approved and guidelines developed to ultimately improve outcomes for pediatric heart failure patients.

To learn more about ACTION and how to join its efforts, please visit: **www.actionlearningnetwork.org.**

SIU SCHOOL of MEDICINE

Pediatric Cardiologist

The Department of Pediatrics at Southern Illinois University School of Medicine is recruiting an M.D./D.O. for a fourth pediatric cardiologist position at the Assistant or Associate Professor level. Faculty will join a rapidly expanding cardiology program at our Children's Hospital, an 80-bed CHA affiliated pediatric referral center for Central and Southern Illinois with a referral base of almost 2 million. The current program includes state-of-the-art noninvasive imaging in TTE, TEE, fetal echocardiogram, and advanced MRI imaging. We have developed a highly successful collaborative clinical and research program with a nationally recognized pediatric cardiology center. Opportunities exist to participate in resident and medical student education and receive an advanced degree in medical education. Candidates must be board eligible in Pediatrics and Pediatric Cardiology. Illinois licensure is required prior to official start date. Travel in central Illinois to outreach clinics is required.

Applications are accepted online at:
https://siumed.edu/hr

For additional information, please contact:

Ramzi Nicolas, MD
217.545.9706
rnicolas@siumed.edu

Southern Illinois University School of Medicine is an Affirmative Action/Equal Opportunity employer and provides equal employment and educational opportunities for all qualified persons without regard to race, color, religion, sex, national origin, age, disability, genetic information, sexual orientation, protected veteran status or marital status in accordance with local, state and federal law. A background investigation is required as a condition of employment.

Duke Pediatric Cardiology Transplant Physician

Duke Pediatric Cardiology and Duke University School of Medicine are seeking an early to mid-career pediatric cardiac transplant/heart failure physician to join our transplant/heart failure team. Candidates should be academically motivated, BE/BC in pediatric cardiology and have advanced training and/or experience in pediatric transplant and heart failure. This position will focus on care in both the in-patient and outpatient settings for the cardiology transplant/heart failure service. The ideal candidate would be motivated to work within a high functioning transplant/heart failure service seeking to provide innovative care to a rapidly expanding patient population. Applicants with research interests/funding are also invited to apply.

The Duke Pediatric and Adult Congenital Heart Center is one of the highest volume pediatric heart programs in the United States. Ranked #7 in 2022 by U.S. News and World Reports for Pediatric Cardiology and Heart Surgery (USNWR pediatric-rankings: cardiology-and-heart-surgery), and recognized for exceptional outcomes (STS Public Reporting Outcomes), the program has experienced exponential growth over the past 4 years. The current Pediatric Heart Failure/Transplant team consists of 2 Transplant Cardiologists, 2 Nurse Practitioners, a dedicated Pediatric Heart Transplant Coordinator, 4 Congenital Cardiac Surgeons, and additional allied healthcare team members. In 2022 the program performed 14 pediatric heart transplants including numerous innovative approaches such as the first pediatric "donation after circulatory death (DCD)" heart transplant performed in the United States, the first ever partial heart transplant and the first ever heart-thymus co-transplant.

Visit Duke Division of Pediatric Cardiology at https://pediatrics.duke.edu/divisions/cardiology

The greater Triangle area of **Raleigh, Durham, and Chapel Hill**, has a population of more than two million residents that offers diverse opportunity. From urban loft living to suburban and rural family homes with acreage – there are options for every lifestyle. The Research Triangle Park (RTP) lies in the midst of the area, a globally prominent research and development center conceived around the main academic centers – Duke University, University of North Carolina, and North Carolina State University. This trio of leading universities, combined with the RTP, has helped create a region that is culturally diverse, economically resilient, and nationally recognized as a wonderful place to live. To learn more about the Duke and Greater Triangle communities, visit https://www.discoverdurham.com/

Interested candidates should submit CV and Letter of Interest via:
https://www.practicematch.com/physicians/job-details.cfm/846879

With a deep commitment to attracting and retaining a diverse staff, Duke University will honor your experiences, perspectives and unique identity. Together, our community strives to create and maintain working, learning and care environments that are inclusive, equitable and welcoming.

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Contact Info:
Sherrod Basnight, Physician Recruiter
sherrod.basnight@duke.edu

Coronary Bioresorbable Scaffolds Nearly as Safe and Effective as Conventional Metal Stents for Heart Disease Patients

First-generation bioresorbable vascular scaffolds (BVS) may be just as effective as drug-eluting metallic stents, which are currently the standard treatment for heart disease patients undergoing Percutaneous Coronary Intervention (PCI).

These are significant findings from a global clinical trial led by a researcher from the Icahn School of Medicine at Mount Sinai. The work could lead to advancements and improvements in new BVS technology and future clinical use among interventional cardiologists across the United States.

This multi-center trial is the largest trial to examine the long-term safety and effectiveness of PCI using Abbott's "Absorb BVS," a novel stent made of absorbable polymer (plastic-like material). It shows this treatment option, when properly implanted, may lead to long-term outcomes for heart disease patients that are similar to conventional treatment with metallic drug-eluting stents.

The five-year results from the "ABSORB IV" trial were announced Wednesday, May 17th, in a Late Breaking Clinical Trials/Hotline session at the EuroPCR meeting in Paris, the official annual meeting of the European Association of Percutaneous Cardiovascular Interventions (EAPCI), and simultaneously published in the Journal of the American College of Cardiology.

"In this study, the largest ever of BVS in patients with coronary artery disease, the absorbable scaffold, when implanted with optimal technique, resulted in similar five-year rates of patient-oriented adverse events, quality of life, and recurrent angina as the standard metallic drug-eluting stent," says lead author Gregg W. Stone, MD, Director of Academic Affairs for the Mount Sinai Health System and Professor of Medicine (Cardiology), and Population Health Science and Policy, at Icahn Mount Sinai. "Some adverse events with this thick strut first-generation scaffold were more common within the first three years, prior to its complete bioresorption. Thereafter, event rates were nearly identical with BVS and metallic stents. The early excess risk could likely be eliminated with an improved thinner next-generation scaffold and its implantation with intravascular imaging guidance, affording long-term restoration of the coronary artery to its original native state without a permanent implant."

Dr. Stone adds, "There is a real desire among patients and their doctors for an absorbable stent which is present early while it is needed and then completely disappears. The favorable long-term results from this study emphasize the fact that this novel technology, which was voluntarily withdrawn from the market by the manufacturer due to lower-than-expected market adoption, should not be abandoned."

Patients with coronary artery disease—plaque buildup inside the arteries that leads to chest pain, shortness of breath, and heart attack—often undergo PCI, a non-surgical procedure in which interventional cardiologists use a catheter to place stents in the blocked coronary arteries to restore blood flow. The standard treatment uses a metallic drug-eluting stent, and the permanent metallic implant effectively opens the artery. However, the permanent metallic cage may be responsible for the roughly 2% per year rate of adverse events that arise from the lesion every year for the life of the patient. Some of these events, known as stent thrombosis events, can cause a fatal heart attack in about 20% of cases.

For decades, manufacturers have been working on BVS made of a polymer (a type of plastic) as an alternative. These scaffolds open the blocked artery and then over a three-year period are safely absorbed into the bloodstream, where they are metabolized into carbon dioxide and water. The Food and Drug Administration approved Abbott's "Absorb BVS" in 2016—the most widely used device of its kind—but the company voluntarily stopped manufacturing and sales.

The ABSORB IV clinical trial compared Abbott's polymeric everolimus-eluting BVS, implanted with improved technique compared to prior studies, with Abbott's cobalt chromium everolimus-eluting stents (CoCr-EES) to assess safety and outcomes over the course of five years following the procedure. Researchers randomized 2,604 patients at 147 sites with stable or acute coronary syndromes to receive either BVS with improved technique or CoCr-EES. Patients did not know which stent they received.

At the five-year mark, 17.5% of patients with BVS had target lesion failure (cardiac death, heart attack, or repeat intervention linked to the treated device or vessel), compared with 14.5% of patients treated with metallic stents—a 3% difference. Twenty-one BVS patients had thrombosis (blood clot) linked to the device, compared with 13 metallic stent patients, a 62% difference. The risk period for increased cardiac events was within the first three years, before the complete scaffold was absorbed into the bloodstream, but the rates of these cardiac events were similar between both groups from three to five years after implantation. At five years, there was no significant difference between the two groups in death or overall cardiac events, both groups had a similar quality of life (which was measured continually through the five year study period with the Seattle Angina Questionnaire (SAQ)-7 and the EuroQOL-5D Visual Analog Scale (EQ-5D VAS)) and there was no difference in chest pain symptoms.

A unique aspect of the study involved an in-depth look at recurring angina—chest pain—that is often the reason that patients undergo stent implantation. Around 5-8% of PCI patients typically report this symptom to their cardiologist at any given follow-up time. However, in this trial, researchers had patients in both groups answer detailed questions to characterize their chest pain symptoms continuously for up to five years post-PCI. The descriptions of these symptoms were reviewed by an independent committee to determine whether they were truly angina. This analysis showed 53% of patients in both groups (BVS and metallic stent) had recurring angina at some point within five years. This rate, much higher than previously appreciated, may give new insights into the burden of angina on patients and raises questions about the causes of angina.

"The fact than angina recurred so frequently was unexpected, and much higher than we would have anticipated given the fact that the patients and lesions treated in this study were not overly complex. This suggests that there may be causes of angina other than obstructive epicardial coronary artery disease, such as microvascular disease and vasospasm, that require different treatments than stents if we are to further improve patient's symptoms," says Dr. Stone.

This study was funded by Abbott.

8th World Congress of Pediatric Cardiology *and* Cardiac Surgery

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In 2023, for the first time ever, the World Congress of Pediatric Cardiology and Cardiac Surgery will be held in the continental United States of America. The 2023 WCPCCS promises to be the most comprehensive, up-to-date and technologically advanced meeting ever designed for Pediatric and Congenital Heart Disease.

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Washington, DC, USA
kimberly_ray@chdinterventions.org

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CME HeartCare and Cardiovascular Medicine Cardiac Surgery
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https://heart.plenareno.com/

Children's Mercy KANSAS CITY

Outpatient Imaging Cardiologist

The Ward Family Heart Center at Children's Mercy Kansas City seeks a pediatric cardiologist at the assistant or associate professor level who would have equal roles in echocardiography and general outpatient cardiology. The successful candidate would join an existing group of 28 cardiologists (25 in Kansas City, 2 in Wichita, KS and 1 in Topeka, KS), 4 CV surgeons, 30 APNs. Experience and interest in peri-operative and peri-procedural TEE is a must. Proficiency in 3D and stress echocardiography is preferred. Training/knowledge in MR/CT imaging is preferred but not required. Trainees in their final year are welcome to apply. In addition to providing echocardiography coverage, the successful candidate will be expected to spend one-two days per week in our local general outpatient clinics and serve as attending on cardiology inpatient or consult service 4-6 weeks/year.

Candidates must be board-certified or board-eligible in Pediatric Cardiology. Strong communication skills are key. There are ample opportunities for clinical/translational research and teaching (medical students, residents and Pediatric Cardiology fellows). Salary and academic rank are commensurate with experience.

Our Heart Center serves a population of over 5 million in the heart of the U.S.A. We perform over 500 cardiac operations, 600 cardiac catheterizations including over 200 invasive EP procedures, 18,000 outpatient visits, and more than 20,000 echocardiograms annually. Our two state-of the art catheterization labs are both hybrid labs and equipped with the latest 3D imaging and EP technology. Telehealth is available and facilitates our outreach clinics. We have video-conferencing capabilities that are routinely used by providers from distant locations to dial into our conferences for patient care and education. In 2022, the Ward Family Heart Center program was ranked #19 nationally by USNWR.

Our super-specialty resources include Electrophysiology (which includes Clinical EP, pacing and Genetic Arrhythmia), Cardiac Transplantation/Heart Failure, Interventional Cardiology and Advanced Cardiac Imaging (fetal echo, 3D echo, trans-esophageal echo, CT, MRI and 3D printing). We also provide specialized, team-based care in Fetal Cardiology (with on-site delivery services for high-risk neonates), Interstage Monitoring (CHAMP), Preventive Cardiology, Cardiac Genetics, Cardio-oncology, Single Ventricle Survivorship, Pulmonary Hypertension, a dedicated POTS clinic and Cardiac Neurodevelopmental Services.

Please submit CV and cover letter to:
https://faculty-childrensmercykc.icims.com/jobs/22690/physician/job

For more information:
Aliessa Barnes MD
Co-Director, Ward Family Heart Center; Chief, Section of Cardiology
816.983.6225, apbarnes@cmh.edu

For more information about Children's Mercy Kansas City and about Kansas City itself, visit cmkc.link/TakeYourPlace.

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