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Use of Recombinant Tissue Plasminogen Activator for the Treatment of Intracardiac Thrombosis in Premature Infants

By Aleksandra Trifunovic, DO; Brigham Willis,
MD, Karim A. Diab, MD, FAAP, FACC

difficult to resolve. Subsequently, these patients become high-risk for cardiac failure, sepsis and multi-organ dysfunction.

Abstract

The use of central catheters in premature infants is associated with significant risk of thrombus formation and infection. We, herein, report a case of successful treatment of a large intracardiac thrombus with tissue plasminogen activator in a premature newborn. We review the use of this thrombolytic therapy in this high risk population.

Introduction

The incidence of neonatal thrombosis has been on a persistent rise in the neonatal intensive care unit partly due to the widespread use of central venous catheters¹. This is true especially in premature and low birth weight infants where central venous catheters have become a common means in providing parenteral nutrition and long term medications. The reported incidence is 13-14% in term infants, but rises to 64-85% in low and very low birth weight infants². Furthermore, these indwelling lines are associated with an increased risk of infection and endocarditis. Even if appropriate antibiotic therapy is initiated and the infected line is removed, these intracardiac thrombi are

The management of these infected intracardiac thrombi in neonates remains controversial. Surgical removal of the thrombus or cardiectomy, although potentially effective, is very risky in this patient population. On the other hand, medical therapy with thrombolytics such as streptokinase and urokinase can be disastrous due to the risk of widespread hemorrhage. While standard anticoagulant drugs such as heparin and low molecular weight heparin have remained an integral part of mainstream thrombolytic therapy, their use seems to be more beneficial in asymptomatic and hemodynamically stable patients. However, in life-threatening cases, a more aggressive and prompt therapy (thrombolytics or thrombectomy) is advised to hasten thrombus resolution. Over the last 10 years, recombinant tissue type plasminogen activator (rTPA) has become more commonly used for thrombolytic therapy in symptomatic and high-risk patients. There have been few reports of such therapy in infants, however, with unclear protocols and dosages. We describe a case of successful treatment of a large right atrial thrombus with rTPA in a premature newborn and review the use of this agent in premature infants.



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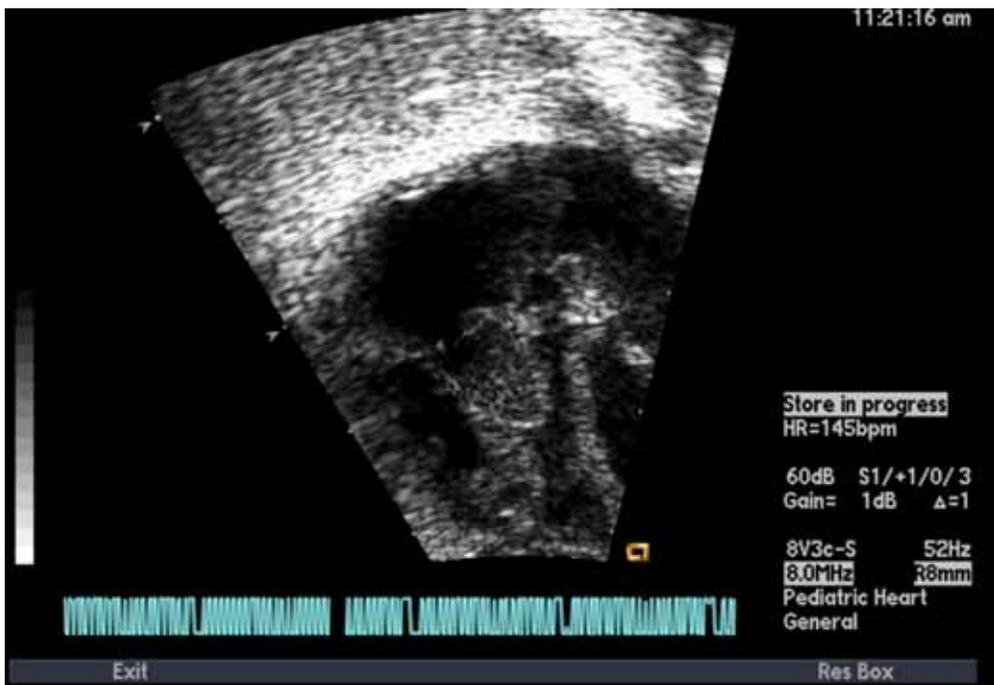


Figure 1 (A & B). Transthoracic echocardiographic images in the 4-chamber apical view showing the right atrial clot. Figure 1B shows the cystic portion of the clot protruding through the tricuspid valve.

Case Report

A 1580 gram female neonate was born at 29 weeks gestation after preterm labor by

normal spontaneous vaginal delivery. The patient was admitted to the NICU for respiratory distress and received mechanical ventilation and surfactant therapy. At birth,

umbilical arterial and venous catheters were correctly placed and they were removed at age of 2 and 8 days respectively. The newborn did well initially and a course of antibiotics with ampicillin and gentamicin was discontinued at age 7 days after blood cultures were negative. She was noted to have normal cardiac anatomy and a large PDA on a routine echocardiogram on Day of Life 3. The PDA was then treated with two doses of indomethacin and became smaller on repeat echocardiogram at age of 8 days. On Day of Life 12, the patient had a percutaneous catheter placed via the left brachial vein to aid with medication administration and parenteral nutrition.

On Day of Life 19, the patient had another echocardiogram done for a persistent murmur and a concern for cardiac failure which showed a large pedunculated thrombus in the right atrium measuring about 10.5x9 mm and giving rise to a 12x 10 mm mobile cystic mass or parachute-like structure that moved in and out of the tricuspid valve annulus (Figure 1). The mass covered nearly half the size of the right atrium. There was no obstruction to systemic venous flow or to the inflow across the tricuspid valve. In addition, the patient had a patent foramen ovale shunting right to left, systemic RV pressures and a large PDA. The patient was also noted to have leukocytosis (WBC 55500), thrombocytopenia (39000) and anemia (Hgb 6.3). The patient was immediately started on empiric antibiotic therapy with vancomycin, cefepime and gentamicin and on anticoagulation therapy with low-molecular weight heparin (enoxaparin). Blood cultures were obtained and subsequently grew coagulase-negative staphylococcus. A congenital infection workup as well as a hypercoagulopathy work-up were done, and were essentially negative.

On Day of Life 23, the patient was started on heparin infusion by receiving a 50cc/kg bolus followed by an infusion of 15-22 units/kg/hr for a total of 7 days. However, the clot was noted to have increased in size to 16 x 9 mm with suprasystemic RV pressures and a right-to-left shunting PFO. In addition, the patient became hypotensive and required pressors for hypotension. In view of the deteriorating condition, treatment with rTPA was initiated at Day of Life 26. Before treatment, head ultrasound revealed no intraventricular hemorrhage. rTPA was



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Saint Louis University, a Catholic, Jesuit institution dedicated to student learning, research, health care, and service is seeking an additional pediatric cardiologist to join an established group within the Division of Cardiology and the Department of Pediatrics at SSM Cardinal Glennon Children's Medical Center. Applicants will be considered at the Assistant/Associate Professor rank, and must be board certified/eligible in Pediatric Cardiology. General responsibilities will include clinical care, teaching, and research.

Non-Invasive Cardiologist

We are seeking an additional non-invasive cardiologist to assist our current faculty with the growing number of echocardiographic procedures performed at our institution. Experience in performing and interpreting both transthoracic and transesophageal echocardiograms is required. Fetal echocardiography experience is desired but not mandatory. An interest in clinical research is encouraged. Academic rank will be commensurate with qualifications and experience.

The cardiology division is in a period of significant expansion, with the opening of the Dorothy and Larry Dallas Heart Center within SSM Cardinal Glennon Children's Medical Center in January, 2009. An active congenital heart surgery program exists, and the hospital houses state-of-the-art operating rooms and a new 60-bed neonatal intensive care unit. Construction of a new hybrid cardiac catheterization lab/operating suite is scheduled to begin in 2010. The Doisy Research Center, a new 10-story tower housing the Health Sciences Center Research laboratories, was opened in 2007.

Interested candidates must submit a cover letter, application, and current CV to <http://jobs.slu.edu>. Other correspondence regarding this position can be sent to:

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infused at 0.3mg/kg/hr over 6 hrs. The patient was transfused with platelets preceding each rTPA infusion in order to keep platelets above 100,000. Daily echocardiograms were done before and after thrombolytic therapy including head US and a daily CBC and fibrinogen level. FFP was given prior each TPA infusion course. The right atrial clot immediately decreased in size to about half after the first course of rTPA infusion and treatment was repeated for a second course. After two infusions, there was complete lysis of the thrombus. All head ultrasounds were negative for intraventricular hemorrhage. The patient was kept on anticoagulation therapy with Lovenox for 6 weeks after completion of thrombolytic therapy. Pulmonary hypertension resolved and the patient was extubated successfully at Day of Life 38. She completed a six-week course of vancomycin and two weeks of gentamicin for endocarditis. The patient was discharged home at the age of 2 months and underwent uneventful coil embolization of a small residual PDA at the age of 12 months.

Discussion

The use of central catheters in premature newborns has definitely helped improve the management and survival of this population. However, this has been associated with a significant risk of thrombosis. This risk of thrombus formation is even higher during the first month of life than during any other period of childhood mostly due to the differences in the neonatal physiology. A higher hematocrit, a smaller vessel diameter and lower flow through the central venous line makes thrombi formation up to 40 times more likely in neonates³. Moreover, the neonatal hemostatic system is characterized by a generalized hypercoagulable state that impairs the ability to lyse thrombi. Hypercoagulability is caused by enhanced concentration and activity of several procoagulant factors, increased thrombin formation, enhanced endothelial activation, and decreased plasma levels of antithrombin III and plasminogen⁴.

A review of intracardiac thrombi in the pediatric population found the right atrium to be the most common location of these thrombi which are frequently associated with the presence of central venous lines³. This is not surprising given the current standards of care for the catheter tip to predominantly be located at the outlet of the inferior vena cava or in the right atrium. The site of the central venous catheter was also found to be a risk factor for thrombus formation: lines in the femoral or subclavian veins have a higher risk for thrombosis than those in the brachial and jugular veins¹. There was no relationship between the rate of thrombosis and the type of catheter inserted (peripheral or central), or its diameter. Almost 12.5% of patients with central venous lines develop a thrombus at the tip of the catheter within 6-8 weeks of line placement⁵.

A recent study suggested that the natural history of cardiac thrombi is resolution, as 18 of 19 patients in the study had complete thrombus resolution with low-molecular weight heparin; thus, thrombolytics were not deemed necessary⁴. However, the duration of treatment ranged from 18 to 90 days until complete thrombus resolution and the thrombus was small enough not to cause any risk of embolization. This prolonged duration of treatment may not be appropriate in symptomatic and very sick infants who may be at increased risk for developing life-threatening complications such as Superior Vena Cava Syndrome, occlusion of the tricuspid valve, thromboembolization, and valvular insufficiency leading to progressive heart failure.

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rTPA has been used successfully to treat intracardiac thrombi in infants with few case reports in the literature on its use in premature infants. The advantage of rTPA is its specific action on the thrombus which avoids systemic fibrinogen proteolysis as is seen with urokinase and streptokinase. rTPA strongly and specifically binds to fibrin which allows for preferential activation of the local fibrin bound plasminogen and hence resolution of the clot⁶. In addition, rTPA has a low affinity for circulating plasminogen and a short half-life (5 min as opposed to 16 min and 23 min compared to that of streptokinase and urokinase respectively) which allows a rapidly reversible hypocoagulable state⁷.

Unfortunately, due to the lack of large studies, clear guidelines for rTPA dosing in the pediatric and neonatal population are still lacking. A review by Hartman et al.² proposed an initial bolus of 0.5-0.7 mg/kg/hr over 15 min followed by an infusion rate of 0.1-0.3 mg/kg/hr of rTPA over 6 hours for a maximum of 72 hours, which seems to have been proven to be adequate in achieving a high resolution rate without an increased risk of major complications. Other more recent reports have shown that a daily continuous infusion of 0.1-0.5 mg/kg/hr over 6 hours until clot resolution is achieved without an initial bolus is very effective⁸. In some cases, particularly in those patients at high risk for bleeding e.g. very low birth weight premature neonates, a more conservative approach of progressively increasing the infusion dose each day can be adopted. In our case, we opted to proceed with a continuous infusion regimen which was effective and did not lead to any significant complications.

In addition to monitoring for signs of bleeding while using rTPA therapy, it is recommended to monitor the platelet count (maintain platelets above $100 \times 10^9/L$), fibrinogen levels (keep >100 mg/dL), daily head ultrasounds, and echocardiograms pre and post therapy to monitor response. It is also recommended to avoid venopuncture, intramuscular injections and urinary catheterizations during the infusion. After successful thrombolysis, a follow-up treatment with another anticoagulant, such as low-molecular-weight heparin, should be continued for at least 6 weeks or maybe longer when thrombophilic factors (i.e. Hereditary thrombophilia) or currently indwelling lines are present⁹.

Some of the general contraindications to rTPA treatment include major surgery or

“In conclusion, rTPA appears to be an effective therapy in critically ill premature neonates who develop intracardiac thrombi.”

intracranial hemorrhage during the last 10 days and a history of severe bleeding, a history of seizures within 10 days, a history of perinatal asphyxia, active bleeding, uncontrolled arterial hypertension, severe thrombocytopenia, and an inability to maintain hemostatic levels of coagulation factors (appropriate platelet and fibrinogen levels) even via transfusion⁷. Although potential complications of rTPA therapy include local bleeding, intraventricular hemorrhage, pulmonary hemorrhage, and renal hemorrhage, these complications can be avoided if patients are monitored closely.

In conclusion, rTPA appears to be an effective therapy in critically ill premature neonates who develop intracardiac thrombi. Larger studies or case series might be helpful to further delineate a clear dosage protocol. Furthermore, placement of central catheters should be such as to avoid its tip protrusion into the RA and thus, possibly decrease the incidence of RA thrombus formation in the first place.

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Preview of the 60th Annual Scientific Session & Expo

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Adult Congenital and Pediatric Cardiology Member Section

The mission of the ACPC Section is to engage pediatric and adult cardiologists, congenital heart disease (CHD) surgeons and CCAs concerned about advancing national initiatives and quality of care for adult and pediatric patients with CHD.

Our 1,200 ACPC Section members work together, to advance and advocate priorities for the pediatric cardiology and CHD profession. Through your support and involvement, we can continue to expand the ACC's efforts in developing initiatives around quality, advocacy and education in congenital cardiology. Additionally, we'll help expand your professional opportunities through Section activities. As an ACPC member you can develop leadership skills, collaborate with Section members and network with your professional mentors or serve as a mentor.

Our community is small, but the work that lies before us is tremendous. We invite you to join us in fulfilling the promise of our community's future.

For more information on Section workgroups and activities or to join the ACC Adult Congenital and Pediatric Cardiology Section, please visit www.CardioSource.org/acpc.

Please join us for the ACPC Section Meeting on Saturday, April 2 from 5:00 p.m. until 7:00 p.m. at the New Orleans Marriott.

ACPC Section Chair, Dr. Gerard Martin, and council members will share updates on Section initiatives, activities and accomplishments, and provide you with an opportunity to contribute ideas for future initiatives.

Please join your colleagues in advancing the needs of the CHD community. Your involvement is vital to the Section's



continuing success. Please RSVP to acpcsection@acc.org.

Special Preview - 60th Annual Scientific Session & Expo ~ Table of Contents ~

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60th Annual Scientific Session & Expo



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CCS.11: Insight into Future Advances

By Daniel J. Murphy Jr., M.D., F.A.C.C.

The field of congenital cardiology represents a continuum of care that includes diagnosis and lifelong treatment from the fetus to the adult with congenital heart disease (CHD). The American College of Cardiology's 60th Annual Scientific Session (ACC.11) this upcoming April in New Orleans, will feature a wide-ranging, engaging array of educational opportunities for CHD and pediatric cardiology specialists. Congenital Cardiology Solutions 2011 (CCS.11) will provide insight into our current state of knowledge as well as look ahead to the future based on the concept that new advances must build upon past experiences. In addition, CCS.11 will emphasize issues related to quality and policy, both of which will determine the future for our patients and our practices.

Highlights from major symposia topics at CCS.11 include:

- Heart failure management in CHD
- Quality improvement and current CHD projects
- Screening for cardiovascular disease
- Beyond Eisenmenger: Pulmonary hypertension in pediatrics
- The Great Debates: three debates addressing:
 - ECG screening for ADHD medications;
 - ACE inhibitors in Fontan patients; and
 - Ablation for asymptomatic patients with WPW

For the third consecutive year, the CCS.11 Program Committee has designed a symposium on "Adult Congenital Heart Disease for the General Cardiologist." This year the session will focus on the right ventricle, highlighting evaluation and management of patients with volume and pressure loading of the right ventricle. This popular session, which promises to be attractive to pediatric and adult cardiologists, will include presentations by some of the most notable experts in care of the adult with CHD, including Drs. William Davidson, M.D., F.A.C.C. and Craig Broberg, M.D., F.A.C.C.

CCS.11 will include the 2nd annual McNamara Lecture, sponsored by the ACC's Adult Congenital and Pediatric Cardiology Section. This year we are honored to have past ACC President, Dr. Arthur Garson Jr., M.D., M.P.H., M.A.C.C., present a lecture entitled "The Heart of CHD Health Policy." The McNamara Lecture will be followed by a symposium on health policy and congenital cardiology.

Responding to feedback from CCS.10 attendees, the Program Committee now has two oral abstract sessions for CCS.11. One session will highlight "Surgical Outcomes in Congenital Heart Disease" and the other will consist of papers addressing "Long-term Outcomes in Congenital Heart Disease." Both sessions will include studies in children and adults with CHD.

Six "Meet the Experts" sessions will allow CCS.11 attendees to interact with experts on a variety of topics, including the failing Fontan, the high risk infant with Hypoplastic Left Heart Syndrome,



understanding quality improvement, when to intervene in CHD, and end of life issues. These case-based sessions will bring clinical relevance to the topics under discussion.

Finally, for the first time at ACC.11 pediatric cardiologists will have an opportunity to participate in Maintenance of Certification activities approved by the American Board of Pediatrics. Participants in the two-hour sessions will review landmark articles and answer questions about them under the guidance of senior clinicians and educators.

With an increasing number of children born with CHD surviving into adulthood, our job is far from over. By encouraging greater participation in CCS.11 by all pediatric cardiology and adult congenital heart disease specialists, we can continue to make a difference in patient lives. We are excited about this year's CCS program and we hope to see you in New Orleans, April 2 – 5, 2011. Go to www.accscientificsession.org to register today!

“Finally, for the first time at ACC.11 pediatric cardiologists will have an opportunity to participate in Maintenance of Certification activities approved by the American Board of Pediatrics.”

Dr. Murphy is a member of the CCS.11 program committee and the ACC's Adult Congenital and Pediatric Cardiology Section. For additional information about CCS.11 and ACC.11, go to www.accscientificsession.org.

CCS.11 Spotlight on Interventional Cardiac Catheterization

By Jacqueline Kreutzer, M.D., F.A.C.C.

The CCS Spotlight on Tuesday, April 5th, is a full-day of sessions featuring outstanding speakers devoted to interventional cardiac catheterization, with a focus on specific novel techniques and applications of various catheter-based therapies. There will be a combination of live interventional cases from Texas Children's Hospital in Houston, with taped case presentations of unique procedures from leading centers in the U.S. and United Kingdom. This year, we will focus on congenital valvular heart disease — particularly the left heart, mitral and aortic valve interventions. At the start of the day, the focus will be on congenital mitral valve stenosis, with a case presentation on mitral valve balloon valvotomy, followed by discussion of anatomic and echocardiographic features, indications and outcomes of both balloon and surgical valvuloplasty.

The rest of the day will cover aortic valve interventions, starting with a live case presentation and followed by a debate on a highly controversial topic related to management of patients with aortic valve disease. The debate, "Should Patients with Mild to Moderate Aortic Stenosis Be Restricted from Sports Participation?" will be of great interest to the general pediatric cardiologist. The session will also include an expert discussion on technical aspects of balloon aortic valvotomy, imaging modalities and insight on the effects of aortic valve disease on the left ventricle.

The CCS Spotlight will end with a session on fetal aortic valve intervention, and for the first time, an actual fetal cardiac procedure will be presented to the audience. The session will include a review on fetal physiology and considerations for prenatal catheter intervention, as well as insight on how to develop a fetal interventional program. A debate on the controversial current role of fetal aortic valvuloplasty will conclude the session.

The exciting program covered in the CCS.11 Spotlight is of great interest to pediatric cardiologists in general, in addition to the pediatric interventionalist, cardiac imaging specialists and more. Live case sessions will be interactive and allow for participation of the audience with questions and discussion.

The faculty of the CCS Spotlight is composed of nationally and internationally recognized experts including: pediatric interventional cardiologists, cardiothoracic surgeons, general pediatric cardiologists, prenatal cardiologists and pediatric cardiac imaging experts. This multidisciplinary program is designed to facilitate extensive group and individual interaction through discussion, questions and answers, and provide the attendees with leading edge information on congenital heart disease (CHD). The field of interventional therapies for CHD continues to explode with new techniques. In addition, for some interventional approaches long-term outcome data has become available for review and discussion. Controversies continue to exist on multiple topics related to these interventions. Their application to left heart congenital valvular disease and alternatives to transcatheter therapy will be covered in depth during the CCS Spotlight. The program is unique and exciting, with an integrated approach focused on an area of major significance in CHD.

Dr. Kreutzer is the Chair of the CCS.11 Spotlight Committee and a member of the ACC Adult Congenital and Pediatric Cardiology Section. For additional information about CCS.11 and ACC.11, go to www.accscientificsession.org.



CCS.11 - EDUCATION: SUNDAY, APRIL 3

8:00-9:00 am - [EXPERTS] - Overcoming Barriers to Transition: A Case-Based Approach

8:00-9:30 am - [SYMPOSIUM] - Heart Failure Management in Congenital Heart Disease

- Heart Failure Treatment and Outcomes in Adults: Extrapolation to Pediatrics
- Heart Failure Management in Children
- Beyond Conventional Treatments: Ventricular Assist Devices, etc.
- Device Management of Heart Failure
- The Scope and Future of Pediatric Heart Failure Management

12:30-1:45 pm - [EXPERTS LUNCH] - The High-Risk Infant with Hypoplastic Left Heart Syndrome

2:00-3:30 pm - [SYMPOSIUM] - 2011 Dan G. McNamara Lecture

- 2011 McNamara Lecture: The Heart of CHD Health Policy presented by Arthur Garson Jr., M.D., M.P.H., M.A.C.C.
- Current State of Health Policies and Efforts to Improve CHD Care
- Coverage and Quality: Key Considerations for the CHD Community
- How the CHD Community Can Support Health Policy Changes

4:45-6:00 pm - [SYMPOSIUM] - Pediatric and Congenital Heart Disease: The Great Debates

- ECG Should Be vs. Should Not Be Performed Before Pharmacologic Treatment of ADHD: Protagonist vs. Antagonist
- All Patients with Fontan Circulation Should vs. Should Not Receive ACE Inhibitors: Protagonist vs. Antagonist
- The Asymptomatic Patient with Wolff-Parkinson-White Syndrome Should vs. Should Not Undergo Accessory Pathway Ablation: Protagonist vs. Antagonist

CSS.11 - EDUCATION: MONDAY, APRIL 4

8:00-9:30 am - [SYMPOSIUM] - Quality Improvement: Current Projects in Congenital Heart Disease

- Nursing Quality Metric: The Nightingale Measures
- JCCHD Single Ventricle Registry
- How the STS Database Is Driving Quality Improvement
- How Maintenance of Certification Is Driving Quality Improvement
- Standardized Clinical Assessment and Management Plans (SCAMPS): Reducing Variation and Improving Outcome

10:45 am-12:15 pm - [ORAL] - Surgical Outcomes in Congenital Heart Disease

- Eighteen Years of the Fontan Operation at a Single Institution: Results from 771 Consecutive Patients
- Trends in the Relationship between Surgical Mortality for Congenital Heart Diseases (CHD) and Surgical Volume: 25-Year Experience from a Multi-Institutional Registry
- Hybrid or Norwood: What Is the Best Reconstructive Strategy for Hypoplastic Left Heart Syndrome?
- The Impact of a Designated Cardiac Intensive Care Unit on Outcomes after the Norwood Procedure
- Patient Risk Status, Center Volume and Outcome Following the Norwood Operation

11:00 am-12:00 pm - [EXPERTS] - The Golden Moment: When to Intervene in Congenital Cardiac Disease

12:30-1:45 pm - [INTERNATIONAL LUNCH] - Joint Session of the Saudi Heart Association and the American College of Cardiology: Interventional Congenital Cardiology

- Introduction: The Burden of Cardiovascular Disease in the Region, Membership in the Society and Initiatives Ongoing or Planned
- Transcatheter Valves in Congenital Heart Disease
- Interventional Cardiology in the Neonate and Infant with CHD
- Bringing New Devices to the Patient in the United States
- New and Future Interventional Devices
- Conclusion: New Insights Gained from the Saudi Heart Association Experience

2:00-3:30 pm - [ORAL] - Outcomes in Congenital Heart Disease

- Efficacy of Implantable Cardioverter Defibrillators in Adults with Congenital Heart Disease
- Coarctation of the Aorta and Coronary Artery Disease: Fact or Fiction?
- MELD-XI Score and Fontan Failure in Patients with Single Ventricle Palliation for Complex Congenital Heart Disease
- Prognosis of Heart Failure in Adults with Congenital Heart Disease
- Hepatic Fibrosis in Fontan Patients Correlates with Pre-Fontan Morbidity D Community Can Support Health Policy Changes

2:30-3:30 pm - [EXPERTS] - Your Worst Nightmare: The Failing Fontan

2:30-3:30 pm - [EXPERTS] - Addressing End of Life in Congenital Heart Disease

4:45-6:00 pm - [SYMPOSIUM] - ACHD for the General Cardiologist: Focus on the RV

- The Right Ventricle in Congenital Heart Disease
- Protecting the Right Ventricle in Tetralogy of Fallot
- The Systemic Right Ventricle
- The Right Ventricle in Eisenmenger Syndrome

CSS.11 - EDUCATION: TUESDAY, APRIL 5

8:00-9:00 am - [EXPERTS] - Understanding QI: Methodology, Process and Science

8:00-9:30 am - [SPOTLIGHT] - Congenital Mitral Valve Stenosis: Management and Outcomes

- Live Case: Mitral Valve Catheter Intervention
- Anatomic and Echocardiographic Features
- Balloon Valvotomy for Congenital Mitral Stenosis: Indications and Outcomes
- Surgical Valvuloplasty for Congenital Mitral Stenosis: Indications and Outcomes

8:00-9:30 am - [SYMPOSIUM] - Screening for Cardiovascular Disease: Who, What, When, How and Why?

- The Epidemiologic Basis of Screening Tests
- Cascade Screening for LQTS
- Lipid Screening in Children
- Screening Families for Congenital Left-Sided Cardiac Defects
- Echocardiographic Screening of Athletes

10:45 am-12:15 pm - [SPOTLIGHT] - Congenital Aortic Valve Stenosis: Controversies in Management and Recommendations

- Live Case: Aortic Balloon Valvotomy
- When to Intervene in Aortic Stenosis
- Patients with Moderate Aortic Stenosis (Mean Echo Gradient of 25 – 40 mmHg) Should Be vs. Should Not Be Restricted from Sports Participation: Protagonist vs. Antagonist

10:45 am-12:15 pm - [SYMPOSIUM] - Beyond Eisenmenger: Pulmonary Hypertension in Pediatrics

- New Therapies for Pulmonary Hypertension
- Neonatal Pulmonary Hypertension: Broncopulmonary Dysplasia and CDH
- Pulmonary Hypertension in Sickle Cell and Other Diseases
- Acute Post-Operation Management of Pulmonary Hypertension
- MRI in Pulmonary Hypertension
- The Scope and Future of Pediatric Pulmonary Hypertension

12:30-1:45 pm - [SPOTLIGHT] - Congenital Aortic Valve Stenosis Balloon Valvotomy: Technique, Imaging and Outcomes

- Taped Case: Aortic Balloon Intervention in Adolescent or Young Adult
- Aortic Balloon Valvotomy: Technical Aspects and Approaches
- Imaging Modalities in Aortic Valve Interventions
- Aortic Balloon Valvotomy: Long-Term Outcomes
- The Victim: The Left Ventricle

2:00-3:30 pm - [SPOTLIGHT] - Fetal Aortic Valve Intervention

- Fetal Aortic Stenosis Physiology and Considerations for Catheter Intervention
- Taped Case: Fetal Aortic Valve Intervention
- How to Develop a Fetal Interventional Program?
- Balloon Aortic Valvuloplasty Should Be vs. Should Not Be Performed in All Mid-Gestation Fetuses with Severe AS/LV Dysfunction to Maximize Chances to Achieve a Biventricular Circulation: Protagonist vs. Antagonist

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CHD Patients Included in NCDR® Expansion

By Gerard Martin, M.D., F.A.C.C.

Babies, children and adults treated for congenital heart disease (CHD) are living longer, healthier lives. But each patient experience has stood alone because no national clinical registry has collected sufficient quality improvement data on CHD interventions and outcomes. Little real data exist to guide decisions made in treating CHD patients. Instead, treatment strategies have grown through the shared experiences of the specialists at large centers — centers that lack the funding to develop multi-center trials to increase the level of evidence for CHD treatments.

“The IMPACT Registry assesses the prevalence, demographics, management and outcomes of pediatric and adult patients with congenital heart disease who are undergoing diagnostic catheterizations and catheter-based interventions.”

Times are changing; the NCDR, an initiative of the American College of Cardiology Foundation, launched the IMPACT Registry (IMproving Pediatric and Adult Congenital Treatment). The IMPACT Registry assesses the prevalence, demographics, management and outcomes of pediatric and adult patients with congenital heart disease who are undergoing diagnostic catheterizations and catheter-based interventions. This registry will provide significant contributions to the knowledge base and outcomes associated with congenital heart disease. Recently launched, the IMPACT Registry is enrolling hospitals.

“The ACC, by supporting the IMPACT Registry, is making an enormous contribution to the community caring for patients with congenital heart disease” said Lisa Bergersen, M.D., M.P.H. “This all-inclusive registry will allow the interventional community the opportunity to share experiences, understand institutional variation, and compare outcomes, ultimately this will improve the care we provide in the catheterization lab.”

And, in response to a request by the Pediatric and Congenital Electrophysiology Society (PACES) to expand the ICD Registry™, Version 2 of the registry includes data elements specific to the pediatric population. Pediatric ICD implantations are estimated to constitute less than one percent of the volume of total ICD implantations. Clinical research in this patient population is sparse. The ICD Registry, while not a clinical study with a control arm and strict inclusion and exclusion criteria, still will yield important information.

To request more information about the IMPACT Registry and the ICD Registry, please visit www.ncdr.com/chd.

Dr. Martin is Chair of the Adult Congenital and Pediatric Cardiology Section, Chair of the IMPACT Steering Committee, and serves on the ACC's Board of Trustees.

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Is there a Need for a North American Pediatric Cardiology Organization?

By Robert Campbell, MD and
Robert Shaddy, MD

The concept for the North American Pediatric Cardiology Organization (NAPCO) was first discussed during a brainstorming session at the February 2010 Children's Hospital of Philadelphia Pediatric Cardiology Meeting in Orlando, Florida. Members of this working group are listed for your interest. In the July 2010 issue of *Congenital Cardiology Today* (CCT) - Volume 8; Issue 7, P. 10 - www.congenitalcardiologytoday.com/index_files/CCT-JUL10-NA.pdf, we presented for discussion and input the notion of establishing a North American Pediatric Cardiology Organization. The practice of pediatric cardiology has been represented as a component of large pediatric organizations (e.g. American Academy of Pediatrics) or large cardiology organizations (e.g. American Heart Association, American College of Cardiology). However, we have no unifying exclusively pediatric cardiac organization, through which we can discuss issues germane to pediatric cardiology and pediatric cardiac services, alone. Many pediatric cardiologists have pursued subspecialty careers, and have become increasingly involved subspecialty organizations (e.g. Heart Rhythm Society, American Society of Echocardiography, Society of Pediatric Research, SCAI, etc.).

Working Group

- Robert Anderson, MD - United Kingdom
- Stuart Berger, MD - Children's Hospital of Wisconsin
- Robert Campbell, MD - Children's Healthcare of Atlanta Sibley Heart Center
- Timothy Feltes, MD - Nationwide Children's Hospital
- Daphne Hsu, MD - Children's Hospital at Montefiore
- Jane Newburger, MD - Children's Hospital of Boston
- Andrew Redington, MD - Hospital for Sick Kids
- Philip Saul, MD - Medical University of South Carolina
- Robert Shaddy, MD - Children's Hospital of Philadelphia
- Kenneth Shaffer, MD - Pediatrix, Austin TX
- Richard Simon - Pediatrix, West Palm Beach, FL
- Jeffrey Towbin, MD - Cincinnati Children's Hospital Medical Center

In the July 2010 issue of *Congenital Cardiology Today* (CCT), we asked for responses to a survey addressing the possible need and benefit of developing a

North American Pediatric Cardiology Organization. It was our goal to solicit input from pediatric cardiologists throughout North America regarding the level of interest and recommendations for best next steps towards the establishment of such an organization. The responses of 350 to the survey are summarized in the tables below.

"It was our goal to solicit input from pediatric cardiologists throughout North America regarding the level of interest and recommendations for best next steps towards the establishment of such an organization."

By Age	
Your Age (years)	Response %
30-40	24.6%
41-50	33.8%
51-60	26.6%
61-70	13.2%
71+	1.7%

By Practice Model	
Practice Model	Response %
Full-time Academic Academic affiliation/ Private practice	57.3%
Private practice	17.7%
Pediatrix	8.4%
Other	13.4%
	3.2%

By Geographic Area	
Geographic Area	Response %
USA NE	30.6%
USA NW	12.1%
USA SE	31.8%
USASW	20.2%
Canada East	0.6%
Canada West	0.0%
Mexico	0.0%
Other	4.6%

By Professional memberships	
Professional memberships	Response %
AHA (American Heart Association)	68.2%
ACC (American College of Cardiology)	80.0%
AAP (American Academy of Pediatrics)	62.7%
SPR/APS (Society of Pediatric Research/American Pediatric Society)	16.1%
HFSA (Heart Failure Society of America)	2.7%
HRS/PACES (Heart Rhythm Society/Pediatric and Congenital EP Society)	11.8%
Echocardiography	32.4%
SCAI (Society for Cardiac Angiography and Interventions)	9.7%
ISHLT (International Society for Heart & Lung Transplantation)	7.0%
PCICS (Pediatric Cardiac Intensive Care Society)	6.1%
Other	16.4%

If yes to professional memberships, have you attended >50% of annual meetings in the past 5 years?		
Professional Association	% Yes	% No
AHA	34%	66%
ACC	29%	71%
AAP	16%	84%
SPR/APS	12%	88%
HFSA	3%	97%
HRS/PACES	33%	67%
ASE/SOPE	33%	67%
SCAI	13%	87%
ISHLT	15%	85%
PCICS	18%	82%
Other	40%	60%

Do you feel that the ACC, AHA or AAP currently represent the global concerns/interests of the pediatric cardiology profession?		
Organization	% Yes	% No
AHA	22%	78%
ACC	19%	81%
AAP	18%	82%

Are you aware of the JCCHD (Joint Council on Congenital Heart Disease) initiative?	
YES	45.5%
No	54.5%

Is there a need for a separate North American Pediatric Cardiac Organization?	
YES	83.5%
No	16.5%

If you answered yes to the question about the need for a separate pediatric cardiac organization, would you attend an annual meeting?	
YES	94.6%
No	5.4%

A North American Pediatric Cardiac Organization should address for the profession:	
Should Address these topics	Response %
Best practice guidelines	91.4%
Quality initiatives	78.0%
Training guidelines	71%
CME	70.7%
Research initiatives	70.1%
Governance of our profession	60.2%
Recertification	59.9%
Leadership development	59.6%
Reimbursement	58.3%
Job search opportunities	54.5%
Electronic medical records	31.2%
Other (specify in comments)	4.1%

The survey results data have been shared with all members of the NAPCO working group. It was also presented at the September 2010 meeting for Joint Council on Congenital Heart Disease (JCCHD), as well as

“Based upon the survey, it seems reasonable to continue these discussions as part of a larger group.”

the November 2010 at the American Heart Association Cardiovascular Disease in the Young business meeting.

Eighty-three point five percent (83.5%) of those responding to the survey felt that there was a need for NAPCO. An overwhelming 94.6% stated that they would attend a separate annual meeting and identified specific business and professional areas that they felt this organization could identify for the profession of pediatric cardiology.

The survey supports the identified need for the development of a North American Pediatric Cardiology Organization. The critical next steps would be the how and where. Finance is always an issue and resources necessary to establish NAPCO and sustain it need to be identified. The organizational structure needs to be defined, and clarifying roles and responsibilities of an executive body and members are critical next steps.

Based upon the survey, it seems reasonable to continue these discussions as part of a larger group.

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CONGENITAL CARDIOLOGY TODAY

CALL FOR CASES AND OTHER ORIGINAL ARTICLES

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- Title page should contain a brief title and full names of all authors, their professional degrees, and their institutional affiliations. The principal author should be identified as the first author. Contact information for the principal author including phone number, fax number, email address, and mailing address should be included.
- Optionally, a picture of the author(s) may be submitted.
- No abstract should be submitted.
- The main text of the article should be written in informal style using correct English. The final manuscript may be between 400-4,000 words, and contain pictures, graphs, charts and tables. Accepted manuscripts will be published within 1-3 months of receipt. Abbreviations which are commonplace in pediatric cardiology or in the lay literature may be used.
- Comprehensive references are not required. We recommend that you provide only the most important and relevant references using the standard format.
- Figures should be submitted separately as individual separate electronic files. Numbered figure captions should be included in the main Word file after the references. Captions should be brief.
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SCAI View - A Monthly Column:

By Daniel S. Levi, MD, FSCAI and Frank F. Ing, MD, FSCAI

Interactivity. That's the buzzword for SCAI 2011 Scientific Sessions, taking place in Baltimore, MD on May 4-7. This year, in an effort to individualize the meeting, there is a concentration on shifting away from large didactic sessions towards smaller, intimate learning settings. New this year will be an infusion of additional learning opportunities outside of the main sessions in smaller rooms with 10 to 15 seats.

This focus on interactivity also means an even greater focus on case-based learning. One of the things we've always appreciated about the SCAI annual meeting has been the focus on cases, so we've loaded the pediatric/congenital program with case-based sessions. No matter your specialty or where you are in your career, you'll be able to learn from the "Brain Scratchers" and "I Blew It" sessions. These sessions are designed to provide discussions about the importance of randomized clinical trial finding that X was better than Y, but we feel physicians learn best in the process of conducting a case and treating a patient. The case-based approach personalizes the topics to the issues you face in day-to-day practice.

If you have a case that might be a good learning tool for the "Brain Scratcher" or "I Blew It" Session, please email them to us at ing@bcm.edu. The presentation should last no more than a total of 10 minutes including a dialogue with participants and moderators in how to deal with the complication. The presentation should conclude with some teaching points.

Cardiovascular Thrombosis Workshop

Focusing on patient care, also new to the Congenital Heart Disease Symposium is an all-new session titled "Cardiovascular Thrombosis in the Pediatric Patient: Diagnosis and Treatment," which will feature information relevant to everyone who attends the program.

This is a session not previously offered at another pediatric or structural heart disease program, and it's necessary because so many of the complications seen in pediatric

patients are secondary to clots. This session will be relevant to cardiologists treating both adults, children and adult congenital patients. If you have a colleague attending SCAI 2011 that treats adult congenital heart disease, be sure to let them know about this workshop.

"Now, facilities treating CHD patients can enroll in the new IMPACT Registry™, collect CHD data, and receive benchmark reports that will allow them to measure performance-related CHD interventions and identify ways to improve outcomes."

SCAI, ACC, AAP Encourage You to Enroll in the New IMPACT Registry™

Congenital heart disease (CHD) occurs in approximately one of every 120 births, making it the most common birth defect in the United States. Thanks to medical and surgical advances, many children born with CHD live well into adulthood. However, until now, no resource for sufficiently collecting and analyzing quality improvement data related to these efforts has been available.

Now, facilities treating CHD patients can enroll in the new **IMPACT Registry™**, collect CHD data, and receive benchmark reports that will allow them to measure performance-related CHD interventions and identify ways to improve outcomes. Created through the ongoing commitment of the American College of Cardiology Foundation, SCAI, and the American Academy of Pediatrics, the IMPACT Registry will help clinicians assess the prevalence, demographics, management, and in-hospital outcomes of CHD patients.

Who undergo diagnostic catheterization and catheter-based interventions?

The **IMPACT Registry** (IMproving Pediatric and Adult Congenital Treatment) is the sixth national clinical data registry of the National Cardiovascular Data Registry's (NCDR). It was successfully piloted this year, with 16 sites submitting data. Paving the way for new site enrollment, the pilot sites tested the usefulness of data elements collected and the feasibility for all centers to collect the information.

For more information or to enroll, contact the IMPACT Registry team at 800-257-4737 or ncdr@acc.org.

CCT



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Course Highlights: 2010 Specialty Review in Pediatric Cardiology - Board Review/CME Course, Chicago

By Maria Serratto, MD

The 2010 "Specialty Review in Pediatric Cardiology" course was held in Chicago October 11-15. Record attendance included participants from 34 states and 6 countries. Since its founding in 1974, this course has served the pediatric cardiology community, offering a biennial comprehensive review of the subspecialty for those preparing for certification or recertification, as well as for physicians and other health professionals seeking an intensive review to remain current in the field.

New in 2010, course sponsorship was assumed by the American Academy of Pediatrics Section on Cardiology & Cardiac Surgery, with the Society of Pediatric Cardiology Training Program Directors continuing as a collaborating partner. Members of the planning committee in addition to myself included: Co-director Steven Neish (University of Texas Health Sciences Center at San Antonio), Associate Director Peter Lang (Harvard Medical School and Boston Children's Hospital); Christopher Snyder (Ochsner Clinic Foundation); Robert Spicer (University of Cincinnati and Cincinnati Children's Hospital), and Paul Weinberg (University of Pennsylvania School of Medicine and The Children's Hospital of Philadelphia). Twelve additional nationally and internationally recognized speakers completed the course faculty.



The 2010 "Specialty Review in Pediatric Cardiology" course attendees

their classroom note-taking directly on their laptop computers. Likewise, daily exam simulation sessions supported by audience response system technology were a continuing and important feature of the course, providing attendees with the opportunity to work on practice exam questions throughout the week, along with other attendees in a supportive environment.

The course venue was the renovated Holiday Inn Mart Plaza Hotel that provided an elegant and comfortable environment for the attendees and the faculty. The beautiful weather that blessed the course throughout its duration allowed Chicago to display its many splendor assets.

Those who were not able to attend, or who otherwise may be in search of a review before the next live offering of "Specialty Review in Pediatric Cardiology," should note that a DVD version of the course using filmed presentations and other materials developed for the October course is currently in production. This version will be released in early 2011 and distributed by our educational partner, Educational Symposia, Inc. (www.edusymp.com). Purchasing options will include the entire course or selected

modules. As with the live course, sponsorship and CME credit will be provided by the American Academy of Pediatrics.

My thanks and appreciation go out to the planning committee, faculty, corporate sponsors and, especially the registrants, who together made the 2010 edition of "Specialty Review in Pediatric Cardiology" a success as indicated by the preliminary review of the attendees comments showing an overwhelming satisfaction with the course content and teachers.

Stimulated by this success, we are already at work to make the 2012 edition even more comprehensive and fruitful in order to maintain the unparalleled board-passing rate of the course participants.

CCT



Peter Lang (Associate Director) Maria Serratto (Founding Course Director), Steve Neish (Co-Director)

Course participants once again appreciated receiving the syllabus in interactive electronic format, which made it possible for them to do

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Protein Found to Predict Brain Injury in Children on "ECMO" Life Support

Johns Hopkins Children's Center scientists have discovered that high blood levels of a protein commonly found in the central nervous system can predict brain injury and death in critically ill children on a form of life support called Extra-Corporeal Membrane Oxygenation or ECMO.

ECMO, used to temporarily oxygenate the blood of patients whose heart and lungs are too weak or damaged to do so on their own, is most often used as a last resort because it can increase the risk for brain bleeding, brain swelling, stroke and death in some patients.

A detailed report of the Hopkins team's findings was published ahead of print edition Nov. 4 in the journal *Pediatric Critical Care Medicine*.

Following 22 ECMO patients, ranging from two days to 9 years of age, the researchers found that those with abnormally high levels of glial fibrillary acidic protein (GFAP) were 13 times more likely to die and 11 times more likely to suffer brain injury than children with normal GFAP levels. GFAP levels are already used as a marker of neurologic damage in adults who suffer strokes and traumatic brain injuries.

Although preliminary, the team's findings may pave the way to a much-needed way to monitor the precarious neurologic status of children on ECMO without using imaging tests like ultrasounds or CT scans. Periodic blood tests measuring GFAP levels may be one such tool to monitor brain function and help ward off brain injury and death, the researchers say.

"A simple, fast and easy-to-use test has been needed to monitor, predict and prevent brain damage in children on ECMO because these children are unresponsive or heavily sedated, and doctors cannot easily gauge their neurologic function," says study lead investigator Melania Bembea, MD, MPH, a pediatric critical-care specialist at Hopkins Children's.

"Early detection of brain injury can help us prevent further harm by changing medication doses and rapidly weaning the patient from ECMO support," she adds.

The findings may have implications beyond ECMO, the researchers say, as they offer a way to monitor brain damage in other high-risk situations, including heart surgery and severely premature birth.

"Our long-term goal is to make lifesaving therapies like ECMO and heart surgery safer and more effective by improving protection of the brain, and GFAP and other biomarkers can give us a much-needed benchmark around which we can make these therapies safer," says senior investigator Allen Everett, MD, a cardiologist at Hopkins Children's.

In the study, seven of the 22 children on ECMO developed brain bleeding or brain swelling, five of whom died subsequently. These children had much higher peak levels of GFAP than children without



Recruiting Physician Leader for PEDIATRIC ECHOCARDIOGRAPHY CORPUS CHRISTI, TEXAS

Driscoll Children's Hospital is advancing a comprehensive Heart Center to meet the healthcare needs of congenital heart patients in South Texas. The Heart Center is seeking to develop a formal echocardiography laboratory and is recruiting a physician leader. Experience or advanced training in diagnostic imaging (i.e., echocardiography, TEE, and fetal) is necessary; experience administering a laboratory is preferred. Sub-specialty board eligible and/or certification is required.

Pediatric Cardiology has been an integral part of Driscoll Children's Hospital since 1962. The Hospital and the Heart Center are committed to bringing state-of-the-art technology and quality service to 31 counties in South Texas. In 2009, the Heart Center saw 9,500 outpatient and satellite visits and performed 3,569 echocardiograms (157 TEE and 116 Fetals). The Center has a thriving fetal echocardiogram service, and in 2010 we anticipate to perform 250 fetal studies. Driscoll Children's Hospital is associated with two pediatric cardiothoracic surgeons who deliver all aspects of surgical service including hybrid procedures.

Corpus Christi and the Rio Grande Valley offer a relaxed "island style" setting with miles of Gulf beaches and mild weather perfect for outdoor activities. South Texas offers world class hunting, fishing, sailing and wind surfing. Golf, cycling and tennis are enjoyed year round. The cost of living in south Texas is low, and there is no state income tax.

Interested applicants should send CV to:

Annette Shook
Executive Director Physician Relations
Phone (361) 694-6807; Fax (361) 808-2000
Annette.Shook@dchstx.org

or

Roozbeh Taeed, MD
Medical Director, Pediatric Cardiology
(361) 694-5086
Roozbeh.Taeed@dchstx.org

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brain injury — 5.9 nanograms per milliliter of blood compared to 0.09 in children without brain injury. GFAP levels were also markedly higher among eight of the 22 children in the study who had poor neurologic outcomes after ECMO (3.6 ng/ml) than in those children who had good neurologic outcomes (0.09 ng/ml).

Researchers also measured GFAP levels among healthy children and among newborns without neurologic injuries. Their median GFAP level was 0.055 nanograms per milliliter of blood and as high as 0.436 in some cases. By comparison, overall GFAP levels in children with neurologic injuries were 13 times greater than GFAP levels in healthy children.

The researchers caution that their findings should be replicated in a larger trial with more patients and that future studies must clarify the relationship between a rise in GFAP levels and the onset of brain injury. In the current study, GFAP levels rose sharply in some patients one or two days before their brain damage was discovered on ultrasound.

ECMO is used in about 1,000 children each year. Between 10 percent and 60 percent of children who survive ECMO suffer neurologic damage either because of their underlying disease or because of complications during ECMO therapy, the researchers say.

Hopkins Children's is Maryland's only hospital providing pediatric ECMO service. The research was funded by the National Institutes of Health.

Other investigators in the study included: William Savage, MD, John Strouse, MD, PhD, Jamie Schwartz, MD, Ernest Graham, Carol Thompson, MBA, MS, all of Hopkins.

A 'Stitch in Time' Could Help Damaged Hearts

A research team at Worcester Polytechnic Institute (WPI) has demonstrated the feasibility of a novel technology that a surgeon could use to deliver stem cells to targeted areas of the body to repair diseased or damaged tissue, including cardiac muscle damaged by a heart attack. The technique involves bundling biopolymer microthreads into biological sutures and seeding the sutures with stem cells. The team has shown that the adult bone-marrow-derived stem cells will multiply while attached to the threads and retain their ability to differentiate and grow into other cell types.

The results are reported in the paper "Fibrin microthreads support mesenchymal stem cell growth while maintaining differentiation potential," which was published online, ahead of print, on Nov. 29, 2010, by the *Journal of Biomedical Materials Research* (<http://onlinelibrary.wiley.com/doi/10.1002/jbm.a.32978/abstract>).

"We're pleased with the progress of this work," said Glenn Gaudette, Assistant Professor of Biomedical Engineering at WPI, and lead author on the paper. "This technology is developing into a potentially powerful system for delivering therapeutic cells right to where they are needed, whether that's a damaged heart or other tissues."

Gaudette's lab is focused on cardiac function, exploring ways to heal damaged heart muscle and to develop cell-based methods to treat cardiac arrhythmias. Much of this work uses human mesenchymal

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stem cells (hMSCs), which come from the bone marrow and can grow into a range of other tissues in the body, including muscle, bone, and fat. Studies by Gaudette and others have shown that when hMSCs are delivered to damaged hearts, they moderately improve cardiac function. A major challenge in these studies, however, is getting sufficient numbers of the hMSCs to engraft into the damaged heart tissue. Prior methods of injecting the cells into the bloodstream, or directly into the heart muscle, have yielded low results, with 15% or less of the cells injected actually surviving and attaching to the heart muscle. Most of the hMSCs delivered by injection are washed away by the bloodstream.

To address the delivery problem, Gaudette teamed up with colleague George Pins, Associate Professor of Biomedical Engineering at WPI, who has developed the biopolymer microthread technology as a scaffold or a temporary structure to use in various applications of wound-healing and cellular therapy. The microthreads, which are about the thickness of a human hair, are made of fibrin, a protein that helps blood clot. The threads can be engineered to have different tensile strengths and to dissolve at different rates once implanted so they can be fine-tuned for a variety of uses. Pins is exploring the use of threads to produce replacement tendons and ligaments. Ray Page, Assistant Professor of Biomedical Engineering at WPI, leads a team using the microthreads as a platform for fibroblasts to induce skeletal muscle regeneration.

In the current study, Gaudette's team developed protocols to seed hMSCs on small bundles of the fibrin microthreads. Once the stem cells attached to the threads, they were cultured for five days and the data showed the cells began to multiply until the two-centimeter-long threads were virtually covered, with nearly 10,000 cells hMSCs on each one. After the seeding and growing process, Gaudette's team attached the microthreads to a surgical needle and drew them through a collagen gel made to simulate human tissue. When the threads were drawn through the gel, the vast majority of the stem cells remained alive and attached to threads, suggesting they could be sutured into human tissue.

Gaudette's team also examined the hMSCs that had grown on the threads to see if they remained multipotent, meaning they retain the ability to grow into other types of cells. They removed the hMSCs from the threads and cultured them via established protocols known to prompt hMSCs to differentiate into fat cells and bone cells. In both cases, the cells taken from the microthreads began to differentiate along the pathways that lead to fat and bone tissue. "It appears that the cells we grew on the threads behave the same way we would expect mesenchymal stem cells would in vivo," Gaudette said. "So we believe these results are proof-of-principle—that we can now deliver these cells anywhere a surgeon can place a suture. That's exciting."

Gaudette's team is already at work on the next steps in this line of research, testing the stem cell-seeded microthreads in a rat model to see if they can engraft into heart tissue and improve cardiac function.

The research reported in the current study was funded by the National Institutes of Health.

Obese Children Have Signs of Heart Disease Typically Seen in Middle-aged Adults

The blood vessels of obese children have stiffness normally seen in much older adults with cardiovascular disease, Dr. Kevin Harris today



LOMA LINDA UNIVERSITY
HEALTH CARE

Wanted: Pediatric Cardiologist with Primary Interest in Echocardiography

The Department of Pediatrics at Loma Linda University is seeking a pediatric cardiologist to join our clinical team. LLU Children's Hospital is a 280 bed facility located at the base of the San Bernardino Mountains. Our location provides easy access to all of Southern California including the cities of Palm Springs, Los Angeles, and San Diego. Access to the area beaches and mountains, for sun, surf, skiing, and outdoor activities is simple and right at our doorstep.

We are seeking a pediatric cardiologist whose primary interest is in echocardiography, ideally with a focus in fetal echocardiography and other diagnostic imaging. General responsibilities include clinical care, teaching and research. A fourth year fellowship in echocardiography is desirable but not necessary. The candidate should be board certified or board eligible in pediatric cardiology.

The Division of Pediatric Cardiology at LLU serves a wide area of Southern California including 4 hospitals and 6 clinic locations. We perform nearly 7000 echocardiograms per year and 300 fetal echocardiograms per year. Our hospital includes an 84 bed neonatal intensive care unit and a 14 bed pediatric cardiothoracic intensive care unit to accommodate the nearly 400 cardiothoracic surgeries annually. We work intimately with the obstetricians in our maternal fetal clinic, and our fetal program continues to rapidly grow.

We welcome your replies of interest as well as recommendations of qualified candidates. Be assured that all correspondence will be handled with professional courtesy and confidentiality.

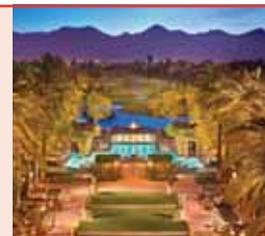
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OPPORTUNITY IN PEDIATRIC CARDIOLOGY CORPUS CHRISTI, TEXAS

Driscoll Children's Hospital is advancing a comprehensive Heart Center to meet the healthcare needs of congenital heart patients in South Texas. The Center is recruiting physicians with expertise in interventional cardiology or diagnostic imaging (i.e., echocardiography, TEE, and fetal). The Center also seeks cardiologists to support outpatient clinic activities, which include local and satellite facilities. Sub-specialty board eligible and/or certification is required for all positions. Advanced training or experience is preferred for clinical specialists. Clinical specialists will focus on their area of expertise and may participate in general and outpatient cardiology.

Pediatric Cardiology has been an integral part of Driscoll Children's Hospital since 1962. The Hospital and the Heart Center are committed to bringing state-of-the-art technology and quality service to 31 counties in South Texas. In 2009, the Heart Center saw 9,500 outpatient and satellite visits; 3,569 echocardiograms and 293 heart catheterizations (82% interventional). Driscoll Children's Hospital is associated with two pediatric cardio-thoracic surgeons who deliver all aspects of surgical service including hybrid procedures.

Corpus Christi and the Rio Grande Valley offer a relaxed "island style" setting with miles of Gulf beaches and mild weather perfect for outdoor activities. South Texas offers world class hunting, fishing, sailing and wind surfing. Golf, cycling and tennis are enjoyed year round. The cost of living in south Texas is low, and there is no state income tax.

Interested applicants should send CV to:

Annette Shook
Executive Director Physician Relations
Phone (361) 694-6807; Fax (361) 808-2000
Annette.Shook@dchstx.org

or

Roozbeh Taeed, MD
Medical Director, Pediatric Cardiology
(361) 694-5086
Roozbeh.Taeed@dchstx.org

told the Canadian Cardiovascular Congress 2010, co-hosted by the Canadian Cardiovascular Society and the Heart and Stroke Foundation (heartandstroke.ca). The clock is ticking and the shape of the 13 year-old-heart is changing – for the worse.

"We were surprised to find that these obese children already have stiff blood vessels," says Dr. Harris from B.C. Children's Hospital. "Aortic stiffness is an early indicator of cardiovascular disease in obese children." He says it is as if the aging process has been accelerated in their aorta.

The aorta is the largest artery in the human body. It carries and distributes oxygen-rich blood to all the other arteries and normally acts as a buffer to the pumping action of the heart. Increased stiffness of the aorta is typically associated with aging and is a strong predictor of future cardiac events and mortality in adults.

"The normal aorta has elastic qualities that buffer the flow of blood. When that elasticity is lost, aortic stiffness results – a sign of developing cardiovascular disease," Dr. Harris told the meeting. "Aortic stiffness is associated with cardiovascular events and early death."

The mean age of the children in Dr. Harris's study was 13 years.

Dr. Harris and colleagues evaluated 63 obese children and compared them with 55 normal weight controls. Blood pressure was taken, lipids evaluated, and body mass index measured. Children then underwent echocardiography, or ultrasound, of the heart and blood vessels. This test was used to determine the Pulse Wave Velocity in the aorta. This is a measure of how fast blood flows and was one of the measures used to assess aortic stiffness.

"The systolic blood pressure was only marginally higher in these obese children," says Dr. Harris. Blood lipid levels – total, HDL and LDL cholesterol – were normal. However, ultrasound of the heart showed that the Pulse Wave Velocity and other measures of arterial health were already abnormal in the obese children.

He says these findings are highly significant because the elastic qualities of their aorta were impaired even though other measures of heart health such as blood lipid levels and blood pressure were not dramatically different.

To see actual changes in the performance of the heart and blood vessels in obese children is extremely alarming, says Heart and Stroke Foundation spokesperson Dr. Beth Abramson.

"We know there is an association between unhealthy lifestyles and heart disease. Our kids are at risk," she says. "Poor nutrition and inactivity are threatening their health and well-being. We must rethink the lifestyle standards we have accepted as a society to protect the future health of our kids."

The rate of childhood obesity has tripled over the last 25 years and it continues to increase, warns Dr. Abramson. Over 25% of Canadian children between the ages of two and 17 years are overweight or obese, with the percent increasing with age from 21% among those two to five years to 29% among those aged 12 to 17.

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Pediatric Cardiologist

The Division of Pediatric Cardiology at the University Of Utah School Of Medicine is recruiting a pediatric cardiologist with a major interest in **Adult Congenital Heart Disease**. The candidate should have a strong clinical background in all areas of pediatric cardiology with expertise in caring for adults with congenital heart disease. The candidate will be joining a 24-member division of Pediatric Cardiology including one pediatric cardiologist currently running the Adult Congenital Heart Disease Program. The Division has a very active clinical program, currently seeing a large volume of adults with congenital heart disease. The Division also has a very active clinical research program and is one of the participating centers in the Pediatric Heart Disease Clinical Research Network funded by the NIH. There will be protected time for clinical research with mentoring available within the Division for clinical research studies. This faculty position will be involved in a very active academic teaching program.

The successful candidate will receive a faculty appointment at the University of Utah. The Pediatric Cardiology Division is based at Primary Children's Medical Center, a tertiary referral center for a three-state area located on the hills overlooking Salt Lake City. Adults with congenital heart disease are seen at the children's hospital and at nearby 'adult' hospitals. The area offers an excellent quality of life with immense cultural and recreational opportunities close and available.

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, disability, or status as a Protected Veteran. Upon request, reasonable accommodations in the application process will be provided to individuals with disabilities. To inquire about the University's nondiscrimination policy or to request disability accommodation, please contact: Director, Office of Equal Opportunity and Affirmative Action, 201 S. Presidents Circle, Room 135, (801) 581-8365.

Interested individuals should send or email a cover letter and curriculum vitae to:

Lloyd Y. Tani, M.D.
Chief, Division of Pediatric Cardiology
University of Utah School of Medicine
100 N. Mario Capecchi Drive
Salt Lake City, UT 84113
Email: lloyd.tani@imail.org



She notes that the health risks to overweight and obese children include heart disease, high blood pressure, and Type 2 diabetes.

Dr. Harris says the next step should be to determine whether these changes are reversible with treatment such as improved diet and exercise. This test may eventually be helpful in monitoring the progression of cardiovascular disease in children and young adults.

MARCH MEETING FOCUS

17th Charleston Symposium: Multi-Modality Imaging

March 13-16, 2011; Charleston, SC USA

<http://clinicaldepartments.musc.edu/pediatrics/divisions/cardiology/pdfs/CHEEP-WebsiteBrochure.pdf>

Overview: The program seeks to build on the success of prior Symposia, with emphasis on hands-on 3DE and multi-modality imaging in pediatric and adult cardiology. The agenda has been specifically designed for pediatric and adult echocardiographers and sonographers. The meeting is co-sponsored by the American Society of Echocardiography.

The Concept: Simulations are the best way to learn. See 'the real thing:' see, hold and dissect a real heart; hold pathology specimens; see what the surgeon sees. Then open a 3D dataset, learn what the malformed heart really looks like, and work on it...for a wide range of pathologies. This is an intensive, interactive agenda that emphasizes hands-on learning, with 1 PC per 2 attendees.

The Method: For each topic, plenary sessions explore common ground for CHD and adult cardiology, followed by concurrent (CHD or adult) breakout sessions that provide the opportunity for more detailed echo-pathology correlations and learning.

I. Structural Disease

- The mitral valve (plenary)
- Atrioventricular septal defect (CHD breakout)
- Double outlet right ventricle (CHD breakout)

Attendees will first perform guided, hands-on dissection of porcine hearts in order to understand how to view and interpret 2D and 3DE images from various perspectives. Cardiac pathologists will illustrate specimens of normal and malformed hearts to demonstrate salient features of anatomy. 3D echocardiographers will discuss image acquisition, optimization and viewing perspectives that are of importance in diagnosing important aspects of pathology by 3DE. Cardiac surgeons will use videos of surgical findings and techniques that they use to work on specific pathologies. Attendees will then learn how to manipulate 3DE datasets at workstations to delineate relevant aspects of anatomy.

II. **3DE and Ventricular Function:** Attendees will learn the benefits of 3DE quantitation of ventricular function. Simulations will be used to demonstrate how to use platforms from various vendors to quantify LV and RV volumetrics. Each of these sessions will include a hands-on component where attendees themselves perform quantitation. The adult breakout session will include discussion of 3DE speckle tracking as well as quantitation of mitral valve structure and function.

III. **Multi-modality imaging:** This will start as a plenary session wherein Dr. Roberto Lang will present his views on the evolving role of multi-modality imaging. This will be followed by a panel discussion that includes adult and pediatric imaging specialists (both cardiologists and radiologists).

Dr. Tony Hlavacek will lead the CHD breakout on multi-modality imaging. He will present his views on the roles of CT angiography and MRI. Following this, he will use CTA to demonstrate abnormalities of the aortic arch, systemic and pulmonary veins. The high resolution of the images, coupled with the 3D demonstration of relationships to extra-cardiac structures that are invisible to echocardiography, provide great value to any student of CHD.

Dr. Joseph Schoepf and Peter Zwerner will lead the adult breakout on multi-modality imaging. They will discuss how they use CTA and MRI in their practice, and provide hands-on demonstrations of findings in clinical cases.

A simultaneous hands-on pathology breakout will enable attendees to interact with Prof. Robert Anderson and Diane Spicer, to ask questions.

The Faculty: Course Director: Girish Shirali; CHD Imaging: Karen Chessa, Anthony Hlavacek, Brad Friedman; CHD Surgery: Scott Bradley; CHD Pathology: Robert Anderson, Diane Spicer; Adult Imaging: Jake Abernathy, Roberto Lang, Scott Reeves, Joseph Schoepf, Stan Shernan, Doug Shook, Lissa Sugeng, Peter Zwerner; Adult Mitral Valve Surgery: David Adams, Randolph Chitwood.

Registration Only 150 seats are available for this meeting. Register now! To register online, go to: http://clinicaldepartments.musc.edu/pediatrics/divisions/cardiology/CHEEP_reg

Call for Applications - Section on Cardiology & Cardiac Surgery of AAP - 2011-2012 Research Fellowship Award

2011-2012 Research Fellowship Award - The grant will provide research support for advanced training to a promising young investigator who has demonstrated aptitude for basic science or clinical science research during their pediatric cardiology fellowship. Trainees in an accredited US pediatric cardiology or cardiovascular surgical training program are eligible.

In making its selection, a special committee will review submitted materials for scientific merit, clarity of presentation, likelihood of productivity by the investigator, and evidence of appropriate academic environment by the sponsor. The recipient will receive a \$35,000.00 grant and will be invited to present this work at the AAP's National Conference and Exhibition in New Orleans in 2012.

Grant Timetable:

- February 1, 2011: Deadline for receipt of application
- April 1, 2011: Notification to Investigator and Institution
- July 1, 2011: Initiation of the Award
- October 16, 2011: Presentation of Award by the Section on Cardiology and Cardiac Surgery during the AAP meeting - Boston, MA
- June 30, 2012: Termination of the Award
- July 31, 2012: Scientific Progress Report due signed by Principal Investigator
- September 30, 2012: Final Financial Report due signed by the Principal Investigator and the institutional Fiscal Officer)
- October 28, 2012: Presentation of research results at the Section on Cardiology and Cardiac Surgery Scientific Program during the AAP meeting in New Orleans, LA

For more information: www.aap.org/sections/cardiology/RFAannouncements.htm

Or write:

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American Academy of Pediatrics
141 Northwest Point Blvd.
Elk Grove Village, IL 60007-1098
Phone: 847/434-7820; Fax: (847) 434-8000
lcogrove@aap.org

The Research Fellowship Award is made possible by an educational grant from the Helen and Will Webster Foundation.

Many Patients With Implantable Cardioverter-Defibrillators Do Not Meet Criteria For Use

A study that included more than 100,000 patients who received implantable cardioverter-defibrillators (ICDs) found that about 20% did not meet evidence-based guidelines for receipt of an ICD, and that these patients had a significantly higher risk of in-hospital death than individuals who met criteria for receiving an ICD, according to a study in the January 5th, 2011 issue of *JAMA*.

Several randomized controlled trials have shown the effectiveness of ICDs for preventing sudden cardiac death in patients with advanced systolic heart failure. But practice guidelines do not recommend use of an ICD for primary prevention in patients recovering from a heart attack or coronary artery bypass graft surgery and those with severe heart failure symptoms or a recent diagnosis of heart failure. "The degree to which physicians in routine clinical practice follow these evidence-based recommendations is not clear," the authors write.

PEDIATRIC CARDIOLOGY

Geisinger Health System is seeking a BC/BE Pediatric Cardiologist to join its collaborative team of 4 Pediatric Cardiologists and 1 Pediatric Cardiovascular Surgeon at Geisinger's Janet Weis Children's Hospital, an exceptional tertiary referral center, located on the campus of Geisinger Medical Center in Danville, PA.

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advanced cardiac imaging center, an Interventional Cardiac Catheterization program, ECMO, a 12-bed PICU and a 38-bed Level III NICU, with all sub-specialties well represented.

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Sana M. Al-Khatib, MD, MHS, of the Duke Clinical Research Institute, Durham, NC, and colleagues conducted a study to determine the number, characteristics, and in-hospital outcomes of patients who received a non-evidence-based ICD. The study included an analysis of cases submitted to the National Cardiovascular Data Registry-ICD Registry between January 2006 and June 2009.

The researchers found that of 111,707 initial primary prevention ICD implants that occurred during the study period, 25,145 were for a non-evidence-based indication (22.5%). Of these, 9,257 were in patients within 40 days of a heart attack (36.8%) and 15,604 were in patients with newly diagnosed heart failure (62.1%). The risk of in-hospital death was significantly higher in patients who received a non-evidence-based device than in patients who received an evidence-based device (0.57% vs. 0.18%). The risk of any postprocedure complication was significantly higher in the non-evidence-based ICD group at 3.23% compared with 2.41% in the evidence-based group.

"Although the absolute difference in complications between the two groups is modest, these complications could have significant effects on patients' quality of life and health care use, including length of hospital stay and costs. Importantly, these complications resulted from procedures that were not clearly indicated in the first place. While a small risk of complications is acceptable when a procedure has been shown to improve outcomes, no risk is acceptable if a procedure has no demonstrated benefit," the authors write.

Any adverse event and death were significantly higher in patients who received a non-evidence-based device. The median (midpoint) length of hospital stay was significantly longer for patients who received a non-evidence-based ICD compared with patients who received an evidence-based ICD (3 days vs. 1 day). Also, there was substantial variation in non-evidence-based ICDs by site.

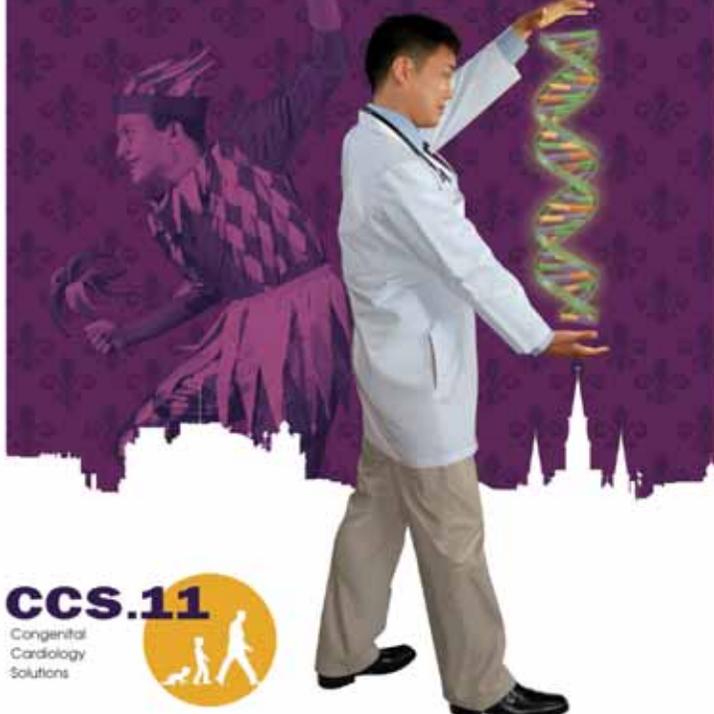
The proportion of ICD implants performed by the different types of physician specialty was 66.6% for electrophysiologists, 24.8% for nonelectrophysiologist cardiologists, 2.6% for thoracic surgeons, and 6.1% for other specialists. The rate of non-evidence-based ICD implants was significantly lower for electrophysiologists (20.8%) than nonelectrophysiologists (24.8% for nonelectrophysiologist cardiologists; 36.1% for thoracic surgeons; and 24.9% for other specialties). There was no clear decrease in the rate of non-evidence-based ICDs over time.

"During this period of limited resources, and due to the Centers for Medicare & Medicaid Services' emphasis on quality improvement by promoting evidence-based care, it is increasingly important to assess hospital performance and to provide feedback to hospitals about their outcomes and compliance with clinical guideline recommendations. Providing such feedback to hospitals has the potential to improve adherence to practice guidelines and eventually patient outcomes," the researchers write.




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Abstract Submission Deadline is March 25, 2011

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CONGENITAL CARDIOLOGY TODAY

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