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21st Annual Pediatric Echocardiography Conference

Imaging in Adult Congenital Heart Disease - Pearls for All Cardiac Providers
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SCAI 2015
May 6-9, 2015; San Diego, CA USA
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25th International Symposium on Adult Congenital Heart Disease
Jun. 3-6, 2015; Toronto, Canada
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Surgical Standby for Complications in the Pediatric Cardiac Catheterization Suite

By Gerald A. Bushman, MD; Mari K. Baldwin, MD

Introduction

Despite the availability of guidelines for pediatric cardiac centers¹ that describe in general the optimal care issues for such centers, the standards for institutional guidelines in the environment of care for pediatric cardiac catheterization patients often do not specifically address the availability of surgical backup in the event rescue is needed during an interventional procedure. This survey was undertaken in order to describe what the common approaches to this issue are among pediatric cardiac centers staffed by anesthesiologists who participate in the Congenital Cardiac Anesthesia Society.

Methods

A survey was constructed and sent to the email addresses of members available in the database of the Congenital Cardiac Anesthesia Society. SurveyMonkey was used as an online resource to collect the the responses from August 1st, 2012 through January 31st, 2013. The questions asked are shown below.

1) The volume of pediatric cardiac interventional procedures done in the catheterization lab of my institution each year is:

- A) 0-100
- B) 101-300
- C) greater than 300

2) Surgical standby is available and scheduled:

- A) for every procedure
- B) for selected procedures
- C) for no procedures

3) Rapid Deployment ECMO support is available at my institution with 24/7 coverage by surgical and support staff in house:

- A) Yes
- B) No

4) In my institution, surgical standby means:

- A) An operating room (OR) team of personnel including surgeon, anesthesiologist, nurses, and perfusionist are on the premises and OR room is available.
- B) The entire OR team is notified and on stand-by, but may not be in-house when the procedure is performed.
- C) The cardiovascular surgeon is notified and on stand-by when the procedure is performed, but may not be in-house when the procedure is performed (other OR personnel such as nurses, perfusionists, or anesthesiologists are not notified unless the surgeon deems it necessary.)
- D) Pediatric cardiac interventional catheterization procedures are not coordinated with the surgical service in my hospital until there is an emergency.

5) Please check the following procedures that are done in your interventional cath

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lab and whether surgical stand-by is scheduled:

- Atrial septostomy, balloon or blade
- Device closure of atrial septal defects
- Device closure of ventricular septal defects
- Valvuloplasty of aortic or pulmonary valve
- Valvuloplasty of mitral or tricuspid valve
- Angioplasty of pulmonary artery
- Stent placement in pulmonary artery
- Angioplasty of aorta
- Stent placement in aorta
- Angioplasty/stent placement in PDA or aortapulmonary shunt
- Device occlusion of PDA or systemic shunt
- Angioplasty with or without stent of pulmonary or systemic venous vessel
- Percutaneous valve implantation, any position

6) Institution of the person responding to the survey.

The survey was left open and available, and after 6 months of time for responses to be made, the data were analyzed. Because the raw results represented some surveys from different responders in the same institution, and some responders failed to answer the question identifying their institution, the results were further filtered. All of the answers in Questions 1-4 by persons not identifying their institution in Question 6 were eliminated. Further, responses for Questions 1-4 which could be identified as coming from the same institution were studied individually and if the answers to each question were identical, it was recorded only once in the filtered database. If the answers for Questions 1-4 from the same institution to a specific question differed, both answers were eliminated from the filtered database. Question 5 reflects the interventions performed and the standby practice from the 85 filtered questionnaires.

Because the response to the survey was voluntary and does not represent the entirety of pediatric interventional cardiology practice in the catheterization lab, statistical analysis of the results was not attempted. The data represents a descriptive presentation of the results.

Results

Surveys were completed by 127 respondents. Twenty surveys did not identify their institution, and twenty-two surveys were identifiable as duplicates of another survey in the database. These qualified for exclusion leaving eighty-five surveys to be analyzed.

The filtered results are presented. In Figure 1, the list of interventions performed is presented with the respondents' collective assertions of whether standby is provided.

The volume of the pediatric interventional catheterization service was described as 100 or fewer procedures/year by 17/85 (20%) of responses, 101-300 procedures/year by 38/85 (44.7%) of responses, and more than 300 procedures/year by 30/85 (35.3%) of responses (Figure 2).

Surgical standby was represented as available for every procedure in 7/85 (8.2%) of responses, for selected procedures in 70/85 (82.3%) of responses, and for no procedures in 8/85 (9.4%) (Figure 3).

Rapid deployment extracorporeal membrane oxygenation was described as available in 52/85 (61.2%) of responses and not available in 33/85 (38.8%) of responses. (Figure 4). Its availability compared between high, medium, and low volume centers is shown in Figure 5.

The definition of "surgical standby" is described in Figure 6.

- The responses of 46/85 (54.1%) indicated the surgeon and anesthesiologist, perfusionist, operating room, and other necessary personnel were available in the hospital for the patient in the lab if needed for surgical rescue.
- "Standby" meant the surgeon and OR team were notified but not necessarily in-house or otherwise immediately available in 13/85 (15.3%) of responses.
- The surgeon was specifically notified but the remaining personnel (perfusion, nurses, anesthesiologists) were not notified in 16/85 (18.8%).
- There was no notification or coordination of surgical standby for pediatric cardiac catheterization surgical emergencies in 10/85 (11.8%) responses.

It is unknown whether there was crossover in the responses of centers that had rapid

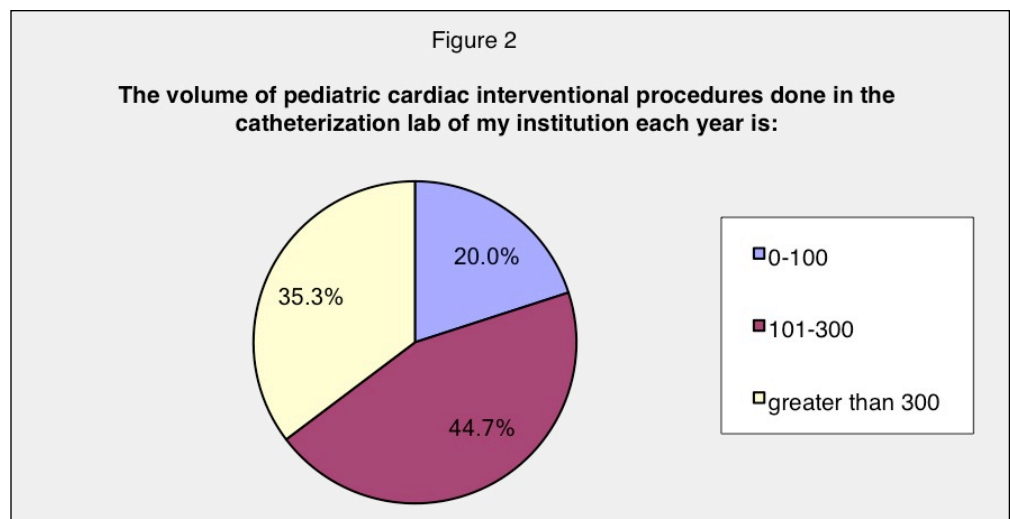
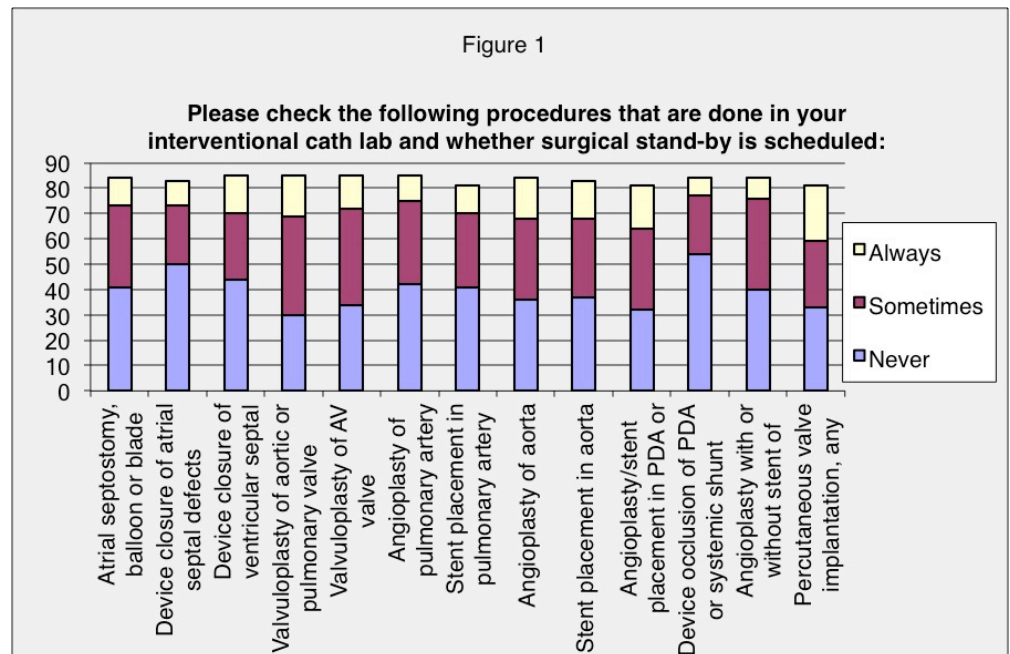


Figure 3

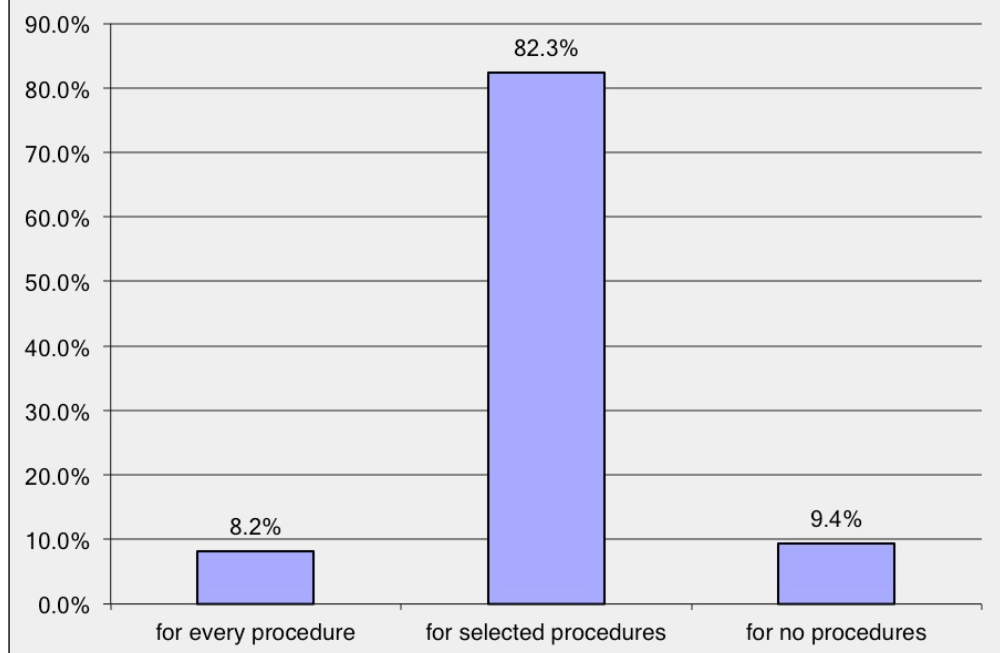
Surgical standby is available and scheduled

Figure 4

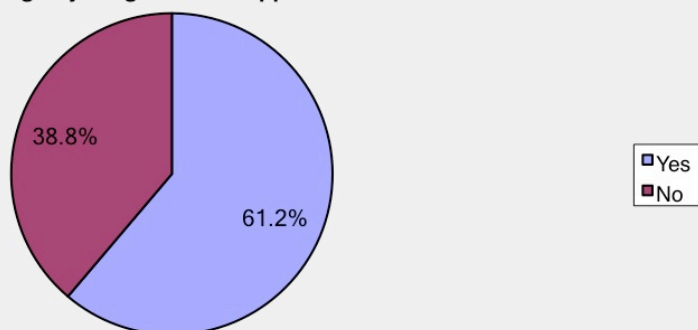
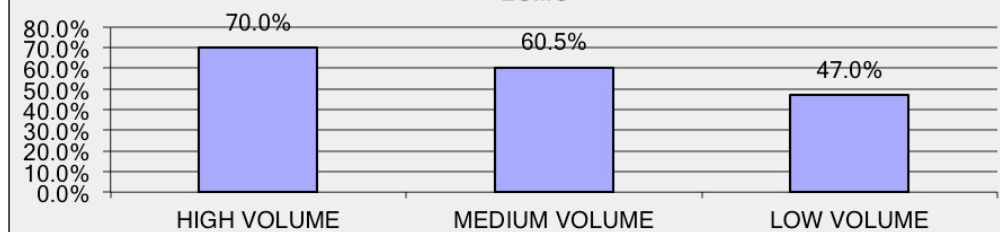
Rapid Deployment ECMO support is available at my institution with 24/7 coverage by surgical and support staff in house?

Figure 5

PERCENT OF INSTITUTIONS WHO PROVIDE RAPID DEPLOYMENT ECMO

deployment ECMO capability and the institutions that regarded their system as providing surgical standby for every case.

The results were further filtered to find the institutions that did not schedule standby (D) and had no ECMO capability for

catheterization lab rescue. One out of seventeen low volume centers, 2/38 medium volume centers, and 2/30 high volume centers were identified self-reported and as having no organized surgical process for rescue from serious catheterization lab complications.

Filtering the centers that did not have ECMO capability (but did claim surgical standby capability) for whether the type of standby provided was in-house showed that in 7/9 low volume centers, 8/15 medium volume centers, and 4/9 high volume centers responded that standby was defined as B, C, or D, meaning that they may not have an entire surgical team in house, or there was no coordination with the surgical team.

Discussion

Pediatric cardiac catheterization has been described since the 1930's and for decades was the standard for determining anatomy and physiology in pediatric patients with Congenital Heart Disease,² pulmonary hypertension,³ and patients considered for cardiac replacement.⁴ Since physiology was primarily determined by invasive measurements of cardiac output and the application of specific algorithms for estimating the fraction of cardiac output involved in an intra- or extracardiac right-to-left or left-to-right shunt, much of the anesthesia literature regarding the management of these patients in the catheterization suite focused on the potential alteration of physiologic parameters by the anesthetic or sedation technique and other concomitant factors such as spontaneous versus controlled ventilation, and FiO₂ and PCO₂.^{5, 6, 7, 8, 9}

However, the era of routine cardiac catheterization for determining the cardiac anatomy in a patient with congenital cardiac disease is largely over. As noninvasive techniques for determining anatomic and physiologic details of a lesion have evolved (echocardiography and more recently, cardiac MRI), the catheterization suite has seen a change in the types of patients and procedures performed.^{10, 11}

Current catheterization lab patient populations are increasingly represented by more specific physiologic queries in patients whose cardiac anatomy is otherwise determined by echocardiography or cardiac MRI. Invasive measurement of pulmonary vascular hemodynamics in children with pulmonary hypertension may still be useful in determining patients who may be candidates for medical therapy.¹² Single ventricle patients usually require hemodynamic assessment during the stages of surgical palliation en route to Fontan completion² and potential cardiac replacement patients may benefit from risk stratification by determining their pulmonary vascular resistance.⁴

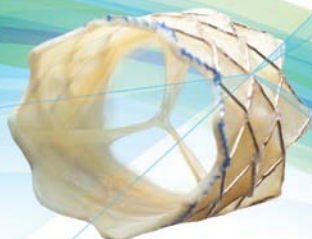
The contemporary indications for pediatric cardiac catheterization and catheter-based interventions are well described.¹⁰ There are indications and recommendations for more than 20 specific interventional procedures whose performance by the cardiologist is rapidly becoming a standard of care.¹⁰ For a



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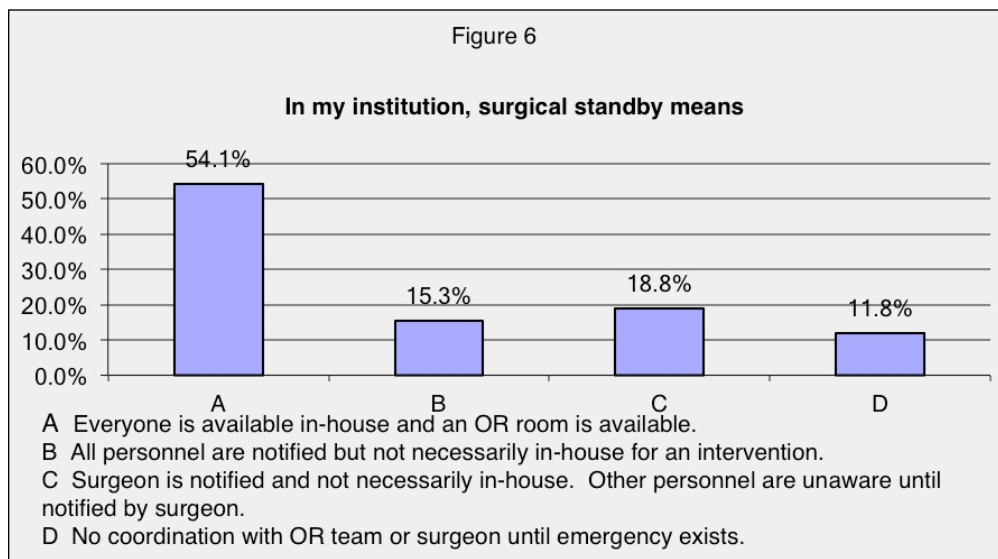
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Figure 6



given pediatric cardiologist, this represents a challenging learning curve.

Interventional procedures now make up the most rapidly increasing percentage of patients undergoing cardiac catheterization,¹¹ and the requirements for an immobile patient whose hemodynamics are likely to be substantially challenged during an interventional procedure are increasingly managed by an anesthesia team rather than sedation by the cardiologist. Additionally, patients may present to the catheterization lab for hybrid procedures¹³ or urgently or emergently after cardiac surgery to diagnose and potentially correct important residual lesions.^{14,15} Some patients may present on ECMO for evaluation or treatment after suffering cardiovascular collapse for diagnostic and therapeutic procedures outside of the catheterization suite. These may include patients with known or unknown heart disease and high-risk cardiac patients who decompensate with the administration of general anesthesia.^{16, 17, 18, 19}

The impact of the anesthesia technique on measurement of intracardiac shunting has become an obsolete question, as the patient in the pediatric lab is more likely to be undergoing dilation of stenotic vasculature, placement of devices to occlude or maintain intracardiac or extracardiac shunts, dilation of stenotic valves, etc. Catheterization interventions to dilate stenotic valves or vasculature may be preferred over surgery in some patients such as those with Williams Syndrome where the procedural risk is extremely high.²⁰ An important component of the skill set of an anesthesiologist in this setting is the ability to accurately diagnose, communicate with the interventionalist, and participate in the appropriate hemodynamic management of the patient during the procedure and when complications occur.

Although many of the above situations occur primarily in tertiary care pediatric centers with a full complement of pediatric cardiac

supportive services, many procedures may be done frequently in community hospitals with varying levels of pediatric cardiac ancillary support.²¹ It is generally recognized that some simple procedures in patients older than one year of age are very low risk; however, there is little data or consensus on whether the complication profile of a procedure such as device ASD or PDA closure applies to more complex procedures done in the catheterization lab such as balloon valvuloplasty or dilation of stenotic pulmonary arteries.²² Although some patient-specific conditions may be more likely to result in a serious complication, the importance of patient selection, operator experience, and other institutional factors typically applicable to risk stratification are at this time somewhat speculative.

A similar situation occurred in the early 1980's as percutaneous revascularization in adult patients with coronary artery disease was applied in elective and emergency settings. Initially, a tool used in high volume adult cardiac centers with surgical backup for failed angioplasty, the homogeneity of the revascularization procedure and patient population led to rapid understanding of the risk factors and conditions which might lead to a catheterization lab scenario which would require surgical rescue. Although many community hospitals initially provided diagnostic coronary angiography services without surgical backup, in the event of an angioplasty complication, the lack of surgical backup could be catastrophic. Guidelines were implemented that recognized the importance of institutional and operator procedural volume in determining whether angioplasty services should be offered.²³ As the typical operator experience in angioplasty revascularization increased, the complication rate decreased.²⁴ The authors speculate that the volume of a single procedure, coronary angioplasty, in the hands of high-volume interventional adult cardiologists represents a more steep and

rapid learning curve than that of pediatric cardiologists who do a variety of interventions on many fewer patients.

Even without the performance of a procedural intervention, pediatric cardiac catheterization carries a definable increased risk, presumably due to the cardiac anomaly requiring study.^{25,26} Current literature shows that major and minor adverse events occur in up to 9% of patients having cardiac catheterization, with those involving interventions having an 11% complication rate.²² Interestingly, the complication rate of a PDA or ASD closure is about half of the complication rate of catheterization procedures overall, indicating that ASD and PDA occlusion in the lab is safe largely because the underlying cardiac anomaly being treated is not acutely serious.²² As a group, therefore, all other interventions and patient's cardiac conditions are at higher risk. In the ASD or PDA patient, it could be reasonably argued that placement of the device is a greater short-term risk than the ASD or PDA, underscoring the need to provide a system where the infrequent procedural mishap can be effectively treated.

Interventional catheterization events requiring surgical rescue are reported anecdotally in the literature, and although are described to be "rare," may occur in 2-4% of patients.²⁷ Case reports indicate that many of these events result in extreme hemodynamic stability, and although they are often successfully treated in the cardiac OR or stabilized by the institution of ECMO the number of events unsuccessfully treated because of inability to provide supportive services on-site is not addressed in the literature.^{28, 29, 30} Small reports suggest that presenting to the catheterization suite on ECMO or because of cardiac instability after cardiac surgery in which there is a significant residual hemodynamic lesion predict a greatly increased likelihood of mortality.^{16, 17} There is little organized data on how institutions that provide interventional pediatric cardiac catheterization procedures provide for emergencies in the catheterization lab which require surgical rescue in the form of immediate transport to a dedicated cardiac OR suite or onsite stabilization with ECMO support in the lab, and what the optimal backup strategy might entail in resource management.

Unlike the era where most cardiac catheterizations were diagnostic and surgical rescue of an unstable patient was rarely required, many interventional procedures are very analogous to a surgical procedure in terms of altering the patient's physiology and correcting or creating anatomic defects. Unlike the operating room where personnel and equipment to place the patient on cardiopulmonary bypass are present and the team has the ability to change a procedural plan in the event the original planned

procedure is inappropriate or unsuccessful, in the catheterization suite there is limited inherent ability to support the patient if needed in the event advanced resuscitation is required for a complication or if an adverse unforeseen outcome of a procedure occurs. Due to the reports of poor outcomes in patients presenting after surgery with uncorrected lesions,¹⁴ it is reasonable to speculate that an unsuccessful intervention in the lab which destabilizes a cardiac patient would also be a highly risky situation since the hemodynamically important lesion is unresolved, or in the case of device migration or malposition, a new hemodynamically important lesion is created.

Further study is required to delineate the patient-specific factors and the procedure specific factors that are related to outcome in patients who require surgical rescue or unexpected extracorporeal support in the catheterization lab. Based on the results of the survey, most institutions support the interventional lab with either direct surgical backup and extremely variable coordination between the lab and the OR, or the self-described ability to deploy ECMO emergently. However, it appears that some institutions are underprepared for these rare, but critical events, while others may devote unnecessary resources to the same problems.

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Symptoms:
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Exercise Intolerance, Growth Delay, Cardiolipin Abnormalities

www.barthsyndrome.org

“Based on the results of the survey, most institutions support the interventional lab with either direct surgical backup and extremely variable coordination between the lab and the OR, or the self-described ability to deploy ECMO emergently. However, it appears that some institutions are underprepared for these rare, but critical events, while others may devote unnecessary resources to the same problems.”

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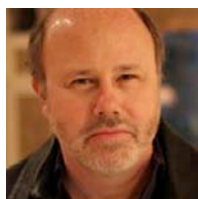
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Brief Introduction of Corresponding Author

Dr. Bushman is an affiliate clinical faculty member of the Department of Anesthesiology, Keck School of Medicine practicing Pediatric Cardiac and Pediatric Anesthesiology at Childrens Hospital Los Angeles (CHLA). He was in Pediatric Cardiac Anesthesiology practice at Arkansas Children's Hospital from 1985-2000. He led the Division of Pediatric Cardiac Anesthesiology at CHLA from 2001-2010. He is an organizing member of the Congenital Cardiac Anesthesia Society which was inaugurated in 2005 as a society within the Society of Pediatric Anesthesia. He has presented and published widely in the field of pediatric cardiac anesthesiology and remains active as a reviewer for several journals, acts as a consultant in Anesthesiology for the Medical Board of California, and as a medical advisor for RxRobots, Inc.

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- 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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Congenital Heart Intervention Mission Support (CHIMS): A Call to Action

By Kathleen Nolan, RT; Karim Diab, MD;
Damien Kenny, MB, MD

Millions of children are born with Congenital Heart Disease (CHD) every year in developing countries. In India alone it is projected that over 200,000 infants are born annually with CHD. Approximately 80,000 of these infants suffer from critical CHD requiring early intervention; however, less than 10% are actually receiving the therapy they need.¹ Multiple charitable organizations have channeled their efforts to counter the worldwide disparity in access to basic medical care for children born with congenital heart disease. Excellent surgical outcomes have been reported despite limited local resources and equipment.² However, many challenges remain. According to one recent published survey of over 80 non-governmental organizations (NGO) providing cardiovascular care in 82 low-middle-income countries, the majority of NGOs were supporting small volume mission visits per year.³ Although the majority (87%) of NGOs provided education, diagnostics, and surgical (59% performed operations in children and infants with 41% performing nonbypass neonatal operations) or catheter-based interventions, approximately a quarter (26%) reported that partner sites do not perform interventions in-between missions. This indicates a lack of coordinated approach to service provision and development in these countries with many charities remaining as "islands" rather than part of a broader collaborative community focused on a standardized approach to development of local resources and personnel.

Development of any congenital cardiac service requires the availability of catheter interventions to support surgical care and in some cases provide a less invasive alternative. This is not without the need for significant capital outlay for development of a cardiac catheterization laboratory with fluoroscopy and hemodynamic monitoring, and the need to stock a large inventory of expensive equipment. Cost effective strategies including sharing of space, equipment, and support personnel with a busy adult cardiology program; use of single plane equipment; the development of sedation protocols to reduce the need for anesthesiologists; strategies to reduce procedure time; reuse of hardware through ethylene oxide sterilization; improvisations to use adult hardware items for CHD interventions; judicious case selection; and improvised alternatives to occlusive

devices have been documented.⁴ Recently a group reported their 10-year experience with development of congenital catheterization services in Mongolia over a 10-year period using some of the aforementioned strategies.⁵ They reported over 350 catheterizations over a 10-year period including 224 transcatheter arterial duct occlusions. Irrespective of local infrastructure, such procedures cost money due to the need for devices. Every year in the developed world millions of dollars worth of catheterization equipment is not used and discarded. In our own laboratory, up to 10% of some inventory expires before use. With advanced inventory systems this may be reduced; however, the broad range of pathologies and patients treated in congenital cardiac laboratories requires a critical mass of equipment to ensure not only therapies can be provided, but that rare complications can be dealt with quickly and efficiently. There will always be unused equipment despite our best efforts, however, there are opportunities to channel this equipment to countries where it may be used.

Currently, a lack of a coordinated approach to development for catheterization services in developing countries for children with CHD and a disconnect between potentially useful

"Currently, a lack of a coordinated approach for development of catheterization services in developing countries for children with CHD and a disconnect between potentially useful equipment and those who may benefit from it remains."

equipment and those who may benefit from it remains. To this end, the Congenital Heart Intervention Mission Support (CHIMS) project was launched at PICS~AICS 2013. The organization aims to support a coordinated and sustainable benefit to interventional catheterization for congenital heart disease in developing countries through centralizing and consolidating pre-existing charitable mission work through three main approaches:¹



Figure 1. (A, B) Numerous boxes of catheter equipment kindly donated to our warehouse in Memphis through a free shipping service. (C) Septostomy catheters. (D, E, F) Stents, devices and delivery sheaths stacked and organized into separate areas to facilitate easy access for the warehouse staff required to fill wish lists for specific missions.

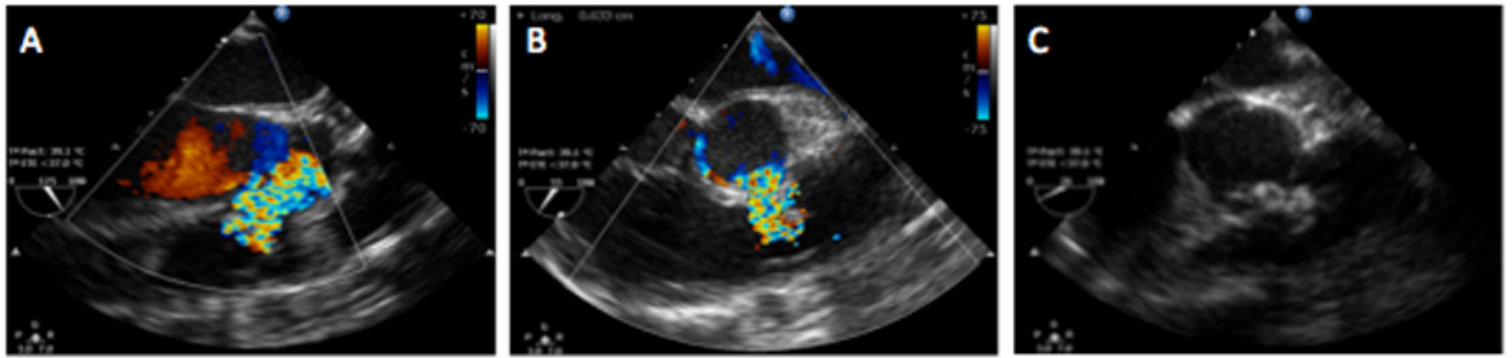


Figure 2. Series of TEE images demonstrating the color flow across the ruptured sinus of Valsalva aneurysm from the right coronary sinus into the right ventricular outflow tract in long axis (A), short axis (B). (C) Demonstrates the ADO II in a good position across the ruptured aneurysm following release.

1. Centralizing all unused and donated equipment relevant to cardiac catheterization from catheter laboratories in North America and other developed countries to a central repository with provision of an online inventory facilitating those involved in mission work to pre-order required equipment to support the intended procedures for their mission.
2. Developing a registry of missions involved in congenital catheterization in the developing world and also a registry of interventionalists, nurses and technologists who would like to support this work.
3. Developing channels for bipartisan educational support with the ultimate aim of ensuring a sustainable self-sufficient catheterization program in emerging countries interested in developing local programs.

The project has organizational support through the PICS Foundation, as well as from the International Children's Heart Foundation (ICHF), the PICES group, CCISC and *Congenital Cardiology Today*.

Since CHIMS inception, over 20 centers have shipped equipment to a centralized repository in Memphis through a cost-free shipping service supported by the ICHF. Beginning in June 2013, a CHIMS volunteer traveled to the warehouse to begin the process of uncrating, sorting, categorizing and shelving the 60-plus boxes of donated equipment (Figure 1). We have been working with local staff at the warehouse facility to ensure there is an understanding of the categories of equipment for inventory purposes. "An inventory system has been purchased which will facilitate instant access to continually updated available equipment. Financing from this has been supported through the annual CHIMS run at PICS, kindly supported by Siemens

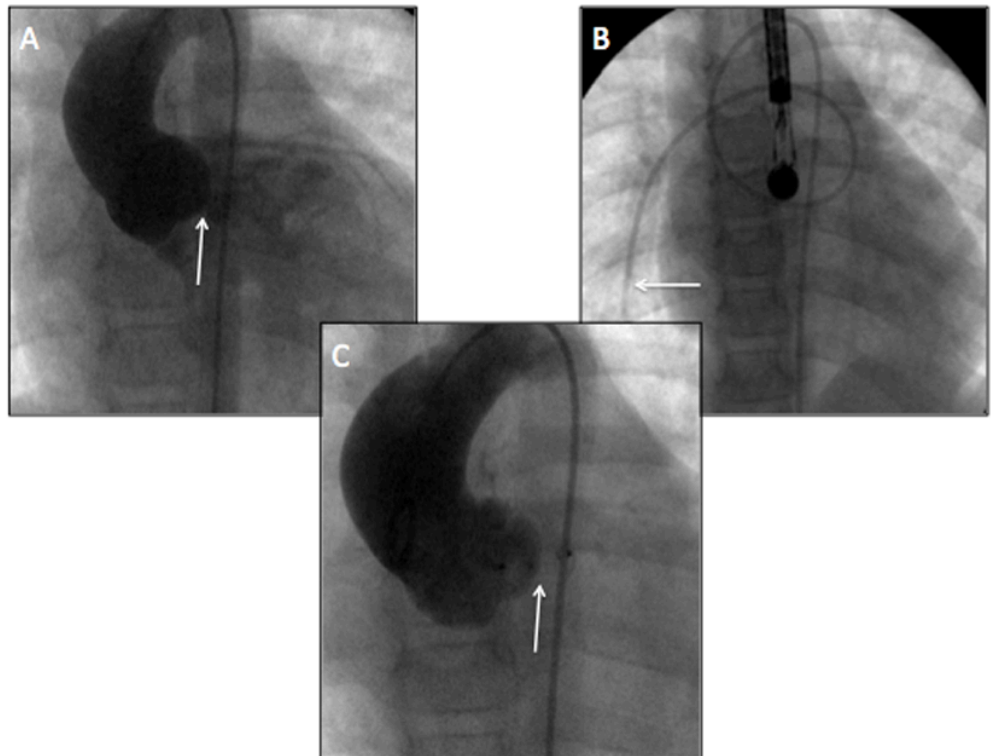


Figure 3. (A) Initial ascending aortogram demonstrates the sinus of Valsalva aneurysm (white arrow) with rupture into the right ventricular outflow. There is also mild AR. (B) Outlines the guiding sheath across the defect from the aorta and positioned distal in the right pulmonary artery. (C) Final ascending aortogram demonstrates the ADO II in a good position (white arrow) with no residual flow across the ruptured aneurysm.

and the PICS Foundation. Eventually the aspiration is that mission organizations will be able to access these data directly through the website and order equipment for their mission trip that will be shipped directly."

To date we have supported eight mission trips and over 50 catheterization procedures. A more robust support system will allow development of a registry on these procedures and equipment used. On a recent trip to the Dominican Republic, eight children underwent catheterization including ASD closure (n=2), pulmonary valvuloplasty (n=2) and one symptomatic 6-year old who had closure of a ruptured sinus of Valsalva aneurysm with an ADO II (Figures 2 and 3). Although an appropriate device was not part

of the donated equipment available for the trip, it was possible to "swap" a device that had been donated for a locally-available device, thus highlighting the benefits of local partnerships at overcoming some of the inventory issues that may exist with sporadically-available donated devices of a particular size.

There exists in most of us by the very nature of our career choice a deep commitment to help those in need. In most circumstances this has involved extensive training and dedication to develop a skill set to provide therapeutic care to children and adults with congenital heart disease. Despite this, many of us may feel a further urge to assist those less fortunate children and adults who have

limited access to the care we take for granted. For some this will involve travel to these areas to disseminate knowledge and skills, however, for others this may not be possible due to commitments at home. This endeavor provides an opportunity to help and contribute by simply sending the equipment that your laboratory is no longer using to a central repository so that it can be acquired and used by those who can for those who need.

Finally, when getting started with this project, the decision was to accept all donations and we will continue to do so. That said, we are particularly interested in non-coronary balloon expandable stents, occlusion devices of all sizes and makes, and balloons and delivery sheaths. Please log on to the CHIMS webpage www.chimsupport.com if you have unused equipment which you are willing to donate or if you would like to request product for a mission trip. Volunteers are also welcome to help with the inventory management at the warehouse.

“Please log on to the CHIMS webpage www.chimsupport.com if you have unused equipment which you are willing to donate or if you would like to request product for a mission trip.”

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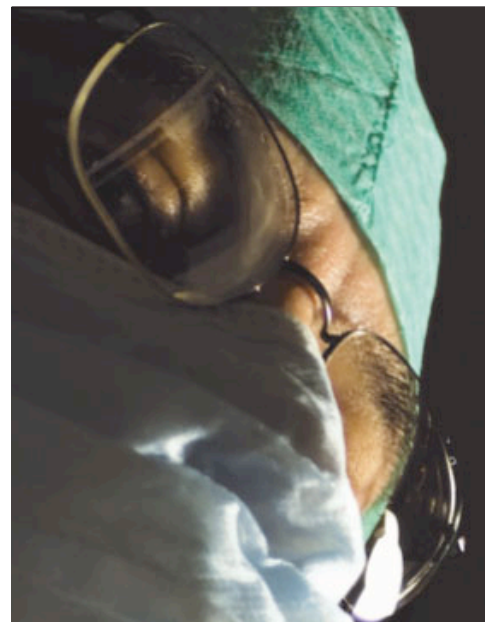


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HOW WE OPERATE

The team involved at C.H.I.M.S. is largely a volunteering group of physicians nurses and technicians who are involved in caring for children with congenital heart disease.

The concept is straightforward. We are asking all interested catheter laboratories to register and donate surplus inventory which we will ship to help support CHD mission trips to developing countries.

25th International Symposium on Adult Congenital Heart Disease - Toronto, Canada, June 3rd-6th, 2015

By Erwin Oechslin, MD; Adrienne H. Kovacs, PhD; Angela Lee, NP;
Susan Lucy Roche, MB, ChB

We warmly welcome you to attend the *25th International Symposium on Adult Congenital Heart Disease*, to be held in Toronto, Canada from June 3rd-6th, 2015. This symposium reflects a long partnership between the faculties of Oregon Health & Science University, Cincinnati Children's Hospital Medical Centre/University of Cincinnati and the University of Toronto. It is a unique forum where medical professionals have the exciting opportunity to meet their colleagues from around the world and exchange ideas and information in the rapidly growing field of Adult Congenital Heart Disease (ACHD). For a quarter of a century, international faculty and attendees have gathered annually to educate, learn and receive updates about the latest innovations in the diagnosis and management of ACHD patients. At this year's symposium, Dr. Erwin Oechslin, Director of the Toronto ACHD program, looks forward to celebrating the 'silver anniversary' with all conference participants!

New Features at this Year's Symposium

This year's Symposium presents the following new features:

- A one-day symposium entitled 'Heart Failure, Transplant & VAD in Adult Congenital Heart Disease.' This event will cover all aspects of the failing heart in the ACHD population, a patient group, which is rapidly growing in complexity and size.
- Investigators will present oral abstracts related to the plenary topics and incorporated within the plenary sessions.
- The International Society of Adult Congenital Heart Disease (ISACHD) will name the ISACHD Young Investigator Award and the ISACHD Cardiac Care Associate Investigator Award; both winners will be invited to present their research.

Toronto's Inaugural ACHD Heart Failure/Transplant and Ventricular Assist Device (VAD) Symposium

The Failing Heart / Circulation in ACHD Patients will be a major theme of the *25th International Symposium 2015* in Toronto. Within the field of congenital cardiology, the most significant gains during the past 50 years have transformed outcomes in children with the most complex forms of congenital heart disease. However, it is increasingly apparent that while ACHD patients are often outwardly healthy as they approach mid-life, a sizable proportion of those with complex anatomy seem fated to develop progressive and life-threatening heart failure (HF). The ACHD community around the globe grapples with this problem and has identified the development of successful management strategies as a clear priority within this field. It is thus appropriate and timely to dedicate a full day to discussion of the burning questions and challenges related to this topic.

Dr. Lucy Roche (Toronto's Clinical Lead for ACHD-HF) and Dr. Adrienne Kovacs (Toronto's ACHD Clinical Psychologist) work closely together in Toronto's ACHD-HF clinic, which follows >80 patients. They have organised this one-day symposium, to be held on June 3rd, to facilitate in-depth exploration of the many challenges facing clinicians and patients as they navigate options and management. Local and international experts in this emerging sub-specialty will talk about their experiences and strategies for dealing with the most complex problems. Clinical cases will be discussed to highlight key approaches and there will be plenty of opportunity for exchange of ideas.

Dr. Luke Burchill (from Portland, OR), will set the stage for the *Inaugural Toronto ACHD Heart Failure Symposium* by reviewing: the demographics of ACHD-HF, the numbers of ACHD patients who are listed for and receive transplants, transplant outcomes in ACHD patients and recent publications on mechanical support in this population. The Toronto ACHD team will then present our local experience of establishing an ACHD-HF clinic. Multi-disciplinary presenters will present

cases to illustrate the innovative strategies we've developed for the management of our most complex patients and will openly share their reflections on outcome of these approaches.

We have initiated a strong collaboration with the ACHD-HF team at the Freeman Hospital (UK) to exchange experiences and to provide the best possible care and treatment for ACHD patients with failing circulations. Drs Asif Hasan and David Crossland (both from the Freeman Hospital) will share their personal reflections on 135 ACHD transplants, including 23 patients with a Fontan circulation. Drs. Jane Heggie and Marjan Jariani (both from Toronto) will then highlight 20 years of experiences in ACHD anaesthesia and focus on issues for ACHD transplant from the perspective of a cardiac anaesthetist.

Small group discussions will be organized during lunch to facilitate interaction between delegates and faculty. Each table will be assigned an ethical, debatable and/or controversial question regarding the topics covered in the *Toronto Heart Failure Symposium*. To widen discussion, a representative from each table will share their table's answers and ideas with the entire audience.

Do We Need ACHD-Specific Heart Transplant Listing Criteria?

Four excellent speakers will debate this important question. Two speakers representing each side will deliver pre-prepared, well-researched arguments. This will be followed by more spontaneous rebuttals, with the opportunity for a moderator in-depth discussion of the issues raised at the end of the debate.

Experts will provide us information about the latest innovations and experiences in Mechanical Support in ACHD, another 'black box' with limited experiences in the management of our heart failure patients.

Fireside Conversation: Living with Uncertainty, Partnering with Patients

This Fireside Conversation, moderated by Dr. Adrienne Kovacs, will take the form of an informal, guided conversation with 3-4 ACHD patients. Our patients and Adrienne will talk about the processes involved with living with heart failure at a time when physicians have no definite answers as to what is the best treatment option. They will discuss the degree to which patients feel they are able to participate in complex decision-making about their ongoing management, which usually includes discussion of conservative management/palliative care as well as aggressive and possibly experimental surgery. We will include patients across the decision-making spectrum in order to learn what it is like to live across various stages in this challenging decision-making process. This interactive session will conclude the *Inaugural Toronto ACHD Heart Failure Symposium* and will strengthen our mission to move forward with our patients as partners, despite the many challenges.

Topic-Based Teaching

Plenary sessions feature topic-based learning in which renowned experts present state-of-the art reviews on CHD, with a perspective for today's clinical practice. The list of topics is summarized in Table 1. As with every annual ACHD symposium, the aims are to identify topics of pressing concern to ACHD clinicians and researchers and to invite internationally-known speakers to present state-of-the-art information.

Breakout Sessions

Breakout sessions provide a unique opportunity for more intense interaction between a smaller audience and three to four experts in various fields of congenital cardiology; these allow for more in-depth discussions of unanswered questions. There will be four breakout

sessions, each of which will include three options: two case-based teaching presentations and one workshop. Case presentations will be repeated once during each day.

Case-Based Teaching

Case Presentations feature case-based learning, and are tailored to topics discussed in the topic-based teaching sessions (Plenary Sessions). Teams from Canada, Switzerland, United Kingdom, and the USA will discuss cases with a special focus on pregnancy, arrhythmias and interventions (Table 1).

Workshops

Workshops will be an interactive educational opportunity to discuss challenging questions associated with: (i) Fontan procedure, (ii) quality assurance, (iii) 'hoping for the best while preparing for the worst,' and (iv) patient care considerations for nurses and other cardiac care associates (Table 1).

Cardiac Care Associates (CCAs)

CCAs and Nurse Practitioners are fully integrated in the program and play major educational roles in the *Inaugural Toronto ACHD Heart Failure Symposium* and also in the remainder of the *Toronto ACHD Symposium*. They have a dedicated workshop entitled, "Patient Care Considerations for Nurses / Cardiac Care Associates" to maximize their role in ACHD patient care management. Marion McRae, Nurse Practitioner at Cedars-Sinai (Los Angeles) will examine the added value of the Nurse Practitioner role to the team of inter-professionals in the care of congenital patients. Christy Sillman, RN and Patient Care Coordinator at Stanford University Medical Centre will present on patient care considerations from a unique lens of both patient and care provider. Lastly, UHN Cardiac Rehabilitation Kinesiologist, Holly Wykes will discuss congenital patient perspectives and outcomes of patients who have participated in a structured exercise program.

During the Friday June 5th CCA dinner, Philip Moons, Professor in Nursing Science from the University of Leuven, Belgium, will be the guest speaker and will review current research on quality of life in adults with Congenital Heart Disease and the translation of findings to clinical practice (Title of the presentation: "Quality of Life in ACHD Patients: From Research to Practice").

Table 1.

Sessions at a Glance 25th International Symposium on Adult Congenital Heart Disease

Toronto's Inaugural ACHD Heart Failure / Transplant and Ventricular Assist Device Symposium:

- Heart failure / transplantation / VAD in ACHD: Where are we in 2015?
- ACHD Heart Failure: Local experience
- ACHD Transplant: personal reflections from keynote speakers
- Debate: Is it time for ACHD-specific heart transplant listing status criteria
- Mechanical support in ACHD
- Fireside conversation: living with uncertainty, partnering with patient

Topic-Based Teaching (Plenary Sessions):

- Coronary anomalies
- Hereditary aortopathies
- Pulmonary arterial hypertension
- Multi-centre ACHD research: challenges and successes
- Beyond the heart
- What are the top challenges in ACHD during the next 10 years?

Case-Based Teaching:

- Tetralogy of Fallot (Team Switzerland)
- Coronary anomalies (Team Canada)
- Fontan procedure (Team United Kingdom)
- Ebstein Anomaly (Team USA)

Workshops:

- The Fontan procedure
- Quality assurance
- Hoping for the best while prepared for the worst
- Patient care considerations for Nurses / Cardiac Care Associates: maximizing the NP, RN and CCA role in ACHD patient care management

Dr. William G Williams Lecture:

- Dr. Glen van Arsdell, Toronto

Debate:

- ALCAPA – How to best manage an adult diagnosis?

International Society of Adult Congenital Heart Disease (ISACHD) Investigator Awards:

- Cardiac Care Associate Investigator Award
- Young Investigator Award

Research Abstracts

One of the priorities of each *International ACHD Symposium* is to give researchers the opportunity to share their latest findings with their peers. The call for abstracts for the 2015 Toronto Symposium closed on March 30th. We are now reviewing abstracts which reflect all aspects of care for ACHD patients, including cardiac issues in the inpatient and outpatient areas, ACHD nursing, surgical, anesthesia and perfusion research, interventional procedures, and diagnostic testing.

Oral abstract presentations have been

introduced as a new feature of this Symposium. Two oral abstracts related to the plenary session topics will be presented and discussed within the plenary session after the invited speakers have given their presentations. Abstracts will be eligible for oral presentation if they relate to one of the four plenary session topics:

- Coronary anomalies.
- Hereditary aortopathies.
- Pulmonary arterial hypertension in CHD.
- The impact of CHD "beyond the heart."

The remaining successful abstracts will be presented as posters, which provide



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Table 2. Key Information

Event Website: www.TorontoACHDConference.ca

Early Bird Registration: April 15th, 2015

Accommodation - Toronto Marriott Downtown Eaton Centre Hotel
Special Rate for the Toronto Marriott must be book by May 13th, 2015

Meeting Dates: June 3rd-6th, 2015

Accreditation: An application has been submitted to the Canadian Cardiovascular Society (CCS) to accredit the Symposium as a group learning activity under Section 1 as defined by the Royal College of Physicians & Surgeons of Canada (RCPSC) for the Maintenance of Certification program.

Contact Information:

Carole Ryan, Administrative Coordinator, Email: carole.ryan@uhn.ca
Dr. Erwin Oechslin, Email: erwin.oechslin@uhn.ca

researchers a unique opportunity to share their scientific papers.

- Recognize the needs to improve patient care, education and research globally.

ISACHD Investigator Awards

The International Society of Adult Congenital Heart Disease (ISACHD) will award the best abstracts submitted by Physicians and by Cardiac Care Associates/Non-Physicians. The winners will receive the ISACHD Young Investigator Award and the ISACHD Cardiac Care Associate Investigator Awards.

Symposium Objectives

At the end of this program, we anticipate that participants will be able to:

- Describe the long-term complications and outcomes in adults with CHD.
- Formulate a rational approach to the diagnosis and treatment of ACHD patients with heart failure.
- Recognize CHD as a chronic disease from childhood into adulthood.
- Describe diagnostic and therapeutic options and strategies in patients with coronary anomalies and hereditary aortopathies.
- Understand the importance of a systematic, multidisciplinary team approach to provide excellent care for adults with CHD.
- Recognize the advantage of participating in a network of centres with expertise in CHD.
- Integrate the important role of advanced nurses/nurse practitioners/cardiac care associates to provide comprehensive care for adults with CHD.
- Integrate modern treatment strategies for arrhythmias into your practice.
- Assess the risks for pregnancy in women with CHD.

Location of the Symposium

The Symposium will be held in Toronto, Ontario, Canada at the Toronto Marriott Downtown Eaton Centre Hotel, which is one of the premier Toronto hotels and is conveniently located in the heart of downtown. Featuring luxurious accommodations within walking distance of the CN Tower, Rogers Centre, and world-famous shopping of Eaton Centre.

The hotel offers a special group rate (net of all taxes in Canadian Dollars): the single and double room rates are \$221.00 per night (if reserved by May 13, 2015)

You can make your hotel reservation on line at www.TorontoACHDConference.ca, and book your group rate. To secure your room, you can also call Toronto Marriott Downtown Eaton Centre Hotel at 1-800-905-0667, and ask to be transferred to the reservations department. Please indicate that you are a participant of the *Conference on Adult Congenital Heart Disease* to obtain your discounted rate.

Registration

Registration is now open at www.TorontoACHDConference.ca. Early Bird Registration ends on April 15th, 2015. If you are an ISACHD and/or CACH Network member in good standing, please take advantage of a discounted registration fee and save 10% of the registration fee.

We Look Forward to Welcoming You!

We expect the Symposium to provide the best of science and education in your area of practice. The program is designed for all healthcare professionals working with ACHD and will familiarize participants with the latest clinical information on the diagnosis and management for ACHD. Nurses and Cardiac Care Associates also have a major organizational and educational role within this program. This is an exciting opportunity to participate in one of the largest ACHD symposiums with a 25 year history and tradition, to meet a dynamic team of faculty members, and to visit Canada's largest, most diverse city.

Local Scientific/Organizing Committee

Barbara Baily (NP), Dr. Edward Hickey, Dr. Adrienne Kovacs, Angela Lee (NP), Dr. Krishnakumar Nair, Dr. Erwin Oechslin, Dr. Lucy Roche, and Dr. Candice Silversides.

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Resources for Professionals

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Medical News, Products & Information

Compiled and Reviewed by Tony Carlson, Senior Editor

Digisonics Exhibits Latest Functionality for Cardiovascular Information System Solutions at ACC 2015

Digisonics (Booth #2521) will exhibit its newest offerings in Cardiovascular Information System (CVIS) Solutions at this year's *American College of Cardiology Annual Scientific Session and Expo* in San Diego, Calif. The Digisonics system is standards-based and vendor-neutral, combining image review, structured reporting, an integrated clinical database and powerful PACS image archive into one complete solution for all cardiovascular modalities. Coupled with seamless integration to incumbent 3rd party systems, the Digisonics system creates a seamless digital workflow with improved efficiency, greater reporting accuracy and faster report turnaround times.

The latest functionality in imaging, structured reporting and 3rd party vendor integration for the CVIS includes:

- **High performance imaging release** for significantly improved processing speeds
- **SMART** (Structured Macros And Report Templates) for the convenience of creating an entire report template through an intuitive, structured workflow
- **Appropriate use criteria** scores and recommendations for echo studies
- **Image playback** using multiple monitors for the same or different studies
- Image slideshow mode for hands-free study review
- **Enhanced image tagging** features with ability to display study's image tags in the worklist
- Ability to burn a blinded CD from the worklist
- **Measuring on zoomed images** and reporting of quick caliper measurements

- **Autopopulation** of summary macros and comments with report data
- **User profiles** for pre-set worklist columns, colors and filters
- **Correlation forms and logs** for vascular accreditation
- **Congenital diagrams** – measurement annotation, full-page print format
- **Seamless integration with advanced quantification software** for 3D/4D echo ultrasound studies including GE EchoPAC and Philips QLAB
- **Voice recognition software integration for seamless workflow** (such as Powerscribe)
- **Powerful data mining capabilities and business analytics tools** - time interval reporting, Q/C and management reports
- **WebView 4.0** - zero footprint cardiovascular image and report review from HTML5 capable browsers or operating system (PC, Mac, iPad, tablets, etc.)
- **DigiConnect** - seamlessly launch 3rd party systems such as EMR/HIS or ECG management software directly from the Digisonics cardiovascular information system workstation with a single sign-on

Digisonics provides top-rated clinical image management and structured reporting systems for cardiovascular (CVIS), radiology, and obstetrics & gynecology. Digisonics structured reporting solutions combine high performance image review workstations, a powerful PACS image archive, an integrated clinical database, comprehensive analysis capabilities and highly configurable reporting for multiple modalities. Key applications are complemented with interfaces to information systems and 3rd party vendors, providing facilities with a seamless, efficient clinical workflow.

For further information, please go to: www.digisonics.com.



Director of Adult Congenital Heart Disease - Chicago and Suburbs

Advocate Children's Hospital (ACH) and Advocate Medical Group (AMG) seek an experienced BC/BE Director to lead our ACHD program. This new leader will organize and direct the ADCH Program throughout the Advocate system. Our goal is to develop a top tier nationally recognized high quality full service ACHD program.

ACH's Heart Institute has been a major center for pediatric cardiology and CV surgery for more than 25 years and collaborates with 100s of adult cardiologists from the AMG employed and APP partners.

Focus for new position includes; clinical management of highly complex adult congenital heart disease population, organization, coordination and growth of the Program, development of interdisciplinary team to meet dynamic, multisystem needs. Interest in clinical research is encouraged with teaching activities for pediatric, adult cardiology fellows, house staff and medical students. Options for academic affiliation.

We require: 5+ yrs. experience, an unrestricted MD degree, eligibility for Illinois licensure, BC in either pediatric or adult cardiology, BC/BE

in adult congenital heart disease, fellowship training or extensive experience in ACHD and proven clinical competencies, leadership and organizational skills.

AMG is a multi-specialty group with 1,300+ physicians, affiliated with AHC, the largest provider of healthcare in Illinois. ACH serves as a major referral center, is the largest network provider of pediatric services in Illinois, among top 10 in the nation, and has been recognized by *U.S. News & World Report* as a national leader in Pediatric Cardiology, Cardiovascular Surgery and Neonatology.

Please forward detailed cover letter and CV to:

Nancy Mathieu, Physician Recruiter, Nancy.mathieu@advocatehealth.com.

www.advocatehealth.com | www.advocatechildrenshospital.com/ach/ | www.amgdoctors.com/about-us.com

For Cardiac Arrest, Epinephrine May Do More Harm than Good

For patients in cardiac arrest, administering epinephrine helps to restart the heart but may increase the overall likelihood of death or debilitating brain damage, according to a study published December 1st, 2014 in the *Journal of the American College of Cardiology*.

The study offers new data in an ongoing debate over the risks and benefits of using epinephrine to treat cardiac arrest, an often-fatal condition in which the heart stops beating. Epinephrine, also known as adrenaline, is a hormone that stimulates the heart and promotes the flow of blood. Current international guidelines recommend administering 1 milligram of epinephrine every 3-5 minutes during resuscitation.

"The role of epinephrine is more and more questionable in cardiac arrest," said the study's lead author Florence Dumas, MD, PhD, of the Parisian Cardiovascular Research Center in France. "We need to constantly assess our procedures and protocols to make sure that the use of epinephrine is effective and done at the correct time."

She added that this study underscores the need for caution when using epinephrine. Administering epinephrine to patients in cardiac arrest has been shown to improve the chance of restarting the heart, known as return of spontaneous circulation or ROSC. But the new study adds to mounting evidence suggesting the drug harms patients' chances of surviving past the post-resuscitation period with brain function intact.

Dumas and colleagues analyzed hospital records for more than 1,500 people admitted to a large Parisian hospital over a 12-year period. Patients included in the analysis had suffered out-of-hospital cardiac arrest, been resuscitated and achieved ROSC. Nearly three-quarters of the patients had received at least one dose of epinephrine.

The primary outcome measured was discharge from the hospital with normal or only moderately compromised brain functioning. Sixty-three percent of patients who did not receive epinephrine achieved this outcome, compared to only 19% of those who received epinephrine.

Patients receiving higher doses of epinephrine fared worse than those with lower doses. As compared to patients who received no epinephrine, those receiving 1-milligram doses were 52% more likely to have a bad outcome and those receiving 5-milligram or larger doses were 77% more likely to have a bad outcome.

Timing also appears to be an important factor. Patients receiving epinephrine in the later stages of resuscitation were more likely to die than those who got their first epinephrine dose shortly after collapsing. The adverse effects of epinephrine appeared to be unaffected by the use of post-resuscitation medical treatments, such as techniques to cool the body to reduce tissue damage or interventions to restore the flow of blood through blocked arteries.

The patients who had not received epinephrine typically had other characteristics that improved their outlook. For example, patients in this group were generally younger and more likely to have been near a witness when they collapsed. However, the research team employed a variety of robust statistical methods to account for these differences.

Dumas said the results do not necessarily indicate an immediate need to change the guidelines, however. "It's very difficult, because epinephrine at a low dose seems to have a good impact in the first few minutes, but appears more harmful if used later," said Dumas. "It would be dangerous to completely incriminate this drug, because it may well be helpful for certain patients under certain circumstances. This is one more study that points strongly to the need to study epinephrine further in animals and in randomized trials."

In addition to further research on epinephrine, Dumas said the study reinforces the need to continue investigating other drugs and drug combinations that might offer safer alternatives to epinephrine during cardiac arrest.



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Each year, more than 420,000 cardiac arrests occur in the United States. Its immediate cause is typically an abnormality in the heart's rhythm, which can result from numerous risk factors including: Coronary Artery Disease, heart attack, an enlarged heart or other heart conditions. Cardiopulmonary resuscitation and defibrillation are the primary treatments.

For more information, visit cardiosource.org/ACC.

CHP NETWORK

CONGENITAL HEART PROFESSIONALS

WHAT IS THE CHiP NETWORK? - The CHiP Network, the Congenital Heart Professionals Network, is designed to provide a single global list of all CHD-interested professionals in order to:

- Connect pediatric and adult CHD-interested professionals to events, conferences, research opportunities and employment
- Keep members up with the literature through the monthly *Journal Watch* service
- Increase education and provider awareness of new developments
- Bring the pediatric and adult congenital heart communities into closer contact
- Offer a communication tool for critical issues

WHO SHOULD PARTICIPATE? - The CHiP Network is all inclusive and is comprised of everyone who considers themselves a congenital heart professional or administrator, including:

- Pediatric cardiologists
- ACHD cardiologists
- RNs and APNs
- Cardiac surgeons
- Cardiac care associates
- Trainees/fellows
- Administrators
- Psychologists and mental health professionals
- Researchers/scientists
- Intensivists
- Anesthetists
- Industry representatives

OUR SUPPORTING PARTNERS:

- Adult Congenital Heart Association
- Asia Pacific Society for ACHD
- Children's Hospital of Philadelphia Cardiology meeting
- Cincinnati Children's Hospital
- Congenital Cardiology Today (official publication of the CHiP Network)
- Congenital Heart Surgeons Society
- International Society for Adult Congenital Heart Disease
- Japanese Society of ACHD
- Johns Hopkins All Children's Heart Institute
- North American ACHD program
- Paediatric Cardiac Society of South Africa
- Pan Arab Congenital Heart Disease Association
- PCICS
- PICS
- Specialty Review in Pediatric Cardiology
- World Congress of Pediatric Cardiology and Cardiac Surgery

JOIN US - Membership is Free!

The CHiP Network management committee invites the participation of other organizations who want to communicate with all or some of the congenital heart professionals on this list. Please contact Dr. Gary Webb (gary.webb@cchmc.org) to ask that your organization's or institution's name be added to the list of partner organizations.

HOW TO REGISTER

Register at www.chipnetwork.org. It takes only a minute and you can unsubscribe at any time.



Funded by Cincinnati Children's Heart Institute

Speedy Heart Transplant for Kids Better than Waiting for Perfect Match

Children who receive a heart transplant as soon as a suitable donor is available are predicted to have better quality-adjusted survival -- even if they have antibodies that may attack the new heart -- than children who wait for a donor to which they do not have antibodies according to research presented at the *American Heart Association's Scientific Sessions 2014*.

When the costs of care while waiting for an urgent transplant are considered, transplantation with the first suitable heart is also cheaper than waiting for a better-matched organ, researchers said.

In the same way that a vaccine activates the body's immune response to fight off a virus, a donated organ can trigger antibodies to fight off foreign tissue. Because of the risk of severe rejection after transplantation, experts traditionally believed that children with these antibodies should wait for a heart that won't activate an antibody response.

But patients with the antibodies in their blood are at high risk of dying while waiting for a perfect match, said Brian Feingold, MD, MS, study lead author and Medical Director of Pediatric Heart and Heart-Lung Transplantation at Children's Hospital of Pittsburgh of UPMC and Associate Professor of the University of Pittsburgh School of Medicine in Pennsylvania.

He noted that as many as 20% of children waiting for a heart transplant may have antibodies.

Researchers examined data of more than 2,700 children listed for transplant since 1999. Patients' average age was 5 years and 45 percent were female. More than half were Caucasian, 23% were African American and 15% were Hispanic. About half of the children were born with heart disease and all urgently needed a heart transplant.

Researchers compared 10-year survival after being listed for transplant using two opposing strategies: waiting for a donor heart to which the candidate does not have antibodies or taking the first suitable offer, regardless of potential problems that antibodies may pose. The study found that accepting the first suitable offer, regardless of antibody concerns, is predicted to:

- increase survival from the time of listing by more than 1 year (adjusted for quality of life) as compared to waiting for transplantation based on antibody status,
- cost an average \$122,856 less than waiting for transplantation based on antibody status.

"Our analysis shows that denial of listing for transplant, solely on the basis of having too many antibodies, is unwarranted," Feingold said. "One of the next questions is whether low levels of antibodies identified using modern antibody detection techniques are clinically meaningful. Are they a harbinger of problems to come, or just a 'false positive' that potentially alters our care of patients with important effects on survival and costs of care?"

For their study, researchers obtained 1999-2009 patient data from the Organ Procurement and Transplantation Network. Cost data came from the Children's Hospital of Pittsburgh of UPMC and the public Healthcare Cost Utilization Project Kids' Inpatient Database.

Researchers were able to control for antibody status, wait-list time and wait-list survival, post-transplant survival in the presence or absence of a positive crossmatch, and costs. They didn't specifically examine rejection rates, nor did they examine treatments other than heart transplant or outcome among patients without antibodies.

As of June 2013, nearly 3,500 patients were waiting for a heart transplant, according to American Heart Association statistics.

Co-authors are: Steven A. Webber, MBChB, MRCP; Cindy L. Bryce, PhD; Heather E. Tomko, MS; Seo Y. Park, PhD; William T. Mahle, MD; and Kenneth J. Smith, MD. Author disclosures are in the manuscript.

The National Center for Advancing Translational Sciences and the National Institutes of Health funded the study.

I-PASS Reduces Medical Error Injuries During Patient Handoff by 30%

Citations: *New England Journal of Medicine*, Nov. 6, 2014

Newswise - Improvements in verbal and written communication between health care providers during patient hand-offs can reduce injuries due to medical errors.

Reported in the Nov. 6th, 2014, *New England Journal of Medicine*, researchers at Walter Reed National Military Medical Center (WRNMMC) and the Uniformed Services University of Health Sciences (USU) recognized this critical safety concern and teamed up with nine civilian hospitals to develop I-PASS (www.ipasshandoffstudy.com/about), an original system of bundled communication and team-training tools for hand-off of patient care between providers. The study revealed a remarkable 30% reduction in injuries due to medical errors after its implementation across all 9 institutions.

According to the Joint Commission (a non-profit organization that accredits and certifies more than 20,500 health care organizations and programs in the United States and whose accreditation and certification is recognized nationwide as a symbol of quality that reflects an organization's commitment to meeting certain performance standards), ineffective hand-off communication is recognized as a critical patient safety problem in health care; in fact, an estimated 80% of serious medical errors involve miscommunication between caregivers during the transfer of patients. The hand-off process involves "givers," those caregivers transmitting patient information and transitioning the care of a patient to the next clinician, and "receivers," those caregivers who accept the patient information and care of that patient. In addition to causing patient harm, defective hand-offs can lead to delays in treatment, inappropriate treatment, and increased length of stay in the hospital.

As the first military hospital to adopt the I-PASS hand-off bundle, which includes training in team communication skills, a verbal hand-off process organized around the verbal mnemonic "I-PASS" (Illness Severity, Patient Summary, Action List, Situational Awareness and Contingency Planning, and Synthesis by Receiver), a written or computerized hand-off tool that reflects the verbal mnemonic, a faculty development and observation program, and an institutional dissemination campaign, Walter Reed Bethesda has now implemented I-PASS for use across multiple disciplines to create an institutional transition of care policy.

According to one of the lead investigators COL Clifton E. Yu, Chief, Graduate Medical Education at Walter Reed Bethesda, "Not only is Walter Reed National Military Medical Center the only military hospital to be involved in the study, but we are also the only study site that was not a major children's hospital. Taking advantage of that fact, we decided to work towards adapting the curriculum for dissemination across multiple clinical areas, to include: adult medicine, surgery, and nursing environments. As our successful institutional

roll out is evolving, we are setting the national standard and precedent for the use of I-PASS in all clinical and nursing domains where transitions of patient care typically occur."

"Training in team communication skills is a critical element of the I-PASS Hand-off Bundle and, given the DoD Patient Safety Program's longstanding interest and expertise in this area through their initial development of the TeamSTEPPS program (Team Strategies and Tools to Enhance Performance and Patient Safety, now jointly sponsored by the Agency for Healthcare Research and Quality), it seemed a natural fit to have WRNMMC and USU investigators take the lead on developing this aspect of the I-PASS curriculum. After completing training as a TeamSTEPPS Master Trainer, I was able to leverage my new knowledge and skills in order to adopt key elements of TeamSTEPPS into the team communication skills training for I-PASS. As it happens, our inclusion of TeamSTEPPS components into I-PASS dovetails perfectly with WRNMMC's current roll out of full TeamSTEPPS training hospital wide," said Army Maj. (Dr.) Jennifer Hepps, Assistant Professor of Pediatrics at USU.

"We were able to use the expertise of USU's Val G. Hemming Simulation Center to create role plays and videos simulating handover scenarios. These simulations helped to teach faculty and residents the best practices in transitions of care between patient teams," said Joseph Lopreiato, MD, MPH, Professor of Pediatrics and Associate Dean of Simulation at USU. "Thanks to the support from the USU administration, our Simulation Center was able to contribute to this groundbreaking research that will go a long way toward reducing medical errors in the transitions of patient care."

"Patients are at the center of everything we do," said Brig. Gen. Jeffrey B. Clark, Director of the Walter Reed National Military Medical Center. "By quickly adopting the I-PASS transitions of care principles for all healthcare teams, we simultaneously bring state-of-the-art healthcare to our patients and teach the next generation of healthcare team members what right looks like."

"A great medical team is like a great relay team: individual effort matters, but victory comes from smooth hand-offs," said Arthur Kellermann, MD, Dean of USU's F. Edward Hébert School of Medicine.

Drs. Yu, Hepps, and Lopreiato are also co-investigators in two follow-on multi-center studies involving I-PASS at WRNMMC that include:

- Family Centered I-PASS Project funded by Patient Centered Outcomes Research Institute (PCORI), (www.pcori.org) evaluating effectiveness of involving all team members, including nursing and families, in communication of medical information

- Mentored I-PASS Implementation Project funded by Society for Hospital Medicine (SHM), examining how to implement I-PASS at other large academic medical institutions

Boston Children's Hospital (www.childrenshospital.org) served as the lead site for the study, while Brigham and Women's Hospital served as the data-coordinating center. Additional facilities that reported on the results of implementing I-PASS through their pediatric residency programs include:

- Benioff Children's Hospital, University of California San Francisco (www.ucsfbenioffchildrens.org)
- Cincinnati Children's Hospital Medical Center, University of Cincinnati (www.cincinnatichildrens.org)
- Doernbecher Children's Hospital, Oregon Health Sciences University (www.ohsu.edu)
- Hospital for Sick Children, University of Toronto (www.sickkids.ca)
- Lucile Packard Children's Hospital, Stanford University (www.stanfordchildrens.org)
- Primary Children's Hospital, University of Utah (intermountainhealthcare.org)
- St. Louis Children's Hospital, Washington University St. Louis (www.stlouischildrens.org)
- St. Christopher's Hospital for Children, Drexel University (www.stchristophershospital.com).

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