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BCCA Belfast 2012 (British Congenital Cardiac Association)
Nov. 15-16, 2012; Belfast, Ireland UK
www.bcca2012.co.uk

Pedirhythm 5
Nov. 28-Dec. 21, 2012; Belfast, Ireland UK
www.pedirhythm5.org

**British Society for Heart Failure
15th Annual Autumn Meeting**
Nov. 29-30, 2012; London, UK
www.bsh.org.uk

**Innovations in Cardiovascular
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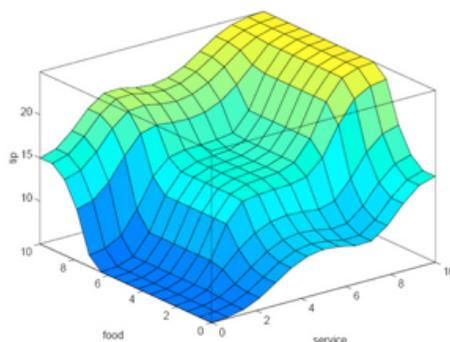
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Artificial Intelligence in Pediatric Cardiology: An Innovative Transformation in Patient Care, Clinical Research, and Medical Education

By Anthony P. Chang, MD, MBA, MPH; Mark
Musen, MD, PhD



*A new type of thinking is essential if mankind is
to survive and move to higher levels.*

~ Albert Einstein

Introduction

In February of 2011, the IBM supercomputer Watson (with its four terabytes of disk storage and a portfolio of sophisticated computer analysis techniques capable of reading and understanding 200 million pages in three seconds) defeated the human champions Ken Jennings and Brad Rutter at Jeopardy!, thus heralding a new era of artificial intelligence (AI) in our society. The current myriad of AI

utilizations includes: military operations, space missions, finance industry, navigation systems, and consumer services (such as Internet searches and product recommendations). Despite the explosion of AI in our daily lives and our medical world slowly devolving into a state of uncertainty, there remains limited data or experience on the use of AI in medicine, especially pediatric cardiology.¹

This manuscript will briefly review the history of AI, the types of classical and modern AI methodologies, and potential utilizations of AI in pediatric cardiology and how it will transform our field in the future.

Brief History of Artificial Intelligence

Early historical roots of AI would necessarily include Talos, the bronze automaton forged by Hephaestus (800 BC) in *The Iliad*, and the system of logic with syllogisms for proper reasoning formulated by Aristotle (384-322 BC). The British mathematician Alan Turing, in deciphering German messages with the dramatic breaking of the code of the German Enigma machine, was the progenitor of mathematical theory for computation. He then published the seminal article "Computing Machinery and Intelligence," and delineated the so-called Turing Test: a test to determine whether a computer can achieve human capability for cognitive tests.

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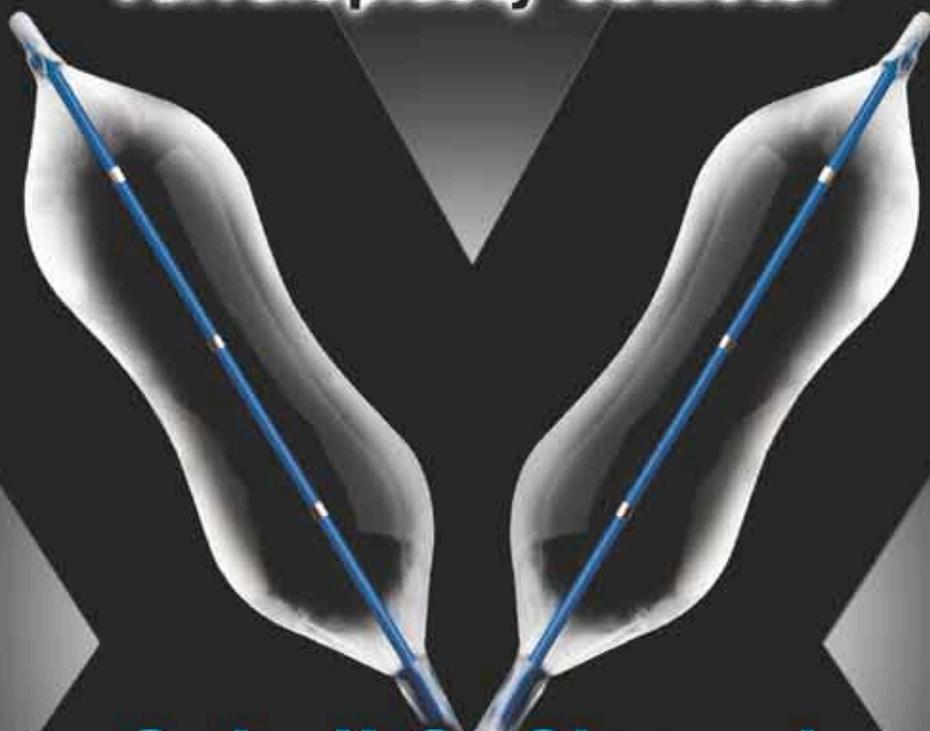
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The inception of AI as a branch of computer science for scholarly pursuit can be traced to an academic conference at Dartmouth College in 1956, organized by John McCarthy (who also coined the term “artificial intelligence”). AI suffered through a few “AI winters” when failed expectations lead to diminished interest and lowered productivity (first 1974-1980 and then again from 1987-1993). Prior to Watson’s triumph on Jeopardy!, the IBM computer Deep Blue defeated the Russian world chess champion Boris Kasparov in 1997, reviving interest in AI on a broad public level.

There were a few early successes in the use of AI in medicine that included:

1. The rules-based medical diagnosis system called MYCIN that outperformed infectious disease experts (developed by Ted Shortliffe at Stanford University)² and
2. The INTERNIST-I system that mimicked the thinking process of a senior internist (designed by Jack Myers and his internal medicine group and Harry Pople from the Business School at University of Pittsburgh).³

These systems, however, were not adopted for use as there were important limitations such as lack of expediency in its use and incessant disruptions in physician workflow.

Classical Artificial Intelligence Methodologies

The early classical AI techniques have more of a top-down approach, a strategy to simulate the higher functions of the human brain.

Expert Systems. Among the first AI methodologies used in medicine, expert systems are computer systems that attempt to emulate the knowledge and expertise as well as the decision-making capability of an expert (or a group of experts). These expert systems, often used in business and finance, consist of three components: the knowledge base provided by the experts, the inference engine (based on reasoning and logic), and a third component, the user interface (see Figure 1). These systems can suffer from difficult expert knowledge engineering, as the rules by the experts are not always consistent or understandable.

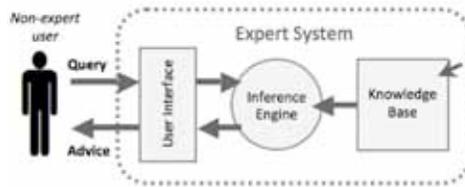


Figure 1. (From www.igcseict.info/index.html)

Fuzzy Logic. This is an AI technique that allows a continuous range in data collection/analysis rather than a binary system observed with conventional Boolean logic (“warm” rather than either “hot” or “cold”). This is therefore a methodology that allows ambiguity in data collection and manipulation and is a form of many-valued logic rather than a rigid (binary yes or no) system. Fuzzy logic is often used in industrial applications that need varying degrees of measurement units (such as “intelligent” sensors, camera auto-focus, and climate control). This flexible methodology is particularly well suited for medical decisions with its nuances in physiology that have an element of imprecision (such as changes in blood pressure and, correspondingly, appropriate vasopressor or vasodilator escalation).

Knowledge Representation. The methodology involves design and development of algorithms that create classification schemes by scrutinizing the data (with dependent and independent variables) for certain patterns and creating rules that will be followed and evaluated. In this AI technique, knowledge is abstracted or modified to result in a base of knowledge that can be later used for an

application. There is a requisite for the computer to be able to reason with the abstracted knowledge base using first-order logic. The aforementioned MYCIN system was an early example of knowledge representation.

Data Mining. Also known as knowledge discovery, data mining is analysis of data to uncover previously unrecognized relationships or patterns. These new discoveries can include: new findings in groups of data (cluster analysis), data dependencies (association rule mining), or unusual data (anomaly detection). Whereas expert systems impose rules on data, data mining derives rules from data. In addition, data mining, which prospectively scrutinizes data to discover new findings, is often confused with data warehousing, which retrospectively interrogates patient data that is stored in a central repository in order to answer queries. Data mining involves several AI methodologies such as neural network, fuzzy logic, genetic algorithm, Bayesian network and case-based reasoning.

Machine Learning. This popular albeit challenging AI methodology involves design and development of algorithms that scrutinize the data for certain patterns and creating rules that will be followed and evaluated (thus “learning from examples”). Machine learning is sometimes confused with data mining: while machine learning focuses on a prediction based on known properties from data, data mining emphasizes instead discovery of unknown properties of data. One significant disadvantage of machine learning is that the data available for scrutiny may not cover all the possibilities.

Modern Artificial Intelligence Methodologies

The modern AI techniques have more of a bottom-up approach, which advocates modeling lower-level behavior such as that of neurons.

Artificial Neural Network (ANN). This is an AI methodology designed to simulate the human brain and its biological learning with

1. an interconnected network of input/output nodes (akin to neurons);
2. middle layers to perform parallel computations; and

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- an output layer (see Figure 2). During the "learning" phase, various positive and negative weights on these nodal interconnections are made depending on the relationships.

These networks, which can require much tedious input and can be simple to complex, can also be supervised (where outputs are known) or unsupervised (where outputs are not known but interesting relationships may be discovered). This brain-inspired computational

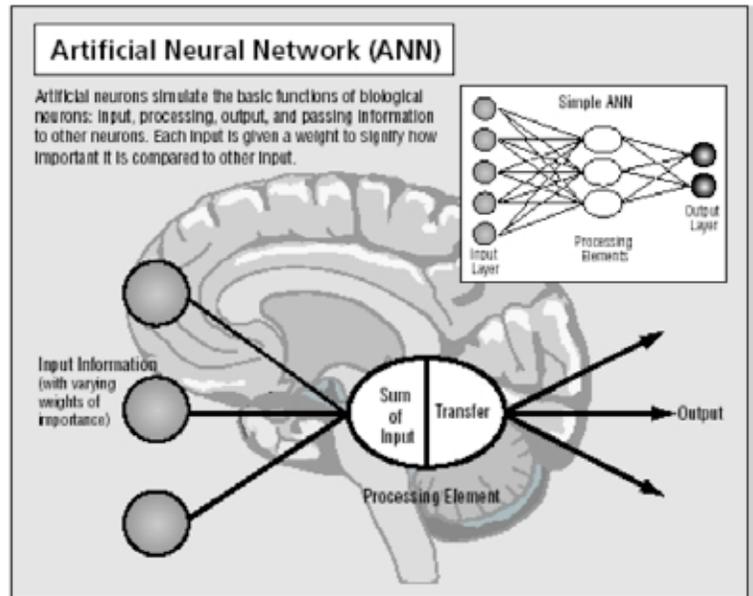


Figure 2. (From Rosenblatt F. *Principles of Neurodynamics*. Spartan, New York, 1962).

analytical tool has become one of the most widely used in medicine especially in the area of outcome prediction.⁴

Evolutionary Computation. This AI methodology of computational techniques consists of heuristically-based, stochastic search and optimization algorithms that mimic the natural Darwinian selection phenomenon of the biological world. One specific type of this technique is called genetic algorithm, which uses Darwinian natural selection principles to select the most optimal solution amongst all the possible solutions. One potential shortcoming of this AI technique is that not all the solutions may be available for this survival of the fittest competition.

Intelligent Agents. Intelligent (or also known as software) agents are software applications that have characteristics of intelligent behavior such as learning or classification. These AI applications, therefore, attempt to achieve a goal without input from the user (autonomously managing assigned tasks).

Case-Based Reasoning. In this AI methodology that is similar to how experts solve cases, a solution is derived by analogy from prior cases that constitute a case base. One potential weakness of this methodology is its reliance on anecdotal cases which may be limited.

Bayesian Network (or Belief Network). Using Bayes Rule (from 18th century mathematician Thomas Bayes), a logic tree of nodes is arranged to describe the relationship of variables to an outcome. This is a sophisticated probabilistic inference model that interrelates random variables and their conditional dependencies with appropriate weighting for stronger relationships (see Figure 3). In medicine, the probabilities of certain processes can be calculated repeatedly using this methodology.

Data Visualization. This is depiction of data in a creative graphical way with a function-design balance in order to increase data comprehension and communication by the user. Current techniques used to achieve this include volume visualization, multi-resolution methods, and modeling techniques.

Natural Language Processing. This is the discipline which studies the interaction between human and computer in the form of linguistics. The level of sophistication in natural language processing increased significantly after the introduction of machine learning algorithms (see above). Challenges in this area include: speech recognition, word segmentation, and word sense disambiguation.



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Hybrid Artificial Intelligence Systems and Multi-Dimensional Architecture

As each of the AI techniques has its own strengths and weaknesses, a hybrid AI system and architecture can be designed to take advantage of the strengths of each of the techniques while the weaknesses can be collectively neutralized. The IBM supercomputer Watson, for example, entails a complex hybrid architecture with natural language processing, information retrieval, knowledge representation, and machine learning. A recent new AI technique called Artificial Life uses a number of AI techniques such as neural networks and genetic algorithms.⁵ In the future, the ultimate AI computers may very well use some or most of the aforementioned AI techniques in various proportions depending on the clinical problem. These AI programs will be able to provide the caretakers of any given field the supreme resource: able to learn like artificial neural network, compromise like fuzzy logic, and search/optimize like evolutionary computing while taking in new data and knowledge, make decisions based on prior experience, and reason like the human brain cortex (with its 100 billion neurons and 100 trillion synapses) in the form of hierarchal temporal memory systems.⁶ Just as man learned to fly by understanding aerodynamic principles rather than imitating birds in flight, we will learn to harness the power of computing and databases and synthesize a new kind of intelligence (rather than imitating the brain).

Potential Utilizations of Artificial Intelligence in Congenital Cardiology

There is an exponential explosion in pediatric and adult congenital patient data: demographic information, surgical and interventional history, drug and laboratory data, and followup echocardiographic and electrophysiologic information. The synergy between "Big Data" (as it approaches one yottabyte, or 10^{24} bytes of storage) and the exponential capability of computing power with its capability to extract and analyze data and information to provide knowledge and intelligence is setting an exciting stage for a new era of AI in pediatric cardiology.

Both AI and the human mind with its unique intuitive properties should combine for synergy in solving problems in pediatric cardiology. Caretakers in pediatric cardiology encounter an escalating volume of data and information as well as even more heterogeneous patients (from fetal to adult) with complex clinical scenarios. This clinical imbroglio demands a multi-dimensional AI architecture (analogous to sections in an orchestra), coming together in a harmonious "symphony" to be lead by a sapient clinical "conductor."

Patient Care. In the area of cardiac diagnostics, screening for cardiac disease often suffers from poor sensitivity and specificity. Use of various AI methodologies can improve our screening process. ANN technique has been utilized for identification of acute myocardial infarction,⁷ with a superior diagnostic sensitivity and specificity compared to physicians. ECGs to screen for hypertrophic cardiomyopathy can yield higher predictive values in the future with machine learning (by learning from known changes) as well as data mining (to discover possible new findings) with weighted fuzzy logic (to give gradations to left ventricular hypertrophy). Both echocardiography and advanced cardiac imaging methodologies can also benefit from use of AI in interpretation.⁸ Another area for AI in cardiology is drug delivery as fuzzy logic can be used to smooth out dosing of vasoconstrictor or vasodilator agents especially in the intensive care setting. In addition, oral drugs such as warfarin can

have more appropriate doses determined by use of sophisticated computer-generated pharmacokinetic profiles. Lastly, decision-making processes in prognosis for cardiac interventions (such as Norwood vs. Sano for Hypoplastic Left Heart Syndrome or whether or not to intervene for lesions such as anomalous origin of the right coronary) are difficult and can gain from ANN or Bayesian technique in AI, as both are well-

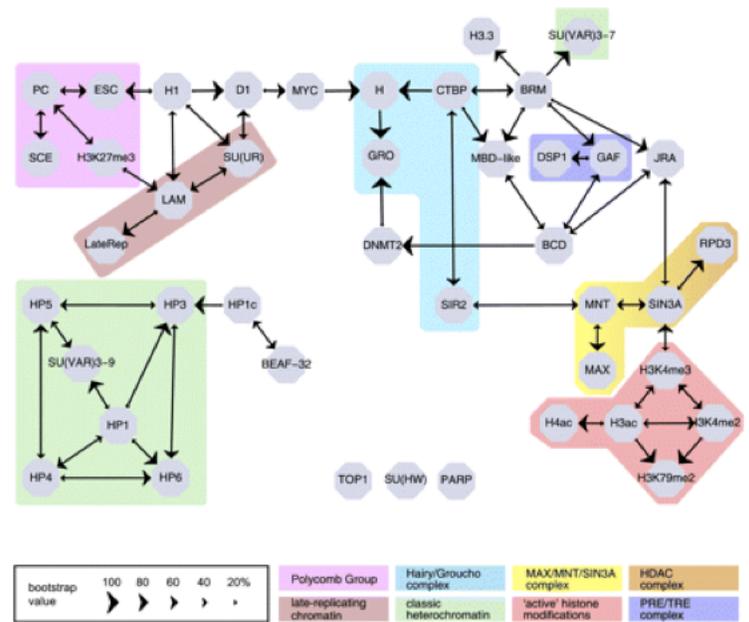


Figure 3. (From van Steensel B et al. Bayesian Network Analysis of Targeting Interactions in Chromatin. *Genome Research* 2010; 20:190-200.)

suited to exploit non-linear relations between several variables. Bayesian network has already been demonstrated as a powerful prognostic tool in decisions involving cardiac surgery.⁹ The decisions based on results can even be individualized to the practitioner in order to

“Einstein so aptly defined insanity as doing the same thing over and over again and expecting different results. Perhaps we should consider mitigating the present insanity of our approach to patient care, clinical research, and medical education, and answer the clarion call to transform pediatric cardiology with the wondrous emerging world of artificial intelligence.”



Archiving Working Group
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increase intelligence in decision-making process.

Clinical Research. Randomized control trials are tedious to perform and costly from a financial and human resource perspective, not to mention often yielding non-conclusive results. Several of the AI techniques can be utilized to gather knowledge and “intelligence” as it learns from previous clinical patient experiences in a cumulative fashion. In addition, patients with rare diseases (such as unilateral pulmonary vein atresia) can gain from a supercomputer’s cumulative knowledge base of any previous case to yield guidance for all practitioners worldwide and for decades to come (a “living” textbook or compendium).¹⁰

Medical Education. Our medical education and academic meetings have become somewhat prosaic with insufficient interaction and suboptimal learning. Use of AI techniques such as ANN and Bayesian network can enable the individual practitioner to gain maximally and efficiently from any educational curriculum or event. In addition, one can even argue that certain clinical protocols (such as endocarditis prophylaxis guidelines and follow-up protocols) can be queried with an expert system software rather than our use of rote memory which may be inaccurate. Rather than having board examinations or recertifications to pressure us to study and learn mundane facts to result in a transient increase in knowledge base, strategic use of AI can greatly enhance our continual knowledge base and medical education (even including use of portable devices such as our cell phones). For instance, any time we search for answers to questions, that search algorithm can be recorded to reinforce our knowledge later if we choose to. In other words, with the use of AI, new and relative weak areas of knowledge can be fortified with repeated questions with explanatory answers to maintain knowledge in these areas. Lastly, we can eventually have a dedicated and tireless “super-mentor” that is fluent in all languages, cognizant of all recent studies and databases, fortified by audiovisual learning aids, and capable of mentoring generations of pediatric cardiologists to come.

Conclusion

From Homer’s description of the mechanical “tripods” that waited on the gods at dinner to the IBM supercomputer Watson defeating the human champions at Jeopardy!, humankind has been fascinated by the panoply of mechanical beings with intelligence. Even with

the recent centenary commemoration of Alan Turing’s birth, however, there remains significant skepticism and nescience in AI and its use in medicine;¹¹ we are undoubtedly in the “innovators” phase of the AI innovation adoption lifecycle. In the future, AI in medicine will likely become a clinical subarea in and of itself, thereby giving nascence to the field of “medical intelligence” and its own training and even subspecialist, the “medical intelligence architect (MIA).”

Einstein so aptly defined insanity as doing the same thing over and over again and expecting different results. Perhaps we should consider mitigating the present insanity of our approach to patient care, clinical research, and medical education, and answer the clarion call to transform pediatric cardiology with the wondrous emerging world of artificial intelligence.

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The Beginnings of the Adult Congenital Heart Disease Learning Center

By Gary Webb, MD; Erwin Oechslin, MD; Curt Daniels, MD

The number of Adult Congenital Heart Disease (ACHD) patients is growing quickly and globally. We need more providers to care for these patients. How are all these people going to gain expertise in the management of ACHD patients?

ACHD cardiology and patient services are still in a fairly early phase of development. Pediatric cardiology and their patient services have a two generation lead on ACHD, which needs to begin to compile the educational and patient care resources needed to deliver high-quality and accessible care to ACHD patients.

One very positive development has to do with the current momentum toward subspecialty certification in ACHD cardiology in the US. The certification has the support of the ABIM and the ABP. They are in the process of approving a two-year program designed to increase the output of cardiologists with special knowledge and skills in the management of ACHD patients. Importantly, these cardiologists will come from both an adult cardiology and a pediatric cardiology background. The ideal candidate for this training is a physician with a med-peds background, but the training program will be open to straight medicine or pediatric providers.

One implication of the new subspecialty certification will be the need to increase the number of training programs in the USA. These new programs will be challenged to develop a strong enough curriculum to support the robust training of these new specialists. A group of dedicated and committed ACHD providers plans to help these new centers gain access to excellent teaching material to assist in this process.

We call this new resource the "ACHD Learning Center." It is being put together with the support of the Cincinnati Children's Hospital Heart Institute. An editorial board is being created by the International Society for Adult Congenital Heart Disease (ISACHD; www.isachd.org) to help guide the development of the center, to assess the suitability of material for the collection, and to maintain the quality and currency of the educational experience.

Priority will be given in the first instance to the education of ACHD providers, including physicians, surgeons, nurses, nurse practitioners, physician assistants, and others. As time goes by and the ACHD Learning Center becomes better established, we will add in other groups of people who will be able to benefit from the material: adult cardiology trainees; pediatric cardiology trainees; cardiology training program directors; medical students; medical school program directors; trainees and program directors of other disciplines, including radiology and maternal fetal medicine; and, finally, patients, families, and the general public.

The first component of the ACHD Learning Center will be the presentations given at the Cincinnati ACHD course in June 2011 (<https://cincinnatiachdcourse.org>). The next will be the presentations given at the Toronto ACHD course in June 2012. At the same time, we will add a link to the Heart

"We call this new resource to the "ACHD Learning Center." It is being put together with the support of the Cincinnati Children's Hospital Heart Institute. An editorial board is being created by the International Society for Adult Congenital Heart Disease (ISACHD) to help guide the development of the center, to assess the suitability of material for the collection, and to maintain the quality and currency of the educational experience."

Disease and Pregnancy website at <http://heartdiseaseandpregnancy.com> and to the Nevil Thomas Library ACHD website (www.achd-online.com). All of these will be excellent teaching resources. Additional material will be obtained from other online sources once it has been approved for this purpose.

We will do this in partnership with the authors of the material. We will basically provide an aggregation service to make it easier for people interested in learning about ACHD to identify available educational resources and to access them. Credit will always be given to the authors whenever their material is displayed. The authors will be entirely in control of whether the material can or cannot be downloaded or copied. Whenever possible, we will wish to allow the users to evaluate the quality of the material using both a five-star "Amazon style" scoring system, as well as a text box for comments and suggestions.

We intend to include the following types of material:

- ECGs.
- Chest x-rays.
- Echocardiograms.
- Angiograms.
- Cardiac catheterization data.
- MRIs.
- CT's.
- Courses and symposia.
- Lectures.
- Self-assessment material.
- Case presentations.
- Textbooks, both online and in print.
- Formal courses, usually with a registration fee.

The managing and editorial group will be composed of ACHD providers from North America, Europe, and Asia. It will have its hands full setting priorities as the Learning Center gets started, presently scheduled for December 2012. The participants will screen material for quality and suitability before posting on the site. They will determine the "fresh before date" for the material, and will create criteria and the process to inactivate material that is not adequately used or well enough received.

There will be a considerable need to create new materials once we have identified all the

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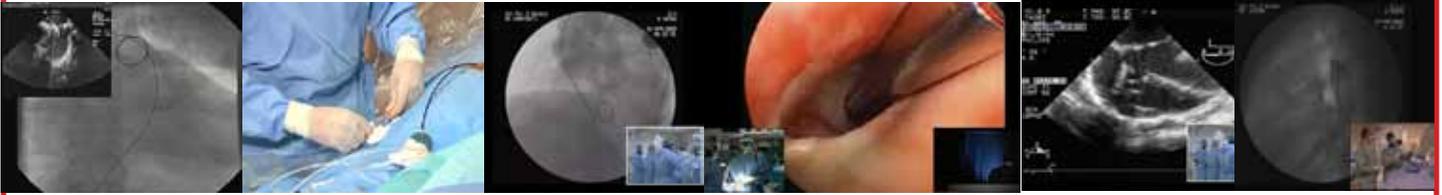
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- Covered Stent to Eliminate Fontan Baffle Leak & Stenosis
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- Intra-operative PA Stent
- Periventricular Muscular VSD Device Closure
- Closure of Septal Defect Using Real Time 3D Echo Guidance
- Periventricular Membranous VSD
- Hybrid Stage I Palliation for HLHS PA Bands and PSA Stent
- Intraoperative Aortic Stent for CoA
- Intraoperative LPA Stent Using Endoscopic Guidance
- Creation of ASD after PA Bands & PDA Stent for HLHS in a Preemie
- Periventricular Implant of Edwards Valve Stent in the Pulmonary Position
- Closure of Septal Defect Using Real Time 3D Echo Guidance
- High Frequency Ultrasound Creation of ASD
- PmVSD Closure
- Hybrid Stage I Palliation for Complex Single Ventricle in a 1.4 kg Neonate
- Transcatheter Implantation of Implantable Melody Valve
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- Closure of ASD Under ICE Guidance
- PFO Closure
- Transcatheter Closure of Atrial Septal Defect (ASD)
- Closure of ASD under TEE Guidance
- Transcatheter Closure of Moderate PDA
- Pulmonary Angioplasty
- Hybrid Stage Palliation
- ADO1 or MVSD Closure of PDA
- VSD Closure Using a PDA Device
- Balloon Pulmonary Valvuloplasty
- Coil or Vascular Plug II closure of Coronary Fistula
- Device Closure of ASD
- Stent Placement Across Recurrent Coarctation
- Stenting RVOT on 7-day Old Newborn
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“...we are looking for other partners to help make this an outstanding educational resource, and would be delighted to entertain other possible partnerships or affiliations.”

high quality material currently in existence that can be made available to the Center.

What can you, the reader, do with this information about the ACHD Learning Center? First, you can answer the following questions:

- Do you know of any educational material that might be suitable for and available to the ACHD Learning Center?
- Do you or a colleague have an interest in participating in this process?
- Do you have suggestions as to how we might best develop the learning center to achieve maximum positive impact?
- Do you have criticisms of the process as you understand it?

If you do, please contact either Gary Webb (gary.webb@cchmc.org), Chair of the Online Editorial Board or Erwin Oechslin (erwin.oechslin@uhn.ca), Chair of the Education Committee of ISACHD.

Beyond that, we would ask the reader to keep the site in mind (<https://cincinnatiachdcourse.org>), and to go to it regularly in the months and years ahead. You will find considerable material not only of interest to you professionally, but useful as a teaching resource for trainees and other staff with whom you work.

We wonder to what extent there is a need for such a resource in the pediatric cardiology community. We would note that while this article is focused on the USA, the learning center is aimed at a global audience. English will be the main language, but we will also include high quality material provided in other languages. While the initial partners in this venture will be Cincinnati Children's Hospital and The International Society for Adult Congenital Heart Disease, we are looking for other partners to help make this an outstanding educational resource, and would be delighted to entertain other possible partnerships or affiliations.

We're grateful to *Congenital Cardiology Today* for giving us the opportunity to write this article, and to its ongoing commitment to providing information and education to members of our congenital heart community.

CCT

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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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Those wishing to have their LTE published will be sent a preproduction draft to review.



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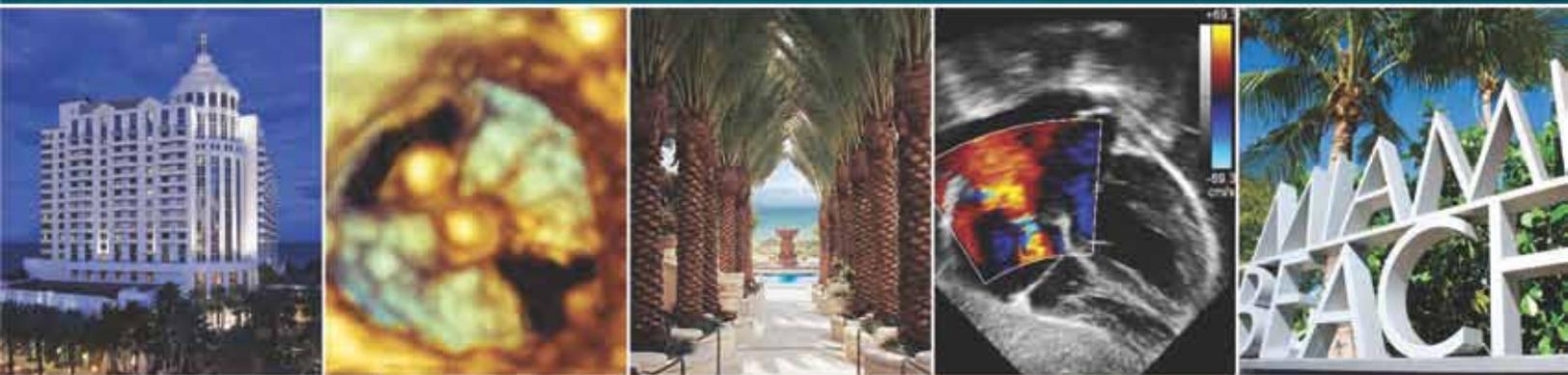
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Health Care Social Media: Joining the Online Revolution

By Farris K. Timimi, MD

There is a marked evolution occurring in health care, and many of us who are not online are excluded. This evolution reflects two broad trends, and the overlap of these two trends defines two seemingly discordant threats and an exciting opportunity that spans arenas of clinical practice, research and education.

The first broad trend reflects the overwhelming impact of data. Practitioners in all fields are truly inundated in clinical data, and the rate and volume of that inundation continues to increase at a marked pace. We are on track to have 22 million citations listed in *Pub Med*, with a new citation being added every minute, reflecting over 3,000 currently referenced journals.¹ For my area of practice, advanced heart failure and transplant cardiology, the National Guideline Clearinghouse lists 497 guidelines that reference heart failure that I may review.² Moreover, this ocean of data available is becoming increasingly transparent and more broadly available to patients as well as providers. This data transparency is fostering a new definition of the patient provider compact, one that has shifted from an historic unidirectional instructional conversation from a provider to a patient, to one that is truly more bidirectional and reflective of real engagement.

We are no longer the only experts in the room. More and more, our patients bring their knowledge and lived experience to the table.

The second broad trend centers on time. The progression in volume and complexity of paperwork continues to represent a daunting time challenge, now consuming one-third of a physician's day.³ For residents in training, the challenge is even more striking, with medical documentation now consuming six hours of their workday,⁴ which represents a nearly two-fold increase in time spent by residents in training on this particular task over the last twenty years.⁵

As our time is being consumed by non-patient care activities, our patient's time is spent more and more often online-and the time they spend online is more often spent seeking health care information. At present, the third most common use of the Internet, after Internet search and e-mail is searching for

health care information.⁶ Indeed, 61% of us seek online medical information or support (for comparison, 58% of American adults have a library card⁸). The most common research questions focus on specific diseases, specific treatments and reviews and references for doctors.

Where we spend time online has evolved as well, into a more social dynamic. Worldwide we spend in excess of 110 billion minutes daily in social media sites, which now represents approximately 22% of all time spent online-literally one in five minutes spent on the Internet.⁹

Our patients are spending more and more time online, often in social media platforms, and while they are online they are focusing more on health care information and support. Yet all too often, we as providers are reluctant to meet our patients there, with risk adverse concerns that focus on reimbursement and litigation.

Frankly, the greatest risk we face as providers is not participating at all.

How we engage with them needs to fill one of two operational needs, from the patient's perspective. It needs to either reflect our

“There is a marked evolution occurring in health care, and many of us who are not online are excluded. This evolution reflects two broad trends, and the overlap of these two trends defines two seemingly discordant threats and an exciting opportunity that spans arenas of clinical practice, research and education.”

capacity to provide content creation of relevant information or content curation and direction. Doing so creates a scalable archived resource that reaches well beyond the confines of geography or time.

Before beginning your online endeavors, your first step should be to review your organizational social media policy and guideline statement, or if they do not exist yet, develop them. Then, carefully consider and define your operational needs and your goals, and ensure that you choose social media tools that will most aptly meet those needs. Once you have chosen your specific tools from the tool set and created your accounts, be sure to review and be familiar with your privacy settings, and plan to re-review them on a regular basis. Be comfortable with the “rules of the road” before driving; our Mayo Clinic Center for Social Media¹⁰ provides the online version of social media drivers training, and can serve as a good resource. Finally, begin your participation in any new site by lurking, you really can learn a great deal by observing before you participate.

Once you are online, try to be authentic, be professional and be respectful. Fundamentally adhere to the Health Insurance Portability and Accountability Act privacy rules. While the majority of HIPAA violations occur in the elevator and not online, online participation has the capacity to leverage any transgression to a much wider and a truly archived audience.

Before you make your first post, pause and review these three questions.

1. Who am I posting this to-who is my online audience?
2. Does my post contain language that is appropriate for all ages?
3. Am I adding material of value to an ongoing conversation?

Some fundamental ground rules that are universally applicable regardless of the social media tool that you chose:

- Don't practice on the Internet, regardless of your good intent.
- Always surmise that HIPAA applies.

You will be asked specific medical questions-it is best to frame your answer in a general sense, as you will not have access to specific



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relevant medical data, i.e., “While I can not comment on your case, in general we recommend patients recheck blood work after beginning an ACE inhibitor.”

- Corporate logo in your username is a no go.
- Adding a disclaimer is probably saner.
- Speak on your behalf, not that of staff.

In general, it is critical that you separate your online personal brand from that of your organizational online personal brand, i.e., “Tweets mine, not Mayo’s.” Moreover, using your corporate logo in your online user profile creates the image that you speak on behalf of your organization, as opposed to your own behalf.

No matter how careful you may be errors will occur. That is why it is critical that you develop social media orientation and training for your new and current employees and an organizational social media policy; your employees and coworkers are online already, and their errors may well impact you or your organization. Provide them with the tools they need to serve as an asset instead of a liability. Blocking access while at work will not achieve this goal; moreover, doing so does not address their online presence at home and it does not address ubiquitous use of smart phones. Fundamentally, view mistakes that occur as learning opportunities, not a rationale for entrenchment.

There is real power in participating with our patients as they walk on their journey through illness to recovery. Doing so online allows you to create content that can be archived and can be scaled and leveraged at little cost, and can extend the reach of your work beyond geographic and time constraints. Doing so with integrity allows you to be a content resource for your online community; when members of that community transition to becoming patients, they will view you as the resource they will seek.

Our patients are online. We should be there with them.

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Medical News, Products and Information

Medtronic Grabs CE Mark for New Oxygenation System for Adult Cardiac Surgery

In September 2012, Medtronic, Inc. announced Conformité Européenne (CE) Mark for its new Affinity Fusion® oxygenation system in Europe. This system, which is designed to serve as a patient's lungs by oxygenating and removing carbon dioxide from blood during various open-heart surgical procedures, incorporates numerous innovations for patient safety and ease of use. Notably, system enhancements are designed to prevent and remove air bubbles that can enter the blood during the procedure, which may reduce the risk of stroke.

The Affinity Fusion oxygenation system's new design enhancements include:

- A proprietary fiber winding process with an interlaced pattern that efficiently filters the blood and removes particles and air while at the same time oxygenating the blood;
- Smooth tubular pathways for blood to pass through and a first-of-its-kind curved venous inlet tube, both of which reduce blood turbulence during the surgical procedure;
- Enhanced setup and customization capabilities, including a new oxygenator system holder, which gives perfusionists improved flexibility and ease of use in various operating rooms, including those with limited space.

"The new Affinity Fusion oxygenator is designed to provide perfusionists with the most innovative and enhanced product of its kind," said cardiac surgeon Dr. John Liddicoat, Senior VP and President of Medtronic's Structural Heart Division. "With so many patients who undergo cardiac surgery each year, Affinity Fusion provides patients with a reliable oxygenation system they can count on."

The Fusion oxygenation system is used by perfusionists during open-heart surgical procedures that require a bloodless, motionless surgical field, such as lifesaving cardiopulmonary bypass surgery. As temporary "lungs," the system adds oxygen and removes carbon dioxide from the blood. This year, cardiopulmonary bypass will occur in roughly 1 million patients worldwide. The development process of the Fusion oxygenator included extensive collaboration between Medtronic engineers and more than 500 perfusionists worldwide.

"During cardiopulmonary bypass, it is imperative that the equipment is designed to maximize patient safety, yet is also sophisticated, versatile and simple to use," said Simon Phillips, Chief Clinical Perfusionist at St George's Hospital in London. "Being part of the collaboration process during the Affinity Fusion oxygenation system development, I am confident that this new technology will benefit

patients who undergo these lifesaving procedures and the surgical teams that use it."

The Affinity Fusion oxygenator is not available in the United States, but Medtronic plans to submit an application for US clearance.

In collaboration with leading clinicians, researchers and scientists, Medtronic offers the broadest range of innovative medical technology for the interventional and surgical treatment of cardiovascular disease and cardiac arrhythmias. The company strives to offer products and services that deliver clinical and economic value to healthcare consumers and providers worldwide.

For more information visit www.medtronic.com.

Abnormal Carotid Arteries Found in Children with Kidney Disease

Newswise — A federally funded study led by researchers at Johns Hopkins Children's Center has found that children with mild to moderate kidney disease have abnormally thick neck arteries, a condition known as carotid atherosclerosis, usually seen in older adults with a long history of elevated cholesterol and untreated hypertension.

The findings — published online ahead of print on Sept. 13 in the *Clinical Journal of the American Society of Nephrology* — are particularly striking, the researchers say, because they point to serious blood vessel damage much earlier in the disease process than previously thought. As a result, they add, even children with early-stage kidney disease should be monitored aggressively and treated promptly for both hypertension and high cholesterol to reduce the risk for serious complications down the road.

The researchers caution they are not sure whether the same fatty deposits that clog adult arteries are the reason behind the abnormally thick carotid arteries they observed in the study. But because most of the children involved in the research already had high cholesterol and hypertension — the leading causes of adult atherosclerosis — the investigators believe they are dealing with a disturbingly early onset of this condition in an already vulnerable population.

"Untreated hypertension and high cholesterol increase the risk for long-term vascular damage in any child, but in a child with kidney disease they can wreak much more serious havoc," says study lead investigator Tammy Brady, MD, MHS, a pediatric nephrologist at Hopkins Children's.

Chronic kidney disease by itself increases cardiovascular risk because of chronic

inflammation and altered metabolism, the investigators say. But the presence of any additional risk factors — such as obesity, high cholesterol and hypertension — can further fuel that risk and put children with kidney disease on a path to early heart attack and stroke if left untreated, they add.

In the current multi-center study, which compared 101 children with kidney disease to 97 healthy children, the majority of patients with kidney disease had high blood pressure (87%) and elevated cholesterol (55%). One-quarter of them were overweight or obese.

Elevated cholesterol and chronically high blood pressure can cause fatty build-up inside the arteries and make them harder and stiffer. A narrowed carotid artery — the neck vessel that carries blood from the heart to the brain — not only restricts blood flow to the brain but is vulnerable to dangerous fatty plaque ruptures that can lead to heart attacks or strokes.

In their study, researchers performed neck ultrasounds to measure the internal thickness of the carotid artery. On average, children with kidney disease had carotid arteries about 0.02 millimeters thicker than those of children without kidney disease, but some children had arteries up to 0.06 millimeters thicker than their healthy counterparts. High blood pressure and elevated cholesterol increased the difference. Children with hypertension had arteries 0.04 millimeters thicker on average, and children with elevated triglyceride levels had arteries that were 0.05 millimeters thicker.

"We cannot emphasize this enough: Pediatricians who take care of children with chronic kidney disease — even kids with early-stage kidney disease — should screen them early for cardiovascular damage, assess their risk factors and treat hypertension and high cholesterol promptly and aggressively," Brady says.

An estimated 20 million Americans have chronic kidney disease, according to the CDC. Because chronic kidney disease often evolves silently over a period of years, researchers estimate that many adults with late-stage or end-stage kidney disease developed the disease as children.

Other institutions participating in the research included Cincinnati Children's Hospital, University of Texas, British Columbia Children's Hospital, Children's Mercy Hospital and Nationwide Children's Hospital.

Scientists Discover How an Out-of-Tune Protein Leads to Muscle Demise in Heart Failure

Newswise — A new Johns Hopkins study has unraveled the changes in a key cardiac protein

that can lead to heart muscle malfunction and precipitate heart failure.

Troponin I, found exclusively in heart muscle, is already used as the gold-standard marker in blood tests to diagnose heart attacks, but the new findings reveal why and how the same protein is also altered in heart failure. Scientists have known for a while that several heart proteins - troponin I is one of them - get "out of tune" in patients with heart failure, but up until now, the precise origin of the "bad notes" remained unclear.

The discovery, published online ahead of print on Sept. 12th in the journal *Circulation*, can pave the way to new - and badly needed - diagnostic tools and therapies for heart failure, a condition marked by heart muscle enlargement and inefficient pumping, and believed to affect more than 6 million adults in the US, the researchers say.

Troponin I acts as an on-off switch in regulating heart relaxation and contraction and, in response to, adrenaline - the "flight-fight" response. But when altered, troponin I can start acting as a dimmer switch instead, one that ever so subtly modulates cardiac muscle function and reduces the heart's ability to pump efficiently and fill with blood, the researchers found.

The Hopkins team used a novel method to pinpoint the exact sites, or epicenters, along the protein's molecule where disease-triggering changes occur. They found 14 such sites, six of them previously unknown. In revealing new details about the molecular sequence of events leading up to heart failure, the researchers said their work may spark the development of tests that better predict disease risk and monitor progression once the heart begins to fail.

"Our findings pinpoint the exact sites on troponin I's molecule where disease-causing activity occurs, and in doing so they give us new targets for treatment," says researcher Jennifer Van Eyk, PhD, Director of the Johns Hopkins Proteomics Innovation Center in Heart Failure.

In the current study, the team analyzed tissue from the hearts of patients with end-stage heart failure and from deceased healthy heart donors. The 14 sites the researchers identified are sites where troponin I binds with phosphate, a process known as phosphorylation.

Phosphate can activate or deactivate many enzymes, thus altering the function of a protein and, in the case of heart failure, ignite disease. The six newly identified sites represent new "hot spots" involved in heart contraction, the researchers say, and could be used as diagnostic markers or a target for treatment to restore function.

The Hopkins researchers found that in some sections of the molecule, phosphorylation ratcheted up the dimmer switch, while ratcheting it down in other sections, but it invariably led to muscle dysfunction.

"Our goal would be to zero in on these new sites, gauge risk of heart failure and, hopefully, restore heart muscle function," Van Eyk says.

Heart failure is a complex progressive disorder, and while cardiac pacemakers can restore or "resynchronize" heart function in many people, about one-third of patients do not improve even with pacemaker therapy in addition to standard medication treatments.

"This is a devastating disorder for which we desperately need new and less invasive therapies," says senior investigator Anne Murphy, MD, a cardiologist at Johns Hopkins Children's Center.

In their analysis, the researchers used a novel technique, called multiple-reaction monitoring (MRM), which pinpoints the exact locations along the protein's molecule where faulty signaling occurs and disrupts heart muscle function. MRM is an ultra-sensitive type of mass spectrometry that measures the exact size and chemical composition of protein fragments. Phosphorylated protein fragments have different molecular weights than non-phosphorylated ones. In this way, MRM accurately homes in on sites where phosphate is bound to troponin I to modulate heart muscle function.

The researchers found that patients with heart failure had markedly different levels of phosphorylation in certain protein segments compared with healthy heart muscle.

The advantage of MRM analysis - one of the first non-antibody based troponin I tests - is that it can measure phosphorylation levels without the need for antibodies, the traditional method currently used to monitor heart muscle function. The researchers believe that MRM can be developed as a clinical diagnostic test, and the Hopkins team is already working to develop a test that would measure phosphorylation levels of proteins in the blood and would allow physicians to monitor the progression of the disease as well as predict which heart attack patients will progress to heart failure. About one-third of them do so.

"Right now, we don't really know which heart attack patients will develop heart failure, and which ones will maintain normal heart muscle function," Murphy says. "Monitoring specific phosphorylation sites might be one way to help us foresee and forestall this complication on an individual patient basis."

Other Johns Hopkins investigators on the study included Pingbo Zhang, PhD, Weihua Ji, MS, Cristobal G. dos Remedios, DSc, Jonathan Kirk, PhD, and David Kass, MD.

This work was supported by the National Heart Lung and Blood Institute's Proteomic Initiative contracts NHLBI-HV-10-05(2) and HHSN268201000032C, P01HL081427, P01HL77189-01, and R01 HL63038; by the Johns Hopkins Clinical Translational Science Award (CTSA); and by American Heart Association Postdoctoral Fellowships 10POST4000001 and 11POST7210031.

Use of Newer-Generation Drug-Releasing Stent Results in Lower Rate of Adverse Cardiac Events For Heart Attack Patients

Compared with a bare-metal stent, the use of a stent with a biodegradable polymer that releases the drug biolimus resulted in a lower rate of major adverse cardiac events at 1 year among patients with ST-segment elevation myocardial infarction (STEMI; a certain pattern on an electrocardiogram following a heart attack) undergoing primary percutaneous coronary intervention (PCI; procedures such as balloon angioplasty or stent placement used to open narrowed coronary arteries), according to a study in the August 22/29 issue of *JAMA*.

"The efficacy and safety of drug-eluting [releasing] stents compared with bare-metal stents remains controversial in patients with STEMI undergoing primary PCI," according to background information in the article. "Early generation drug-eluting stents releasing sirolimus or paclitaxel from durable polymers reduce the need for repeat revascularization compared with bare-metal stents. However, vessel healing is delayed with evidence of chronic inflammation related at least in part to the persistence of durable polymer components in patients with acute STEMI. Newer-generation drug-eluting stents with biodegradable polymers provide controlled drug release with subsequent degradation of the polymer rendering the stent surface more closely to a bare-metal stent after the period of biodegradation."

Lorenz Räber, MD, of Bern University Hospital, Bern, Switzerland, and colleagues compared the efficacy and safety of stents eluting biolimus from a biodegradable polymer with bare-metal stents of otherwise identical design. The randomized controlled trial included 1,161 patients with STEMI at 11 sites in Europe and Israel between September 2009 and January 2011. Clinical follow-up was performed at 1 and 12 months. Patients were randomized to receive the biolimus-eluting stent (n = 575) or the bare-metal stent (n = 582). The primary outcome measured for the study was the rate of major adverse cardiac events, a composite of cardiac death, target vessel-related reinfarction, and ischemia-driven target-lesion revascularization at 1 year. The average age of patients was 61 years and 79% were men.

The researchers found that at one year, the primary endpoint of major adverse cardiac events occurred in 4.3% of patients receiving

biolimus-eluting stents and 8.7% of patients receiving bare-metal stents, which is a significant 4.4% absolute reduction and 51% relative reduction in the risk of major adverse cardiac events (and the prevention of 42 events per 1,000 patients treated with biolimus-eluting stents compared with bare-metal stents at 1 year). "For cardiac death alone, the percentages were smaller [(2.9% vs. 3.5%, respectively)]. The treatment effect in favor of patients receiving biolimus-eluting stents was attributable to both a lower risk of target vessel-related reinfarction (0.5% vs. 2.7%) and ischemia-driven target-lesion revascularization (1.6% vs. 5.7%)." At 1 year, rates of definite stent thrombosis amounted to 0.9% among patients receiving biolimus-eluting stents and 2.1% among patients receiving bare-metal stents.

The authors also observed no differences in all-cause and cardiac mortality between the groups at 1 year. "In addition to the device-oriented primary outcome measure, we recorded a lower risk of the comprehensive patient-oriented composite of death, any reinfarction, and any revascularization in favor of biolimus-eluting stents (8.4% vs. 12.2%)."

"... our results suggest better clinical outcomes in terms of major adverse cardiac events of a stent releasing biolimus from a biodegradable polymer compared with a bare-metal stent for the treatment of patients with STEMI."

In an accompanying editorial, Salvatore Cassese, MD, and Adnan Kastrati, MD, of the Technische Universität, Munich, Germany, wrote that the findings from this study (COMFORTABLE AMI) and from a series of previous trials on drug-eluting stents (DESs) in patients with heart attack provide several important lessons.

"First, the efficacy of DESs vs. bare-metal stents (BMSs) in STEMI is already established and, therefore, further studies comparing these interventions might not be needed. Second, concerns about a possible very late safety issue with DESs are apparently DES-type specific, mostly related to first-generation DESs and less justified with newer DESs. Larger randomized trials with longer follow-up and head-to-head comparisons of the available DES technologies are, however, required to completely eliminate these concerns. These studies should also take broader advantage of intravascular imaging technologies to provide mechanistic insights into the clinical findings. Third, although there is almost no rationale for performing DES vs. BMS studies anymore, it might be conceivable to expect studies that test the hypothesis of noninferiority of new, improved BMSs to available DESs. Until then, recent studies such as the COMFORTABLE AMI trial should make cardiologists feel more comfortable with the use of new-generation DESs in patients with STEMI."

This work was supported by the European Commission.

Coping Skills, Marital Satisfaction Help Pregnant Moms Manage Stress When Fetus had a Heart Defect

Newswise - Expectant mothers who learn from prenatal diagnosis that they are carrying a fetus with a congenital heart defect (CHD) commonly suffer post-traumatic stress, depression and anxiety. However, a healthy relationship with one's partner and positive coping mechanisms can reduce this intense stress, according to new research from the Cardiac Center of The Children's Hospital of Philadelphia.

The study was published in the September 2012 issue of *The Journal of Pediatrics*.

"Receiving the news of carrying a fetus with a CHD is a stressful event which can potentially influence a mother's anxiety level," said study leader Jack Rychik, MD, Medical Director of the Fetal Heart Program in the Cardiac Center at The Children's Hospital of Philadelphia. "Prenatal diagnosis is helpful in that it gives parents time to learn about the defect, review treatment options, plan for necessary interventions and consider their options. While this is intrinsically a stressful time for parents, there has previously been little research on the details of this stress and ways to buffer it."

The researchers surveyed 59 pregnant mothers, ranging in gestational age from 17 to 31.5 weeks, who were recruited by nurse coordinators at either the initial visit to the Fetal Heart Program or a follow-up visit, then followed throughout the rest of their gestation. Participants intended to continue the pregnancy, and to plan for follow-up with the Fetal Heart Program. All were carrying fetuses with serious CHD requiring neonatal evaluation and postnatal surgical or catheter-based intervention within the first six months of life.

Using psychological evaluation tools and self-report instruments, the study team measured traumatic stress, depression and anxiety among the mothers. The researchers also measured partner satisfaction and collected demographic data.

More than 39% of the women experienced clinically important traumatic stress, 22% experienced depression, and 31% experienced state anxiety. Lower partner satisfaction and lower income were both associated with higher levels of depression, anxiety and traumatic stress. When the researchers controlled for partner satisfaction and income, they found denial to be most important factor contributing to depression.

"Prenatal diagnosis of CHD is a traumatic event for many pregnant women. In our study we found that a substantial proportion of mothers exhibited evidence for traumatic stress, with nearly 40% exceeding clinical cut-

off points for post-traumatic stress disorder," said Guy S. Diamond, PhD, a psychologist at The Children's Hospital of Philadelphia who participated in this study.

"While individual coping skills are important, partner satisfaction may better predict a more resilient response to the stress of prenatal CHD," Diamond added. We have identified 'denial' as an important contributor to depression and that on-going counseling sessions should focus on this risk factor."

"This study is the beginning, and more research needs to be done to ensure we are giving mothers the very best multidisciplinary care. In one way, the families are fortunate to know in advance that their baby has a CHD and in another way given more stress with that knowledge. In the future, optimal management strategies to improve outcomes for both mom and fetus will include stress reduction techniques, which should accompany the diagnosis of CHD prior to birth," added Rychik.

Dr. Rychik's co-authors are Denise D. Donaghue, RN, MSN; Suzanne Levy, PhD; Clara Fajardo, MS; Jill Combs, RN, MSN; Xuemei Zhang, MS; Anita Szwasz, MD, and Guy S. Diamond, PhD, all from The Children's Hospital of Philadelphia.

Cincinnati Children's Announces Major Advancement in Treatment of Duchenne Muscular Dystrophy

In what may be the biggest breakthrough in muscular dystrophy in years, a patient at Cincinnati Children's Hospital Medical Center is believed to be the first in the nation with Duchenne muscular dystrophy to have a device implanted to help his heart pump blood to the body long-term.

Because 80% of boys and men with Duchenne muscular dystrophy (DMD), ultimately die of heart failure, the implanted left ventricular assist device (LVAD), could add years or even decades to the lives of patients with DMD.

"This is a major milestone in the care of Duchenne muscular dystrophy," says John Lynn Jefferies, MD, Director of the Heart Failure and Ventricular Assist Device Programs at the Cincinnati Children's Heart Institute. "This treatment offers the possibility to change the outcome and the lives of these young men in a significant way that has never been realized up until now."

Due to their severe muscle disease, patients with DMD are not typically candidates for heart transplant and some other treatment options that exist for patients with other muscular dystrophies. Patients with Becker muscular dystrophy, for example, a less severe form of muscular dystrophy caused by the same gene as DMD, have a larger range of treatment



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options, including transplant and LVADs, which have successfully been implanted in this population. DMD patients often die at a much younger age than patients with Becker muscular dystrophy due to heart failure.

Surgeons at Cincinnati Children's, led by David Morales, MD, Chief of Cardiovascular Surgery and Executive Co-Director of the Heart Institute, demonstrated the feasibility of using LVADs as an option for Duchenne patients by implanting a Thoratec HeartMate II LVAD into the chest of Jason Williams, 29, a DMD patient from Peebles, Ohio. Williams is hoping not only for an improved quality of life for himself, but to be a pioneer in helping all patients with DMD.

"I wanted to live longer with a better quality of life, and help other people – those with Duchenne facing heart failure and death," says Williams. "I hope that doctors and surgeons can learn from my surgery and my recovery and be able to offer this treatment to other men and boys with Duchenne."

Muscular dystrophy is a group of inherited diseases in which the muscles progressively weaken. DMD affects mostly males, appearing between the ages of 2 and 6. Disease progression varies, but many people with Duchenne need a wheelchair before the age of 12, which was the case with Williams.

Later stages of the disease are characterized by severe difficulty breathing and heart problems. Those with DMD usually die in their late teens or early 20s.

"For these patients, a long-term solution for heart failure would be groundbreaking," says Jeffrey Towbin, MD, Executive Co-Director of the Heart Institute and Chief of Pediatric Cardiology at Cincinnati Children's.

"We could perhaps change the natural history of this disease," says Dr. Morales. "This operation gives Jason the most important thing: hope for a future. He has a lot going for him. In Cincinnati Children's, he has a broad and deep heart team; a backbone of basic, translational and clinical researchers working for him; international thought leaders in muscle disease to help manage his care; and institutional leadership that makes advances such as this possible. Most importantly, he has a tremendously dedicated family to support him."

The Comprehensive Neuromuscular Center at Cincinnati Children's is dedicated to helping children, adolescents and adults with neuromuscular disorders live better, fuller lives. Directed by Brenda Wong, MD, the Center cares for more than 1,100 children from around the world with a range of neuromuscular diseases. The staff of experts includes such disciplines as pulmonary medicine, cardiology, pediatric rehabilitation, genetics, physical therapy, gastroenterology, nutrition therapy, social services, psychology, neuropsychology,

endocrinology, ophthalmology, and orthopaedics.

Despite years of research into DMD and other forms of muscular dystrophy, medical advances have been limited. Perhaps the biggest impact came more than a decade ago, when steroid therapy began to be used extensively to prolong skeletal muscle. Then, in 2005, Drs. Jefferies and Towbin published a study predicting when patients would develop cardiac disease, allowing earlier intervention to occur.

Approximately 2,500 individuals are born around the world each year with DMD. By the age of 21, 100% of patients with DMD have dilated cardiomyopathy, a disease of the heart muscle.

MEDICAL MEETING FOCUS: JANUARY

Sudden Cardiac Arrest in Children & Adolescents - Current Controversies

Jan. 25 - 26, 2013

Disney's Grand Californian Hotel
Anaheim, CA 92808 USA

www.choc.org.scaconference

Overview

Designed for practicing cardiologists, internists, pediatricians and other health care professionals with an interest in sudden cardiac arrest (SCA), this two-day conference will present current controversies on topics related to the diagnosis, therapy and prevention of cardiac arrest in children and adolescents.

Keynote Speakers

- Frank I. Marcus, MD
University of Arizona Health Sciences Ctr.
- Barry J. Maron, MD
Minneapolis Heart Institute Foundation

Program Director

Anjan S Batra, MD, FHRS
Director of Electrophysiology
Children's Hospital of Orange County
Associate Professor of Clinical Pediatrics
University of California, Irvine

At the conclusion of this conference, the physician attendee should be able to:

- Recognize the causes of SCA
- Describe the utility of screening ECGs in prevention of SCA
- Recognize rare consequences of common symptoms
- Describe the utility of CPR training and AEDs in prevention of SCA
- List the differential diagnosis of patients who are at risk for sudden cardiac death based on age, race or gender

Accreditation: CHOC is accredited by the Institute for Medical Quality/California Medical Association (IMQ/CMA) to provide continuing medical education for physicians.

Ventricular assist devices are mechanical pumps implanted in the chest to help a weakened heart pump blood to the body. They are often used as a bridge to transplant, delaying the need for transplant until a suitable heart can be located. Although patients with Duchenne are not candidates for heart transplant, this doesn't mean that assist devices can't be seen as bridges to more advanced care.

Current research is looking at whether stem cell therapy might be used to increase the heart's ability to squeeze and better pump blood. Researchers are examining whether bone marrow cells can be injected into the heart and replace cells that are not working properly. Researchers are hoping that VADs can be used until stem cell therapy becomes a reality.

CONGENITAL CARDIOLOGY TODAY

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Professor Emeritus, Pediatric Cardiology, Stanford University



This four-and-a-half day conference will discuss important concepts in congenital heart disease as well as the most recent advances in imaging, diagnosis and management of fetal cardiac abnormalities. This year, there is an added emphasis on the perinatal and genetics components, with advanced techniques in the assessment of the fetal circulation and extra-cardiac abnormalities. Breakout workshops including 4D echo volume manipulation, hands on scanning, and Doppler assessment techniques are planned.

Lectures, procedure demonstrations and interactive case study formats will focus on expanding evidence-based care management strategies for clinical decision making. Speakers are nationally and internationally prominent experts, creating an authoritative learning venue for fetal cardiology and fetal cardiac imaging.

This symposium has been designed for physicians- both pediatric cardiology and maternal fetal medicine, sonographers and other paramedical colleagues. The activity will provide up to a maximum of 33.5 AMA PRA Category 1 credits. Attendees should only claim credit commensurate with the extent of their participation in the activity.

Featured Speakers

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Giancarlo Mari MD
Lawrence Platt MD
Beth Rumack NNP
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For more information contact Program Coordinator, Kathryn Poole at kpoole@phoenixchildrens.com, (602) 933-2318 or visit www.fetalcardio.com



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