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Comprehensive Cardiac Emergency Services Enhanced by Regional System of Protocol-based Care

The Level One Heart Attack Program launched by the Minneapolis Heart Institute® in 2003 has demonstrated that a statewide program using a standardized protocol ensures timely access to care and improved outcomes among patients with ST-elevation myocardial infarction (STEMI).

Now, lessons learned in the development of the Level One Heart Attack Program have been applied to other cardiac emergencies and adapted to ensure access to other time-sensitive treatments.

At the beginning of this decade, it was clear that percutaneous coronary intervention (PCI) was the preferred treatment for STEMI – but few hospitals had catheterization labs, and the process of transferring patients and initiating treatment was complicated and inefficient.

"We felt it was our responsibility to referring physicians to develop a standard protocol that was effective and efficient," said Tim Henry, MD, who led the team that developed the Level One Heart Attack Program. "It has succeeded beyond what we ever imagined – we have cut mortality by 50 percent, and the transfer times we have achieved are equivalent to a country like Denmark, which has a small population and an organized transfer system."

According to Barb Unger, RN, director of Cardiac Emergency Services, the success of the Level One Heart Attack Program is due to collaboration among Emergency Medical System (EMS) staff, referring hospitals, the Emergency Department at Abbott Northwestern Hospital and the Minneapolis Heart Institute®. Working as partners, they have made accessing services easier, hastened patient transport and streamlined care.

"When you need to access a large tertiary center, the first hurdle is figuring out who to call and who does what, while at the same time taking care of the patient. So we created one phone number, one set of orders and a standardized protocol," Unger said.

To address patient transport barriers, Unger said it was important to make plans that were hospital-specific. "Every hospital has its nuances. We needed to go to the outstate hospitals and understand their challenges and strengths."

A Level One paging system helped to streamline

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processes at Abbott Northwestern Hospital. "There was nothing new that had to be built or created. It was just streamlining all the steps from the helipad to the cath lab. Once our team gets the page, everyone jumps into action and knows exactly what to do," said Unger.

This regional, protocol-based approach has been replicated to care for patients with non-STEMI, unstable angina, aortic dissection, critical limb ischemia and abdominal aortic aneurism and to ensure that, when needed, therapeutic hypothermia for patients suffering cardiac arrest is delivered as effectively as possible.

NON-STEMI AND UNSTABLE ANGINA: REDUCING PRACTICE VARIATIONS

Earlier this year, the Minneapolis Heart Institute® launched its Chest Pain Program, which applies protocol-based care to the treatment of non-STEMI and unstable angina (see *MHI™ Quarterly*, May 2009). There are twice as many Emergency Department visits for these conditions as there are for STEMI. But while the mortality rate from STEMI has decreased, it has remained unchanged for non-STEMI.

"By reducing practice variations and creating a more efficient way to treat these patients, we hope to see a similar reduction in mortality for non-STEMI," said Nicholas Burke, MD, director of the Chest Pain Program.

The program has been welcomed by referring hospitals and physicians because it spells out exactly which patients need to be transferred and which can remain in the community for testing and follow-up.

While hospitals nation-wide are adopting similar treatment protocols for acute coronary syndrome, the Chest Pain Program is one of the first multi-hospital initiatives to do so.

AORTIC DISSECTION: WHEN CHEST PAIN DOESN'T ADD UP TO MI

The key to treating aortic dissection is the ability to quickly distinguish it from myocardial infarction (MI). The two conditions may present similarly, but the treatment is quite different. Then it's a matter of getting the patient to the operating room without delay.

The Minneapolis Heart Institute® introduced its aortic dissection protocol in 2005. "Our first priority was education for the Level One regional network," said Kevin Harris, MD, cardiologist and director of the Ascending Aortic Dissection Program. Because aortic dissection is relatively rare, it may not be an immediate consideration for a patient who presents with chest pain. "But if a patient presents with chest pain and it doesn't quite add up to MI, you need to be thinking about aortic dissection."

Important clues include chest pain without EKG changes, and sudden, severe chest or back pain that may radiate to the head, abdomen and legs.

"If we have a patient in Alexandria who has atypical chest pain, all it takes is for someone to think of AD as a possibility," said Frazier Eales, MD, cardiovascular surgeon at the Minneapolis Heart Institute®. The diagnosis can be made with a computed tomography (CT) scan. The AD protocol specifies how the CT should be done and includes a process to ensure immediate interpretation. If needed, CT scans are transmitted to the surgeon in Minneapolis before the patient arrives.

The protocol also establishes blood pressure parameters, specifies which medications to use and streamlines the processes required to prepare for AD surgery. "Instead of a longitudinal decision-making process, everything is defined by the protocol," said Eales. "Having all those steps set up in advance so it can proceed automatically is a huge benefit."

A study by the Minneapolis Heart Institute Foundation showed that since implementing the protocol, the mortality rate has decreased by more than 50 percent. Other key quality measures are shown in Table 1.

TABLE 1 | REGIONAL AORTIC DISSECTION: KEY QUALITY MEASURES

	2003-July 2005 (pre-implementation)	August 2005-present (post-implementation)
Average time to make AD diagnosis	279 minutes	158 minutes
Average time from AD diagnosis to operating room	112 minutes	56 minutes
Percentage of AD cases in which betablockers were used	46 percent	96 percent
AD mortality rate	35 percent	16 percent

Source: Strauss CE, Eales F, Hirsch AT, Kroshus TJ, Duval S, Kebede TD, Adolphson GM, Inampudi S, Mitchell, PA, Cohen JD, Unger BT, Orlandi QG, Streckenbach S, Kapsner C, Flavin TF, Kshettry VR, Henry TD, Graham KJ, Harris KM. Improving the process of care for the management of acute aortic dissection. J Am Cardiol Coll 2009;53:A400

TABLE 2 | ABDOMINAL AORTIC ANEURYSM SURVIVAL

	October 2005-July 2008 (pre-implementation)	August 2008-August 2009 (post-impementation)
Total number of patients	15	22
Number of survivors at discharge	11	17
Survival rate	73 percent	77 percent

Source: Minneapolis Heart Institute® database

ABDOMINAL AORTIC ANEURYSM: NEW PROTOCOL, NEW TREATMENT OPTION

Treatment for abdominal aortic aneurysm (AAA) has been enhanced through the use of a new protocol as well as the development of a new treatment option: endovascular stenting.

Many aneurysms can be treated with a stent, which is less invasive and has fewer complications, shorter hospitalizations and a lower mortality rate than open surgical repair.

Before the protocol was implemented, emergency AAA repair using endovascular stents was a process "that on a good day required dozens of calls in a short time period," said Alex Tretinyak, MD, vascular surgeon. "Our challenge was to whittle down the process so more of it could happen automatically. We worked off the scaffolding of the Level One Heart Attack Program and translated it to do endovascular triple-A repairs."

As a result, the time required to diagnose AAA has been reduced by more than 30 minutes, and the time from diagnosis to making the incision in the operating room has been reduced by more than an hour. "If you can gain an hour in repairing triple-A, you greatly increase the likelihood that the patient will survive," said Tretinyak. The survival rate for AAA patients at the Minneapolis Heart Institute® has increased since the protocol was implemented, as shown in Table 2.

COOL IT: TREATMENT BEGINS BEFORE TRANSFER

One of the most important recent developments in emergency cardiac care has been the use of therapeutic hypothermia to reduce the risk of brain injury in patients who are resuscitated following a cardiac arrest. In 2006, Abbott Northwestern Hospital and the Minneapolis Heart Institute® helped pioneer therapeutic hypothermia in Minnesota and the treatment has become a standard of care across the state.

"We chose to implement the Cool It Program using a state-wide strategy from the very beginning," said Michael Mooney, MD, cardiologist and lead on the Cool It development team. He credits nursing colleagues for helping to bring the program to a variety of community settings and educating EMS and Emergency Department staffs across the region. "That's where it has to begin in order for the therapy to be effective," he said.

The Intensive Care service at Abbott Northwestern is also critical to the program. "This treatment involves complex multi-system failure in patients with metabolic derangement that goes beyond what most cardiologists treat. That's one of the unique aspects of our program. Very few places in the state have 24/7 intensivist coverage, which these patients very clearly need," said Mooney.

In addition to beginning treatment before patients are transferred, the Cool It Program has not used rigorous exclusions in determining which patients to treat. "The magnitude of the clinical benefit is so great, we did not want to withhold treatment from anyone. As a result, we've treated a higher risk group than are included in some previously published studies."

The results have been remarkable, both in terms of the scientific data and individual patient experiences. "Our survival rates are 70 percent when patients have a simultaneous full cardiac arrest with brain injury. And there have been spectacular saves – people who were not expected to survive," said Mooney.

TRACKING OUTCOMES

The importance of tracking quality measures and patient outcomes and reporting back to referring hospitals and physicians is another lesson from the Level One Heart Attack Program. "You have to pay attention to the details," said Unger. "You can't just set up a system and walk away."

The Minneapolis Heart Institute® provides immediate follow-up to physicians and nurses from referring hospitals whenever patients are transferred. In addition, data collected on cardiac emergency services helps Abbott Northwestern and the Minneapolis Heart Institute® improve services and is made available to regional hospitals for their quality improvement efforts.

"It's clear that if you can standardize care, you can improve outcomes. Working with our regional system allows us to take this a step further," said Henry. "Our approach to these problems is to have a comprehensive system. It's not just having the best stents or the best technology. We want to make every part of the care we deliver better for patients."

Closing the Gender Gap in Women's Heart Health

While women's heart health has received more attention in recent years, American Heart Association statistics published in *Circulation* (2009; 119:e21-e181) confirm that disparities remain in recognizing and treating women's heart disease.

At the Minneapolis Heart Institute®, cardiologists are closing the gender gap in providing emergency cardiovascular care to women.

"Because of the Level One Heart Attack Program, the treatment gap has closed. Once women arrive in an emergency department they are receiving treatment about as quickly as men," said Elizabeth Grey, MD, cardiologist and director of the Women's Heart Health Program at the Minneapolis Heart Institute®.

Yet, outcomes for women who have had a heart attack continue to lag behind men's. "One of the big questions is 'Why do women with myocardial infarction have a higher incidence of cardiogenic shock and death than men?'" said Grey. "We suspect that one reason is they may be waiting at home longer before going to the ED, but that's a hard thing to pin down."

In addition to providing clinical care for women, the Women's Heart Health Program is dedicated to gaining a better understanding of this and other aspects of women's heart disease.

Through research, education and clinical care, the program is working to raise awareness of the risks of heart disease in women, support women and families in creating lifestyles which strengthen heart health, nurture and care for women with heart disease, and add to the body of research specific to women and cardiovascular disease.

Historically, cardiac research has been hindered by the gender gap, leaving women under-represented in many cardiac studies. But in recent years, "there's been a huge push by the American Heart Association to educate the public about women and heart disease and to focus more research on women," said Grey.

Through its association with the Minneapolis Heart Institute Foundation, the Women's Heart Health Program is participating in several national studies and local protocols that focus on women (see page 5).

COMMITMENT TO EDUCATION

The Women's Heart Health Program also sponsors a variety of educational sessions around the region for women and health care providers. "We feel that educating people about women's heart health is one of the most important services we can provide," said Grey. This year, seminars focusing on women's heart health have been held in 12 locations throughout Minnesota and Wisconsin.

A weekly women's-only cardiac support group is held at the Minneapolis Heart Institute® to provide information, encouragement, camaraderie and support to women with heart disease. "As treatment advancements have trimmed the hospital length of stay, there is less time for education and support in the hospital. It also takes time to assimilate information and adopt new behaviors that will alter coronary risk factors," said Grey. The support group helps to address these needs.

The Women's Heart Health Program at the Minneapolis Heart Institute® in conjunction with the Mayo Clinic and the University of Minnesota is also hosting a summit conference on April 29, 2010: Eliminating Untimely Deaths of Women from Heart Disease. The summit is designed to help chart the next steps in addressing the needs of women with heart disease and improving women's cardiac care (see sidebar).

CHALLENGES FOR PRIMARY CARE

Grey believes that involving primary care physicians in finding solutions is critical because many of the challenges in caring for women with heart disease occur in the primary care setting. "One thing we and others have noticed is that the typical risk profile – the Framingham Risk Score – does not always accurately identify risk levels in women," she said. "The greatest challenge is deciding who is at risk before an event occurs, and this remains an important issue for primary care physicians as well as cardiologists."

Elizabeth Grey, MD

Also, because women with heart disease have atypical symptoms more often than men, they may not notice or bother to report symptoms that may be significant. "People think they are supposed to be feeling pain before they worry about their hearts. I ask about exertional shortness of breath and whether there has been a sudden change in exercise tolerance. Another symptom might be chest pressure or heaviness with exertion. Often women will say, 'It's just an ache that I hardly notice.' But these are indications that further tests may be needed," said Grey. "Often it is what people don't report or pay much attention to that is important in terms of heart disease."

Women's Heart Health Program Current Research

Lite HEARTEN Study

Psychosocial stress is a significant risk factor for coronary artery disease (CAD). This study examines the effects of two interventions on the stress responses and vascular functioning of women with documented heart disease as well as on other subclinical markers of CAD. Subjects will be randomly assigned to one of three intervention groups: mindfulness-based stress reduction, aerobic exercise or the control group. The study is currently enrolling patients. (Ruth Lindquist, PhD, principal investigator).

Stress Cardiomyopathy

Broken heart syndrome, or Tako-tsubo cardiomyopathy, is characterized by acute reversible left ventricular systolic dysfunction triggered by an emotionally or physically stressful event and occurs most frequently in post-menopausal women. Scott Sharkey, MD, has extensive knowledge in this area and has developed a database designed to study the cause and course of stress cardiomyopathy and to improve the care of patients with this condition. Women account for 97 percent of this population.

Women's Marathon Study

This study is a follow-up to the Minneapolis Heart Institute Foundation Marathon Study conducted by Robert Schwartz, MD. It will determine the effects of extreme fitness in women. It will compare female long distance runners for coronary artery status (plaque and stenosis) on a risk-adjusted basis with age and risk-matched controls from both sedentary and fitness activity groups who have never been significant runners. Multi-slice CT will be used to characterize the amount, severity and type of atherosclerotic lesions. The study is currently enrolling participants.

VIRGO Study

The Minneapolis Heart Institute Foundation is a participating center for this Yale University study: Variation In Recovery: Role of Gender on Outcomes in Young AMI Patients. Despite perceptions that young women are protected from heart disease, it is one of the leading causes of death in women 55 years and younger. Building on more than a decade of work studying gender differences in heart disease, this landmark multi-site study will enroll 2,000 young women and 1,000 men for comparison. As the largest, most comprehensive investigation of young women with heart attacks, VIRGO will identify key determinants of recovery and assist in improving care in this population. (Norma Thiessen, MD, principal investigator)

For more information about these and other studies or to refer a potential participant, call the Minneapolis Heart Institute Foundation at 612-863-3833.

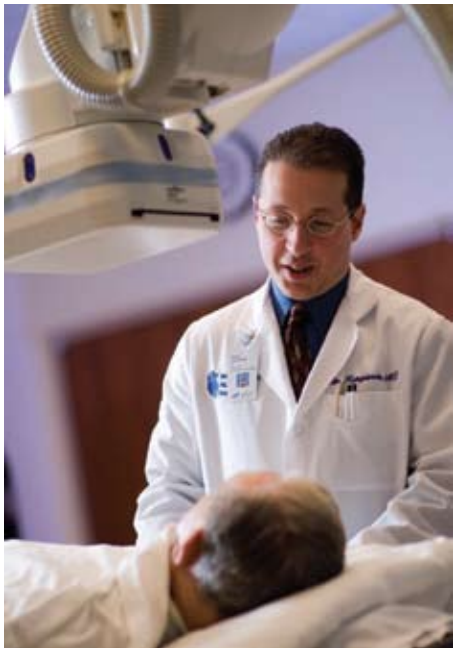
The Summit: Eliminating Untimely Deaths of Women from Heart Disease

Save the Date: April 29, 2010

Marquette Hotel – Windows on Minnesota, Minneapolis, Minn.

Join professionals from around the country and honorary guest Mary Pawlenty, first lady of Minnesota, for dialogue and planning to improve women's heart health and cardiac care. Nanette Wenger, MD, professor of Medicine in the Division of Cardiology at Emory University School of Medicine, will deliver the keynote address. Moderator-led panel discussions will focus on four key areas that are considered critical to improving women's heart health, including screening and prevention, symptom recognition and delays in seeking treatment, the gender gap in survival and ongoing management. The summit is intended to serve as a call to action for providers, researchers and other stakeholders in the design and delivery of women's health care. For more information call 612-863-3816.

Genetic Arrhythmia Center Offers Systematic Approach to Treat Rare Conditions



William Katsiyiannis, MD

A new program at the Minneapolis Heart Institute® is offering hope for families who have many questions but few answers. It is also giving researchers a unique opportunity to study several genetic disorders that are not well understood and for which treatment remains uncertain.

The Genetic Arrhythmia Center, led by William Katsiyiannis, MD, an electrophysiologist at the Minneapolis Heart Institute®, was created last year with support from the Minneapolis Heart Institute Foundation and private donors. It serves patients and families who are affected by rare genetic conditions like long QT syndrome, arrhythmogenic right ventricular dysplasia, Brugada's syndrome, left ventricular noncompaction and catecholamine-induced polymorphic ventricular tachycardia.

These disorders can lead to sudden cardiac arrest and death, but they are often undetected until a life-threatening event occurs. Furthermore, the conditions are so rare that the average cardiologist may see only a few cases of each disorder throughout his or her career – and most cardiologists do not have the resources to coordinate the extensive testing and follow-up that are required when a family is affected by a complex genetic disorder.

Growing frustration with the lack of guidance in treating such disorders led Katsiyiannis and his colleagues to seek funding to develop a systematic approach for screening, diagnosis and treatment.

The Genetic Arrhythmia Center is modeled after the Minneapolis Heart Institute Foundation's Hypertrophic Cardiomyopathy (HCM) Center, which was started by Barry Maron, MD, an internationally known expert on HCM.

Similar to the HCM Center, the Genetic Arrhythmia Center will gather information about patients and family members and determine over time how best to treat them. It brings together experts from several areas who are dedicated to improving outcomes, including electrophysiologists, cardiologists, imaging specialists, a genetic counselor and clinical nurse specialists. "The clinical nurse specialists are the backbone of the program," said Katsiyiannis. "It's not uncommon for them to work with several siblings, children, aunts, uncles and cousins with multiple last names who are spread out across the country. The structure of the Center allows us to track a great deal of information that otherwise would be unavailable."

Katsiyiannis noted that the Genetic Arrhythmia Center benefits from the clinical resources available at the Minneapolis Heart Institute® and Abbott Northwestern Hospital. "We have a symbiotic relationship with many of the other programs," he said. "Because of programs like Cool It, we have people surviving these events who otherwise might not have survived. Among those survivors are people who we have subsequently diagnosed with a genetic arrhythmia disorder. This has led to screening and follow-up with other family members and in some cases, recommending a defibrillator."

Katsiyiannis said that the Center is quickly becoming known as a resource when there is a sudden, unexplained death due to cardiac arrest. "I think that is a credit to our group of physicians as well as an indication of the need. We have family members coming to us who have no answers. We're here to help them find some answers and to prevent a life-threatening event from occurring in any other family members."

When to consider a referral to the Genetic Arrhythmia Center:

- Family medical history includes an unexpected, sudden death before age 40 (including unexplained car accidents or drownings)
- Fainting episodes (syncope) during or immediately after physical activity, or as a result of emotional excitement or distress.

For more information, call the Genetic Arrhythmia Center at 612-775-3905.

Get Timely Clinical Updates Via Email

The Minneapolis Heart Institute® is building an email list for those interested in receiving timely clinical information and helpful educational materials for patients on topics like Plavix-PPI interaction, a case of the week discussion and the use of fish oil in managing cardiovascular risks. Your address will not be spammed or shared. If you are interested in being added to the Minneapolis Heart Institute® email list, please send a blank e-mail with MHI™ as the subject line to info@mplsheart.com.

Cardiac Device Registry Expanding Its Scope

Robert Hauser, MD

Researchers at the Minneapolis Heart Institute Foundation are preparing to expand the scope of a one-of-a-kind independent cardiac device registry.

The Multicenter Registry was started in 1998 by Robert Hauser, MD, a cardiologist at the Minneapolis Heart Institute®. The Registry began collecting failure data on pacemakers and implantable defibrillators from nine centers. "Our initial thought was to provide an early warning system on device failure and this has proven to be exactly what we have done," said Hauser.

The Registry has been used to track the performance of batteries in pacemakers and defibrillators and to characterize the ways in which the leads connecting the device to the heart can fail. It has also been instrumental in the recall of cardiac devices and in a recent legal case involving faulty defibrillators.

Currently, 15 centers participate in the Registry. It is unique among device registries because participation is voluntary, and it focuses specifically on device failure. The Registry contains information on 7,500 devices, including 4,000 pacemakers/pacemaker leads and 3,500 defibrillators.

"The value of this registry is that it helps us better manage the care of our patients. We know more about what's going on with these devices after implantation than anyone else, including the manufacturers and the Food and Drug Administration," said Hauser.

Members of Registry can search the database and information is made available to other researchers by request. In addition, the Registry submits papers and abstracts for publication and presentation at national and international scientific meetings.

A recent $1 million grant will help to fund further study about the use of cardiac devices and expand the Registry's scope to include information about all devices implanted at the participating centers, not just the faulty devices. "The deficiency in the Registry is that we have the numerator but we don't know the denominator," said Hauser. "We'll be able to look at not only device complications, but clinical complications and that may help us improve surgical procedures."

For more information, visit www.pacerandicdregistry.com or email rhauser747@aol.com.

PARTICIPATING CENTERS

- Minneapolis Heart Institute®
- Montefiore Medical Center
- University of Alabama
- Mayo Clinic
- San Pedro Peninsula Hospital
- Eastern Heart Institute
- Winthrop-University Hospital
- Marshfield Clinic
- Milton S. Hershey Medical Center
- Grey Nuns Hospital
- Good Samaritan Hospital
- University Hospital at Stony Brook
- University of British Columbia
- University of Southern California
- Newark Beth Israel Medical Center

New Physicians at the Minneapolis Heart Institute®

Raed H. Abdelhadi,MD, is a cardiac electrophysiologist who joined the electrophysiology group at the Minneapolis Heart Institute® in August. Abdelhadi completed a cardiac electrophysiology fellowship and cardiovascular medicine fellowship at the University of Pittsburgh Medical Center. He completed a research fellowship in clinical electrophysiology as well as an internal medicine residency at the Cleveland Clinic Foundation in Cleveland, Ohio. He earned his medical degree at the University of Jordan in Amman, Jordan.

David S. Feldman, MD, PhD, joined the Minneapolis Heart Institute® in June and is the new medical director of the Heart Failure, VAD and Cardiac Transplant program. Previously Feldman was the director of the Heart Failure and Cardiac program at the Ohio State University Medical Center. He received his doctorate of Philosophy and Medicine from the Medical College of Georgia. His cardiology fellowship was completed at Barnes-Jewish Hospital, Washington University School of Medicine in St. Louis, Mis. Feldman was an assistant professor of medicine and cardiology at the Medical University of South Carolina before moving to the Ohio State University.

Nada B. Memon, MD, is a cardiac electrophysiologist. She joined the electrophysiology group at the Minneapolis Heart Institute® in August. Memon completed fellowships in electrophysiology and cardiology/electrophysiology at Washington University in St. Louis, Mo., and a cardiology fellowship at the University of Texas Southwestern Medical Center. She is also board certified in internal medicine, completing her residency at Washington University. Memon earned her medical degree at the University of Alabama.

Minneapolis Heart Institute®

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CME Events 2009 & 2010

Evenings of Cardiology in 2009
Thursday, Nov. 5: Northfield, Minn.
Thursday, Nov. 19: Crosby & Aitkin, Minn.
For information: 612-863-7032 or email lisa.wahl@allina.com

Emergency Cardiac Resuscitation Conference
Miracle on Ice: Therapeutic Hypothermia for Cardiac Arrest Patients
Thursday-Friday, Dec. 3 &4: Marriott Minneapolis Airport
For information and to register: www.mplsheart.com/miracleonice/

The Summit: Eliminating Untimely Deaths of Women from Heart Disease
Thursday, April 29: Marquette Hotel – Windows on Minnesota
Minneapolis, Minn.
For more information: 612-863-3816.