# HeartWATCH

SUMMER 2008

A Newsletter Produced by the Texas Heart Institute

Texas Heart® Institute

*at St. Luke's Episcopal Hospital*

# Appropriateness Criteria Set New Standards for Transthoracic and Transesophageal Echocardiography Usage

**Abstract:** Recent recommendations, made by the American College of Cardiology Foundation, American Society of Echocardiography, and other professional groups, give valuable guidance for echocardiography usage.

Transthoracic echocardiography (TTE) and transesophageal (TEE) echocardiography (cardiac ultrasound) are the most widely used imaging modalities for evaluating cardiac structure and function. One advantage of TTE and TEE is that they provide comprehensive diagnostic information and pose little risk, because they do not use ionizing radiation. However, physicians should not order TTE/TEE studies without an adequate reason.

"There are many common clinical scenarios in which an initial echocardiogram is indicated and improves patient management decisions. However, in some common clinical situations, particularly in cases of repeat examinations, the echocardiogram may not be needed," says Raymond Stainback, MD, FACC, FASE, medical director of Noninvasive Cardiac Imaging at the Texas Heart Institute at St. Luke's Episcopal Hospital.

"Inappropriate usage of TTE/TEE can subject patients to unnecessary initial and follow-up testing," he explains. "Echocardiography has become very widely available and is a safe and powerful imaging modality that unquestionably improves patient care, particularly in rapidly changing clinical situations. However, each exam requires a significant commitment of technical resources and personnel. Inappropriate usage of TTE/TEE can limit the availability of resources for patients who really need these procedures."

"The popularity of these tests and the related increases in imaging volume have led to greater scrutiny by third-party payers, as well as growing concerns about reimbursement within the medical community," adds Dr. Stainback. "Currently, Centers for Medicare & Medicaid Services reject about a quarter of the services they process, often because those services, rightly or wrongly, are deemed unnecessary."

To resolve these issues, an Appropriateness Criteria Review Group recently studied TTE and TEE usage. The group then established guidelines to help ensure high-quality TTE/TEE for all patients who need it, while avoiding unnecessary use of this technology.

*"The majority of physicians who order TTE or TEE are not cardiologists," says Dr. Stainback. "The new criteria will increase their confidence that they are selecting this test for appropriate reasons and will alert them to instances in which the procedure may not be necessary."*

The review, which was sponsored by the American College of Cardiology Foundation, the American Society of Echocardiography, and other key specialty and subspecialty societies, identified 59 common scenarios in which a physician might consider ordering TTE/TEE. Although not intended to be fully comprehensive, the scenarios encompassed most aspects of contemporary clinical practice in adult patients. Using a scale of 1 to 9, in ascending order of appropriateness, reviewers (who represented a broad base of ordering physicians or "stake holders") then rated the wisdom of ordering TTE/TEE in each instance.

The review group deemed TTE/TEE appropriate in 44 of the 59 scenarios, inappropriate in 14 scenarios, and of uncertain value in 1 scenario. In some of the "appropriate" scenarios, the reviewers concluded that echocardiography may be underutilized.

Dr. Stainback was a member of the Appropriateness Criteria Writing Group that formulated the test indications and published the reviewers' conclusions. "These conclusions were based on current understanding of the technical capabilities of the imaging modalities examined and their clinical impact," he explains. "The resulting criteria address a broad range of clinical situations in which TTE/TEE might be used for patients with cardiac arrhythmias, hypertension, stroke, heart valve disease, or congenital heart disease."

In general, the Appropriateness Criteria Review Group endorsed the use of TTE/TEE for initial evaluation of cardiac structure and function. Routine repeat echocardiographic testing and general screening were viewed less favorably.

The American Society of Echocardiography has approved the new criteria. By promoting appropriate standards that will help prevent overuse of TTE/TEE, the society's endorsement should have a positive effect on usage and reimbursement.

"The majority of physicians who order TTE or TEE are not cardiologists," says Dr. Stainback. "The new criteria will increase their confidence that they are selecting this test for appropriate reasons and will alert them to instances in which the procedure may not be necessary."

The TTE/TEE Appropriateness Criteria can be found online, in a downloadable PDF format, at asecho.org/freepdf/AppropriatenessDocument.PDF. ●

## For more information:

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# Patient Receives Allogeneic Mesenchymal Precursor Cells to Treat Acute Myocardial Infarction

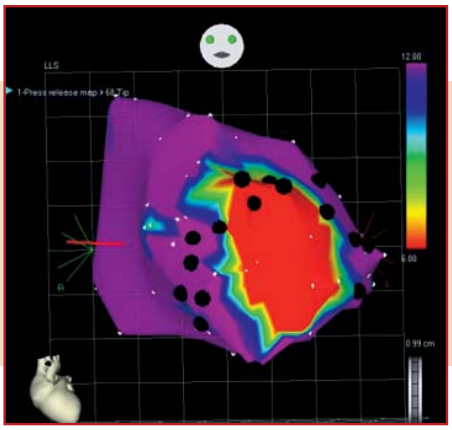
**Abstract:** Researchers at THI at SLEH have begun a clinical trial using allogeneic mesenchymal precursor cells to treat acute myocardial infarction.

**A phase II trial** using allogeneic mesenchymal precursor cells (MPCs) to treat acute myocardial infarction (AMI) is currently underway at the Texas Heart Institute at St. Luke's Episcopal Hospital (THI at SLEH). The trial is being led by Emerson C. Perin, MD, PhD, medical director of the Stem Cell Center, director of New Cardiovascular Interventional Technology, and director of Clinical Research for Cardiovascular Medicine at THI at SLEH. The trial is being co-directed by James T. Willerson, MD, president elect and medical director, director of Cardiology Research, and co-director of the Cullen Cardiovascular Research Laboratories at THI at SLEH, and president of The University of Texas Health Science Center at Houston.

Mesenchymal precursor cells are derived from the bone marrow, have a high degree of plasticity, and secrete several cytokines. These favorable properties have led to an interest in the use of MPCs in cardiac repair. In preclinical studies, Dr. Perin's group showed that allogeneic MPCs injected into the myocardium after AMI in dogs were safe, increased vascularity, and improved cardiac function (*J Mol Cell Cardiol* 2008;44:486-95).

The first person ever to receive allogeneic MPC treatment was a 65-year-old man admitted to THI at SLEH in April 2008 for an AMI. The patient underwent angioplasty, then received the allogeneic MPCs 10 days later. Ten days is a critical point because the heart tissue is no longer inflamed and scar tissue has not yet formed.

According to Dr. Perin, "This is the first time we have been able to inject cells directly into the damaged area shortly after a heart attack." The cells are applied to the border zone of the damaged area so that healing occurs from the outside inward, preventing expansion of the ischemic area and worsening of heart function. Dr. Perin hopes that the MPCs will also prevent programmed cell death of the cardiac myocytes and dilation of the left ventricle. Dr. Willerson anticipates that the MPCs will develop into additional heart tissue and blood vessels, thereby leading to repair of the damaged areas.



Electromechanical map of the heart of the first patient enrolled in the trial. Note the black dots (cell injection sites) encircling the red area of recent myocardial infarction.

For the study, the THI investigators will use stem cells provided by Angioblast Systems, Inc. (New York, NY), a company that has developed a method for separating the MPCs from the bone marrow and for producing a highly concentrated population of cells by using monoclonal antibodies that bind unique markers to the surface of the MPCs. The cells in the THI study are obtained from allogeneic, or unrelated, donors; because of their special immunomodulating properties, allogeneic MSCs do not activate the recipient's immune system.

The US Food and Drug Administration recently approved the THI trial for studying the safety and feasibility of transendocardial delivery of allogeneic MPCs in patients with a recent AMI. Three different cell doses (25, 75, or 150 million) will be injected into the ischemic myocardium by means of an electromechanical mapping (EMM) system and a special femoral artery catheter. The EMM system will identify ischemic but viable myocardium into which the MPCs will be injected (*see Figure*). The first cohort will receive the lowest dose. If that dose is safe, the next cohort will receive the medium dose, and, finally, the third cohort will receive the highest dose. The patients in the control group will receive the standard care for AMI. Drs. Perin and Willerson will assess the cells' ability to promote healing and will determine the most effective MPC dose.

Both physicians stress the potential importance of stem cell therapy, especially for patients with severe cardiovascular disease and few satisfactory treatment options. ●

## For more information:

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## Contents

# Two Grateful Patients Visit the Surgeon Who Pioneered the Operation That Saved Their Lives 50 Years Earlier

**Abstract:** Fifty years after devising a successful open heart operation for correcting supracardiac TAPVR, Dr. Cooley was visited by the first 2 patients to have undergone the operation.

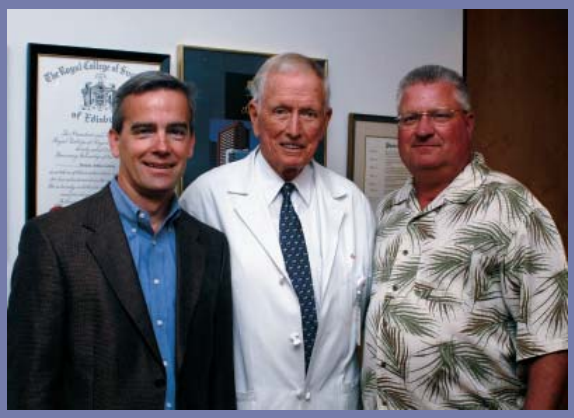
**Total anomalous** pulmonary venous return (TAPVR) accounts for 1% to 2% of all congenital heart defects. This disorder is classified in 3 categories: supracardiac, in which the pulmonary veins drain into the right atrium via the superior vena cava; cardiac, in which the pulmonary veins come together behind the heart and then drain into the right atrium through the coronary sinus; and infracardiac, in which the pulmonary veins drain into the right atrium via the hepatic veins and inferior vena cava. Before surgical repair techniques were developed, 80% of patients born with TAPVR died within their first year. Today, the mortality rate for patients with TAPVR uncomplicated by pulmonary obstruction is less than 5%.

In July 1957, Denton A. Cooley, MD, currently president and surgeon-in-chief of the Texas Heart Institute at St. Luke's Episcopal Hospital (THI at SLEH), performed the first successful correction of supracardiac TAPVR by using cardiopulmonary bypass with a transatrial right and left atrial approach and an open anastomosis. The patient was a 6-month-old boy who weighed 10 pounds at the time of surgery. In January 1958, Dr. Cooley repeated his successful TAPVR operation in a second patient, a 4-month-old boy who weighed 11 pounds, 7 ounces.

Until that time, other teams had successfully repaired non-supracardiac TAPVR by using general body hypothermia, temporary cardiac inflow occlusion, and an atrial-well technique. However, until Dr. Cooley's use of cardiopulmonary bypass in these cases, there had not been a successful open heart surgical repair of supracardiac TAPVR. Partial repair had been the only treatment available.

In May 2008, Dr. Cooley's former patients, now 50 years old, both came to visit him at THI. The parents of the 2 patients had remained in contact for several years after their sons' operations. On February 28, 2008, one of the former patients accompanied his mother to a Texas Children's Hospital event called "An Evening with a Texas Legend," at which Dr. Cooley was the featured honoree and Larry King was the honorary host interviewer. Afterward, the patient did a quick Internet search and found the other man who had undergone the TAPVR procedure. The 2 men decided to visit Dr. Cooley to thank him for his successful surgical innovation.

"I am especially gratified to have seen these men," says Dr. Cooley. "They were the first and second patients in my professional experience who required surgical repair of supracardiac TAPVR. I am proud that I was able to contribute to the surgical treatment of this anomaly." ●



The first 2 patients to have undergone Dr. Cooley's groundbreaking total anomalous pulmonary venous return operation visit with him 50 years later.

### For more information:

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## HeartMate II LVAS Is Approved as a Bridge to Transplantation

The United States Food and Drug Administration has approved the HeartMate II Left Ventricular Assist System (LVAS) (Thoratec Corp, Pleasanton, Calif) as a bridge to transplantation in patients who have advanced heart failure. The device is the first continuous flow LVAS approved for this purpose in the United States. The Texas Heart Institute at St. Luke's Episcopal Hospital (THI at SLEH) was one of 44 centers in the country to participate in the clinical trials of this pump. Since 2003, THI at SLEH has successfully implanted 77 HeartMate II devices—more than have been implanted by any other heart center. "It's a good pump," says O.H. Frazier, MD, chief of Cardiopulmonary Transplantation and director of Cardiovascular Surgical Research at THI at SLEH. "The pump is durable and reliable, and implanting it is much less complicated than implanting larger, pulsatile pumps. This smaller, continuous flow device allows patients to recover more quickly and experience less pain."

# Potentially Dangerous Weight-loss Supplements Are Easily Obtained via the Internet

**Abstract:** Researchers at THI at SLEH have found that many herbal weight-loss supplements that are easily found and purchased on the Web contain ingredients associated with serious adverse cardiac effects.

As the prevalence of obesity in the United States continues to rise, so does public demand for weight-loss products. These include herbal supplements that are marketed on the Internet as weight-loss aids. Because these supplements are not classified as drugs, they are not regulated by the US Food and Drug Administration (FDA) and can be obtained without a medical consultation or prescription, even though some supplements contain substances (mainly stimulants) that may threaten users' cardiovascular health.

To determine the extent of this problem, research scientist Mehdi Razavi, MD, postdoctoral research fellow Alireza Nazeri, MD, and their colleagues at the Center for Cardiac Arrhythmias and Electrophysiology at the Texas Heart Institute at St. Luke's Episcopal Hospital used a systematic search algorithm with 3 popular Internet search engines (Google, Yahoo, and MSN) to locate and purchase 12 weight-loss supplements. The researchers examined the packages, labels, and inserts that came with each supplement, recorded the listed ingredients, and then searched 2 databases—Medline and the Natural Medicines Comprehensive Database—using as search terms the name of the ingredient and, sequentially, the terms "cardiac arrhythmias," "ventricular fibrillation," "ventricular tachycardia," "myocardial infarction," "cardiac arrest," and "death."

"We found that 8 of the 12 supplements we purchased contained 1 or more ingredients that are associated with at least 1 report of life-threatening cardiac effects, including bitter orange, *Camellia sinensis* (tea plant), Korean ginseng, licorice root, buckwheat, caffeine anhydrous, and guarana," says Dr. Razavi. "One product contained ma huang, or Chinese ephedra, even though the FDA banned the US sale of ephedra-containing supplements in 2004 because of their cardiovascular effects."

Dr. Nazeri adds, "None of the websites, packages, or package inserts contained any warnings about the potential dangers posed by these ingredients. Furthermore, some ingredients were referred to by different names on different product labels. For example, the names 'bitter orange,' '*Citrus aurantium*,' and 'synephrine HCl' appeared on different labels, even though they refer to the same substance. The lack of standardized nomenclature can make it harder for consumers to understand what they are getting when they buy weight-loss supplements."

> *"Consumers need to know that many of these products contain substances or combinations of substances that can threaten their health."*

Drs. Razavi and Nazeri hope that their findings will promote efforts to educate the public about the potential dangers of using herbal weight-loss supplements.

"We had no trouble finding these products and obtaining them—even the one containing ephedra—by mail order," says Dr. Razavi. "Consumers need to know that many of these products contain substances or combinations of substances that can threaten their health." ●

**For more information:**

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## Denton A. Cooley, MD, Inducted Into Michael E. DeBakey International Surgical Society

On May 2, 2008, Denton A. Cooley, MD, was inducted into the Michael E. DeBakey International Surgical Society during the Society's 17th Congress. At the ceremony, Dr. DeBakey acknowledged Dr. Cooley's considerable contributions to cardiovascular surgery. "I don't think I could have done it without Dr. Cooley; in fact, I know I couldn't," said Dr. DeBakey. One week earlier, Dr. DeBakey had received the Congressional Gold Medal, Congress' highest civilian award. Dr. Cooley attended the ceremony in Washington DC. In October 2007, Dr. DeBakey was inducted into the Denton A. Cooley Cardiovascular Surgical Society at that group's 15th International Symposium.

# GenTAC Registry Will Improve Clinical Management of Genetically Induced Thoracic Aortic Aneurysms

**Abstract:** The GenTAC registry has been established as a source of data and specimens for optimizing the management of genetic thoracic aortic aneurysms.

## Thoracic aortic aneurysms

(TAAs) can cause life-threatening complications, ranging from aortic dissection and rupture to heart failure. Caused by degeneration of the elastic fibers in the vessel wall, TAAs often have a genetic basis, especially in younger patients. Despite medical advances, optimal methods for identifying and treating genetically induced TAAs have not been defined.

To facilitate a comprehensive study of genetic TAAs, the Genetically Triggered Thoracic Aortic Aneurysms and Cardiovascular Conditions (GenTAC) national registry has been established to gather data and specimens from patients who have genetic conditions related to TAAs. The registry collects clinical and outcome data from patients with thoracic aortic aneurysms, dissections, and related cardiovascular conditions that have a known or suspected genetic cause. It processes and stores tissue and blood samples, analyzes data, and supports the research of GenTAC investigators.

The National Heart, Lung, and Blood Institute, the National Institute of Arthritis and Musculoskeletal and Skin Diseases, the National Marfan Foundation, and the Ehlers-Danlos National Foundation have recently partnered to fund longitudinal, observational cohort studies using the GenTAC registry. Patients are enrolled in the GenTAC registry from 5 regional centers in the United States, including the University of Texas at Houston/Baylor College of Medicine center, led by Dianna M. Milewicz, MD, PhD, director of the division of Medical Genetics at the University of Texas Medical School at Houston. With an expected enrollment of more than 2800 patients from throughout the United States, the study group will comprise a heterogeneous population of adults and children with inherited TAA disorders (*see Table*). Each patient is assigned a unique identifier to ensure privacy and is asked to provide a family history, a blood or saliva sample, and surgical tissue specimens, when appropriate. For most patients, follow-up evaluations will be conducted every 2 years for the duration of the 5-year study.

### Conditions that qualify patients for inclusion in the GenTAC registry

- Marfan syndrome
- Turner syndrome
- Ehlers-Danlos syndrome
- Loeys-Dietz syndrome
- Shprintzen-Goldberg syndrome
- Mutations in genes for fibrillin 1, transforming growth factor-β receptors, β-myosin heavy chain, or smooth muscle cell α-actin
- Aneurysms or dissections of the thoracic aorta
  - with bicuspid aortic valve
  - with a family history of aneurysm and dissection of the aorta
  - with other congenital heart disease (eg, tetralogy of Fallot, coarctation)
  - not due to trauma in patients aged 50 years or younger

"Using data from the registry, GenTAC investigators will have a unique opportunity to systematically correlate genetic, biologic, and clinical data with outcome data to generate a broad knowledge base in multiple areas of thoracic aortic disease," says Scott A. LeMaire, MD, a cardiovascular surgeon at the Texas Heart Institute at St. Luke's Episcopal Hospital and an associate professor and director of research in the Division of Cardiothoracic Surgery at Baylor College of Medicine. Dr. LeMaire serves as the principal investigator at the GenTAC site at Baylor.

The GenTAC investigators will study a wide range of topics, including criteria for diagnosis and possible drug combinations for treatment. Studies will also focus on anatomic predictors of dissection and on factors that affect outcome. Searching for molecular markers of prognostic significance, the investigators will study products of degradation and inflammation, such as C-reactive protein. To optimize patient care, they will examine phenotypic and anatomic indicators for interventional therapy, as well as differences in procedural indications and outcomes among patients with various genetic conditions that trigger TAAs.

Outside investigators studying ancillary topics that do not significantly overlap with those of GenTAC investigators will have access to the registry. In addition to using GenTAC specimens and clinical data, outside investigators may request supplemental data or additional samples for their related studies.

"The GenTAC registry will be an invaluable resource for promoting a basic understanding of genetically based TAAs and will lead to the development of optimal methods for diagnosing and treating patients with heritable aneurysms," says Dr. LeMaire. ●

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# New Insights Further the Understanding of Left Ventricular Apical Ballooning (Takotsubo Syndrome)

**Abstract:** By reproducing LV apical ballooning in the cardiac catheterization laboratory, a cardiologist at THI has found evidence that multivessel spasm may be the mechanism responsible for this disorder.

Left ventricular apical ballooning (LVAB), or takotsubo syndrome, is a puzzling condition characterized by transient, severe weakness of the apical portion of the heart muscle despite the presence of "normal" coronary arteries. The typical LVAB patient is a postmenopausal woman with sudden-onset chest pain, severe myocardial dysfunction, and ischemic electrocardiographic changes suggestive of a classic heart attack. However, a heart attack is typically caused by progression of a partial atherosclerotic blockage to a total coronary occlusion. In contrast, early after the onset of LVAB, angiography shows no coronary blockage.

Because LVAB is usually preceded by physical stress or an emotional shock, it is sometimes called stress cardiomyopathy or "broken heart" syndrome. It may lead to shock or pulmonary edema, resulting in death in 2% of cases. However, most patients recover spontaneously within 4 weeks and have no irreversible myocardial damage; the late prognosis is good, and the recurrence rate is about 10%.

Left ventricular apical ballooning was originally described by Japanese physicians, who thought the bulging left ventricle resembled an octopus trap (takotsubo). However, the syndrome is being increasingly encountered in Europe and the United States. Of patients diagnosed with a heart attack, about 2% of men and 12% of women may instead have LVAB. Because agents normally used to treat a heart attack (vasopressors, β-blockers, thrombolytic agents, and anticoagulants) may be contraindicated in LVAB, physicians need to be familiar with the syndrome and its management.

The mechanism of LVAB is poorly understood. Recently, however, Paolo Angelini, MD, a cardiologist at the Texas Heart Institute at St. Luke's Episcopal Hospital (THI at SLEH), provided new insights into this syndrome. He described the spectrum of presentations of LVAB and his initial experience with acetylcholine challenge testing in 4 patients (*Catheter Cardiovasc Interv* 2008;71:342-52). In 3 patients, the test provoked symptoms and electrocardiographic changes suggestive of LVAB and extreme spasm of all the coronary branches; in 1 patient, echocardiography documented acetylcholine-induced apical ballooning. Intracoronary nitroglycerin resolved the symptoms, spasm, and ballooning.

"Researchers have theorized that the mechanism of LVAB involves a transient, clot-related coronary occlusion, a multivessel coronary spasm, a microcirculatory dysfunction, or a direct myocyte injury," says Dr. Angelini. "Our clinical experience provides substantial evidence that LVAB is due to severe multivessel spasm in patients who have a variable degree of endothelial dysfunction and who are exposed to stressors of various kinds and intensities."

"In some cases, sudden stress causes large amounts of catecholamines (mainly epinephrine) to be released into the bloodstream," he continues. "Occasionally, the levels of these stress hormones may be up to 34 times greater than normal. By means of direct myocardial toxicity, they may induce a temporary stunned state. However, heightened catecholamine levels are a rare cause of LVAB. Typically, the levels are mildly elevated or normal in this condition."

Dr. Angelini recently discovered the mechanism of an LVAB variant that involves severe midcavity dilatation with preserved apical contractility. "Like typical LVAB," he explains, "this variant was reproducible by acetylcholine testing. Unlike typical LVAB, however, the midcavity variant seems to predominantly involve extreme spasm of the diagonal, ramus, and circumflex branches, and, only to a much lesser extent, of the left anterior descending artery's territory."

Moreover, certain similarities exist between LVAB and Prinzmetal angina. In the latter condition, a spasm occurs in a single coronary artery but does not last long enough to cause myocardial stunning. In both conditions, recurrence may be better prevented by calcium antagonists and nitrates than by other cardiovascular agents.

Some researchers believe that LVAB is part of a spectrum of related clinical entities that have a common pathophysiology. Clarification of this hypothesis awaits further testing. Meanwhile, Dr. Angelini's findings have shed new light on the possible mechanism of this puzzling syndrome. ●

### For more information:

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## Texas Heart Institute Awarded NIH Grant for New Artificial Heart

On June 12, 2008, the Texas Heart Institute (THI) was awarded a prestigious $2.8-million grant from the National Institutes of Health to support the development of a new total artificial heart. In this ground-breaking research, Dr. O.H. Frazier will lead an outstanding team of heart specialists from THI, MicroMed Cardiovascular, Inc. (Houston, Tex), the University of Houston, and Rice University.

The new artificial heart will comprise 2 small, continuous flow MicroMed® DeBakey ventricular assist devices, which will be implanted into calves. One pump will function as the left ventricle and the other pump as the right ventricle. While 1 pump circulates blood throughout the entire body, the other pump will provide blood flow to and from the lungs. An essential goal of this research is to find a way for the pumps to respond automatically to the body's changing needs for blood, as encountered during exercise.

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*Cover:* Artwork donated by the American Heart Association, for the Celebration of Hearts display in the Wallace D. Wilson Museum of the Texas Heart Institute at St. Luke's Episcopal Hospital—The Denton A. Cooley Building.

# Calendar of Events

## Texas Heart Institute Continuing Medical Education Symposia

### Eighth Texas Update in Cardiovascular Advancements
July 25–26, 2008 • Houston, Texas
Program Director: James T. Willerson, MD
Register online at: cme.texasheart.org

### Future Direction of Stem Cells in Cardiovascular Disease Satellite Symposium at American Heart Association Scientific Sessions
November 7, 2008 • New Orleans, Louisiana
Program Director: James T. Willerson, MD

## Selected Upcoming Local, National, and International Meetings

### European Association for Cardiothoracic Surgery
September 13–17, 2008 • Lisbon, Portugal

### American College of Surgeons 94th Annual Clinical Congress
October 12–16, 2008 • San Francisco, California

### American Society of Anesthesiologists Annual Meeting
October 18–22, 2008 • Orlando, Florida

### American College of Chest Physicians
October 25–30, 2008 • Philadelphia, Pennsylvania

### Southern Thoracic Surgical Association 55th Annual Meeting
November 5–8, 2008 • Austin, Texas

### American Heart Association Scientific Sessions 2008
November 8–12, 2008 • New Orleans, Louisiana

*For information about the Texas Heart Institute CME activities listed above, please e-mail cme@heart.thi.tmc.edu or call 832.355.2157. To view selected CME presentations and other physician resources online, visit cme.texasheart.org.*


For 17 consecutive years, the Texas Heart Institute at St. Luke's Episcopal Hospital has been ranked among the top 10 heart centers in the United States by *U.S. News & World Report*'s annual guide to "America's Best Hospitals."

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