



Cardiovascular Surgery Healing Enhancement Team: Promoting Healing After Heart Surgery



Thoralf M. Sundt III, MD

Many technological advances in cardiac surgery have led to rapid expansion of the field and enabled cardiac surgeons to extend and improve the quality of life for thousands of patients each year. The progress made in surgical techniques has reduced mortality rates for most cardiac procedures. While this progress continues, there is also the need to reflect on the impact of these procedures and interventions on the whole person. Optimal approaches to patient-centered care require a holistic view of each patient's experience and a focus on restoring the patient to wellness.

Recognition of the holistic needs of patients led to formation of a dedicated multidisciplinary team committed to developing a program focusing on all the needs of the patients in their return to wellness. This program functions under the moniker "Healing Enhancement." Initially, the aim of this program was to minimize the emotional and physical trauma of hospitalization by optimizing conventional care and offering integrative and complementary therapies. "As the program met with success, a broader calling has been recognized to aid in patients' general recovery, helping them achieve improved overall health through a truly transformational experience," says Thoralf M. Sundt III, MD, a cardiovascular surgeon at Mayo Clinic Rochester.

The team's initial focus was on the physical pain associated with surgery. Adequate opioid dosing and scheduling, including continuous infusions and patient-controlled analgesia, were important first steps. However, patients were also experiencing a great deal of musculoskeletal back and shoulder pain. A simple, low-risk intervention of therapeutic massage was introduced with a remarkable impact on patients' experience of pain and anxiety (Figure). There are many physiologic and psychological advantages of massage; human touch conveys a sense of caring during the recovery. As a logical extension of this experience, the Saint Marys Hospital (SMH) Auxiliary staff initiated a program of relaxing caring hand massage to patients and their families.

In addition to pain, patients are subjected to a great deal of stress and anxiety during and after hospitalization for heart surgery. The negative impact of stress, anxiety, and depression on recovery is well recognized. The Healing Enhancement team has begun exploring other complementary therapies and simple healing practices focused on reducing pain, stress, and anxiety with the aim of helping patients change their lifestyle patterns to improve health and wellness. Patients are exposed to simple interventions, such as guided imagery specific for successful surgery, which uses soothing music and gentle spoken words to convey images to guide patients through their surgical recovery. Guided-imagery CDs are provided preoperatively to help patients cope with stress and take an active role in their recovery. "This practice is supported by research demonstrating that specific guided-imagery CDs can decrease pain, anxiety, and length of hospital stay after cardiac surgery," says Dr Sundt.

The team has also been exploring the use of auditory interventions to improve the patient's experience. There have been numerous studies on the effects of music on hospitalized patients, and music has been used in the hospital environment on a limited basis. Music is a simple intervention that can help patients relax and not focus on other invasive noises in the hospital environment. With the help of the SMH Auxiliary Volunteers, high-quality CD players have been purchased for all patient rooms on

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Figure. Patient undergoing therapeutic massage.

Cardiovascular Surgery

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the cardiovascular surgery unit. Patients are encouraged to bring their own selections of music that have meaning to them; they are also provided with ambient music therapy created by Chip Davis of the musical ensemble Mannheim Steamroller, which is a unique combination of relaxing music and nature sounds.

Because stress has such an impact on the patient's and family's recovery and overall health and wellness, the team engaged educators from the Patient Education Center to create a program focused on giving patients and their families information on how to manage the effects of stress. The class has now taken on the name "Relieving Stress and Renewing Energy" and is offered twice weekly. A class entitled "Healing Movement," a combination of easy movements that increase balance and flexibility from teaching on tai chi, has been added recently. "The simple movements of tai chi are easy forms of exercise that can be done early after surgery until a patient is able to attend a formal cardiac rehabilitation program," says Dr Sundt.

In the past year, the team has focused on ameliorating the effects of sleep deprivation in the hospital. Again, simple interventions such as massage, music, eye masks, and ear plugs have been made available, in addition to imagery CDs for healthful sleep. The team is also exploring complementary approaches to preventing postoperative nausea and vomiting. In addition to medications that have been used for years, other measures such as acupuncture, acupressure, and dietary changes are being investigated through prospective randomized trials on the unit. Areas for future work include interventions—new ways of teaching dietary recommendations—to help patients improve their nutrition.

Finally, it is increasingly clear that caregivers cannot provide all the support needed by patients on their road back to health in the way that those who have been through the same experience can. Several interventions to bring patients into contact with others who have undergone heart surgery are under way in association with the local Coronary Club, regional Mended Hearts organization, and the SMH Auxiliary Volunteer group.

The Healing Enhancement program is being recognized as a focus of quality of care and an example of patient-centered care. The program has grown to provide a collaborative, evidence-based approach to basic integrative healing therapies. As studies continue on the interventions used and as their efficacy is validated, they will become part of the usual care for cardiovascular surgery patients. The concept of combining the best of evidence-based conventional care with the best of evidence-based integrative medicine practices recognizes the whole patient—mind, body, and spirit. "A focus on healing and wellness may well be the key to future medical management of cardiovascular disease and sustainable approaches to health care," says Dr Sundt.

Mayo Clinic Implements "A.C.T. Now" in Rochester School System

The Divisions of Pediatric Cardiology and Cardiovascular Diseases have launched a program to place automated external defibrillators (AEDs) in all Olmsted County, Minnesota, schools through A.C.T. (AED/CPR/Training) Now. By the end of 2008, AEDs will be in place and the program implemented in all schools. Regardless of the etiology of sudden cardiac death, the best chance of survival is prompt defibrillation. In contrast to most other programs of its kind, A.C.T. Now provides CPR training, follow-up event debriefings, compli-

ance testing, and quarterly competency assessments. Mary Christine Bjerke, RN, of Mayo Clinic Rochester is the program coordinator.

Not only students are at risk of sudden cardiac death within the school system. "Every day, 20% of our nation's population travels through a school. Older adults such as school employees and family members have higher risks of coronary disease and thus sudden cardiac death," according to Frank Cetta, MD, chair of pediatric cardiol-

ogy at Mayo Clinic Rochester. In addition to providing rapid defibrillation in those who suffer sudden cardiac death, the program will also provide vital training to students and teachers alike. "AEDs are appearing in many public venues. The training provided to students and staff in the A.C.T. Now program will make them more effective when a sudden cardiac death occurs inside or outside the school setting," says Dr Cetta.

Mayo Clinic Congenital Cardiac Care Has Global Range



Allison K. Cabalka, MD

Pediatric Cardiology

Frank Cetta, MD, *Chair*
 Michael J. Ackerman, MD, PhD
 Benjamin W. Eidem, MD
 Allison K. Cabalka, MD
 David J. Driscoll, MD
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Congenital cardiac defects are among the most common and, if untreated, the most lethal birth defects. Surgeons at Mayo Clinic Rochester pioneered the development of cardiac surgery for congenital heart disease, and over the past 50 years, diagnosis and treatment of congenital heart disease have been further refined. However, children with congenital heart disease in countries without access to health care professionals and technology have limited options for diagnosis and treatment—and survival.

“The irony is that, although congenital defects, if untreated, can severely curtail a child’s life, many defects, such as ventricular septal defects and tetralogy of Fallot, can be effectively treated with surgery,” says Allison K. Cabalka, MD, pediatric cardiologist at Mayo Clinic Rochester.

As a participant in the international Children’s Heart Project, Mayo Clinic Rochester provides corrective cardiac surgery to children who otherwise would not have access to treatment at home (Figure). The project currently operates in 4 countries: Mongolia, Kosovo, Honduras, and Uganda. Mayo Clinic staff travel to these countries to work with local health care providers to identify children who might benefit from cardiac surgery and to bring them, along with parents and translators, to Rochester.

“Many of the families we help come from remote villages. In Mongolia, some of the families are part of nomadic communities,” says Dr Cabalka. “The contrast between their lives at home and life in Rochester is shocking to them.”

The health care team helps shepherd the child and family through tests, examinations, procedures, and surgery. Local families volunteer to host the child, a parent, and a translator for the duration of

their stay at Mayo Clinic.

“It’s wonderful to be able to give these children the chance to live normal lives,” says Dr Cabalka. “For those of us on the medical team to help the families come through this journey, to see their gratitude, to know how happy they are, and to watch them go home with new hope are such a blessing.”

In addition to Dr Cabalka, Mayo Clinic Rochester physicians Benjamin W. Eidem, MD (pediatric cardiology), David J. Driscoll, MD (pediatric cardiology), and Joseph A. Dearani, MD, and Harold M. Burkhart, MD (cardiovascular surgery), participate in the Children’s Heart Project.

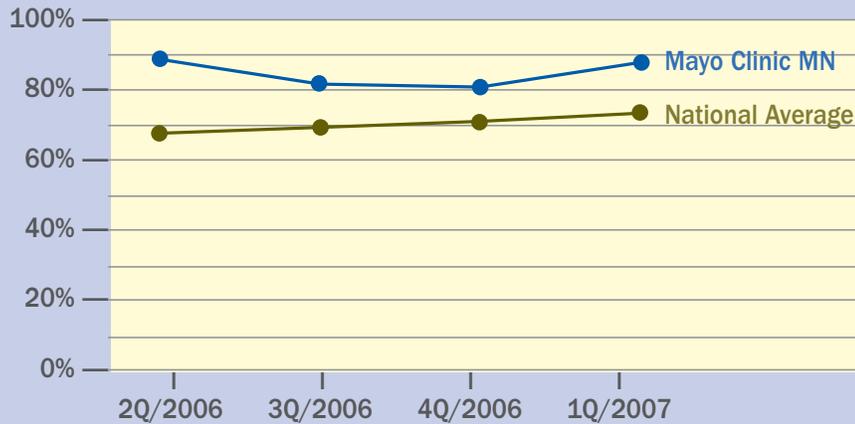


Figure. Dr Cabalka with a child who underwent one of the first transcatheter closures of her atrial septal defect in Mongolia (shown with her mother and a member of the nursing staff).



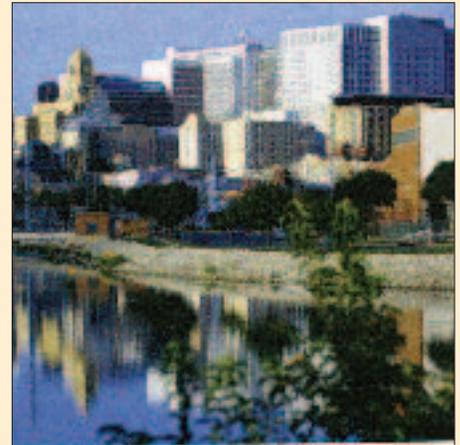
Questions for *Cardiovascular Update*, send us an e-mail to CVUpdate@mayo.edu.

Heart Failure Care 2006-2007



This graph displays the percentage of eligible Mayo Clinic Rochester patients diagnosed with heart failure in whom all mandated quality care measures were achieved. For more information, see the Mayo Clinic quality Web site at <http://www.mayoclinic.org/quality/quality-measures.html>.

RECOGNITION



For the fifth consecutive year, *Fortune* magazine has named Mayo Clinic to its list of the “100 Best Companies to Work For” in America, the magazine’s annual compilation of companies that “rate high with employees.”

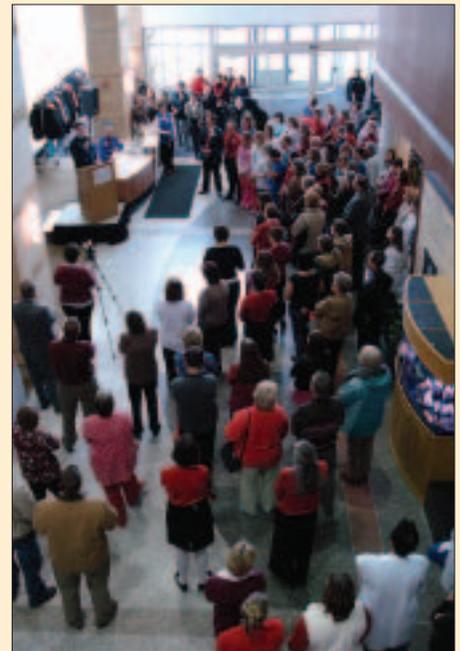
ENHANCE Trial Results Puzzling

The ENHANCE (Effect of Combination Ezetimibe and High-Dose Simvastatin vs Simvastatin Alone on the Atherosclerotic Process in Patients With Heterozygous Familial Hypercholesterolemia) trial results were recently released. The study used a very high dose of statin therapy (simvastatin, 80 mg) and compared it with that same statin dose with the addition of ezetimibe (simvastatin, 80 mg, plus ezetimibe, 10 mg, in the commercial preparation Vytorin) in 720 patients previously identified as having challenging dyslipidemia (and likely not representative of the typical patient with dyslipidemia whom most clinicians evaluate and treat).

The study design was not powered to address traditional clinical end points such as cardiovascular mortality, risk of myocardial infarction, and risk of stroke. Instead, the study design examined the impact of 2 treatment strategies on carotid artery intimal plaque growth (intimal-medial thickness [IMT]) measured by an imaging technique. The group randomly assigned to combination therapy had greater low-density li-

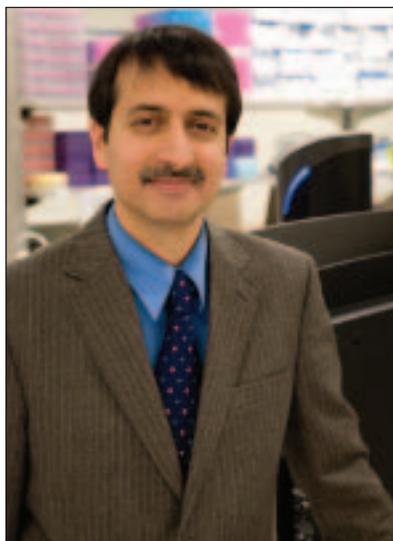
poprotein cholesterol reductions (58%) compared with the simvastatin group (41%). The difference in IMT changes between the simvastatin group and the combination-drug group was 0.006 mm vs 0.011 mm, which was not statistically significant ($P=.29$). “The study was simply designed to assess progression or regression of carotid plaque, an end point that is not strongly or definitively established with risks for heart attack or cardiovascular morbidity,” according to Randal J. Thomas, MD, director of the Mayo Clinic Rochester Cardiovascular Health Clinic.

The data from ENHANCE do confirm earlier studies that ezetimibe is an effective adjunct to statin therapy for lipid lowering and has an excellent safety profile. “For management of high blood cholesterol, we recommend the use of medications that have been shown in large-scale, long-term studies to lower cholesterol levels and to lower heart attack and cardiovascular death rates,” says Dr Thomas. “Two drug groups meet these criteria: 1) statin drugs, such as simvastatin, atorvastatin, pravastatin, and lovastatin and 2) niacin.”



Immanuel St. Joseph’s–Mayo Health System in Mankato, Minnesota, held an open house in February for the new ISJ Heart Center, providing regional access to world-class facilities and enhanced technology. The \$23-million building includes a new cardiac catheterization laboratory, patient examination rooms, a cardiac rehabilitation facility, and physician offices. The facility will allow for comprehensive and integrated access to all cardiac care in one location.

Cardiovascular Risk Stratification: A Multidimensional Approach



Iftikhar J. Kullo, MD

Early Atherosclerosis Clinic

Iftikhar J. Kullo, MD, Director
 Stephen L. Kopecky, MD
 Robert D. McBane, MD
 Randal J. Thomas, MD

Cardiovascular disease is the leading cause of mortality in the United States. A significant proportion of cardiovascular events occur without warning in asymptomatic patients. Conventional risk factor profiles are helpful in predicting those at risk for myocardial infarction or ischemic stroke; however, these factors are prevalent in much of the population, thus limiting the value of treatment algorithms based on conventional risk factor analysis. Tests are needed for early

detection of cardiovascular disease at a stage when it is most amenable to intervention. Consequently, there has been intense interest in the identification of circulating biomarkers related to the development of atherosclerosis as well as new imaging techniques and tests of arterial function. “The purpose of developing these new modalities for evaluating cardiovascular disease is to improve risk stratification,” according to Iftikhar J. Kullo, MD,

director of the Early Atherosclerosis Clinic at Mayo Clinic Rochester.

Novel Risk Factors

Risk factors can be divided into conventional, predisposing, novel (conditional), and emerging (Table 1). The term “novel risk factors” refers to factors associated with an increased risk of cardiovascular disease although no direct causative relationship has yet been established. Novel biochemical and genetic factors may be associated with residual variability in measures of atherosclerotic disease. Additionally, the risk of atherosclerosis varies among ethnic groups; these novel risk factors may explain in part this variation.

At Mayo Clinic Rochester, these markers are obtained in selected patients seen in the Early Atherosclerosis Clinic (Table 2, Figure 1). Typical patients have an intermediate risk profile by conventional factors; additional information gleaned from the novel risk factor profile can help direct treatment and motivate patients to make lifestyle changes. “An example of a patient who might benefit from this type of evaluation is a young patient with an intermediate risk factor profile but a strong family his-

Table 1. Categories of Risk Factors for Coronary Artery Disease

Conventional	Predisposing	Novel	Emerging
Cigarette smoking	Overweight and obesity	C-reactive protein	Lipoprotein-associated phospholipase A2
Elevated blood pressure	Physical inactivity	Fibrinogen	Pregnancy-associated plasma phosphatase
Elevated serum cholesterol	Male sex	Homocysteine	Asymmetric dimethyl arginine
Low HDL cholesterol	Family history of early-onset coronary artery disease	Lipoprotein(a)	B-type natriuretic peptide
Diabetes mellitus	Socioeconomic factors	Small LDL particle size and number	Myeloperoxidase
	Behavioral factors		Measures of oxidative stress
	Insulin resistance		Candidate gene polymorphisms

Derived from Smith SC Jr, Greenland P, Grundy SM. Prevention Conference V: Beyond secondary prevention: identifying the high-risk patient for primary prevention: executive summary. *Circulation* 2000; 101:111-116.

Table 2. Early Atherosclerosis Clinic

The Early Atherosclerosis Clinic serves 3 types of patients:

- Patients in whom manifestations of atherosclerosis develop at a relatively young age (in men younger than 55 years, in women younger than 65 years)
- Asymptomatic patients who have a family history of premature atherosclerosis
- Patients with abnormal levels of novel risk factors

tory of premature atherosclerosis,” says Dr Kullo. “If the novel risk factor profile indicates increased risk of cardiovascular disease, we will work harder to help the patient reduce modifiable risk factors.”

Tests of Arterial Function

Alterations in arterial function predate the development of clinically significant atherosclerosis. The demonstration of abnormal arterial function in easily accessible peripheral vessels may be useful in predicting future coronary and cranial atherosclerotic disease. Common noninvasive tests include assessment of conduit artery and microvascular endothelial function, radial artery pulse wave analysis, and measurement of aortic pulse wave velocity (Figure 2).

Subclinical Disease

Two markers of subclinical disease are carotid intimal thickening and coronary artery calcification. Several studies have demonstrated that carotid intimal thickening is predictive of future cardiovascular events such as myocardial infarction and stroke. High-resolution ultrasonography has been used extensively in noninvasive measurement of carotid disease, and the

findings correlate well with atherosclerotic disease in other vascular beds and findings at autopsy.

Coronary artery calcium has been demonstrated to be a marker for coronary atherosclerosis, and the quantity of coronary artery calcification is related to the overall coronary atherosclerotic burden. Furthermore, the quantity of coronary artery calcium has been found to be independently predictive of future coronary events.

Vascular Age

Given the association between carotid intimal thickening and coronary artery calcification with cardiovascular events, the concept of vascular age has been proposed. A limitation of the Framingham risk factor calculation is its dependence on the chronological age of individuals, which may not be a true representation of the risk of vascular disease. Computer algorithms have been developed that integrate measures of carotid intimal thickening with patient variables to produce a projected vascular age of the patient. With application of this carotid intimal thickening–derived vascular age, almost half of patients assigned to intermediate risk by Framingham criteria are reclassified in higher or lower risk categories. “This reclassification allows us to concentrate our efforts on risk factor reduction in those patients who are truly at high risk,” says Dr Kullo.

The Early Atherosclerosis Clinic has developed a multidisciplinary program incorporating dietitians, exercise, smoking cessation, and, when appropriate, pharmacologic therapy. After comprehensive risk factor analysis, a customized program is outlined for each patient. “This is an opportunity for us to further our understanding of the role of these factors in the development of atherosclerosis and to provide unique preventive care to at-risk patients,” says Dr Kullo.

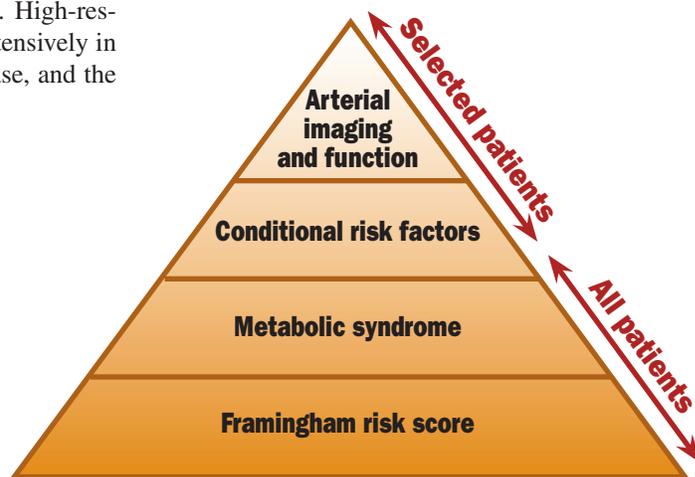


Figure 1. Risk factor stratification scheme illustrating approach to appropriate patient classification.

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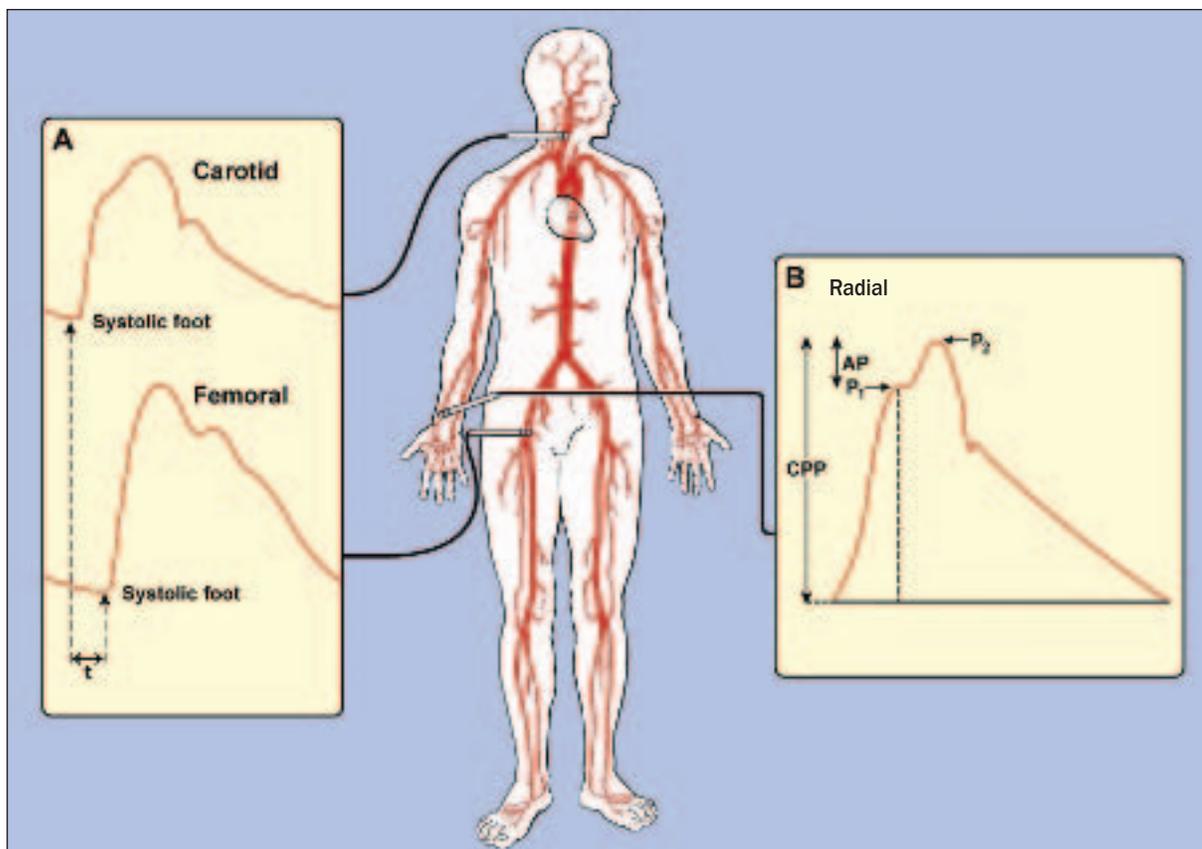


Figure 2. Measurements of arterial stiffness (A) and wave reflection (B). The velocity of the pulse as it travels from the carotid to the femoral artery is a robust measure of arterial stiffness. Pulse wave analysis involves noninvasive acquisition of a radial artery pressure waveform by an applanation tonometer calibrated to conventionally measured brachial systolic and diastolic blood pressure and the derivation of a central aortic pressure waveform from ensemble-averaged radial artery waveforms using mathematical equations. The first peak represents the systolic pressure in the absence of peripheral wave reflection, and the second peak represents the augmentation of pressure waveform by the reflected wave. AP is absolute augmentation pressure, CPP is the central pulse pressure, P₁ is the inflection point at which the reflected wave meets the incident wave, P₂ is the peak systolic pressure after augmentation, and t is time.



Thomas M. Munger, MD, Section of Cardiovascular Diseases, received the 2007 Department of Medicine Laureate Award.



Lawrence J. Sinak, MD, received the 2007 Department of Medicine Community Excellence Award.



William D. Edwards, MD, of the Department of Laboratory Medicine and Pathology at Mayo Clinic Rochester, is this year's recipient of the Distinguished Achievement Award at the Society for Cardiovascular Pathology.



Cardiovascular fellows at Mayo Clinic Rochester have won the following awards: Ondrej Lisy, MD, PhD, has been chosen as the Balfour Award Recipient for 2008 for Outstanding Research. Bernard B. C. Lim, MD, PhD, has received the 2008 Internal Medicine Summerskill Award for Outstanding Research Achievement. Monique A. P. Ford, MD, has received the Mayo Brothers Distinguished Fellowship Award.

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Web site: www.asecho.org



RECOGNITION



Mayo Clinic Rochester's Ventricular Assist Device (VAD) Program, directed by cardiovascular surgeon Soon Park, MD, has earned the Joint Commission's Gold Seal of Approval for health care quality. To earn the Gold Seal of Approval, the disease management program undergoes an extensive on-site evaluation with an emphasis on the program's processes, the program's ability to evaluate and improve care within its own organization, and interviews with patients and staff.

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