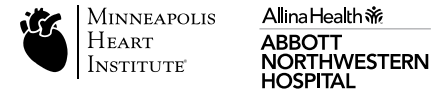




MINNEAPOLIS HEART INSTITUTE®

at Abbott Northwestern Hospital

Overview and Outcomes Report 2012



Setting the Pace in Cardiovascular Innovation and Care

Colleagues,

Thank you to everyone who responded to our 2010 Overview and Outcomes Report. We hope you found it informative and objective when evaluating the breadth and quality of our cardiovascular programs.

This year's report focuses on quaternary services, along with information about our many Centers of Excellence and our commitment to improve cardiovascular care and cardiovascular health throughout the region. Expanded clinical services, superior outcomes and exceptional patient experiences continue to define the Minneapolis Heart Institute® at Abbott Northwestern Hospital and in its affiliated communities. Our steadfast partner, the Minneapolis Heart Institute Foundation™, continues to be a national and international leader in clinical research and education.

Cardiovascular quaternary services

In recent years, we've made important strides in our efforts to advance quaternary services. We offer treatments that are not readily available elsewhere in the region, and we have invested in the people, systems and technology that help us set the pace in cardiovascular innovation and care.

- The Minneapolis Heart Institute® has continued to expand services to those patients with end-stage heart failure. Our **Center for Advanced Heart Failure Treatment** has had exceptional results, not only for those patients going on to heart transplantation, but also for the large number of patients who have benefited from placement of mechanical assist devices and extracorporeal mechanical oxygenation (ECMO).
- Transcatheter aortic valve replacement (TAVR) provided by our **Center for Valvular and Structural Heart Disease** has become an important treatment option for a select number of patients who qualify for this life-saving procedure.

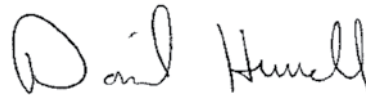
- Complex procedures for arrhythmia management have grown and now our program, the **Center for Complex Electrophysiology and Heart Rhythm Management**, is the largest in the Midwest with more than 700 ablations performed each year. Our **Center for Genetic Arrhythmia** has become a foundational program for the identification of patient and family members at risk for life-threatening arrhythmias.
- Our **Center for Hypertrophic Cardiomyopathy** represents one of the most respected and published clinical programs for this condition in the world.
- Our **Center for Comprehensive Imaging** has grown to be one of the largest programs in the country, providing exceptional clinical information and research in both adult and pediatric cardiovascular imaging.

Systems of care with uncompromising quality

The Minneapolis Heart Institute® has focused on comprehensive cardiovascular care with nation-leading quality since its inception. This year is no exception. As with our 2010 Outcomes Report, each Center of Excellence presents its data on quality performance. Our intention is to be second to none in cardiovascular quality, patient experience and value. The physicians, nurses, technologists and support staff of the Minneapolis Heart Institute® take great pride in serving the patients who entrust us with their care.

We welcome your comments and questions about this report, and we look forward to working with you to deliver optimal cardiovascular patient care.

Warmest personal regards,



David G. Hurrell, MD



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Recent Awards and Recognition



The 2012 *US News & World Report* Best Hospitals list ranked cardiology services and heart surgery at Minneapolis Heart Institute® at Abbott Northwestern Hospital in the top 20 nationally and #1 in the Twin Cities metropolitan area.

- Minneapolis Heart Institute® at Abbott Northwestern Hospital was selected by the Cardiovascular Cell Therapy Research Network as one of its seven U.S. centers of excellence.
- John Lesser, MD, director of Advanced Cardiovascular Imaging at the Minneapolis Heart Institute® at Abbott Northwestern Hospital, was named president of the Society of Cardiovascular Computed Tomography.
- Minneapolis Heart Institute® at Abbott Northwestern Hospital received the Medical Leadership Award from the Sudden Cardiac Arrest Association. The Award recognized the regional "Cool It" program directed by interventional cardiologist Michael Mooney, MD, which provides therapeutic hypothermia to patients with sudden cardiac arrest.
- *Minnesota Physician* named Tim Henry, MD, director of Research, Minneapolis Heart Institute Foundation, as one of Minnesota's 100 Influential Health Care Leaders.
- *Minneapolis St. Paul Magazine* recognized 21 Minneapolis Heart Institute® physicians in their 2012 Top Doctors issue.
- The 2012 American College of Cardiology annual meeting included physicians from the Minneapolis Heart Institute® and Minneapolis Heart Institute Foundation in 37 sessions, 15 invited presentations and 22 original research presentations.



Regional Referral Center for Quaternary Cardiovascular Services

Quaternary services set the Minneapolis Heart Institute® apart from other providers.

Transcatheter aortic valve replacement

An 81-year-old male with severe, symptomatic aortic stenosis and coronary artery disease was evaluated at a regional hospital for aortic valve replacement after a recent hospitalization for NYHA Class III to IV heart failure. Following angiography with placement of two bare metal stents, a cardiovascular surgeon reviewed the case and felt the patient was a poor surgical candidate. The patient was evaluated at the Minneapolis Heart Institute® for transcatheter aortic valve replacement. An echocardiogram and CTA in lieu of coronary CTA indicated that the patient was a candidate for the PARTNER II trial. He received a 26mm Sapien XT valve through transfemoral access and was discharged home three days later. At 30-day follow-up, the patient had dramatic improvement in his heart failure with NYHA Class I to II symptoms.

Left ventricular assist device

A 62-year-old male with a 22-year history of ischemic cardiomyopathy, multiple percutaneous revascularization procedures and an EF of less than 20 percent, developed chest pain while playing golf. He underwent percutaneous stenting of the left anterior descending and circumflex arteries at a hospital in Iowa. He sustained a cardiac arrest, was resuscitated for 90 minutes, placed on a temporary circulatory support device and ECMO, and transferred to Abbott Northwestern for consideration of advanced options. After evaluation, a HeartMate II left ventricular assist device (LVAD) was implanted. He has been supported on this device for more than one year as he awaits a transplant. With the LVAD, he is participating in cardiac rehabilitation and is back on the golf course.



Minneapolis Heart Institute®
at Abbott Northwestern Hospital

Patients described above provided written permission for the Minneapolis Heart Institute® to include these case summaries in this report.

Complex ablation for ventricular tachycardia

A 27-year-old female with a history of severe idiopathic systolic cardiomyopathy had tests demonstrating extensive myocardial fibrosis. She also developed recurrent sustained ventricular tachycardia. Several antiarrhythmic agents were used without success. After a complex ablation procedure at another hospital, a ventricular tachycardia arising from the epicardial surface of the heart was identified. The patient was referred to the Minneapolis Heart Institute® for ablation of this uncommon tachycardia. Utilizing a specialized technique, the epicardial space was entered using a needle, which then allowed successful ablation of the tachycardia using a small catheter. The patient subsequently recovered and has no further tachycardia and no need for antiarrhythmic medications.

Heart transplant

A 50-year-old female with a 28-year history of hypertrophic cardiomyopathy was evaluated by Barry Maron, MD, director of the Hypertrophic Cardiomyopathy Center, and referred for advanced therapies. Her symptoms were consistent with Class IV heart failure, and she was accepted as a transplant candidate. Her condition continued to deteriorate, requiring inotropic support. After eight weeks in the intensive care unit, she underwent heart transplantation and was discharged ten days later. At three months post-transplant, she was doing well, had completed cardiac rehabilitation and had significantly improved her ability to exercise and participate in other physical activities.

Hyperbaric oxygen therapy

A patient whose cancer had previously been treated with radiation was referred with radiation necrosis and a failed myocutaneous flap. Each of these diagnoses independently met the criteria for hyperbaric oxygen therapy (HBOT), which is thought to repair the vascular beds (angiogenesis), allowing the body to heal itself. In difficult wound cases like this one, a reconstructive skin graft or flap is needed to close the wound. HBOT can increase the availability of oxygen to the wound beds so they are ready to accept and nourish a graft. In this case, the patient had a series of 50 daily treatments, 90 minutes in duration, and then had tissue transfer surgery to close the wound.

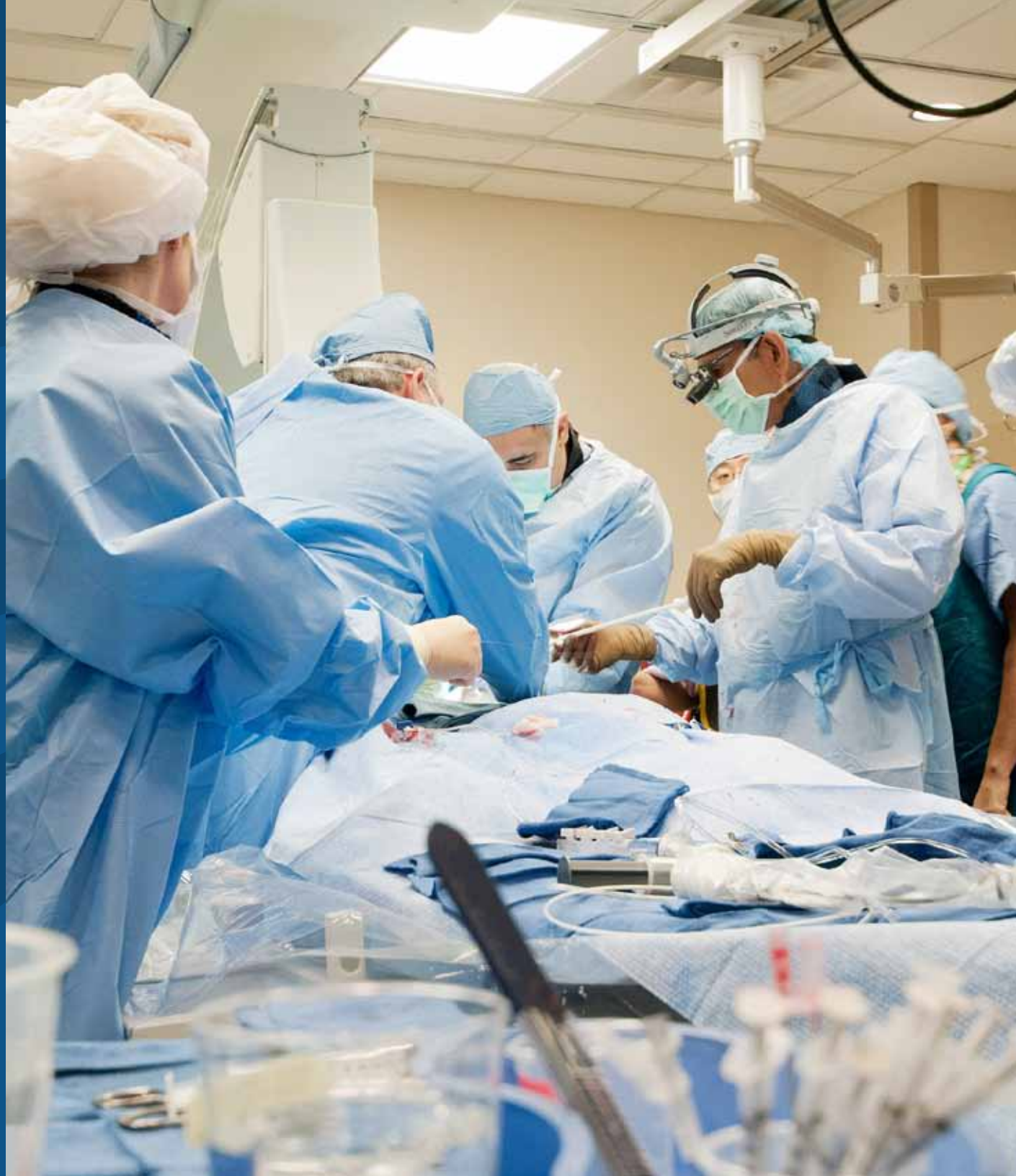
Cardiovascular cell therapy

An 83-year-old male with a long history of severe three-vessel coronary artery disease was referred to the OPTIMIST Clinic in 2007. He had ischemic cardiomyopathy with an ejection fraction (EF) of approximately 20 percent and Class II heart failure. In 2008, he enrolled in the BioHeart Marvel study and received intramyocardial injections of low-dose autologous skeletal myoblast cells. He did well until 2010 when his symptoms worsened and he was admitted with an EF of 10-15 percent and Class III heart failure. Following ultrafiltration, he was discharged to home in stable condition on maximal medical therapy. He returned to the OPTIMIST Clinic to discuss enrollment into the Aastrom dilated cardiomyopathy study. After a bone marrow biopsy, he was randomized to receive intramyocardial injections of his own stem cells. Two years later, he continues to be active and play golf.

Highly specialized services are concentrated at Abbott Northwestern Hospital, where patients benefit from:

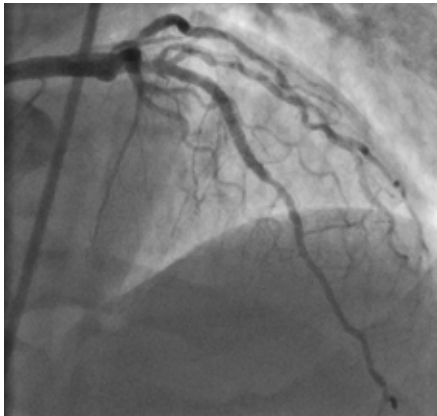
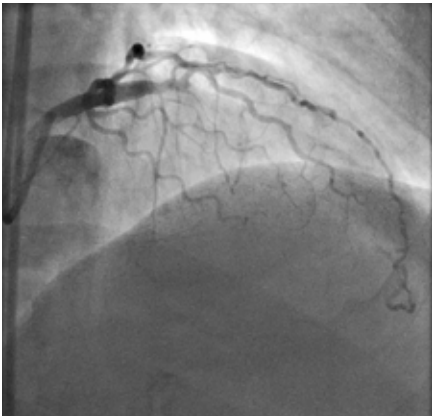
- advanced diagnostic and therapeutic approaches that are not available elsewhere
- multidisciplinary teams that include subspecialty physicians who are national leaders in their fields
- a high level of coordination between Minneapolis Heart Institute® physicians and regional partners
- access to clinical trials and the latest FDA-approved devices, treatments and medications.

Centers of Excellence



Diagnostic Catheterization and Coronary Therapeutics

Since performing the first coronary angioplasty in the Twin Cities in 1978, the Minneapolis Heart Institute® at Abbott Northwestern Hospital has become a regional and nationally recognized leader in coronary therapeutics. By participating in multiple large clinical trials and performing complex coronary interventional procedures, the Minneapolis Heart Institute® has developed innovative programs to treat coronary artery disease, cardiac emergencies and structural and valvular heart disease. Interventional cardiologists are dedicated to advancing new and novel approaches to cardiovascular therapeutics.



Left: Coronary angiogram showing chronic total occlusion of a patient's proximal left anterior descending artery.

Right: Coronary angiogram immediately following successful stenting of the occlusion using the reverse controlled antegrade and retrograde tracking (CART) technique. The Minneapolis Heart Institute® was the first center in the Upper Midwest to use this novel approach to open chronic total occlusions and it now trains interventional cardiologists at other regional centers in using the technique.

2011 Catheterization Lab Volume

Diagnostic procedures*	5,714
Interventional coronary procedures	1,845
STEMI	309
Non-STEMI	1,026
Other	510

*Includes angiograms, catheterizations, biopsies, temporary pacemakers, Swan Ganz catheters, intravascular ultrasounds, fractional flow reserves and optical coherence tomography.

Source: Allina Health Enterprise Data Warehouse, Witt System Report, GE Cath Procedure Report.

2011 In-hospital Risk-adjusted Mortality (n=1,793)

Percutaneous coronary intervention	1.26%
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Source: American College of Cardiology Foundation's National Cardiovascular Data Registry, CathPCI Registry®. Used with permission.



The Minneapolis Heart Institute® works closely with emergency care providers and community EDs to provide timely, protocol-based care for all cardiovascular emergencies.

Cardiovascular Emergency Care

The Minneapolis Heart Institute® created the first comprehensive cardiovascular emergency center capable of immediately triaging and treating all forms of cardiovascular emergencies, not just acute myocardial infarctions or heart attacks. Modeled after Level One trauma programs and based on the Minneapolis Heart Institute®'s first-in-the-nation ST-segment elevation myocardial infarction (STEMI) transfer program, the Cardiovascular Emergency Center is ready for any cardiovascular emergency including cardiac arrest, ascending aortic dissection, abdominal aortic aneurysm (AAA), critical limb ischemia, STEMI, non-STEMI/unstable angina and cardiogenic shock.

The Cardiovascular Emergency Center is made possible because of the depth and breadth of services available at the Minneapolis Heart Institute® and features a board-certified cardiologist inhouse 24/7. Emergency teams are always ready and provide the most advanced therapies available, such as therapeutic hypothermia and all forms of cardiovascular surgery including ventricular assist devices (VADs). The Minneapolis Heart Institute®'s Cardiovascular Emergency Center is the most comprehensive program of its kind in the nation.

Level One Heart Attack Program

When a patient is diagnosed with STEMI, the goal is to open the blocked artery within 90 minutes or less, from the time the patient arrives at a community emergency department to the start of life-saving percutaneous coronary intervention (PCI) at Abbott Northwestern Hospital. This is achieved through a standardized process with statewide emergency care providers who stabilize the patient and begin adjunctive therapies even before the patient arrives in Minneapolis. When a Level One emergency is declared, all systems and personnel are set in motion, communication is frequent and thorough, and the patient is transported directly to a waiting, expert PCI team—anytime, day or night.

Therapeutic hypothermia

Minneapolis Heart Institute® pioneered the collaborative “Cool It” protocol and was the first to simultaneously combine transport, emergency angioplasty and cooling. The core body temperature of a patient resuscitated after cardiac arrest is cooled to 33° C to reduce the risk of permanent neurological damage. In 2011, the Minneapolis Heart Institute® was recognized by the Sudden Cardiac Arrest Association and the American Heart Association for its model program, world-leading outcomes and guidance to other institutions nationwide.

Aortic dissection

In 2005, the Minneapolis Heart Institute® created a multidisciplinary aortic dissection program to aid in the emergency room recognition, triage and surgical treatment of these critically ill patients. Through regular updates to the regional network partners, the time to diagnosis this condition has been cut by 43 percent (or by 4.5 hours at community hospitals) and the time to surgical treatment has been cut in half. For a condition with a 1 percent per hour mortality rate, this has dramatically improved care¹.

On a local level, the multidisciplinary team of cardiologists, cardiac and vascular surgeons, emergency room physicians, radiologists and cardiac anesthesiologists meets regularly to review cases and treatment times to continue to improve care. Care protocols for patients with suspected and confirmed aortic dissection are available. Patients are encouraged to return to the aortic dissection clinic for regular follow-up care that includes complex imaging studies.

Critical limb ischemia

Peripheral arterial disease can manifest as critical limb ischemia. Prompt diagnosis and treatment are mandatory to prevent limb loss. Treatment algorithms designed to help referring clinicians diagnose critical limb ischemia (and all other cardiovascular emergencies) and facilitate transfer are available at mplsheart.com. Emergent endovascular and surgical therapies are provided by the Minneapolis Heart Institute® vascular surgery team.

Ruptured aortic aneurysm

Minneapolis Heart Institute® vascular surgeons adapted the Level One Heart Attack protocol to ensure faster diagnosis and emergency treatment of thoracic and abdominal aortic aneurysms. As a result, time from diagnosis to intervention dropped by more than an hour. Combined with increased use of endovascular therapy, survival outcomes improved from 69 percent to 89 percent for these historically deadly vascular emergencies².

Non-STEMI and unstable angina

The Minneapolis Heart Institute® at Abbott Northwestern Hospital is Minnesota's first Accredited Chest Pain Center, as designated by the Society of Chest Pain Centers. The Chest Pain Program applies protocol-based care to reduce variations in treatment and create a more efficient and effective way to treat patients with all types of acute coronary syndromes, not just STEMI. One of the first multi-hospital initiatives for this condition nationwide, the program clearly identifies which patients need to be transferred to Abbott Northwestern and which can safely remain in their communities for testing and follow-up.



Working to improve aortic dissection care

Minneapolis Heart Institute® physicians collaborate with International Registry of Acute Aortic Dissection (IRAD) investigators around the world to better recognize and treat aortic dissection. In 2011, Minneapolis Heart Institute® physicians and IRAD investigators published an article on the reasons for delay in the diagnosis and treatment of aortic dissection in *Circulation*, the journal of the American Heart Association. This study showed that the diagnosis of aortic dissection takes an average of more than four hours, and an additional four hours elapses from the time of diagnosis to surgical treatment³. Minneapolis Heart Institute® physicians are working hard to improve these important time intervals.

³ Harris KM, Strauss CE, Eagle KA, et al. Correlates of delayed recognition and treatment of type A aortic dissection: the International Registry of Acute Aortic Dissection (IRAD). *Circulation*. 2011; 124:1911-1918.

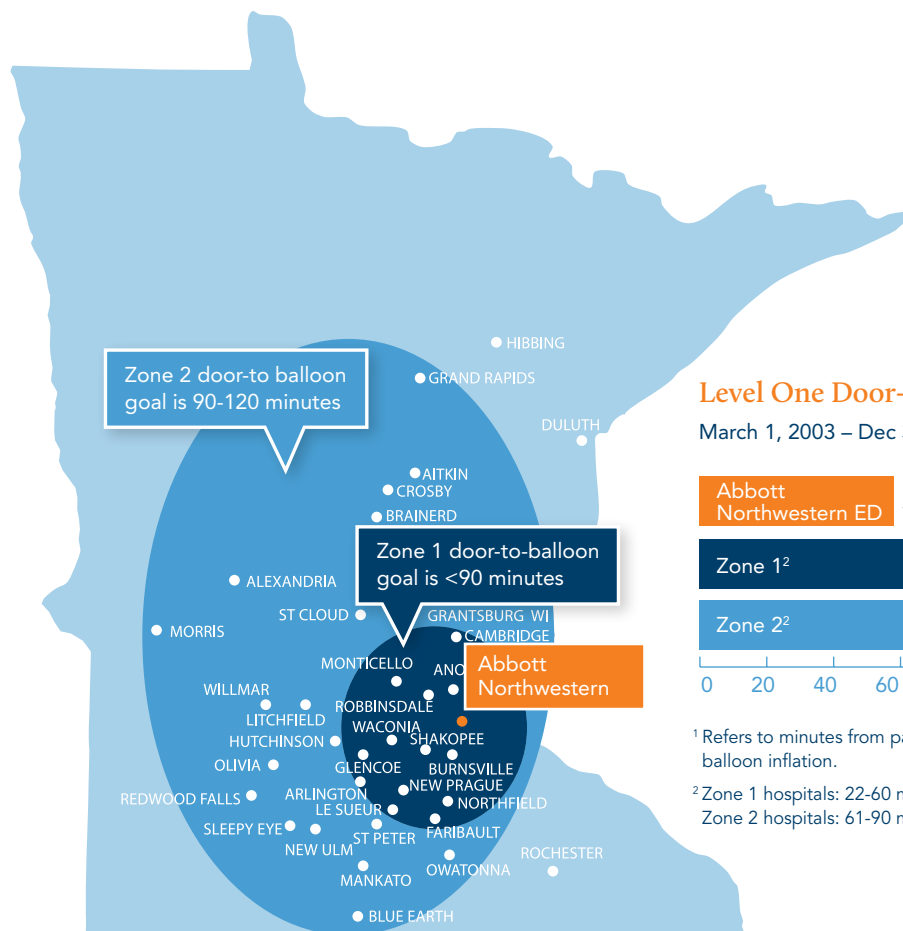
¹ Harris KM, Strauss CE, Eales F, Unger BT, Rohman E, Kroshus T, Inampudi S, Kapsner C, Kebede TD, Adolphson GM, Cohen JD, Orlandi QG, Streckenbach S, Flavin TF, Kshetry VR, Henry TD, Graham KJ, Hirsch AT. Standardized care for acute aortic dissection: design of the program and initial results. *Circulation: Cardiovascular Quality and Outcomes* 2010; 3(4) 424-30.

² Minneapolis Heart Institute® Level One CV Emergency Aortic Aneurysm Database.

Download cardiovascular emergency protocols at mplsheart.com

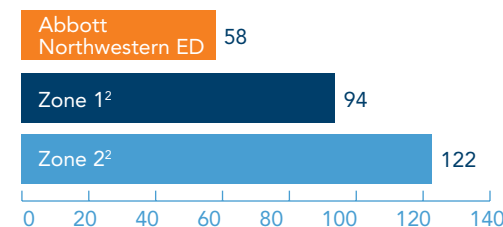


Protocols for diagnosing and treating abdominal aortic aneurysm, acute coronary syndrome, critical limb ischemia, aortic dissection and Level One (STEMI) heart attack, and to begin therapeutic hypothermia for cardiac arrest, are available at mplsheart.com. The protocols include algorithms, order sets, fax cover sheets, transfer instructions and other information necessary for treatment and transport.



Level One Door-to-Balloon Median Time¹

March 1, 2003 – Dec 31, 2011 (n=3,435)



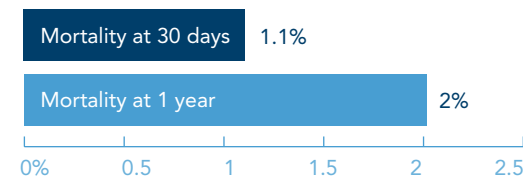
¹ Refers to minutes from patient presentation at the ED to balloon inflation.

² Zone 1 hospitals: 22-60 miles from Abbott Northwestern; Zone 2 hospitals: 61-90 miles from Abbott Northwestern.

Acute myocardial infarction mortality has decreased not because of new technology, but because systems and people are working together to improve care.

Level One Mortality³

March 1, 2003 – Dec 31, 2010 (n=3,042)



³ Excludes patients with cardiac arrest, cardiogenic shock, age ≥ 80 or cause of death that is non-cardiac related.

Source: Minneapolis Heart Institute® Level One Database.

Valvular and Structural Heart Disease

The Minneapolis Heart Institute® has valve subspecialists in interventional cardiology, cardiothoracic surgery and advanced cardiovascular imaging who work as an integrated team to offer the full spectrum of traditional and pioneering valve therapies. The valve team meets weekly to discuss complex and high-risk patients and determine the most appropriate therapy, including options for leading-edge interventions.

Valve subspecialists and valve nurse coordinators are available to answer referring physicians' questions regarding traditional valve therapies as well as patient eligibility for investigational percutaneous trials.

The Minneapolis Heart Institute® at Abbott Northwestern Hospital is a regional valve center of excellence with a hybrid operating room designed for transcatheter and minimally invasive surgical valve procedures. These high tech rooms have the advanced imaging systems necessary for repairing and implanting valves often through very small incisions necessitating indirect visualization.

Transcatheter treatments for valvular heart disease

Aortic balloon valvuloplasty is a percutaneous procedure for symptom palliation and enhanced quality of life in appropriately selected patients who are not candidates for surgical or transcatheter aortic valve replacement. Further, it can be a useful bridge for select patients to undergo subsequent surgical or percutaneous aortic valve replacement. The Minneapolis Heart Institute® is a recognized world leader in establishing and performing this therapy and is one of the highest volume centers in the country.

The team also has extensive experience in mitral and pulmonic balloon valvuloplasty, which unlike aortic valvuloplasty, are treatments of first choice for mitral and pulmonic stenosis.

The Minneapolis Heart Institute® Aortic Balloon Valvuloplasty Database^{1, 2, 3} has shown that among patients who have had the procedure:

- more than 90 percent achieve >30 percent improvement in aortic valve area
- more than 90 percent achieve New York Heart Association functional class of ≤ 2 with sustained benefit for 0.5-1.5 years
- less than 3 percent experience complications.

¹ Minneapolis Heart Institute® Aortic Balloon Valvuloplasty Database (330 patients, 412 procedures; 2003-February 2012).

² Hura H, Pedersen WR, Ladich E, et al. Percutaneous balloon aortic valvuloplasty revisited: time for a renaissance? *Circulation*. 2007;115:e334-8.

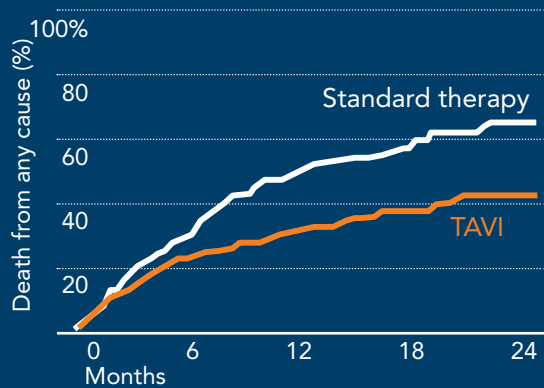
³ Pedersen WR, Goldenberg I, Feldman T. Balloon aortic valvuloplasty in the TAVI era: A review of current technique and uses in stand-alone, bridging, and predilation settings. *Cardiac Interventions Today*. 2010;77-84.



The Valve Center performed 116 adult valvuloplasty procedures (aortic, mitral and pulmonic) in 2011.



The valve team meets weekly to discuss complex and high-risk patients to determine the most appropriate therapy.



The PARTNER I Clinical Trial demonstrated a 20 percent decrease in mortality and dramatic improvement in quality of life in severe aortic stenosis patients who were not candidates for surgical aortic valve replacement.

Hazard ratio, 0.55
(% CL, 0.40-0.74)
p<0.001

Leon MB, Smith CR, Mack M, Miller DC, et al for the PARTNER Trial Investigators. Transcatheter aortic-valve implantation for aortic stenosis in patients who cannot undergo surgery. *N Engl J Med* 2010; 363: 1597-1607.

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Valve Center physicians' published studies have shown that the procedure can be safely performed:

- in patients over 90 years of age⁴
- in combination with coronary stenting⁵
- in patients with severe left ventricular dysfunction (including LVEF <20 percent).⁶

Transcatheter aortic valve replacement (TAVR) is a revolutionary percutaneous therapy for aortic valve replacement. At present, however, this therapy can be offered only to patients who are nonoperative or high risk for traditional open heart surgery.

Read more about valve research on page 42.

The Valve Center currently performs TAVR using transfemoral or transapical approaches, both of which are now approved by the Food and Drug Administration (FDA).

Transcatheter (percutaneous) mitral valve repair is an investigational option for the treatment of high surgical risk patients with severe mitral regurgitation. The Valve Center is currently evaluating the

MitraClip system in these patients.

Percutaneous repair of periprosthetic valve leaks addresses perivalvular leaks that can be severe in 1 to 2 percent of patients following surgical valve replacement. This option avoids the need for a second open heart surgery, but it is a technically demanding procedure performed at only a few centers in the U.S.

⁴ Pedersen WR, Klaassen PJ, Boisjolie CR, et al. Feasibility of transcatheter intervention for severe aortic stenosis in patients >90 years of age: aortic valvuloplasty revisited. *Cathet Cardiovasc Interv.* 2007;70:149-54.

⁵ Pedersen WR, Klassen P, Pedersen C, et al. Comparison of outcomes in high risk patients > 70 years of age with aortic valvuloplasty and percutaneous coronary intervention versus aortic valvuloplasty alone. *Am J Cardiol.* 2008;101:1309-14.

⁶ Pedersen WR, Dang M, Krueger D, et al. Intra and post-procedural outcomes in severe aortic stenosis patients with left ventricular ejection fractions < 20% undergoing balloon valvuloplasty. *Catheter Cardiovasc Interv.* 2011;77(Suppl): S136-37.

Surgical replacement and repair

Minneapolis Heart Institute® cardiothoracic surgeons offer surgical valve replacement and repair using conventional and minimally invasive approaches to best meet patients' needs. Surgical replacement or repair is the recognized gold standard for treatment of valvular disease.

Treatments for other structural diseases

The atrial septal defect (ASD)-patent foramen ovale (PFO) percutaneous closure program is well established. Since 2003, Minneapolis Heart Institute® has done more than 300 procedures with a minimal complication rate. Careful patient selection, advanced CT and TEE imaging, including 3D TEE and intra-cardiac echo, help make this possible.

Newer guidelines, based on recent clinical trials, and American Heart Association and American College of Cardiology position statements currently favor a more conservative approach in patients with PFO and stroke. Minneapolis Heart Institute® physicians incorporate these newer guidelines into their practice, which is tailored to each individual patient to provide the best possible care.



Valve subspecialists in interventional cardiology, cardiothoracic surgery and advanced cardiovascular imaging, along with valve nurse coordinators and other care providers, work as an integrated team.



2011 Volume

365 Surgical valve cases including valve repair, replacement and multivalves





Physicians from the Advanced Heart Failure Treatment team with recent VAD recipients. These patients represent the full spectrum of clinical applications for VADs: bridge to recovery, bridge to transplant and destination therapy.

Advanced heart failure therapies

The Center for Advanced Heart Failure Treatment offers treatments using the latest technology and managed by a team of clinicians and health care workers specially trained and dedicated to the inpatient and outpatient success of heart failure patients 24 hours a day.

Advanced Heart Failure Treatment

For the growing number of patients with advanced heart failure, successful outcomes depend on consistent, evidence-based clinical management and expert heart failure practitioners. The highly skilled multidisciplinary team at the Center for Advanced Heart Failure Treatment delivers comprehensive care for the most complex, end-stage heart failure patients. They offer the full spectrum of therapeutic options, from traditional treatment to breakthrough approaches on the forefront of technology.

Minneapolis Heart Institute® physicians are in close communication with partnering physicians throughout the patient's care—from diagnosis of early heart failure through advanced treatment. They are available 24/7 to discuss any heart failure concerns.

The team includes:

- specialized cardiologists who are board certified in Advanced Heart Failure Therapies and Transplant
- cardiothoracic surgeons
- doctors of pharmacy
- certified nurse practitioners and physician assistants
- nurses, including specialized care coordinators
- dietitians
- social workers
- exercise physiologists
- support staff.

Immediate transfer of patients in cardiogenic shock

Patients in cardiogenic shock who require advanced mechanical support benefit from the rapid response and transfer protocols that are supported by the Minneapolis Heart Institute®'s established network of partner community hospitals and its highly skilled and experienced clinical team.

Heart transplantation

When tailored medical therapy is not enough, heart transplantation may offer a life-saving treatment option for patients with end-stage heart failure. Since establishing a new team and reorganizing the program in 2010, 38 transplant procedures have been performed at the Minneapolis Heart Institute® at Abbott Northwestern Hospital (as of June 2012). Abbott Northwestern's Heart Transplant Program is Centers for Medicare & Medicaid Services certified.

Ventricular assist devices (VADs)

A variety of temporary and long-term mechanical circulatory support devices are available, specific to each patient's need. These devices are an important option as a bridge to cardiovascular recovery, a bridge to transplantation or as a destination therapy for permanent support. The VAD Program received Joint Commission Certification for VAD Destination Therapy in November 2010.

Pioneering research

With the support of the Minneapolis Heart Institute Foundation, advanced heart failure specialists are involved in FDA-approved and National Institutes of Health (NIH)-sponsored trials for:

- novel heart failure therapies
- new generation VADs
- adult stem cell angiogenesis.

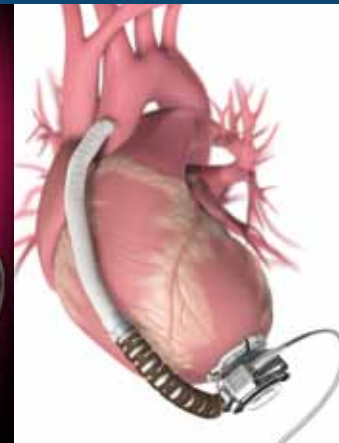
Case Volume	2010	2011
Heart transplants	14	13
Ventricular assist devices	17	34
Extracorporeal membrane oxygenation	11	17



HeartMatell® Left Ventricular Assist System, image courtesy of Thoratec Corporation



Total Artificial Heart; image courtesy of syncardia.com



Heartware® Ventricular Assist Device; image courtesy of HeartWare International, Inc.

Design improvements in the latest generation of left ventricular assist devices have made them smaller and more durable, leading to new treatment options for heart failure patients. The variety of circulatory support systems available at the Minneapolis Heart Institute® allows tailoring of therapy to individual needs.



Pulmonary Hypertension Program

A specialized, multidisciplinary team provides:

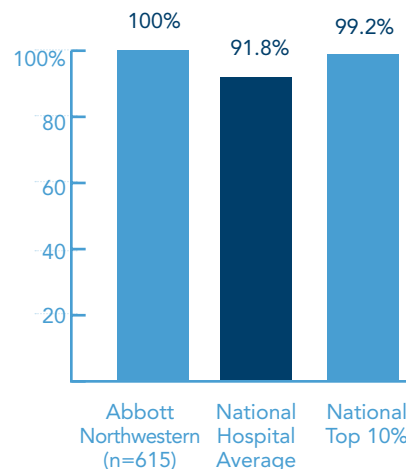
- comprehensive assessment including vasoreactivity testing for all clinical classifications of pulmonary hypertension
- 24/7 access for outpatient and inpatient support
- diverse treatment modalities including oral, inhalational, subcutaneous and intravenous therapies
- FDA-approved research on novel treatment approaches for additional patient options.

Survival rates: higher than national benchmarks

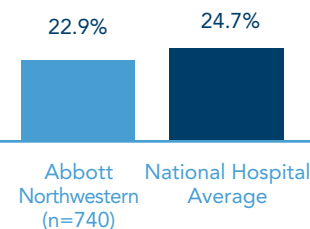
Heart transplant. The Heart Transplant Program has a current one-year survival rate of 91.67 percent as published by the Scientific Registry of Transplant Recipients. This is higher than the risk-adjusted expected rate of 87.15 percent and the overall national rate of 90.21 percent (SRTR.org, July 12, 2012).

VADs. During 2010 – 2011, 47 patients received VADs at Abbott Northwestern. The six-month survival for patients receiving continuous flow VADS (N=46) is 94.3 percent, higher than the survival rate of 88 percent reported by INTERMACS, the national mechanical circulatory support registry (Kirklin et al., *J Heart Lung Transplant* 2012; 31:117-26).

2011 Heart Failure Optimal Care¹

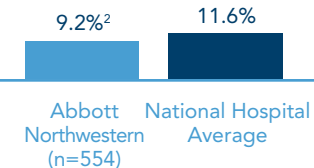


Heart Failure 30-day Risk-Standardized Readmission



Heart Failure 30-day Risk-Standardized Mortality

Abbott Northwestern Hospital is one of the top two Minnesota hospitals with the lowest heart failure 30-day mortality rate.



¹ Abbott Northwestern achieved 100 percent compliance in delivering heart failure optimal care, which includes appropriate medications, discharge instructions and assessment of left ventricular systolic dysfunction.

² Statistically significant by greater than two standard deviations from the national hospital average (p value ≤ 0.05).

Sources: Allina Enterprise Data Warehouse and CMS Hospital Special Report, July 2008-June 2011.

Cardiothoracic Surgical Services

Cardiac surgery at the Minneapolis Heart Institute® has always maintained an exceptionally high level of quality and expertise. With increased emphasis on system-wide program development, cardiothoracic surgeons are advancing innovative surgical therapies and creating new options for patients. A true multidisciplinary focus allows surgeons and cardiologists to collaborate with patients to develop optimal individualized treatment plans.

Minneapolis Heart Institute® cardiothoracic surgeons have nearly 100 years of combined experience, offering expertise and options that are not available at most other hospitals in the region. They perform a range of complex procedures including:

Complex structural heart surgery

- ventricular assist devices for end-stage heart failure and total artificial heart surgery
- heart transplants
- transcatheter valve procedures in partnership with interventional cardiologists
- adult congenital heart surgery in partnership with pediatric cardiac surgeons
- valve-sparing root, complex mitral valve (including bi-leaflet repairs) and tricuspid valve repairs

Surgery for arrhythmias

- concomitant atrial fibrillation surgery
- lone atrial fibrillation surgery

Surgery of the great vessels

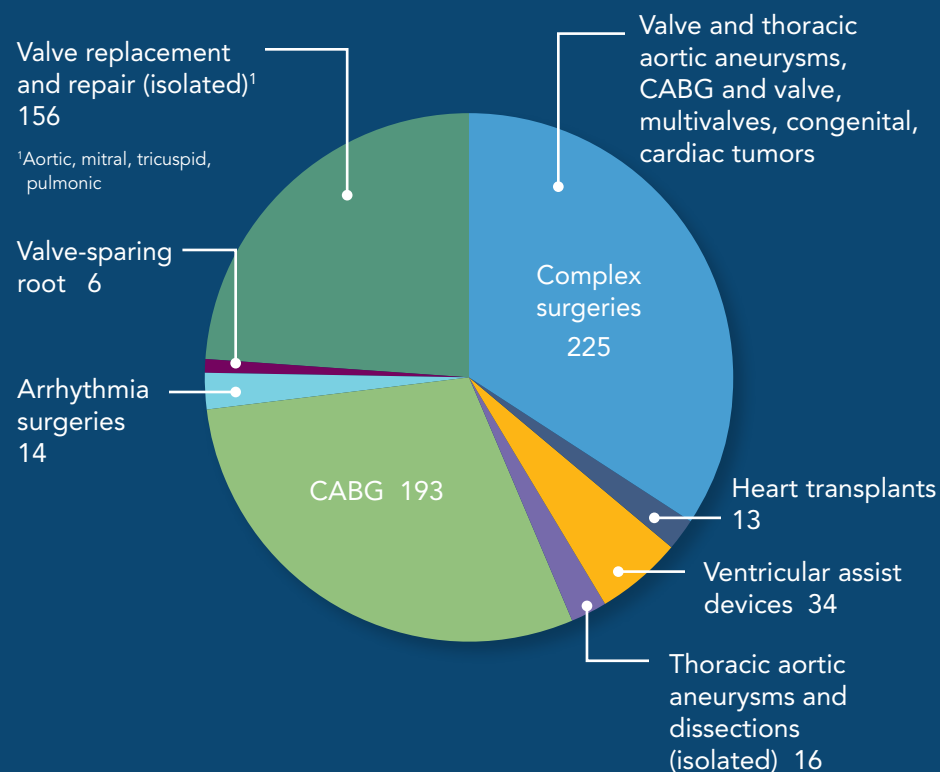
- complex aortic aneurysm surgery including the transverse arch
- aortic dissection surgery

High-risk coronary artery bypass

Less invasive approaches to conventional surgery

Thoracic surgery including lung cancer and video-assisted procedures.

2011 Surgical Cases Total: 657



Sources: Allina Health Enterprise Data Warehouse, Transplant Office.

2011 Volume

77 Thoracic aortic aneurysms (complex and isolated)



Cardiothoracic surgeons collaborate with cardiologists, other subspecialists and patients to develop individualized treatment plans.



Minneapolis Heart Institute® cardiothoracic surgeons have nearly 100 years of combined experience, offering expertise and options that are not available at most other hospitals in the region.

Research

Ongoing clinical investigation sustains the leadership role of academic institutions. Surgeons at Minneapolis Heart Institute® are participating in more than 25 ongoing clinical research trials. In 2011, they published 14 peer-reviewed manuscripts and presented 10 abstracts at national and international meetings. Surgeons were also invited lecturers nationally and internationally.

Complex Electrophysiology and Heart Rhythm Management

The Minneapolis Heart Institute® at Abbott Northwestern has one of the largest and most comprehensive arrhythmia programs in the United States. Its team of nationally known electrophysiologists, skilled technicians, advanced practitioners and nurses collaborate closely to provide a full range of services and personalized care in state-of-the-art facilities.

The center treats many patients with complex conditions and performs nearly 1,900 procedures annually, a high volume by national standards. This volume continues to grow. For example, the team has doubled the number of complex atrial fibrillation ablations performed in the past five years with success and safety rates that are among the best in the nation.

The electrophysiologists also establish close communication and strong partnerships with referring physicians, patients and families regarding complex treatment plans and results. The group is dedicated to providing education programs for referring physicians, patients and citizen groups to advance the understanding of life-threatening arrhythmias.

The team offers extensive experience and quality results using leading edge technology in the following areas:

Complex ablation procedures using 3D mapping systems

- atrial fibrillation
- epicardial ablation
- ventricular tachycardia
- arrhythmias associated with congenital heart disease

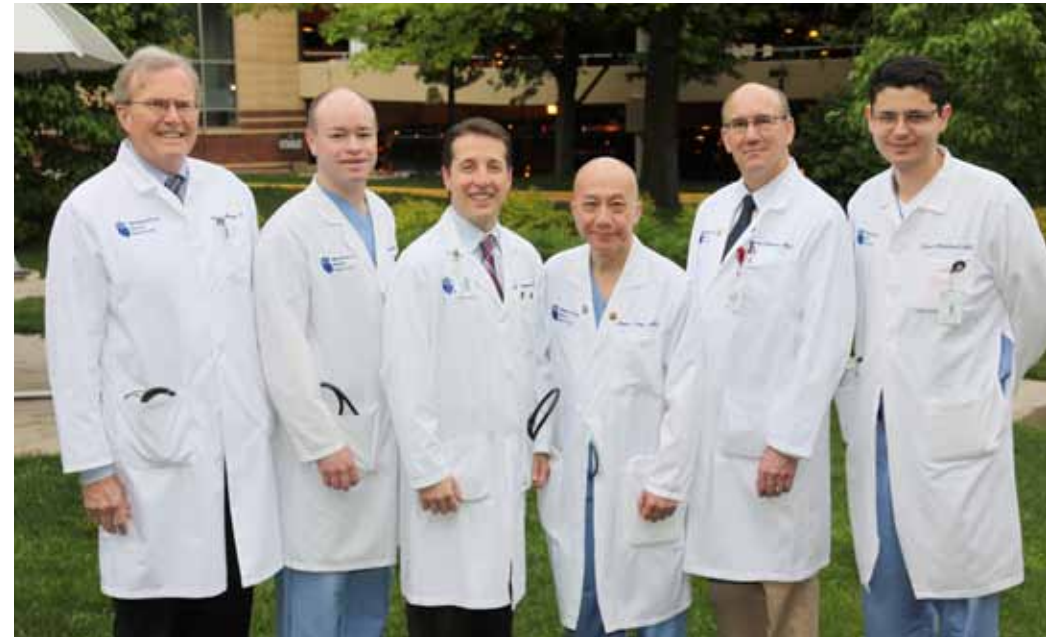
Lead extraction with laser assistance and surgical back-up

Advanced ablation techniques

- magnetically guided stereotaxis
- cryoballoon
- surgery for atrial fibrillation (concomitant Maze procedures, minimally invasive procedures)

Cardiac device therapy for heart rhythm and heart failure management including patients with genetic arrhythmias and complex congenital disease

Left atrial appendage occlusion device therapy.



The electrophysiology team includes nationally known physicians who have special expertise in treating patients with complex arrhythmias.

Heart Rhythm Management Program

Outpatient device clinics for new and follow-up patients are staffed with certified cardiac device specialist registered nurses who see more than 17,000 patients a year. More than half of the patients are seen in 24 outreach partner sites, allowing them to remain in their own communities for follow-up care. Started in 1998, the Heart Rhythm Management Program is another Minneapolis Heart Institute® first that benefits patients directly by delivering care in their communities whenever possible.



2011 Electrophysiology Volume

Pacemakers¹	556
Cardiac resynchronization therapy pacemakers	109
Implantable cardiac defibrillators¹	455
Cardiac resynchronization therapy defibrillators	234
Lead extractions (includes laser-assisted)	122
Catheter ablations	754
Complex ablations ²	479
Supraventricular tachycardia ablations ³	275
Total EP procedures	1,887

¹Changeouts, changeout and revisions, revisions, new implants, upgrades

²Atrial fibrillation, atrial tachycardia, ventricular arrhythmias

³Atrioventricular node, atrial flutter, atrioventricular nodal re-entrant tachycardia, accessory connection

Source: Allina Health EP Database.

Genetic Arrhythmias

Modeled after the world-renowned Center for Hypertrophic Cardiomyopathy, the Center for Genetic Arrhythmias focuses on the diagnosis, treatment and research related to five additional life-threatening arrhythmic conditions:

- long QT syndrome
- arrhythmogenic right ventricular dysplasia
- Brugada’s syndrome
- left ventricular noncompaction
- catecholamine-induced, polymorphic, ventricular tachycardia.

The Genetic Arrhythmias staff can screen, diagnose and care for entire families who have been affected by one of these conditions. Ongoing research—including a comprehensive registry of the family medical history—examines protocols and evaluates treatment plans, giving hope to subsequent generations.

The Center has experts in advanced cardiovascular imaging, electrophysiology, cardiology, genetic counseling and clinical nursing. Team members obtain exhaustive assessments, chart the natural history of these conditions and determine how to most efficiently and effectively care for patients and their families.

The team also works directly with the world renowned Jesse E. Edwards Registry of Cardiovascular Disease at United Hospital in St. Paul, part of Allina Health, to diagnose conditions that have resulted in sudden cardiac death. These results then can be used to screen and evaluate surviving family members. Established in 1960, the Registry has examined more than 24,000 cardiac specimens and is a vital repository of knowledge.

Vascular and Endovascular Surgery

At this nationally recognized center, specialists from vascular surgery, endovascular surgery, interventional radiology, advanced cardiovascular imaging, vascular medicine and vascular nursing collaborate to provide the most advanced care for patients with vascular disease.

Patients benefit from the Center's comprehensive diagnostic and treatment services provided by specialists dedicated to the field of vascular disease. They may also have the opportunity to enroll in regional and national multi-center clinical trials that offer new therapies and treatment options.

Vascular and endovascular services are designed to diagnose and prevent disease progression, provide ongoing therapy, preserve independence and improve quality of life.

Vascular and endovascular surgery

Surgeries include innovative, complex open and endovascular techniques—supported by a Level One statewide emergency system of care—that are designed to treat:

Aortic diseases: detection, follow-up and treatment

- abdominal aortic aneurysm
- complex aortic pathology
- thoracic/thoracoabdominal aneurysm
- aortic dissection (acute and chronic)

Carotid and vertebral artery disease

- carotid endarterectomy
- carotid angioplasty/stenting
- vertebral artery reconstruction

Peripheral artery disease (PAD)

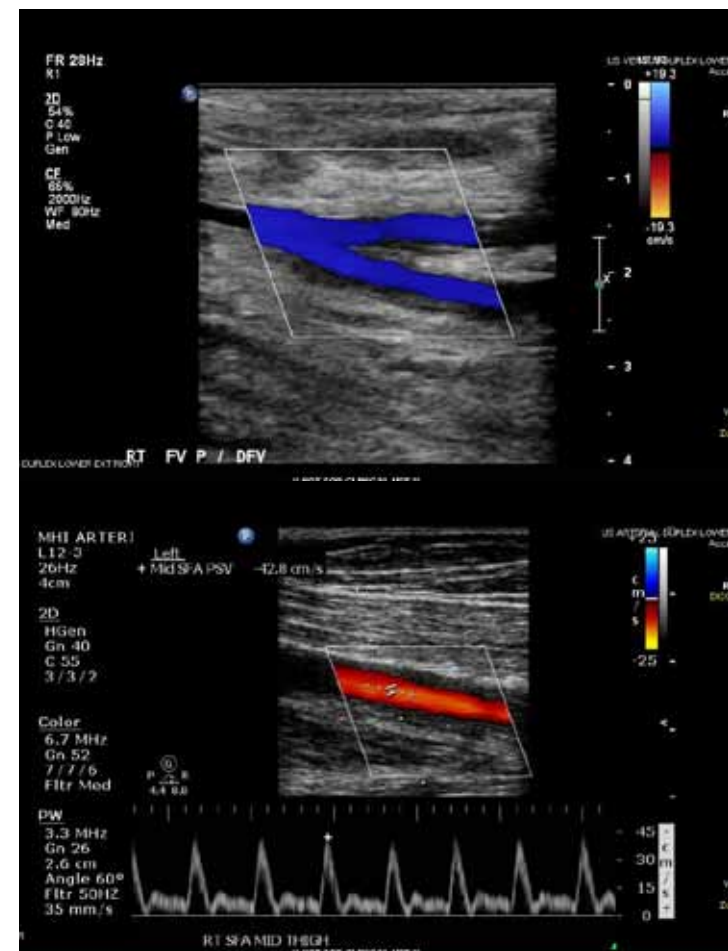
- claudication
- critical limb ischemia

Renal artery and mesenteric arterial disease

- refractory hypertension
- mesenteric ischemia

Venous disease

- varicose veins and venous insufficiency
- non-invasive evaluation
- radiofrequency ablation
- sclerotherapy.



Ultrasound images showing a femoral vein (top) and lower extremity artery (bottom).

The Vascular Laboratory at the Minneapolis Heart Institute® is one of the largest in the country. Accredited by the Intersocietal Commission for the Accreditation of Vascular Laboratories, the lab offers sophisticated noninvasive imaging to patients at Abbott Northwestern and throughout Minnesota with its Mobile Vascular Service.



Advanced endovascular procedures

Patients have access to the most advanced, minimally invasive treatments, including:

- endovascular abdominal aortic aneurysm repair
- endovascular thoracic aneurysm repair
- percutaneous revascularization of lower extremity PAD
- renal/mesenteric stenting
- carotid stenting
- stent-graft therapies for complex aortic pathology.



Left: Reformatted computed tomography angiography (CTA) demonstrating a 6 cm infrarenal abdominal aortic aneurysm.

Right: A three-month postoperative CTA demonstrating successful exclusion of the aneurysm using a commercially available endovascular stent graft. There is no further filling of the aneurysm sac.

Vascular medicine

Vascular medicine services involve preventing, diagnosing and managing arterial, venous and lymphatic disorders. Diagnostic services include physiologic and radiologic lab testing and test interpretation. Conditions treated include:

Arterial disease

- vasoactive disorders: Raynaud's, acrocyanosis, erythromelalgia, frost bite and pernio chilblains
- vascular compression: thoracic outlet, median arcuate ligament and nutcracker syndromes, popliteal entrapment and external iliac artery endofibrosis
- vasculitis: large, medium and small vessels

Venous disease

- varicose vein and venous insufficiency using chemical and endothermal ablation
- deep vein thrombosis and pulmonary embolism
- thrombophilia and hypercoagulation testing, anticoagulation management and using new anticoagulation agents.
- anticoagulation before and after procedures

Lymphatic disease

- Congenital and secondary lymphedema

Congenital syndromes

- Fibromuscular dysplasia, vascular malformation, segmental arterial mediolysis, Klippel Trenaunary Syndrome, May Thurner Syndrome, Von Hippel Lindau disease, and connective tissue disorders including Marfan and Ehlers-Danlos syndromes.

Vascular emergency services

Vascular and endovascular physicians participate in the Center for Cardiovascular Emergency Care (see page 8), ensuring that critical systems are in place to respond to all vascular emergencies, including aortic dissection, critical limb ischemia, and ruptured or symptomatic aortic aneurysm.



Wound Clinic and Hyperbaric Oxygen Therapy Program

Abbott Northwestern Hospital’s multidisciplinary Wound Clinic is staffed by vascular surgeons, general surgeons, plastic surgeons, infectious disease specialists, podiatrists, advanced practice providers and nurses specializing in wound care. The Wound Clinic provides a variety of treatment options to promote wound healing, including hyperbaric oxygen therapy, which stimulates angiogenesis by delivering 100 percent oxygen at elevated barometric pressure.

The Wound Clinic offers treatment for:

- surgical wounds
- pressure ulcers
- skin tears, grafts or flaps
- radiation damage
- lower leg or foot wounds.

Hyperbaric oxygen therapy may be used to treat:

- diabetic wounds
- compromised skin flaps and grafts
- side effects of radiation therapy
- non-healing wounds.

Elective Infrarenal AAA Repair: Mortality Rate

	2009	2010	2011
Total	0% (0/101)	0% (0/93)	0% (0/74)
Endovascular	0% (0/74)	0% (0/71)	0% (0/55)
Open	0% (0/27)	0% (0/22)	0% (0/19)

Carotid Endarterectomy Outcomes

	2009	2010	2011
Mortality rate	0% (0/137)	0% (0/148)	0% (0/133)
Stroke	0.7% (1/137)	0.67% (1/148)	0.76% (1/133)



Vascular clinical research

The Minneapolis Heart Institute Foundation provides valuable infrastructure for the investigation of innovative vascular disease treatments performed at the Minneapolis Heart Institute®. Current FDA-approved research involves angiogenesis with adult stem cell (see page 39) or gene transfer, novel devices and techniques, and new medications.



Barry Maron, MD, director of the Hypertrophic Cardiomyopathy Center

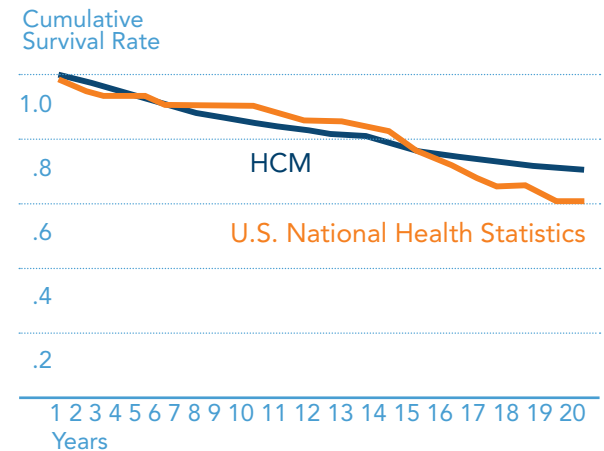
Minneapolis Heart Institute Foundation Hypertrophic Cardiomyopathy

Hypertrophic cardiomyopathy (HCM) is the most common genetic heart disease, the most frequent cause of sudden cardiac death in the young (including trained athletes), and can be responsible for heart failure symptoms at any age. For the last 20 years, Barry J. Maron, MD, an international expert on HCM, has directed the unique HCM Center at the Minneapolis Heart Institute Foundation (MHIF).

The HCM Center has led in patient care, research and teaching related to this complex disease. As the first of its kind, it is a model in delivering patient care that involves the diverse cardiovascular disciplines of electrophysiology, interventional cardiology, echocardiography and cardiovascular magnetic resonance imaging, heart failure and transplant cardiology and surgery, genetic testing and family counseling provided through strong clinical nursing. The large HCM Center cohort includes 1,500 patients from all 50 states and 25 foreign countries whose ages range from 2 to 95 years.

The Center operates on the principle that all potential complications of HCM can be effectively treated, providing the opportunity for normal life expectancy. This focused approach has substantially improved patient outcomes. Targeted strategies include using the implantable defibrillator (ICD) to prevent sudden death (the first systematic program of its kind) and surgical myectomy (in collaboration with the Mayo Clinic)

HCM Survival Compared to U.S. Population



With appropriate treatment, survival with hypertrophic cardiomyopathy is similar to the general U.S. population.

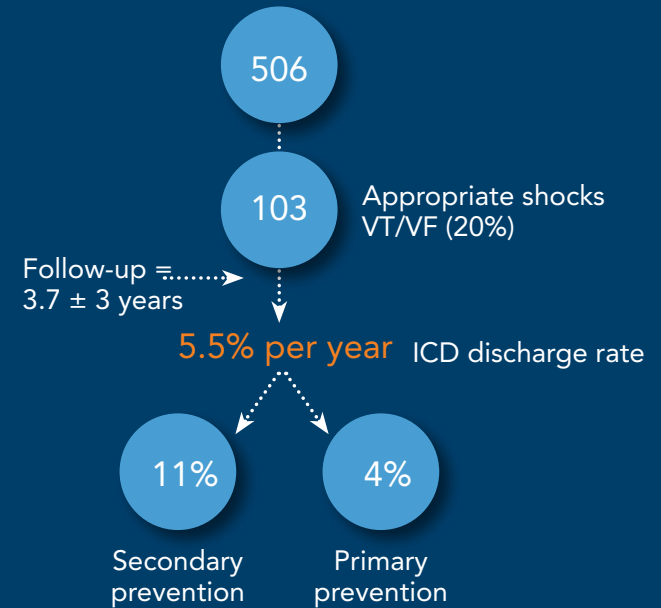
(n=234)
Average follow-up = 8.1 years
HCM mortality rate = 1.2% per year
p=0.22



to reverse heart failure, enhancing quality of life and the opportunity for normal longevity. By virtue of MHIF's sudden death prevention initiative, 250 young patients have received life-saving ICD therapy and survive to the present.

The HCM Center, in collaboration with the Minneapolis Heart Institute's Center for Cardiovascular Imaging, has made major advances in noninvasive diagnosis of this disease, including identifying high-risk patients with HCM whose disease might otherwise be undetected.

Clinical research is a major impetus of the HCM Center, which has contributed 525 papers to the literature over 20 years that describe the diagnosis, natural history and treatment-related outcomes of patients with this complex genetic disease. This systematic series of investigations has measurably changed perceptions, management, decision-making and outcome of HCM.



Of 506 patients with hypertrophic cardiomyopathy and implantable defibrillators, 20 percent had life-saving defibrillator interventions over an average of only 3.7 years. These events occurred at a higher rate in secondary prevention patients (11 percent/year; implants after cardiac arrest), but were also considerable in primary prevention (4 percent/year; implants for risk factors only in mostly asymptomatic patients).

Maron BJ, Casey SA, Poliac LC, Gohman TE, Almquist AK, Aeppli DM. Clinical course of hypertrophic cardiomyopathy in a regional United States cohort. *JAMA* 1999;281:650-655.

Maron BJ, Spirito P, Shen W-K, Haas TS, et al. Implantable cardioverter-defibrillators and prevention of sudden cardiac death in hypertrophic cardiomyopathy. *JAMA* 2007;298:405-412.



Physicians staffing the Preventive Cardiology Clinic have expertise in risk assessment and have incorporated emerging risk factors in patient assessments.

Cardiovascular Disease Prevention

Preventive Cardiology Clinic

The physicians at the Minneapolis Heart Institute® believe it is critical to not only treat heart disease where it exists but prevent heart disease before it begins. The Preventive Cardiology Clinic provides risk assessment, screening and preventive strategies based on the latest research. Clinic staff work with individuals who already have or who are at risk of heart disease, helping them reduce risks and maintain health through a variety of innovative programs.

Areas of focus for 2011 included increased sophistication of risk stratification, enhanced treatment programs and an expanded view of focus. The clinic is staffed by experts in the recognition and treatment of patients with existing cardiovascular disease, as well as patients with high cardiovascular risk without disease, such as having a family member with premature heart disease.

Clinic physicians have developed strategies to approach the common problem of intolerance to statin medications (statin aching). They have incorporated emerging risk factors in patient assessments, including the use of highly sensitive CRP assay, calcium scoring, LDL particle size and lipoprotein(a) measurement. These tools are needed in the expanding field of risk assessment and help the Preventive Cardiology team develop a personal optimal treatment approach. Registered dietitians and other care specialists are available to help patients achieve their goals.



Registered dietitians and other care specialists are available to help patients achieve their goals.

The Preventive Cardiology Clinic now offers a complete apheresis program for those individuals with extremely elevated LDL cholesterol. This technique uses dialysis-like technology to remove harmful atherogenic LDL particles from the blood. Marked elevations of LDL cholesterol can be familial. This common problem, called familial hypercholesterolemia, affects 1 in 500 Americans and can lead to heart attack and cardiovascular death before age 40. It often affects multiple family members, which emphasizes the need for comprehensive screening of all family members. The apheresis program offers these patients the ability to reduce cholesterol to near-normal levels when all other medical treatments fail.

HeartScan Minnesota®

The coronary calcium CT scan is the single most effective test to detect heart disease in its earliest stage. It is especially helpful for patients who have several risk factors but no symptoms of heart disease. Coronary artery calcium scoring is expressed as score adjusted for age and gender. All HeartScan Minnesota scores are compared to a database of more than 19,000 asymptomatic people of the same age and gender. Each scan is reviewed by a cardiologist and radiologist, and patients receive a comprehensive, personalized information packet to help them understand the results. Radiation doses are carefully monitored to ensure the lowest possible radiation exposure. The test is available at a price that ensures patients can consider having it regardless of insurance coverage.

Partnering in prevention—Predict One™

To enhance prevention services for patients throughout the region, the Minneapolis Heart Institute® offers the Predict One™ program. This program provides a complete package of comprehensive calcium scoring, risk stratification and treatment algorithms to partners within the Minneapolis Heart Institute® integrated cardiovascular network. It is currently offered at the Minneapolis Heart Institute® - Brainerd Lakes, Allina Medical Clinic - Faribault, Hutchinson Area Health Care Center and New Ulm Medical Center.



Women's Heart Health Program

Disparities remain in recognizing and treating cardiovascular disease in women. Women are also traditionally under-represented in clinical research. The Women's Heart Health Program tackles these issues by focusing on clinical care, education and research related to cardiovascular disease in women.

Women have the benefit of excellent, comprehensive clinical care from a multi-disciplinary team of experts. At-visit lab results and advanced imaging services deliver timely responses to women's concerns.

Dedicated to its mission of supporting women, the Women's Heart Health Program provides numerous industry, professional and community education events. The Women-Only Cardiac Support Group is a weekly program offering encouragement, camaraderie and education about heart health. The Women's Heart Health Program's collaboration with the Minneapolis Heart Institute Foundation seeks to close the gender gap by initiating and participating in national and local research, including pioneering research in gender-specific stress cardiomyopathy.

Advanced Cardiovascular Imaging



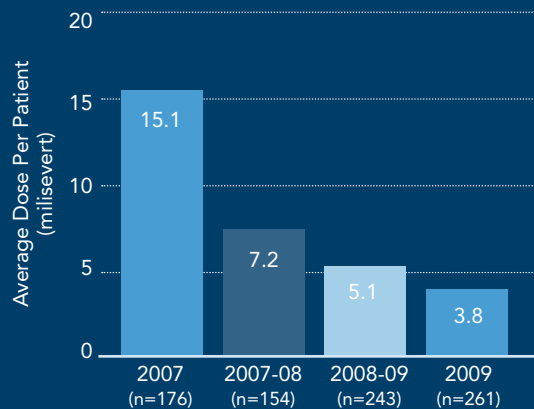
The Minneapolis Heart Institute® at Abbott Northwestern is a recognized leader in raising the standard of care for advanced cardiovascular imaging. Its imaging specialists have been involved in:

- developing the appropriateness guidelines for cardiac computed tomography angiography (CCTA) and cardiac magnetic resonance imaging (MRI)
- developing cardiac CT board examination and the CT lab accreditation criteria with the Intersocietal Commission
- teaching about cardiovascular CT through their leadership in the Society for Cardiac Computed Tomography.

Decrease in Average Radiation Dose for Coronary CT, 2007-09

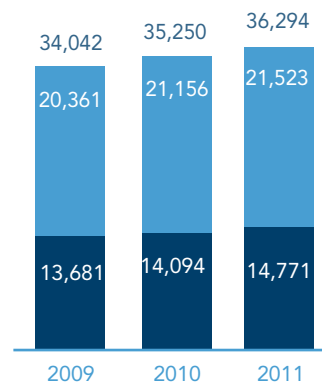
Long-term patient safety

State-of-the-art coronary CT equipment, coupled with the experience of one of the largest coronary CT angiography centers, dramatically reduces radiation doses, as recorded in cooperative study registries.

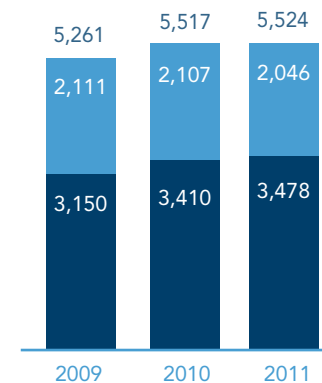


Source: Minneapolis Heart Institute® Cardiovascular Imaging Database.

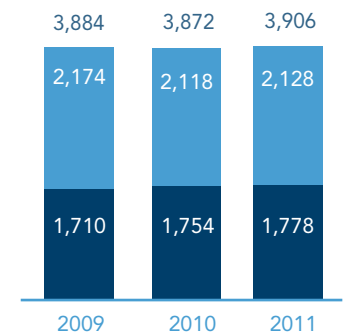
Echocardiograms



Vascular Diagnostic Tests



Cardiac Nuclear Medicine Procedures



■ Minneapolis Heart Institute® at Abbott Northwestern ■ Minneapolis Heart Institute® Community-Based

Source: Minneapolis Heart Institute® Finance Usage Report.

The Center for Advanced Cardiovascular Imaging offers patients comprehensive cardiovascular imaging services, including dedicated adult and pediatric cardiovascular CT and MRI. The availability of complete cardiovascular diagnostic imaging and treatment services at the Abbott Northwestern campus allows patients seamless access to tests and treatment, often on the same day, if necessary. Further, patients can access the Minneapolis Heart Institute®'s mobile imaging services through outreach sites close to their homes.

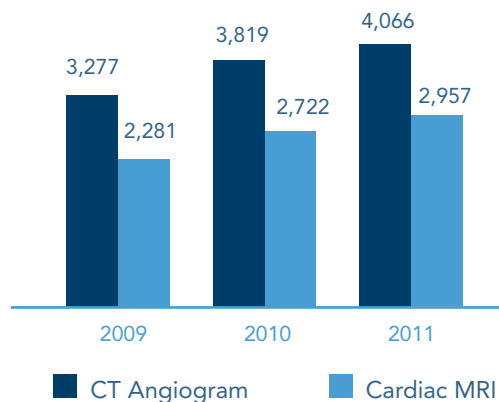
The integration of advanced cardiovascular imaging with subspecialty expertise at the Minneapolis Heart Institute® has led to unique treatment approaches for vascular disease, genetic arrhythmias and heart failure. Each scan is individualized to help triage a patient to the best treatment option. State-of-the-art coronary CT equipment, coupled with the experience

of one of the largest coronary CT angiography centers, dramatically reduces radiation doses, as recorded in cooperative study registries. Cardiologists and radiologists from around the world come for specialized training through a case-based, mentored approach.

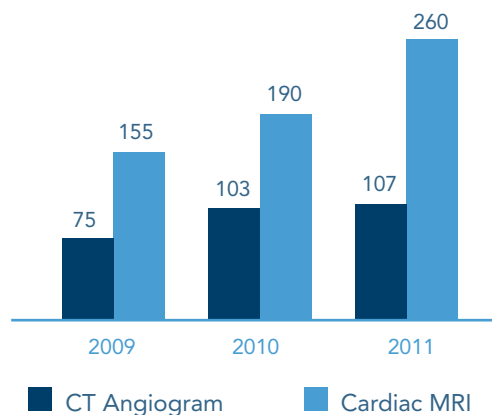
Accomplishments of the echo lab in 2011 include: Transesophageal echocardiography (TEE) and 3D echo support for the Valve Center, TEE support of complex surgical procedures, and TEE cardioversions (a new process with one-time anesthesia for patients undergoing cardioversion and TEE).



Advanced Cardiovascular Imaging Volume—Adult Patients



Advanced Cardiovascular Imaging Volume—Pediatric Patients



Sources: Minneapolis Heart Institute® Finance Usage Report and Cardiovascular Imaging Department Tracking Report.

Advanced cardiovascular care close to home

The Minneapolis Heart Institute® has one of the largest echocardiography and nuclear cardiology programs in the region. Patients in more than 50 sites throughout Minnesota and western Wisconsin benefit from the Minneapolis Heart Institute® mobile programs. Fully accredited technicians travel to clinics, supporting cardiologists and allowing patients to receive advanced cardiovascular diagnostics in their own communities.

Top-rated, Comprehensive Care





Regional clinic sites like Minneapolis Heart Institute® - Brainerd Lakes ensure that subspecialty cardiovascular care is readily and widely available.

The right care in the right setting

Minneapolis Heart Institute® is a pioneer in developing regional offices throughout Minnesota to place cardiologists, nurses and professional staff within the communities it serves. It's also a leader in providing regionally based mobile diagnostic services.

Patients no longer need to travel long distances to receive state-of-the-art cardiovascular care. Instead, they can be evaluated and receive follow-up care locally while remaining near family and friends in a familiar setting. When the need arises for complex procedures such as heart surgery, catheter-based valve replacement, ablation treatment of arrhythmia, or treatment of advanced heart failure, the expertise of the entire Minneapolis Heart Institute® team is available nearly instantly.

2011 Outpatient Visits*

Minneapolis (Abbott Northwestern)	61,877
Baxter	5,386
Edina	7,675
Plymouth	3,185
Shakopee	2,292
Waconia	3,743
Crosby	3,607

*Patient visits at the locations listed above include their satellite clinics throughout Minnesota and Western Wisconsin.

Source: Cadence Scheduling System.

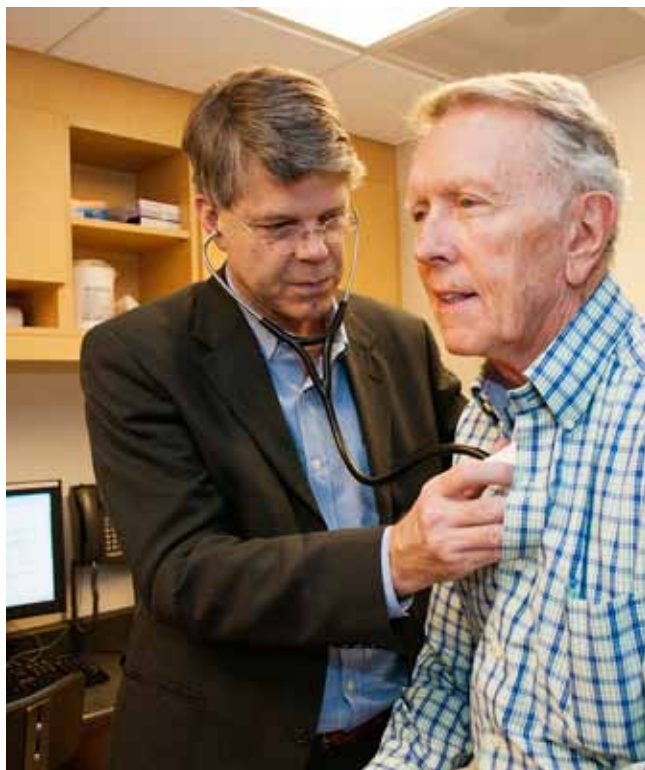
In 2011, the Minneapolis Heart Institute® provided more than 80 professional education programs across the state.

Topics included new developments in cardiovascular disease prevention, women and heart disease, atrial fibrillation evaluation and management, valve disease management, heart failure management and preoperative cardiovascular risk assessment.

Partnering to provide cardiovascular education

The Minneapolis Heart Institute® cardiovascular care model is successful because of the expertise and commitment of health care professionals in the local community. A primary mission is to provide medical education and training at the local level to share evidence-based advances in cardiology. Minneapolis Heart Institute® physicians, nurses and related professionals provide programs tailored to the needs of community partners.

In addition, community health care professionals are encouraged to visit the Abbott Northwestern campus for special training in areas such as stress testing, evaluating pacemakers and managing patients with advanced heart failure. Community physicians and nurses also actively participate in Minneapolis Heart Institute® research studies, many of which have been published in internationally recognized medical journals.



2011 Outpatient Visit Satisfaction Survey*

Would you recommend this doctor's office to your friends and family?

96% indicated "Definitely yes"
(n=611)

*Reflects clinic patient surveys from Minneapolis Heart Institute® at Abbott Northwestern and Minneapolis Heart Institute® hub locations.

Source: Clinician And Group Consumer Assessment of Healthcare Providers Survey.

Fellowship Training in Cardiovascular Disease

In 2011, the Minneapolis Heart Institute® at Abbott Northwestern Hospital and Hennepin County Medical Center started a three-year, American College of Graduate Medical Education-accredited fellowship training program in cardiovascular disease. Its mission is to provide outstanding clinical training in cardiology and builds upon the long history of both institutions in training cardiovascular fellows. These fellows participate in specialized fellow conferences open to all staff at both institutions weekly as well as an array of clinically based multidisciplinary conferences.

The exchange of ideas between the trainees and staff is beneficial to both sides and helps the Minneapolis Heart Institute® stay on the cutting edge in cardiology. The Minneapolis Heart Institute® also partners with the University of Minnesota to provide fellowship training in interventional cardiology, cardiac surgery and vascular surgery.

Many studies have shown that patients in academic environments experience improved care and outcomes and are more likely to receive recommended therapies. These research and teaching efforts—which are uncommon for a private-practice medical facility—stand as an example of how the Minneapolis Heart Institute® and Abbott Northwestern Hospital are committed to a world-class experience for patients and families.



Daily rounds in the cardiovascular ICU enhance communication among care team members and ensure that each patient's treatment plan is coordinated and continuously updated.

The H4100 Cardiovascular Surgical Intensive Care Unit earned the Beacon Award for Critical Care Excellence from the America Association of Critical Care Nurses in 2010. The award recognizes exceptional patient care and a commitment to maintaining the highest standards of nursing practice.

Cardiovascular Hospital Care

Abbott Northwestern's 128-bed Heart Hospital supports the Minneapolis Heart Institute's comprehensive programs and includes:

- 32 cardiovascular critical care beds
- 96 telemetry beds
- remote cardiac monitoring systems for patients throughout the hospital with primary conditions beyond cardiology.

The Heart Hospital was designed with healing and the needs of patients and families in mind. Spaces are aesthetically pleasing with ample daylight and open views to promote a sense of well-being. Patient rooms promote privacy, quiet surroundings and family involvement. Family lounges provide a place to step away and feel refreshed.

In addition to advanced technology, specialized procedure areas, innovative research and demonstrable outcomes, the Minneapolis Heart Institute® at Abbott Northwestern excels because of exceptional care provided by a multidisciplinary team. The American Nurses Credentialing Center (ANCC) granted Magnet Recognition Program®

status to Abbott Northwestern in 2009. In addition, many caregivers in nursing and other disciplines have specialized training and experience working with cardiovascular patients who have complex needs.

Cardiovascular care team

- cardiac rehabilitation specialists
- chaplains
- dietitians
- integrative health practitioners
- nurse practitioners
- nurses
- palliative care staff
- pharmacists
- physician assistants
- physicians
- respiratory therapists
- social workers



America's Best Hospitals

U.S. News & World Report ranked Abbott Northwestern Hospital as one of the nation's Best Hospitals in seven specialties: cardiology and heart surgery, orthopedics, neurology and neurosurgery, gastroenterology, geriatrics, pulmonology and gynecology.

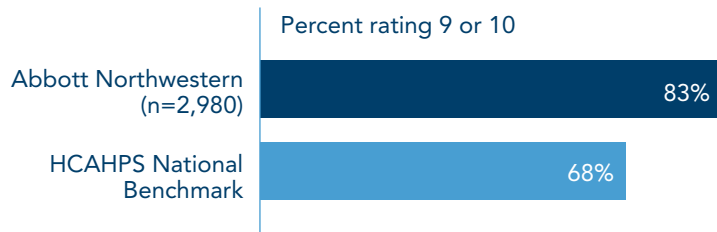


In 2011, Abbott Northwestern's Heart Hospital had 8,128 cardiovascular admissions.

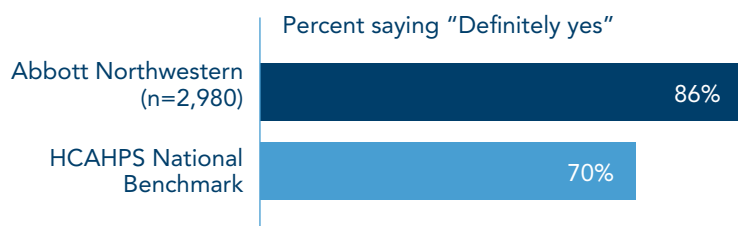


2011 Cardiovascular Inpatient Satisfaction Survey

Using any number from 0 to 10 where 10 is the best hospital possible, what number would you use to rate this hospital during your stay?



Would you recommend this hospital to your friends and family?



Staying connected

With one of the most comprehensive electronic medical record (EMR) systems in the nation, Allina Health—the parent company for Abbott Northwestern Hospital and the Minneapolis Heart Institute®—received the Davies Award for health information technology in 2007, when other hospitals were just beginning their efforts. The system currently spans 11 hospitals and 86 clinics, integrating departments, specialties, home care, clinics, inpatient care and outreach centers. Throughout the entire continuum of patient care, physicians and care team members have immediate access to EMR information, helping them to deliver seamless, coordinate and more informed care and improve patient safety.

Sources: Allina Health 2011 Hospital Consumer Assessment of Health Care Providers of Services Survey (HCAHPS) and Centers for Medicare & Medicaid Services - HCAHPS Reporting, July 2010-June 2011 (hospitalcompare.org).



Penny George™ Institute for Health and Healing

The Penny George Institute for Health and Healing is the nation's largest hospital-based integrative health program. Through its range of inpatient services plus its Outpatient Clinic, LiveWell Fitness Center, Integrative Health and Medicine Research Center, and community and professional education programs, the Penny George Institute has created a model of patient care built on optimizing the health of the whole person—mind, body and spirit.

Integrative health focuses on prevention and wellness, activation of the body's natural healing capacity and the development of self-care skills. Inpatient therapies at Abbott Northwestern are available at no charge to the patient and include acupuncture, integrative nursing consultations, mind/body therapies, music therapy, therapeutic massage and more.

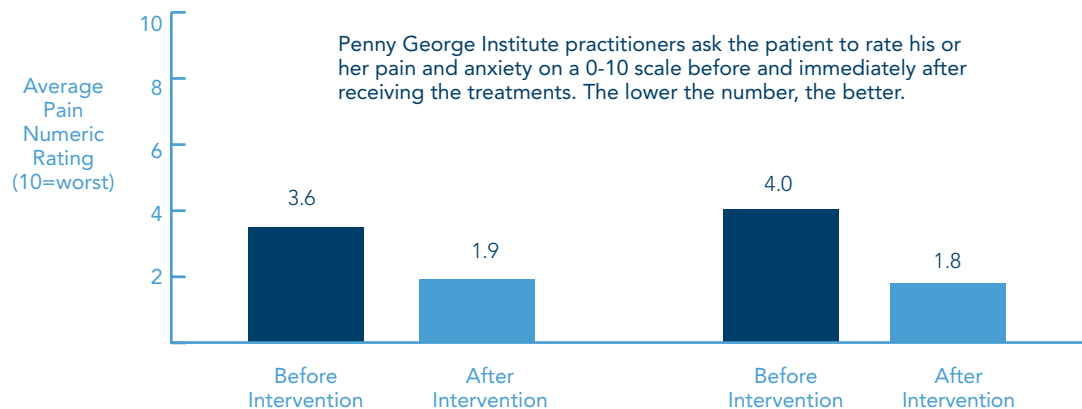
Minneapolis Heart Institute® physicians have been at the forefront of integrative care. In addition to developing innovative inpatient and outpatient programs, they participate in research on various aspects of the feasibility, safety and impact of complementary and alternative medical therapies for patients with cardiovascular disease. The recent MANTRA II trial, published in *The Lancet*, examined music, imagery, touch and prayer as adjuncts to interventional cardiac care.

Following a cardiovascular diagnosis, patients can be referred to the Penny George Institute's Outpatient Clinic and the LiveWell Fitness Center. The clinic and the fitness center offer patients integrative services and medical fitness programs designed to help them optimize their mental and physical health during their rehabilitation by working with qualified, licensed health care professionals.

The Penny George Institute's Integrative Health and Medicine Research Center has conducted a National Institutes of Health funded study of mind/body interventions for reducing blood pressure in older adults with hypertension.

2009 Cardiovascular Inpatient
Self-Reported Pain Scores (n=548)

2009 Cardiovascular Inpatient
Self-Reported Anxiety Scores (n = 533)





Minneapolis Heart Institute Foundation

Physicians who come to the Minneapolis Heart Institute® at Abbott Northwestern understand that they will be joining a distinctive organization. In addition to practicing exceptional clinical medicine, they have the opportunity to lead clinical research and education through the Minneapolis Heart Institute Foundation (MHIF). Since its inception in 1982, the Minneapolis Heart Institute Foundation has established itself as a national and international leader in cardiovascular clinical research and education.

MHIF engages the community to promote cardiovascular health through programs like Girls & Moms on the Move™, a fun way to help moms and daughters develop lifelong healthy habits.

The Minneapolis Heart Institute® has treated more cardiovascular patients using adult stem cell therapy than any other center in the nation.

Programs offered in 2011 include:

- Cardiology Grand Rounds (33 meetings/50 attendees each)
- MHIF Research Internship Program, June – August (14 interns)
- Allina Cardiovascular Nursing Conference (340 attendees)
- Allina Cardiology Forum for Primary Care Providers (92 attendees)



Creating a World Without Heart Disease®

The Minneapolis Heart Institute Foundation is participating in more than 130 Internal Review Board-approved clinical research projects. Several of these projects are highlighted in the following pages. In addition, research staff published more than 100 articles in peer-reviewed journals in 2011. The Foundation is one of only five National Institutes of Health (NIH) Cardiovascular Stem Cell Therapy sites in the United States and is a national leader in cardiovascular cell therapies. Groundbreaking research in multiple areas, performed by visionary research physicians and funded by philanthropy through the Minneapolis Heart Institute Foundation, gives patients hope and options when there were none.

The education arm of the Foundation encompasses professional development, outreach initiatives and community health education. In 2011, the Minneapolis Heart Institute Foundation reached nearly 3,000 people through community education initiatives and educated more than 1,000 professionals, who earned more than 7,000 hours of education credits. Professional programs help doctors and nurses incorporate the latest research into their work.

Research and Innovation

In both breadth and depth, MHIF’s clinical research programs are comparable to those seen only in large academic cardiovascular research institutes. MHIF participates in National Institutes of Health (NIH) studies, industry-sponsored cardiovascular drug and device trials and home-grown physician-initiated studies. A sampling of research areas of interest is highlighted below.

Cardiovascular Cell Therapy Program

In 2005, the National Institutes of Health selected the Minneapolis Heart Institute® at Abbott Northwestern Hospital as one of only five Cardiovascular Cell Therapy Research Network (CCTRN) sites in the United States. This grant was renewed for another seven years in 2012. The Minneapolis Heart Institute® has treated more cardiovascular patients using adult stem cell therapy than any other center in the nation. Cardiovascular cell therapy research is supported through the Minneapolis Heart Institute Foundation and includes multiple stem cell clinical trials in addition to its own CCTRN-approved trials. Protocols are currently open for five types of cardiovascular disease:

- acute MI
- heart failure, including LVAD
- refractory angina
- critical limb ischemia and claudication
- stroke.

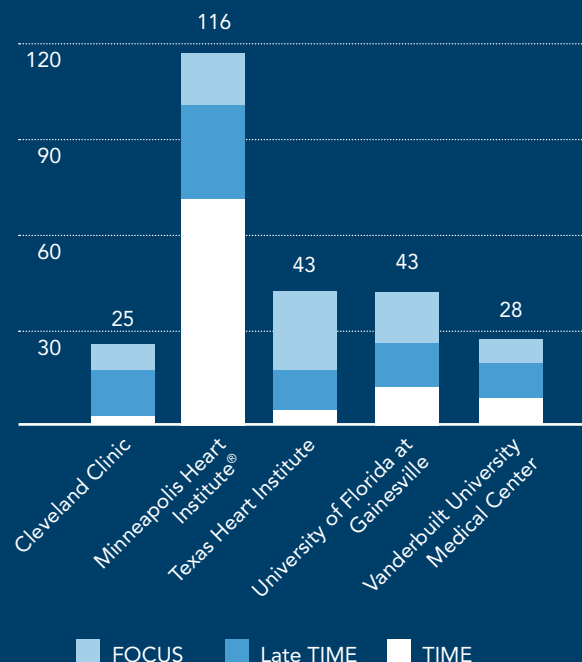
The goal of the Cardiovascular Cell Therapy Program is to answer important questions about safety, efficacy, optimal methods of delivery and long-term outcomes. Encouraging data from several early-phase trials suggest that adult stem cell therapy may benefit for selected patients with diagnoses that are not amenable to traditional treatment involving medical therapy or surgery.

The Minneapolis Heart Institute® is uniquely suited to provide national and international leadership in cardiovascular stem cell therapy, based on the success of programs such as:

- OPTIMIST Program for patients with refractory angina
- Level One Heart Attack Program
- Center for Advanced Heart Failure Treatment
- Critical Limb Ischemia Program.

The Minneapolis Heart Institute Foundation is participating in more than 130 Internal Review Board-approved clinical research projects. For information about current studies, visit mplsheart.org.

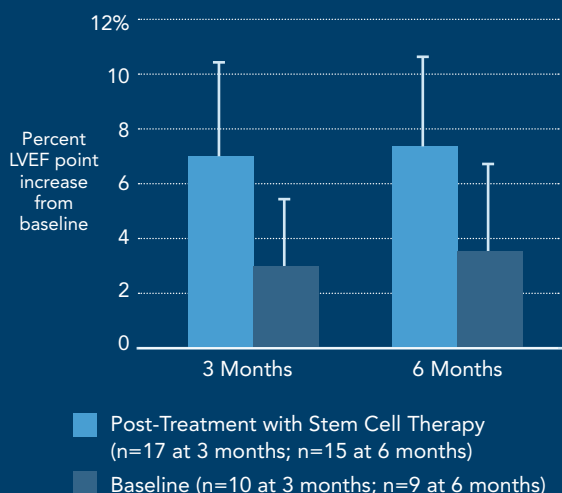
Patient Enrollment by Site
Cardiovascular Cell Therapy Research Network



The Minneapolis Heart Institute® has enrolled more patients for stem cell research than any other CCTRN site. It has enrolled the majority of patients for the Time (67) and LateTIME (33) studies. Only Florida has enrolled 10 or more patients to TIME, while enrollment for LateTIME is more evenly distributed among the other four sites (11-16 patients each). Texas has enrolled the majority of FOCUS patients with 25, and the other four sites have enrolled 9-16 patients each.

Left Ventricular Ejection Fraction Improvement with Stem Cell Therapy in Patients with Anterior MI (3 months, 6 months)

In patients with anterior myocardial infarction receiving stem cell therapy, left ventricular ejection fraction (LVEF) improved significantly from baseline at three and six months post-treatment.



Hare JM, Traverse JH, Henry TD et al. A randomized, double-blind, placebo-controlled, dose-escalation study of intravenous adult human mesenchymal stem cells (prochymal) after acute myocardial infarction. *JACC* 2009;54(24): 2277-2286.

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Study name	Principal investigators	Description
PreSERVE AMI Phase II	Timothy Henry, MD	The study is designed to evaluate the potential of AMR-001 to improve perfusion, preserve cardiac function and improve clinical outcomes in patient with ST-elevation myocardial infarction (anterior).
RENEW	Timothy Henry, MD (national PI) Jay Traverse, MD (MHIF PI)	This study will investigate the efficacy and safety of CD34+ cells in patients with refractory ischemia.
ATHENA	Timothy Henry, MD (national co-PI)	This study will investigate the safety and feasibility of adipose-derived cells in patients with heart failure not amenable to surgical or interventional revascularization.

Read more

Traverse JH, Henry TD, Ellis SG, et al. Effect of intracoronary delivery of autologous bone marrow mononuclear cells 2 to 3 weeks following acute myocardial infarction on left ventricular function: The LateTIME randomized trial. *JAMA* 2011;306:2110-2119.

Traverse JH, McKenna DH, Harvey K, Jorgenson BC, Olson RE, Bostrom N, Kadidlo D, Lesser JR, Jagadeesan V, Garberich R, Henry TD. Results of a phase 1, randomized, double-blind, placebo-controlled trial of bone marrow mononuclear stem cell administration in patients following ST-elevation myocardial infarction. *Am Heart J* 2010;160:428-34.

The OPTIMIST Program

OPTIMIST = OPTions In Myocardial Ischemia Syndrome Therapy

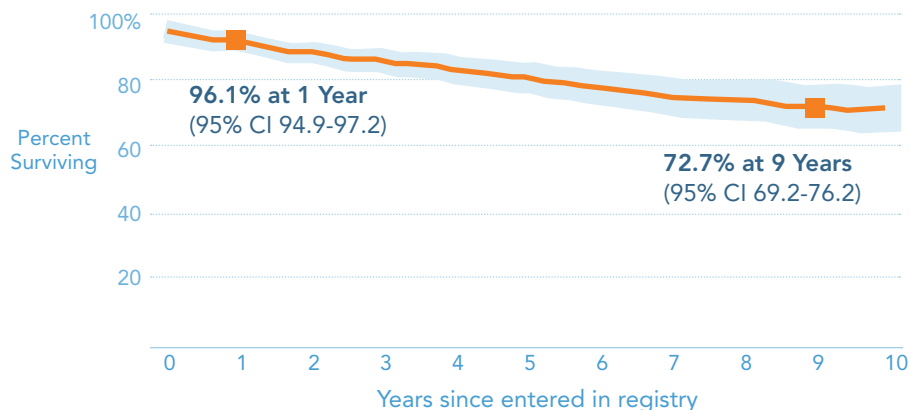
As mortality from coronary artery disease declines, an increasing number of patients have myocardial ischemia, despite having undergone optimal medical therapy. These patients are often not candidates for further surgical or percutaneous revascularization. The OPTIMIST Program—a collaboration of the Minneapolis Heart Institute® and the Minneapolis Heart Institute Foundation—was designed to address the needs of patients with refractory angina and advanced coronary disease, and has provided options to more than 1,400 patients from across the country since its inception in 2001.

Clinical research and treatment options include:

- angiogenesis (gene and adult stem cell therapy)
- enhanced external counterpulsation (EECP)
- interventional procedures (advanced chronic total occlusion/coronary sinus occluder)
- innovative pharmacologic agents
- spinal cord stimulation
- transmural laser revascularization (robotic).



Long-Term Survival of Patients in the OPTIMIST Program



Source: OPTIMIST Program Database.

The goals of the program are to:

- improve the quality of care for this unique and growing subset of patients
- define long-term outcomes, natural history and predictors of adverse outcomes
- provide unique treatment options including current clinical and novel research approaches.



Transcatheter treatments for valvular heart disease

Minneapolis Heart Institute® physicians are participating in the next phase of ground-breaking transcatheter clinical trials looking at lower profile devices, different vascular access options, lower risk patients and treatment options for bioprosthetic valve degeneration. Key studies include:

Study name	Principal investigators	Description
PARTNER II Placement of AoRTic TraNscathER Valves) Trial ¹	Wesley Pedersen, MD Vib Kshetry, MD	This trial focuses on transcatheter aortic valve replacement (TAVR) using lower profile transfemoral, transapical and transaortic access options. Cohort A is a randomized trial for intermediate risk patients (STS >4%). Cohort B is a non-randomized registry for high-risk patients poorly suited for surgical valve replacement.
REALISM Real World ExpAndered MuLtlcenter Study of the MitraClip® Registry ²	Wesley Pedersen, MD	This is a non-randomized registry evaluating the MitraClip repair system for transcatheter mitral valve repair in high-risk patients with severe (3+ or greater) MR who are poorly suited for surgical valve treatments. MHIF researchers coauthored a recent study with other EVEREST II investigators showing favorable outcomes in these nonsurgical candidates. ³ MHIF has one of the highest patient enrollments in REALISM and is continuing to enroll patients.

¹ See clintrials.com for more information.

² Ibid.

³ Whitlow LW, Feldman T, Pedersen WR, et al. Acute and 12-month results with catheter-based mitral valve leaflet repair. *JACC*. 2012;59:130-139.

Mechanical circulatory support

In 2011, MHIF researchers conducted studies on several newer generation investigational left ventricular assist devices. These devices are relatively small, easier to implant and have more durable battery packs and drive systems. The studies are both NIH- and industry-sponsored. MHIF has investigational devices for bridge (awaiting heart transplant) and destination (permanent implantation) therapies. Studies include:

Study name	Principal investigators	Description
Revive-it	David Feldman, MD	This study will investigate the efficacy of a left ventricular assist device (LVAD) compared to optimal medical management with NY Class 3 heart failure.
Heartware	Barry Cabuay, MD	This study is investigating which LVAD is better (Heartware vs. Heartmate II) for destination therapy in patients with severe heart failure.
SynCardia	Barry Cabuay, MD	This study is investigating a total artificial heart technology with a portable power driver that will allow patients to be discharge from the hospital while waiting for heart transplant. Currently, the only FDA-approved power drive technology weighs more than 400 pounds.





Hearts Beat Back: The Heart of New Ulm Project

Hearts Beat Back: The Heart of New Ulm Project (HONU) is a community-based prevention program with the goal of reducing myocardial infarctions and coronary heart disease risk factors in the south central Minnesota town of New Ulm over a 10-year period. Begun in 2009, it is a partnership of Minneapolis Heart Institute® physicians, the Minneapolis Heart Institute Foundation, Allina Health, physicians of the New Ulm Medical Center and residents in New Ulm.

The HONU Project focuses on individual behavior change and environmental level improvements with interventions dispersed across health care settings, worksites and the community. Key components include:

- heart health screenings
- community-based and health care-based programs
- HeartBeat Connections program offering coaching by telephone for high-risk individuals
- collaboration with local restaurants and stores to increase healthy food options and with employers to develop worksite wellness programs.

Early results presented at national cardiology meetings showed evidence of reduced cardiovascular risk factors among community residents.

Changes Among Cohort of People Screened in 2009 and 2011 (n = 1,779)

	Females (n = 1,132)		Males (n = 647)	
	2009	2011	2009	2011
Behavioral factors (in %)				
Current smoker*	6.0	5.2	7.0	5.3
High stress level †‡	13.0	7.6	7.9	7.5
Fruit and vegetable servings (≥ 5/day)†‡‡	22.3	37.3	11.5	21.2
Exercise (> 150 min/wk)†‡‡	66.5	76.5	71.7	77.6
Biometric factors (in %)				
Obese (BMI > 30 kg/m ²)	34.9	34.3	38.1	37.9
Hypertension (> 140/90 mmHg)†‡‡	22.0	18.3	27.6	19.4
High cholesterol (> 200 mg/dL)†‡‡	52.1	47.4	44.2	34.9
High LDL (> 130 mg/dL)*‡	37.4	35.0	38.0	29.5
High-sensitivity C-reactive protein (> 3 mg/dL)†‡	34.5	30.0	21.6	20.2
High glucose (> 100 mg/dL)†	22.7	19.0	33.5	30.1
High triglycerides (> 150 mg/dL)†	25.9	21.6	34.2	32.3

The table shows the reduction in cardiovascular risk factors in people who participated in the HONU Project screening program in both 2009 and 2011. There were significant reductions in cardiovascular risk factors including diabetes, hypertension and high cholesterol. Women showed more reductions in stress and more increases in fruit/vegetable consumption and exercise than men.

† 2011 results show significant change at $\alpha = 0.05$ for females.

* 2011 results show significant change at $\alpha = 0.05$ for males.

‡ 2011 changes differ by gender at $\alpha = 0.05$.

The HONU Project has worked with local restaurants to increase healthy menu options.

Nearly two-thirds of the adult population has participated in HONU Project heart health screenings, including more than 3,000 individuals in 2011.



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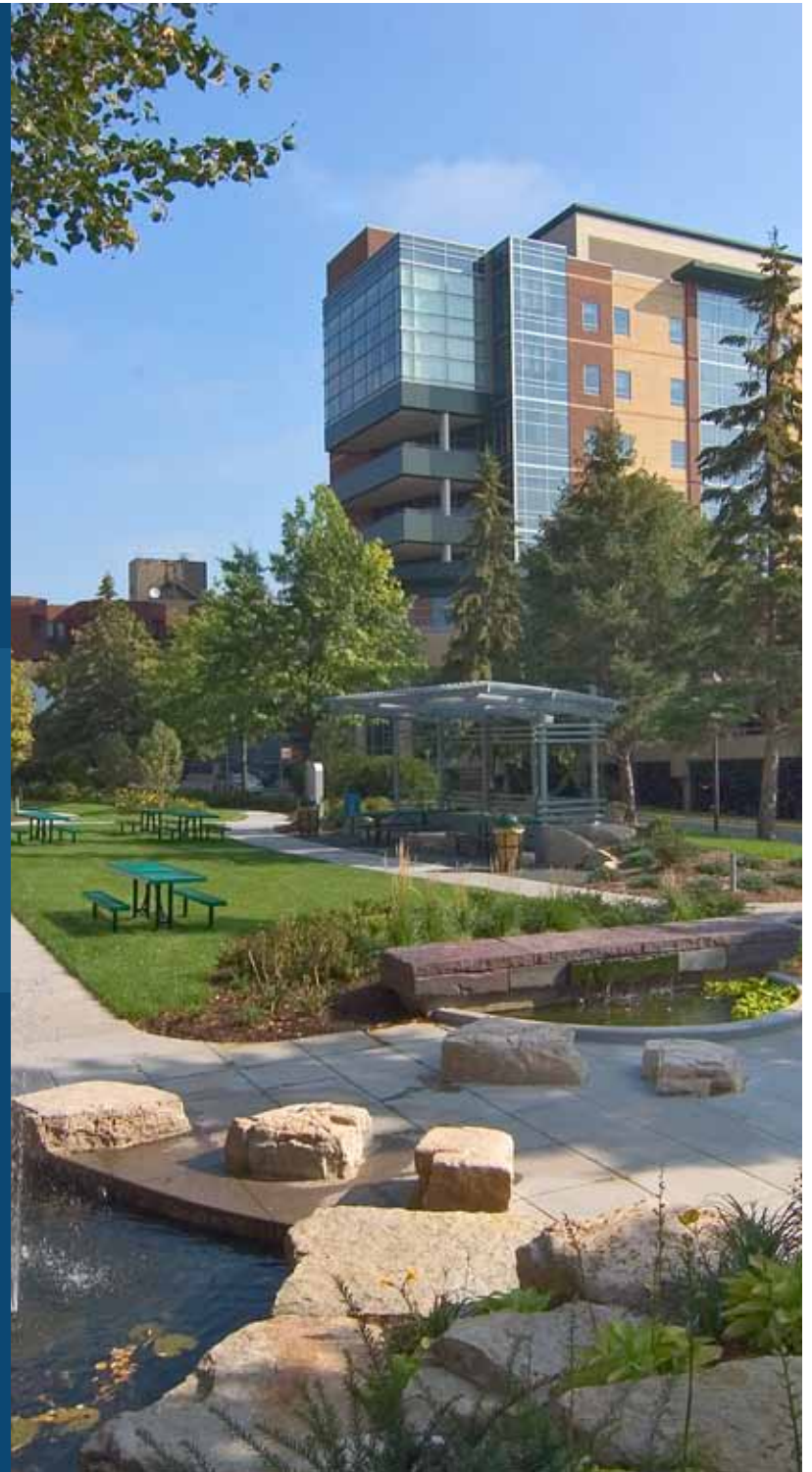
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