



CARDIAC AND VASCULAR INSTITUTE

2014 YEAR IN REVIEW

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INTRODUCTION

The team at NYU Langone Medical Center's Cardiac and Vascular Institute (CVI) is delighted to share with you our report chronicling an exciting year of achievements and milestones.

At CVI, the complex is commonplace. Our expertise in many of the most challenging areas of cardiac and vascular care continues to thrive and expand, including groundbreaking work in treating aortic dissections, robust programs in heart rhythm disorders and congenital heart disease, and a rapidly expanding valvular heart disease program now led by one of the nation's leading experts in cardiac surgery and interventional cardiology.

Over the past year, we have built on our foundation of excellence in cardiology, cardiac surgery, and vascular disease care by adding several renowned faculty members, pioneering new technologies, leading key clinical trials, and launching first-of-their-kind clinical and research programs that will serve as models in the field.

Our motivation is simple: Advancing cardiac and vascular care saves lives. According to a study recently published in *The Lancet*, death rates from cardiovascular disease in some regions have decreased by as much as 22 percent, while life expectancy has increased by more than six years since 1990. We owe these remarkable gains in part to innovative cardiac care—pioneered here and elsewhere—now considered routine.

We expect those trends to continue as we redefine the boundaries of possibility, develop treatments for conditions that were once untreatable, and restore health to the sickest of patients. It all starts with the basic, translational, and clinical research we pursue today.

At NYU Langone, we are honored to contribute to the cardiac and vascular health of communities worldwide.

FACTS & FIGURES****Cardiac and Vascular Institute*****#11** in the country

for Cardiology & Heart Surgery in U.S. News & World Report's 2014-15 "Best Hospitals"

\$28 million

NIH research funding

95%

of isolated mitral valve repairs performed minimally invasively

2,700+

electrophysiology procedures

400+

scientific publications

4,000+mitral valve repairs
(since 1996)**Silver**

AHA Quality Achievement Award for Heart Failure

1,100+

fetal echocardiograms

4,000+

pediatric echocardiograms

98%

overall survival rate for pediatric heart surgeries

first in the country

The Leon H. Charney Division of Cardiology at NYU School of Medicine is among the oldest and most renowned in the United States. Founded in 1911, when the John Wyckoff Cardiology Clinic opened its doors at Bellevue Hospital Center, it became the first ambulatory cardiac clinic in the United States.

NYU Langone Medical Center**Ranked #1 for Two Years in a Row**

in overall patient safety and quality, among leading academic medical centers across the nation that participated in the University HealthSystem Consortium Quality & Accountability Study

**Ranked #15 on "Best Hospitals" Honor Roll**

by U.S. News & World Report and nationally ranked in 13 specialties, including top 10 rankings in Orthopaedics (#4), Rheumatology (#6), Geriatrics (#8), Neurology & Neurosurgery (#8), and Rehabilitation (#9)

**Ranked One of the Top 20 Medical Schools**

by U.S. News & World Report

Magnet Designation for Third Consecutive Term

for Tisch Hospital and Rusk Rehabilitation, an honor achieved by only 2% of hospitals in the country. NYU Langone's Hospital for Joint Diseases received its first Magnet recognition in 2012.



NEW & NOTEWORTHY

A Year of Progress: New Recruits, Inventions, Programs, and Honors

During the past year, NYU Langone Medical Center's Cardiac and Vascular Institute has added several key faculty members, launched notable new programs, spearheaded key clinical trials, and helped pioneer groundbreaking devices.

Renowned Surgeon- Interventionalist Joins CVI

One of the nation's most uniquely trained cardiac experts has joined the faculty of NYU Langone's Cardiac and Vascular Institute (CVI). Mathew R. Williams, MD, named chief of the Division of Adult Cardiac Surgery and director of interventional cardiology in 2014, is the first and among the only physicians in the United States to be dually trained in cardiothoracic surgery and interventional cardiology. Dr. Williams serves as either principal investigator or steering-committee member for several clinical trials under way in cardiovascular medicine, including the repositionable CoreValve® Evolut R™ System transcatheter aortic valve, the smallest-caliber valve available, which reduces the risk of complications. Dr. Williams's expertise allows CVI to offer hybrid procedures, combining catheter-based stenting and traditional surgery, and paves the way for significant expansion of NYU Langone's structural heart program.

Lead Extraction Expert Joins Faculty

Charles Love, MD, joined the Cardiac and Vascular Institute in 2014 as director of Cardiac Rhythm Device Management. Widely respected as an expert in the implantation of heart rhythm devices such as pacemakers, defibrillators, cardiac resynchronization devices, and hemodynamic monitoring devices, Dr. Love is also recognized as a pioneer in the extraction of chronically implanted pacing and defibrillator leads. Dr. Love has implanted more than 7,000 devices and has removed more than 3,000 pacing and defibrillator leads.

A Heart for Seniors: New Geriatric Cardiology Program

With the population of the nation's oldest seniors expected to triple by 2050, NYU Langone has opened the first specialized geriatric cardiology program in New York. John A. Dodson, MD, assistant professor of medicine (cardiology) and director of the Geriatric Cardiology Program, spends an hour with each new patient, assessing not only their cardiac function and complete clinical history but also indicators of aging like frailty and cognitive decline that are commonly assessed by geriatricians but not by cardiologists. The geriatric cardiology program's comprehensive, individualized care aims to significantly improve the outcome and quality of life for seniors, many of whom have comorbid conditions and cognitive impairment. For high-risk patients who require cardiac surgery, the program also includes an innovative "prehab" component, which introduces rehabilitation exercises well before the surgery to speed the patient's recovery.

NEW & NOTEWORTHY

Center for Venous Thromboembolic Disease Launches

The new Venous Thromboembolic Disease Center (VTEC), funded with a donation of \$5 million from longtime trustee Bernard Schwartz and his late wife Irene, is a first-of-its-kind, comprehensive program aimed at understanding, diagnosing, and treating deep vein thrombosis and pulmonary embolus. A major public health threat, venous thromboembolism (VTE) kills more than 200,000 people in the United States each year. VTEC aims to establish a national standard of care for VTE screening, detection, and treatment and serve as a model for VTE-related education and training.

CVI Selected by CMS for Care Improvement Initiative

CVI has been selected by the Centers for Medicare & Medicaid Services to participate in the Bundled Payments for Care Improvement Initiative. The effort, created by the Affordable Care Act, is testing innovative payment and service delivery models that have the potential to reduce expenditures while preserving or enhancing quality of care.



Judith S. Hochman, MD, received the AHA's Clinical Research Award

An Early Warning System for Heart Failure Patients

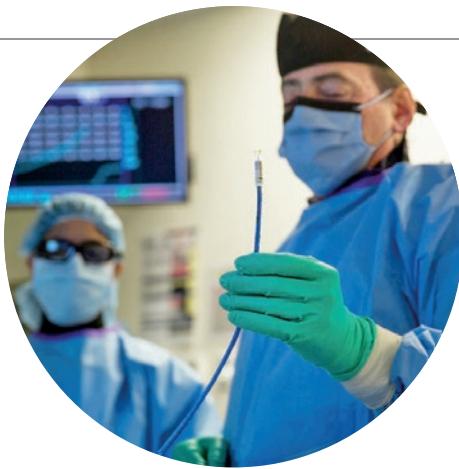
CVI cardiologists debuted another innovative cardiac device at NYU Langone last September. In a collaborative procedure, Alex Reyentovich, MD, assistant professor of medicine (cardiology) and medical director of the Ventricular Assist Device Program, Larry A. Chinitz, MD, the Alvin Benjamin and Kenneth Coyle, Sr. Family Professor of Medicine and Cardiac Electrophysiology, and the Heart Rhythm Center team, were the first in the tri-state area to implant the CardioMEMS™ HF System for patients with advanced heart failure. Placed permanently in the pulmonary artery, the implantable sensor—about the size of a small paper clip—sends daily pressure readings to the patient's care team, warning of rising pulmonary artery pressure. In a clinical study, there was a clinically and statistically significant reduction in heart failure-related hospitalizations for the participants whose doctors had remote access to pulmonary artery pressure data.

Hochman Honored by AHA for Trial Leadership

Judith S. Hochman, MD, the Harold Snyder Family Professor of Cardiology, associate director of the Leon H. Charney Division of Cardiology, senior associate dean for clinical sciences at NYU Langone, director of the Cardiovascular Clinical Research Center, and co-director of the NYU-HHC Clinical and Translational Science Institute, has received the American Heart Association's 2014 Clinical Research Award for her leadership in landmark clinical trials aimed at updating the national guidelines for the management of ischemic heart disease.

Dr. Hochman has led multiple National Heart, Lung, and Blood Institute-sponsored international clinical trials that sought to determine the optimal management of ischemic heart disease, leading to the development of new recommendations for the role of revascularization (stent placement and coronary bypass surgery) in clinical practice guidelines. She also served as study chair for the first phase II (SHOCK 2) and phase III (TRIUMPH) trials conducted to test a pharmacological agent for cardiogenic shock.

Larry A. Chinitz, MD, shows the leadless pacemaker implanted by catheter



World's Smallest Pacemaker

In February 2014, Larry A. Chinitz, MD, the Alvin Benjamin and Kenneth Coyle, Sr. Family Professor of Medicine and Cardiac Electrophysiology and director of the Heart Rhythm Center, implanted the first Micra™ Transcatheter Pacing System (Micra TPS), the world's smallest pacemaker. About one-tenth the size of conventional pacemakers, or roughly the size of a large vitamin, the new leadless pacemaker can be implanted, repositioned, and removed nonsurgically through a catheter inserted into the femoral vein. NYU Langone is one of the leading sites for the global clinical trial of the Micra TPS.

Focus on Prevention

The expanded Center for the Prevention of Cardiovascular Disease at NYU Langone takes a multidisciplinary approach toward reducing morbidity and mortality associated with cardiovascular disease, pairing clinicians and researchers. Led by Edward A. Fisher, MD, PhD, MPH, the Leon H. Charney Professor of Cardiovascular Medicine and director of the Marc and Ruti Bell Vascular Biology and Disease Program, the Center's expert team is a national leader in the diagnosis and treatment of cardiovascular risk factors.

First Study to Assess Effect of Vegan Diet on Heart Health

NYU Langone has launched the first-ever clinical trial comparing blood markers in patients with cardiovascular disease assigned to eat a vegan diet (a whole-foods, plant-based diet with minimal processing and minimal oils) with a group placed on a diet recommended by the American Heart Association. The trial is funded by the Purjes Foundation, a private nonprofit institution established by Dan and Edna Purjes. Dan Purjes became a vegan in 2011 after he suffered a heart attack and underwent a stent procedure by NYU Langone's James N. Slater, MD, the Robert and Marc Bell Professor of Cardiology and director of the Cardiac Catheterization Laboratory. Within 60 days, Purjes was free of all medication and his blood markers placed him in the lowest risk category for another cardiovascular event. Anecdotal evidence like Purjes's suggests that the 8-week trial of the vegan diet could show significant improvements in vital cardiovascular markers, such as C-reactive protein, cholesterol levels, triglycerides, and glucose.

A Growing Ambulatory Care Network

In recent years, NYU Langone has expanded its ambulatory care network to all five boroughs of New York City and beyond to other areas of New York. It now offers outpatient cardiology care at three sites in Queens and on Long Island, as well as in Manhattan, Brooklyn, Staten Island, and the Hudson Valley. In addition, multispecialty practices that include cardiovascular care can be found at six Manhattan locations, three Brooklyn locations, and one location each in Queens and Long Island.

CLINICAL CARE

The Heart of the Matter

At NYU Langone, the latest research and medical innovations in cardiac and vascular treatments translate to pioneering minimally invasive care for the most challenging cases.



Aubrey C. Galloway, MD,
and members of the cardiac
surgery team at NYU Langone

Creating a Sound Structure

STRUCTURAL AND VALVULAR HEART PROGRAM

NYU Langone's structural heart program is led by Mathew R. Williams, MD, associate professor of cardiothoracic surgery and medicine, who recently joined NYU Langone Medical Center as chief of the Division of Adult Cardiac Surgery and director of interventional cardiology. Dr. Williams was the nation's first physician to cross-train in both cardiac surgery and interventional catheter-based techniques, and he remains one of only a handful of physicians with this background. Dr. Williams complements CVI's established expertise in valvular disease, joining James N. Slater, MD, the Robert and Marc Bell Professor of Cardiology and director of CVI's Cardiac Catheterization Laboratory, and Aubrey C. Galloway, MD, the Seymour Cohn Professor of Cardiothoracic Surgery and chair of the Department of Cardiothoracic Surgery. With their combined knowledge and experience of surgical and interventional cardiology, the clinicians form a strong, multidisciplinary team able to offer a wide range of patients with valvular heart disease outstanding care.

2014 Highlights

- Among 1,500 patients receiving minimally invasive aortic valve replacement, a surgical risk of only 2 to 3 percent was found in patients over 75 and only a 1 percent risk in younger patients. (CVI findings, reported in a case-matched study published in a 2013 retrospective study in *The Journal of Thoracic and Cardiovascular Surgery*.)
- CVI's mitral valve repair database is one of the world's largest, with more than 4,000 NYU Langone patient records. It shows an operative mortality of 0.5 percent in patients under age 70—1.3 percent overall—and a 95 percent 8-year freedom from repeat operation or moderate or severe recurrent mitral regurgitation for the initial series of 1,071 right minithoracotomy mitral valve repairs.

NEW TRIALS EXAMINE TRANSCATHETER AORTIC VALVE REPLACEMENT

NYU Langone Medical Center was one of a select group of academic medical centers to participate in the CoreValve® trial. The trial compares aortic valve replacement surgery with transcatheter aortic valve replacement (TAVR) procedures in high-risk patients (those at greater than 10 percent mortality risk with surgical valve replacement). This pivotal trial, published in March 2014, found that patients with severe aortic stenosis who underwent TAVR had a significantly higher rate of survival at one year than those who were treated with surgical aortic valve replacement. The CoreValve® trial was the first prospective study of any device to suggest that TAVR is superior to surgery in certain patient populations.

NYU Langone also serves as a primary site for the SURTAVI trial, assessing the viability of expanding the use of TAVR to patients of intermediate risk according to the Society of Thoracic Surgeons risk scale (5 to 10 percent), with surgery. Drs. James Slater and Aubrey C. Galloway serve as primary investigators for these trials.

In other research news, last September NYU Langone announced its participation in the first U.S. clinical study to examine the CoreValve® Evolut™ R System, a next-generation self-expanding transcatheter valve. The prospective study, which includes 25 sites in the U.S., will enroll up to 250 patients with severe symptomatic aortic stenosis who are at high risk for open-heart surgical aortic valve replacement. To date, the team at CVI has more experience implanting the CoreValve® Evolut™ R System than any other medical center in the world. The trial, co-led by Dr. Williams, will evaluate the safety and effectiveness of the novel valve used in TAVR procedures.

"The new device is smaller and more maneuverable than the previous generation of transcatheter valves, which may allow the surgeon more flexibility during surgery," says Dr. Williams. "This could be an advantage over previous generations of this device, and may have the potential to improve patients' quality of life through the use of minimally invasive techniques."

CLINICAL CARE

The CVI team performs

95%

of its isolated mitral valve repairs minimally invasively

Approximately

50%

of the robotic mitral valve repairs at CVI are complex cases involving 3 or more repair techniques

**BLOOD CONSERVATION STRATEGY**

A restrictive approach to blood transfusion in cardiac surgery has become recognized as a best practice nationwide, but limited data on the safety of a blood conservation strategy (BCS) in aortic valve replacement surgeries limited its use. In a 2014 review of nearly 800 aortic valve replacements performed at the Medical Center between 2007 and 2011 using a multidisciplinary BCS, Dr. Galloway and his colleagues found that perioperative BCS reduced red blood cell transfusion without an increase in mortality or morbidity. The article, which appeared in *The Annals of Thoracic Surgery* in January 2014, calls for guidelines for BCS in routine cardiac operations to be extended to aortic valve patients.

Mathew R. Williams, MD (center), chief of Adult Cardiac Surgery and director of Interventional Cardiology, and interventional cardiologist Michael Attubato, MD, performing a TAVR procedure in the hybrid OR

MITRAL VALVE DISEASE

James N. Slater, MD, director of the Cardiac Catheterization Laboratory, performs a percutaneous coronary procedure in the Cath Lab



MITRAL CLIP AVOIDS OPEN HEART SURGERY

A mitral clip affords patients with degenerative mitral valve regurgitation (in which the heart valve fails to close properly) the option of nonsurgical valve repair when surgery is deemed too risky. By reducing mitral regurgitation—often by more than 50 percent—and improving hemodynamics, the clip reduces complications and significantly improves quality of life. With the expertise of Drs. Slater and Williams, who have collectively placed the mitral clip in more than 100 patients, NYU Langone now claims more experience with the device than any other medical center in the New York area.

With NYU Langone as the primary site, Drs. Slater and Galloway served as principal investigators in the EVEREST clinical trials that led the FDA to approve the first mitral clip device in 2013.

NYU Langone is also enrolling patients in the COAPT trial, which will examine the use of the mitral clip in patients with idiopathic dilated cardiomyopathy, which stems not from intrinsic abnormalities in the mitral valve but from ischemic heart disease or other causes.

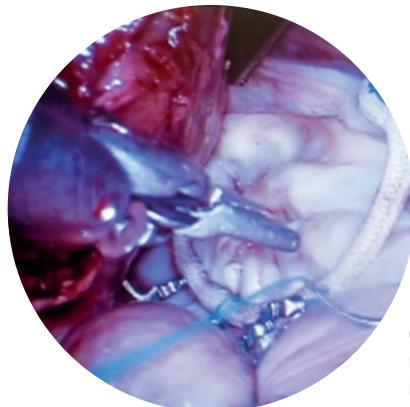
MINIMALLY INVASIVE MITRAL VALVE REPAIR

With expertise in both cardiothoracic surgery and interventional cardiology, Dr. Williams expands treatment options for CVI's riskiest, most complex cases. His broad experience bolsters NYU Langone's three decades of experience in mitral valve repair. Our cardiac surgery team performs 95 percent of its isolated mitral valve repairs minimally invasively. In CVI's hybrid operating room, Drs. Slater and Galloway and Didier F. Loulmet, MD, associate professor of cardiothoracic surgery and director of the Robotic Cardiac Surgery Program, frequently collaborate, pairing robotic or minimally invasive surgery with catheter-based procedures.

ROBOTICS PROVIDES SAFE, EFFECTIVE MITRAL VALVE REPAIR

NYU Langone is one of the only medical centers in the tri-state area to perform mitral valve repair robotically, in addition to performing minimally invasive direct vision surgery. Using the da Vinci® surgical robot, Dr. Loulmet can execute more than 50 different techniques for mitral valve reconstruction, including valve resection, papillary muscle sliding plasty, and the addition of artificial chordae.

The main indications for robotic cardiac surgery are degenerative mitral valve diseases, including Barlow's disease, specifically in younger patients. Dr. Loulmet, who was a member of the French cardiothoracic team that in 1996 performed the first-ever robotic mitral valve repair, performs 90 percent of his mitral valve procedures robotically. Surgeons at CVI have performed more than 200 of these procedures consecutively, with a zero percent mortality rate.



Close-up of minimally invasive mitral valve repair

CLINICAL CARE

Restoring Rhythm When Hearts Are Off Beat

RHYTHM DISORDERS

One of the highest-volume arrhythmia treatment centers in the country, the Heart Rhythm Center (HRC) at NYU Langone's Cardiac and Vascular Institute maintains a comprehensive and highly integrated research and clinical practice program aimed at advancing care for patients with heart rhythm disorders. HRC is one of the most prolific centers in the nation for the treatment of atrial fibrillation, which accounts for the majority of ablation procedures performed at HRC.

8

full-time clinical
electrophysiologists

3

full-time
researchers

NEW TECHNOLOGIES REDUCE PACE MAKER LEAD COMPLICATIONS

In February 2014, Larry A. Chinitz, MD, the Alvin Benjamin and Kenneth Coyle, Sr. Family Professor of Medicine and Cardiac Electrophysiology and director of HRC, became the first electrophysiologist in the United States to implant the new Micra™ Transcatheter Pacing System (Micra TPS). The device, about the size of a large vitamin, is the world's smallest leadless pacemaker. With no generator or leads, this novel pacemaker features a slim 29-millimeter bipole inserted in the apex of the right ventricle via the femoral vein.

"With its small size and minimally invasive procedure, this technology represents the future of pacing," says Dr. Chinitz. "Eliminating the need for a lead and pocket has the potential to reduce complications and recovery times compared to traditional pacemaker implants—a major benefit to patients."

Separate pacemaker generators and leads have been associated with infections, lead fractures, and hematomas, as well as prolonged hospitalizations. The leadless pacemaker decreases post-procedure recovery time by eliminating these complications. With no battery pack, the leadless pacemaker is cosmetically appealing and offers a safer option to patients who may not easily tolerate a subcutaneous generator. NYU Langone is a site for the LEADLESS II clinical trial of the new pacemaker, which will be tested on approximately 670 patients throughout the United States, Canada, and Europe.

HRC also offers subcutaneous implantable cardioverter defibrillators (SICDs). An SICD sits under the skin and does not require leads to be threaded through the venous system, a major plus for individuals with access issues and for those with congenital cardiac or structural anomalies. The devices require no fluoroscopy, which eliminates radiation exposure, and avoids complications associated with intravascular leads.

BUILDING STRENGTH IN LEAD MANAGEMENT

As the number of implantable cardioverter defibrillator (ICD) placements grows, so, too, does the need for expertise in the management of ICD leads.

Charles Love, MD, professor of medicine (cardiology), who joined the Cardiac and Vascular Institute in 2014 as director of the new Cardiac Rhythm Device Management Program, brings this expertise to NYU Langone. Well known for his techniques in implanting heart rhythm devices such as pacemakers, defibrillators, cardiac resynchronization devices, and hemodynamic monitoring devices, Dr. Love is also a pioneer in the extraction of chronically implanted pacing and defibrillator leads. To date, Dr. Love has implanted more than 7,000 devices and has removed more than 3,000 pacing and defibrillator leads.

2,700+
procedures

Stats for Heart Rhythm Center
(fiscal year Sept 2013-Aug 2014)

1,200+
cardiac
ablations

Nearly
1,000
devices
implanted

500
non-imaging
procedures

Larry A. Chinitz, MD,
director of the Heart
Rhythm Center,
performing a cardiac
electrophysiology
procedure



MODULATING THE AUTONOMIC NERVOUS SYSTEM

HRC is exploring novel treatments for heart rhythm disorders, such as manipulation of the autonomic nervous system through ablation or stimulation.

In fall 2013, HRC received FDA approval to serve as a principal investigation site for an international study examining the use of radiofrequency energy to disrupt the normal nerve signals that travel to the brain from the renal artery. Denervation of the nerves around the renal artery, combined with catheter ablation in the heart, has been demonstrated in laboratory studies to help control atrial fibrillation—but further study of this combination therapy is needed. In the trial, the HRC team is exploring whether concomitant renal artery denervation and atrial fibrillation catheter ablation will improve the outcomes of the ablation procedure.

In an earlier study, HRC looked at spinal cord stimulation as a way of modulating the autonomic nervous system. Using laboratory models, HRC's study, published in *Heart Rhythm* in 2012, demonstrated the efficacy of spinal cord stimulation for modulating atrial electrophysiology and protecting against the development of atrial fibrillation.

LEFT ATRIAL APPENDAGE CLOSURES TO REDUCE THROMBOSIS RISK

Dr. Chinitz and his team recently published findings in the *Journal of the American Society of Echocardiography* on the indispensable role of real-time transesophageal echocardiography in the guidance of left atrial appendage closure using two devices, the FDA-approved LARIAT and the still-investigational WATCHMAN. Closing off the left atrial appendage is an interventional cardiac treatment strategy for reducing the risk of thrombosis in patients with atrial fibrillation.

UNCOVERING THE GENETICS OF RHYTHM DISORDERS

In HRC, Dr. Chinitz and his team work closely with the Cardiovascular Genetics Program, which is directed by leading expert in sudden arrhythmia death syndrome, Silvia G. Priori, MD, PhD, professor of medicine, and cardiac electrophysiologist Steven J. Fowler, MD, assistant professor of medicine and a full-time faculty member of HRC, to evaluate, monitor, and care for individuals with inherited rhythm disorders.

CLINICAL CARE

A National Leader in Minimally Invasive Procedures

AORTIC DISEASE AND VASCULAR DISEASE

NYU Langone Medical Center was one of the first centers in the United States to adopt the minimally invasive approach to aortic aneurysm repair. We continue to participate in numerous FDA clinical trials involving endovascular therapy for complex aortic disease. Our highly specialized team, led by Mark A. Adelman, MD, the Frank J. Veith, MD Professor of Vascular and Endovascular Surgery and chief of the Division of Vascular Surgery, and Aubrey C. Galloway, MD, the Seymour Cohn Professor of Cardiothoracic Surgery and chair of the Department of Cardiothoracic Surgery, offers comprehensive therapeutic options for patients with aortic aneurysms, aortic dissections, and all inherited and acquired diseases of the aorta.

A TEACHING SITE FOR FENESTRATED STENT GRAFTS

NYU Langone is one of perhaps a dozen sites in the United States to offer endovascular abdominal aortic aneurysm repairs using a fenestrated stent graft. Fenestrated stent grafts protect the weakened area of the aorta from the pressure of blood flow without blocking blood flow to the renal artery branches through openings called fenestrations. Thomas Maldonado, MD, associate professor of surgery and director of the Center for Aortic Disease, and Neal S. Cayne, MD, associate professor of surgery and director of the Endovascular Surgery Program, were the lead investigators in the trials that led to FDA approval of the Zenith Fenestrated graft in 2012. They and other CVI surgeons and radiologists use three-dimensional (3D) computed tomography scans, sophisticated imaging software, and 3D printers to model and create stents specifically tailored to each patient.

The Division of Vascular Surgery also benefits from the expertise of Frank J. Veith, MD, professor of surgery, who serves as a senior faculty member and mentor. In 1992, Dr. Veith, a pioneer in the field of endovascular surgery, became the first U.S. surgeon to implant an endovascular stent graft.

Because of its leadership in stent graft development, NYU Langone serves as one of eight national teaching sites for fenestrated stent application and is a national training site for other physicians seeking expertise in fenestrated technology.

TRIALS BRING NEW STENT TECHNOLOGIES TO PATIENTS

Through NYU Langone's participation in clinical trials, CVI patients have access to other new technologies, such as branched stent grafts, which allow endovascular repair of suprarenal aneurysms while preserving blood flow to important arteries supplying the upper gastrointestinal organs, as well as the kidneys. With its experience and expertise in this area, NYU Langone aims to bring its patients the latest options for the treatment of complex aortic disease—including aortic branch vessel revascularization devices—as soon as they become available.

This work in complex aortic repair builds on NYU Langone's longstanding reputation as a pioneer of aortic endografting and stenting. In 1994, NYU Langone was one of only 12 centers in the country to implant the first minimally invasive aortic endografts. "Since then, we have been involved in virtually every major U.S. aortic device trial in the chest, abdomen, and aorta," says Dr. Adelman.



Mark A. Adelman, MD (left), and Aubrey C. Galloway, MD (right), talk with a patient

AORTIC REPAIR TEAM LEADS EXPLORATION OF NEW TECHNOLOGIES

Together, Drs. Adelman, Maldonado, and Cayne and Firas F. Mussa, MD, associate professor of surgery, play a central role in CVI's participation in aneurysm and aortic endograft clinical trials.

Dr. Adelman currently chairs two FDA-mandated industry committees: one for aortic arch repair and the other for iliac vessel repair device trials. These two trials are still in the early stages, but "first in human" implants have taken place. CVI's 12 vascular surgeons continue to pioneer new technologies in the field and serve as principal investigators on trials for endovascular treatment of pararenal aortic aneurysms, as well as acute aortic dissections.

NYU Langone's aortic repair team also includes nine surgeons qualified to perform complex and experimental procedures.

NEW CENTER LEADS CARE FOR VENOUS THROMBOEMBOLIC DISEASE

In 2014, NYU Langone took an aggressive approach to venous thromboembolism (VTE), a major public health threat, by opening the Venous Thromboembolic Disease Center (VTEC). VTEC, directed by Dr. Maldonado, is a first-of-its-kind, comprehensive center for advanced screening, prevention, diagnosis, and treatment of deep vein thrombosis and pulmonary embolus.

The VTEC team seeks to pioneer a nationwide standard of care for VTE. Multidisciplinary teams of clinicians and scientists from some 20 specialties will establish baseline data, share and advance research, and translate their findings into real-world healthcare solutions. VTEC's mission also emphasizes comprehensive education and training programs, including a first-ever academically integrated, specialized fellowship.

In addition to its commitment to clinical excellence, VTEC also aims to identify new markers and risk factors for venous thromboembolic disease. Jeffrey S. Berger, MD, assistant professor of medicine and surgery, director of the Cardiovascular Thrombosis Program, and researcher in the Leon H. Charney Division of Cardiology, and Caron B. Rockman, MD, professor of surgery, are leading these efforts.

"VTE is one of the biggest killers in America," says Glenn R. Jacobowitz, MD, professor of surgery and vice chief of the Division of Vascular Surgery. "Our vision for VTEC is to create the same kind of multispecialty center model that was pioneered to treat cancer several decades ago."

NYU Langone is also one of the few centers nationwide to specialize in deep venous reconstruction, primarily with stents. Deep venous occlusion can

prevent blood from leaving the legs to return to the heart, leading to deep vein thrombosis; it can also lead to pelvic congestion syndrome, a painful condition that is more common in women who have given birth. NYU Langone's Vein Center, headed by Lowell S. Kabnick, MD, associate professor of surgery, is participating in two deep venous reconstruction trials, led by Todd L. Berland, MD, assistant professor of surgery and director of outpatient vascular interventions, and Mikel Sadek, MD, assistant professor of surgery.

HYBRID OPERATING ROOM FOSTERS TEAM APPROACH FOR COMPLEX CASES

In CVI's hybrid operating room, cardiothoracic and vascular surgeons with expertise in aortic and vascular diseases frequently team up to perform surgeries. The hybrid OR combines a modern operating room equipped with advanced imaging technology and an interventional catheterization laboratory. The facility, which lets physicians collaboratively perform surgical and endovascular procedures, has been so successful that CVI has begun designing and building a second one.

Dr. Cayne and a team of eight aortic surgeons from cardiac or vascular surgery perform complex surgeries in the hybrid OR. These surgeries include a recent repair of a thoracic aortic aneurysm, an aneurysm in the aortic arch—one of the most complex sections of the aorta to operate on—using part traditional open surgery and part endovascular approach. CVI's cardiac surgery team has extensive expertise in repairing thoracoabdominal aortic aneurysms, which involve the thoracic aorta and extend into the abdominal aorta. At their most extreme, these aneurysms extend the entire length of the thoracoabdominal aorta, into the upper portion of the abdominal aorta and to the bifurcation of the aorta in the pelvis; in many cases, they can be treated with endovascular stent repair or hybrid surgery. And type A aortic dissections, which involve the ascending aorta and usually require emergency surgery, can benefit from hybrid surgery as well.

Marfan Syndrome and the Aorta

The rare genetic disorder Marfan syndrome carries increased risk for aortic aneurysms or aortic dissections. At CVI, our expert team of cardiac and vascular surgeons, cardiologists, geneticists, ophthalmologists, and orthopaedic surgeons offer patients with Marfan syndrome world-class care for this and other connective tissue disorders.

CLINICAL CARE

Hope for Failing Hearts: Leaders in Quality, Safety, and Device Management

HEART FAILURE

NYU Langone Medical Center has one of the lowest mortality rates and highest measures of quality of care for heart failure patients in the nation, according to government (Centers for Medicare & Medicaid Services, CMS) and hospital industry (University HealthSystem Consortium) studies.

Patients with heart failure at NYU Langone benefit from the continuity of care provided at the multidisciplinary Heart Failure Advanced Care Center, directed by Stuart D. Katz, MD, MS, the Helen L. and Martin S. Kimmel Professor of Advanced Cardiac Therapeutics and a nationally known expert who has trained many of the leaders of other heart failure programs in the tri-state area. This specialized practice is dedicated to delivering advanced, patient-centered, medically complex care of the highest quality to heart failure patients.

The program continues to grow, with the addition over the past year of cardiac surgeon Deane E. Smith, MD, assistant professor of cardiothoracic surgery and advanced trained in ventricular assist device and transplant surgery, and heart failure cardiologist Anu Lala, MD, instructor in the Department of Medicine and advanced trained in advanced heart disease, whose special focus is the imaging of the hearts of patients with ventricular assist devices. All three heart failure cardiologists on the team are either board-certified or board-eligible in advanced heart failure and cardiac transplantation, and all are involved in National Institutes of Health-funded heart failure research.

SETTING STANDARDS FOR TREATING HEART FAILURE

Dr. Katz has been instrumental in establishing key benchmarks for high-quality care of heart failure patients. This includes research that Dr. Katz and other CVI members published in their 2014 article "Quality of Care for Heart Failure Patients Hospitalized for Any Cause," which appeared in the *Journal of the American College of Cardiology*.

Dr. Katz is also the author of a clinical textbook on the treatment of heart failure—*Heart Failure: A Practical Guide for Diagnosis and Management*—published in 2013 by Oxford University Press. He has conducted research on both endothelial and autonomic dysfunction in heart failure, and he is investigating the biological effects of iron stores on vascular function. Dr. Katz also coordinates an array of CVI research studies that explore next-generation novel therapies for heart failure.

LEFT VENTRICULAR ASSISTANCE DEVICE THERAPY

Despite innovative and optimal medical therapies, a substantial number of patients with heart failure progress to end-stage disease (Stage D) that will not respond to conventional medical and device therapy; these patients may be candidates for a cardiac transplantation or a left ventricular assistance device (LVAD). CVI's LVAD Program, established in 2011, is directed by Alex Reyentovich, MD, assistant professor of medicine (cardiology), and Leora B. Balsam, MD, assistant professor of cardiothoracic surgery. LVAD therapy can be transformative for patients with advanced or end-stage systolic heart failure; research shows that it can increase patient survival by five years or more.





8.1%

heart failure mortality rate—
below the national average

21.4%

lowest 30-day readmission rate among NYC centers
(CMS survey)

Stuart D. Katz, MD,
Alex Reyentovich, MD, and
Leora B. Balsam, MD from
the Heart Failure and VAD team

DEVICE ALLOWS REMOTE MONITORING OF HEART FAILURE

In 2014, NYU Langone became the first center in the tri-state area to offer the state-of-the-art CardioMEMS™ HF System for patients with advanced heart failure.

Implanted in the pulmonary artery, the device sends data wirelessly to the hospital and alerts physicians when pressures in the artery are rising—an early warning sign of worsening heart failure. Patients' medications can then be adjusted as needed, helping to prevent relapses and hospitalizations.

In September, Larry A. Chinitz, MD, the Alvin Benjamin and Kenneth Coyle, Sr. Family Professor of Medicine and Cardiac Electrophysiology and director of the Heart Rhythm Center, implanted the first CardioMEMS device in the tri-state area, in collaboration with the heart failure team's Dr. Reyentovich. A multidisciplinary team of dedicated heart failure nurse practitioners and attending physicians manage the CardioMEMS data. "I think it's really something that is going to change the field of managing heart failure, by making patients feel better and also by keeping them out of the hospital," says Dr. Reyentovich.

MULTIDISCIPLINARY CLINIC HELPS OPTIMIZE HEART FAILURE DEVICES

The Heart Failure Advanced Care Center and the Heart Rhythm Center jointly see patients in the Heart Failure Device Optimization Clinic, a multidisciplinary program that combines medical management with optimization of advanced device technology. Patients who receive heart rhythm device therapy are evaluated in this specialized clinic to optimize both their medical and their device therapy.

NYU Langone continues to pioneer innovative therapies for the management of heart failure across subspecialties. Dr. Chinitz and Charles Love, MD, professor of medicine and director of Cardiac Rhythm Device Management, use advanced interrogation and programming techniques, along with sophisticated imaging, to achieve optimal pacing for patients with congestive heart failure. This includes the use of biventricular implantable cardioverter defibrillators (ICDs) for more severely advanced patients.

CLINICAL CARE

When Heart Disease Care Begins Before Birth

CONGENITAL HEART DISEASE

NYU Langone Medical Center is one of the few centers in the nation that has fully integrated the care of congenital heart disease (CHD) patients—from fetal life through adulthood—into one comprehensive program. The Congenital Cardiac Care Program at NYU Langone, an integral component of the Cardiac and Vascular Institute as well as Hassenfeld Children’s Hospital, treats all forms of CHD. These include the rarest and most complex cases. Patients from newborns to young adults are cared for in NYU Langone’s comprehensive congenital cardiovascular care unit (CCVCU)—one of the only such units in the area—staffed by cardiac intensivists, specialty-trained nurses, and nurse practitioners who provide continuous, one-on-one care. As a result, NYU Langone’s outcomes are among the best in the nation.

NYU Langone’s pediatric cardiac team is led by Achiash Ludomirsky, MD, the Andral E. Pearson Professor of Pediatric Cardiology and director of the Division of Pediatric Cardiology, and Ralph S. Mosca, MD, the George E. Reed Professor of Cardiac Surgery, professor of pediatrics, and chief of the Division of Pediatric and Adult Congenital Cardiac Surgery. It includes pediatric cardiologists, adult congenital cardiologists, congenital cardiac surgeons, congenital interventional cardiologists, cardiac intensivists, neonatologists, pediatric cardiac nurses, pediatric cardiac anesthesiologists, pediatric cardiac electrophysiologists, and pediatric radiologists, among other clinicians with specific expertise in CHD.

2014 Highlights

- At NYU Langone, pediatric cardiologists with expertise in echocardiography perform more than 1,100 fetal echocardiograms and about 4,000 pediatric echocardiograms each year.
- The pediatric cardiothoracic surgery program has a 98 percent overall survival rate—above the national average according to the Society of Thoracic Surgeons Risk Adjustment for Congenital Heart Surgery (RACHS) classification system. For RACHS category 5—among the most complex cases—the program has a 100 percent survival rate.

NEW RESEARCH IN EARLY DETECTION AND MANAGEMENT OF CONGENITAL HEART DEFECTS

Early detection of heart defects is essential to patients’ survival and ability to thrive throughout life. At NYU Langone, pediatric echocardiographers specializing in CHD perform more than 1,100 fetal echocardiograms and about 4,000 pediatric echocardiograms each year. A team of 14 pediatric cardiologists is then available to provide sophisticated diagnostic and interventional procedures.

During the past year, Dr. Ludomirsky and Dr. Mosca and their team have published important research on prenatal and neonatal diagnosis and the management of complex structural heart abnormalities. Dr. Ludomirsky and his colleagues reported on an unusual case of persistent fifth arch (PFA), a rare, often missed anomaly that they were able to diagnose early in pregnancy using fetal echocardiography. Their findings, published online by *Echocardiography*, highlight the importance of using serial fetal echocardiograms to evaluate evolving lesions.

Puneet Bhatla, MD, associate professor of pediatrics, one of the pediatric cardiologists, collaborated closely with NYU Polytechnic School of Engineering to use three-dimensional (3D) printing in the evaluation of CHD, creating 3D models of the heart from MRI and CT data. These models allow for better understanding of the cardiac pathology, leading to improvement in surgical and catheterization planning.

In the May 2013 issue of the *Journal of Cardiac Surgery*, Dr. Mosca and his team reported on a successful surgery in a neonate for a variant of anomalous left coronary artery from the pulmonary artery (ALCAPA), a very rare condition present in approximately 1 in 300,000 live births. Later, in the December 2014 issue of *The Annals of Thoracic Surgery*, the physicians described the “periscope technique,” a simple, modified alternative to the traditional right ventricle to pulmonary artery conduit placement in the Norwood procedure for hypoplastic left heart syndrome.

PERFORMING COMPLEX PEDIATRIC CARDIOTHORACIC SURGERIES

NYU Langone's pediatric cardiothoracic surgeons perform a range of complex procedures, including the arterial switch procedure for transposition of the great vessels and Norwood palliation for hypoplastic left heart syndrome. For complex malformations, the surgeons must often modify traditional approaches, performing multiple procedures in a single surgery, for example. Wherever possible, the surgeons use minimally invasive and combined procedures to reduce the number of interventions and ensure a healthy circulation as soon as possible.



Ralph S. Mosca, MD,
with his patients,
twin boys on whom he
performed surgery

MANAGING CHD IN ADULTS

Advances in technology, medical care, surgery, and interventional procedures over the past 35 years have enabled a greater number of children with CHD, including those with conditions once considered fatal, to survive into adulthood. As a result, the number of adults with CHD now outnumbers children with the condition. As CHD patients age, they are at risk for a variety of CHD-related issues, such as abnormal heart rhythms, ventricular dysfunction, conduit stenosis, and organ failure from the strained hemodynamics of their heart. In addition, they may be subject to many of the same adult conditions—such as coronary artery disease and hypertension—that occur in the general population. Moreover, many CHD patients who underwent surgical procedures like valve replacements, Fontan procedures, and aortic arch repairs decades ago, when tools and techniques were still evolving, now require additional interventions. At NYU, these patients are cared for by a team of CHD specialists expertly trained for these unique circumstances.

NYU Langone's broad experience in interventional cardiology and structural heart disease provides patients with CHD access to the latest procedures and best practices, such as new approaches to aortic valve repair and replacement. Dr. Mosca provides expertise in both pediatric and adult congenital cardiac surgery. The Congenital Cardiac Care Program offers comprehensive, lifelong care.

TRACKING ARRHYTHMIAS IN CHILDREN AND ADULTS WITH CHD

Individuals with CHD are predisposed to cardiac arrhythmias. These arrhythmias may be the result of previous surgeries to repair the congenital defects, or the congenital condition itself. And adults with CHD, who may not have had arrhythmias during childhood, often develop arrhythmias as they age.

Expanding its expertise in diagnosing and treating heart rhythm disorders, NYU Langone recently welcomed Frank Cecchin, MD, professor of pediatrics and medicine and director of pediatric and congenital cardiac electrophysiology, to its faculty. Dr. Cecchin treats all types of pediatric heart rhythm pathologies, including the highest-risk cases, such as those diagnosed in utero and in premature infants. He specializes in implanting pacemakers and defibrillators in children and adults with CHD and in children with normal heart structures who develop conduction system disorders.

Reducing radiation exposure is a primary focus of Dr. Cecchin's translational research studies. Dr. Cecchin uses magnetic catheter navigation in place of X-rays to image the hearts of children and adults with CHD during catheter ablation procedures. Often, the entire procedure can be completed without the use of any radiation—thus making NYU Langone among the safest options for the treatment of an arrhythmia.

RESEARCH

Research

► *Tomorrow's cardiac advances are taking shape today in the CVI's laboratories and clinics. While our clinicians head up important trials of promising new drugs and devices, our researchers are investigating new genetic and molecular clues to solve some of the most complex challenges in cardiac and vascular disease.*



Glenn I. Fishman, MD (right), the William Goldring Professor of Medicine and director of the Leon H. Charney Division of Cardiology, and Akshay Shekhar, BS, MEng (left), in Dr. Fishman's Cardiovascular Research Lab

NYU Langone Study Challenges Controversial Blood Pressure Targets for Older Patients

The Eighth Joint National Committee (JNC 8) Panel's new blood pressure guidelines (released in December 2013) on the management of adult hypertension may not be optimal compared to previous targets, CVI researchers reported in an analysis published in August 2014 in the *Journal of the American College of Cardiology*.

For people aged 60 years and older with coronary artery disease, the JNC 8 panel recommended a systolic blood pressure threshold for initiation of drug therapy and a therapeutic target of less than 150/90 mmHg. This is a significant change from the previous, more aggressive target of less than 140/90 mmHg recommended by JNC 7. Moreover, the NYU Langone study warns that it could be putting patients at higher risk of stroke and even death.

The study, an observational analysis of more than 8,000 patients enrolled in the INternational VErapamil SR Trandolapril SStudy (INVEST), evaluated the optimal blood pressure in patients aged 60 or older with coronary artery disease. Patients who achieved a systolic blood pressure of less than 140 mmHg had the lowest rates of mortality, cardiovascular mortality, fatal and nonfatal heart attacks, and fatal and nonfatal stroke compared with groups that achieved a systolic blood pressure greater than or equal to 140 mmHg, without any increase in adverse experiences.

Those targeted for JNC 8's recommended blood pressure of 140 to 150 mmHg experienced increased rates of cardiac death, stroke, and nonfatal stroke compared to the group that achieved the lower systolic blood pressure goal of less than 140 mmHg.

"Relaxing blood pressure targets for elderly patients, who are at increased risk of stroke and cardiovascular death, could clearly have far-reaching consequences," says lead author Sripal Bangalore, MD, associate professor of medicine in the Leon H. Charney Division of Cardiology.

Proteins May Hold Clues for Treating Heart Arrhythmias

Glenn I. Fishman, MD, the William Goldring Professor of Medicine, professor of neuroscience and physiology and of biochemistry and molecular pharmacology, and director of the Leon H. Charney Division of Cardiology, has identified the Purkinje cell protein (*Pcp4*) as an important regulator of heart rhythms. In an article published in *The Journal of Clinical Investigation* in October 2014, Dr. Fishman and his team reported that disruption of the *Pcp4* gene can cause ventricular arrhythmias. When *Pcp4* expression was reduced in an animal model, electrical activity was short-circuited in a small but critical population of cells in the heart muscle.

"Now that we know that *Pcp4* is an important regulator of the heart's rhythm, it could serve as an important drug target for treating arrhythmias," says Dr. Fishman. "Although much work remains to be done, our data suggest that drugs that mimic *Pcp4*'s action in the heart could potentially stabilize the heart's rhythm."

Meanwhile, Mario Delmar, MD, PhD, professor of medicine and cell biology and director of the Early Translational Research Program of the NYU-HHC Clinical and Translational Science Institute, has identified a new method of risk stratification for sudden arrhythmia death syndrome (SADS) that could help physicians determine the most appropriate course of clinical care for patients.

In a March 2014 article published in the journal *Circulation*, Dr. Delmar and colleagues showed that mutations in a protein of the desmosome (an intercellular connection, classically associated with another disease of the heart, arrhythmogenic right ventricular cardiomyopathy) can change the function of sodium channels that carry the electrical impulses through the heart to make it beat. These findings indicate that desmosomal mutations can lead to SADS in the absence of alterations in the contractility of the heart muscle itself.

Using Platelet Function to Predict Risk of Surgical Cardiac Events

Some people who have significant cardiac events while undergoing surgery or immediately afterward show none of the traditional risk factors for myocardial infarction, such as high cholesterol, hypertension, diabetes, and smoking. Jeffrey S. Berger, MD, MS, assistant professor of medicine and surgery, director of the Cardiovascular Thrombosis Program, and researcher in the Leon H. Charney Division of Cardiology, believes that adverse cardiac events can be linked to the function of platelets.

Dr. Berger studies the measurement of platelet activity, including adhesion, activation, aggregation, and RNA within cells, in an effort to establish biomarkers for platelets. In collaboration with Caron B. Rockman, MD, professor of surgery, his team aims to develop a standardized platelet score to predict the likelihood of clotting and bleeding before, during, and after surgery. Based on an individual's platelet function score, patients could be prescribed the medication that best lowers their risk of myocardial infarction linked to surgery, improving survival rates.

RESEARCH

Blocking an Immune-Signaling Molecule to Control Obesity-Related Diseases

Researchers at NYU Langone Medical Center have found that blocking the action of netrin-1, a key signaling molecule in the immune system, reverses the chronic inflammation and insulin resistance tied to obesity.

In an article published in March 2014 in *Nature Medicine*, Kathryn J. Moore, PhD, professor of medicine and cell biology, reported that netrin-1 controls inflammatory macrophage buildup and prevents the macrophages from leaving the fat tissue and carrying away debris, as the immune cells would normally do. This leads to uncontrolled inflammation, which causes damage to arteries and vital organs. Dr. Moore's study results suggest that targeting netrin-1 could lessen and possibly reverse the chronic inflammation and insulin resistance associated with major diseases tied to obesity, such as atherosclerosis and type 2 diabetes.

Study results suggest that targeting netrin-1 could lessen and possibly reverse the chronic inflammation and insulin resistance associated with major diseases tied to obesity.

This study is believed to be the first to identify a chemical signal that stalls macrophage movement out of fat tissue and causes the chronic inflammation driven by obesity and fatty diets. Dr. Moore's team plans to develop highly specific, netrin-1-inhibiting drugs that can target specific macrophage cells or fat tissues as nanotherapies or delivered via catheter, so netrin-1 function in nonfat tissue elsewhere in the body could continue normally.

Developing New Therapeutic Targets for Diabetes

Researchers from the Division of Endocrinology working toward new treatments for diabetes and heart disease include Ann Marie Schmidt, MD, the Dr. Iven Young Professor of Endocrinology and professor of pharmacology, who originally identified the RAGE (receptor for advanced glycation end-products [AGEs]) two decades ago.

Levels of AGEs are abnormally high in diabetics, causing destructive inflammation and tissue injuries that can be devastating in these patients. Dr. Schmidt and her team, including Ravichandran Ramasamy, PhD, associate professor of medicine and biochemistry and molecular pharmacology, are developing small molecules to interfere with the adverse consequences of AGE binding to RAGE. Drs. Ramasamy and Schmidt recently joined forces with Marc and Ruti Bell Program in Vascular Biology and Disease members Edward A. Fisher, PhD, MD, MPH, Leon H. Charney Professor of Cardiovascular Medicine, and Kathryn Moore, PhD, professor of medicine and cell biology, to take an integrated approach to mechanisms of diabetes-induced inflammation in coronary artery disease and obesity.

Clinical research focused on the cardiometabolic complications of obesity, led by Ira J. Goldberg, MD, the Clarissa and Edgar Bronfman Jr. Professor of Endocrinology and director of the Division of Endocrinology, Diabetes, and Metabolism, has also reached a critical stage. Dr. Goldberg has partnered with Dr. Fisher and other members of the Center for the Prevention of Cardiovascular Disease to initiate a series of clinical trials. Within a year, Dr. Goldberg predicts that NYU Langone will be a very active hub of investigation for new drugs, procedures, and techniques for treating and preventing the cardiovascular complications of diabetes.

Major Grant Will Advance Cardiac Care for Patients with Kidney Disease

Led by Sripal Bangalore, MD, associate professor of medicine in the Leon H. Charney Division of Cardiology, the ISCHEMIA-CKD (International Study of Comparative Health Effectiveness with Medical and Invasive Approaches—Chronic Kidney Disease) trial will study approximately 1,000 patients with CKD and at least moderate ischemia.

Currently, patients with advanced CKD have a 4-year mortality rate of 50 percent, which is 15 to 30 times higher than the mortality rate among the general population diagnosed with cardiovascular disease. Despite this, more than 80 percent of cardiovascular disease trials exclude CKD participants. "Given the aging population and the dramatic increase in obesity and diabetes—all of which are risk factors for kidney disease—the question of how to best manage patients with kidney disease who also have ischemia is exceedingly important," says Dr. Bangalore.

The four-year international study will involve approximately 300 medical centers in the United States and more than 30 other countries. Its aim is to determine whether an invasive strategy of routine early catheterization followed by optimal revascularization, in addition to optimal medical therapy (OMT), will reduce the likelihood of death or heart attack in patients with advanced CKD, compared to an initial conservative strategy of OMT alone, with catheterization reserved for those for whom OMT fails.

TECHNOLOGY

Turning to Technology for an Inside View

CARDIAC IMAGING

The Cardiac and Vascular Institute's team of highly experienced specialists and subspecialists offer patients the latest in cardiac imaging technology, performing more than 20,000 echocardiograms alone each year.

It also offers advanced computed tomography (CT) technologies to diagnose heart problems, including high-speed, high-resolution multidetector CT scanners, such as the latest-generation dual source CT (DSCT) scanner, the fastest scanner currently available.

To obtain high-resolution diagnostic images with the lowest possible radiation exposure, cardiologist Robert M. Donnino, MD, assistant professor of medicine (cardiology) and radiology, along with Jil Jacobs, MD, professor of radiology, and their colleagues, use the latest-generation DSCT, which is found in only a handful of medical facilities nationwide. The DSCT can obtain images emitting less than 1 millisievert of radiation per procedure, far less than the background radiation that we are exposed to every year just by living on Earth.

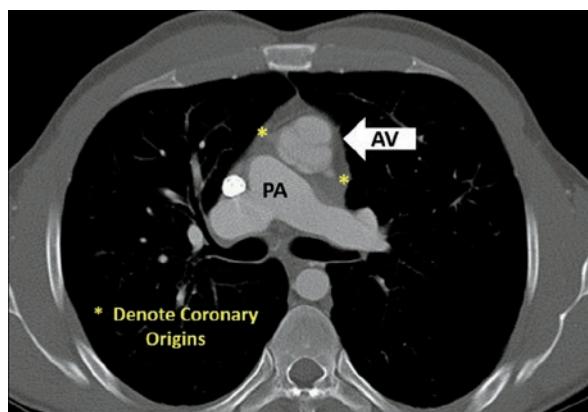
Additionally, NYU Langone offers highly advanced forms of MRI, including a high-field 3 Tesla, and stress perfusion MRI, which is offered by just a few medical institutions in the nation. Stress perfusion MRI is used to identify areas of the heart muscle that are not receiving adequate perfusion.

NYU Langone imaging experts are also playing a leading role in establishing standardized parameters for assessing heart disease across different cardiac imaging modalities. Lawrence Phillips, MD, assistant professor of medicine (cardiology), directs NYU Langone's imaging-education contribution to the large international ISCHEMIA trial, led by NYU Langone's Judith S. Hochman, MD. In 2014, national leaders in cardiac imaging, including Dr. Phillips, published comparative definitions for moderate to severe ischemia in stress nuclear imaging, echocardiography, and MRI. They noted that "using a similar annual rate of cardiac events including heart attacks and death associated with amount of myocardial ischemia across different imaging modalities instead of myocardial ischemia alone may in the future guide medication and invasive management decisions."

These latest developments build on the Medical Center's legacy of imaging advances. In the 1990s, NYU Langone was one of the first institutions in the nation to use three-dimensional (3D) echocardiography in clinical practice; for the first time, echocardiographers could see the heart as the surgeon sees it during an operation. Over the next decade, NYU Langone also became one of the first to adopt real-time 3D transesophageal echocardiography (TEE), providing image guidance during interventional heart procedures.

More recently, NYU Langone's Muhammed Saric, MD, PhD, associate professor of medicine in the Leon H. Charney Division of Cardiology, advanced the 3D TEE technique with the "tilt-up-then-left" (TUPLE) maneuver (described in the *Journal of the American Society of Echocardiography* in November 2010), which improves the visualization of atrial septal defects, including the important anatomic relationship between atrial septal defects and their surrounding structures. The TUPLE maneuver was recently featured as the recommended procedure for imaging the atrial septum on 3D TEE in *Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine*, which is referenced by medical specialists worldwide.

Along with technologies such as 3D-echocardiography and cardiac MRI to diagnose complex congenital heart disease, these advanced cardiac imaging capabilities have even made it possible to noninvasively image heart structures in newborns, infants, and children.



CT of transposition
of the great arteries

EDUCATION & TRAINING



The Heart of Future Practice

► *Our rigorous training programs prepare the next generation of cardiologists, cardiac surgeons, and vascular surgeons to bring cardiovascular medicine to new levels of excellence.*

Adam H. Skolnick, MD, instructing a resident in how to use a handheld ultrasound during cardiology patient rounds

EDUCATION & TRAINING

NYU Langone's residency and fellowship programs have trained hundreds of cardiologists, cardiac surgeons, and vascular surgeons—many of whom have become leaders at NYU Langone and other top institutions. Fellows and residents find a wide range of diversity along NYU School of Medicine's half-mile biomedical corridor, gaining experience at NYU Langone Medical Center, NYC Health and Hospitals Corporation's Bellevue Hospital Center, and the Veterans Administration New York Harbor Healthcare System (Manhattan Campus).

6

fellows per year accepted to NYU Langone's cardiovascular disease training program, out of more than 500 applicants

2

fellows per year accepted (on average) to pediatric cardiology fellowship

2

fellows per year accepted to vascular surgery fellowship

2

fellows per year accepted to cardiothoracic surgery fellowship

Fellowships

CARDIOVASCULAR DISEASE

Two Cardiovascular Disease Fellowship pathways share a foundational two-year curriculum in comprehensive clinical cardiology. Rotations through clinical laboratories and services hone expertise in diagnosis and patient management. Mandatory procedural training in electrophysiology, echocardiography, cardiac catheterization, and stress and nuclear cardiology is augmented by electives in preventive cardiology, interdisciplinary imaging techniques, cardiovascular surgery, and vascular medicine.

After completing the foundational curriculum, fellows move on to their chosen Cardiovascular Disease pathway:

- The Clinician Educator Pathway: a three-year program of evidence-based patient care and education, including a year of clinical electives and research.
- The Physician-Investigator Pathway: a four- or five-year program of independent investigation in cardiovascular medicine, plus two years of intensive research training—on a basic science or a clinical investigator track—supported by NYU Langone's National Institutes of Health Training Program in Cardiovascular Sciences.

Join us for our upcoming Continuing Medical Education (CME) courses:

Invasive Cardiology Update for Practicing Physicians

April 2015

Advances in Cardiovascular Risk Reduction

May 2015

SADS Foundation Conference Sudden Arrhythmic Death Syndromes

May 2015

For more information, go to
nyulmc.org/cme

Outstanding candidates may also pursue advanced fellowship training in:

- Clinical Cardiac Electrophysiology
- Interventional Cardiology
- Advanced Heart Failure and Transplant Cardiology
- Cardiovascular Imaging
- Preventive Cardiology

PEDIATRIC CARDIOLOGY

The three-year Pediatric Cardiology Fellowship program provides training in the diagnosis and management of heart disease in fetal life through adolescence and in adults with congenital heart disease.

CARDIOTHORACIC SURGERY

Trainees on the three-year Cardiothoracic Surgery Fellowship track develop advanced skills in minimally invasive valve surgery, advanced valve repair surgery, catheter-based valve surgery, stent graft therapies for thoracic aneurysms, robotic surgery, and advanced surgical therapies for heart failure.

VASCULAR SURGERY

The Vascular Fellowship Program trains a total of seven vascular fellows each year in a mix of complex vascular surgeries and trauma found at a major urban academic medical center, with surgical rotations at NYU Langone's Tisch Hospital, Bellevue Hospital Center, and the Manhattan VA. Trainees also have the opportunity to participate in advanced clinical research and to present at conferences.

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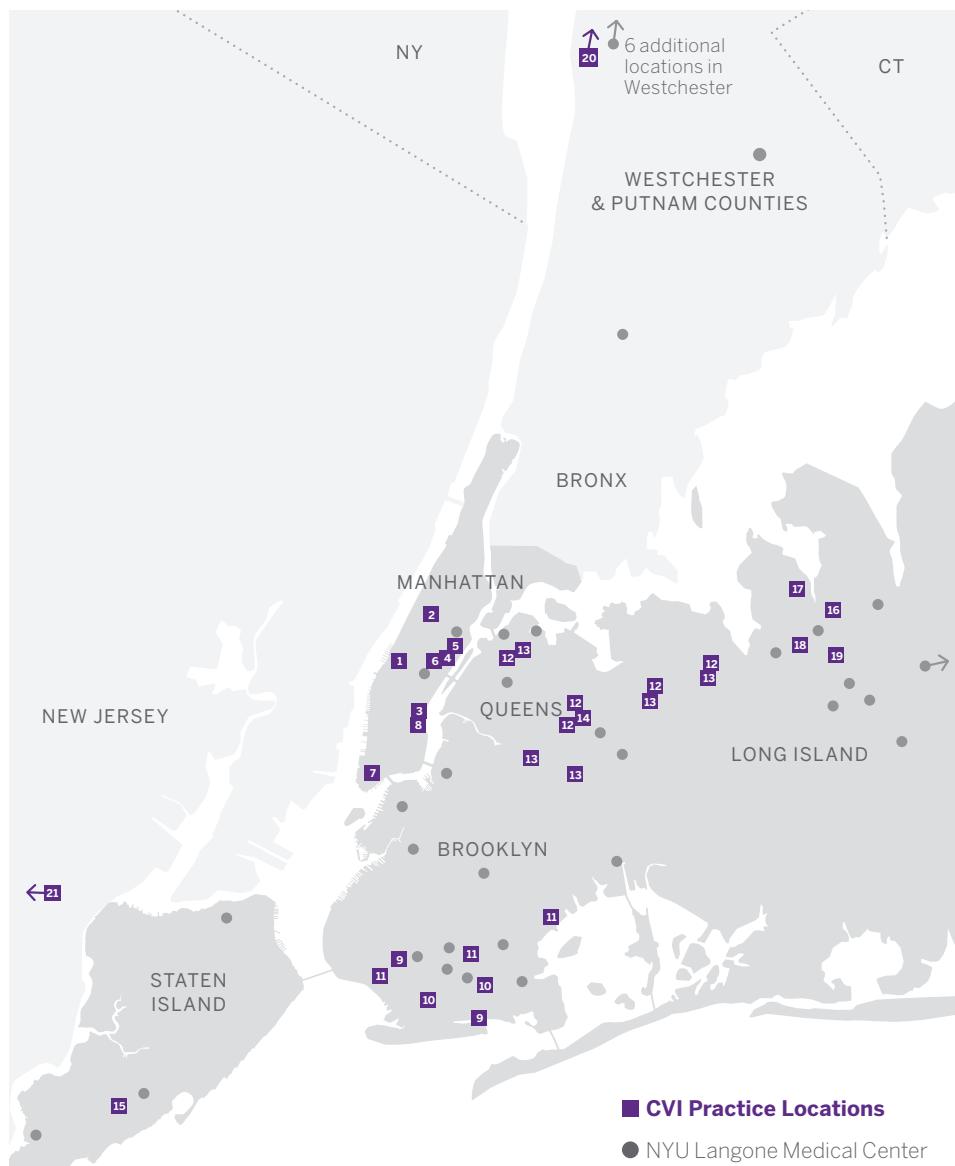
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