NYU Langone MEDICAL CENTER

2016 / YEAR IN REVIEW

Cardiology & Heart Surgery

Cardiology | Cardiothoracic Surgery
Vascular & Endovascular Surgery

#10
IN *U.S. NEWS & WORLD REPORT*

300+
SCIENTIFIC PUBLICATIONS

$20M
NIH FUNDING

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NYU Langone's Cardiac and Vascular Institute ranks among the nation's top specialty programs—a point of pride that reflects our dedication to clinical care, education, and research.

Over the past year, we have built on our foundation of excellence in cardiology, cardiac surgery, and vascular disease care by pioneering new technologies, spearheading key clinical trials, and launching first-of-their-kind clinical and research programs.

In 2016, we became the first center in the world to successfully implant an investigational transcatheter device to treat mitral valve regurgitation and implanted the first Medtronic CoreValve™ Evolut™ PRO TAVR (transcatheter aortic valve replacement) System in a patient with severe aortic stenosis with a successful outcome. NYU Langone also was selected as one of only five sites in the nation to pilot a novel stent graft device for aortic aneurysms.

We launched a novel multispecialty program in cardiac amyloidosis, a poorly understood and often fatal disease caused by deposits of an abnormal protein in heart tissue. And, we piloted surgical and medical treatment innovations for hypertrophic cardiomyopathy (HCM) in a new program led by two of the nation's top experts in this genetic heart disorder.

A major grant from the American Heart Association helped to open an innovative new clinical and research center, the Sarah Ross Soter Center for Women's Cardiovascular Research, which will focus its research on determining specific heart attack risk differences in women, particularly those with blocked and open arteries, such as the impact of stress and the involvement of platelets.

And, our unique Center for the Prevention of Cardiovascular Disease has helped to prevent and manage cardiovascular disease risk for more than 5,000 patients.

These clinical milestones have been accompanied by a number of major research achievements, including the identification of important new genes in cardiac conduction biology and platelet function, the establishment of our first basic and translational science laboratory focused on aortic aneurysms, and the publication of a paradigm-shifting meta-analysis demonstrating that angiotensin receptor blockers (ARBs) are just as effective at controlling hypertension as are angiotensin-converting enzyme (ACE) inhibitors.

We believe that our progress this year in clinical medicine, basic science, and translational research represents a significant contribution not only to the heart health of our patients, but also to the field of cardiovascular medicine as a whole.

Cardiology & Heart Surgery

Patient Volume

400 +
TRANSCATHETER VALVE PROCEDURES

1,300 +
CARDIAC ABLATIONS

1,700 +
FETAL ECHOCARDIOGRAMS

29,000 +
ADULT ECHOCARDIOGRAMS

300 +
MINIMALLY INVASIVE SURGICAL VALVE PROCEDURES

220 +
PEDIATRIC CONGENITAL HEART SURGERIES

5,300 +
PEDIATRIC ECHOCARDIOGRAMS

6,300 +
CORONARY CARDIAC CATHETERIZATION PROCEDURES

(Diagnostic and Interventional)

Faculty & Fellows

339
FACULTY MEMBERS

50
FELLOWS

TOP 4
AGGREGATE PROGRAM SCORE

on the annual American College of Cardiology In-Training Examination (ACC-ITE) of fellows (among 200 participating cardiology training programs)

Research & Funding

300 +
SCIENTIFIC PUBLICATIONS

$ 20M
NIH FUNDING

112
ACTIVE CLINICAL TRIALS

NYU Langone Medical Center

Honors

#10

IN THE COUNTRY FOR CARDIOLOGY & HEART SURGERY

in *U.S. News & World Report*'s "Best Hospitals"

FIRST

IN THE COUNTRY

The Leon H. Charney Division of Cardiology at NYU School of Medicine is among the oldest and most renowned cardiology programs 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

#10

IN THE NATION BEST HOSPITALS

and nationally ranked in 12 specialties, including top 10 rankings in Orthopaedics, Geriatrics, Neurology & Neurosurgery, Rheumatology, Rehabilitation, Cardiology & Heart Surgery, and Urology. Nationally ranked in Cancer, Diabetes & Endocrinology, Ear, Nose & Throat, Gastroenterology & GI Surgery, and Pulmonology

#11

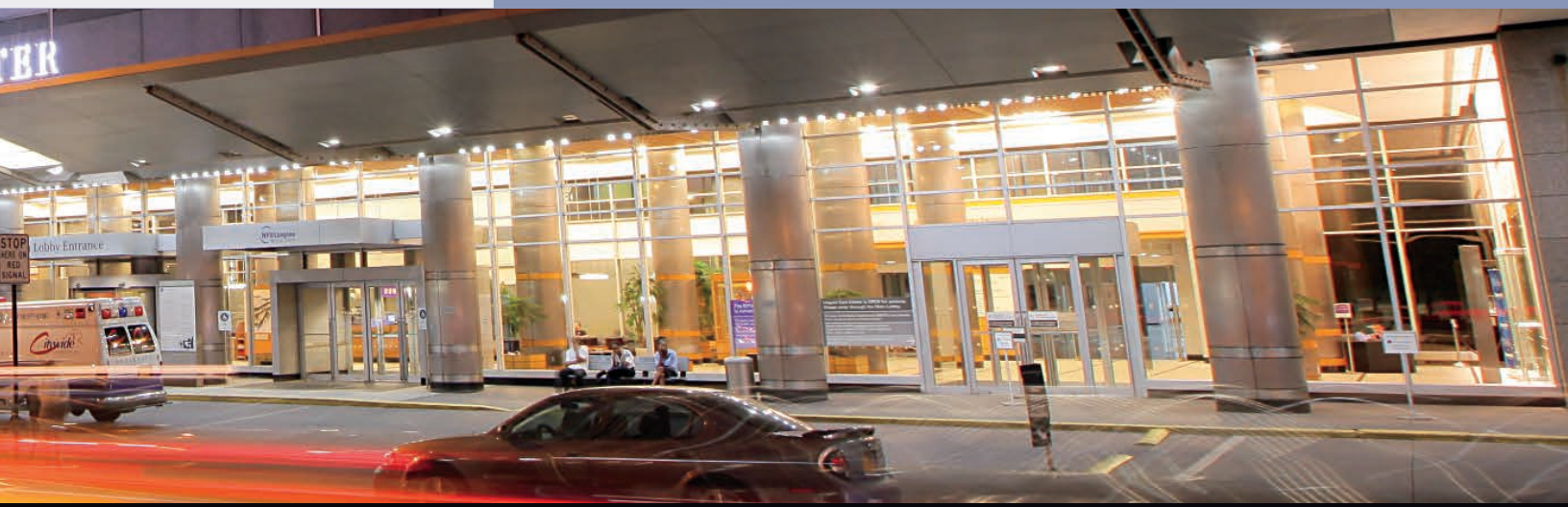
IN THE NATION BEST MEDICAL SCHOOLS FOR RESEARCH

and a leader in innovation in medical education, including accelerated pathways to the MD degree

LEADER

IN QUALITY CARE AND PATIENT SAFETY

and recognized for superior performance as measured by Vizient's nationwide 2016 Quality and Accountability Study



Transforming the Future of Cardiovascular Medicine

New Recruit: Transcatheter Valve Technology Expert Joins NYU Langone

Expanding the Medical Center's breadth of expertise, Hasan Jilaihawi, MD, an interventional cardiologist and valve specialist formerly of Cedars-Sinai Medical Center in California, has joined the NYU Langone team as co-director of transcatheter valve therapies. Among Dr. Jilaihawi's significant contributions to the advancement of transcatheter valve technology is a new platform he developed for optimal mitral valve placement and a device he created to improve imaging during transcatheter aortic valve replacement (TAVR). He is heavily involved in all aspects of interventional cardiology and has special interests in innovative methods of imaging structural heart disease, complex percutaneous coronary intervention, and procedural planning in the field of TAVR. He trained in Scotland, England, France, Canada, and the United States at Brigham and Women's Hospital and Cedars-Sinai Medical Center. In 2007, he was one of the two physicians who performed the United Kingdom's first TAVR procedure.

↑ Hasan Jilaihawi, MD

Pioneering New Transcatheter Mitral Valve Replacement System

In 2016, NYU Langone became the first medical center in the world to successfully implant a new, investigational transcatheter device to treat mitral valve regurgitation in extremely compromised patients with limited treatment options. As opposed to other transcatheter mitral valve replacement technologies that require a small incision in the chest, this new procedure is performed completely through the groin without the need for any incisions.

The team that performed the procedures is part of NYU Langone's internationally renowned Heart Valve Center, led by Mathew R. Williams, MD, associate professor of cardiovascular surgery and medicine, chief of the Division of Adult Cardiac Surgery, and director of Interventional Cardiology. The procedure—known as a transcatheter mitral valve replacement (TMVR)—was conducted in NYU Langone's state-of-the-art hybrid operating room, one of the newest and most advanced of its kind in the country (*see related article on page 15*).

NYU LANGONE AFFILIATION WITH WINTHROP-UNIVERSITY HOSPITAL BRINGS EXPANDED AND ENHANCED HEALTHCARE NETWORKS TO LONG ISLAND

NYU Langone and Winthrop-University Hospital on Long Island have reached an agreement to affiliate the institutions' extensive healthcare networks. NYU Langone, with more than 150 ambulatory sites throughout the region, will complement Winthrop-University Hospital's main campus, multiple ambulatory sites, and network of 66 faculty and community-based practices in more than 140 locations extending from eastern Long Island to Upper Manhattan.

The affiliation will further expand NYU Langone's presence on Long Island, while enhancing Winthrop's inpatient and outpatient services with improved access to NYU Langone's wide range of medical and surgical specialties.

"This agreement publicly confirms our confidence that an affiliation will allow both of our institutions to collaborate and share best practices to better meet the healthcare needs of the communities we serve," says Robert I. Grossman, MD, the Saul J. Farber Dean and CEO of NYU Langone. Pending regulatory approval, the institutions are aiming to complete their affiliation in spring 2017.

Using Big Data to Challenge Conventional Wisdom

Angiotensin receptor blockers (ARBs) are as effective as angiotensin-converting enzyme (ACE) inhibitors developed 10 years earlier, despite previous study results to the contrary, according to a new meta-analysis by NYU Langone researchers of more than 100 published clinical trials of both drugs. The researchers described the results of the meta-analysis in January 2016 in *Mayo Clinic Proceedings*.

"There has been debate for many years over the safety and efficacy of ACE inhibitors compared to ARBs. An 'ACE inhibitor-first' approach has been common, with ARBs regarded as less effective," says Sripal Bangalore, MD, associate professor of medicine in the Leon H. Charney Division of Cardiology, director of research for the Cardiac Catheterization Laboratory, and lead study author. "We believe that our study ends the debate and gives physicians the option to prescribe either drug for their patients."

The new meta-analysis included 106 randomized trials that enrolled 254,301 patients, and is an example of Dr. Bangalore's and other NYU Langone researchers' use of large, population-based data sets to assess—and often challenge—accepted paradigms in cardiology.

"Often, the data do not support the things we think are true, the things we do because we 'always did it that way,'" explains Glenn I. Fishman, MD, the William Goldring Professor of Medicine and director of the Leon H. Charney Division of Cardiology. By challenging the "old way" with new evidence, NYU Langone researchers are helping to shape the next generation of cardiology guidelines.

Cardiovascular Comprehensive Outcomes Tracking System

NYU Langone is developing a comprehensive outcomes tracking system to pool all cardiovascular data across cardiology, cardiac surgery, and vascular surgery. The Data Core, created with the support of a major gift from NYU Langone trustees Richard P. and Ellen Richman, will help further leverage large data sets like these in the development of future cardiology guidelines. "We are seeking to transform patient care with this major investment in the use of population data," says Larry A. Chinitz, MD, the Alvin Benjamin and Kenneth Coyle, Sr. Family Professor of Medicine and Cardiac Electrophysiology, director of the Heart Rhythm Center, and clinical director of the Leon H. Charney Division of Cardiology.

NEW SCIENCE BUILDING TO ENABLE STRONGER COLLABORATIONS

Soon, cardiac and vascular researchers will be working out of NYU Langone's Science Building—a new facility encompassing more than 385,000 square feet and 10 floors of laboratory space dedicated to research, including wet laboratory space, core facilities, a new vivarium, conference spaces, and public amenities in an expansive, integrated environment. The building's design will help strategically integrate research facilities and services so that investigators, students, faculty, and clinicians can work more efficiently and collaboratively. Its laboratory floors are designed to be open, efficient, flexible, and easily adaptable with cutting-edge, shared equipment to accommodate advances in research over time.

"We're looking forward to getting our researchers under one roof and to see the fruitful collaborations that will enable," says Glenn I. Fishman, the William Goldring Professor of Medicine and director of the Leon H. Charney Division of Cardiology.

↑ Edward A. Fisher, MD, PhD, MPH, Ira J. Goldberg, MD, and Kathryn J. Moore, PhD

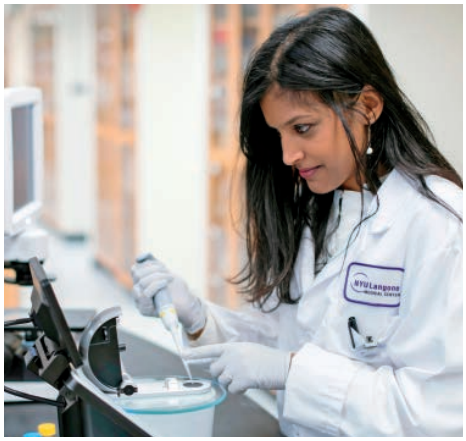
↑ Judith S. Hochman, MD

SUCCESSFUL RECRUITMENT FOR ISCHEMIA TRIALS

As of November 2016, more than 3,500 patients have been enrolled in the worldwide ISCHEMIA trial, a randomized controlled trial that will ultimately study 5,000 patients with stable ischemic heart disease (SIHD) and moderate to severe ischemia. The study, funded by one of the largest grants ever awarded by the National Institutes of Health for a comparative effectiveness trial, is led by Judith S. Hochman, MD, Harold Snyder Family Professor of Cardiology, associate director of the Leon Charney Division of Cardiology, and senior associate dean for clinical sciences. "ISCHEMIA has already accrued 50 percent more study participants than the two previous largest trials on this topic, which were in the range of 2,200 to 2,400 patients," Dr. Hochman notes. Many patients who have failed to qualify for the main ISCHEMIA trial have been randomized to one of two ancillary studies also led by NYU Langone investigators. ISCHEMIA-CKD, for patients with SIHD and advanced chronic kidney disease, is led by Sripal Bangalore, MD, associate professor of medicine in the Leon H. Charney Division of Cardiology, and has recruited more than 400 patients, while a study of patients who have ischemia but no obstructive coronary disease, led by Harmony R. Reynolds, Saul J. Farber Associate Professor of Medicine, has recruited more than 100 patients.

New Laboratory Focuses on Inflammation and Abdominal Aortic Aneurysms

Newly appointed assistant professor of surgery, Bhama Ramkhelawon, PhD, has established a laboratory focused on deciphering the role of the immune response in abdominal aortic aneurysms, which has garnered recent support from the National Institutes of Health (NIH). "This translational research is the perfect complement to act synergistically with the clinical division of vascular surgery, and its national presence in aortic pathology," said Mark A. Adelman, the Frank J. Veith, MD Professor and Chief of Vascular and Endovascular Surgery. In Dr. Ramkhelawon's previous postdoctoral training performed in the laboratory of Kathryn J. Moore, PhD, the Jean and David Blechman Professor of Cardiology and professor of cell biology, she discovered that macrophages, which serve as "cleanup" cells for the body, secrete a protein called Netrin-1 when they are located in fatty tissues. Netrin-1 induces macrophages to accumulate in adipose tissues while at the same time preventing them from carrying away pathogens and unwanted fat cells. "This fosters chronic inflammation in tissues and promotes the progression of diseases such as atherosclerosis," she says. Expanding on these findings, Dr. Ramkhelawon's laboratory is now studying the possible role of Netrin-1 in aortic aneurysms. "Like atherosclerosis, this vascular disease is also very inflammatory," she notes. "In experimental mouse models of aneurysm and human specimens, we find a lot of activated macrophages in the tissues. We are looking to identify why they're there, and what role they play." Positive early findings from this research have led the NIH to award Dr. Ramkhelawon a K-99/R00 grant to investigate the role of Netrin-1 abdominal aortic aneurysm development.



↑ Bhama Ramkhelawon, PhD

first

IN THE NATION

to implant the world's smallest pacemaker, the Micra™ transcatheter pacing system (TPS)

first

IN THE WORLD

to perform a completely transseptal mitral valve replacement

the only

CONGENITAL CARDIOVASCULAR CARE UNIT (CCVCU)

in New York devoted to newborns, infants, and children

↑ (left to right) Gregory E. Morley, PhD, Larry A. Chinitz, MD, Glenn I. Fishman, MD, Boyce E. Griffith, PhD, and William A. Coetzee, PhD

Awards & Recognition

→ **Sripal Bangalore, MD,** associate professor of medicine, director of research for the Cardiac Catheterization Laboratory: **awarded the Douglas P. Zipes Distinguished Young Scientist Award** in recognition of his contributions to cardiovascular research.

→ **Frank Cecchin, MD,** Andrall E. Pearson Professor of Pediatric Cardiology and professor of medicine: **named director of the Division of Pediatric Cardiology.**

→ **Larry A. Chinitz, MD,** the Alvin Benjamin and Kenneth Coyle, Sr. Family Professor of Medicine and Cardiac Electrophysiology, director of the Heart Rhythm Center, and clinical director of the Leon H. Charney Division of Cardiology: **named board president of the American Heart Association New York Chapter;** inducted as fellow of the Heart Rhythm Society.

→ **Mario Delmar, MD, PhD,** the Patricia M. and Robert H. Martinsen Professor of Cardiology and professor of cell biology: **appointed vice president of the Cardiac Electrophysiology Society.**

→ **Edward A. Fisher, MD, PhD, MPH,** Leon H. Charney Professor of Cardiovascular Medicine and professor of medicine, pediatrics, and cell biology: **received the Lifetime Achievement Award,** National Lipid Association; leader of semifinalist team, One Brave Idea Competition.

→ **Glenn I. Fishman, MD,** William Goldring Professor of Medicine and director of the Leon H. Charney Division of Cardiology: **awarded the American Heart Association's 2015 Basic Research Prize** in recognition of his outstanding contributions to cardiovascular science and groundbreaking discoveries of the molecular defects associated with cardiovascular diseases, including those responsible for heart rhythm disorders and cardiomyopathies.

→ **Judith S. Hochman, MD,** Harold Snyder Family Professor of Cardiology, and **Harmony R. Reynolds, MD,** Saul J. Farber Associate Professor of Medicine: **selected as co-leaders of the new Sarah Ross Soter Center for Women's Cardiovascular Research.** In addition, Dr. Hochman **received the American College of Cardiology's Distinguished Scientist Award—Clinical Domain.**

→ **Achiau Ludomirsky, MD,** professor of pediatrics: **named associate chair for outreach in the Department of Pediatrics.**

→ **Thomas S. Maldonado, MD,** professor of surgery and medical director of the Venous Thromboembolic Center: **appointed president of the Vascular and Endovascular Surgery Society.**

→ **Kathryn J. Moore, PhD,** Jean and David Blechman Professor of Cardiology and professor of cell biology: **appointed chair of the American Heart Association Arteriosclerosis Thrombosis and Vascular Biology (ATVB) Leadership Committee.**

→ **Caron B. Rockman, MD,** the Florence and Joseph Ritorto Professor of Surgical Research and professor of vascular surgery: **appointed secretary of the Society for Clinical Vascular Surgery.**

→ **Adam H. Skolnick, MD,** associate professor of medicine and associate director of the HCC11 Cardiology Service: **named a fellow of the American Heart Association.**

→ **Howard Weintraub, MD,** clinical professor of medicine and clinical director of the Center for the Prevention of Cardiovascular Disease: **elected to Board of Directors as Treasurer of the American Society for Preventive Cardiology.**

Leading the Way in Clinical Care & Research

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.

↑ Larry A. Chinitz, MD

Mapping Heart Rhythm Risks at the Cellular Level

NYU Langone researchers have created the first detailed, three-dimensional images of intercalated discs—protein structures that connect heart muscle cells into working groups—enabling the visualization of previously unseen aspects of these discs.

3D IMAGES AT NANOMETER RESOLUTION

To re-create the discs from a mouse model, the team, led by Mario Delmar, MD, PhD, the Patricia M. and Robert H. Martinsen Professor of Cardiology and professor of cell biology, combined powerful imaging techniques—including focused ion beam-scanning electron microscopy, which creates three-dimensional images at nanometer resolution—and mathematical models. These discs have two essential jobs: to pass on electrical signals and to transmit the pumping force needed for the heart to beat normally.

Dr. Delmar's team, including Eli Rothenberg, PhD, associate professor of biochemistry and molecular pharmacology, and David Fenyo, PhD, professor of biochemistry and molecular pharmacology, found that the proteins that do these two jobs occur together in clusters and that abnormal separation of these proteins—even by billionths of a meter—may represent a new marker of electrical malfunction that leads to arrhythmias. Dr. Delmar believes that the images, published in January 2016 in *Nature Communications*, may someday help physicians and genetic counselors more accurately identify people at risk for potentially life-threatening arrhythmias before they develop. His long-term goal is to develop a simple blood test capable of detecting dangerous disc protein structures, and thus arrhythmia risk, that can be used in routine health screening.

UNCOVERING THE MECHANISM BEHIND ARRHYTHMOGENIC RIGHT VENTRICULAR CARDIOMYOPATHY

Dr. Delmar also continues to elucidate the mechanisms involved with arrhythmogenic right ventricular cardiomyopathy (ARVC), an inherited genetic condition that predisposes individuals to sudden cardiac death (SCD). A disorder of the myocardium, ARVC often results from mutations in genes involved in the function of desmosomes, structures that attach heart muscle cells to one another.

Using a mouse model they recently developed, Dr. Delmar and his colleagues have found that life-threatening arrhythmias in ARVC actually develop before serious structural disease begins. "When structural disease develops, it can compound the arrhythmias, but electrical malfunction consequent to changes in gene programming in the cell is the first thing to manifest in this disease," Dr. Delmar says.

Therefore, patients who suffer life-threatening arrhythmias as a result of ARVC may show no previous signs of the condition. Dr. Delmar has been collaborating with multiple investigators, including Steven Fowler, MD, assistant professor of medicine, and Marina Cerrone, MD, research assistant professor of medicine, to investigate cases of young people whose sudden, unexpected life-threatening arrhythmias may be due to mutations in desmosomal genes.

"These research insights, combined with our high volume of patients and procedures—we are one of the highest-volume heart rhythm centers in the country—keep us at the forefront of arrhythmia research and care," adds Larry A. Chinitz, MD, the Alvin Benjamin and Kenneth Coyle, Sr. Family Professor of Medicine and Cardiac Electrophysiology, director of the Heart Rhythm Center, and clinical director of the Leon H. Charney Division of Cardiology.

Hypertrophic Cardiomyopathy Program

Hypertrophic cardiomyopathy (HCM), an abnormal, inherited thickening of the heart muscle that causes life-threatening arrhythmias, is the most common genetic heart disorder and cause of sudden death in people under 30 years of age.

CENTER OF EXCELLENCE LEADS THE WAY IN HYPERTROPHIC CARDIOMYOPATHY

NYU Langone is one of only a handful of institutions in the United States to offer comprehensive management of HCM.

The Hypertrophic Cardiomyopathy Program now cares for more than 1,700 patients, making it one of the largest such programs in the world. The program is directed by Mark V. Sherrid, MD, professor of medicine, a cardiologist who has specialized in managing patients with HCM for three decades. The program's surgical director Daniel G. Swistel, MD, associate professor of cardiothoracic surgery, is one of the country's few surgeons with extensive experience performing myectomy for HCM—a procedure that often alleviates heart failure symptoms when medical management has failed.

TARGETED HCM TREATMENT

Most heart failure symptoms in HCM patients respond to pharmacologic therapy, and Dr. Sherrid's research was influential in establishing the utility of disopyramide therapy for obstructive HCM. The drug now has a Class IIa recommendation in America and a Ib recommendation in Europe.

Patients with HCM are at risk of sudden cardiac death; the NYU Langone program assesses every patient's individual risk. Approximately 20 percent of assessed patients carry a risk significant enough to receive an implantable cardioverter defibrillator (ICD). "Because patients with HCM are often younger, and the risk of sudden death is lifelong, some are candidates for the new subcutaneous ICD—which spares the patient from intravascular wire(s)," notes Dr. Sherrid.

INNOVATION IMPROVES SURGICAL OUTCOMES

In 2000, Dr. Swistel developed a significant surgical modification to the traditional myectomy procedure performed on approximately one-third of patients with obstruction—usually those who have failed pharmacologic therapy.

Dr. Swistel noted that the mitral valve of HCM patients significantly protrudes into the left ventricular chamber, and is swept by the flow into the septal wall; his innovative surgical modification, called a horizontal plication, offers an additional benefit in myectomy by shortening the valve. To further help a selected cross section of patients, he recently took the procedure a step further by resecting the tip of the mitral valve to decrease or eliminate obstruction.

"The mitral valve is often too large in patients suffering from HCM, and the typical mitral valve repair done for regurgitation does not work for these patients," Dr. Swistel explains. "These new techniques shorten the anterior leaflet of the mitral valve by removing excess tissue. Every patient with HCM is a little different, and we must tailor our operations to their unique pathophysiologies."

In 2016, Dr. Sherrid, Dr. Swistel, and Leon Axel, MD, PhD, professor of radiology, medicine, and physiology and neuroscience, published a paper in the *Journal of the American College of Cardiology*, comprehensively reviewing the anomalies seen on echocardiography and cardiac magnetic resonance in obstructive HCM and detailing a variety of surgical innovations performed at NYU Langone.

PUBLIC HEALTH POLICY: AED ADVOCACY TO PREVENT SUDDEN DEATH

Venturing beyond the clinic and the laboratory, Dr. Sherrid has taken a role in public health advocacy, recently publishing a paper in the *Journal of the American College of Cardiology*, which highlights the state legislative requirements for automatic external defibrillators in schools throughout the United States, and helps to frame the debate about the medical advantages of early access. HCM is the leading cause of sudden death in young athletes—yet screening all 60 million youth sport participants with an electrocardiogram or echocardiogram, above and beyond standard screening using a history and physical exam, would incur both added costs and unnecessary false positives. Instead, Dr. Sherrid argues that state and local governments should support widespread availability of automatic external defibrillators (AEDs) in all schools.

"Currently, only 17 states require schools to have AEDs on premises, and only five offer funding to schools to purchase them," he says. "But their availability throughout the country would greatly increase the chances of successful resuscitation should a child with HCM or other inherited cardiac condition suffer sudden cardiac arrest on school grounds."

MAY 6–7, 2017

Hypertrophic Cardiomyopathy: Comprehensive Management of a Complex Disease

Sponsored by the Hypertrophic Cardiomyopathy Program at NYU Langone, the only such conference held in the tri-state metropolitan area

To register, visit **med.nyu.edu/cme/HCM**

↑ Mark V. Sherrid, MD, and Daniel G. Swistel, MD

Detection and Treatment of Congenital Heart Disease

The lifelong management of congenital heart disease is among the most complex challenges in medicine.

GROWING UP: MANAGING CONGENITAL HEART DISEASE INTO ADULTHOOD

Congenital heart disease (CHD) is the most common major birth defect, affecting more than 1 percent of newborns. In the past, many patients with CHD died before reaching adulthood, but thanks to several decades of extraordinary medical advances, as many as 90 percent of children born with CHD survive to adulthood. For these patients, the adult congenital heart disease (ACHD) program at NYU Langone provides the expert subspecialty care they need to manage their condition as adults. Led by Medical Director Dan G. Halpern, MD, assistant professor of medicine, the program includes three board-certified adult congenital heart disease specialists, more than any other institution in New York.

"We collaborate with a comprehensive team of pediatric and adult subspecialists representing every discipline that touches adult congenital heart disease, including pediatric cardiology, imaging, electrophysiology, interventional cardiology, rehabilitation, ICU, heart failure, reproductive services, genetics, and anesthesia," says Dr. Halpern. "This core group meets once a week to discuss challenging cases."

As children with congenital heart disease reach adolescence, it is important that they begin a carefully managed transition from their pediatric cardiology team to the care of specialists with expertise in the unique medical, psychological, and social issues involved with adult congenital heart disease. To achieve a smooth handoff in care for each patient, Dr. Halpern and his colleagues, cardiologist Catherine Weinberg, MD,

↑ Abigail Walsh, MSN, CPNP-AC, Frank Cecchin, MD, Dan Halpern, MD, and Rachel Smaldone, MSN, AGPCNP-BC

clinical instructor of medicine; Frank Cecchin, MD, the Andrall E. Pearson Professor of Pediatric Cardiology and director of pediatric cardiology; and Abigail Walsh, MSN, CPNP-AC, have developed a comprehensive transition process for these young people.

The "Journey to Knowing My Heart" program maps out a process, from around the age of 12 through the teen years to adulthood, helping patients independently manage their own care. Attending physicians from pediatric cardiology and the adult congenital heart disease program collaborate with nurse practitioners, cardiology nurses, social workers, and child life specialists to ensure that each child and his or her family are guided through a developmentally appropriate transition process. "It's designed to help these children empower themselves and take control of their disease," Dr. Halpern says.

Once patients reach adulthood, the ACHD program has a specialized in-house educational module to help practitioners provide targeted care for adult congenital heart disease. All nursing staff working in ACHD-dedicated areas must pass the module. "So far, we have taught more than 1,000 members of our nursing staff in various areas of practice how to take care of adult congenital heart disease patients," Dr. Halpern says.

Although NYU Langone has long delivered leading-edge care for ACHD patients, the formal program was launched less than two years ago—and is already garnering a national reputation. Dr. Halpern has co-authored a chapter on pregnancy and heart disease for Hurst's *The Heart*, an essential cardiology textbook, to be published in early 2017. NYU Langone also will host its first continuing medical education seminar in 2017 covering advanced cardiovascular therapeutics, with a major focus on adult congenital heart disease.

PERFORMING COMPLEX PEDIATRIC CARDIOTHORACIC SURGERIES

The cardiothoracic surgeons at Hassenfeld Children's Hospital of New York performed more than 200 cardiac surgeries in 2016, 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.

↓ Ralph S. Mosca, MD

WHEN CARE BEGINS BEFORE BIRTH

Nearly 1 in every 100 infants is born with a congenital heart defect. Hassenfeld Children's Hospital of New York at NYU Langone is a national leader in providing patients who have congenital heart disease (CHD) with fully integrated care from fetal life through adulthood.

Wherever possible, the surgeons use minimally invasive and combined techniques to reduce the number of interventions and ensure a healthy circulation as soon as possible. "Each child is unique, and as a team, we aim to provide individualized care to every patient who comes through our doors," explains 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. "We review each case and collaborate to determine the best course of action. It takes a lot of planning and coordination, but to see a child grow and thrive—despite the odds—makes it all worth it."

The Congenital Cardiovascular Care Unit (CCVCU), the first unit of its kind in New York City, provides critical care to children before and after congenital heart surgery, as well as to those who have undergone complex cardiac procedures. Led by Sujata B. Chakravarti, MD, assistant professor of pediatrics, the unit has more than 300 admissions each year. Patients from neonates to adolescents receive continuous, one-on-one care from a highly specialized team of cardiac intensivists, cardiologists, nurse practitioners, and nurses.

Affiliation Enhances Treatment Options for Atrial Septal Defect

Case Presentation: Chronic Cyanosis in an Adult

While in her 20s, the patient had been diagnosed with a large atrial septal defect (ASD). Over the years, her condition worsened, until she reached the point where she was chronically cyanotic and could no longer eat, sleep, or care for her grade school-aged son.

Presenting with chronic cyanosis at the age of 35, her clinical team at NYU Lutheran in Brooklyn, led by Thao Ngo, MD, clinical instructor of medicine and director of noninvasive cardiology, treated the patient for severe cyanosis, ASD and heart failure.

Due to the severity and length of the patient's cyanotic conditions, suspicions were raised for Eisenmenger's syndrome, in which the left-to-right shunt of blood flow caused by the ASD causes severe pulmonary hypertension, which ultimately reverses the direction of the shunt leading to cyanosis.

The uniqueness of this case prompted Dr. Ngo to consult with Dan Halpern, MD, assistant professor of medicine and medical director of the Adult Congenital Heart Disease Program at NYU Langone. Together, they identified the need for the patient to be transferred to NYU Langone in order to receive advanced cardiac care.

ADULT AND PEDIATRIC CARDIOLOGIST: A SYNCHRONIZED APPROACH

When the patient was first transferred to NYU Langone, Dr. Halpern was uncertain of what he was dealing with. "The patient had been chronically cyanotic for years," he recalls. "Her skin was blue and incredibly she had managed to become pregnant and give birth to her son while severely deoxygenated."

But when Dr. Halpern and his colleagues, 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, and Michael Argilla, MD, assistant professor of pediatrics and director of the Pediatric Catheterization Laboratory, ordered a series of diagnostic studies—echocardiography, cardiac MRI, and cardiac catheterization—they identified an extremely unique condition. "The right side of her heart was abnormally small—forcibly shunting blood away from the right ventricle through the large atrial septal defect," Dr. Halpern says. "So instead of the left-to-right shunt that commonly goes through an ASD and causes severe pulmonary vascular disease, she had a right-to-left shunt that bypassed the lungs. This protected her lungs, but she was still cyanotic and rapidly deteriorating."

BIDIRECTIONAL GLENN SHUNT SIGNIFICANTLY IMPROVES CARDIAC FUNCTION

It is extremely rare for a patient with a small right heart and right-to-left shunt to have reached the age of 35 undiagnosed and untreated. Dr. Halpern, Dr. Mosca, and Dr. Argilla performed a cardiac catheterization and proved that the patient would not tolerate closure of the ASD. They decided to first place her on medication to lower her pulmonary pressures and increase blood flow to the right side of her heart.

After three months of treatment, they decided to perform a surgery that is quite common in pediatric cardiology, but almost never performed in adults: a bidirectional Glenn shunt. "If we had just closed the ASD, she would not have enough blood going into the right side and would have decompensated," Dr. Mosca explains. "So in addition, we connected the superior vena cava directly to the pulmonary artery, diverting some of the blood from the right side of the heart to the lungs immediately."

Within moments after the procedure was completed, the patient's oxygen saturation jumped from 75 percent to 99 percent.

SURGICAL OUTCOMES: FUNCTION PRESERVED, RECOVERY EXPEDITED

The patient spent two weeks in the intensive care unit, and now, nearly two years later, her life has dramatically improved. "Her heart function is strong, and she can enjoy life while taking care of her son," says Dr. Halpern. "This was the first time a bidirectional Glenn shunt was performed on an adult at NYU Langone. That's the beauty of what we do—thinking outside of the box to make our patients better."

NYU Langone's medical team continues to monitor the patient and works with her through rehabilitation and nutrition counseling to improve her self-care.

Advancing the Science of Valve Replacement

Two decades ago, NYU Langone surgeons conducted the nation's first minimally invasive mitral valve repair. In that same pioneering spirit, in July 2016, specialists in our world-renowned Heart Valve Center achieved another groundbreaking first in mitral valve repair.

VALVE REPLACEMENT INNOVATIONS EXPAND MINIMALLY INVASIVE OPTIONS

Led by Mathew R. Williams, MD, associate professor of cardiothoracic surgery and medicine, chief of the Division of Adult Cardiac Surgery, and director of Interventional Cardiology and the Heart Valve Center, the center became the world's first to implant an investigational transcatheter device for mitral valve regurgitation in extremely compromised patients.

NYU Langone is a leading center in the PRELUDE (Percutaneous Mitral Valve Replacement EvaLuation Utilizing IDE Early Feasibility) clinical trial to assess the new transcatheter mitral valve replacement (TMVR) system, which offers an important alternative for patients who are too high risk for conventional open-heart surgery and have limited options.

The TMVR valve is complex, and the approach poses more challenges than transcatheter aortic valve replacement (TAVR). Unlike other transcatheter mitral valve replacement technologies, which require a small incision in the chest, this new procedure is performed completely through the groin without any incisions. It offers dramatically shorter recovery times, with patients walking just a few hours after the procedure.

"This latest achievement is an absolutely transformational development in the field of valve replacement that has totally changed what we can do in healthcare," says Aubrey C. Galloway, MD, the Seymour Cohn Professor of Cardiothoracic Surgery and chair of the Department of Cardiothoracic Surgery. In addition to Dr. Williams, the NYU Langone team leading this trial includes Muhamed Saric, MD, PhD, associate professor of medicine and clinical director of non-invasive cardiology; Cezar S. Staniloae, MD, clinical associate professor of medicine and assistant director of the Heart Valve Center; and Peter J. Neuberger, MD, assistant professor of anesthesiology, perioperative care, and pain medicine.

↓ Mathew R. Williams, MD

2,500+

number of transcatheter aortic valve procedures performed by

MATHEW R. WILLIAMS, MD

WITH SURGICAL SYSTEM, ROBOTIC APPROACH EXTENDS TO COMPLEX CASES

Mitral valve repair surgery at NYU Langone is performed using the new, state-of-the-art da Vinci Xi® robotic surgical system, which integrates three-dimensional high-definition endoscopy and robotic technology to virtually extend the surgeon's eyes and hands into the patient. "Robotic mitral valve repair is the least invasive and the most precise way of performing mitral valve surgery," says Didier F. Loulmet, MD, associate professor of cardiothoracic surgery, director of robotic cardiac surgery at Tisch Hospital, and chief of cardiac surgery. NYU Langone is one of only a few cardiac centers in the world with this latest generation of the da Vinci system, which is also used for the resection of intracardiac tumors and hybrid revascularization.

"Patients have virtually no postoperative infections, minimal bleeding, much less pain, and recover much more quickly."

—Didier F. Loulmet, MD

Many institutions only use robotic approaches for simple mitral valve repair, while complex cases are managed with open-heart surgery. "But thanks to the extensive experience of our team, which includes anesthesiologists, perfusionists, and a specialized nursing staff, we can do even the most complex cases robotically, with outstanding outcomes," Dr. Loulmet says. "Patients have virtually no postoperative infections, minimal bleeding, much less pain, and recover much more quickly."

PAVING THE WAY WITH INVESTIGATIONAL TAVR SYSTEM FOR AORTIC STENOSIS

The Heart Valve Center also continues to lead the way in transcatheter valve replacement. In June 2016, the Center was the first in the world to implant Medtronic's new investigational CoreValve™ Evolut™ PRO TAVR (transcatheter aortic valve replacement) System in a patient with severe aortic stenosis with a successful outcome; the patient was released the following day.

"This new technology represents an innovative advancement on an already-approved device that we hope, with more study, will become a new option for patients with severe aortic stenosis," says Dr. Williams. He was the first physician to be cross-trained in both interventional cardiology and cardiac surgery, and remains one of only a few specialists with this dual expertise. NYU Langone is currently a leading center in the trial of the new valve technology.

Like the Evolut™ R System, which was approved by the Food and Drug Administration in 2015 following trials led by NYU Langone, the new PRO TAVR System is both recapturable and repositionable, improving accuracy in placement and control during the procedure. In addition, the PRO TAVR System includes an outer layer designed to further reduce leakage around the implant.

Robotic Heart Surgery Yields Optimal Outcome on Complex Case

Case Presentation: Severe Mitral Valve Regurgitation

When a vigorous, active 49-year-old male underwent a routine physical, he did not expect they would find anything wrong. After all, he had no symptoms. But the examination detected a previously unknown heart murmur, and after an appointment with a cardiologist, the patient was diagnosed with severe mitral valve regurgitation.

↓ Didier F. Loulmet, MD

Further testing revealed that the chambers of his heart had already become significantly enlarged, dilating his heart and compromising ventricular contraction. The patient visited multiple surgeons and was continuously told he should have conventional open heart surgery, requiring a full sternotomy incision. At his age, and with no noticeable symptoms, the man was reluctant to have such an invasive operation, known for having a long recovery period.

"Many people with mitral valve regurgitation may be feeling well and experiencing no symptoms. But if you delay performing the repair too long, at some point the deterioration of the heart's condition becomes irreversible" explains Didier F. Loulmet, MD, associate professor of cardiothoracic surgery, director of robotic cardiac surgery at Tisch Hospital, and chief of cardiac surgery.

MINIMALLY INVASIVE ROBOTIC HEART SURGERY

Finally, after multiple opinions, the patient found Dr. Loulmet, a pioneer of robotic minimally invasive valvular surgery. "We proposed to fix his mitral valve robotically, using just five small incisions on the right side of the chest between the ribs, instead of a sternotomy," says Dr. Loulmet. "This approach lowers the complication rate and facilitates recovery."

The patient's mitral valve dysfunction was characteristic of a condition called Barlow's disease, a particularly challenging repair. "It usually presents with degenerative changes in which the tissue of the valve itself is thickened, and the valve does not close tightly," Dr. Loulmet explains. "Very often, part of the valve prolapses, which is what happened in this case. We used a sliding plasty of the postural leaflet, combined with a classical annuloplasty technique, to repair his valve. This complex procedure is used in only about 20 percent of cases."

The team for the three-hour complex surgery, performed in November 2016, included Dr. Loulmet, his colleague Eugene A. Grossi, MD, the Stephen B. Colvin, MD Professor of Cardiothoracic Surgery, and assistant director of the cardiac surgery robotics transcather valve surgical program, and Robert G. Nampiaparampil, MD, assistant professor of anesthesiology, perioperative care, and pain medicine.

SURGICAL OUTCOME

Like a growing number of Dr. Loulmet's patients, the patient was extubated in the operating room. Made possible by innovations in robotics, early extubation decreases length of stay in the intensive care unit and improves the patient's recovery.

The patient remained in the hospital for just three nights, before returning home and going back to his normal daily activities at work and home. "We've seen him again for a checkup, and he is doing very well and is very happy," says Dr. Loulmet.

Pioneers in Vascular Disease

In 2016, NYU Langone advanced its leadership in the diagnosis and treatment of vascular disease, with a pioneering new stent graft device for abdominal aortic aneurysms and a new method for tracking patients with dangerous blood clots.

A SELECT SITE PILOTING NOVEL STENT GRAFTS

NYU Langone was chosen as one of only five sites in the nation to pilot the novel stent graft, designed by Patrick Kelly, MD, a vascular surgeon in South Dakota. This one-of-a-kind graft features four octopus-like arms that descend from above to selectively stent the vessels: two arms for the intestines and one for each kidney. Dr. Kelly's investigational device exemption (IDE) for the new device has been extended to vascular surgeon Thomas Maldonado, MD, professor of surgery and medical director of the Venous Thromboembolic Center at NYU Langone, and testing will begin in 2017. "This device uniquely allows us to treat aneurysms that involve all the branches of the thoracoabdominal portion," says Dr. Maldonado. "If successful, it will significantly enhance our ability to treat aneurysm patients."

↑ Thomas Maldonado, MD

"This feasibility study continues the tradition of innovation in vascular surgery at NYU Langone. Our division was one of the first in the United States to initiate aortic endografting beginning in 1994 with the first endograft trial," stated Mark A. Adelman, MD, the Frank J. Veith, MD Professor and Chief of Vascular and Endovascular Surgery at NYU Langone.

In addition, NYU Langone is also the only center in the New York City area—and one of about 15 nationwide—selected as an investigative site for the new Zenith® p-Branch® fenestrated stent graft. Fenestrated stent grafts have openings that allow for the treatment of aneurysms at or above the renal level, without blocking blood flow to essential arteries. Currently, these grafts must be custom designed to fit each patient's anatomy, a process that can take four to six weeks. The Zenith p-Branch graft is an "off-the-shelf" graft with pivoting renal windows, which allows it to fit more patients without customization. This more responsive approach is especially valuable in treating symptomatic patients with impending aortic aneurysm rupture, who lack the luxury of waiting for a customized device to be manufactured and whose only treatment option is therefore open-heart surgery.

RAPID RESPONSE TO PULMONARY EMBOLISM

NYU Langone recently established the Venous Thromboembolic Center (VTEC), one of a few centers nationwide with a focused program in venous thromboembolic disease (VTE). VTEC's multidisciplinary team of clinicians and scientists collaborate to advance patient care and conduct innovative research in VTE, the most commonly preventable cause of hospital-related death.

To save lives and reduce disability, VTEC has established a pulmonary embolism response team (PERT), which is immediately alerted to every new pulmonary embolism at an NYU Langone location. "As with stroke, for PE there is often a 'golden hour' for optimal diagnosis and treatment once that clot travels from the leg to the lungs," says Dr. Maldonado. "With our new alert system, cardiac surgery, interventional radiology, and intensive care are all placed on a conference call to direct patient care within minutes after a PE is reported."

VTEC also is alerted every time a patient with any new localized blood clot is diagnosed at any NYU Langone location. Center staff follows up with each patient to ensure that they are placed on a proper regimen of blood thinners and receive care from a hematologist if appropriate. Patients also are asked to participate in a registry and enroll in a prospective study, both of which aim to identify previously unknown factors that might predispose an individual to clotting and obstructive thrombosis.

"If at the time of preoperative testing, a simple blood test can help us better understand precisely which factors put someone at highest risk for clots, we also could identify which patients would benefit most from prophylaxis with blood thinners or placement of IVC filters before surgery," Dr. Maldonado says. To date, the data associated with more than 900 new blood clots have been captured for the registry.

OUTSTANDING RESULTS IN NATIONAL REGISTRY

NYU Langone has been participating for four years in the Vascular Quality Initiative (VQI), a voluntary national and regional database sponsored by the Patient Safety Organization of the Society for Vascular Surgery, with outstanding results in regard to many key indicators for vascular surgery outcomes. For example, NYU Langone's rate of serious complications following a carotid endarterectomy, a procedure designed to reduce the risk of stroke, is just 0.5 percent, compared with 1.1 percent nationwide. In addition, when performing minimally invasive endovascular procedures to treat blockages in the blood vessels of the leg, which are now almost universally guided by ultrasound, NYU Langone's rate of catheter insertion complications is just 0.3 percent, compared with 3.2 percent nationally. "The ability to amalgamate data on a national scale is facilitating change in vascular surgery practice throughout the United States," indicated Dr. Adelman.

"When you agree as an institution to participate in the VQI, you cannot just submit your good outcomes," says Caron B. Rockman, MD, the Florence and Joseph Ritorto Professor of Surgical Research and professor of vascular surgery. "You must submit all data on every surgical case, both operative and minimally invasive. The VQI will not accept submissions with any missing data. The amount of data collected on each case is extraordinary, and there is a rigorous quality control program."

Participating in the VQI allows an institution to monitor its own results as compared to established quality benchmarks. "Quarterly reports give participating institutions the opportunity for immediate feedback and performance improvement, which translates quickly into improved patient outcomes. Additionally, the initiative allows vascular surgeons and other experts in vascular disease to quickly accumulate information on a much larger number of cases than could be supplied by one institution alone. We can then analyze factors that would predispose or protect our patients from complications, and use this outcomes research to change practice."

TICAGRELOR, CLOPIDOGREL YIELD SIMILAR OUTCOMES IN EUCLID TRIAL

Despite previous theories, ticagrelor is not superior to clopidogrel for the reduction of cardiovascular events in patients with symptomatic peripheral artery disease (PAD), according to findings from the Examining Use of Ticagrelor in PAD (EUCLID) trial, the first large multinational trial of best antiplatelet therapies in PAD. Presented at the American Heart Association meeting in November and simultaneously published in the *New England Journal of Medicine*, EUCLID is "an extraordinarily important trial," said primary investigator Jeffrey S. Berger, MD, associate professor of medicine and surgery. "While it's disappointing that the trial was negative, it is still a giant step in the field of vascular medicine and will help healthcare professionals take better care of patients with PAD. Prior to this study, there have been no large trials of these agents that focused on this patient population."

Advanced Care for Heart Failure

At NYU Langone's Heart Failure Advanced Care Center, state-of-the-art technology is aimed at extending and improving the lives of people with advanced heart failure.

These advances encompass all FDA-approved ventricular assist devices and cardiac pacing devices, including the world's smallest pacemaker, the Micra™ Transcatheter Pacing System (Micra TPS), for which the Medical Center is a leading clinical trial site.

NEW PROGRAM TARGETS CARDIAC AMYLOIDOSIS

NYU Langone has developed a new multispecialty program to enhance care for cardiac amyloidosis, a poorly understood and often fatal disease caused by buildup of amyloid protein deposits in tissue. Led by Alex Reyentovich, MD, assistant professor of medicine, clinical director of the Heart Failure Program, and medical director of the Left Ventricular Assist Device Program, this collaborative program is one of only a handful focused exclusively on cardiac amyloidosis. It brings together experts from subspecialties, including neurology, oncology, hematology, and nephrology, to rapidly identify and treat patients with this less recognized cause of heart failure.

There are several types of amyloidosis; the most commonly diagnosed, and most dangerous type to affect the heart is immunoglobulin light-chain (AL or primary systemic) amyloidosis. About half of the 2,500 new U.S. cases of AL amyloidosis affect the heart, with congestive heart failure as the presenting clinical manifestation in about half of these patients.

"It is critical to identify heart failure caused by AL amyloidosis as soon as possible, as it can be very aggressive and rapidly fatal," explains Dr. Reyentovich. Once congestive heart failure occurs, the median survival for untreated patients is less than six months, but the condition can respond well to chemotherapy when treated promptly. Many patients respond to treatment after as few as three cycles of tailored therapy, usually with a regimen similar to those used in multiple myeloma, which can extend survival by a decade or more.

Dr. Reyentovich and his colleagues also have initiated a new study to validate a novel radiologic approach, a technetium pyrophosphate (PYP) scan, to help identify the type of amyloid involved in a patient's disease. The noninvasive diagnostic tool could provide an alternative to invasive heart biopsy, the standard tool currently used to differentiate types of cardiac amyloidosis.

↑ Stuart D. Katz, MD, Alex Reyentovich, MD, and Leora B. Balsam, MD

GAINING GROUND AGAINST CARDIOGENIC SHOCK

Cardiogenic shock, the leading cause of death among patients experiencing an acute myocardial infarction in the absence of aggressive, highly specialized care, is fatal in 70 to 90 percent of cases. The Cardiogenic Shock Program at NYU Langone, implemented in 2015, is aimed at providing the rapid, targeted care these patients need. Through the program, at least a dozen people who otherwise would have almost certainly died have now returned to their daily lives with the aid of short-term circulatory support, reports Deane E. Smith, MD, assistant professor of cardiothoracic surgery.

> 300,000

PEOPLE

die from heart failure related causes in the United States each year

Dr. Smith directs the program with Leora B. Balsam, MD, associate professor of cardiothoracic surgery, associate director of cardiac surgical research, and director of the Ventricular Assist Device Program (VAD). "Between 2015 and 2016, we treated 17 adult patients with extracorporeal membrane oxygenation (ECMO), a significant increase over our volume from the previous year," says Dr. Smith.

Early referral of these patients is critical, Dr. Smith adds. "As soon as the physician recognizes that the patient is in shock and medical therapy is not working, prompt institution of mechanical circulatory support is essential to improve outcomes."

An expanding armamentarium of support devices for patients with advanced heart failure or cardiogenic shock allows the team to provide the optimal treatments to more complex patients in both acute and long-term situations, Dr. Balsam notes. Several patients also have been treated with a novel percutaneous right ventricular assist device (RVAD), another option to support patients with acute heart failure that does not require sternotomy.

"We now have more than 35 patients who are chronically supported," adds Dr. Balsam. "Some patients who might have been too sick to be treated with one type of device are being helped with another. Our patients benefit from a team with the extensive experience and skill to care for complex conditions using all available devices."

STANDARDIZING CARE FOR PATIENTS WITH HEART FAILURE

Frank M. Volpicelli, MD, assistant professor of medicine and clinical lead of Value-Based Management (VBM) at NYU Langone, has been looking closely at the clinical pathways that guide physicians' management of common conditions.

"We wanted to find out what the ideal course of hospitalization would be for patients with acute decompensated heart failure or pneumonia—and where we were falling down in that care," he says. "For example, in the vast majority of cases of heart failure, patients were being admitted because of excess fluid. But in our investigation, we found that often we were not giving evidence-based doses of diuretics and not re-dosing aggressively enough."

As a result of the investigation—conducted in partnership with Stuart D. Katz, MD, the Helen L. and Martin S. Kimmel Professor of Advanced Cardiac Therapeutics and director of the Heart Failure Program, and Alex Reyentovich, MD—the care of hospitalized heart failure patients is now standardized and nurses know what to expect at every phase of the patient's stay. Dr. Volpicelli adds that since the standardized system was implemented, the hospital has seen shorter stays and reduced readmission rates for patients with heart failure and pneumonia.

"As a patient progresses through NYU Langone, there is a seamless course that's predictable," Dr. Volpicelli says. "We get patients to the point of heart failure management faster than ever before."

Data collection for similar activities continues not only at the Medical Center's main campus, but also throughout its network. Dr. Volpicelli adds that although VBM faces challenging perceptions, its benefits for patients cannot be ignored. To increase VBM's acceptance and adoption, he notes, "we must help our colleagues understand that the driving force behind VBM is to improve patients' experiences and outcomes with better, more sustainable ways of delivering care."

Preventive Cardiology

Combining medical therapeutics with lifestyle changes, the NYU Langone's Center for the Prevention of Cardiovascular Disease helps patients reduce their risk of a first heart attack or a recurrent heart attack.

MULTISPECIALTY TEAM PROVIDES WHOLE-PATIENT CARDIOVASCULAR SERVICES

For more than 5,000 outpatients and 500 inpatients seen last year, the six-physician center offered special expertise in lipid disorders, metabolic syndrome/diabetes, and hypertension, and a comprehensive approach to lifestyle modification that is rarely found in academic medical centers.

"Very few places in the country have the multidisciplinary expertise that we have in our center to aggressively manage patients' cardiovascular risk factors," says Edward A. Fisher, MD, PhD, MPH, the Leon H. Charney Professor of Cardiovascular Medicine and the Center's director.

This wide-ranging expertise includes in-depth dietary counseling provided by the registered dietitian, Maria A. Bella, MS, RD; personalized fitness plans delivered by preventive cardiologist Sean P. Heffron, MD, instructor of medicine, who holds a master's degree in exercise physiology, and Margaret M. McCarthy, RN, PhD, assistant professor of New York University Rory Meyers College of Nursing; and stress-reduction guidance from Dennis A. Goodman, MD, clinical professor of medicine and Director of Integrative Medicine.

Most inpatient consultations involve patients coming through the Medical Center's cardiac interventional and electrophysiology services. When a patient with certain risk indications is admitted, the Center receives an alert through the electronic medical record, and the patient is promptly seen by a preventive cardiology fellow—one of eight such fellowships in the nation, and the only one in New York. "Soon, we will expand the consultative service to proactively provide thorough cardiac prevention consultations for patients with cardiovascular risk factors from other departments in the hospital," says Howard Weintraub, MD, clinical professor of medicine and clinical director of the Center.

UNIQUE BODY OF CLINICAL RESEARCH INFORMS PREVENTIVE CARE

To expand the specialty's knowledge base in preventive care, the Center recently launched two preventive cardiology registries—one for inpatients, the other for outpatients—with a running total of more than 2,500 data entries. These registries have received approval to collect samples of DNA, whole blood RNA, platelet RNA, plasma, and serum, with approximately 200 stored already, for use in a number of future research initiatives.

Among research initiatives recently completed, the randomized IMPACT (Investigation of Motivational Interviewing and Prevention Consults to Achieve Cardiovascular Targets) trial assessed the benefits of a prevention consult and behavioral modification for 400 patients post-cardiovascular intervention. Led by Eugenia Gianos, MD, assistant professor of medicine and the Center's co-clinical director, and Jeffrey S. Berger, MD, associate professor of medicine and surgery, the trial's results will be presented at the 2017 meeting of the American Heart Association.

Dr. Berger is also the lead investigator on the HONOR study, focused on physical activity and peripheral arterial disease, and the PACE study on platelets and peripheral arterial disease. Separately, Dr. Heffron is leading two studies on bariatric surgery and HDL (bad) function, while Jonathan Newman, MD, MPH, the Eugene Braunwald MD Assistant Professor of Cardiology, is leading three studies on cardiovascular disease risk factors among people with diabetes.

Deciphering Gender Differences in Heart Health

Every year, some 400,000 women in the United States experience heart attacks. Clinicians are well aware of many of the differences in heart attack risk factors, symptoms, and outcomes experienced by women versus men.

For example, women are more likely to have a heart attack with coronary arteries that are open, rather than significantly narrowed, and stress plays a much more significant role. But despite the answers, many questions remain when it comes to preventing, diagnosing, and treating heart attacks in women.

AHA-DESIGNATED RESEARCH CENTER EXPLORES UNANSWERED QUESTIONS IN WOMEN'S HEART HEALTH

This year, NYU Langone's new Sarah Ross Soter Center for Women's Cardiovascular Research was designated as one of five national centers in the American Heart Association (AHA) Go Red For Women Research Network to conduct research in pursuit of answers to these questions. The Soter Center's interdisciplinary team is both investigating the causes of heart attack in women and exploring new techniques to manage stress in women who have suffered a heart attack. "Our hope is that perhaps what the research uncovers about stress may help the many women who have not yet had a heart attack," says Sarah Ross Soter, who funded the network and selected NYU Langone's center as the one to bear her name.

Investigators at the Soter Center have complementary expertise in basic science, clinical research, and

↑ Binita Shah, MD, and Harmony R. Reynolds, MD

population health. "This research initiative will help us advance knowledge in three important areas: why women have heart attacks, what makes heart attacks different in women, and the best techniques to diagnose, manage, and treat women with heart attacks," says Harmony R. Reynolds, MD, the Saul J. Farber Associate Professor of Medicine, associate director of the Cardiovascular Clinical Research Center, and co-leader of the Soter Center.

"This research initiative will help us advance knowledge in three important areas: why women have heart attacks, what makes heart attacks different in women, and the best techniques to diagnose, manage, and treat women with heart attacks."

—Harmony R. Reynolds, MD

The Soter Center includes three research projects recruiting women with heart attacks. In a clinical trial, Dr. Reynolds will study the role of advanced diagnostics and outcomes in women who have atypical heart attacks, with open arteries. Tanya Spruill, PhD, assistant professor of population health and medicine and the lead population study investigator in the Soter Center, will assess whether stress modification can improve outcomes in women with heart attacks, in a randomized trial. Jeffrey S. Berger, MD, associate professor of medicine and surgery and the lead basic science investigator at the Soter Center, will evaluate the influence of genetics and psychosocial factors on platelet activity, which can affect risk of clotting. Many women will participate in more than one of the studies. This synergistic approach will enable the research team to answer more questions than they would have working independently. For example, Dr. Berger also will analyze how stress can change the platelets' behavior. "Our hypothesis is that one reason that heart attacks present differently in women than in men is that women's platelets respond to stress in a different way," says Dr. Berger.

One of the first findings on gender differences in heart health from the Soter Center researchers: peripheral vascular disease manifests differently in women than in men. "Women have a significantly higher prevalence of peripheral artery disease, while men have a higher prevalence of carotid artery stenosis and abdominal aortic aneurysms," explains Dr. Berger, who analyzed data collected from more than 3.6 million individuals during community-based preventive health screenings. He presented his findings at the 2016 American College of Cardiology Annual Scientific Sessions.

The Soter Center also will train new cadres of basic, clinical, and translational scientists in women's cardiovascular disease, says the project's training director, Glenn I. Fishman, MD, the William Goldring Professor of Medicine, professor of neuroscience and physiology, biochemistry and molecular pharmacology, vice chair of research for the Department of Medicine, and director of the Leon H. Charney Division of Cardiology. "The Soter Center builds upon NYU Langone's long tradition of research into the complexities of heart disease in women, and promises to provide new answers that will positively impact women's heart health."

New Genes Identified in Cholesterol Trafficking, Cardiac Conduction Disease, and Platelet Function

Several groups of cardiac and vascular investigators reported important genetic findings over the past year.

MICRORNA miR-33

Kathryn J. Moore, PhD, the Jean and David Blechman Professor of Cardiology and professor of cell biology, and colleagues have previously identified the microRNA miR-33 as an important regulator of cholesterol metabolism. Dr. Moore noticed that the gene OSBPL6, which encodes the OSBPL-related protein 6 (ORP6), is targeted by miR-33, and set out to determine the gene's previously unknown function. They found that OSBPL6 plays an important role in trafficking cholesterol out of cells and maintaining normal cholesterol homeostasis. In laboratory studies, Dr. Moore's team demonstrated that knockdown of OSBPL6 correlates with cholesterol accumulation, while upregulation of the gene enhances cholesterol trafficking. "We think that this gene plays a critical role in facilitating the normal processes that allow free cholesterol to move from lysosome to endoplasmic reticulum," says Dr. Moore. "Now that we have an idea what it is doing, we can do further research to dissect its function. It is possible that in a condition like Niemann-Pick disease, in which free cholesterol accumulates in the lysosomes and causes neurologic deficits, OSBPL6 might provide a therapeutic target." The group's findings were published in *Arteriosclerosis, Thrombosis, and Vascular Biology* in May 2016.

TRANSCRIPTION FACTOR ETV1

Transcription factor ETV1 is a critical regulator of fast conduction physiology in the heart, essential for maintaining normal cardiac rhythm and optimal cardiac output, according to new research from a team led by scientists Glenn I. Fishman, MD, the William Goldring Professor of Medicine and director of the Leon H. Charney Division of Cardiology, Mario Delmar, MD, PhD, the Patricia M. and Robert H. Martinsen Professor of Cardiology, and David S. Park, MD, assistant professor of medicine. Published in the *Journal of Clinical Investigation* in October 2016, the study examines the little-known gene regulatory network that dictates the fast conduction phenotype, implicates ETV1 as a major regulator of cardiac conduction biology, and identifies it as an important gene in cardiac conduction disease.

WD40 REPEAT DOMAIN 1 (WDR1)

Another group of NYU Langone investigators has identified a new gene that is involved with the control of platelet function and is associated with cardiovascular disease. WD40 repeat domain 1 (WDR1) is significantly downregulated in patients with cardiovascular disease, according to lead investigator Jeffrey S. Berger, MD, associate professor of medicine and surgery. By studying the platelet transcriptome, Dr. Berger and his team were able to identify significant differences among patients based on their platelet function. "Although our study is small, including just 27 patients with established disease and 10 age- and sex-matched controls, our analysis showed that differential expression of WDR1 does identify individuals at higher or lower risk for cardiovascular disease," he said. "WDR1 has not been previously described to affect either platelet function or cardiovascular disease." The study appeared in *Blood* in September 2016.

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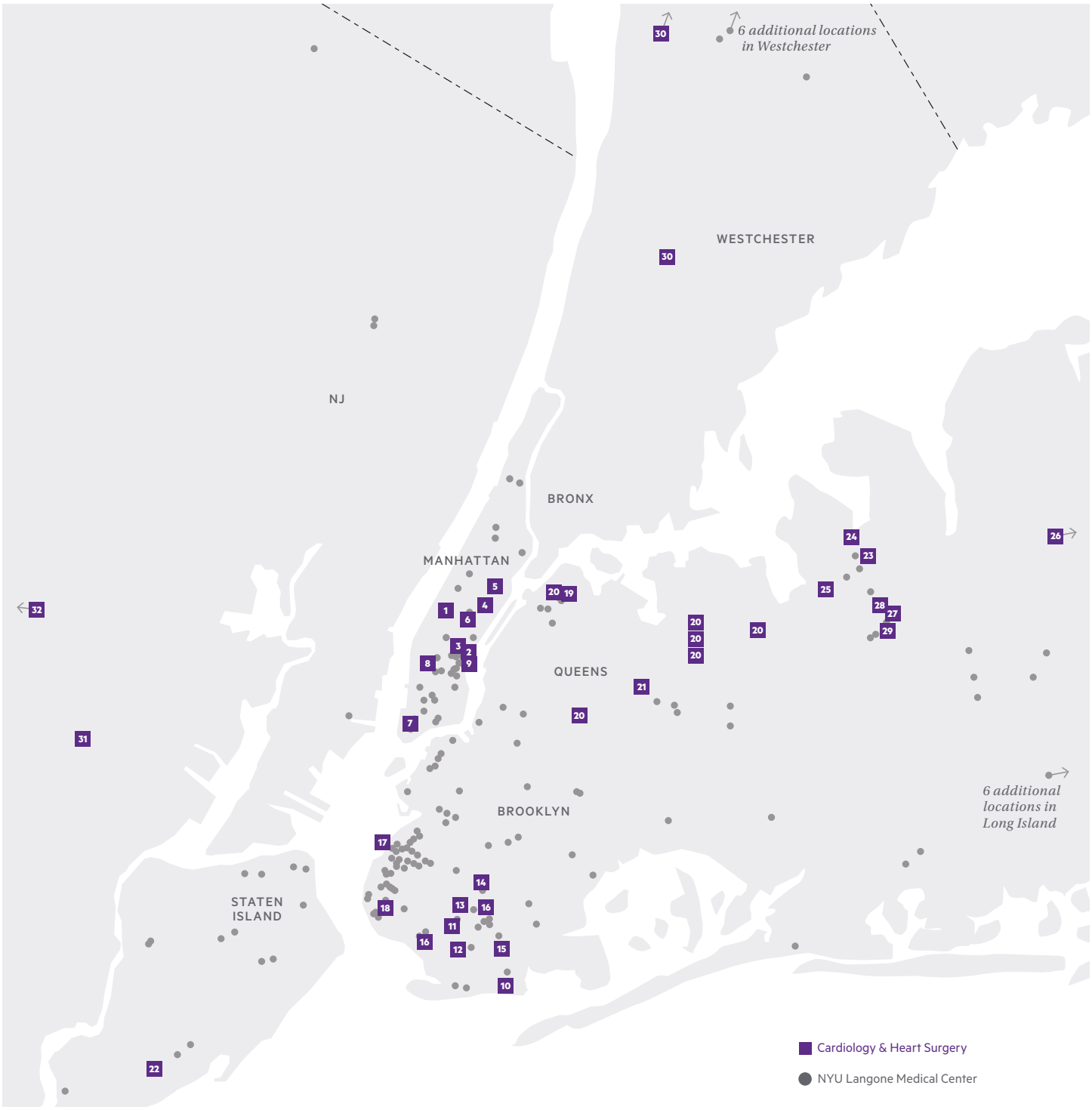
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IN MEMORIAM: LEON H. CHARNEY

In 2002, the Division was renamed the Leon H. Charney Division of Cardiology, reflecting a remarkable gift from a longtime friend of NYU Langone. The generosity of this gift and many others has enabled our program to grow dramatically—today we are recognized as one of the leading cardiology programs in the country, with expertise in virtually all aspects of cardiovascular prevention, acute care, and rehabilitation. Mr. Charney's death in March 2016, at the age of 78, is a tremendous loss to all of us at NYU Langone. We are deeply indebted to him for his years of friendship and philanthropy. We offer our condolences to his wife, Tzili, and their sons, Nati and Mickey.

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NYU Langone By the Numbers*

1,519 Beds	**100** Operating Rooms	**145,907** Emergency Room Visits	**68,602** Patient Discharges	**3,850,000** Outpatient Faculty Practice Visits	**9,649** Births

3,584 Physicians	**4,899** Nurses	**574** MD Candidates	**80** MD/PhD Candidates	**233** PhD Candidates	**397** Postdoctoral Fellows	**1,472** Residents and Fellows

4,381 Original Research Papers**	**550,500** Square Feet of Research Space	**$334M** NIH Funding	**$328M** Total Grant Revenue

*Numbers represent FY16 (Sept 2015–Aug 2016) and include NYU Lutheran
**Calendar year 2015

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