# NewYork-Presbyterian
## Cardiac and Vascular Services
### 2015 OUTCOMES AND QUALITY REPORT

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For More Information or to Make a Referral: 1-844-NYP-6444
NewYork-Presbyterian/Columbia University Medical Center

NewYork-Presbyterian/Weill Cornell Medical Center
Dear Colleague:

With their commitment to excellence and the advancement of the field of cardiac medicine, the physicians and surgeons of NewYork-Presbyterian Hospital’s Cardiac and Vascular Services are helping thousands of patients to live longer, healthier lives. We continually strive to achieve the best outcomes for each patient who comes to us for care. The strengths of our program are derived, in part, from the Hospital’s affiliation with two premier medical schools and their associated research endeavors; prominent clinical leadership with national reputations; and cardiovascular clinical volume that is among the highest in the country.

In the following report, I invite you to learn more about our comprehensive program that is providing patients with access to world-class medical and surgical experts, new and innovative treatments, including an expansive clinical trials program, and outcomes that exceed the national averages.

As a cardiologist, I take particular pride in NewYork-Presbyterian’s quality care, clinical achievements, and research contributions to cardiovascular care.

Sincerely,

Steven J. Corwin, MD
President and Chief Executive Officer
NewYork-Presbyterian
Dear Colleague:

Columbia University Medical Center is proud to partner with NewYork-Presbyterian and work in concert with Weill Cornell Medicine to build best-in-class programs in cardiac care. This level of excellence requires spectacular, dedicated clinicians who care for patients, researchers who inform that care, and educators who train the next generation’s clinicians and researchers who will, in turn, continue to move the field forward.

Our ColumbiaDoctors bring an unsurpassed combination of skill and experience to the benefit of our patients. Our cardiologists, cardiac surgeons, and their colleagues care for heart patients using the latest diagnostic tools and procedures, many of which are the direct result of work by our own researchers. And at the same time, these clinicians and scientists are also identifying and implementing new ways to prevent heart disease. Our own patients are the first to benefit even as we rapidly share these advances so that people can benefit throughout the world.

Despite remarkable advances over the last several decades, heart disease remains the leading cause of death in the developed world and is an increasing cause of death in the developing world. As a cardiologist myself, I especially appreciate the value of Columbia’s leadership in cardiac and vascular care and research, and I predict even greater successes will follow as we continue to work with NewYork-Presbyterian and Weill Cornell Medicine. Together, we can and will make a difference in the lives of millions.

Sincerely,

Lee Goldman, MD
Executive Vice President and Dean of the Faculties of Health Sciences and Medicine
Columbia University Medical Center
Dear Colleague:

Weill Cornell Medicine is proud to partner with NewYork-Presbyterian and Columbia University College of Physicians and Surgeons to provide the highest quality cardiovascular care to patients in New York and around the country. The physicians and surgeons at Weill Cornell Medicine are leaders and innovators, dedicated to improving outcomes and safety for patients with cardiac and vascular disease.

Our collaborative work in research and clinical care encompasses healthcare professionals and investigators across multiple departments. As this outstanding volume indicates, we are steadily advancing the field of cardiovascular care and helping our patients achieve greater longevity, with fewer complications. We are particularly proud of the survival and quality of life outcomes from our cardiac care, which are among the top in the nation for many years running.

Our cardiologists and cardiothoracic and vascular surgeons also provide exceptional training to the next generation of healthcare professionals, ensuring that our shared commitment to excellence continues long into the future.

Sincerely,

Laurie H. Glimcher, MD
Stephen and Suzanne Weiss Dean
Weill Cornell Medicine
We are pleased to share with you the Cardiac and Vascular Services 2015 Outcomes and Quality Report of NewYork-Presbyterian Hospital. This report—our inaugural issue—highlights key metrics that place our program among the leading cardiovascular centers in the nation.

We attribute our successful outcomes and achievements to an unparalleled collaboration and integration of expertise and experience among our cardiologists, interventional cardiologists, and cardiothoracic and vascular surgeons. Together, we pursue advances in the understanding, diagnosis, and treatment of heart and vascular diseases and all of their challenging presentations.

From medical management to device development and new ways of applying interventional and surgical approaches, we are committed to elevating the field to improve the lives of patients. We are proud of the contributions that we have made over the past several decades, many of these in concert with our colleagues around the country and the world.

At NewYork-Presbyterian, each of us is privileged to work side by side with an outstanding team of specialty trained anesthesiologists, nurses, physician assistants, and countless other clinical and non-clinical staff who support our efforts to heal patients and save lives.

Michael Argenziano, MD
Chief, Adult Cardiac Surgery
NewYork-Presbyterian/Columbia University Medical Center

Leonard N. Girardi, MD
Cardiothoracic Surgeon-in-Chief
NewYork-Presbyterian/Weill Cornell Medical Center

Martin B. Leon, MD
Director, Center for Interventional Vascular Therapy
NewYork-Presbyterian/Columbia University Medical Center

Darren B. Schneider, MD
Chief, Division of Vascular and Endovascular Surgery
NewYork-Presbyterian/Weill Cornell Medical Center

Emile A. Bacha, MD
Chief, Division of Cardiac, Thoracic, and Vascular Surgery
NewYork-Presbyterian/Columbia University Medical Center

Richard M. Green, MD
Associate Chief, Division of Cardiac, Thoracic, and Vascular Surgery
NewYork-Presbyterian/Columbia University Medical Center

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Chief, Maurice R. and Corinne P. Greenberg Division of Cardiology
NewYork-Presbyterian/Weill Cornell Medical Center

Allan Schwartz, MD
Chief, Division of Cardiology
NewYork-Presbyterian/Columbia University Medical Center

Michael A. Borger, MD
Director, Aortic Surgery
Director, Cardiovascular Institute
NewYork-Presbyterian/Columbia University Medical Center

Karl H. Krieger, MD
Vice Chairman, Department of Cardiothoracic Surgery
NewYork-Presbyterian/Weill Cornell Medical Center

Yoshifumi Naka, MD, PhD
Director, Cardiac Transplantation and Mechanical Circulatory Support Program
NewYork-Presbyterian/Columbia University Medical Center

Craig R. Smith, MD
Surgeon-in-Chief
NewYork-Presbyterian/Columbia University Medical Center
For patients experiencing STEMI – the deadliest form of heart attack – survival depends on restoring blood flow to the ischemic heart muscle and reducing infarct size as quickly as possible. Multidisciplinary collaborations between the Hospital’s cardiology programs and Emergency Departments have resulted in reductions in short-term mortality.

NewYork-Presbyterian physicians performed 3,666 PCI procedures in 2014 with a survival rate of 99%.

Selected Publications


ISCHEMIC HEART DISEASE

ACUTE MYOCARDIAL INFARCTION

Mortality Rate
n=922
July 1, 2011 - June 30, 2014

Mortality rates show whether patients died within 30 days of being hospitalized. These rates provide information about important aspects of hospital care that affect patients’ outcomes — such as prevention of and response to complications, emphasis on patient safety, and timeliness of care.

NEW YORK-PRESCRIBING

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Mortality rates show whether patients died within 30 days of being hospitalized. These rates provide information about important aspects of hospital care that affect patients’ outcomes — such as prevention of and response to complications, emphasis on patient safety, and timeliness of care.

PERCUTANEOUS CORONARY INTERVENTION (PCI)

Mortality Rate
2014

All Adverse Events*

* Composite of adverse events – death, emergency CABG, stroke, repeat target revascularization

Selected Publications


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PERCUTANEOUS CORONARY INTERVENTION (PCI)

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All Adverse Events*

* Composite of adverse events – death, emergency CABG, stroke, repeat target revascularization

Selected Publications


Percutaneous Coronary Intervention (PCI)

Risk Factors of Patients Undergoing PCI 2014

Patients who had PCI procedures at NewYork-Presbyterian had more complex medical backgrounds than patients at other hospitals in the ACC National Cardiovascular Data Registry.

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>NewYork-Presbyterian</th>
<th>ACC-NCDR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age ≥75</td>
<td>28.5%</td>
<td>23.1%</td>
</tr>
<tr>
<td>Acute Care Transfer</td>
<td>17.9%</td>
<td>17.5%</td>
</tr>
<tr>
<td>Prior Myocardial Infarction (&gt;7 days)</td>
<td>32.6%</td>
<td>30.4%</td>
</tr>
<tr>
<td>Prior Heart Failure</td>
<td>16.9%</td>
<td>13.9%</td>
</tr>
<tr>
<td>Diabetes Mellitus</td>
<td>43.1%</td>
<td>38.8%</td>
</tr>
<tr>
<td>Currently on Dialysis</td>
<td>3.6%</td>
<td>2.7%</td>
</tr>
<tr>
<td>Prior Coronary Artery Bypass Grafting</td>
<td>19.9%</td>
<td>17.8%</td>
</tr>
</tbody>
</table>

Source: American College of Cardiology National Cardiovascular Data Registry (ACC-NCDR) CathPCI Registry Institutional Outcomes Report 2014

PCI Complications 2014

Patients who had PCI procedures at NewYork-Presbyterian had lower complication rates (5.5%) than patients at other hospitals in the ACC National Cardiovascular Data Registry (6.8%).

<table>
<thead>
<tr>
<th>Complication</th>
<th>NewYork-Presbyterian</th>
<th>ACC-NCDR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiogenic Shock</td>
<td>0.7%</td>
<td>1.3%</td>
</tr>
<tr>
<td>Complications at Vascular Site</td>
<td>1.2%</td>
<td>1.5%</td>
</tr>
<tr>
<td>Cerebrovascular Accident/Stroke</td>
<td>0.2%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Heart Failure</td>
<td>0.6%</td>
<td>1.2%</td>
</tr>
<tr>
<td>Myocardial Infarction</td>
<td>0.8%</td>
<td>1.8%</td>
</tr>
<tr>
<td>Renal Failure/Dialysis</td>
<td>0.3%</td>
<td>0.3%</td>
</tr>
</tbody>
</table>

Source: American College of Cardiology National Cardiovascular Data Registry (ACC-NCDR) CathPCI Registry Institutional Outcomes Report 2014

Selected Publications


With an unparalleled depth of experience and scope of resources, NewYork-Presbyterian serves as a major referral center for the most complex, challenging, and aggressive cardiac revascularization procedures. Nearly 25% of the Hospital’s patients are transferred from other hospitals for these technically demanding surgeries.

The cardiac surgical team at NewYork-Presbyterian has extensive expertise with bilateral internal mammary artery bypass grafting. In 2014, bilateral internal mammarys were used in 28% of all CABG procedures, compared to only 4% nationally.

Coronary Artery Bypass Grafting (CABG)
Volume
n=939
2014

With 939 cases in 2014, NewYork-Presbyterian has one of the largest volume of CABG cases in the nation.

CABG
In-Hospital Mortality Rate
2014

In 2014, the mortality rate for Isolated CABG was significantly below the expected rate of 1.8%. Similar trends were noted for CABG + other procedures where the observed mortality was well below the expected mortality of 6%.

CABG
30-Day Survival*
2014

NewYork-Presbyterian was among the 14% of hospitals nationally that ranked high performing in heart bypass surgery.
Age is a major factor influencing the complexity of coronary revascularization. As interventional technology advances, patients referred to NewYork-Presbyterian for open cardiac revascularization surgery are older with greater comorbid conditions.

Patients >75 Years Old
In-Hospital Mortality Rate
n=296
2014

28% of patients undergoing CABG are over 75 years old.

Outcomes
Surgical Site Infection Rate
2010-2014

With NewYork-Presbyterian’s increased efforts to reduce infections, the Hospital has achieved a decline in sternal wound infections over the past five years.

Isolated CABG Complications Rate
2014

Using advanced techniques, our physicians maintain a low incidence of major complications despite the increasing age, frailty, and incidence of comorbidities.
The Advanced Heart Failure Program of NewYork-Presbyterian Hospital was the first program in the United States devoted solely to the treatment of congestive heart failure. NewYork-Presbyterian manages challenging cases throughout all stages of heart failure, extending from the latest medical therapies through mechanical assist devices and heart transplantation.

In 2014, heart failure patients received all of the CMS recommended care, exceeding the state and national average. This included discharge instructions, evaluation of left ventricular systolic function, and an ACE inhibitor or ARB for left ventricular systolic dysfunction.

Selected Publications


Case Study

A 59-year-old physician with a history of multiple myocardial infarctions beginning at age 43 and two coronary artery bypass graft surgeries in 1977 and 1988 presented for cardiac transplant evaluation. In January 1993, following multiple cardiac arrests, the patient received a left ventricular assist device. The patient experienced neurological deterioration and renal failure requiring dialysis. He also experienced gross deconditioning requiring nutritional support via gastric tube, as well as numerous infections, visual disturbances, and neurological impairment.

In August 1993, the patient received a heart transplant and was discharged home accompanied by his wife and 6-year-old son.

“Life after my heart transplant is far superior to the previous 16 years,” he says.
NewYork-Presbyterian has one of the oldest and largest mechanical circulatory support programs in the country, having performed more than 1,221 implants since the program’s launch.

In-Hospital Mortality Rate 2014

NewYork-Presbyterian has a nearly 97% in-hospital survival rate for patients undergoing VAD implantation.

Selected Publications


Selected Publications


**VENTRICULAR ASSIST DEVICES (VADS)**

**Patient Profiles \*INTERMACS**

Nearly 85% of NewYork-Presbyterian patients are within the three most critical INTERMACS levels.

<table>
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<tr>
<th>Level</th>
<th>NewYork-Presbyterian</th>
<th>INTERMACS</th>
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<tr>
<td>1 Critical Cardiogenic Shock</td>
<td>11.70%</td>
<td>17.60%</td>
</tr>
<tr>
<td>2 Progressive Decline</td>
<td>56.00%</td>
<td>37.50%</td>
</tr>
<tr>
<td>3 Stable but Inotrope Dependent</td>
<td>27.70%</td>
<td>27.70%</td>
</tr>
<tr>
<td>Levels 4-7</td>
<td>5.45%</td>
<td>17.20%</td>
</tr>
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\* INTERMACS is the United States national registry for patients receiving durable mechanical circulatory support device therapy to treat advanced heart failure.

Source: INTERMACS Quality Assurance Quarterly Report (Q1 2015)

**Adverse Events**

<table>
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<tr>
<th>Event</th>
<th>NewYork-Presbyterian</th>
<th>INTERMACS</th>
</tr>
</thead>
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<tr>
<td>Neurological Dysfunction</td>
<td>3.10%</td>
<td>4.00%</td>
</tr>
<tr>
<td>Renal Dysfunction</td>
<td>2.00%</td>
<td>2.50%</td>
</tr>
<tr>
<td>Respiratory Failure</td>
<td>3.10%</td>
<td>4.10%</td>
</tr>
<tr>
<td>Pump/Related-Drive Line Infections (after the first 3 months)</td>
<td>1.56%</td>
<td>1.56%</td>
</tr>
<tr>
<td>Pump/Related-Drive Line Infections (during the first 3 months)</td>
<td>0.79%</td>
<td>1.57%</td>
</tr>
<tr>
<td>Bleeding</td>
<td>13.70%</td>
<td>14.00%</td>
</tr>
<tr>
<td>Rehospitalization</td>
<td>25.80%</td>
<td>36.70%</td>
</tr>
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\*Table includes overall counts and percentages for each type of adverse event reported at Hospital site and INTERMACS overall. These totals are based on adverse events reported for primary prospective patients between June 23, 2006 and March 31, 2015.

**Current Clinical Trials at NewYork-Presbyterian**

**MOMENTUM 3** A prospective, multicenter study comparing the HeartMate 3 LVAS to the HeartMate II® LVAS in advanced stage heart failure patients for use as a destination therapy for bridge-to-transplantation

**Jarvik 2000 FlowMaker®** An FDA-approved clinical investigation of the Jarvik 2000 device as a bridge-to-heart transplant for patients dying of heart failure

**Selected Publications**


NewYork-Presbyterian is at the forefront of VAD implantation training, having trained to date over 1,000 clinicians from 135 centers worldwide.
The mission of the ECMO (Extracorporeal Membrane Oxygenation) program at NewYork-Presbyterian Hospital is to sustain life and provide the Hospital’s clinical team with the tools that support the most critical situations. NewYork-Presbyterian is a designated Center of Excellence by the Extracorporeal Life Support Organization. The use of this evolving technology enables physicians to provide immediate cardiopulmonary support while resting the damaged native heart and lungs, improve perfusion and oxygenation of end organs, and allow ample time for diagnosis, treatment, and recovery from the primary injury or disease.

At the same time, the Hospital is striving to advance ECMO technology and novel applications to treat patients with life-threatening illness, while balancing ethical considerations and cost/benefit.

**Case Study**

A 37-year-old female with no history of cardiac disease presented to the Emergency Department with burning, substernal chest pain, vomiting, ST elevations, influenza B complicated by pericarditis, and evolving fulminant myocarditis. The patient was medically managed with inotropes and vasopressors, but remained in shock with her right and left ventricles barely contracting. An Impella CP percutaneous left ventricular assist device was inserted. The surgical team was consulted and cardiac ECMO was inserted, immediately restoring blood pressure and kidney function. Device support was then escalated to a surgical biventricular assist device. The patient’s native heart function showed remarkable recovery and she underwent device explantation. With support from physical therapists, she was stabilized and discharged home. Today, she has achieved full recovery and returned to her normal life.
Cardiac and Respiratory ECMO

Cardiac Applications
- Cardiogenic shock
- Cardiac arrest
- Massive acute myocardial infarction
- Acute worsening of chronic heart failure
- Fulminant myocarditis
- Primary graft failure after heart transplantation
- Postcardiotomy shock after open heart surgery

Respiratory Applications
- Acute respiratory distress syndrome
- H1N1 flu-induced lung injury
- Severe pulmonary hypertension
- Bridge-to-lung transplantation

Selected Publications


NewYork-Presbyterian is a recipient of the ELSO Award for Excellence in Life Support and a designated ELSO Center of Excellence, 2013-2015.
With nearly four decades of experience, the Cardiac Transplantation Program of NewYork-Presbyterian Hospital is one of the top heart transplant programs in the world and one of the largest in the nation.

The program is committed to excellence in clinical outcomes as defined by the number of patients who are successfully transplanted and return to productive lifestyles. We are also committed to promoting the quality of life of our patients during the complete transplant process, from evaluation as a transplant candidate, to surgical care, and throughout follow-up as a transplant recipient. The Hospital’s cardiovascular fellowship is one of only a few in the nation offering a rotation in heart transplant.

1,924 heart transplants have been performed at NewYork-Presbyterian between 1988 and 2014.

Selected Publications


NewYork-Presbyterian offers rare expertise in the management of all forms of pulmonary hypertension, including idiopathic pulmonary hypertension related to connective tissue disease, congenital heart disease, left heart disease, lung disease, certain hematological and oncological diseases and treatment, and renal and hepatic diseases. We provide multidisciplinary management of the most complex multifactorial pulmonary hypertension.

The Hospital is home to the only regional program for chronic thromboembolic pulmonary hypertension and pulmonary thromboendarterectomy, as well as an acute pulmonary embolism program that includes catheter directed lysis and surgical pulmonary embolectomy.

There has been rapid growth of the chronic thromboembolic pulmonary hypertension and pulmonary thromboendarterectomy program since its official inception at NewYork-Presbyterian in 2010. We have now performed over 100 pulmonary thromboendarterectomy surgeries with excellent outcomes.

NewYork-Presbyterian is home to the only regional program for chronic thromboembolic pulmonary hypertension and pulmonary thromboendarterectomy.
Case Study

A 48-year-old female, previously a fit marathon runner, presented to an outside hospital with worsening dyspnea over a one-month period and recent long-distance travel. CT angiography showed consistent with bilateral pulmonary embolism/chronic thromboembolic pulmonary hypertension (PE-CTEPH). She was started on heparin and the surgical team at the outside hospital attempted pulmonary thromboendarterectomy (PTE) and patent foramen ovale closure. However, the patient was too hemodynamically unstable and unable to come off of cardiopulmonary bypass. An intra-aortic balloon pump (IABP) was inserted and the patient was centrally cannulated onto veno-arterial ECMO.

NewYork-Presbyterian’s thoracic surgical team was called to the outside hospital, where they stabilized the patient and transported her to NewYork-Presbyterian for further management. The patient was on multiple pressors and in extremis but stabilized during her first night in the ICU. The following day she was taken to the OR for PTE. Extensive acute and chronic thrombotic material was removed bilaterally. Following resection, the patient was able to come off of the IABP and ECMO in the OR. She returned to the ICU on inhaled nitric oxide (iNO) and pressor/inotropic support. Postoperative transesophageal echocardiogram demonstrated normal left ventricle function and mildly decreased right ventricle function, which was markedly improved from her pre-op status. The patient was weaned from iNO easily as her pulmonary arterial pressure normalized completely in the immediate postoperative period. The patient will remain on long-term anticoagulation, but she did not require additional targeted pulmonary arterial hypertension therapy. She was discharged home 10 days later.

The patient is now nearly two years post surgery with normal pulmonary pressure and cardiac function and has resumed long-distance running.

Genetic investigators at NewYork-Presbyterian reported the very first mutation associated with inherited forms of pulmonary hypertension and have more recently identified three novel genes for pulmonary hypertension.

The pulmonary hypertension programs established at NewYork-Presbyterian more than 30 years ago have been at the forefront of clinical and research endeavors. These include the discovery of several genes and ongoing studies associated with genetically transmitted pulmonary hypertension and all treatment modalities beginning with intravenous Flolan® and inclusive of the newer oral and inhaled therapies.

NewYork-Presbyterian has long been a leader in the field of genetic discovery in cardiovascular disease and notably, pulmonary arterial hypertension. Genetic investigators at NewYork-Presbyterian reported the very first mutation associated with inherited forms of pulmonary hypertension and have more recently identified three novel genes for pulmonary hypertension using techniques, including linkage analysis, association studies, comparative genomic hybridization, and whole exome/genome sequencing and RNA sequencing. The program has also focused on human genetic research of monogenic and complex traits, including diseases such as congenital heart disease, inherited arrhythmias, and cardiomyopathies.

Pulmonary thromboendarterectomy surgery specimens
Current Clinical Trials at NewYork-Presbyterian

**Rituximab for the Treatment of Systemic Sclerosis-Associated Pulmonary Hypertension**  This prospective, double-blind, placebo-controlled, randomized Phase II multicenter trial will evaluate the effect of rituximab on disease progression in subjects with SSc-PAH receiving concurrent stable-dose standard medical therapy with a prostanoid, endothelin receptor antagonist, and/or phosphodiesterase 5 (PDE-5) inhibitor

**PVDOMICS: Pulmonary Vascular Disease Phenomics**  Selected for this national NIH-sponsored trial to define the future fingerprints of pulmonary vascular disease using a variety of OMIC signatures

**CTEPH Registry**  A national registry to further our understanding of the natural history of chronic thromboembolic pulmonary hypertension (CTEPH) and interventions including pulmonary thromboendarterectomy (PTE)

**QuERI: Eisenmenger Quality Enhancement Research Initiative**  Study to compare the management of patients with Eisenmenger syndrome and adherence to national guidelines

**PAH Biobank**  A national biological sample and data repository for pulmonary arterial hypertension

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Prevalence of Pulmonary Hypertension in Patients with Multiple Myeloma

A retrospective data analysis of symptomatic untreated multiple myeloma patients currently undergoing evaluation of induction chemotherapies

**Pulmonary Hypertension in Scleroderma Patients**  Multicenter, web-based observational study to determine the timeline of progression from pre-pulmonary hypertension to diagnosable pulmonary hypertension based on right heart catheterization and from diagnosable pulmonary hypertension to clinical worsening of disease as defined as death, hospitalization, or worsening of pulmonary hypertension symptoms

**TRANSIT**  Multicenter, open-label, single-group study to assess the tolerability and the safety of the TRANSITion from inhaled treprostinil to oral selexipag in adult patients with pulmonary arterial hypertension

**Extracellular RNA as Biomarkers**  A pilot study to quantify and identify the utility of different exRNA expressions and their potential for therapeutics in pulmonary hypertension

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Selected Publications


The rhythm disorders program of NewYork-Presbyterian has a long and distinguished history of pioneering effective treatments for patients with abnormal heart rhythms, including life-threatening cardiac arrhythmias – those presenting with and without structural heart disease. Patients with primary electrophysiological disorders benefit from the experience and research of the Hospital’s physicians in advancing the genetic understanding of these diseases.

The Hospital’s electrophysiology services are among the busiest and most experienced laboratories in the country, offering the full complement of cardiac rhythm management. This includes laser lead extraction, catheter ablation for atrial and ventricular arrhythmias, and pacemaker implantation.

In 2014, NewYork-Presbyterian performed more than 2,800 electrophysiology procedures, from EP studies to ablations and device implantations.

### Procedures by Type

$n=2,800$

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead Extractions</td>
<td>2%</td>
</tr>
<tr>
<td>Ablations</td>
<td>36%</td>
</tr>
<tr>
<td>Pacemakers</td>
<td>34%</td>
</tr>
<tr>
<td>Implantable Cardioverter Defibrillators (ICD)</td>
<td>28%</td>
</tr>
</tbody>
</table>

### Devices

**Volume 2010-2014**

- Pacemakers
- ICDs

### Lead Extraction

NewYork-Presbyterian physicians have particular expertise in lead extractions, which carry the risk of complications. Over the past five years they have performed 390 lead extractions.
Catheter Ablations

Catheter Ablations Volume 2010-2014

Source: NewYork-Presbyterian

Catheter Ablations by Type of Arrhythmia 2014

Source: NewYork-Presbyterian

Atrial Fibrillation Ablation Complications Rate 2014

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pericardial Effusion/Tamponade</td>
<td>0.51%</td>
</tr>
<tr>
<td>Transient Ischemic Attack/Cerebrovascular Accident</td>
<td>0.77%</td>
</tr>
<tr>
<td>Myocardial Infarction</td>
<td>0.00%</td>
</tr>
<tr>
<td>Transfusion</td>
<td>0.00%</td>
</tr>
</tbody>
</table>

Source: NewYork-Presbyterian

Atrial Fibrillation
Catheter ablation has emerged as an important and effective therapy for patients with atrial fibrillation. Ablation of atrial fibrillation involves pulmonary vein isolation, requiring ablation with radiofrequency or cooling energy to prevent abnormal electrical signals from escaping the pulmonary veins to initiate atrial fibrillation. In addition, we also have one of the world’s largest experiences in minimally invasive surgical treatment of atrial fibrillation. The uniquely collaborative relationship between our electrophysiologists and surgeons allows each patient to benefit from every available technology, including minimally invasive and hybrid approaches.

Multipolar catheter mapping of rotor for atrial fibrillation

Electro-anatomic map of left atrium during atrial fibrillation ablation
Ventricular Tachycardia
Catheter ablation of ventricular tachycardia can offer substantial benefits in terms of symptom improvement and reduction in defibrillator shocks. At NewYork-Presbyterian, collaboration among electrophysiology, heart failure/transplant, and cardiac surgery has led to the innovative use of catheter ablation in patients with implanted left ventricular assist devices (LVADs). Although LVADs can significantly prolong survival and improve heart failure symptoms, ventricular tachycardia may be a persistent problem even after implant. Due to the large number of patients with LVADs who are followed at NewYork-Presbyterian, the experience with catheter ablation in this population is among the most extensive in the nation.

NewYork-Presbyterian’s experience with catheter ablation for ventricular tachycardia among patients with ventricular assist devices is one of the most extensive in the nation.

Case Study
A 50-year-old woman with non-ischemic dilated cardiomyopathy and left ventricular ejection fraction of 10% underwent left ventricular assist device (LVAD) implant as a bridge-to-transplant. Seven days after surgery, she received 13 appropriate shocks for incessant ventricular tachycardia at 240 beats per minute that was unresponsive to multiple antiarrhythmic medications. Based on assessment of her electrocardiograms, it was decided to perform a combined endocardial and epicardial ablation procedure for her ventricular tachycardia. Epicardial access was obtained through a subxiphoid pericardial window, and catheter mapping and ablation were performed. Three epicardial ventricular tachycardia circuits and one endocardial circuit were ablated. The patient has been discharged and is living with her LVAD while awaiting heart transplant.
NewYork-Presbyterian is one of 50 centers in the United States to implant the world’s first leadless pacemaker as part of the LEADLESS II Clinical Trial. Developed for patients with bradycardia, the retrievable device is designed to be placed directly in a patient’s heart without the visible lump, scar, and leads required for conventional pacemakers.

**Selected Publications**


Adult aged patients with congenital heart disease make up a highly varied, extremely complex, and rapidly growing population. Prior to the development of novel surgical interventions in the 1960s, 1970s, and 1980s, many of these patients did not survive through infancy. In the 21st century, as a result of our successes, the number of adult congenital heart disease patients far exceeds the number of pediatric-aged patients with congenital heart disease. The vast majority of these adults are leading productive and active lives. They have families of their own and are fully employed.

Despite these successes, adult congenital heart disease patients continue to need advanced care throughout the course of their lives, including imaging studies of their complex anatomy, catheter-based interventions for amelioration of residual defects and rhythm disturbances, additional surgery for repair or replacement of valves that may no longer be functioning normally, repair of residual holes in the heart, or replacement of artificial blood vessels implanted decades earlier that may become obstructed.

NewYork-Presbyterian’s congenital cardiologists, interventional congenital cardiologists, congenital cardiac surgeons, and congenital cardiac imaging specialists have formed a team dedicated to the care of the adult congenital heart disease patient. In addition to the patients who “graduate” from the Hospital’s pediatric cardiology program, patients are referred from throughout the New York region and around the world for consultation and therapy with NewYork-Presbyterian’s experts in adult congenital heart disease.
Case Study

A 31-year-old female with a Rastelli repair was referred after an outside pre-pregnancy evaluation showed extremely elevated pressure in the right ventricle. A severely dilated and hypokinetic right ventricle with systemic right ventricular pressure, combined conduit and right pulmonary artery stenosis, and tricuspid regurgitation were found. The right pulmonary artery was stented. The patient improved somewhat, then underwent complex Melody percutaneous pulmonary valve replacement eight months later. The two catheter interventions made it possible to avoid reoperation. Her right ventricular function and pressures improved dramatically and she had a successful pregnancy 18 months later.

Current Clinical Trials at NewYork-Presbyterian

Adult Congenital Heart Disease Registry (QuERI)  Multicenter, observational, U.S.-based longitudinal program designed to improve the management of patients with a history of repaired congenital heart disease

Ticagrelor Therapy for RefrACTORY Migraine Study (TRACTOR)  A pilot study of 40 subjects to assess the hypothesis that P2Y, G protein-coupled 12 (P2Y12) inhibition with Brilinta (ticagrelor), 90 mg by mouth twice a day, reduces episodic and/or chronic migraine headache symptoms in patients with right-to-left shunt

The AMPLATZER® Septal Occluder Post Market Surveillance Study  A prospective, multicenter case-cohort study following patients implanted with the AMPLATZER ASO for atrial septal defects to ensure real-world device safety over an extended follow-up period

Right-to-Left Cardiac Shunt Detection (Patent Foramen Ovale Detection)  This study will evaluate the sensitivity and specificity of the Cardiox Flow Detection System in identifying an intracardiac right-to-left shunt compared to the results of transesophageal echocardiography

Selected Publications


Three years ago, NewYork-Presbyterian Hospital established a hypertrophic cardiomyopathy (HCM) program, bringing together the resources and expertise in adult and pediatric cardiology, imaging, cardiac interventional techniques, and surgery to address this chronic disorder. In addition, through advanced testing, we can identify patients who have left ventricular outflow tract obstruction. Our program cares for patients with HCM and their families at every age and at every stage of the disease and includes the screening and assessment of first-degree relatives for HCM-related genes. Genetic testing can include the option of having the entire family evaluated clinically on the same day.

Awarded the Center of Excellence status from the Hypertrophic Cardiomyopathy Association, the HCM program manages patients with medications; a personalized program of exercise, diet, and nutrition; and interventions ranging from implantable cardioverter defibrillators to septal ablation or surgical myectomy. In the rare situation, we are able to offer heart transplantation to patients who progress to end-stage HCM.

A robust research program is investigating several aspects of HCM, including:

- **Genetic Traits in Infants** This multicenter study employs the most advanced genetic methods to analyze all 20,000 human genes to identify new genes related to infantile cardiomyopathy. The goal is to establish new targets for treatment and provide reproductive options for families who hope to have healthy children in the future.

- **Relation of Cardiovascular Disease and HCM in the Aging Process** With funding from the National Institute on Aging, this study is exploring the higher prevalence of cardiovascular disease in older individuals with a goal to understand the mechanism that leads to manifestations of HCM in the elderly.

- **Understanding the Evolution of HCM** To better determine the origin of hypertrophic heart muscle and the predisposition for sudden cardiac death, basic science research is underway on the development of HCM cells into a hypertrophic heart. Gaining new insights into the origins of HCM could help lead to new treatments for this chronic disease.

**Selected Publications**


NewYork-Presbyterian Hospital offers a highly specialized program in cardio-oncology, providing cardiac care for cancer patients and cancer survivors. Many commonly used and many of the new biologic agents have known cardiotoxic side effects. It is critical to catch changes in heart function early prior to the development of irreversible damage. With specific cardiac medications, we can usually prevent further heart damage from occurring and, in many cases, reverse any damage that has been done. Our team works in close collaboration with oncologists to identify chemotherapy agents that are safer for the heart. A major goal of the cardio-oncology program is to enable patients to remain on chemotherapy while minimizing cardiac damage.

This unique and innovative program provides comprehensive and compassionate patient-centered longitudinal cardiac care for cancer patients with a history of cardiovascular disease and for those patients who are at risk for developing cardiac complications as a consequence of cancer or cancer treatment. The program offers the following clinical services:

- Inpatient consultations for hospitalized cancer patients
- Outpatient consultations for cancer patients
- Adult cancer survivors clinic
- Childhood cancer survivors clinic

We are also actively engaged in research focused on identifying mechanisms for cancer-related cardiac disease and improving cardiovascular outcomes in cancer patients.

**Cardiac Tumor Program**

Cardiac tumors are a rare but serious medical condition that require a specialized care center for optimal patient outcomes. Our cardiac tumor program is one of only a handful of such programs in the world dedicated to caring for patients with a cardiac mass. Our patients benefit from the combined expertise of specialists in clinical cardiology, clinical oncology, cardiovascular imaging, cardiac surgery, and cardiac pathology, as well as access to the most advanced medical therapies and cutting-edge surgical technologies currently available.

Our cardiac surgeons have extensive experience with minimally invasive approaches for cardiac mass resections, which have been demonstrated to be as safe and effective when compared with the traditional sternotomy. We have found that limited surgical exposure does not compromise tumor resection margins and the approach is associated with a shorter hospital length of stay.

**Selected Publications**


Combining the expertise of cardiologists, interventionalists, cardiothoracic surgeons, and cardiac imaging specialists, NewYork-Presbyterian has established leading programs in the treatment of valve disease. These multidisciplinary initiatives include surgical, interventional, and hybrid options for a variety of valvular conditions, supported by comprehensive efforts in the development and evaluation of novel, less-invasive techniques for repairing and replacing damaged mitral, aortic, tricuspid, and pulmonic valves.

The Hospital has achieved superior outcomes using these innovative approaches and by collaborating across medical and surgical specialties. NewYork-Presbyterian clinicians have served and continue to serve as the principal investigators of such groundbreaking trials as transcatheter aortic valve replacement (TAVR) and mitral valve repair (MitraClip) and the national PARTNER and EVEREST trials that established the effectiveness of these minimally invasive procedures.

NewYork-Presbyterian surgeons pioneered many of the minimally invasive valve procedures now in standard use around the country.
NewYork-Presbyterian has implemented a number of infection prevention protocols and safety practices to reduce the rate of surgery related infections.

NewYork-Presbyterian was one of the first institutions in the United States to perform percutaneous transcatheter aortic valve replacement.

NewYork-Presbyterian physicians are leaders in the development and evaluation of novel, less invasive techniques for repairing and replacing damaged mitral, aortic, tricuspid, and pulmonary valves.
NewYork-Presbyterian’s heart valve program is one of the largest of its kind in the country and its valve disease specialists are spearheading clinical trials in aortic and mitral valve therapies with the goal of offering less invasive, cutting-edge therapies to optimize patient outcomes.

Selected Publications


Open Aortic Valve Procedures Volume 2009-2014

NewYork-Presbyterian performed 1,018 aortic valve procedures in 2014.

In-Hospital Mortality Rate 2014

NewYork-Presbyterian has a 99% survival rate in patients undergoing isolated aortic valve procedures.

*Expected mortality was determined using UHC risk-adjustment methodology.

Source: These data are prepared using the University HealthSystem Consortium (UHC) Clinical Database / uhc.edu

NewYork-Presbyterian physicians have led and continue to participate in the most important clinical trials in the field, including the EDWARDS INTUITY Valve System, which consists of a bovine pericardial heart valve and novel balloon-expandable frame.

(Courtesy of Edwards Lifesciences)
NewYork-Presbyterian physicians provide the full spectrum of therapeutic possibilities in the treatment of mitral valve disease, including advanced valve repair techniques, minimally invasive approaches, and transcatheter techniques.

Our physicians are experts in mitral valve repair and have performed over 1,000 of these types of operations minimally invasively – without a sternotomy – with success rates equal to those obtained with conventional sternotomy approaches.

Selected Publications


Selected Publications


Transcatheter Valve Repairs
Volume 2009-2014

The majority of transcatheter procedures at NewYork-Presbyterian are performed using the transfemoral approach.

Case Study

A young man in his early 30s had his first open-heart surgery, an aortic aneurysm repair, in 2006. Complications resulted in endocarditis, necessitating four additional open-heart surgeries, including replacement of the aortic root and an aortic valve replacement, within a 10-month span. The man recovered and went on to marry and have two children. In 2012, while playing soccer he began to experience shortness of breath. Over the next several months the symptoms persisted. His aortic valve was leaking and needed replacement immediately. His heart surgeon gave him a 50/50 chance of survival. Seeking a second opinion at NewYork-Presbyterian, the patient learned that he was a candidate for TAVR. The procedure was successful, and two days later he was discharged with no shortness of breath and renewed energy. Today at 37 he coaches his sons' T-ball and soccer teams, and he is confident that he will see his children grow up.
Current Clinical Trials at NewYork-Presbyterian

**PARTNER II** Placement of AoRTic TraNscathetER Valve Trial: Effectiveness of the Edwards SAPIEN device and delivery systems (transfemoral, transapical, and transaortic) for use in patients with severe aortic stenosis in two cohorts: 1) patients at intermediate/high risk for surgical valve replacement and 2) inoperable patients

**TRANSFORM** Study of the EDWARDS INTUITY Elite Valve System designed to enable rapid deployment for faster procedures and to facilitate small incision surgery

**COAPT** Clinical Outcomes Assessment of the MitraClip Percutaneous Therapy: Use of the MitraClip System in treating both high risk and prohibitive risk surgical candidates with moderate to severe, centralized mitral regurgitation

**SENTINEL** Use of the Sentinel Cerebral Protection System consisting of an embolic filter designed to catch and remove any calcified particulates that may dislodge during the TAVR procedure

NewYork-Presbyterian physicians served as the **national principal investigators of the PARTNER trial**, the landmark study showing that a balloon-expandable transcatheter valve replacement in patients at high risk for surgery is as safe and effective as open surgery in terms of one-year survival.

*Expected mortality was determined using UHC risk-adjustment methodology.
Source: These data are prepared using the University HealthSystem Consortium (UHC) Clinical Database / uhc.edu

Source: These data are prepared using the University HealthSystem Consortium (UHC) Clinical Database / uhc.edu

More than 40% of interventional cardiologists who perform TAVR around the country have been trained at NewYork-Presbyterian, and the Hospital is the key site for the PARTNER Publications Office.

(Courtesy of Edwards Lifesciences)
NewYork-Presbyterian has extensive experience with the traditional surgical repair and minimally invasive endovascular stent grafting of aortic aneurysms and dissection. With the expertise of our specialists, aneurysms can be successfully repaired with excellent outcomes and with mortality rates well below national rates. One of the keys to the successful treatment of aortic aneurysms is careful monitoring and referral for surgical consultation to avoid rupture or dissection of the aneurysm – medical emergencies requiring immediate surgical intervention.

Patients with aortic disease can present with involvement of multiple segments, requiring a multidisciplinary approach to their management.

AORTIC DISEASE

AORTIC PROCEDURES

Volume 2010-2014

<table>
<thead>
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<th>Year</th>
<th>Volume</th>
</tr>
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<td>2010</td>
<td>400</td>
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<td>2011</td>
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<td>2012</td>
<td>600</td>
</tr>
<tr>
<td>2013</td>
<td>550</td>
</tr>
<tr>
<td>2014</td>
<td>650</td>
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</table>

Volume by Type 2014

- Open Surgical: 66%
- Endovascular: 34%

Approach is determined by individualized patient profile and the location of the pathology.

Volume by Location 2014

- Ascending/aortic arch represents over 55% of the aortic procedures.
- Thoracoabdominal
- Descending
- Ascending / Arch
- Abdominal

Source: NewYork-Presbyterian
As leaders in the field of aortic surgery, NewYork-Presbyterian surgeons, interventionalists, and our dedicated multidisciplinary teams provide state-of-the-art treatments for aortic aneurysms and dissections. Using cutting-edge techniques and technology, we offer treatments for all aortic pathologies, including the most complex. Moreover, our many ongoing clinical trials allow us to provide patients with access to novel therapies that are not necessarily available elsewhere. Traditionally, ascending aortic procedures require the replacement of the aortic valve. NewYork-Presbyterian surgeons have significant experience utilizing valve-sparing techniques, which allow them to replace the diseased part of the aortic root and still preserve the patient’s native aortic valve.

### Ascending Aorta and Aortic Arch

#### In-Hospital Mortality Rate 2014

24% of patients undergoing elective ascending aortic arch repair in 2014 at NewYork-Presbyterian had a valve-sparing operation with 0% hospital mortality.

#### In-Hospital Complications Rate 2014

<table>
<thead>
<tr>
<th>Condition</th>
<th>Elective</th>
<th>Urgent / Emergent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Renal Failure / Dialysis</td>
<td>1.0%</td>
<td></td>
</tr>
<tr>
<td>Deep Sternal Wound Infection</td>
<td>0.7%</td>
<td></td>
</tr>
<tr>
<td>Postoperative Stroke</td>
<td>3.0%</td>
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*Observed = Expected*  

*Expected mortality was determined using UHC risk-adjustment methodology. Source: These data are prepared using the University HealthSystem Consortium (UHC) Clinical Database / uhc.edu

### Valve-sparing ascending aortic aneurysm repair
The bicuspid aortic valve is the most common cardiac congenital abnormality, which occurs in 1% to 2% of the general population. This condition is associated with abnormalities of the aortic wall, such as coarctation of the aorta, aortic dissection, and aortic aneurysm.

Patients with Marfan syndrome are at particular risk for aortic aneurysms and aortic dissection. Defects in elastin-associated microfibrils, predominately composed of fibrillin, leave the aortic wall fragile and susceptible to dissection. A majority of Marfan patients will develop some enlargement of the aorta; 85% to 90% will develop at least a minor aneurysm and many will require aortic surgery.

In 2014, NewYork-Presbyterian surgeons performed 193 aneurysm repairs for patients with bicuspid aortic valves.

### Case Study

A 36-year-old male had a documented history of Marfan syndrome and hypertension and whose mother had a type A dissection. Despite his history of hypertension, the patient was noncompliant with medications. He presented to a local hospital with abdominal pain and hypertension and was started on nicardipine. A CT scan revealed dissection of the abdominal aorta extending to the origin of the iliac and involvement of the descending thoracic aorta, as well as a 5.2 cm aortic root without evidence of dissection. He was transferred to NewYork-Presbyterian, where an echocardiogram revealed 1 to 2+ aortic insufficiency and a trileaflet aortic valve.

The patient was placed on medical therapy and treated for the type B dissection. A repeat CT scan showed stability of the dissection. However, in consideration of noncompliance and a 5.2 cm aortic root, a decision was made to electively perform valve-sparing ascending aortic repair to avoid catastrophic rupture. Postoperatively, the patient was hemodynamically stable. He was discharged home with antihypertensive medication and referred to his local primary care physician for follow-up.
ENDOVASCULAR PROCEDURES

Volume
2010-2014

Aortic Procedures by Location
2014

Thoracic Aortic Aneurysm
Thoracic endovascular aneurysm repair (TEVAR) is a minimally invasive alternative to major open surgery for the repair of thoracic aortic aneurysm that results in improved recovery time. TEVAR is also a primary therapy for patients with traumatic aortic rupture and is utilized for complicated acute type B dissections.
Abdominal Aortic Aneurysm
Abdominal aortic aneurysm (AAA) is the 13th leading cause of death in the United States and the 10th leading cause of death in men. Most AAAs can be successfully treated with a minimally invasive endovascular approach using a stent graft delivered through a catheter system entering an artery in the groin. NewYork-Presbyterian has extensive experience and surgical expertise in both endovascular aneurysm repair (EVAR) and traditional surgical repair, achieving a 100% survival rate in treating infrarenal aneurysms in 2013-2014.

CT scan following successful endovascular repair of a type IV thoracoabdominal aortic aneurysm with a custom stent graft with branches to all four visceral arteries

Endovascular Abdominal Aortic Repair
In-Hospital Mortality Rate
2014
Abdominal aortic aneurysm repairs are predominantly performed using an endovascular approach with in-hospital mortality rates better than the expected. 

Endovascular Abdominal Aortic Repair
by Location
2014

Endovascular Abdominal Aortic Aneurysm
In-Hospital Complications Rate
2013-2014

Acute Renal Failure / Dialysis 1.2%
Infection 1.2%
Leg Ischemia 0.0%
Endoleak 0.4%
Postoperative Stroke 0.0%

Source: NewYork-Presbyterian
*Expected mortality was determined using UHC risk-adjustment methodology. Source: These data are prepared using the University HealthSystem Consortium (UHC) Clinical Database / uhc.edu
Management of Complex Aneurysms

Approximately 20% of patients with aneurysms involving the abdominal aorta cannot be treated with standard endovascular stent grafts because the aneurysms are either too close to or involve the aorta in the upper abdomen that gives rise to the branches that supply critical blood flow to the abdominal organs. To address aneurysms that are near the renal arteries and thoracoabdominal aortic aneurysms that involve the visceral arteries, NewYork-Presbyterian employs specialized fenestrated and branched stent grafts that can provide patients with minimally invasive endovascular options for treatment of these complex aneurysms.

Fenestrated Stent Grafts
Stent grafts with fenestrations in the stent graft fabric maintain blood flow to critical aortic branches. They are used for treatment of juxtarenal and some thoracoabdominal aortic aneurysms.

Branched Stent Grafts
Stent grafts with branches can be connected to visceral branches of the abdominal aorta to maintain blood flow to critical abdominal organs. They are used for treatment of thoracoabdominal aortic aneurysms.

Case Study

NewYork-Presbyterian Hospital is one of seven centers in the United States and the only center in the Northeast region using custom manufactured fenestrated and branched stent grafts as part of a physician-sponsored IDE clinical trial.

A 76-year-old woman presented to NewYork-Presbyterian with an approximately 7 cm diameter type 2 thoracoabdominal aortic aneurysm. She had previously undergone open surgical repair of an abdominal aortic aneurysm. Subsequently, she developed back pain and was found by another hospital to have a large type 2 thoracoabdominal aortic aneurysm starting at the end of the aortic arch and extending down to her previously repaired lower abdominal aorta. She also had a chronic type B dissection involving the descending thoracic aorta. Considered to be at extremely high risk for open surgical repair, she was transferred to NewYork-Presbyterian Hospital.

The patient was enrolled in our physician-sponsored IDE study for endovascular repair of thoracoabdominal aortic aneurysms with branched and fenestrated stent grafts. This involved a planned two-stage repair. The first stage consisted of placement of a thoracic stent graft into her descending thoracic aorta from just distal to the left subclavian artery down to the celiac artery. During the second stage of the repair, a branched stent graft was inserted. This custom-made branched stent graft had four branches that were connected to her visceral aortic branches to complete the aneurysm repair and to maintain critical blood flow to her abdominal organs. She recovered well and is monitored periodically with CT scan imaging.

(Left) Schematic representation of a branched stent graft used for minimally invasive treatment of complex aortic aneurysms involving the visceral arteries
(Center and right) CT scan images following a successful endovascular repair of a type III thoracoabdominal aortic aneurysm in a patient who had previously undergone open surgical repair of an abdominal aortic aneurysm and endovascular repair of an iliac aneurysm
Hybrid Cardiac Surgery
A hybrid cardiac surgical procedure combines a conventional surgical technique with an interventional approach. A catheter-based procedure guided by fluoroscopy imaging is performed in a hybrid OR without interruption. NewYork-Presbyterian is equipped with several hybrid operating rooms that allow us to offer patients the most advanced options to minimize risk. Our surgeons are currently performing the “frozen elephant trunk” and the arch debranching approach.

Case Study
A 70-year-old woman arrived at NewYork-Presbyterian’s Emergency Department with impending rupture of a thoracoabdominal aortic aneurysm. The patient had a past medical history of severe chronic obstructive pulmonary disease precluding thoracotomy and cardiopulmonary bypass. Additionally, the aneurysm had been followed over several years but untreated as a result of comorbidities.

A preoperative CT scan demonstrated a 9 cm aneurysm, which extended from the distal left subclavian artery to her iliac artery bifurcation. A visceral debranching procedure was done to create a suitable distal landing zone for a thoracic endovascular aneurysm repair (TEVAR). This procedure involved an aortic to celiac artery, aortic to superior mesenteric bypass, and aortic to right and left renal artery bypasses, along with proximal ligation of each of these vessels. Once performed, thoracic endografts were placed percutaneously from the right femoral artery. The patient recovered and was discharged from the Hospital 10 days postoperatively. A follow-up CT scan showed thrombosis of the aneurysm sac and perfusion of her visceral vessels.

Preoperative CT upon arrival to ER for back and flank pain; aneurysm has grown to 9 cm and has extraluminal contrast.
Aneurysm extends from left subclavian artery to the infrarenal aorta.
Intraoperative view after deployment of thoracic endograft just distal to the left subclavian artery.
Angiogram showing the visceral revascularization, graft patency, as well as absence of sac filling.

One-month CT scan showing absence of endoleak.
Selected Publications


Current Clinical Trials at NewYork-Presbyterian

**Evaluation of the Gore® Excluder® Iliac Branch Endoprosthesis**  A study to determine the safety and effectiveness of the GORE® EXCLUDER® Iliac Branch Endoprosthesis when used for treatment of common iliac artery aneurysms or aorto-iliac aneurysms

**Endovascular Thoracoabdominal Aortic Aneurysm (TAAA) Repair**  A research study to assess endovascular stent graft implantation using a standard configuration branched and fenestrated stent graft or physician-specified branched and fenestrated stent grafts for treatment of TAAA involving the mesenteric and renal arteries in patients at high risk for open surgery

**PRESERVE: Zenith® Iliac Branch System Clinical Study**  An extended study to collect confirmatory safety and effectiveness data on the Zenith® Branch Endovascular Graft-Iliac Bifurcation System, which will be used in patients with an unsuitable distal sealing site for a Zenith® iliac leg component proximal to the common iliac bifurcation

**The Zenith® Low Profile AAA Endovascular Graft**  A study to evaluate performance of a smaller introduction system and modified device for patients with an abdominal aortic or aorto-iliac aneurysm and with inadequate access for commercially available endovascular graft delivery systems

**National Registry of Genetically Triggered Thoracic Aortic Aneurysms and Cardiovascular Conditions (GenTAC)**  Establishment of a registry of patients with genetic conditions that may be related to thoracic aortic aneurysms and to collect medical data and biologic samples that will be made available for research

**AORTIC DISEASE**
Stroke is the third highest cause of death and the leading cause of disability in the United States. Carotid artery disease causes more than a third of all strokes, which strike more than 750,000 people in the United States each year.

People with vascular disease have an increased risk of potentially disabling or fatal conditions, including stroke due to blockage in the carotid arteries. In many cases, because these conditions can become quite serious before they produce symptoms, early detection can significantly reduce the risk of death and disability.

NewYork-Presbyterian specialists in cerebrovascular disease treat patients who have had stroke or TIA caused by carotid disease, as well as patients with asymptomatic carotid disease who may be at risk for stroke. The Hospital provides expertise in screening and surveillance with non-invasive tests, including carotid ultrasound, CT angiography, and MR angiography; medical management; and both open carotid surgery and minimally invasive carotid stenting.

**CEREBROVASCULAR DISEASE**

[Image of an atherosclerotic carotid artery with a necrotic core removed during an endarterectomy procedure in a patient with a symptomatic carotid artery stenosis.]

**In-Hospital Mortality Rate 2012-2014**

NewYork-Presbyterian has achieved a 99% survival rate for carotid procedures.

[Bar chart showing in-hospital mortality rates for carotid procedures from 2010 to 2014, with observed and expected mortality rates compared.]

*Expected mortality was determined using UHC risk-adjustment methodology.
Source: These data are prepared using the University HealthSystem Consortium (UHC) Clinical Database / uhc.edu
CAROTID ARTERY STENTING

Perioperative through 30 Days Post-Procedure 2012-2014

NewYork-Presbyterian’s carotid artery stenting outcomes are markedly better than expected national standards, reflecting the experience of the Hospital’s clinical team.

Current Clinical Trials at NewYork-Presbyterian

Carotid Revascularization for Primary Prevention of Stroke (CREST-2) Supported by the NIH, these independent multicenter, randomized controlled trials will evaluate carotid revascularization and intensive medical management versus medical management alone in patients with asymptomatic high-grade carotid stenosis; NewYork-Presbyterian is the only hospital in New York City with the CREST-2 trial

SCAFFOLD Gore carotid stent clinical study for the treatment of carotid artery stenosis in patients at increased risk for adverse events from carotid endarterectomy

Selected Publications


NewYork-Presbyterian vascular specialists from cardiology, radiology, and vascular surgery are dedicated to the management of patients with peripheral vascular disease. Each patient receives specialized care utilizing advanced therapies to manage limb-threatening ischemia, non-healing wounds, pain with walking, and diabetes. Our skilled team provides medical management, as well as catheter-based minimally invasive procedures, gene therapy, and surgical bypass. Therapies are individualized with minimally invasive revascularization techniques utilized whenever appropriate.

Non-Invasive Vascular Lab
NewYork-Presbyterian has ICAVL-accredited Vascular Diagnostic Laboratories that provide state-of-the art, non-invasive, diagnostic, preventive, and screening services. Utilizing the newest technologies and advanced B-mode and Doppler capabilities, our highly trained team of vascular technologists offers patients the full range of vascular studies and testing.

Bypass surgery for treatment of a patient with critical limb ischemia. Basilic and cephalic vein segments harvested from the arm used to create a lower extremity femoral artery to peroneal artery bypass.
Case Study

A recently retired 76-year-old male was looking forward to spending more time traveling with his wife. Six months prior, he had developed an extensive foot wound that extended to his forefoot. He saw a number of wound care specialists and underwent four leg angiograms and interventions and multiple debridements to treat the severe foot wound but without a successful outcome. Because of his history of diabetes, hypertension, and carotid arterial disease, a foot amputation had been recommended. Not ready to accept this as a treatment option, he sought another opinion at NewYork-Presbyterian.

At NewYork-Presbyterian, the vascular team developed a plan to save his foot. Surgeons performed an angiogram with minimally invasive treatment and were able to regain a palpable pulse, followed by surgical debridement of the wound. He progressed very well, and within one month, his foot wound had finally healed. Three months later, he was able to travel to Italy with his wife for their 50th wedding anniversary.

Current Clinical Trials at NewYork-Presbyterian

AMG0001 for CLI/AnGes Study to demonstrate that AMG0001 (HGF plasmid) is safe and effective in improving circulation and avoiding major amputations in subjects with CLI without any other treatment options

BEST-CLI/NIH Study to evaluate and compare the effectiveness of best endovascular revascularization with the best surgical revascularization in patients with CLI

ENDOMAX Study to demonstrate that anticoagulation with bivalirudin results in fewer major bleeding complications compared with unfractionated heparin in peripheral endovascular interventions, with a secondary objective to identify potential benefits from bivalirudin therapy on other clinically important events

FlexStent® Femoropopliteal Self-Expanding Stent System Study to demonstrate that the FlexStent® Femoropopliteal Self-Expanding Stent System is safe and effective for the treatment of patients with peripheral arterial disease

LEVANT 2 Safety Registry Investigation of safety and efficacy of the Lutonix drug coated balloon for the treatment of narrowed leg blood vessels

Selected Publications


Imaging specialists at NewYork-Presbyterian employ a multidisciplinary, multimodality approach to the detection and treatment of heart disease, with a focus on finding new answers about prevention of cardiovascular disease in at-risk individuals. Specialized expertise is available in imaging for ischemic, valvular, and congenital heart disease, and thoracic disorders.

State-of-the-art imaging technologies, which include MRI, multidetector CT angiography, PET, and cardiac SPECT, enable decreased imaging time and lower radiation dose. These are used in conjunction with other cutting-edge diagnostic tests, including blood markers of inflammation, protein expression, and metabolism.

Engineers and computer scientists are employing advanced computational fluid dynamic methods to determine the hemodynamic significance of coronary artery disease. From a typically acquired coronary CT angiogram, cardiovascular imagers can calculate the fractional flow reserve in a non-invasive fashion. This technology has been adopted by clinical cardiologists at NewYork-Presbyterian to precisely identify specific coronary artery lesions that cause ischemia or reduced blood flow to the myocardium. Our investigators led the pivotal multicenter trials resulting in the approval of this technology, and NewYork-Presbyterian is the only hospital on the Eastern seaboard to offer this technology for routine patient evaluation.

In recent years, the emergence of non-invasive coronary CT angiography has led to the ability of researchers and clinicians to identify specific components of atherosclerotic plaque, including measures of remodeling, volume, composition, and presence of a necrotic lipid-laden intraplaque core. By innovative methods developed at NewYork-Presbyterian, automated quantification and characterization of atherosclerotic plaque can now be accurately assessed. Our researchers have demonstrated the importance of these findings in a recent multicenter study in which the type of atherosclerotic plaque was independently associated with specific coronary artery lesions that reduced blood flow to the heart. When coupled with other advanced imaging techniques, the comprehensive assessment of coronary atherosclerotic plaque can help clinicians better diagnose and treat coronary artery disease.
An example of a fractional flow reserve CT from a patient evaluated at NewYork-Presbyterian.

Machine learning techniques allow our doctors to account for the complexities of coronary heart disease.

Coronary computed tomographic angiography shows specific components of atherosclerotic plaque.

NewYork-Presbyterian researchers have also employed machine learning techniques to more precisely identify individuals at risk of future heart attacks. Machine learning, which allows computers to learn and behave without the need for programming, has been widely used in non-medical fields for the refinement of Internet searches or self-driving automobiles. Researchers at NewYork-Presbyterian have significantly improved the discriminatory ability to identify and exclude patients at risk of heart attacks using machine learning methods applied to cardiovascular images when compared to traditional clinical and imaging methods of evaluation. Machine learning techniques allow our doctors to account for the complexities of coronary heart disease, including the extent, severity, distribution, location, and composition of atherosclerotic plaque.

Selected Publications


A team of NewYork-Presbyterian doctors developed a surgical plan for an infant with complex congenital heart disease using a 3-D printed model of the newborn's heart created with data taken from a low-dose CT scan performed just one day after the baby's birth.
NewYork-Presbyterian Hospital has made a major commitment to the prevention of cardiovascular disease in individuals with diabetes, high blood pressure, and high cholesterol, as well as smokers and those who are obese. Initiatives include patient education, research, and community and corporate outreach efforts to reduce the burden of cardiovascular disease and to promote heart health. Programs offer individualized treatment plans using a range of modalities, from psychotherapy, to physician-monitored exercise plans, to education and counseling in nutrition, stress and anger management, and smoking cessation.

**Women’s Heart Disease** In 2014, a unique collaboration between two of America’s leading medical institutions, the Barbra Streisand Women’s Heart Center at Cedars-Sinai Heart Institute and NewYork-Presbyterian Hospital, and two major philanthropists in business and entertainment, Barbra Streisand and Ronald O. Perelman, created The Women’s Heart Alliance to encourage action on women’s heart health. The Women’s Heart Alliance launched the Fight the Ladykiller campaign to:

- encourage women to talk to their healthcare providers and empower them with a single, meaningful action they can take – #getHeartChecked
- encourage the medical community to proactively address the screening, diagnostic, and therapeutic differences of a woman’s heart and talk to patients and peers about women’s heart health
- move Congress and federal agencies to action on funding women’s heart health research

To learn more, see www.fighttheladykiller or www.womensheartalliance.

**HeartSmarts** The HeartSmarts program aims to reduce the incidence of cardiovascular disease through education of underserved communities. In collaboration with churches and wellness ministries, the program has created a coalition of lay health ambassadors who utilize a faith-based curriculum to enable members of their organizations and their surrounding communities to increase knowledge of cardiovascular health.

**HeartHealth** The mission of the HeartHealth program of the Dalio Institute of Cardiovascular Imaging is to prevent cardiovascular disease and promote overall health and well-being. This state-of-the-art clinical program provides evaluation of individuals at high risk of cardiovascular disease, including a comprehensive cardiovascular consultation and exam and advanced cardiac imaging, as well as employing biomarkers, lipid profiling, and psychosocial inventories. The multidisciplinary approach will determine the presence or extent of cardiovascular disease with precision. The HeartHealth team works in collaboration with behavioral psychologists, nutritionists, radiologists, and other clinical specialists. Patients receive an individualized plan to decrease the chance of a cardiovascular event, such as heart attack or stroke, and increase health awareness and promote healthy choices.

**Health Education and Promotion** NewYork-Presbyterian offers innovative health education and promotion programs, often in partnership with community organizations that share the same goals. Patients and the public are offered a wide variety of interactive classes and activities, such as Hands-Only CPR, as well as one-to-one health education so individuals can make smart choices in the prevention and management of heart disease. Patients and the public can participate in interactive classes and activities.

The HeartSmarts program demonstrated overall improvement in blood pressure, weight, BMI, and waist circumference.

<table>
<thead>
<tr>
<th>Year</th>
<th>Deteriorated</th>
<th>No Change</th>
<th>Improved</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>26%</td>
<td>13%</td>
<td>61%</td>
</tr>
<tr>
<td>2013</td>
<td>14%</td>
<td>17%</td>
<td>69%</td>
</tr>
</tbody>
</table>
and heart disease prevention. Following completion of a 12-week training course, these ambassadors then teach the HeartSmarts class in their churches. Ambassadors assess participants’ blood pressure, weight, waist circumference, and knowledge of cardiovascular health.

Between January 31, 2012 and May 1, 2014, HeartSmarts trained 80 health ambassadors, who in turn educated 500 congregation members. An evaluation of the program demonstrated statistically significant improvements in diastolic blood pressure and BMI. Both the participants and ambassadors improved their knowledge of cardiovascular health; reduced weight, blood pressure, and waist circumference; and increased physical activity.

**Behavioral Health**

NewYork-Presbyterian is making important contributions to cardiovascular behavioral medicine research with a team of highly skilled interdisciplinary professionals — internists, cardiologists, psychologists, and quantitative faculty — engaged in research studies investigating:

- **behavioral and biological factors that explain the relationship between depression and heart disease**
- **ways to treat depression in those with established heart disease**
- **psychosocial factors and biological mechanisms that contribute to hypertension**
- **alternative approaches to diagnosing and treating hypertension**

Scientific investigation will increase the understanding of the mechanisms involved in cardiovascular diseases and improve their management with recognition of the importance of behavioral, psychological, societal, and lifestyle factors in the risks for hypertension and heart disease.

**Selected Publications**


With NewYork-Presbyterian’s commitment to clinical progress comes a responsibility to set evidence-based standards for quality and safety practices in the delivery of patient care. Our quality and patient safety program, founded on a comprehensive philosophy, strategy, and methodology to endeavor to produce consistent and sustainable improvements, has established strategies and mechanisms to minimize or eliminate healthcare errors and risk. By integrating clinical, environmental, service, and operational factors, we promote patient and organizational safety and continuous quality improvement.

The Hospital’s quality and patient safety efforts in cardiovascular care focus on:

**Heart Attack and Heart Failure**  
The risk of patients dying at 30 days after hospitalization is a key metric reported by the Centers for Medicare and Medicaid Services. Thirty-day mortality rates are publicly reported for patients hospitalized with five common conditions: heart attack, heart failure, pneumonia, stroke, and chronic obstructive pulmonary disease (COPD).

NewYork-Presbyterian’s 30-day mortality rates in 2014 were statistically better than the national average for heart attack, heart failure, pneumonia, and stroke.

**Surgical Care Improvement Project (SCIP)**  
In line with SCIP’s core measures, NewYork-Presbyterian’s efforts focus on antibiotic prophylaxis and glucose control for coronary artery bypass graft and cardiac surgery patients. SCIP guidelines serve to optimize antibiotic use and patient outcomes while limiting the emergence of resistant strains of bacteria. Our antibiotic prophylaxis measures are above the Hospital Compare benchmark.

**American College of Cardiology PCI Registry**  
NewYork-Presbyterian Hospital participates in the ACC’s CathPCI Registry. This tool, which assesses the characteristics, treatments, and outcomes of cardiac disease patients who receive diagnostic catheterization and/or percutaneous coronary intervention (PCI) procedures, is currently in use in the majority of the nation’s cardiac catheterization labs. NewYork-Presbyterian began participating in the registry in 2008 and has consistently ranked better than benchmark in risk-adjusted mortality and angiographic success.

**Deep Sternal Wound Infections**  
As part of the mandatory reporting to the New York State Department of Health database, a deep sternal wound infection must be reported as a major event following an operation even if it does not become apparent until after the patient is discharged from the hospital. To decrease deep sternal wound infections, NewYork-Presbyterian established protocols regarding OR traffic control, prophylactic antibiotic selection, and skin prep. A weekly interdisciplinary group monitors all returns to the Cardiothoracic ICU, post-discharge readmissions, antibiotic to incision time, and chest tube duration. The group also implemented a structured CTICU admission note along with intensive glucose monitoring, resulting in significant decreases in deep sternal wound infection over the last several years.

### 30-Day Mortality Rates  
**Q3 2011 - Q2 2014**

<table>
<thead>
<tr>
<th>Disease</th>
<th>NewYork-Presbyterian</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart Attack</td>
<td>✓</td>
</tr>
<tr>
<td>Heart Failure</td>
<td>✓</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>✓</td>
</tr>
<tr>
<td>Stroke</td>
<td>✓</td>
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</tbody>
</table>

Source: Hospital Compare / www.medicare.gov/hospitalcompare

NewYork-Presbyterian performed better than the national average on 30-day mortality for heart attack, heart failure, pneumonia, and stroke.
In 2014, the cardiac and vascular inpatient units of NewYork-Presbyterian Hospital scored consistently better than the national average according to the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS). In addition, patient satisfaction rankings for outpatient care for 2014 were above 90% in five of the six survey domains. In addition, patient satisfaction rankings for outpatient care for 2014 were above 90% in five of the six survey domains.

Joe Tiralosi was clinically dead for 47 minutes. Joe walked into the NewYork-Presbyterian emergency room feeling sick and disoriented. He collapsed a minute later after suffering cardiac arrest. His heart stopped beating for 47 minutes. The emergency department team went into action. They never stopped working on Joe. And after 4,500 chest compressions, Joe’s heart started to beat again. His body temperature was cooled to 91 degrees to help preserve brain function. He says, “I’m just an ordinary Joe who had an extraordinary experience working with the best doctors in the world.”
Transforming Care with Innovative Information Technology

As a leading healthcare institution, NewYork-Presbyterian has been developing and implementing a culture of innovation to enhance our ability to provide high quality, safe, and reliable patient care. Through its dedicated Innovation Center, the Hospital is advancing a variety of technology projects, including a number of innovative information technologies that are helping to transform the experience for patients, families, providers, and staff. At right are a few of the technologies now available at NewYork-Presbyterian that are making patient care delivery more efficient, more effective, and more patient-centered.

**NewYork-Presbyterian Innovation Center**

Innovative information technology at NewYork-Presbyterian is a creative collaboration and partnership between IT, our care providers, our patients, and our families.

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**Bedside Patient Tablet** Helps patients manage their own care by viewing members of their care team; seeing their medications, lab, and radiology orders; accessing social media and the Internet; and video chatting with loved ones from an iPad or tablet.

**Pain Notification Application** Notifies and mobilizes a specialized pain team when a patient is in pain.

**Automated Texting** Alerts family members about the real-time status of their loved ones who are in the OR.

**NYPConnect** Enables care team members to conveniently connect to one another.
NewYork-Presbyterian/Columbia University Medical Center
630 West 168th Street
New York, NY 10032

NewYork-Presbyterian/Weill Cornell Medical Center
525 East 68th Street
New York, NY 10065

NewYork-Presbyterian Cardiac and Vascular Services

2015 OUTCOMES AND QUALITY REPORT
in collaboration with
Columbia University College of Physicians and Surgeons
and
Weill Cornell Medicine
NewYork-Presbyterian is one of the nation’s most comprehensive academic health care delivery systems, dedicated to providing the highest quality, most compassionate care to patients in the New York metropolitan area and throughout the globe. In collaboration with two renowned medical schools, Weill Cornell Medical College and Columbia University College of Physicians & Surgeons, NewYork-Presbyterian is consistently recognized as a leader in medical education, ground-breaking research, and innovative, patient-centered clinical care. NewYork-Presbyterian’s cardiac and vascular services are leading the way in the full range of heart care, from advances in cardiovascular imaging and electrophysiology technologies, to interventional therapies, hybrid procedures, and surgical approaches, including cardiac transplantation.

NewYork-Presbyterian has four major divisions:

- NewYork-Presbyterian Hospital, a world class academic medical center ranked #1 in the New York metropolitan area by U.S. News and World Report and repeatedly named to the Honor Roll of Best Hospitals in the nation;
- NewYork-Presbyterian Regional Hospital Network, comprised of leading regional hospitals in the New York metropolitan region, including NewYork-Presbyterian/Lawrence Hospital in Bronxville and NewYork-Presbyterian/ Hudson Valley Hospital in Cortlandt Manor, both in Westchester, and NewYork-Presbyterian/Queens in Flushing, Queens;
- NewYork-Presbyterian Physician Services, which connects medical experts with patients in their communities to expand coordinated health care delivery across the region. It includes the NewYork-Presbyterian Medical Groups in Westchester, Queens, and Brooklyn, which increase access to primary care in collaboration with Weill Cornell Physicians and ColumbiaDoctors, which deliver specialty care;
- NewYork-Presbyterian Community and Population Health, encompassing ambulatory care network sites and community health care initiatives, including NewYork Quality Care, the Accountable Care Organization jointly established by NewYork-Presbyterian, Weill Cornell Medicine, and Columbia University College of Physicians & Surgeons.

NewYork-Presbyterian is one of the largest health care providers in the U.S. Each year, nearly 29,000 NewYork-Presbyterian professionals deliver exceptional care to more than 2 million patients.

For More Information or to Make a Referral
1-844-NYP-6444

www.nyp.org