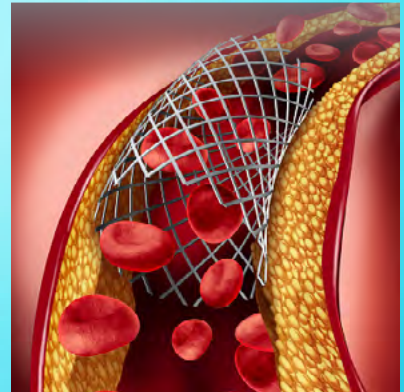
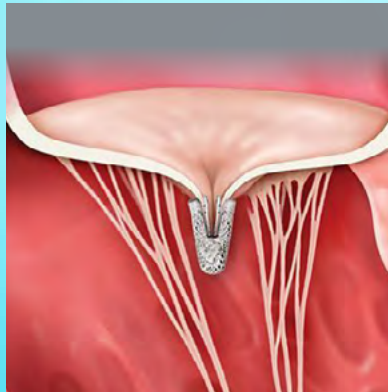
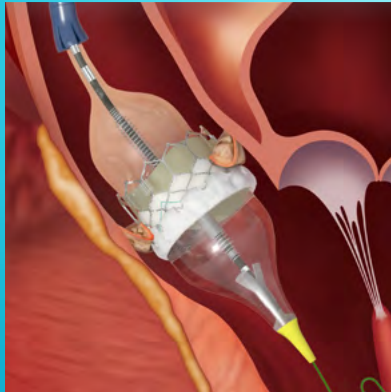


DR. SAMIN K. SHARMA FAMILY FOUNDATION

# Cardiac Catheterization Laboratory

**2021 Clinical Outcomes  
& Innovations Report**





### **Samin K. Sharma, MD, FACC, MSCAI**

Senior Vice-President, Operations  
& Quality, Mount Sinai Heart  
Director, Interventional Cardiology,  
Mount Sinai Health System  
President, Mount Sinai Heart Network



### **Annapoorna S. Kini, MD, MRCP, FACC**

Director, Cardiac Catheterization Laboratory  
Interventional Director, Structural Heart  
Disease, Mount Sinai Health System  
Director, Interventional Cardiology  
Fellowship Program

## **From Drs. Samin K. Sharma and Annapoorna S. Kini**

We are proud to present this 2021 edition of our *Clinical Outcomes & Innovations Report*. For more than 10 years, we've been compiling this report of our procedural outcomes and volume, transparently sharing our results as compared to other centers in our region and across the country. The landscape of interventional cardiology is changing constantly with the main goal of improving patient outcomes.

At The Mount Sinai Hospital, our Catheterization Laboratory remains a leader for several reasons, including the:

- Talent of our team of interventionalists and supporting staff;
- Strict adherence to proven protocols and standards of care;
- Innovation and implementation of new technologies, techniques, and approaches, including participation in clinical trials that can benefit our patients;
- Heart team approach, which involves consulting with our colleagues in clinical cardiology and cardiac surgery to ensure the best course of care for each complex patient;
- Compassion and genuine concern for our patients' health, long after their procedure.

Our procedural outcomes data over the years support the statement that we have *perfected the art of PCI*. As a result, many patients who have been considered too high risk to receive care elsewhere are referred here and go home with a successful outcome and an improved quality of life.

Patients remain at the center of everything we do. In this publication, you will read the words of our grateful patients, many of whom had particularly challenging clinical scenarios. As we look to 2021 and beyond the COVID-19 variants, we will continue to pioneer new paths, setting the pace for another remarkable year of innovation and excellence in 2022. We will continue to improve our patient outcomes by constantly analyzing our results critically.

## Table of Contents

A Message from Drs. Samin K. Sharma and Annapoorna S. Kini	2
An Overview of Services and Outcomes	6
Innovations	13
Research and Clinical Trials	54
Top Ten Major Publications of 2021	56
Full-Time Senior Attendings	58
Full-Time Attendings	64
Voluntary Attendings	68
<i>CCC Live Cases: Monthly Webcast Program</i>	74
Cardiac Catheterization Laboratory Educational Events	75
Cardiac Catheterization Laboratory Achievements	76
Mount Sinai Heart Directory	79

---

For more information, visit [www.mountsinai.org/interventional-cardiology-cath-lab](http://www.mountsinai.org/interventional-cardiology-cath-lab)

## Director, Mount Sinai Heart



### Valentin Fuster, MD, PhD, MACC

Physician-in-Chief,  
The Mount Sinai Hospital  
Director, Mount Sinai Heart  
Director, Zena and Michael A. Wiener  
Cardiovascular Institute and  
Marie-Josée and Henry R. Kravis  
Center for Cardiovascular Health  
Richard Gorlin, MD, Heart Research  
Foundation Professor of Cardiology

Although the last two years have presented us all with difficult challenges, they have also presented us with unique opportunities. The entire staff of The Samin K. Sharma Family Foundation Cardiac Catheterization Laboratory was tasked with providing the highest level of cardiac care in the midst of a devastating pandemic. Novel treatments were given to those who suffered from COVID-19 and its variants.

While the entire hospital had to develop new techniques for preventing the spread of the virus while serving a continuing stream of very sick patients, Mount Sinai Heart was able to provide cutting-edge techniques to our cardiac patients who also manifested underlying symptoms and needed additional care. We improved testing protocols so that those individuals who were suffering from symptoms beyond their cardiac needs were given the treatments to restore them to full health.

Research continues to play a central role in the forward thinking that leads to successful outcomes. The role of genetics and diet helps to shine a light on ways to prevent cardiac disease. Our clinicians are given the resources and encouragement to move the state of the art forward, and our commitment to being the most innovative cardiac catheterization laboratory in the country and worldwide is undiminished.

Ultimately, success has to be measured by what our patients experience after their treatment is complete. In the *2021 Clinical Outcomes & Innovations Report*, we have included several case studies of patients who have enjoyed successful outcomes from having varying levels of cardiac complexities.

## President, The Mount Sinai Hospital

---



**David L. Reich, MD**

President and Chief Operating Officer,  
The Mount Sinai Hospital

Even the most routine procedure that happens in the Cardiac Catheterization Laboratory is remarkable. Every day, interventional cardiologists open vessels, returning blood flow to the heart through the smallest of incisions. At The Mount Sinai Hospital, we do that for more than 15,000 patients each year, returning them to their families with a success rate greater than 99 percent.

Mount Sinai's Dr. Samin K. Sharma Family Foundation Cardiac Catheterization Laboratory is among the busiest in the nation, but the real distinguishing characteristic is a dedication to advancing the art of PCI. Through their high volume and relentless commitment to refining and perfecting protocols, Samin K. Sharma, MD, and Annapoorna S. Kini, MD, and their experienced team have remained at the top of the field of interventional cardiology.

Their gaze remains fixed on the future, as they investigate new devices, new tools, and new techniques, and bring the most promising procedures to the bedsides of our patients. These advances have moved interventional cardiology beyond the coronary arteries to also repairing structural heart conditions like valve stenosis and congenital heart deformities, as well as conditions of the peripheral arteries.

In addition to pioneering new ways to heal hearts without open surgery, our physician scientists also explore the physiology of cardiac disease to help prevent disease and understand the long-term impact of these treatments. These findings are disseminated through webcasts and publications, and to the talented fellows who gain invaluable experience alongside experienced operators.

We hope you enjoy reading this *Cardiac Catheterization Laboratory Clinical Outcomes & Innovations Report* and welcome your feedback on our progress.

# The Cardiac Catheterization Laboratory at The Mount Sinai Hospital

AN OVERVIEW OF SERVICES AND OUTCOMES



**From left, front row** — Jeffrey Bander, MD; Pedro Moreno, MD; Prakash Krishnan, MD; Annapoorna S. Kini, MD; Samin K. Sharma, MD; George Dangas, MD; Raman Sharma, MD  
**Back row** — Gregory Serrao, MD; Sahil Khera, MD; Joseph M. Sweeny, MD; Vishal Kapur, MD; Amit Hooda, MD; Parasuram Melarcode Krishnamoorthy, MD

The Cardiac Catheterization Laboratory at The Mount Sinai Hospital is among the highest-volume centers, yet also among the safest interventional catheterization laboratories in the United States. Each member of the Cardiac Catheterization Laboratory staff has a strong work ethic and takes pride in his or her contribution to the principal goal: delivery of efficient and safe care to patients in need. As a result, the Cardiac Catheterization Laboratory consistently reports a high level of patient satisfaction; 64 percent of patients are discharged on the same day of their successful interventional procedure.

## 64 Percent

OF OUR ELECTIVE INTERVENTIONAL PATIENTS ARE DISCHARGED ON THE SAME DAY OF THE PROCEDURE

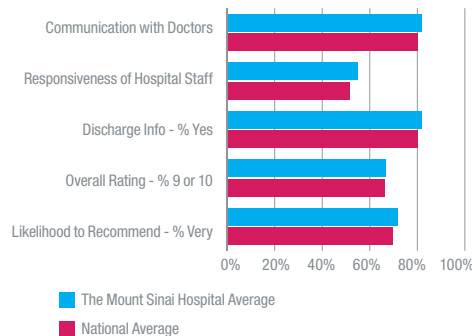
The system of established standard protocols, rigorous attention to details, and a strong sense of teamwork have helped us to achieve the best interventional outcomes in the country. Overall angiographic success of non-CTO lesions remains over 99 percent in our Cardiac Catheterization Laboratory. We continue to improve our outcomes while maintaining low procedural complications in 2021. This remarkably low complication rate has been achieved despite high complexity and comorbid medical conditions of patients treated in the Cardiac Catheterization Laboratory.



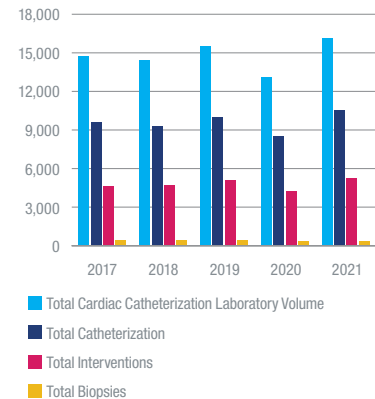
**Great things come from hard work and perseverance, no excuses. If you love a thing, you will overcome all difficulties.”**

— KOBE BRYANT  
THE LATE STAR BASKETBALL PLAYER

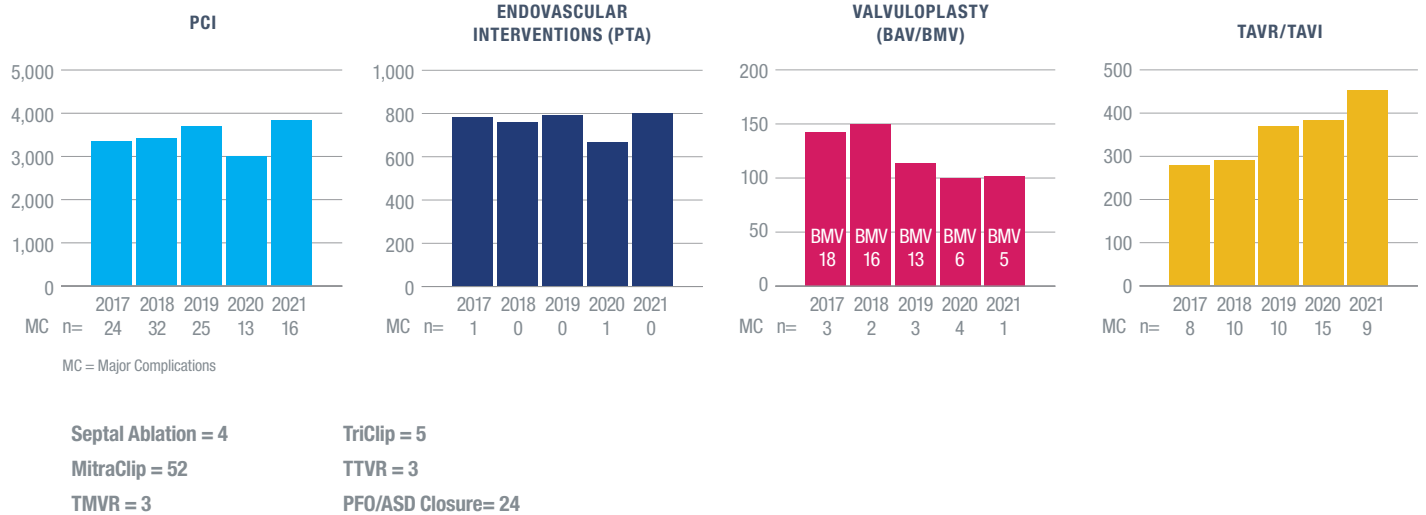
PATIENT SATISFACTION: 2021 HCAHPS SURVEY



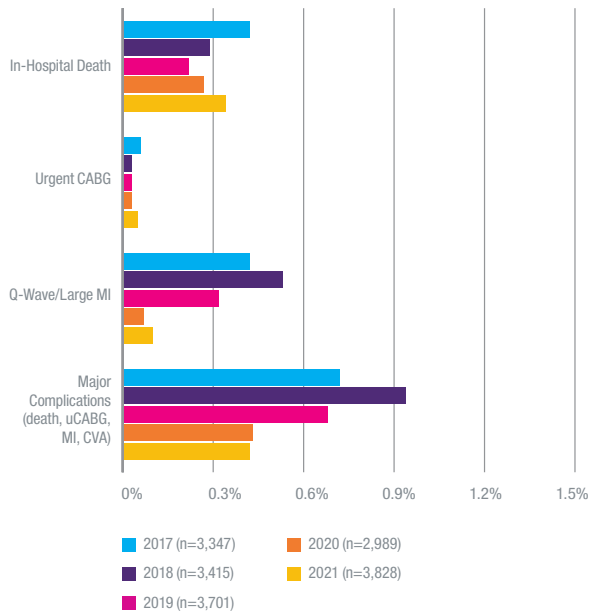
CARDIAC CATH LAB VOLUME AT MSH PROCEDURES OVER THE LAST FIVE YEARS



**INTERVENTIONAL VOLUME AND MAJOR COMPLICATIONS (MC) 2017-2021**



**TEMPORAL TRENDS IN COMPLICATIONS OF PCI AT THE MOUNT SINAI HOSPITAL**



**24 Percent of 3,828**

**CASES HAD A PLAQUE MODIFICATION STRATEGY BEFORE STENT IMPLANTATION DUE TO LESION COMPLEXITY**

**37 Percent**

**OF PCI'S AND 52 PERCENT OF DIAGNOSTIC CATHS WERE DONE VIA RADIAL ACCESS**



## COMPARISON OF THE MOUNT SINAI HOSPITAL INTERVENTIONAL OUTCOMES WITH NEW YORK STATE DATA: 2017–2021

Our Cardiac Catheterization Laboratory continues to serve the full range of cases, from the routine to the most complex with high clinical comorbidities and complex angiographic characteristics. Despite that added complexity, by most measures, complications at The Mount Sinai Hospital have been one-third to one-half that of the New York State hospitals.

Reports of risk-adjusted PCI mortality have consistently placed The Mount Sinai Hospital Cardiac Catheterization Laboratory among the lowest for in-hospital and 30-day risk-adjusted mortality. The Cardiac Catheterization Laboratory has received the double star, denoting statistically significantly lower RAMR than the statewide average consistently over the last 23 years of New York State Department of Health PCI reporting.

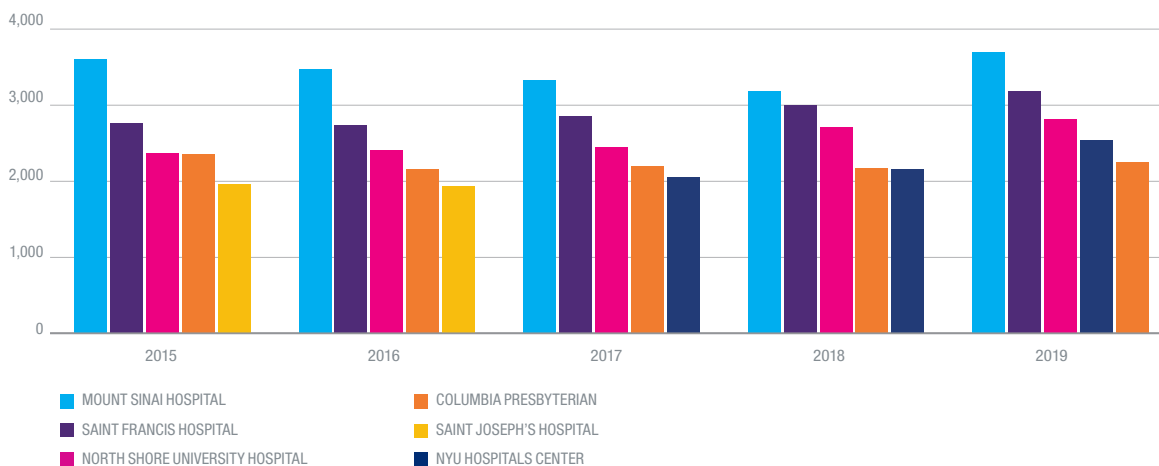
This lower 30-day risk-adjusted mortality can be attributed in large part to the experience and high procedural volume of the five senior full-time interventionalists, who together perform more than 3,800 interventions per year. Our interventionalists frequently get double star notations (\*\*) for PCI safety among 600 interventionalists practicing in the state.

### NYS-DOH REPORT OF PCI 2017 DATA ON THE TOP 10 VOLUME CENTERS IN NY STATE 30-DAY RAMR

PCI Statistics 2017	# Cases	All Cases	Non-Emergency Cases
<b>1. The Mount Sinai Hospital</b>	<b>3,333</b>	<b>0.84</b>	<b>0.50</b>
2. Saint Francis Hospital	2,849	1.08	0.69
3. North Shore University Hospital	2,452	1.30	0.92
4. Columbia Presbyterian Hospital	2,198	1.36	0.87
5. NYU Hospitals Center	2,051	1.18	0.72
6. Saint Joseph's Hospital	2,015	1.25	0.93
7. Lenox Hill Hospital	1,808	0.68	0.35
8. Mount Sinai Beth Israel	1,531	0.89	0.34
9. Stony Brook University Hospital	1,476	1.46	0.95
8. Buffalo General Medical Center	1,455	0.92	0.40
<b>NYS Total</b>	<b>51,429</b>	<b>1.13</b>	<b>0.78</b>

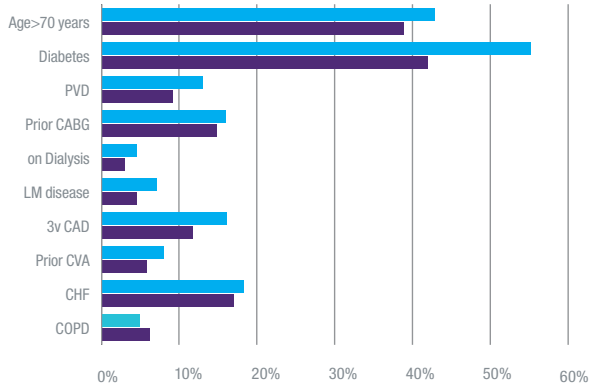
[www.nyhealth.gov](http://www.nyhealth.gov)

### NYS-DOH REPORTED PCI VOLUMES FOR TOP NEW YORK HOSPITALS OVER THE LAST FIVE YEARS



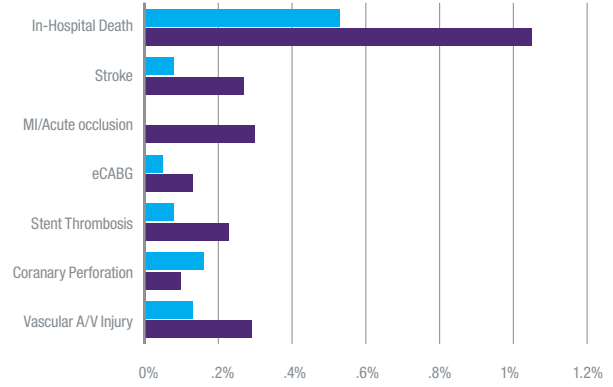
**IMPORTANT BASELINE CLINICAL AND LESION CHARACTERISTICS OF PCI:**

NY STATE HOSPITAL DATA 2017-2021



■ The Mount Sinai Hospital (n=3,782) 2021  
 ■ NY State Hospital (n=51,979) 2017

**NYS-REPORTED MAJOR PCI COMPLICATIONS**



■ The Mount Sinai Hospital (n=3,504) 2019  
 ■ New York State (n=50,975) 2016

**15,000+**

**Cases Per Year**

**LED BY FIVE SENIOR FULL-TIME INTERVENTIONALISTS,**  
 WHO TOGETHER PERFORM MORE  
 THAN 9,500 CASES PER YEAR.

**23 Consecutive Years**

THE MOUNT SINAI CARDIAC CATHETERIZATION  
 LABORATORY RECEIVES PRESTIGIOUS  
 TWO-STAR RATING FOR PCI IN **NY STATE.**



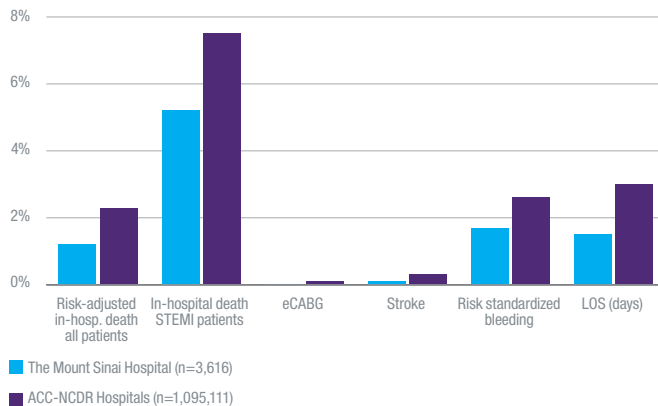
## COMPARISON OF THE MOUNT SINAI HOSPITAL INTERVENTIONAL OUTCOMES WITH OTHER U.S. HOSPITALS: 2021 R4Q2 ACC-NCDR REPORTS

The American College of Cardiology-National Cardiovascular Data Registry (ACC-NCDR) reports the characteristics and in-hospital outcomes after PCI of more than 1,400 hospitals in the United States, providing data of more than one million patients annually.

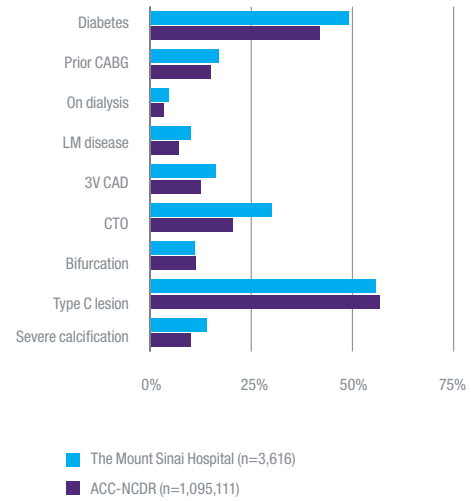
On these pages are the important baseline and procedure characteristics of The Mount Sinai Hospital versus ACC-NCDR hospitals. These graphs show superior outcomes despite higher complexities for PCI patients at The Mount Sinai Hospital in comparison to other U.S. hospitals in the ACC-NCDR report for 2021 R4Q2.

At Mount Sinai, we have established evidence-based protocols for proper evaluation of CAD patients before scheduling catheterization and possible intervention. We follow a rigorous application of the appropriate use criteria of the American College of Cardiology and fractional flow reserve (FFR/iFR) guiding the decision-making for appropriately indicated PCI.

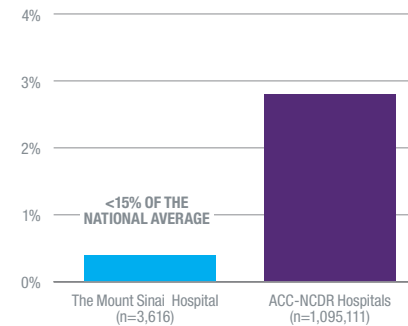
### PCI COMPLICATIONS: MSH VS. ACC-NCDR HOSPITALS 2021 RQ2



### IMPORTANT BASELINE CLINICAL AND LESION CHARACTERISTICS OF PCI: ACC-NCDR DATA FOR 2021 R4Q2



### NATIONAL PCI OUTCOME METRICS; MAJOR COMPLICATIONS: COMPOSITE: PROPORTION OF PCI PATIENTS WITH DEATH, ECABG, STROKE OR ETVR; MSH VS. ACC-NCDR (N=1,400 HOSPITALS) FOR 2021 R4Q2





Annapoorna S. Kini, MD, with the current interventional fellow class.

## Alexander Oystacher

**“I’m not only able to walk up hills without stopping, but I could sprint up them more than once if I wanted to.”**



**Diagnosis:** 2 V CAD + LM Disease

**Treatment:** Intervention of distal LM, proximal LAD and RCA CTO

“I lived with what I thought was heartburn for 21 years. When my wife and I first moved to the U.S. from Ukraine after Chernobyl, I felt fine. I used to be very active; I was a jock when I was young and loved to play soccer, but as I got older, I began getting winded going for walks. Walking uphill was the most difficult; pains in my chest would make me stop more than once. Sometimes, I would feel tightness after I had eaten, which is why I associated it with heartburn. I became so fearful of the pain that some days I wouldn’t want to eat or play with my grandchildren.

“Along the way, a friend of mine suggested a stress test and recommended Dr. Sharma because he’s the best at what he does. After a stress test and angiogram, Dr. Sharma told me I needed a stent to free a blockage in my left artery, and that my right was completely blocked. He was not only able to free the blockage on the left, but the right as well. What I thought was heartburn turned out to be something more serious, but Dr. Sharma fixed me with ease.

“Now, my wife and I are back to taking walks and she’s unable to keep up with me again. I’m not

only able to walk up hills without stopping, but I could sprint up them more than once if I wanted to. I can be a good father and grandfather again because I’m able to play with the kids. Because of Dr. Sharma, I feel reborn.”

# Complex High-Risk Percutaneous Coronary Interventions (PCI)

SAMIN K. SHARMA, MD, AND ANNAPOORNA S. KINI, MD

Earlier randomized clinical trials have suggested the benefit for coronary artery bypass graft (CABG) surgery in higher angiographic-complexity cases over PCI. Based on the available evidence, there is an increasing tendency at The Mount Sinai Hospital to recommend surgery for patients with more complex coronary artery disease (CAD). Ultimately, the decision to have either surgery or PCI lies with the patient and his or her family after consultation with the Heart Team, which includes a cardiologist, cardiothoracic surgeon, and a cardiac interventionalist. Many patients ( $\approx$  50 percent) with complex CAD choose revascularization with PCI, due to lower short-term complications and relative ease of recovery compared with surgery.

As far as the left main (LM) CAD is concerned, a recent meta-analysis comparing PCI with CABG showed similar mortality at 5 years and at 10 years after PCI vs. CABG but higher myocardial infarction (MI) and repeat revascularization after PCI.

The EXCEL Trial, which compared the XIENCE drug-eluting stent (DES) with CABG in treating unprotected LM disease with a SYNTAX Score below 32, has shown equal results after five years for both modes of revascularization, but a higher mortality in the PCI group. Additional studies involving newer stents, combined with advanced imaging modalities before and during procedures, may tip the balance in favor of recommending PCI as first-line therapy for more patients with moderate to severe CAD.

Based on the current data and practice guidelines, the following patient groups will see a greater benefit from CABG over PCI:

- Three-vessel CAD and a SYNTAX Score  $>32$
- Diabetics with three-vessel CAD or complex two-vessel CAD with prox-mid left anterior descending (LAD) lesion
- LM  $\pm$  additional vessel CAD with SYNTAX Score  $>32$

In addition to expertise in interventional treatment of complex CAD, our Cardiac Catheterization Laboratory serves as a tertiary center for complex coronary intervention (bifurcation, calcified, LM, chronic total occlusion (CTO), and/or vein graft lesions) and patients with low ejection fraction (LVEF  $<35$  percent).

IABP SYSTEM



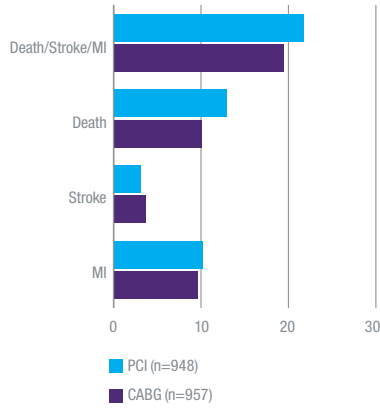
IMPELLA SYSTEM



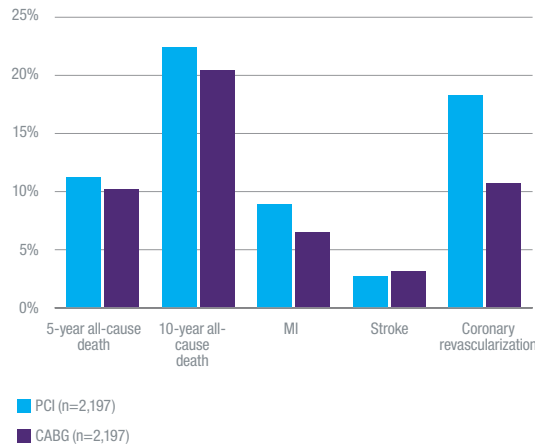
ECMO CARDIOHELP SYSTEM



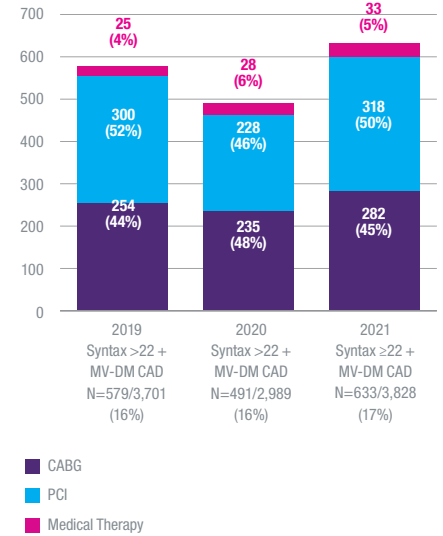
**EXCEL TRIAL: PRIMARY ENDPOINTS AT 5 YEARS**



**CLINICAL OUTCOMES AFTER PCI DES VS CABG IN LM CAD**



**REVASCUARIZATION CHOICES FOR COMPLEX CAD (HIGH SYNTAX SCORE AND/OR MV DIABETES): MSH DATA 2021**



We use a variety of adjunct interventional techniques in these complex coronary cases, such as atherectomy (24 percent of lesions) and thrombectomy/distal protection devices (2 percent for thrombotic and vein graft lesions). In a small number of PCI patients with complex lesions (≈5 percent) and reduced ejection fraction (LVEF <35 percent), we use left ventricular (LV) assist devices such as intra-aortic balloon pumps (IABP), Impella, ECMO CardioHelp, or percutaneous transseptal left ventricular assist (PTVA) to safely and dependably perform these high-risk PCIs (protected PCI).



Scan the QR Code to view an archived case featuring:

**LAD CTO bifurcation with the reversed crush technique**

Performed by Dr. Annapoorna S. Kini and Dr. Parasuram Melarcode-Krishnamoorthy

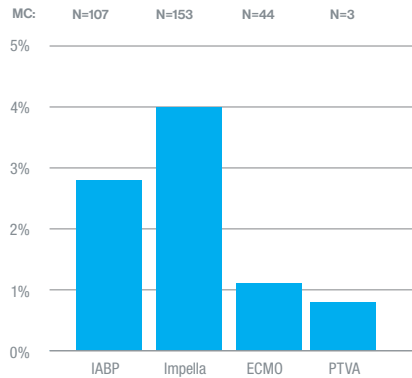


Scan the QR Code to view an archived case featuring:

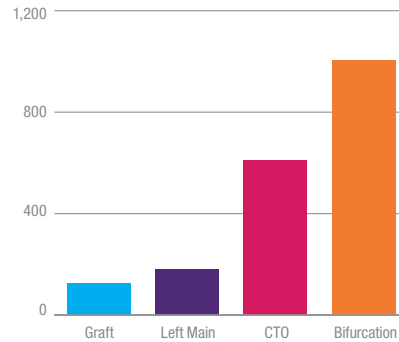
**PCI of tortuous heavily calcified mLAD and D1 using rotational atherectomy and IVL with Impella support**

Performed by Dr. Samin K. Sharma and Dr. Nitin Barman

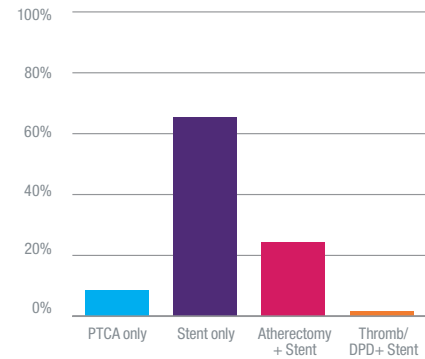
**HIGH RISK PCI WITH LV SUPPORT IN 2021 AT THE MOUNT SINAI HOSPITAL: (N=3,828 PCIs)**



**COMPLEX CORONARY INTERVENTIONS IN 2021 (N=3,828 PCIs)**



**TYPE OF CORONARY INTERVENTIONS IN 2021 (N=3,828 PCIs)**



Lynn Richard



**Diagnosis:** 1v CAD (CTO RCA)

**Treatment:** Successful atherectomy & 2 DES of RCA

"I have Ehlers-Danlos Syndrome, a connective tissue disorder. After more than 30 surgeries, two aneurysms and a rupture, most doctors don't even want to look at me.

"My first heart attack struck while I was staying in Florida in 2014 — a total occlusion of the right coronary artery. I was treated in a hospital there, but the intervention was unsuccessful. They told me they couldn't fix me. My life totally changed; I couldn't even work.

"So, I flew home to Connecticut and underwent an additional series of interventions which were also unsuccessful. I was totally dejected.

**"Since my last operation, I'm able to bike 20 miles a day again, and babysit my grandkids."**

"My daughter told me her best friend's dad had an incredible doctor at Mount Sinai who fixed him when nobody else could. So, I made an appointment. The first time Dr. Sharma looked at my charts, he said, 'I can fix you.' I had three stents put in , into two steps to open the blockage.

"The care I received was incredible. Dr. Sharma, Dr. Kini and the whole staff were extraordinary. I watched when they opened the stents, everybody stopped and clapped.

"In October 2020, a stress test in Florida revealed yet another blockage, but my doctor told me my case was too complex to treat. I

hung up in tears. At 7:48 pm I wrote an email to Dr. Sharma. At 7:56 pm he wrote back, and said, 'you come down here Friday and we will care for you again.' I felt like everything was hopeless, but in that moment Dr. Sharma gave me my hope back.

"Since my last operation, I'm able to bike 20 miles a day again, and babysit my grandkids. I'm retired, but I give vaccinations at the ER now. I feel like I've been given so much, and if I still have things to give, I'll still give."



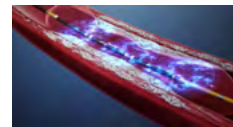
**ROTAPRO ROTATIONAL  
ATHERECTOMY SYSTEM (RA)**



**EXCIMER LASER  
ATHERECTOMY SYSTEM (ELCA)**



**DIAMONDBACK 360 ORBITAL  
ATHERECTOMY SYSTEM (OA)**



**SHOCKWAVE INTRAVASCULAR LITHOTRIPSY (IVL)**

## Birinder Madan

**“I am so thankful to Dr. Sharma for saving my life. He is an outstanding doctor and a miracle worker.”**



**Diagnosis:** Non-STEMI

**Treatment:** Successful PCI of LAD and LCx using atherectomy and 3 DES

“I’ve been seeing Dr. Sharma since December 2007. Over the years, he and I have become close friends. Both of us being from India is a comfort because I know whenever I call him, he can speak to me in my native language. My cousin told me about Dr. Sharma after seeing him himself, and since my first visit, he has been a blessing to me. He saved my life on more than one occasion after I was diagnosed with chronic artery blockage.

“When I was first told I needed open heart surgery in 2007, I was against it and very hesitant because my father had open heart

surgery that came with a difficult recovery. I was also in the middle of running my own business as a CEO and president of a service company with over 80 employees, so I couldn’t afford to take time off for open heart surgery. Dr. Sharma reassured me the operation would be successful and had me back to work just one week after surgery. Dr. Sharma has put in a total of 9 stents during my course of treatments and gave me the ability to work full time until the age of 75. Even though I am technically retired now, I’m still just as active now as I was when I was 30.

“I am so thankful to Dr. Sharma for saving my life. He is an outstanding doctor and a miracle worker.”

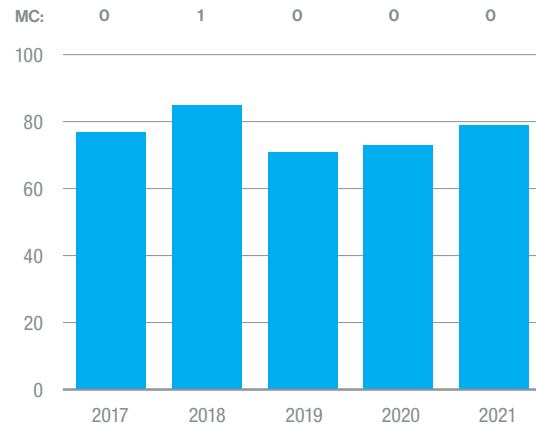


## INTRAVASCULAR BRACHYTHERAPY (IVBT) FOR MULTI-LAYER RECURRENT DES IN-STENT RESTENOSIS

Patients with recurrent in-stent restenosis (ISR) of DES with more than two layers of stents are appropriate cases for IVBT using the Beta-Cath™ System to reduce subsequent restenosis by inhibiting intimal hyperplasia (scar tissue).

Our IVBT data over the last five years have shown excellent acute outcomes with <1 percent major complications (MC), no need for implantation of another stent, and long-term restenosis of <20 percent (compared to 55 percent in comparable recurrent drug-eluting stents (DES) ISR without IVBT) — a reduction of 70 percent compared to routine treatment.

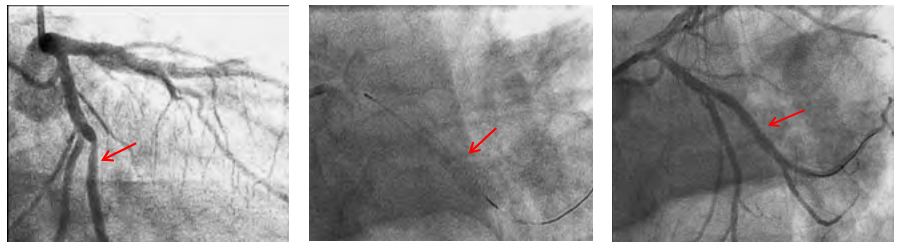
IVBT VOLUME AT THE MOUNT SINAI HOSPITAL



## NOVOSTE™ BETA-CATH™ 3.5F SYSTEM



## INTRAVASCULAR BRACHYTHERAPY TREATMENT



## References

1. Five-Year Outcomes After PCI or CABG for Left Main Coronary Disease (EXCEL Trial), *N Engl J Med* 2019;381:1820
2. Current Status of Rotational Atherectomy, *J Am Coll Cardiol Interv* 2014;7:345
3. Intravascular Brachytherapy for the Management of Repeated Multimetal-Layered Drug-Eluting Coronary Stent Restenosis, *Circ Cardiovasc Interv* 2018;11:e00683

# Expanding the Indications of Transcatheter Aortic Valve Replacement (TAVR)

SAMIN K. SHARMA, MD, AND ANNAPOORNA S. KINI, MD

Multiple trials of transcatheter aortic valve replacement (TAVR) in patients with varying surgical risks (based on STS Score) have shown TAVR as the viable therapeutic option for patients who have severe, symptomatic calcific aortic stenosis (AS) in all surgical risks.

Recently, the PARTNER 3 Trial comparing TAVR vs. surgical aortic valve replacement (SAVR) in low STS risk have shown better results after TAVR vs. SAVR at two years. Hence TAVR is now indicated in majority of patients with severe aortic stenosis.

The NOTION trial, which compared surgical vs. transcatheter aortic valve replacement in low STS risk, showed equivalent results after both strategies. It also showed similar durability of TAVR compared to surgical valve replacement at eight years.

The use of Sentinel Cerebral Protection System (which is an embolic filter designed

to trap calcified and thrombotic deposits that become dislodged during the TAVR procedure) has shown that SENTINEL device is associated with lower risk of brain infarction and stroke rates compared to the control group.

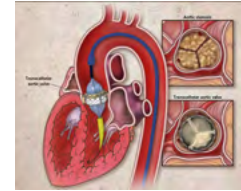
At our center, the SENTINEL device is routinely used during TAVR (~60 percent of cases).

The Mount Sinai Hospital was the first center in the United States to deploy the CoreValve®, in December 2010. Since then, our TAVR volume and outcomes have improved significantly as reported by the TVT registry.

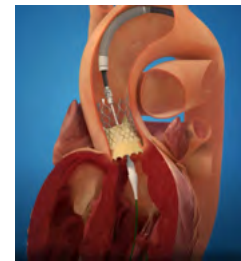
There are some categories of AS patients associated with a higher incidence of complications for TAVR. These patients are best suited to open SAVR.

## TRANSCATHETER AORTIC VALVES FDA APPROVED DEVICES

Sapien



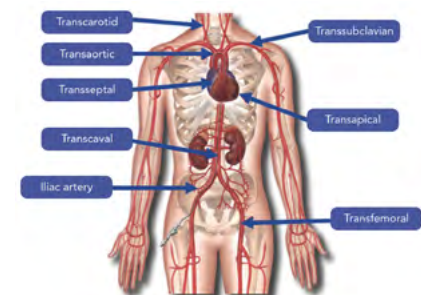
Evolut



Portico



## OVERVIEW OF APPROACHES FOR TAVR



**TAVR STS RISK ASSESSMENT**  
AS RISK STRATIFICATION REDEFINED

Traditional

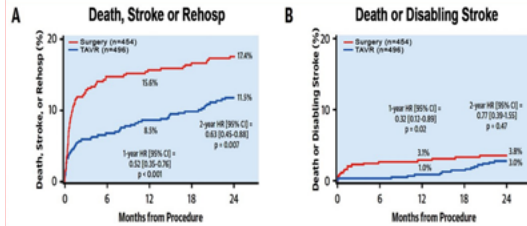


Recent /Contemporary: TAVR for ALL

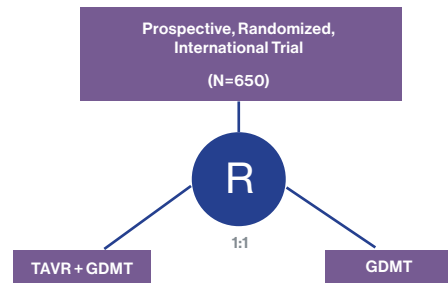


Need to be equipped with open heart surgery and CPB in emergency

**PARTNER 3: TIME-TO EVENT CURVES AND DISEASE-SPECIFIC HEALTH STATUS IN TAVR VS SURGERY THROUGH 2 YEARS**



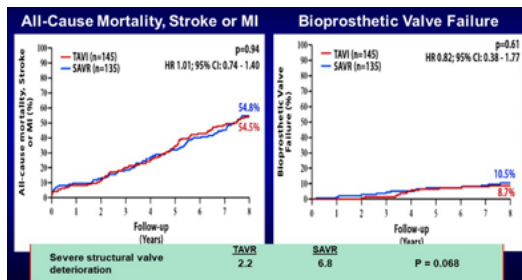
**TAVR EVOLUT™ EXPAND II PIVOTAL TRIAL FOR MODERATE AORTIC STENOSIS**



Clinical Primary Endpoints: Death, Stroke, BARC 3-4 Bleeding, AKI, Rehosp, Re-intervention at 30-day follow up

Primary Effectiveness Endpoints: All-cause Mortality, HF, AVR or Re-intervention at 2 years

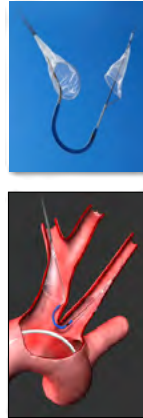
**NOTION TRIAL: CLINICAL AND AORTIC BIOPROSTHETIC VALVE FAILURE AFTER 8 YEARS AFTER TAVR VS. SAVR**



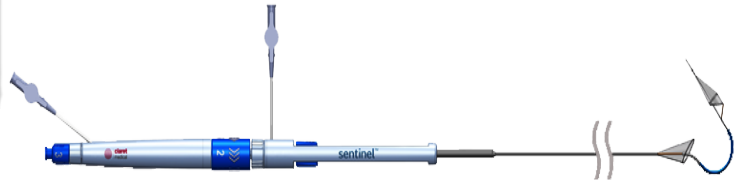
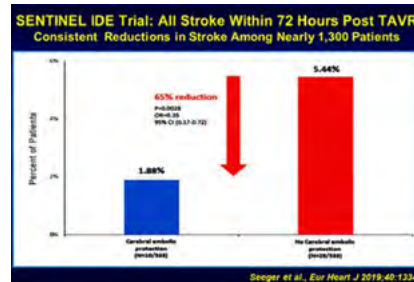
**SAVR will be indicated for patients with these characteristics:**

- Age <65 years old
- Low to intermediate STS risk and extensive/complex CAD
- Bicuspid AV with low STS risk
- Concomitant aortic root/aorta dilatation (>4.6cm)
- Heavy LVOT calcification (high chance of annular rupture)
- Low-intermediate STS risk bio-prosthetic dysfunction
- Adverse anatomy (low coronary height, too small or large annulus)
- Concomitant significant MV disease with low surgical risk

Now that TAVR has proven effective in treating patients with severe AS, the procedure is now being evaluated for patients with moderate AS under the FDA approved clinical trial — TAVR EXPAND II Pivotal Trial.



**SENTINEL® CEREBRAL PROTECTION SYSTEM**



Scan the QR Code to view an archived case featuring:

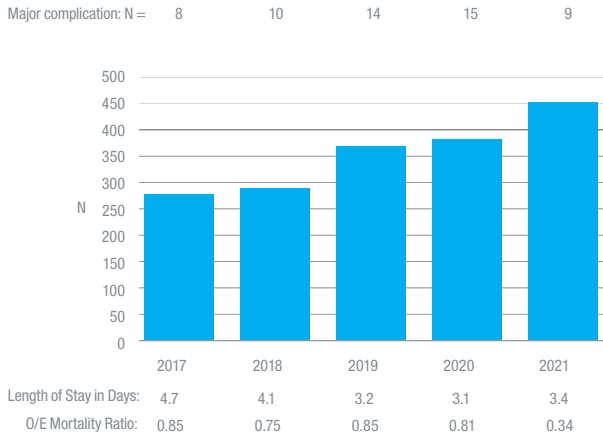
**TF ViV TAVR using 26mm SAPIEN-3 Ultra with Sentinel Cerebral Embolic Protection Device**

Performed by Dr. Samin K. Sharma, Dr. Annapoorna S. Kini, Dr. Gilbert Tang and Dr. Sahil Kherra

References

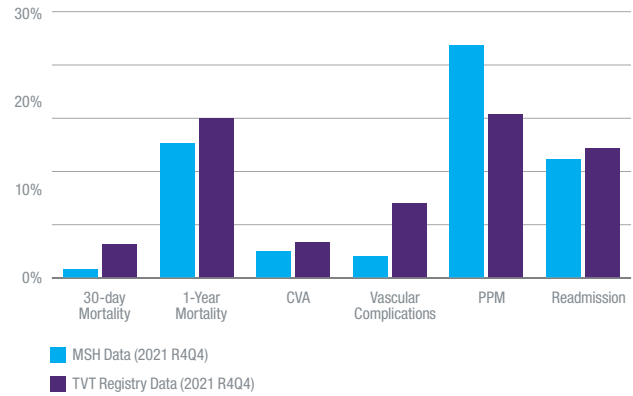
1. Eight-Year Outcomes for Patients with Aortic Valve Stenosis at Low Surgical Risk Randomized to Transcatheter vs. Surgical Aortic Valve Replacement (NOTION Trial), *Eur Heart J* 2021;42:2912
2. Outcomes 2 Years After Transcatheter Aortic Valve Replacement in Patients at Low Surgical Risk (PARTNER 3 Trial), *J Am Coll Cardiol* 2021;77:1149
3. Rate of Peri-Procedural Stroke Observed With Cerebral Embolic Protection During Transcatheter Aortic Valve Replacement: A Patient-Level Propensity-Matched Analysis. *Eur Heart J* 2019;40:1334

**GROWING STRUCTURAL TRANSCATHETER HEART INTERVENTIONS**  
TAVR PROCEDURES AT MSH: 2017 TO 2021



**TAVR OUTCOMES AT THE MOUNT SINAI HOSPITAL 2021**

- 46% Evolut-R CoreValve, 54% SAPIEN-3, 0.4% ACURATE
- 86.5% Conscious Sedation; 13.5% GA
- 93.2% Perc Femoral; 6.8% Cutdown Femoral; 0% Subclavian; 0% Direct Aortic; 0% Transcatheter



Rosalind Egilinsky



**Diagnosis:** Severe calcific aortic stenosis

**Treatment:** Successful TAVR using EVOLUT Pro+ Valve

“Whenever anyone asks how my procedure went with Dr. Sharma, I always tell them that I feel like a new person. Dr. Sharma helped me get back to walking three to four miles a day without the need to stop from being winded. Everyone made my stay at the hospital very comfortable and did a wonderful job of checking in on me.

“At the beginning of my recovery, I was nervous to become active again but slowly regained my strength and confidence. Now, it’s almost like I never even had an operation or needed an aortic valve replacement in the first place.

“There are no scars, no discomfort, and I no longer have any shortness of breath.”

There are no scars, no discomfort, and I no longer have any shortness of breath.

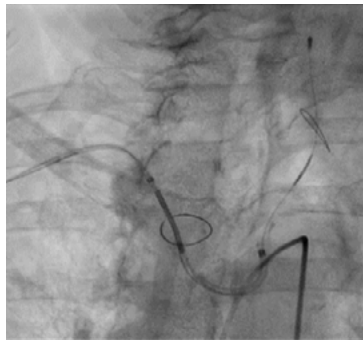
“I’m so grateful for Dr. Sharma and his team. I really can’t thank them enough.”

# Strategies to Reduce Stroke After TAVR

SAHIL KHERA, MD, AND ANNAPOORNA S. KINI, MD

Transcatheter aortic valve replacement (TAVR) for aortic stenosis has been the greatest technological advancement in the field of interventional cardiology in the last decade. Initially intended for high-risk patients and those prohibited from surgery, TAVR has evolved into a mainstream therapy for management of all types of aortic stenosis. It offers patients a shorter hospital stay, early mobility, and immediate symptomatic improvement. Despite the numerous benefits (compared with conventional open heart surgery), stroke risk remains the Achilles heel of TAVR.

Early stroke after TAVR is primarily driven by debris embolization and patient comorbidities. The debris can be calcium, tissue fragments, or thrombus. Comorbidities predisposing patients to higher stroke rate after TAVR are atrial fibrillation, prior history of stroke, chronic kidney disease, peripheral vascular disease, and frailty. The 30-day stroke rate remains around 4 percent in



SENTINEL EMBOLIC PROTECTION DEVICE BEING USED IN A TAVR CASE. THE DEVICE PROVIDES FULL COVERAGE TO 74% OF THE BRAIN VOLUME.



SENTINEL EMBOLIC PROTECTION DEVICE - DISTAL FILTER PROTECTS THE LEFT COMMON CAROTID AND PROXIMAL FILTER PROTECTS THE RIGHT BRACHIOCEPHALIC.

randomized clinical trials and 2–3 percent in national TVT registry data. Stroke is associated with worse quality of life and poor long-term survival.

We at Mount Sinai Structural Heart Program pride ourselves on being one of the highest volume TAVR sites with the lowest stroke rates (<2). This is possible because of our comprehensive

neuroprotection strategy, which involves mechanical, pharmacological, and procedural neuroprotection. The Sentinel embolic protection device (Boston Scientific) is a filter that prevents debris from entering the cerebral circulation. It serves as a mechanical neuroprotection for our TAVR patients. In addition, we adhere to meticulous and detailed procedure planning. We also focus on minimizing

procedure duration and anticoagulation interruption for our patients. All patients deserve the highest quality structural heart interventions that are evidence driven and focus on improving patient satisfaction and quality of life.

#### References

1. Rate of Peri-Procedural Stroke Observed With Cerebral Embolic Protection During Transcatheter Aortic Valve Replacement: A Patient-Level Propensity-Matched Analysis. *Eur Heart J* 2019;40:1334

## Edgar Mallari



**Diagnosis:** 1 Vessel CAD

**Treatment:** PTCA and placement of stent in left circumflex artery

“It started five to six years ago with sharp pain on the left side of my chest. I was an active technician, so I used to move around a lot, but then they put me on a desk job, and when they did, my health began to decline. So I made appointments to have testing done. Both my EKG and stress test came back normal, but I was still in pain.

“One day the pain became so unbearable that I went to the ER, where they kept me overnight to run more tests. Again, everything came back normal. Finally, my cardiologist decided to do an angiogram and discovered a blockage. They took me into surgery, and placed a stent to

## “The entire team was so professional, I was in awe.”

repair the blockage. I felt better right away. But then two years ago I started having pain again. My doctor found another artery blocked so he went back in to place another stent but couldn't. I was awake during the surgery and was in so much pain, and remember my doctor finally saying that he couldn't fix me. After my second procedure, he called me in for a consult and decided to send me to Mount Sinai to see Dr. Sharma, who had been his mentor.

“Two weeks later someone called and scheduled me for my procedure with Dr. Sharma; I was so thankful they could see me so quickly. I was amazed by what

Dr. Sharma could do. The entire team was so professional, I was in awe. When they wheeled me into the operating room I saw the instruments, the people, and the way they worked, and it was incredible. Unlike my previous doctor, Dr. Sharma didn't make me stay awake for the operation, so I wasn't in any pain. Next thing I knew, he was waking me up and said I was done. I went home the very next day at noon. His team is an A team from preparation to finish and Dr. Sharma is a master at his work.”

# TAVRbot: Planned Digital Improvements to Structural Heart Patient Experience

ANNAPOORNA S. KINI, MD, AND ANDRIY VENGRENYUK

The Cardiac Catheterization Laboratory performs more than 450 Transcatheter Aortic Valve Replacement (TAVR) procedures annually, with numbers rising due to broadening FDA-approval to low-risk patients and positive clinical trial findings for both balloon and self-expanding valves. TAVR, as well as several other procedures such as mitral

transcatheter edge-to-edge repair, has a complex process of pre-procedure workups such as an echocardiogram, CT scan, diagnostic catheterization, pulmonary function test, carotid Doppler ultrasound, and transesophageal echocardiogram (TEE). Keeping track of the multiple appointments on different dates and at different locations can feel overwhelming for these patients.

In this era of technology, we are able to more easily expand into the digital space. In the upcoming TAVRbot patient platform, a chatbot will handle simple questions, such as the location of the hospital, while our care team can jump in and chat directly with patients about more intricate clinical questions. An online portal controls automated reminder messages about

SOME OF THE CAPABILITIES PATIENTS WILL HAVE ACCESS TO WITH THE NEW TAVRBOT PATIENT PLATFORM.





upcoming appointments and allows us to send out clinical surveys that can inform our practice. Referring physicians will be updated automatically on the status of their patients, and family members can easily participate as designated points of contact throughout the process.

Structural heart procedures can feel overwhelming, but with more tools for communication and education available to our providers and their patients, we hope to make them more streamlined, inspiring confidence throughout the process.

#### References

1. Mack M, Smith C, et. Al, Transcatheter Aortic-Valve Replacement with a Balloon-Expandable Valve in Low-Risk Patients. *NEJM*. 2019, 380:1695-1705.
2. Popma J, Reardon M, et. Al, Transcatheter Aortic-Valve Replacement with a Self-Expanding Valve in Low-Risk Patients. *NEJM*. 2019, 380:1706-1715.
3. Tang G, Verma S, Bhatt D, Transcatheter Aortic Valve Replacement in Low-Risk Patients. *Circulation*. 2019;140:801–803.

## Rafik Abboud

“Throughout all the years I have been a patient, the staff at Mount Sinai have always been wonderful.”



“In 1990 I had a heart attack while I was living in Staten Island. I was referred to Mount Sinai and have been a patient for the last 15 years. Mount Sinai is still my primary cardiac care provider because I like to stay with the same place when I’m receiving good care.

“Recently, Dr. Kini operated to repair my mitral valve with a MitraClip. My stay in the hospital after the procedure was only

one night. Recovery happened fast; I felt the difference just four weeks later.

“I used to have symptoms that aren’t there anymore. Shortness of breath, and fatigue no longer stop me from being able to take walks around my neighborhood with my wife.”

“Throughout all the years I have been a patient, the staff at Mount Sinai have always been wonderful.

I know I will always receive good care when I put my health in their hands.”

**Diagnosis:** Severe mitral valve regurgitation and chronic systolic heart failure

**Treatment:** MitraClip/TEER

# STEMICathAid in a Large Health System

ANNAPOORNA S. KINI, MD, AND ANDRIY VENGRENYUK

In 2021, The Mount Sinai Hospital Cardiac Catheterization Laboratory piloted the STEMIcathAID application with Mount Sinai Queens, one of its sister hospitals. For the first time since the invention of the pager system, a substantial paradigm shift in STEMI patient care was implemented. A large group of health care providers consisting of members from the Cardiac Catheterization Lab, the Emergency Department, Transfer Services, and Strategic Operations collaborated to modify the existing system process consisting of a web of pagers and phone calls.<sup>1</sup>

Switching to a new digital platform unlocked a number of improvements previously not possible. Key members, such as the on-call Catheterization Laboratory attending and fellow, as well as the transfer coordinator, are instantly and simultaneously alerted to a new potential STEMI alert. A clinical discussion can be held between attendings to get a full picture around the EKG that has been digitally transmitted while an ambulance is dispatched without delay. False alarms are more readily caught before the nursing team and technicians are brought on, reducing potential for burnout, increasing the urgency for alarms that do go through, and helping avoid costly false activations which can be as high as \$700.<sup>2</sup>

SCHEMATIC DEMONSTRATING SOME OF THE COLLABORATIVE EFFORTS THE STEMI CARE TEAM IS ABLE TO PARTICIPATE IN SIMULTANEOUSLY USING STEMICATHAID.



In-hospital mortality has been found to be significantly lower when device time was <90 minutes in a combined cohort of stable and unstable patients, 3.9 percent vs. 12.2 percent for times >90 minutes (p=0.0001)<sup>3</sup>. In contact-to-balloon times between 60 and 180 minutes, there is a near linear relationship where a 10-minute delay for

cardiogenic shock patients results in a 3.31 percent increase in mortality; 0.34 percent in stable STEMI patients. The pilot program has generated some encouraging data. Preliminary indications demonstrate faster overall door-to-device times, the primary metric the American Heart Association's Mission: Lifeline STEMI registry uses

to assess the quality of a center's STEMI care. Through this new digital platform, combined with other traditional quality improvement efforts, we continue to strive for the best possible patient care.

#### References

1. Krishnamoorthy S, Kini A, et. Al. Eur Heart J. – Digital Health. 2021; 2: 189-201
2. Heinrich Scholz, K, et. Al. Eur Heart J. 2018 Apr 1; 39: 1065–1074.
3. Timothy A, et. Al. Circ Cardiovasc Qual Outcomes. 2012; 5: 62-69

## Natashia Belletty



**Diagnosis:** STEMI

**Treatment:** 2 stents, used the STEMIcathAid app

"In October of 2021 I was in a bad car accident. I was sitting in the passenger seat when the accident happened, and something hit me in the chest. Aside from all my other injuries, I had chronic chest pain because of whatever collided with my chest. It felt like an elephant sitting on my chest. Before that, I had never had any heart problems despite it running in my family. My dad had a lot of heart issues, but because I never did, I didn't relate the chest pain to heart complications.

"Then on November 19th I started having severe pains in my chest that began around three in the morning. At first, I thought maybe

something I had eaten for dinner was giving me heartburn, or maybe I had food poisoning because I kept feeling the urge to throw-up. Finally, at 10 am, I called the ambulance and as soon as I got to Mount Sinai and they did a catheterization to see what was going on. The nurse started yelling for an MRI and the doctor. My hands and feet were cold, and my eyes were full of tears. I felt like my body was shutting down while I was laying in the hospital bed.

"Then, Dr. Kini saved me. She put in one stent on the 19th and then a second on the 25th. The team at Mount Sinai saved my life. A

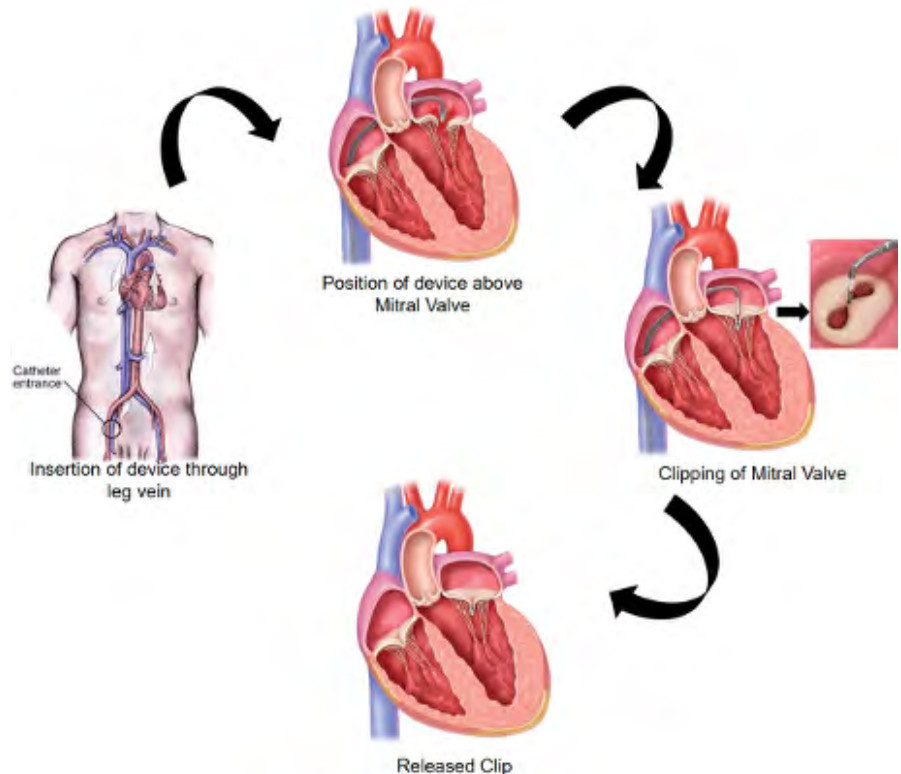
heart attack doesn't tell you when its coming, and I had ignored the signs. It was scary. Now, I would recommend anyone to Dr. Kini because she's wonderful at what she does. The people, and the services at Mount Sinai are so nice. And now when my doctors ask me about my elephant, I tell them it's not there."

# Safety and Indication of Transcatheter Edge-to-Edge Repair (TEER) Using MitraClip

ANNAPOORNA S. KINI, MD, AND PARASURAM MELARCODE-KRISHNAMOORTHY, MD

Valvular heart disease remains an important public health problem, imposing a huge economic burden on health care systems in the United States. Moderate or severe valvular disease is common, impacting 12 percent of the general population, with the prevalence increasing with advancing age. Among all valvular heart diseases, mitral regurgitation (MR) is the most common valvular abnormality, affecting 10 percent of individuals aged >75 years.

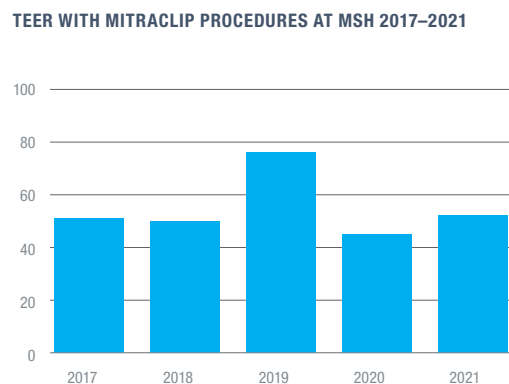
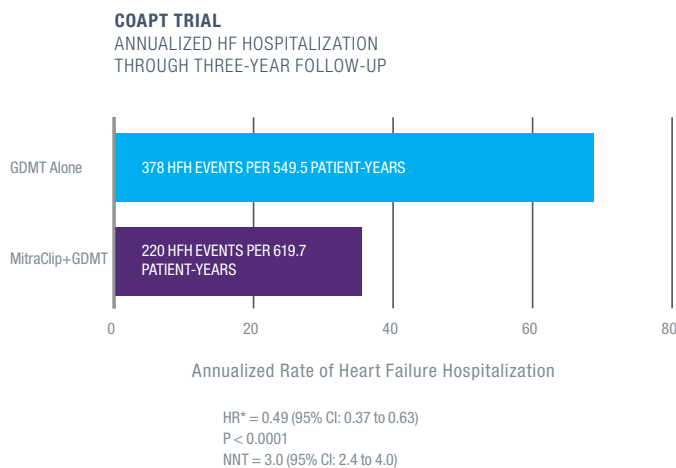
Mitral regurgitation can be classified into primary or secondary functional MR. Structural abnormalities of mitral valve lead to primary MR. Mitral regurgitation due to primary pathology in the left ventricle is called secondary or functional MR. When a mitral valve is determined to have a severe backflow of blood across the valve, the patient's cardiologist will refer them to a structural heart program, where they will have a consult with the structural heart team and several noninvasive studies to determine procedure eligibility and plan for the procedure. Candidacy for the MitraClip procedure is determined by a team and based on a number of factors and tests performed at Mount Sinai. The tests



required are transthoracic echocardiogram (TTE), transesophageal echocardiogram (TEE), and consults with an interventional cardiologist and a cardiothoracic surgeon. Surgical repair would typically restore the mitral valve function and minimize the mitral regurgitation. Transcatheter edge-to-edge repair (TEER) by MitraClip is currently indicated in patients with primary MR who are high risk for mitral valve surgery, and asymptomatic patients with secondary MR despite optimal guideline-directed medical therapy (GDMT). The TEER for primary MR remains the second line therapy for those deemed too high risk for MV surgery as it does not completely eliminate the MR but rather reduces it.

The MitraClip device is a small metal alloy clip covered with a polyester fabric that is implanted on the mitral valve. The MitraClip works by bringing the two leaflets of mitral valve together, which allows the valve to close more effectively and reduce the amount of blood that flows backwards. With TEE and the patient under general anesthesia, the device is implanted using a catheter inserted through the leg vein to the heart. The mitral clip procedure takes about two hours. Usually one to three clips are implanted in the mitral valve during the procedure, until a favorable result is obtained. MitraClip is an extremely safe procedure, but there is very small (<1 percent) risk of death, stroke, heart attack,

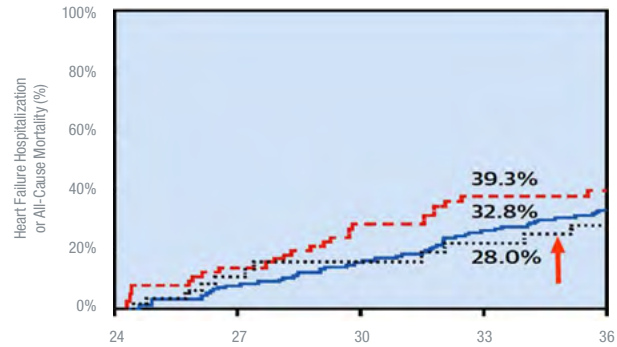
bleeding, vascular injury, clip detachment, and infection. Usually two to three days of hospital stay is required. Patients should begin to feel relief of their symptoms within a few weeks after their procedure. MitraClip, in addition to the current medical therapy, will help improve the management of patients with heart failure. In the COAPT trial, MitraClip has been shown to improve the survival of patients with heart failure with reduced fraction (HFrEF) and reduce their hospitalization due to heart failure. Also GDMT patients who received MitraClip after completion of the trial had similar outcomes as of the original MitraClip patients (arrow).



The Mount Sinai Hospital experience with the MitraClip TEER procedure from 01/2017 to 12/2021 is shown in the figure along with a less than 1 percent complication rate. Strict adherence to our highly effective and cautious protocol, appropriately complemented by post-procedure management, has helped us in optimizing our outcomes.

### COAPT TRIAL

OUTCOMES OF PATIENTS IN THE GDMT GROUP WHO CROSSED OVER TO MITRACLIP VS. WITH THOSE CONTINUED IN GMT ALONE VS. THOSE WITH ORIGINAL MITRACLIP PROCEDURE



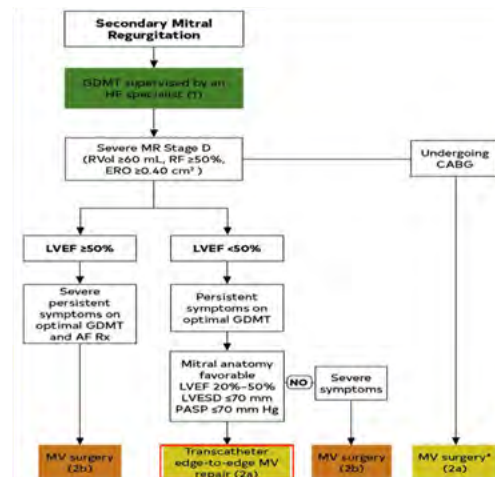
Time After Randomization of Crossover (Months)

Mitra Clip + GMT (n=158)

GDMT Only (w/o Crossover) (n=88)

Crossovers (n=58)

### LATEST GUIDELINE RECOMMENDATIONS FOR MANAGEMENT OF SECONDARY MR





Scan the QR Code to view an archived case featuring:

### **TEER using MitraClip XTW**

Performed by Samin K. Sharma, MD, Annapoorna S. Kini, MD, Gilbert Tang, MD, and Parasuram Melarcode-Krishnamoorthy, MD

#### References

1. Otto C, Nishimura R, Bonow R, et al., 2020 ACC/AHA Guideline for the Management of Patients with Valvular Heart Disease: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. *J Am Coll Cardiol* 2021;77:e25
2. Mack M, Lindenfeld J, Abraham W, et al., 3-Year Outcomes of Transcatheter Mitral Valve Repair in Patients with Heart Failure. *J Am Coll Cardiol* 2021;77:1029

## Betty Crawford

**“The team at Mount Sinai helped to make my recovery easy, and the follow-up process was simple.”**



**Diagnosis:** Severe mitral valve regurgitation and chronic systolic heart failure

**Treatment:** Successful MitraClip/TEER procedure

“About four years ago, I started noticing I was having trouble breathing, even when I was walking. I was concerned and I made an appointment with Mount Sinai right away,” explained Betty Crawford. Betty approached Mount Sinai for answers, and that’s where she met Annapoorna S. Kini, MD.

A diagnostic angiogram revealed severe mitral valve regurgitation and chronic systolic heart failure. Dr. Kini and her team devised a course of action. On November 12, 2021, Dr. Kini performed a successful MitraClip procedure to repair Betty’s mitral valve and improve her quality of life.

“Dr. Kini and her team were very nice and supportive. My recovery was pretty quick and easier than I thought it would be. I still have good days and bad days, but after having my surgery, I have a lot more good days.”

Since her MitraClip procedure, Betty can do more of the things she loves again, like spending a weekend at Atlantic City for her niece’s birthday.

“The team at Mount Sinai helped to make my recovery easy, and the follow-up process was simple. I would recommend Mount Sinai Heart to anyone who asked.”

# AngioAID 3D: A Unique App for our Educational Library

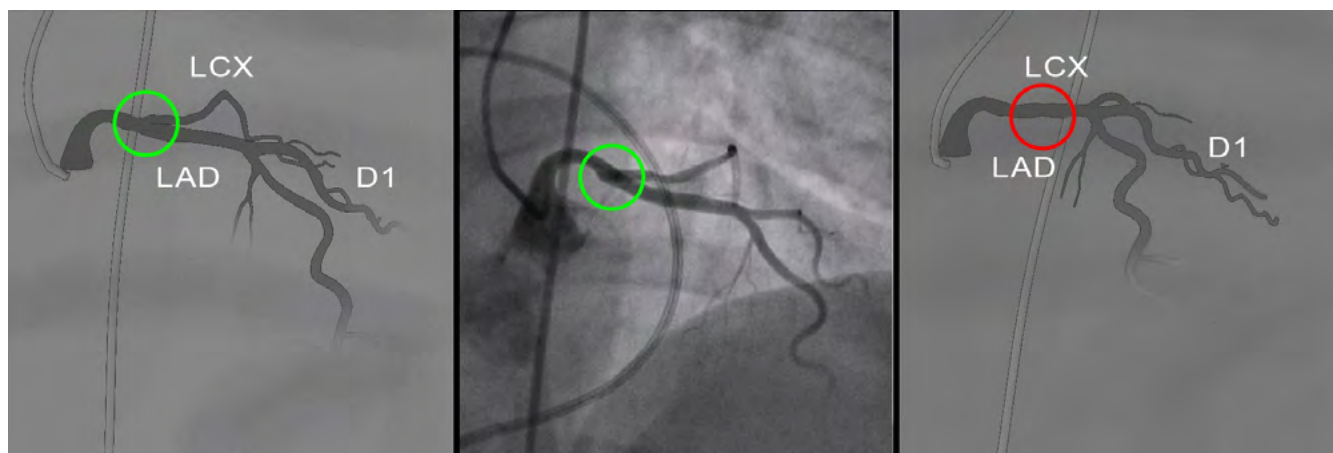
ANNAPOORNA S. KINI, MD, AND ANDRIY VENGRENYUK

Good quality coronary angiography is paramount to the identification and successful treatment of disease. While having to retake an angiographic cine may be as quick and easy as a video on a cellphone, steps must be taken to avoid any unnecessary radiation and contrast dye in the best interests of the patient. Variations in coronary anatomy, the need to visualize the

various vessels in three-dimensional space, and selection of the best views to pinpoint findings that may be under one millimeter, can make the task overwhelming for some new interventionalists in training.

Following our entry into 3D models in the new BifurcAID 3D Application, we wanted to further expand our offerings in technology-based education. Slated to

join an ever-growing portfolio of eight educational applications available on [www.CardiologyApps.com](http://www.CardiologyApps.com), AngioAID 3D will provide a simulated diagnostic cardiac catheterization experience for users to get familiar with concepts like proper catheter engagement, minimizing dye usage, remembering common radiographic views, and recognizing anomalous coronaries.



**PATIENT-SPECIFIC MODEL SHOWING HOW A LOWER-THAN 15 DEGREE ROTATION CAN ENTIRELY OBSTRUCT A KEY AREA OF INTEREST LIKE THE LEFT MAIN BIFURCATION. GREEN SHOWS GOOD IMAGING, RED SHOWS AN OBSCURED VIEW, MIDDLE SHOWS ACTUAL ANGIOGRAM.**

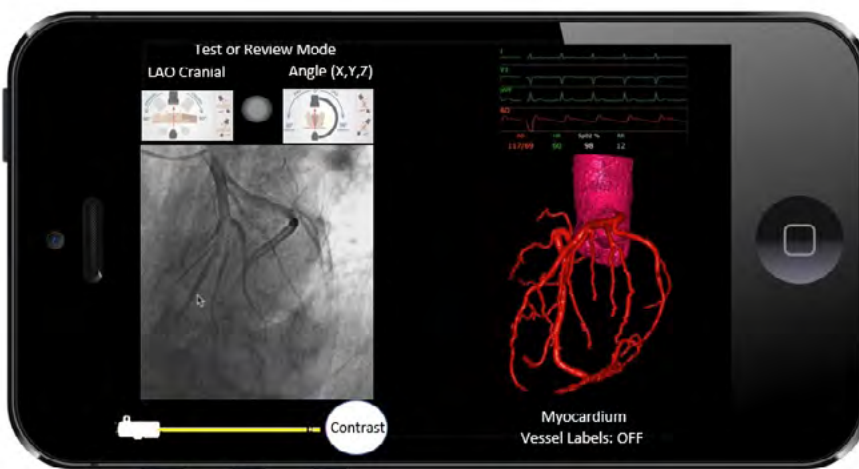
\*IMAGES BASED ON PRELIMINARY PROTOTYPING WORK AND MOCK-UPS.



Zoom, panning, angle, dye injection, and catheter engagement are all variable inputs in the 10 cases.

Users can simulate dye injection in a patient-specific model of the coronary arteries and compare their selected angle to the actual angiograms taken in our Cardiac Catheterization Laboratory. Are the vessels overlapping one another in a way that may obscure potential ischemic disease, thrombus, dissection, or other findings? Does excessive foreshortening give the student a warped perspective of the vessel of interest? Would the interventionalist have to retake the angiogram because a major vessel was out of frame? At the end of the test, when all traditional views have been simulated and collected, users can review their radiation and contrast-based score and compare angiograms to the real ones on file. This contributes to an expanded understanding of angiography.

Visit [www.mountsinai.org/about/social](http://www.mountsinai.org/about/social) to follow our social accounts and make sure you receive a notification when our new applications come out!



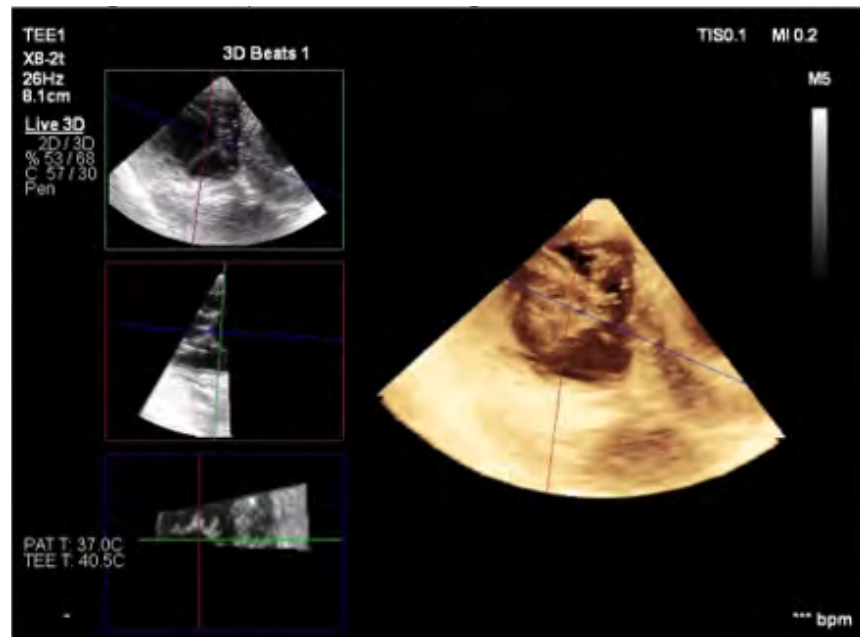
**PROTOTYPE MOCK-UP SHOWING SIMULTANEOUS 3D AS WELL AS RECORDED ANGIOGRAM, CATHETER AND CONTRAST CONTROLS, ANGLE VISUALIZATION, AND HEMODYNAMIC REPRESENTATION.**

# Innovations in Transcatheter Mitral Valve and Tricuspid Valve Interventions

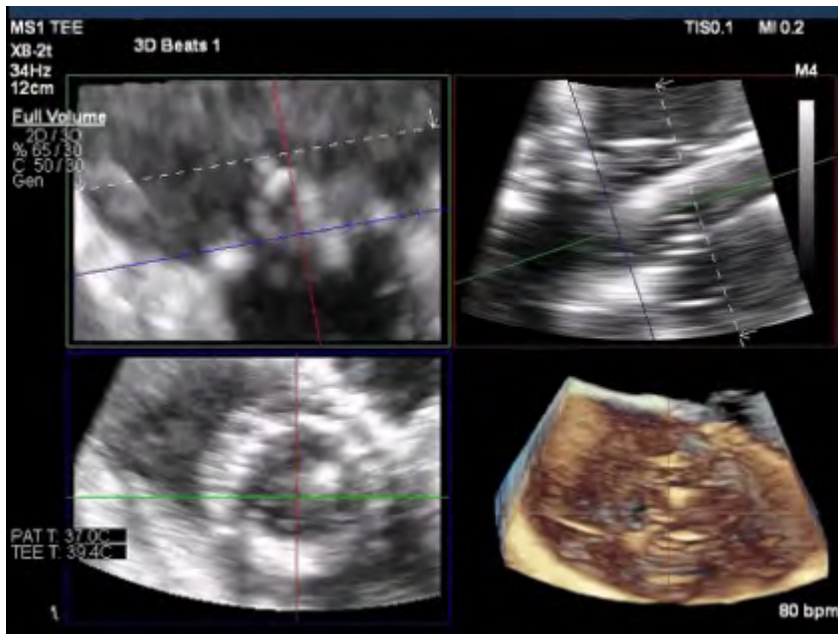
GILBERT H. L. TANG, MD, PARASURAM KRISHNAMOORTHY-MELARCODE, MD, STAMATIOS LERAKIS, MD, AND MALCOLM ANASTASIUS, MD

Transcatheter tricuspid valve interventions have progressed rapidly over the past year to include treatment for symptomatic severe tricuspid regurgitation (TR). The Abbott TriClip system has completed the TRILUMINATE early feasibility study with sustained favorable one-year outcomes in TR reduction, right ventricular remodeling, and improvement in quality of life. The TRILUMINATE pivotal trial, which randomizes patients to optimal medical therapy versus TriClip G4 system repair, is currently enrolling patients, and Mount Sinai is one of the leading sites in the New York area. The Edwards PASCAL tricuspid repair system has begun its pivotal trial as well.

Three-dimensional intracardiac echocardiography (ICE) may improve the ability to image the tricuspid valve during the procedure to improve therapy expansion, and Mount Sinai is one of the leading sites in the country to use



CT RECONSTRUCTION DEPICTING A MEDTRONIC INTREPID TMVR DEVICE FITTING IN A PATIENT'S ANATOMY TO EVALUATE LVOT OBSTRUCTION RISK.



**AN EDWARDS SAPIEN 3 DEVICE IMPLANTED PERCUTANEOUSLY IN NATIVE MITRAL DISEASE WITH SEVERE MITRAL ANNULAR CALCIFICATION (MAC).**

3D ICE in conjunction with transesophageal echocardiography (TEE) to guide transcatheter tricuspid interventions. Transcatheter tricuspid valve replacement (TTVR) for native disease has seen growing clinical experience with the Medtronic Intrepid and Edwards Evoque devices showing favorable 30-day and six-month outcomes, but high pacemaker rates and bleeding issues, as well as a need for anticoagulation and unknown risk of valve thrombosis, will make this more of a complementary therapy to transcatheter tricuspid repair in patients who are not anatomically suitable for repair.

# Atrial Septal Defects / Patent Foramen Ovale

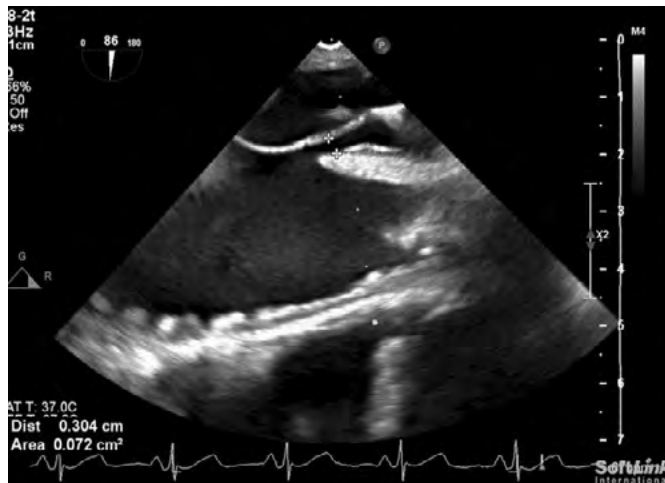
SAHIL KHERA, MD, AND PARASURAM MELARCODE-KRISHNAMOORTHY, MD

Atrial septal defects (ASD) are birth defects leading to a hole that separates the upper chambers of the heart. In the United States, 1 in every 1,800 babies are born with an ASD. Genetic and environmental factors are often implicated. In many cases, these defects are not recognized until later in adult life, when patients present with difficulty breathing, exertional shortness of breath, palpitations, swelling of legs,

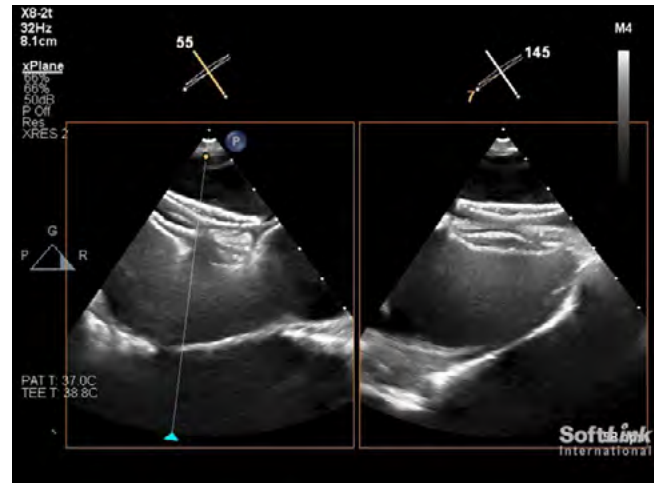
or stroke. ASDs may also lead to dilation of the right-sided chambers of the heart without causing any symptoms. Some patients may also need a cardiac CT scan or cardiac MRI for further evaluation of these defects. They can be managed either surgically or percutaneously using a transcatheter approach.

A patent foramen ovale (PFO) is a small tunnel-like opening between the upper

chambers of the heart. A normal part of fetal circulation, it is present in everyone before birth, typically closing soon after birth. However, it remains patent (open) in 25–30 percent of the adult population. In some patients, PFOs can have abnormal blood flow and serve as conduits for blood clots. These clots travel from the right side to the left side of the heart, and can lead to strokes if they make their way to



PATENT FORAMEN OVALE IN A YOUNG PATIENT WITH RECENT STROKE



AFTER TRANSCATHETER CLOSURE OF THE PFO

the brain's blood vessels. These defects can be percutaneously closed after careful evaluation of the presenting history and the echocardiogram.

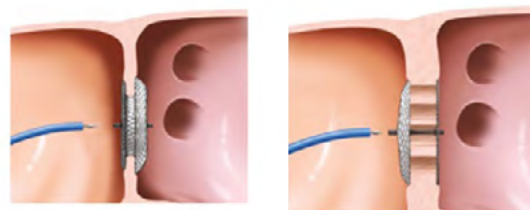
Our structural heart program has extensive experience in managing patients with structural defects like ASDs or PFOs. We currently offer two commercially available transcatheter closure devices — Gore Cardioform and Abbott Amplatzer. When a patient is referred, our team will determine if any further testing (right heart catheterization, transesophageal echocardiography, cardiac CT, or cardiac MRI) is indicated. During the procedure, the closure device is delivered to the heart via a catheter through a tiny incision in the right groin vein. The procedure time is 15 minutes to an hour depending on the complexity of the case, and most of our patients go home the next day. Patients can return to regular activity soon after.



**GORE CARDIOFORM CLOSURE DEVICES**



**ABBOTT AMPLATZER SEPTAL OCCLUDERS**



# Percutaneous Bypass for Critical Limb Ischemia

PRAKASH KRISHNAN, MD

Critical limb ischemia (CLI) is a severe blockage of blood vessels to the legs, resulting in reduced blood supply. This condition has far-reaching socioeconomic and quality of life implications, and can even impact patient survival.

Consistent patient preference for a minimally invasive approach, along with a high rate of complicating comorbidities, continue to drive physicians toward an endovascular-first approach. With the advent of modern percutaneous techniques, including retrograde access, distal vessel angioplasty, and arterial strategies that consider angiosome and wound implications, the ability to treat CLI has made remarkable progress.

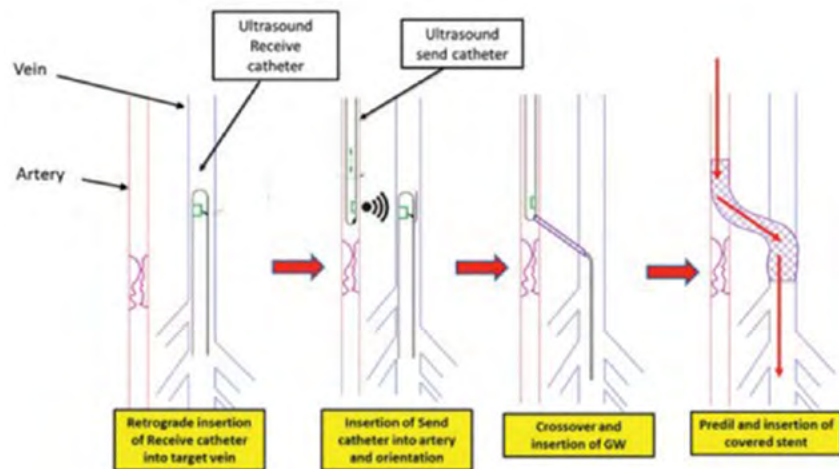
Patients with CLI who arrive at the Cardiac Catheterization Laboratory are increasingly older, have more severe complications of diabetes, and often have had previous, sometimes multiple interventions. It is common to see patients present with “desert

foot,” a severe case of peripheral artery disease (PAD), where there is no accessible vessels for bypass or intervention. These patients are traditionally coined “no-option” end-stage CLI cases. Stem cell therapy may offer some promise but is still in a relatively early phase of evaluation.

## DEEP VENOUS ARTERIALIZATION

Deep venous arterialization (DVA) is not a new concept. It involves shunting arterial blood to the deep veins. Early surgical attempts and more recent surgical series have shown varying results.

FIGURE 1: OVERVIEW OF THE LIMFLOW APPROACH TO PERCUTANEOUS DEEP VENOUS ARTERIALIZATION.



The concept of DVA using a completely percutaneous approach (Figure 1), called percutaneous deep venous arterialization (PDVA), has achieved promising initial angiographic and clinical success (1–2).

### ELIGIBLE PATIENTS

All patients who are candidates for this procedure were deemed “end stage” with no remaining conventional open or endovascular options as verified.

### DEVICE OVERVIEW AND TECHNIQUE

The LimFlow device consists of a 7-F arterial catheter, a 5-F venous catheter, and a console to facilitate the crossing procedure with a needle (Figure 2 and Figure 3).

FIGURE 2: VENOS “RECIEVE” CATHETER

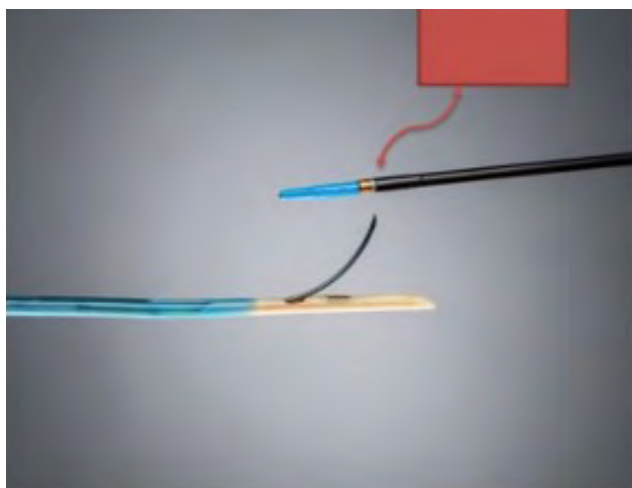
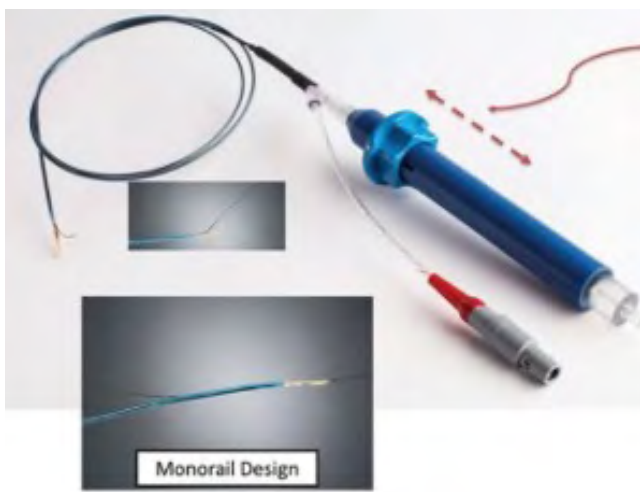


FIGURE 3: ARTERIAL “SEND” CATHETER



Scan the QR Code to view an archived case featuring:

**Complex multilevel intervention for critical limb ischemia**

Performed by Dr. Prakash Krishnan, Dr. Karthik Gujja and Dr. Vishal Kapur

An antegrade arterial 7-F sheath and a retrograde posterior tibial vein 5-F sheath are both placed under ultrasound guidance.

Control angiography is performed to show the crossover point, the area where a needle from the arterial catheter is anticipated to traverse into the vein. (Figure 4 A, B, C). A proprietary reversed valvulotome is used

to disrupt the valves to allow uninhibited proximal-to-distal blood flow (Figure 5).

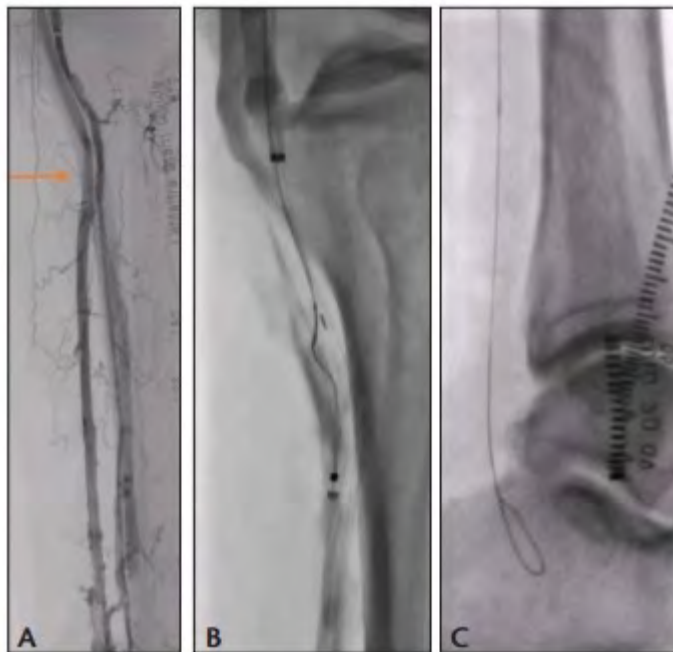
The immediate angiographic result is shown in Figure 6.

#### DISCUSSION AND SUMMARY

Early angiography results are excellent, with satisfactory improvement of symptoms.

Percutaneous DVA represents a new concept

in perfusing the foot by routing blood into the deep venous circulation. This technique represents a novel way to percutaneously treat the “no-option” end-stage CLI patient.

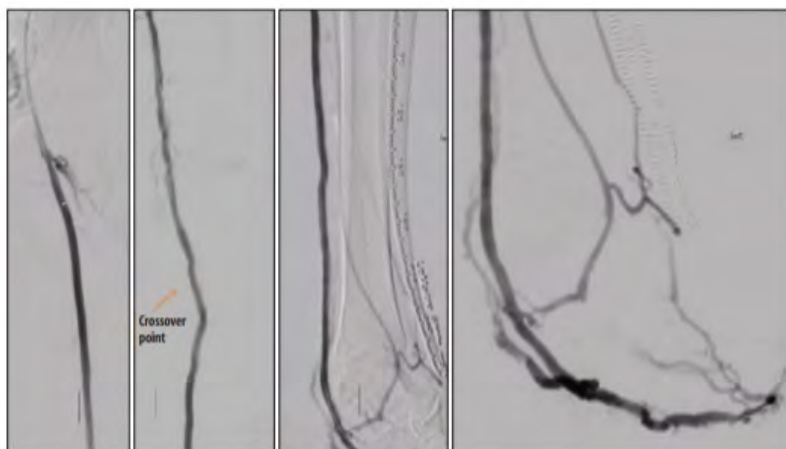


**FIGURE 4: SIMULTANEOUS “DOUBLE INJECTION” THROUGH THE 7-F ARTERIAL CATHETER AND 5-F VENOUS SHEATHS, SHOWING THE IDEAL CROSSOVER POINT (ARROW), WHICH IS THE AREA WHERE THE NEEDLE FROM THE ARTERIAL CATHETER IS ANTICIPATED TO TRAVERSE INTO THE VEIN (A). THE CROSSOVER PROCEDURE. A 0.014-INCH WIRE IS DRIVEN INTO THE VEIN FROM THE ARTERY AFTER ALIGNMENT OF THE CATHETERS WITH ULTRASOUND SIGNALS (B). SENDING THE GUIDEWIRE PAST THE VALVES (C).**



**FIGURE 5: ANGIOGRAM OF THE FOOT SHOWING PLACEMENT OF THE REVERSE VALVULOTOME.**





**FIGURE 5: ANGIOGRAM SHOWING THE RESULTS IMMEDIATELY AFTER THE PROCEDURE WAS COMPLETED. THE PLANTAR VENOUS ARCH IS OPACIFIED.**

#### References

1. Mutirangura P, Ruangsetakit C, Wongwanit C, et al. Pedal bypass with deep venous arterialization: the therapeutic option in critical limb ischemia and unreconstructable distal arteries. *Vascular*. 2011;19:313-319.
2. Schreve MA, Minnee RC, Bosma J, et al. Comparative study of venous arterialization and pedal bypass in a patient cohort with critical limb ischemia. *Ann Vasc Surg*. 2014;28:1123-1127.

## Jane Tark



**Diagnosis:** Critical limb ischemia with impending gangrene and limb loss

**Treatment:** Complex multilevel intervention of leg arteries

"I have arteriosclerosis in my leg, have had several angioplasties and a bypass surgery on my leg. I've been struggling with blockages in my legs for years. It would make walking difficult, and I would have pain in my legs. Even after numerous treatments, nothing had worked, and I was still in pain.

"Rather than attempting another angioplasty, my doctor recommended me to Mount Sinai for the operation. During the procedure, I had a blood clot, so they had to stop the surgery. After

## "Thanks to Dr. Krishnan, I'm able to walk without pain."

receiving a round of medication to remedy the clot, I stayed in the hospital overnight. The next day they brought me back to the operation room and completed the procedure. After my surgery, I only stayed in the hospital for about four days before I went home.

"Mount Sinai is very good hospital and everyone who helped me was really great. The staff was very attentive during my stay, both when I had the blood clot, and during the four days before I went home.

"Thanks to Dr. Krishnan, I'm able to walk without pain. Having the angioplasty at Mount Sinai definitely improved my health. I can keep up with my grandson, who will be on the move even more now that he's almost two years old, and soon I'll be keeping up with two because another grandchild is due this summer."

# Impact of Radiation Exposure Measurable in the Cardiac Cath Lab

JOSEPH SWEENEY, MD, AND DEREK PINEDA, NP

Procedures and treatments in the Cardiac Catheterization Laboratory have evolved greatly in treating both coronary artery disease and structural heart disease. Utilization of X-ray fluoroscopy has allowed the field of interventional cardiology to expand minimally invasive treatments of numerous cardiac disease states. However, at high levels, this radiation exposure can be associated with molecular-level effects on human tissue to both patients and exposed medical personnel.

Given the possible effects of ionizing radiation, The Mount Sinai Cardiac Catheterization Laboratory strives to minimize radiation exposure during invasive cardiac procedures. Through the collaborative effort between the Mount Sinai Radiation Safety Office and the Cardiac Catheterization Laboratory, a unique and comprehensive protocol, which monitors radiation doses intra-procedurally, has been developed, along with an education and monitoring program for those patients who are exposed to substantial radiation doses during their procedure. Through these protocols, an increase in radiation safety awareness has been established, as well as the vigilance to limit the radiation dose used to as low as reasonably possible.

TABLE 1

SUGGESTED VALUES FOR FIRST AND SUBSEQUENT NOTIFICATIONS AND THE SRDL

Dose Metric	SRDL
Peak skin dose (Gy)	3
Air kerma (Gy)	5
Dose area product (Gy cm <sup>2</sup> )	500
Fluoroscopy time (min)	60

Following the guidelines from the National Council on Radiation Protection and Measurements (NCRP), our team of physicians, fellows-in-training, advanced practice providers, nurses, and cardiovascular technicians monitor, in real time, the Air Kerma (AK) at the interventional reference point, the Dose Area Product (DAP), and Fluoroscopic Time (FT) on all patients who undergo fluoroscopically guided procedures.

Although the risks of radiation associated skin damage is rare, we educate and inform all patients prior to their cardiac procedure regarding the use of ionizing radiation and the potential for a significant, yet clinically necessary dose to be delivered. For those

patients whose radiation dose crosses our pre-determined safety thresholds (Table 1), our post-procedure care providers educate the patients on the potential radiation effects and skin changes and arrange clinical follow-up as necessary.

Our proceduralists continue to perform complex procedures. By deploying a multi-faceted monitoring program, The Mount Sinai Cardiac Catheterization Laboratory aims to reduce associated radiation risks even further.

#### References

1. Hirshfeld, JW et al. ACC/HRS/NASCI/SCAI/SCCT Expert Consensus Document on Optimal Use of Ionizing Radiation in Cardiovascular Imaging: Best Practices for Safety and Effectiveness. J AM Coll Cardiol. 2018;71:e283-351
2. Mahesh, M. NCRP 168: Its Significance to Fluoroscopically Guided Interventional Procedures. Am Coll Radiol. 2013; 61:551

## Arlene Richman



**Diagnosis:** MI (Myocardial Infarction)

**Treatment:** Emergent PCI; STEMI

“At 4 am on September 29, I was experiencing pain in my chest, left arm, and armpit. I was scared it was a heart attack because my mother had died from a heart attack; 40 years ago she walked into the emergency room and never left. I took myself to the ER — I didn’t call an ambulance because I’ve had other procedures at Mount Sinai before and didn’t want to go anywhere else.

“My bloodwork was inconclusive, so I took a stress test. After reading the EKG, the physician told me I had just had a heart attack. Within a minute of screening, Joseph Sweeny, MD, was there and I was

## “I’m blessed that Dr. Sweeny was my surgeon.”

being rolled to the cardiac cath lab — I had a complete blockage of the main artery. I stayed at the hospital for two nights. I was there alone, which can be frightening, but Dr. Sweeny and his staff were so comforting.

“The day after my surgery, an echocardiogram showed low levels, which meant they may need to implant a defibrillator if my numbers didn’t get better. Before I left the hospital, I was given an external defibrillator to wear for three months. The staff were always great at following up with me — and after three months, my numbers had improved.

“I don’t think everybody has the same compassion as Dr. Sweeny. He really is a great doctor and treated me like I wasn’t just another number — I think that aided in my recovery. I could tell he really cared. He is not only extremely competent and knowledgeable, but it’s his whole approach and character are reassuring.

“I feel lucky that Dr. Sweeny was the on-call surgeon the day I went to the ER. I owe my life to him; I can’t be more appreciative. I’m blessed that Dr. Sweeny was my surgeon.”

# Antithrombotic Therapy in Interventional Cardiology: Latest Advances in The Field

GEORGE DANGAS, MD

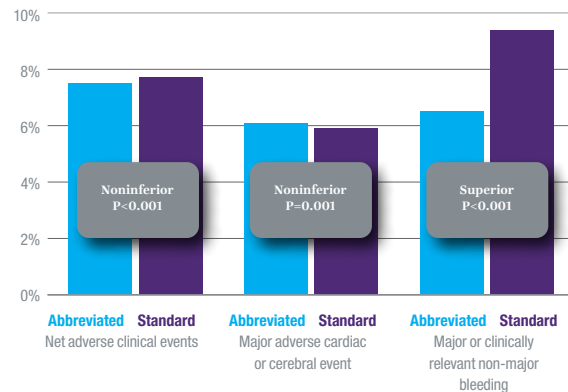
Despite significant advances in coronary revascularization and valve repair procedures, patients remain at high risk for ischemic and bleeding complications. Landmark clinical trials have been published this year in the field of adjunctive pharmacotherapy aimed at preventing these post-procedural adverse events. The MASTER DAPT trial was the first study to evaluate a short-duration dual antiplatelet therapy (DAPT) regimen in high-bleeding risk (HBR) patients undergoing percutaneous coronary intervention (PCI). Following one-month DAPT after PCI, patients were randomized to either a single antiplatelet therapy (SAPT) or to a DAPT for at least five additional months. At one-year follow-up, the SAPT strategy was similar to DAPT in preventing adverse cardiac events and was associated with a significant decrease in bleeding complications (Figure 1). This new evidence, along with recently published trials, indicate that a short DAPT course followed by P2Y12 inhibitor monotherapy is a safe and efficacious bleeding avoidance strategy and was recently endorsed by

the 2021 American College of Cardiology Revascularization Guidelines. As for chronic maintenance therapy beyond the initial high-risk period after PCI, the HOST-EXAM trial showed that clopidogrel alone after 6–18 months DAPT decreases the risk of bleeding and ischemic events in patients who had undergone PCI, as compared with aspirin alone.

Regarding the optimal choice of blood thinners after transcatheter aortic valve replacement (TAVR), the ATLANTIS trial revealed that apixaban does not offer any additional advantages over the current standard of care in patients with or without an indication for oral anticoagulation with respect to the occurrence of ischemic and bleeding events. These findings, coupled with the results of previous trials, suggest that aspirin should

remain the drug of choice in the absence of indications for DAPT (i.e., coronary stenting) or oral anticoagulation (i.e., atrial fibrillation). Lastly, the ENVISAGE TAVI AF trial revealed that edoxaban is as efficacious as warfarin in preventing ischemic complications in patients with atrial fibrillation and undergoing TAVR, despite higher rates of major bleeding (Figure 1).

FIGURE 1: PRIMARY OUTCOMES



References

1. Primary outcomes in the MASTER DAPT trial. Valgimigli M et al., N Engl J Med 2021; 385:1643-1655.
2. Bleeding events in the ENVISAGE TAVI AF trial. Van Mieghem N et al., N Engl J Med 2021; 385:2150-2160.

**FIGURE 2: SAFETY OUTCOMES**  
**NUMBER OF PATIENTS (RATE PER 100 PERSON-YEAR)**

Outcome	Edoxaban (N=713)	VKA (N=713)	Hazard Ratio (95% CI)
Major bleeding*	98 (9.7)	68 (7.0)	1.40 (1.03-1.91) †
Major GI bleeding	56 (5.4)	27 (2.7)	2.03 (1.28-3.22)

\* The ISTH definition was used.

† Noninferiority margin, 1.38; P=0.93 for noninferiority

## Edmond Fitzgerald



**Diagnosis:** Aortic tear

**Treatment:** Emergent life-saving complex, transcatheter aneurysm repair – followed by an adjunct bypass of left subclavian artery per the Vascular Surgery Team in a collaborative set-up.

**“If Dr. Dangas hadn’t moved as quickly as he did when I first arrived at the hospital, I wouldn’t have made it.”**

“I’ve had five siblings need an aortic valve dissection, so when the EMT told me the pain I was experiencing was just sciatica, I knew better. It was early Sunday morning when I got up to use the bathroom, noticed some discomfort in my leg, and felt like something was off. While my wife called 911, I was on the phone with my doctors at Mount Sinai and as soon as we arrived, my primary doctor and Dr. Dangas were waiting for me. After running some tests, they determined it was an extensive aortic tear and rushed me to surgery. While repairing the descending tear, two sleeves were used rather than one due to the length of the laceration.

“The night after my surgery, I pressed the call button because I was having pain in my arm. Shortly after the nurse came in and checked everything, I was wheeled back into surgery to have a stent put in.

“I stayed in the hospital for a total of seven days and the attentiveness of the staff was wonderful the entire time I was there. If Dr. Dangas hadn’t moved as quickly as he did when I first arrived at the hospital, I wouldn’t have made it.”

# Update in Prediction of Contrast-Associated Acute Kidney Injury

ROXANA MEHRAN, MD

Radiologic procedures utilizing iodinated contrast media are commonly performed worldwide, with almost 280 million procedures each year in the United States alone. However, the use of iodinated contrast media, especially in an interventional setting such as percutaneous coronary intervention, has been historically associated with the risk of contrast-associated kidney injury (CA-AKI). CA-AKI is defined by a rapid, though often reversible, decline in kidney function, with a concomitant increase in circulating renal biomarkers following contrast media administration, in the absence of any alternative etiology. Several studies have demonstrated a strong association between the occurrence of CA-AKI and long-term impairment of renal function, need for renal replacement therapy, prolonged hospital stay, and mortality. Clinical research has long been striving to identify preventive strategies for patients at risk of CA-AKI, but often with negative results. Hydration, both before and after the procedure, remains the single most important measure to prevent

CA-AKI, and adequate risk assessment is key to limit the occurrence of CA-AKI.

Based on the experience gained from our high-volume tertiary-care center, our group developed an updated, contemporary, and user-friendly tool to quantify the risk of CA-AKI after percutaneous coronary intervention at bedside. We showed that by using only preprocedural baseline variables that are readily available, we can accurately predict the risk of CA-AKI. Elderly patients, as well as those with congestive heart failure, impaired renal function, or acute myocardial infarction, exhibited the highest risk of developing this complication. Conversely, procedural factors, such as the amount of contrast media, only had a marginal impact on the overall performance of our risk score. These features altogether make this novel risk score very practical and facilitate its implementation in daily practice.

From the clinician's perspective, identification of high-risk patients prompts an increased level of care and timely

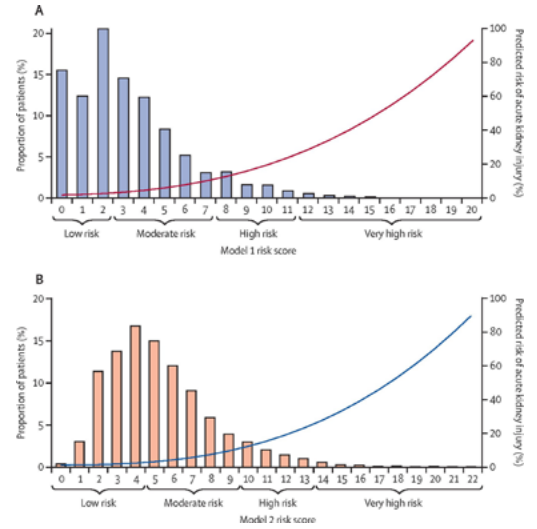
initiation of adequate preventive strategies that may significantly reduce the risk of CA-AKI. In the case of low-risk patients, CA-AKI prevention measures may be abbreviated. In conclusion, our risk score will help in a tailored approach aimed at applying appropriate CA-AKI preventive measures based on each patient's risk profile.

## References

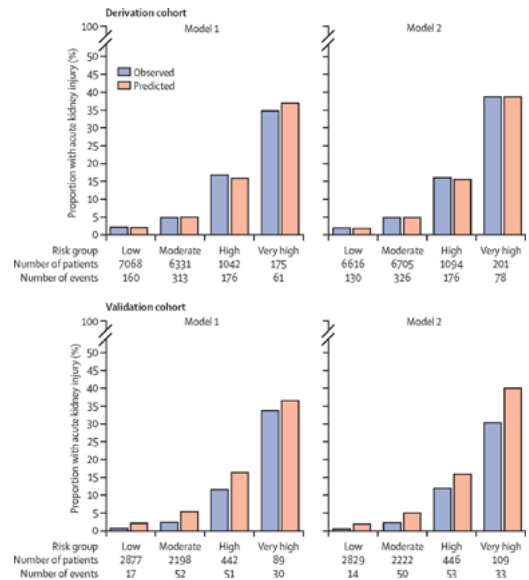
1. Mehran R., et al. *Lancet*. 2021 Nov 27;398(10315):1974-1983. doi: 10.1016/S0140-6736(21)02326-6.
2. Mehran R., et al. *J Am Coll Cardiol*. 2004 Oct 6;44(7):1393-9. doi: 10.1016/j.jacc.2004.06.068

Clinical Features		Integer Score
Presentation	Asymptomatic or stable angina	0
	Unstable angina	2
	NSTEMI	4
	STEMI	8
eGFR, mL/min/1.73 m <sup>2</sup>	≥60	0
	30–59	1
	<30	4
Left ventricular ejection fraction <40%		2
Diabetes mellitus	No diabetes	0
	Non-insulin-treated	1
	Insulin-treated	2
Haemoglobin <11 g/dL		1
Basal glucose ≥150 mg/dL		1
Congestive heart failure on presentation		1
Age >75 years		1

**TABLE 1: PREDICTIVE FEATURES OF CA-AKI AND THEIR ASSOCIATED INTEGER SCORE**



**FIGURE 1. RISK OF CONTRAST-ASSOCIATED ACUTE KIDNEY INJURY ACCORDING TO RISK SCORE VALUES. BARS SHOW PROPORTION OF PATIENTS (LEFT AXES), AND LINES SHOW THE PREDICTED RISK OF ACUTE KIDNEY INJURY (RIGHT AXES)..**



**FIGURE 2. OBSERVED AND PREDICTED RISK OF CA-AKI IN THE FOUR RISK GROUPS FOR THE DERIVATION COHORT AND THE VALIDATION COHORT OF THE CA-AKI RISK SCORE.**

# Treating the Expanding PAD Network With the Latest Intravascular Technologies

VISHAL KAPUR, MD, AND RAMAN SHARMA, MD

Peripheral arterial disease (PAD) continues to be an important public health issue and a consistent economic burden on health systems around the world. Patients with PAD have all the same risk factors as those with cardiovascular disease, (i.e. smoking, diabetes, hypertension, hyperlipidemia, etc.) and understandably have a mortality that is driven by cardiovascular cause. However, the PAD population is also troubled by complications of vascular disease, including significantly impaired mobility (intermittent claudication), which can progress to critical limb-threatening ischemia (CLTI) including rest pain, non-healing wounds/ulcers, and gangrene, which in some cases may require amputation.

Mount Sinai Heart's Endovascular Division has recognized the risk associated with this population and continues to expand its outpatient services to identify these patients and provide the appropriate treatments. Our team is currently seeing patients in Manhattan, Queens, Brooklyn, Staten Island, Scarsdale, and Yonkers. Providing consultations for PAD patients, establishing the necessary noninvasive testing (arterial ultrasounds and ABI testing), and identifying the patients who need more than

medical therapy to treat their disease are integral components to our services.

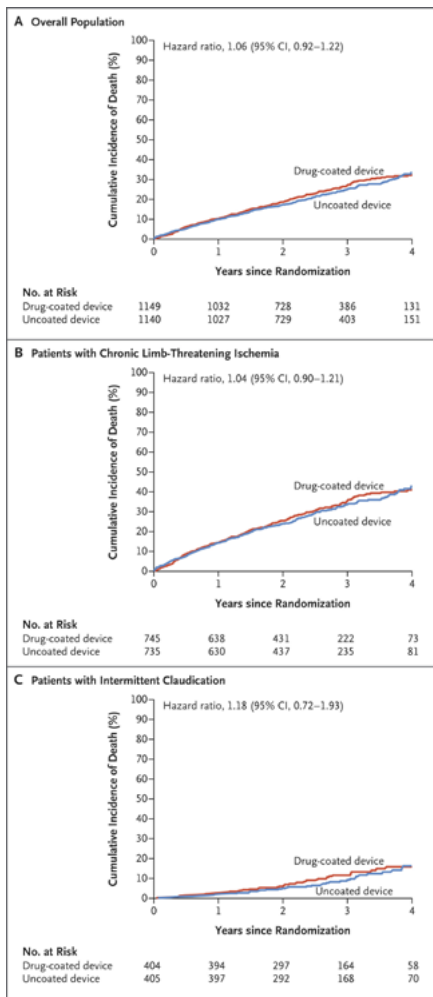
For patients who require endovascular interventions, we provide a spectrum of well-established treatment options. Our division has the expertise in performing >1,000 arterial and >2,000 venous interventions a year. In addition, the Endovascular Division has been a leader in the country in integration and usage of the latest technologies for maximal benefit to the patient. One such example is the use of Shockwave Intravascular Lithotripsy (IVL). This unique technology involves the use of sound waves (similar to ones used in kidney stones) in the treatment of heavily calcified aortoiliac, femoro-popliteal disease, and infrapopliteal tibial vessels disease. IVL fractures superficial and deep calcium through the shockwaves emitted from generators on the device, which allows for safe luminal gain with very low rates of complication.

In addition, we have been a part of a trial to study the effects of use of bioabsorbable stents in the infrapopliteal vessels. We are also the leaders in the use of drug-coated balloon technology and its usage in patients,

thereby decreasing the use of stents in the lower extremities without compromising long-term benefits. Advancements in balloon technology can be highlighted with use of the Serranator PTA Balloon, which provides another new approach to treating infrapopliteal tibial disease. Equipped with serrated blades, this balloon provides excellent luminal gain and freedom from reintervention at six months, and most importantly, also has a low bailout stent rate. In the most complex cases of CLTI, where there is no clear arterial vessel to revascularize, deep venous arterialization can be performed. A conduit is created from a proximal tibial artery to a tibial vein, and covered stents create a pathway for blood to reach the foot, thereby saving the patient from a major amputation.

Our Endovascular Division at Mount Sinai Heart is continuing to expand, and providing our patients with the full scale of our services, from maximizing medical therapy to employing the most cutting-edge technologies to prevent the debilitating complications of PAD.





# Invasive Therapy for Vulnerable Plaque

PEDRO R. MORENO, MD

Despite major advances in diagnosis and therapy, the fight against coronary plaque rupture and thrombosis is far from over. The vulnerable plaque (VP), a lipid-rich, thin-cap fibroatheroma, is the most common source for acute coronary syndromes (ACS). Detailed intravascular imaging after intense LDL-Cholesterol therapy demonstrated morphologic reduction of vulnerability. Nevertheless, even after the most aggressive pharmacologic therapy, recurrent coronary events are devastating. Therefore, for these resistant lesions, which account for approximately five percent of all non-obstructive plaques, a more aggressive approach is necessary to prevent fatal and non-fatal ACS.

Experimental and human studies (1) demonstrated that metallic, drug-eluting stents or bio-resolvable vascular scaffolds (BVS) would result in thickening the fibrous cap with significant reduction of the necrotic core (See Figure). Consequently, coronary stenting will eliminate crucial features of vulnerability, stabilize lesion morphology, and possibly prevent progression to plaque rupture and thrombosis. However, stenting VP may trigger complications such as peri-procedural MI, stent thrombosis, neo-atherosclerosis, and restenosis. Only

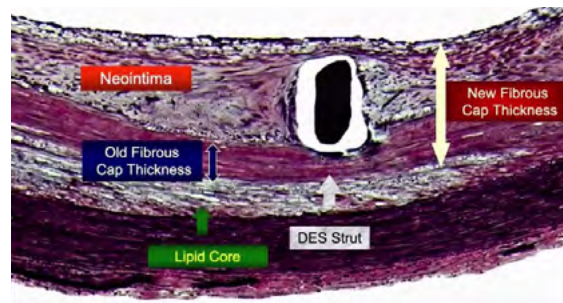
a randomized trial could estimate the risk/benefit of stenting vulnerable plaques.

The Prospect-Absorb trial (2) included 182 patients with non-obstructive VP, as characterized by IVUS and Near-Infrared Spectroscopy. VPs were randomized to Absorb-BVS + guideline-directed medical therapy (GDMT) vs. GDMT alone. The primary endpoint was IVUS-derived minimum luminal area (IVUS-MLA) at two years. Target-lesion failure and (non-powered) major adverse cardiac events (MACE) were also tested. IVUS-MLA was superior in BVS-treated lesions when compared with GDMT alone — treated lesions ( $6.9 \pm 2.6 \text{ mm}^2$  vs.  $3.0 \pm 1.0 \text{ mm}^2$ ;  $p < 0.0001$ ). Target-lesion failure was similar (4.3 percent vs. 4.5 percent  $p = \text{NS}$ ). MACE occurred in 4.3 percent of BVS-treated patients versus 10.7 percent of GDMT alone — treated patients (odds ratio: 0.38;

95 percent confidence interval: 0.11 to 1.28;  $p = 0.12$ ). The investigators conclude that Absorb-BVS + GDMT substantially enlarged IVUS-MLA at follow up. The procedure was safe, and was associated with favorable long-term clinical outcomes.

A clinically powered trial entitled “The Preventive Coronary Intervention on Stenosis with Functionally Insignificant Vulnerable Plaque (PREVENT)” is now ongoing to evaluate clinical events (NCT02316886; ClinicalTrials.gov).

Although stenting VP is not clinically indicated at this moment, the PREVENT Trial may clarify if this procedure will decrease plaque rupture and thrombosis. If this is the case, invasive intravascular diagnosis and therapy of vulnerable plaques may help in the fight against heart disease, reducing the devastating consequences of ACS.



## References

1. Moreno PR. Vulnerable plaque: definition, diagnosis, and treatment. *Cardiol Clin* 2010;28:1-30.
2. Stone GW, Maehara A, Ali ZA, et al. Percutaneous coronary intervention for vulnerable coronary atherosclerotic plaque. *J Am Coll Cardiol* 2020;76:2289-301.

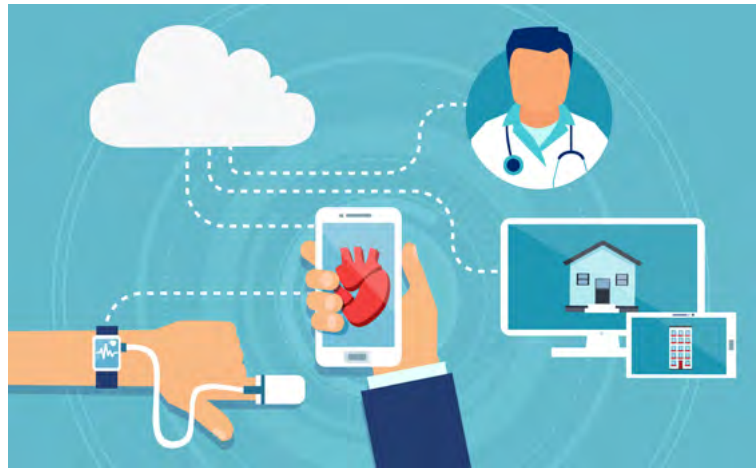
# Remote Patient Monitoring

JEFFREY BANDER, MD

Health care is a field that is constantly developing technology, services, and ways to more effectively treat patients. The challenges of COVID-19 have opened the door for both telemedicine and remote patient monitoring (RPM). RPM is a cost-effective, simple, and efficient way to monitor and manage chronic cardiovascular diseases.

Coronary disease's most prevalent risk factors are hypertension, hyperlipidemia, smoking, and diabetes. Patients can now be monitored for these risks from the comfort of their own home, without having to purchase a device at their own cost. In the last year, we have been at the forefront of developing RPM solutions for a range of cardiovascular illnesses. Patients are given their device in the clinic with thorough instruction, ensuring that they have both the knowledge to take their own vitals and the assurance that they are being monitored. RPM bridges the traditional health care setting into patients' everyday lives, allowing for more engagement and interactions.

Health care in the everyday setting helps to create multiple touchpoints in the patient's care, allowing providers to carefully manage the patient and customize their care



regimen based on current data. Having the patient take their vitals at home allows the patient and their family further engagement in the management of their health and the ability to discuss their concerns with their providers. RPM allows the care team to have access to many aspects of the patient's medical life and helps control and monitor illnesses, which leads to decreased intervention and a lower cost for the health care system. RPM devices send the data

directly to the care team, which is organized and accessible, eliminating the need for patients to keep records. With real-time readings, it allows for early detection of changes to the patient's health and the status of their condition. RPM is the solution to lowering cost to the health care system while still providing appropriate care to patients.

## References

1. Dolan, Shelagh. "The Technology, Devices, And Benefits Of Remote Patient Monitoring In The Healthcare Industry." *Insider Intelligence*, 2021, <https://www.insiderintelligence.com/insights/remote-patient-monitoring-industry-explained/>.

# A Dedicated Cardiogenic Shock Team to Improve Patient Outcomes

GREGORY SERRAO, MD, AND ANNAPOORNA S. KINI, MD

Cardiogenic shock, a condition in which the heart becomes unable to effectively pump blood to all of the organs in the body, has historically been difficult to treat and is associated with poor patient outcomes. This condition may develop as a result of a major heart attack or chronic heart failure. Recent data has shown that when a dedicated team of specialists work together to treat patients with cardiogenic shock, patients are more likely to survive, recover, and return to their previous quality of life.<sup>1,2</sup>

Since 2019, The Mount Sinai Hospital has emulated this approach, with dedicated specialists from interventional cardiology, advanced heart failure cardiology, cardiothoracic surgery, and cardiac critical care medicine working together to treat patients with cardiogenic shock. This team uses specialized medications and pumps, inserted without the need for open heart surgery, to support the heart as it recovers. Our team members are experts in the implantation and management of such devices, including the intra-aortic

balloon pump, microaxial flow catheter (Impella), left atrial-femoral artery bypass (TandemHeart), and extracorporeal membrane oxygenation. In some situations, the heart is unable to recover and, when necessary, members of the team can safely perform open heart surgery to place a permanent pump in the heart, known as a left ventricular assist device (LVAD), or perform heart transplantation.

This team is on call 24 hours a day, seven days per week for the Mount Sinai Catheterization Laboratory and has successfully treated hundreds of patients since its development, with a survival rate of more than twice the national average. The team is also available to other hospitals who wish to transfer a patient to The Mount Sinai Hospital for the team's expert care.



**Cardiogenic Shock**  
transfer to Mount Sinai Heart

**1-833-MH-SHOCK**  
**(1-833-647-4625)**

**MOUNT SINAI HEART**

## References

1. Tehrani BN, Truesdell AG, Sherwood MW, Desai S, Tran HA, Epps KC, Singh R, et al. Standardized Team-Based Care for Cardiogenic Shock. *J Am Coll Cardiol* 2019;73:1659-1669.
2. Taleb I, Koliopoulou AG, Tandar A, McKellar SH, Tonna JE, Nativi-Nicolau J, Alvarez Villela M, et al. Shock Team Approach in Refractory Cardiogenic Shock Requiring Short-Term Mechanical Circulatory Support: A Proof of Concept. *Circulation* 2019;140:98-100.

# Interventional Fellowship Corner: Navigating the Intense Learning and Needed Relaxation

HTOO KYAW, MD, AND ISHA RANADIVE, MD

“To get through the hardest journey, we need only one step at a time, but we must keep stepping.” — Chinese Proverb

As we embarked on our journey through the Interventional Cardiology Fellowship at Mount Sinai Heart, an esteemed institution with world-renowned pioneers in all fields of interventional cardiology, our initial excitement slowly devolved into a sense of apprehension. Would we be able to keep up with the complexity, the pace, and the intensity of each case from the early morning into the late hours of the night? Would we be able to perform at the expected level? With the guidance of world-renowned teachers and mentors from The Mount Sinai Hospital, we are fortunate to navigate through every step of the most challenging cases while being given the autonomy and

confidence to become primary operators in highly complex cases. By empowering us to build superior technical and procedural skills, our leaders also emphasize the significance of understanding ourselves — our strengths and weaknesses — to obtain our most tremendous potential.

One of the distinguishing parts of training at Mount Sinai Heart is the acknowledgment of the impacts of continuous high-intensity training on our mental and physical well-being. Annapoorna S. Kini, MD, known for her interest in practicing and promoting yoga for cardiovascular health, has championed the initiative “Yoga for Interventionalists” for the last couple of years. The entire cardiology department spends several mornings together learning and practicing yoga, in person

and on Zoom, to improve our mental well-being. Our wellness curriculum, sponsored by Samin K. Sharma, MD, and Annapoorna S. Kini, includes monthly sessions focusing on practicing mindfulness and utilizing stress-relieving techniques daily. With the camaraderie of co-fellows, both in the hospital or exploring NYC together, we found some levity amidst our intense training days.

With the relentless training and support in our technical skills, as well as our mental and physical health, the Interventional Cardiology Fellowship at The Mount Sinai Hospital is incredibly unique, paving the way for us to become not only very technically advanced interventionalists, but also well-rounded individuals with healthy minds and bodies.



# Research and Clinical Trials

Study Title	Study Details	Sponsor	Principal Investigator(s) at MSH	Target Enrollment and Study Sites	Current Status/ Enrollment at MSH
YELLOW III Trial	Effect of Evolocumab on coronary plaque characteristics: a multimodality imaging study.	Amgen	A. Kini	130 USA MSH	Ongoing/82 subjects enrolled
Protect IV Trial	Impella®-Supported PCI in High-Risk Patients With Complex Coronary Artery Disease and Reduced Left Ventricular Function: The PROTECT IV Trial	Abiomed Inc.	S. Sharma	1,252 (Global) 120 centers	Ongoing/22 subjects enrolled
SPIRIT 48 Study	A Clinical Investigation to Assess the Abbott Next Generation Drug Eluting Stent 48mm Everolimus Eluting Coronary Stent System (EECSS) in Treatment of de Novo Native Coronary Artery Disease	Abbott Laboratories	A. Kini	800 (USA) 80 centers	Ongoing/3 subjects enrolled
AEGIS-II	A Phase 3, Multicenter, Double-blind, Randomized, Placebo-controlled, Parallel-group Study to Investigate the Efficacy and Safety of CSL112 in Subjects With Acute Coronary Syndrome	CSL Behring LLC	N. Barman	17,440 (Global) 200 centers	Ongoing/17 subjects enrolled
Triluminate Study	Trial to Evaluate Treatment With Abbott Transcatheter Clip Repair System in Patients With Moderate or Greater Tricuspid Regurgitation (TRILUMINATE)	Abbott Laboratories	G. Tang	450 (Global) 30 Centers	Ongoing/20 subjects enrolled

<b>Study Title</b>	<b>Study Details</b>	<b>Sponsor</b>	<b>Principal Investigator(s) at MSH</b>	<b>Target Enrollment and Study Sites</b>	<b>Current Status/ Enrollment at MSH</b>
ACURATE IDE Trial	ACURATE IDE: Transcatheter Replacement of Stenotic Aortic Valve Through Implantation of ACURATE in Subjects Indicated for TAVR.	Boston Scientific Corp.	A. Kini	640 (USA) 80 centers	Ongoing/ 14 subjects enrolled
SMART Trial	SMAll Annuli Randomized To Evolut™ or SAPIEN™ Trial.	Medtronic PLC	S. Sharma	700 (USA) 60 centers	Ongoing/ 18 subjects enrolled
ENVISAGE TAVI-AF Trial	Edoxaban Versus Standard of Care and Their Effects on Clinical Outcomes in Patients Having Undergone Transcatheter Aortic Valve Implantation (TAVI) - in Atrial Fibrillation.	Daiichi Sankyo INC.	G. Dangas	1,400 (Global) 80 centers	Completed/ 14 subject enrolled
Chocolate Touch Study	A Randomized Trial to Confirm the Safety and Effectiveness of Chocolate Touch™ Paclitaxel Coated Balloon Catheter, in Above the Knee Lesions.	TriReme Medical, LLC	P. Krishnan	406 (USA) 48 centers	Completed/20 subjects enrolled
FlowMet-R	FlowMet-R Blood Flow Measurement for the Diagnosis of Peripheral Artery Disease (PAD) and Critical Limb Ischemia (CLI).	Medtronic PLC	P. Krishnan	350 (USA) 30 centers	Ongoing/31 subjects enrolled

# Top Ten Major Publications of 2021



## 1. Edoxaban versus Vitamin K Antagonist for Atrial Fibrillation after TAVR

Van Mieghem NM, Unverdorben M, Hengstenberg C, Dangas GD, et al; ENVISAGE-TAVI AF Investigators. Edoxaban versus Vitamin K Antagonist for Atrial Fibrillation after TAVR. *N Engl J Med*. 2021 Dec 2;385(23):2150-2160. doi: 10.1056/NEJMoa2111016. Epub 2021 Aug 28. PMID: 34449183.

In patients with mainly prevalent atrial fibrillation who underwent successful TAVR, edoxaban was noninferior to vitamin K antagonists as determined by a hazard ratio margin of 38 percent for a composite primary outcome of adverse clinical events. The incidence of major bleeding was higher with edoxaban than with vitamin K antagonists.



## 2. A Contemporary Simple Risk Score for Prediction of Contrast-Associated Acute Kidney Injury After Percutaneous Coronary Intervention: Derivation and Validation from an Observational Registry

Mehran R, Owen R, Chiarito M, Dangas G., et al; A contemporary simple risk score for prediction of contrast-associated acute kidney injury after percutaneous coronary intervention: derivation and validation from an observational registry. *Lancet*. 2021 Nov 27;398(10315):1974-1983. doi: 10.1016/S0140-6736(21)02326-6. Epub 2021 Nov 15. PMID: 34793743.

Contrast-associated acute kidney injury can occur after percutaneous coronary intervention (PCI). We sought to develop a simple risk score to estimate contrast-associated acute kidney injury risk based on a large contemporary PCI cohort. A contemporary simple risk score based on readily available variables from patients undergoing PCI can accurately discriminate the risk of contrast-associated acute kidney injury, the occurrence of which is strongly associated with subsequent death.



## 3. Identification of Vulnerable Plaques and Patients by Intracoronary Near-Infrared Spectroscopy and Ultrasound (PROSPECT II): A Prospective Natural History Study

Erlinge D, Maehara A, Ben-Yehuda O, Stone GW, et al.; PROSPECT II Investigators. Identification of vulnerable plaques and patients by intracoronary near-infrared spectroscopy and ultrasound (PROSPECT II): a prospective natural history study. *Lancet*. 2021 Mar 13;397(10278):985-995. doi: 10.1016/S0140-6736(21)00249-X. PMID: 33714389.

Near-infrared spectroscopy (NIRS) and intravascular ultrasound are promising imaging modalities to identify non-obstructive plaques likely to cause coronary-related events. We aimed to assess whether combined NIRS and IVUS can identify high-risk plaques. Combined NIRS and intravascular ultrasound detects angiographically non-obstructive lesions with a high lipid content and large plaque burden that are at increased risk for future adverse cardiac outcomes.



## 4. Ticagrelor monotherapy in patients with chronic kidney disease undergoing percutaneous coronary intervention: TWILIGHT-CKD

Stefanini GG, Briguori C, Cao D, Mehran R., et al; Ticagrelor monotherapy in patients with chronic kidney disease undergoing percutaneous coronary intervention: TWILIGHT-CKD. *Eur Heart J*. 2021 Dec 1;42(45):4683-4693. doi: 10.1093/eurheartj/ehab533. PMID: 34423374.

The aim of this study was to assess the impact of chronic kidney disease (CKD) on the safety and efficacy of ticagrelor monotherapy among patients undergoing PCI. Among CKD patients undergoing PCI, ticagrelor monotherapy reduced the risk of bleeding without a significant increase in ischaemic events as compared with ticagrelor plus aspirin.



## 5. Diagnosis, Functional Assessment, and Management of Myocardial Bridge (MB): JACC State-of-the-Art Review

Sternheim D, Power DA, Samtani R, Kini A, Fuster V, Sharma S. Myocardial Bridging: Diagnosis, Functional Assessment, and Management: *JACC State-of-the-Art Review*. *J Am Coll Cardiol*. 2021 Nov 30;78(22):2196-2212. doi: 10.1016/j.jacc.2021.09.859. PMID: 34823663.

MB is a common congenital anomaly encountered frequently in clinical practice. Although generally benign, consideration should be given to identifying and treating the subset of patients with symptomatic disease. Noninvasive imaging techniques such as CCTA and intracoronary hemodynamics have improved our ability to characterize symptoms producing MB. In symptomatic patients, medical therapy is usually an effective option. For those failing medical therapies, multimodality anatomic and hemodynamic characterization may aid in guiding safer revascularization.



## 6. Sex Differences Among Patients With High Risk Receiving Ticagrelor With or Without Aspirin After Percutaneous Coronary Intervention: A Subgroup Analysis of the TWILIGHT Randomized Clinical Trial

Vogel B, Baber U, Cohen DJ, Mehran R., et al; Sex Differences Among Patients With High Risk Receiving Ticagrelor With or Without Aspirin After Percutaneous Coronary Intervention: A Subgroup Analysis of the TWILIGHT Randomized Clinical Trial. *JAMA Cardiol.* 2021 Sep 1;6(9):1032-1041. doi: 10.1001/jamacardio.2021.1720. PMID: 33991416; PMCID: PMC8124295.

The objective is to explore sex differences and evaluate the association of sex with outcomes among patients treated with ticagrelor monotherapy vs. ticagrelor plus aspirin. The findings suggest that the higher bleeding risk in women compared with men was mostly attributable to baseline differences, whereas ischemic events were similar between sexes.

## 7. Association of Effective Regurgitation Orifice Area to Left Ventricular End-Diastolic Volume Ratio With Transcatheter Mitral Valve Repair Outcomes: A Secondary Analysis of the COAPT Trial

Lindenfeld J, Abraham WT, Grayburn PA, Stone GW, et al; Cardiovascular Outcomes Assessment of the MitraClip Percutaneous Therapy for Heart Failure Patients With Functional Mitral Regurgitation (COAPT) Investigators. Association of Effective Regurgitation Orifice Area to Left Ventricular End-Diastolic Volume Ratio With Transcatheter Mitral Valve Repair Outcomes: A Secondary Analysis of the COAPT Trial. *JAMA Cardiol.* 2021 Apr 1;6(4):427-436. doi: 10.1001/jamacardio.2020.7200. PMID: 33533873; PMCID: PMC7859876.

A small subgroup of COAPT-resembling patients enrolled in MITRA-FR did not achieve improvement in ACM or HFH at 24 months but had a significant benefit on patient-centered outcomes. Further subgroup analyses with 24-month follow-up suggest that the benefit of TMVr is not fully supported by the proportionate-disproportionate hypothesis.

## 8. Meta-Analysis of Anticoagulation Therapy for the Prevention of Cardiovascular Events in Patients With Peripheral Arterial Disease

*Am J Cardiol.* 2021 Jun 1;148:165-171. doi: 10.1016/j.amjcard.2021.02.033. Epub 2021 Mar 3. PMID: 33667437.

The aim of our study is to evaluate the efficacy and safety of anticoagulation (AC) therapy vs. standard-of-care or reducing cardiovascular and limb events in patients with PAD and risk of major bleeding. Meta-analysis was performed using weighted pooled absolute risk difference (RD) with 95 percent confidence interval (CI) and fixed effects model for overall and sub-groups of full dose (FD) and low dose (LD) AC therapies.

## 9. Side Branch (SB) Fractional Flow Reserve After Provisional Stenting of Calcified Bifurcation Lesions: The ORBID-FFR Study

Kini AS, Okamoto N, Barman N, Sharma S, et al; Side branch fractional flow reserve after provisional stenting of calcified bifurcation lesions: The ORBID-FFR study. *Catheter Cardiovasc Interv.* 2021 Oct;98(4):658-668. doi: 10.1002/ccd.29307. Epub 2020 Oct 9. PMID: 33034419.

The rates of SB compromise and functionally significant stenosis after provisional stenting of calcified bifurcation lesions were similar between two lesion preparation strategies. OCT SBOA can detect SB branches with FFR  $\leq$  0.80 with high sensitivity and specificity.

## 10. Myval Transcatheter Heart Valve System in the Treatment of Severe Symptomatic Aortic Stenosis

Sharma SK, Rao RS, Chopra M, Sonawane A, Jose J, Sengottuvelu G. Myval transcatheter heart valve system in the treatment of severe symptomatic aortic stenosis. *Future Cardiol.* 2021 Jan;17(1):73-80. doi: 10.2217/fca-2020-0020. Epub 2020 Jul 6. PMID: 32628046.

Indigenously developed Myval THV technology is India's first and globally second-generation balloon-expandable valve characterized by clever design changes that facilitate precise positioning of the valve and ensure accurate orthotopic valve deployment. So far, the real-world experience in more than 800 cases has been exceptionally promising.





#### Clinical Interests:

Coronary Artery Disease  
Interventional Cardiology  
Atherectomy  
Valvular Intervention

212-241-4021  
[samin.sharma@mountsinai.org](mailto:samin.sharma@mountsinai.org)

Samin K. Sharma, MD, is a renowned interventional cardiology expert well known for performing high-risk complex coronary interventions (more than 1,500 interventions per year) with an extremely high success rate (greater than 99 percent) while achieving an extremely low complication rate (less than 0.2 percent major complication). He has received the prestigious two-star designation (significantly lower than expected mortality) numerous times by the New York State Department of Health, and the Governor's Award of Excellence in Medicine in 1996.

## Samin K. Sharma, MD, FACC, MSCAI

Senior Vice President, Operations and Quality, Mount Sinai Heart  
Director, Interventional Cardiology, Mount Sinai Health System  
President, Mount Sinai Heart Network  
Anandi Lal Sharma Professor of Medicine (Cardiology)

He served on New York State's Cardiac Advisory Board from 2004–2016. Under Dr. Sharma's leadership, The Mount Sinai Hospital Cardiac Catheterization Laboratory has become one of the safest and busiest centers in New York, providing state-of-the-art cardiac and interventional care for all types of simple and complex heart patients. In addition to coronary interventions, Dr. Sharma specializes in the nonsurgical treatment of mitral and aortic valve disease, including transcatheter aortic valve replacement (TAVR) and MitraClip procedures (TEER).

He has been dubbed "master of the Rotablator" and is regularly featured on national and local TV (recently on CBS, TV Asia) and in newspapers and magazines including *Newsday*, *Newsweek*, the *New York Times*, the *New York Post*, *Forbes*, the *Wall Street Journal*, the *New York Daily News*, the *Washington Post*, *New York Magazine*, *India Abroad*, and *India Today*. He has received numerous awards: 2018 Chairman Board of Trustees, Association of Indians in America (AIA); 2015 Honorary Master of Science PhD degree by Rajasthan University Jaipur India; 2014 Distinguished Physician Scientist by AAPI-QLI for excellence in Medicine; 2011 Ellis Island Medal of Honor; 2011 American Heart Association Achievement in Cardiovascular Science & Medicine Award; 2011 American Association of Physicians of Indian Origin

(AAPI) Physician of the Year; 2010 AIA for Excellence in Medicine; 2003–2007 and 2010–2021 Best Doctors by *New York Magazine*; 2008–2021 Super Doctors; 2007 Jacobi Medallion Award by The Mount Sinai Hospital; 2007 Physician of the Year by The Mount Sinai Hospital and 2000 Simon Deck Award for Outstanding Teacher of the Year.

He has authored more than 300 papers and 15 book chapters in the field of coronary interventions, structural heart disease and safety of percutaneous interventions. He is also a philanthropist, and The Mount Sinai Hospital Cardiac Catheterization Laboratory is now named the Dr. Samin K. Sharma Family Foundation Cardiac Catheterization Laboratory. Dr. Sharma has built a 250-bed heart hospital (EHCC) in his native Jaipur, India, to provide the best care to all patients irrespective of their financial and social status.

His live monthly webcast series, *CCC Live Cases* ([www.cclivecases.org](http://www.cclivecases.org)), started in 2009 and has an audience of more than 25,000 viewers each month in 170 countries. He also enjoys teaching other cardiologists and improving patient outcomes with his annual Complex Coronary Cases (CCC) Symposium, which started in 1998. He is also the Director of the Top Ten Topics in Clinical Cardiology Course every October and the NY Transcatheter Valves Symposium every December.



## Annapoorna S. Kini, MD, MRCP, FACC

Director, Cardiac Catheterization Laboratory  
Interventional Director, Structural Heart Program for System  
Director, Interventional Cardiology Fellowship Program  
Zena and Michael A. Weiner Professor of Medicine

### Clinical Interests:

Intravascular Imaging

Interventional Cardiology: CTO

Valvular Intervention

212-241-4181

[annapoorna.kini@mountsinai.org](mailto:annapoorna.kini@mountsinai.org)

Annapoorna S. Kini, MD, is internationally acclaimed for her special expertise in performing complex coronary interventions, especially in chronic total occlusion for patients with advanced coronary artery disease, high-risk interventional cases, and alcohol septal ablation for the treatment of obstructive hypertrophic cardiomyopathy. Dr. Kini has been the principal or co-investigator in numerous randomized clinical trials. She has extensive experience with mitral and aortic balloon valvuloplasty and has been among the first few interventional cardiologists in the country to use the transcatheter aortic valve implantation procedure in the

treatment of inoperable patients with critical aortic stenosis. She has also made history by performing the first live case performed entirely by women during the CRT meeting on March 5, 2018.

Dr. Kini performs more than 1,000 coronary interventions annually, the highest number by a female interventionist in the United States, with an extremely low complication rate of less than 0.3 percent; an official report from The Department of Health, NYS, recognized Dr. Kini as the safest operator among 350 other physicians in the state of New York numerous times (2004-2016). She is the recipient of 2011 *Dean's Award for Excellence in Clinical Medicine* at The Mount Sinai Hospital. She also received the Physician of the Year award in 2014 from The Mount Sinai Hospital nurses. She received the *Excellence in Medicine Award* from the National Association of Physicians of India (AAPI) in July 2016. In May 2017, she received the prestigious *Ellis Island Medal of Honor*, the highest award given to any immigrant civilian, and in 2018 she received the *American Heart Association's Heart of Gold Award*.

Dr. Kini is the recipient of the "Rock Star of Science" award from the American Heart Association. She is a member of the Royal College of Physicians of London and Fellow of the American College of Cardiology.

The recent YELLOW II study was an ambitious translational combination of multimodality imaging with clinically

relevant cellular biology and comprehensive transcriptomics, with YELLOW III now fast approaching the end of enrollment.

In the digital field, Dr. Kini has led the development of eight free educational applications. She has also created a mobile app-based chair yoga program for her recent SLYM II trial, and is developing a patient experience and education platform called TAVRbot for structural heart patients. Her recent STEMicathAID Mount Sinai Queens has been working to reduce the device time to reperfusion on vulnerable heart attack patients since July of 2021.

Dr. Kini is an excellent teacher, and is dedicated to the teaching of both cardiology and interventional fellows. In fact, the 2012 batch of Mount Sinai interventional fellows created a teaching award in her name, "The Annapoorna S. Kini Fellows' Choice Award" for excellence in teaching. Her achievements are not limited to serving as the Director of the Annual Live Symposium of Complex Coronary Cases at The Mount Sinai Hospital, one of the most attended and respected meetings in the field of interventional cardiology in the country. She is also the director of a monthly webcast program, *CCC Live Cases* ([www.ccclivecases.org](http://www.ccclivecases.org)), started in 2009 and has an audience of more than 25,000 in 170 countries.



## Prakash Krishnan, MD, FACC

Director of Endovascular Services, The Mount Sinai Health System

Associate Professor of Medicine (Cardiology)

Associate Professor of Radiology

### Clinical Interests:

Interventional Cardiology

Endovascular Intervention

Carotid Stenting

212-241-5407

[prakash.krishnan@m MountSinai.org](mailto:prakash.krishnan@m MountSinai.org)

Prakash Krishnan, MD, is a world-renowned expert in peripheral vascular disease and is internationally recognized as a leader in the catheter-based treatment of peripheral arterial disease. Dr. Krishnan's expertise includes nonsurgical treatment of coronary and peripheral vascular diseases, including coronary stents, peripheral vascular angioplasty and stents, atherectomy, carotid stents, renal stents, renal denervation, and complex venous disease intervention.

Dr. Krishnan is a patient advocate and an educator. He has built a robust community-based outreach program that serves a vast population of patients with complex coronary and peripheral arterial disease. He also serves as the Director of the Endovascular Intervention Fellowship in the Cardiac Catheterization Laboratory and has been educating interventionalists globally via live satellite transmissions at national and international meetings and with the monthly webcasts showcased on [www.ccclivecases.org](http://www.ccclivecases.org). He served as the co-national primary investigator in the ILLUMENATE Trial and is a leading authority in the performance of non-surgical interventions for peripheral arterial disease. He has received numerous awards and honors, most recently the Reverend Dr. Martin Luther King Legacy Award for Physician Services from Clergy with a Purpose. He has also served as editor of numerous textbooks on endovascular interventions and has authored numerous peer-reviewed articles and book chapters. He is co-director of the annual LINC Mount Sinai conference.

Dr. Krishnan is an internationally established leader in education. He has been both innovative and progressive, and recognized the opportunity to reach thousands of physicians to help advance

the understanding of techniques in the interventional treatment of peripheral arterial disease.

In 2012, Dr. Krishnan began to broadcast monthly Peripheral Interventions Live via *CCC Live Cases*, which has over 25,000 views per month in 170 countries. He founded the Endovascular Fellowship in 2013 with a mission to train highly qualified physicians with the necessary skills to treat patients with vascular disease. From 2009–2015, he was the Endovascular Director of the Live Symposium of Complex Coronary and Vascular Cases and in 2013, he established the Mount Sinai Endovascular Fellows Course to train fellows from institutions all over the globe. In 2015, Dr. Krishnan advanced international education in peripheral arterial disease through collaboration with the Leipzig Interventional Course to create the LINC Mount Sinai Symposium. This allowed for the education of a worldwide audience in the advanced endovascular techniques for peripheral vascular disease. He has expanded this meeting and launched the very successful New York Endovascular Summit in the fall of 2021. Dr. Krishnan is also a key faculty member for multiple national and international conferences.



## George D. Dangas, MD, PhD, FACC, MSCAI

Director, Cardiovascular  
Innovation

Professor of Medicine  
(Cardiology)

Professor of Surgery (Vascular)

George D. Dangas, MD, performs a wide spectrum of complex cardiovascular interventional procedures to treat coronary and valvular heart disease, aortic, carotid and peripheral arterial disease, and resistant hypertension.

Dr. Dangas is a leading authority in

the performance of nonsurgical cardiac and vascular interventions and in the development of innovative approaches to treat complex problems across many specialties. He is currently a trustee of the American College of Cardiology and editor-in-chief of *CardioSource WorldNews Interventions*, and has been chair of the Interventional Scientific Council and a trustee of the Society for Cardiovascular Angiography and Interventions. He is co-director of the annual conferences “Transcatheter Cardiovascular Therapeutics” and “Interventional Fellows’ Courses” in the United States and Europe, and a key faculty and program committee member for multiple international conferences, including the ACCi2 Summit, ACCIS, AHA, and SCAI for many years. Dr. Dangas is the Director of Academic Affairs at the Cardiovascular Research Foundation.

He is currently the Vice President of the Society of Cardiovascular Angiography and Interventions, Chair of the AHA Laennec Society, Section Editor of the Journal of the American College of Cardiology and Editor-in-chief of the 3rd Edition textbook “Interventional Cardiology Principles & Practice.” He serves as Course Director of TCT – Transcatheter Cardiovascular Therapeutics and several other national and international conferences. Dr. Dangas is a founding physician and Director of Academic Affairs of the Cardiovascular Research Foundation in New York and Adjunct Professor at the Universities of Athens and Vienna.

212-241-7014 | [george.dangas@mountsinai.org](mailto:george.dangas@mountsinai.org)



## Joseph M. Sweeny, MD, FACC

Medical Director,  
Ambulatory  
Cardiology Center

Associate Professor of  
Medicine (Cardiology)

### Clinical Interests:

Acute Myocardial  
Infarction

Fellows Education

Coronary Intervention

Joseph M. Sweeny, MD, performs both diagnostic cardiac catheterization and coronary interventions. He is the principal investigator of multiple national clinical trials and is actively involved in the Interventional Cardiology

Fellowship Training Program as the associate program director. In 2014, he became the medical director of the Lauder Ambulatory Cardiology Center, which provides comprehensive ambulatory care with all modalities of non-invasive cardiac testing in one central location.

With a special interest in treating post-heart transplant patients, Dr. Sweeny works closely with the Heart Transplant Team for coronary artery vasculopathy surveillance and endomyocardial biopsies in the Cardiac Catheterization Laboratory.

His research has focused mainly on antiplatelet therapy in the treatment of acute coronary syndromes. Dr. Sweeny serves as an assistant editor/reviewer for *The Journal of the American College of Cardiology* and was the Site Principal Investigator for the NIH-sponsored Ischemia Trial. As the associate program director for the Interventional Cardiology Fellowship program, he is actively involved in the selection, education, and mentoring of our interventional fellows.

Dr. Sweeny also serves as the Radiation Safety Officer for the Cardiac Catheterization Laboratory. In this role, he has developed protocols and processes for tracking and monitoring patient radiation dose during interventional procedures.

212-241-7016 | [joseph.sweeny@mountsinai.org](mailto:joseph.sweeny@mountsinai.org)



## Pedro R. Moreno, MD, FACC

Director of Quality Assurance for Cardiology  
Director of Credentials and Promotions for Cardiology  
Professor of Medicine (Cardiology)

Pedro R. Moreno, MD, performs more than 1,000 cardiac coronary invasive procedures annually (including diagnostic catheterizations, angioplasties, and coronary stents) with >99 percent success rate and <1 percent major complications.

As a world-renowned expert

in atherosclerosis, Dr. Moreno has been a pioneer in the understanding of inflammation and acute coronary syndromes. Dr. Moreno also contributed to vascular biologic aspects of restenosis, a re-narrowing process that occurs in coronary or peripheral arteries after stenting.

Dr. Moreno has additional extensive experimental research in novel diagnostic and therapeutic modalities for vulnerable plaques, the most common cause of a heart attack.

Dr. Moreno is an official reviewer for the American Heart Association and several scientific journals including *Annals of Internal Medicine*, *Circulation*, *The Journal of the American College of Cardiology*, *American Journal of Cardiology*, *American Heart Journal*, and *European Heart Journal*. He is honorary member of several international cardiology organizations including the Chilean Society of Cardiology, the Venezuelan Society of Cardiology, the Colombian Society of Cardiology and the Dominican Republic Society of Cardiology. Finally, he is an excellent teacher and a mentor of clinical and research fellows at The Mount Sinai Hospital.

212-523-2672 | [pedro.moreno@mountsinai.org](mailto:pedro.moreno@mountsinai.org)



## Roxana Mehran, MD, FACC, FACP, FESC, MSCAI

Director, The Center for Interventional Cardiovascular Research and Clinical Trials

Roxana Mehran, MD, is an internationally renowned clinical research expert in the field of interventional cardiovascular disease. She has built a globally-respected academic research center focused on developing randomized clinical trials, outcomes research projects, and high-impact academic publications. She has served as principal investigator for numerous global studies,

### Clinical Interests:

Antithrombotic Therapy for Secondary Prevention

Contrast-Induced Acute Kidney Injury (AKI)

Cardiovascular Disease in Women

developed risk scores for bleeding and acute kidney injury, participates regularly in developing clinical guidelines, and has authored >1,100 peer-reviewed articles. Dr. Mehran is a current member of the American College of Cardiology (ACC) Board of Trustees. She has been included for the past four consecutive years in Clarivate Analytics: “Most Cited Researchers – Top 1%” as well as “The World’s Most Influential Scientific Minds” (*Thomson Reuters*).

Dr. Mehran is currently leading the Lancet Commission on Women’s Cardiovascular Diseases, which brings together leading female researchers from around the world who have clinical expertise in cardiovascular medicine, to identify and bridge gaps in research and care for women with cardiovascular disease.

Dr. Mehran is a recipient of several awards, including the 2016 American College of Cardiology Bernadine Healy Leadership in CV disease award, the 2018 Nanette Wenger Award from Women’s Heart for excellence in research and education, the 2019 Ellis Island Medal of Honor, and the 2019 ESC Silver Medal and Andreas Grüntzig Lecture plaque.

212-659-9691 | [roxana.mehran@mountsinai.org](mailto:roxana.mehran@mountsinai.org)



## Vishal Kapur, MD, FACC, FSCAI, RPVI

Director of Endovascular  
Services, Mount Sinai  
Morningside

Assistant Director,  
Endovascular Services,  
The Mount Sinai Hospital

Assistant Professor of  
Medicine (Cardiology)

Vishal Kapur, MD, is an interventional and endovascular cardiologist. He is board-certified in the fields of cardiology, interventional cardiology, vascular

medicine, and endovascular medicine, and has trained with world renowned experts in the field. He is an expert in catheter-based vascular therapy, specializing in endovascular management of acute and chronic arterial and venous disease. He is proficient in procedures such as coronary angioplasty, stenting, rotational atherectomy, angioplasty-stenting of carotid, renal, subclavian, mesenteric, Iliac, and lower extremities, IVC filter placement, thrombolysis, rheolysis thrombectomy in the management of acute limb ischemia, and deep vein thrombosis. He is also trained in performing venous ablation and sclerotherapy in the management of reticular and varicose veins.

Dr. Kapur is an excellent teacher and educator with keen interest in complex coronary interventions and peripheral endovascular interventions. He has published numerous research articles in peer-reviewed renowned medical journals and written text book chapters. His research work has been presented at various national and international meetings and he has been a co-investigator in various multi-center trials. Dr. Kapur remains committed to the field of cardiology and has an unrelenting dedication toward being an outstanding clinician, researcher, and teacher.

212-241-0898 | [vishal.kapur@mountsinai.org](mailto:vishal.kapur@mountsinai.org)



## Jeffrey Bander, MD, FACC

Chief of Cardiology,  
Mount Sinai West

Medical Director, Network  
Development, Mount  
Sinai Hospital Network

Associate Professor of  
Medicine (Cardiology)

### Clinical Interests:

Clinical Cardiology  
Cardiac Catheterization  
Coronary Interventions

Jeffery Bander, MD, has pursued many areas in the health care industry after attending Harvard Medical School and MIT. One of those areas has been as a health care entrepreneur. Dr. Bander founded two successful health

care companies, Providerloop and Referwell, both of which have continued to grow. Dr. Bander's role as Medical Director of Network Development at The Mount Sinai Hospital has allowed him to collaborate with many departments to help grow and increase efficiency. While still maintaining these roles, Dr. Bander is now Chief of Cardiology at Mount Sinai West. With Dr. Bander's experience in many facets of the health care system, from practicing medicine, running departments and fundraising, to excelling in health care finance and information technology, he seeks to build and develop the health care system to create a more efficient and effective organization to treat patients and save lives.

With the rise of COVID-19, Dr. Bander took on new roles to treat infected patients, raise awareness, and helped create treatments to stop the spread of COVID-19. During the pandemic, he helped coordinate the Mount Sinai Health System's convalescent plasma program and coordinated large donor drives for hyperimmune globulin. He has helped operationalize monoclonal antibody infusion at Mount Sinai and led patient awareness campaigns. Dr. Bander continually seeks to find new innovative ways to grow and develop our health care system.

212-381-0918 | [jeffrey.bander@mountsinai.org](mailto:jeffrey.bander@mountsinai.org)



## Malcom Anastasius, MD

Assistant Professor of  
Medicine (Cardiology)

**Clinical interests:** Cardiovascular  
Imaging (echocardiography/cardiac  
CT and MRI), Imaging for Structural  
Heart Interventions

**212-241-6365**  
**malcolm.anastasius@**  
**mountsinai.org**



## Nitin Barman, MD, FACC

Director, Cardiac Catheterization  
Laboratory, Mount Sinai Morningside

Assistant Professor of  
Medicine (Cardiology)

**Clinical Interests:** Clinical Cardiology,  
Transradial Intervention, AMI  
Intervention, Complex Coronary  
Interventions

**212-523-1094**  
**nitin.barman@mountsinai.org**



## Farah E. Atallah-Lajam, MD, FACC

Director, Mount Sinai  
Jackson Heights

Assistant Professor of Medicine

**Clinical Interests:** Clinical  
Cardiology, Cardiac Catheterization,  
Nuclear Cardiology

**866-Heart-01 (Morningside)**  
**718-879-1600 (Jackson Heights)**  
**falcardiology@gmail.com**



## Srinivas Duvvuri, MD, FACC

Network Senior Medical  
Director, Staten Island

Associate Professor of  
Medicine (Cardiology)

**Clinical Interests:** General Cardiology,  
Cardiac Catheterization, Interventional  
Cardiology, Trans-radial Intervention

**718-981-2684**  
**srinivas.duvvuri@mountsinai.org**





## Serdar Farhan, MD, FESC, FACC

**Clinical Interests:** Endovascular, Structural Heart, and Coronary Intervention

**212-241-1615**

**Serdar.farhan@mountsinai.org**



## Sunny Goel, MD, FACC, FSCAI

**Assistant Clinical Professor of  
Medicine (Cardiology)**

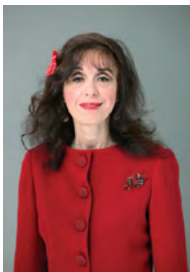
**Clinical Interests:** Complex Coronary Interventions, Primary PCI

**917-280-6832**

**516-632-3672 (Mount Sinai South  
Nassau)**

**sunny.goel@mountsinai.org**

**sunny.goel@snch.org**



## Lynne Glasser, MD

**Director, Interventional Inpatient  
Service**

**Assistant Professor of  
Medicine (Cardiology)**

**Clinical Interests:** Clinical Cardiology, Preventive Cardiology, Inpatient Cardiology

Since joining The Mount Sinai Hospital in November 2008, Dr. Glasser has been playing an important role in the treatment and management of interventional patients, before and after the procedure.

**212-241-4521**

**lynne.glasser@mountsinai.org**



## Yumiko Kanei, MD, FACC, FSCAI

**Associate Program Director,  
Cardiology Fellowship, MSBI**

**Associate Professor of  
Medicine, Icahn School of  
Medicine at Mount Sinai**

**Clinical Interests:** Percutaneous Coronary Intervention, Acute Coronary Syndrome, Valvular heart Disease

**212-420-2416**

**yumiko.kanei@mountsinai.org**



## Sahil Khera, MD, MPH, FACP, FACC, FSCAI

Interventional Director, Structural  
Heart Disease Program, MSH

Assistant Professor of  
Medicine (Cardiology)

**Clinical Interests:** Transcatheter  
Aortic Valve Replacement and  
Transcatheter Mitral Valve Repair,  
Complex Coronary Interventions,  
ASD/PFO Closure

**212-241-4906**

**sahil.khera@mountsinai.org**



## Atul Kukar, DO, MBA, MS, FACC, FSCAI

Chair, Department of Cardiology,  
Mount Sinai Queens

Associate Professor of Medicine

**Clinical Interests:** Coronary  
Interventions, Peripheral Interventions,  
General Cardiology

**212-241-6422**

**atul.kukar@mountsinai.org**



## Stamatios Lerakis, MD, PhD, FACC, FASE, FSCCT

Director, Noninvasive Cardiology

Director of Imaging for Structural  
and Valve Interventions,  
Mount Sinai Health System

Professor of Medicine (Cardiology)

**Clinical Interests:** Cardiovascular  
Multimodality Imaging, Multimodality  
Imaging for Structural Heart  
Interventions, Echocardiography, CMR,  
Cardiac CT, Nuclear Cardiology, 4D ICE

**212-241-1002**

**stamatios.lerakis@mountsinai.org**



## Parasuram Melarcode Krishnamoorthy, MD, FACC

Associate Director, Structural  
Heart Disease Program

Assistant Professor of Medicine,  
Division of Cardiology

**Clinical Interests:** Complex Coronary  
Interventions, Transcatheter Aortic Valve  
Replacement, Transcatheter Mitral Valve  
Repair, Transcatheter Tricuspid Valve  
Repair, Paravalvular Leak Closure, ASD/PFO  
Closure

**732-501-5100**

**parasuram.melarcode-krishnamoorthy@  
mountsinai.org**

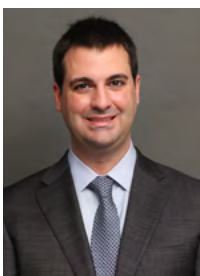


## **William Schwartz, MD, FACC**

**Clinical Director of Ambulatory  
Cardiology at Mount Sinai Queens  
Assistant Clinical Professor  
of Medicine (Cardiology)**

**Clinical Interests:** Clinical Cardiology,  
Noninvasive Cardiology, Cardiac  
Catheterization

**718-721-1500  
wjsheartmd@aol.com**



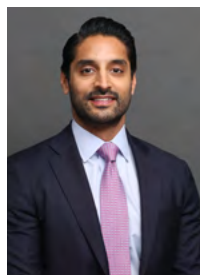
## **Gregory Serrao, MD, MSE**

**Director, Mechanical Circulatory  
Support, Cardiac Cath Lab**

**Assistant Program Director,  
Cardiovascular Disease  
Academic Track**

**Clinical Interests:** Cardiogenic Shock,  
Mechanical Circulatory Support,  
Cardiac Catheterization

**917-756-6852  
gregory.serrao@mountsinai.org**



## **Raman Sharma, MD**

**Assistant Director, Endovascular  
Interventions Program**

**Assistant Professor of  
Medicine (Cardiology)**

**Clinical Interests:** Peripheral  
Arterial Disease, Endovascular  
Intervention, Critical Limb  
Threatening Ischemia, Complex  
Coronary Interventions, Venous  
Disease and Intervention,  
Carotid Artery Stenting

**212-241-5437  
raman.sharma@mssm.edu**



## **Joshua Shatzkes, MD, MS**

**Assistant Professor of  
Medicine (Cardiology)**

**Clinical Interests:** Cardiovascular Disease  
Prevention, Noninvasive Cardiovascular  
Imaging, Peripheral Arterial Disease

**212-241-9457  
joshua.shatzkes@mssm.edu**



**Michael Alan G. Sicut, MD**

Assistant Professor of Medicine (Cardiology)

Clinical Interests: Clinical Cardiology, Echocardiography, Cardiac Catheterization

718-273-9080

michael.sicut@mountsinai.org



**Gilbert Tang, MD, MSc, MBA, FRCSC, FACC, FSCAI**

Surgical Director, Structural Heart Program, Mount Sinai Health System

Professor of Cardiovascular Surgery

Clinical Interests: Transcatheter Aortic and Mitral Valve Therapy, Transcatheter Tricuspid Repair

646-761-0391

gilbert.tang@mountsinai.org



**Javed Suleman, MD, FACC**

Associate Clinical Professor of Medicine (Cardiology)

Clinical Interests Clinical Cardiology, Coronary Intervention, Primary PCI

718-297-0440

javed.suleman@mountsinai.org



**Karthik Gujja, MD, MPH**

Associate Director, Endovascular Interventions

Clinical Instructor Medicine (Cardiology)

Clinical Interests: Peripheral Artery Disease, Endovascular Intervention, Venous Interventions

646-584-6460

karthik.gujja@mountsinai.org

**VOLUNTARY ATTENDING**

(LISTED ALPHABETICALLY)



## **Choudhury M. Hasan, MD**

**Assistant Clinical Professor  
of Medicine (Cardiology)**

**Clinical Interests:** Cardiac  
Catheterization, Coronary  
Interventions, Echocardiography

**718-657-8001**

**cmmhasan03@gmail.com**



## **Vinod Patel, MD, FACC, FSCAI**

**Assistant Clinical Professor  
of Medicine (Cardiology)**

**Clinical Interests:** Noninvasive  
Cardiology, Cardiac Catheterization,  
Peripheral Vascular Interventions

**718-788-1688**

**drvinodpatel@gmail.com**



## **Haroon Kamran, MD, FACC, FSCAI**

**Assistant Clinical Professor  
of Medicine (Cardiology)**

**Clinical Interests:** Clinical Cardiology,  
Interventional Cardiology, Peripheral  
Endovascular Intervention

**347-868-1902**

**hkamran@  
cardiovascularconsulting.com**



## **Anita Ravi, MD**

**Clinical Instructor**

**Clinical Interests:** Interventional  
Cardiology, Peripheral Interventions,  
Clinical Cardiology

**732-947-4201**

**Anita.Ravi2@mountsinai.org**



## **José Meller, MD**

**Clinical Professor of  
Medicine (Cardiology)**

**Clinical Interests:** Clinical  
Cardiology, Fellows Education,  
Cardiac Catheterization

**212-988-3772**

**josemeller44@gmail.com**



**Beth Oliver,  
DNP, RN**

Senior Vice President of  
Cardiac Services, Mount  
Sinai Health System

212-241-0796

[beth.oliver@mounsinai.org](mailto:beth.oliver@mounsinai.org)

Dr. Oliver leads cardiovascular service line strategy and operations and is responsible for ensuring the delivery of quality patient care to Mount Sinai Heart patients. She is a member of Sigma Theta Tau, the American Organization of Nurse Executives, the American College of Cardiology and the American Heart Association. In July 2018, she was appointed President of the American Heart Association's Board of Directors in New York City. Dr. Oliver is committed to the current and future role of nurses in achieving their goal.



**Haydee Garcia,  
MSN, ACNP-BC**

Nursing Director, Mount  
Sinai Heart

212-241-3058

[haydee.garcia@mounsinai.org](mailto:haydee.garcia@mounsinai.org)

Haydee Garcia started as a nurse practitioner (NP) in the Mount Sinai Hospital Cardiac Catheterization Laboratory in 2006, serving as the lead NP from 2010–2014 before transitioning into her leadership role in 2014 as nursing director for Mount Sinai Heart. She directs, oversees, and coordinates all administrative and clinical operations for the Cardiac Catheterization Laboratory, Post Intervention Units, Noninvasive Cardiology, Cardiovascular Ambulatory, and Cardiac Nurse Practitioners.



**Lyora Fox, RN**

Senior Clinical Coordinator,  
Cardiac Catheterization  
Laboratory

646-369-9621

[mamercedes.zapatos@mounsinai.org](mailto:mamercedes.zapatos@mounsinai.org)

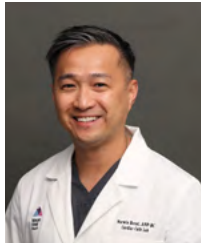


## NURSE PRACTITIONER TEAM

The Mount Sinai Hospital's dedicated staff of nurse practitioners work closely with the physicians in planning and implementing care from the time of intake to discharge, ensuring a quality experience at all points in the patient's visit.



Maryam Akhtar



Norwin Bunal



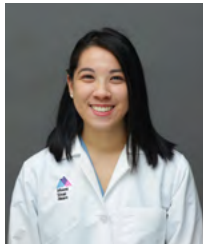
Melissa Chang



Jessica Erskine



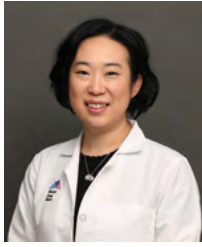
Aira Fides Gonzales



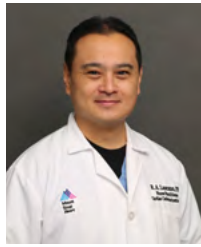
Michelle Hang



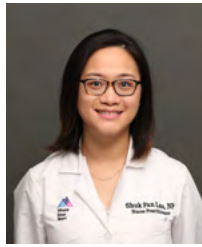
Kristina Hartig



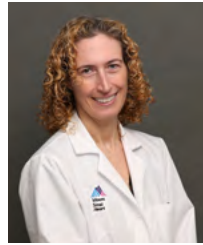
Hyo Jin Kang



Rheoneil Lascano



Shuk Fan Lau-Mckee



Dana Leichter



Jessica Lim



Nelya Lozynska



Derek Pineda



Supawadee  
Pitakmongkolkul



Aanal Shah



Indra Sinanan



Richard Ternemille



Shira Wender



Kevin Williams

## INTERVENTIONAL CARDIOLOGY FELLOWS

Mount Sinai Heart's Interventional Cardiology Fellowship Program is the largest in the country, educating the next generation of clinical cardiology and interventional cardiology specialists. This well-regarded program, which combines academic and hands-on experience, has graduated physicians who are serving as noted leaders in community and academic medical centers.



**Shiv Bagga, MD**



**Htoo Kyaw, MD**



**Amit Hooda, MD**



**Isha Ranadive, MD**



**Mayank Yadav, MD**



**Kartik Kumar, MD**



**Negar Salehi, MD**



**Ali Farooq, MD**



**Prasahant  
Dwivedi, MD**



**Anoop Koshy, MD**



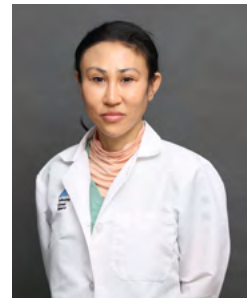
**Maheedhar  
Gedela, MD**



**J. Luke Murphy, MD**

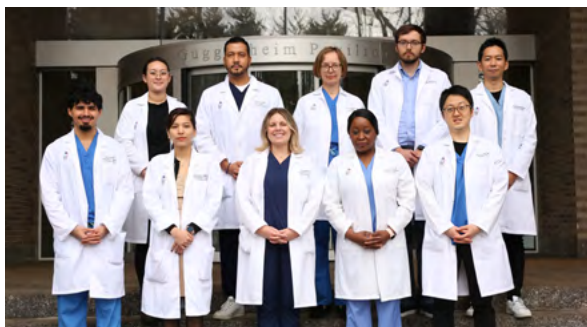


**Twinkle Singh, MD**



**Lily Zhang, MD**





## Research Team

**Back Row:** Riela Popp, Miguel Vasquez, Yuliya Vengrenyuk, Andriy Vengrenyuk, Shingo Minatoguchi

**Front Row:** Jaime Gonzalez; Nimisha Baruah, Grace MacDonald, Nicole Saint Vrestil, Keisuke Yasumura



## Supporting Staff

**Back Row:** Shulandia Avila, Jasmin Jordan, Juanita Gamboa, Gaitree Jawahir

**Front Row:** Shante Hines, Radha Gokul, Maria Directo, Carol Henry



## Interventional Database Team

Pooja Vijay, Kevin Dellner, Lydia Fikru, Kayla Bedel-Franklin, Roja Thapi, Elena Ramos

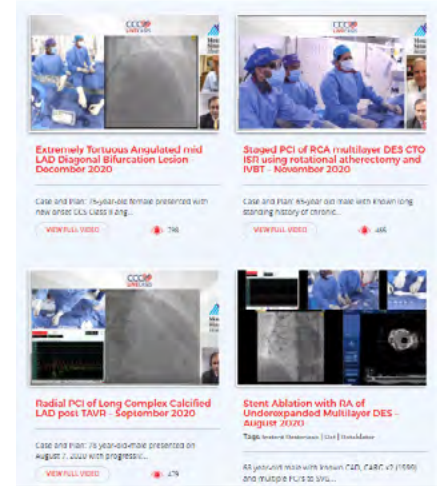
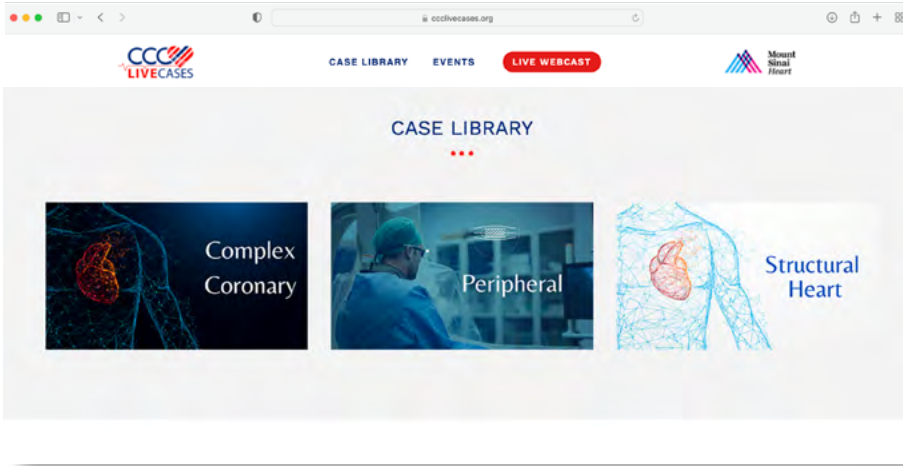


## Structural Heart Team

**Left to Right:** Shuk Fan Lau-mckee, Angela Gratereaux, Dana Leichter, Hyo Jin Kang, Jancin Robinson, Maryam Akhtar, Adriana Bautista, Derek Fernandez



[www.ccclivecases.org](http://www.ccclivecases.org)



## COMPLEX CORONARY

Every 3<sup>rd</sup> Tuesday of the month  
at 8 am EST

## PERIPHERAL

Every 4<sup>th</sup> Wednesday of the  
month at 8 am EST

## STRUCTURAL HEART

Every 2<sup>nd</sup> Tuesday of every  
other month at 9 am EST

OVER  
**1.8 Million**  
VIEWS

New, updated, more user-friendly website



[WWW.CCCLIVECASES.ORG](http://WWW.CCCLIVECASES.ORG)  
an educational resource to view live  
complex coronary, peripheral and  
structural heart cases.

## EVENTS

Mount Sinai Heart holds several important educational events throughout the year, including the New York Endovascular Summit, the Mount Sinai Endovascular Fellows Course, the Complex Coronary Cases Symposium, Top Ten Topics in Clinical Cardiology, and the New York Transcatheter Valves Symposium. To learn more about upcoming events, visit [ccclivecases.org/our-events](http://ccclivecases.org/our-events) or email [info@gaffneyevents.com](mailto:info@gaffneyevents.com).



## SAVE THE DATE:

### Complex Coronary Symposium (CCC) – Thursday, June 16, 2022

#### Associated with CCC:

- Nurse/Technologist Symposium – Friday, June 17, 2022
- Interventional Cardiology Fellows Course – Friday, June 17, 2022
- Complex High-Risk Interventional Procedures Course – Wednesday, June 15, 2022



**Mount Sinai Endovascular Fellows Course**  
Thursday, October 6, 2022



**NY Endovascular Summit**  
Friday, October 7 and  
Saturday October 8, 2022



**Top Ten Topics in Clinical Cardiology**  
Friday, October 14, 2022



**NY Transcatheter Valves**  
Thursday, December 8, 2022

# Cardiac Catheterization Laboratory Achievements

## 1 *New York Magazine* Best Doctors



Samin K. Sharma, MD  
(12 times in 17 years)

Annapoorna S. Kini, MD  
(4 times in 5 years)

Prakash Krishnan, MD  
(1<sup>st</sup> year)

George Dangas, MD  
(7 times in 8 years)

Pedro Moreno, MD  
(6<sup>th</sup> year in a row)

Roxana Mehran, MD  
(6 times in 8 years)

Joseph Sweeny, MD  
(1<sup>st</sup> year)

William Schwartz, MD  
(4 times in 13 years)

Gregg Stone, MD  
(6 times in 18 years)

Javed Suleman, MD  
(1st year)

## 2 *New York Times Magazine* Super Doctors



Samin K. Sharma, MD  
(14<sup>th</sup> year in a row)

Annapoorna S. Kini, MD  
(12<sup>th</sup> year in a row)

George Dangas, MD  
(5<sup>th</sup> year in a row)

Atul Kukar, DO  
(2<sup>nd</sup> year in a row)

Srinivas Duvvuri, MD  
(1<sup>st</sup> year)

## 3 *Castle Connolly* Top Doctors



Samin K. Sharma, MD

Annapoorna S. Kini, MD

Prakash Krishnan, MD

George Dangas, MD

Pedro Moreno, MD

Roxana Mehran, MD

Joseph Sweeny, MD

William Schwartz, MD

Javed Suleman, MD

Gregg Stone, MD

**4** George Dangas, MD, appointed Vice President of the Society for Cardiovascular Angiography and Interventions (SCAI)

---

**5** Roxana Mehran, MD, listed in “2021 Most Cited Researchers — Top 1%,” *Clarivate Analytics* (For the 6th year in a row)

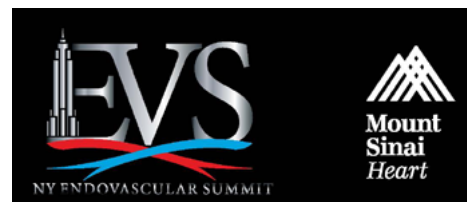
---



**7** Physician of the Year — Team Award 2021 — Given to the STEMI Team



**6** Prakash Krishnan, MD, launched the 1st Annual Endovascular Summit and continuation of The Mount Sinai Endovascular Fellows Course





“I hope they’re downloading my apps!”

-Annapoorna S. Kini, MD

# Mount Sinai Heart Directory

Area	Telephone
MS Heart Director	212-241-7911
Adult Congenital Heart Disease Center	212-241-1382
Cardiac Rehab Program	212-241-8597
Cardiology Administration	212-241-4030
Cardiology Appointments	212-427-1540
Cardiology Privileges	212-241-4029
Cardiothoracic Surgery	212-659-6800
Cardiovascular MRI and CT Imaging	855-MSHEART
Catheterization Laboratories	212-241-5881
<b>Cardiac Catheterization Laboratory Assistance (any issues)</b>	<b>212-241-0935</b>
Catheterization Laboratory Events	212-241-0592
Catheterization Laboratory Office	212-241-4021
Catheterization Laboratory Research	212-241-0229
Catheterization Laboratory Scheduling	212-241-5136
Coronary Care Unit	212-241-7222
Electrophysiology/Pacemakers	212-241-7272
Genetic Disorders	212-241-3303
Heart Failure/Transplantation	212-241-7300
Lipid Management	212-241-7651
MS Heart Information Technology	212-241-4026
Noninvasive Cardiology	855-MSHEART
Pediatric Cardiology	212-241-8662
Pulmonary Hypertension	212-241-7300
To Transfer a Patient	212-241-6467
Vascular Laboratory	212-241-6773

Publication of the *2021 Clinical Outcomes & Innovations Report* was made possible through generous gifts from the following people:

- Corrine Graber
- Joseph Ficalora
- Dr. Samin K. Sharma Family Foundation

Scan the following QR code to request an appointment:



## Contact Info

To make an appointment:

Phone: 212-241-0884

To refer a patient:

Phone: 212-241-5136

Designed and Produced by:  
Onward Publishing Inc.  
464 Main Street, Port Jefferson, NY 11777  
631-757-8300  
www.onwardpublishing.com

©2022 The Mount Sinai Hospital  
Marketing and Communications

**“A team is not only a group of people who work together,  
a team is a group of people who trust each other.”**



**Cardiac Catheterization Laboratory Mission:**

To improve outcomes and safety of interventional patients by delivering clinical innovations, unrivaled research, and personalized clinical care as a Team Concept.

