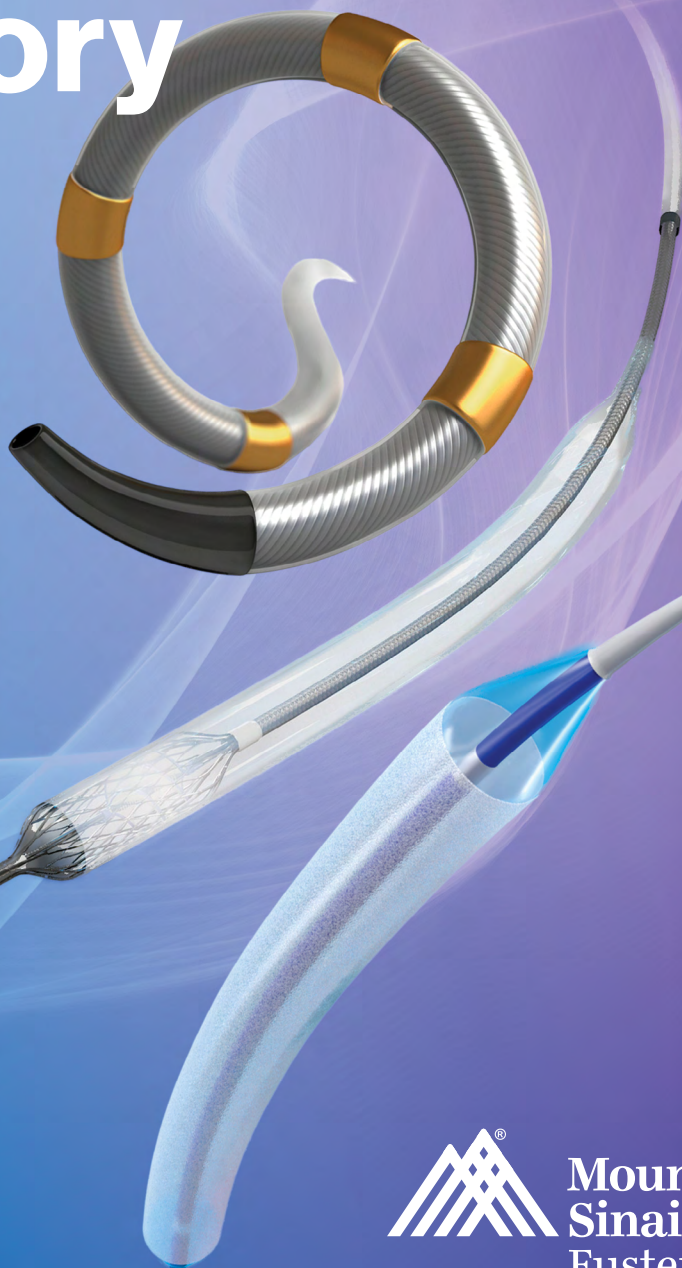


DR. SAMIN K. SHARMA FAMILY FOUNDATION

# Cardiac Catheterization Laboratory

2023 Clinical Outcomes  
& Innovations Report



Mount  
Sinai  
Fuster  
Heart Hospital



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

Director, Cardiovascular Clinical Institute  
 Senior Vice-President, Operations &  
 Quality, Mount Sinai Fuster Heart Hospital  
 Director, Interventional Cardiology,  
 Mount Sinai Health System  
 President, Mount Sinai Fuster  
 Heart Hospital 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 Samin K. Sharma, MD, and Annapoorna S. Kini, MD

The landscape of interventional cardiology is changing constantly with the main goal of improving patient outcomes. We are proud to present this 2023 edition of our *Clinical Outcomes & Innovations Report*. For more than 12 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. At The Mount Sinai Hospital, our Cardiac Catheterization Laboratory remains a leader for several reasons, including the:

- Talent of our team of interventionalists and supporting staff, who all work together and respect each other;
- Strict adherence to proven updated protocols and standards of care;
- Innovation and implementation of new technologies and techniques, including participation in numerous clinical trials that can benefit our patients. Many of the first-in-human devices are implanted in our Cardiac Catheterization Laboratory.
- A 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, we frequently treat patients successfully in our Cardiac Catheterization Laboratory who are considered too high-risk to receive care elsewhere and they are able to go home with a smile on their face 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. We will continue to pioneer new paths, setting the pace for another remarkable year of innovation and excellence in 2024. We will continue to improve our patient clinical and procedural outcomes by constantly analyzing our results critically and making new advances.

“We frequently treat patients successfully in our Cardiac Catheterization Laboratory who are considered too high-risk to receive care elsewhere and they are able to go home with a smile on their face and an improved quality of life.”

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# Table of Contents

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A Message From Samin K. Sharma, MD, and Annapoorna S. Kini, MD	2
Overview of Services and Outcomes	6
Innovations	13
Research and Clinical Trials	52
Top Ten Major Publications of 2023	54
Full-Time Senior Attendings	56
Full-Time Attendings	62
Voluntary Attendings	65
Administrative Staff	66
Nurse Practitioner Team	67
Interventional Cardiology Fellows	68
Collaborative Teams	69
Cardiac Catheterization Laboratory Achievements	70
CCC Live Cases: Monthly Webcast Program	72
Cardiac Catheterization Laboratory Educational Events	73
Mount Sinai Fuster Heart Hospital Directory	74
Contacts	75

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



### **Valentin Fuster, MD, PhD, MACC**

Physician-in-Chief,  
The Mount Sinai Hospital  
President, Mount Sinai Fuster Heart Hospital

Within the Mount Sinai Cardiac Catheterization Laboratory, we see patients from all walks of life. While many have been deemed too high risk at other centers, here we do not shy away from complex cases. Our top-notch interventionalists and support staff work together and apply the latest innovations to take on even the most challenging cardiovascular diseases, including patients with advanced heart failure to those with congenital defects.

I'm continually impressed by what Samin K. Sharma, MD, and Annapoorna S. Kini, MD, have built at Mount Sinai Fuster Heart Hospital: Not only is their remarkable team at the forefront of the latest research and creative innovations, but their creativity, care and compassion shine through as they center patient care in everything they do. As our center has continued to grow, I'm happy to report that our over 99 percent success rate has remained, and our vision has never wavered: To give our patients an opportunity to enjoy many more healthy years.

We are proud to present the *2023 Clinical Outcomes & Innovations Report*, which features not only our team's impressive research and achievements, but the words of grateful patients whose lives and futures have been changed for the better.



### **Deepak L. Bhatt, MD, MPH, MBA**

Director of Mount Sinai Fuster Heart Hospital  
Dr. Valentin Fuster Professor of  
Cardiovascular Medicine

As I reflect on my first full year as the Director of the Mount Sinai Fuster Heart Hospital, I am pleased to share the continued success of our flagship Cardiac Catheterization Laboratory at The Mount Sinai Hospital in Manhattan

From the very start, I have been continuously impressed by the dedication and expertise of each member of the stellar team of cardiologists, interventionalists, advanced care providers, nurses, and support staff that Drs. Sharma and Kini have assembled. This incredible team's unwavering commitment to providing the highest quality of care to our patients is truly commendable and sets the standard for our health system.

The tireless efforts and commitment to excellence have resulted in yet another year of remarkable procedural success and outstanding patient outcomes. This dedication to advancing the field of interventional cardiology is a testament to the team's skill and passion for patient care.

With an eye toward procedural excellence, patient satisfaction, and innovation in new techniques and technology that improve care and expand the horizons of what is possible in interventional cardiology, I have no doubt that the Mount Sinai Fuster Heart Hospital will continue to set new standards in cardiovascular care.





**David L. Reich, MD**

President, The Mount Sinai Hospital  
and Mount Sinai Queens

“From big, bold ideas, to small hunches, we encourage staff at every level to not just think about the kinds of treatments that are making headlines today, but to break the bounds of old ideas and think of completely novel approaches.”

## President, The Mount Sinai Hospital

The vitality of a health care organization goes well beyond just the day-to-day appointments and procedures. Certainly, the thousands of people who pass through the doors of the Fuster Heart Hospital at The Mount Sinai Hospital receive excellent heart care. That’s why our hospital is Ranked No. 1 in New York and No. 4 in the nation for Cardiology, Heart & Vascular Surgery by *U.S. News & World Report*® for 2023-24. But The Mount Sinai Hospital has a long history of clinical excellence in cardiac care. How do we maintain this consistently high level of care?

**It starts with science and research.** Across our heart hospital, our caregivers, researchers and physicians are imagining a future with new tools and new approaches to managing cardiac conditions of all kinds. From big, bold ideas, to small hunches, we encourage staff at every level to not just think about the kinds of treatments that are making headlines today, but to break the bounds of old ideas and think of completely novel approaches.

**It continues with education.** Though many firsts were had at The Mount Sinai Hospital, there has always been an impetus to share these discoveries with our colleagues across medicine, getting novel treatments, procedures and techniques into the hands of as many skilled care providers across the globe.

**It is cemented through culture.** People need to want to come to work, to be united with a common mission to help provide the highest level of care while treating patients with dignity and allay their concerns.

The Cardiac Catheterization Laboratory at The Mount Sinai Hospital embodies all of these pillars of excellence. On these following pages, you’ll see research and innovations that show a team committed to investigating heart care from every angle; backing up new approaches with hard science with the goal of improving patient care.

This annual report also demonstrates a commitment to education, as Dr. Sharma, Dr. Kini and the staff of the Cardiac Catheterization Laboratory share their expertise with peers across the globe as well as elbow to elbow with their fellows, who come from all over the globe to learn the latest in interventional cardiology. You’ll also see the words of grateful patients, who were compelled to reach out after witnessing the professionalism and kindness with which they were treated.

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# The Cardiac Catheterization Laboratory at The Mount Sinai Hospital

## An Overview of Services and Outcomes



**From Left:** Amit Hooda, MD, Pedro Moreno, MD, Isha Ranadive, MD, Vishal Kapur, MD, Prakash Krishnan, MD, Parasuram Melarcode Krishnamoorthy, MD, Joseph M. Sweeny, MD, Annapoorna S. Kini, MD, Gregory Serrao, MD, Samin Sharma, MD, Roxana Mehran, MD, Vishal Kapur, MD, George Dangas, MD, Sahil Kherra, MD.

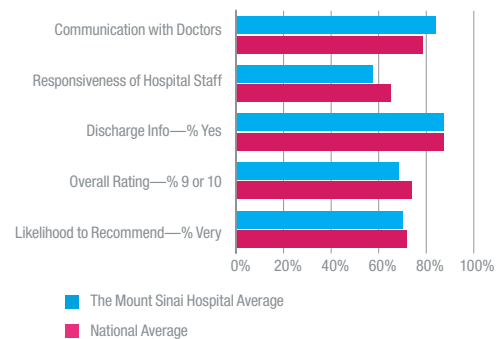
“The highest levels of performance come to people who are centered, intuitive, creative, and reflective—people who know to see a problem as an opportunity”

- DEEPAK CHOPRA  
SPIRITUAL TRANSFORMATIVE GURU

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 appropriate, efficient and safe care to patients in need. As a result, the Cardiac Catheterization Laboratory consistently reports a high level of patient satisfaction; 62 percent of patients are discharged on the same day after their successful interventional 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 every year, maintaining low procedural complications in 2023. This remarkably low complication rate has been achieved despite high complexity and comorbid medical conditions of patients treated in the Cardiac Catheterization Laboratory.

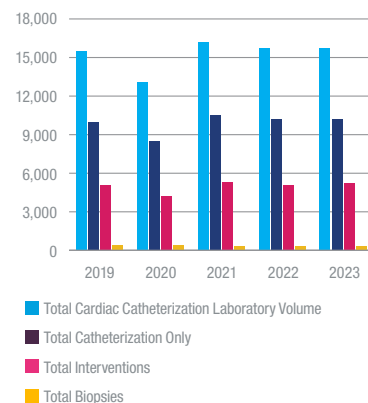
PATIENT SATISFACTION: 2023 HCAHPS SURVEY



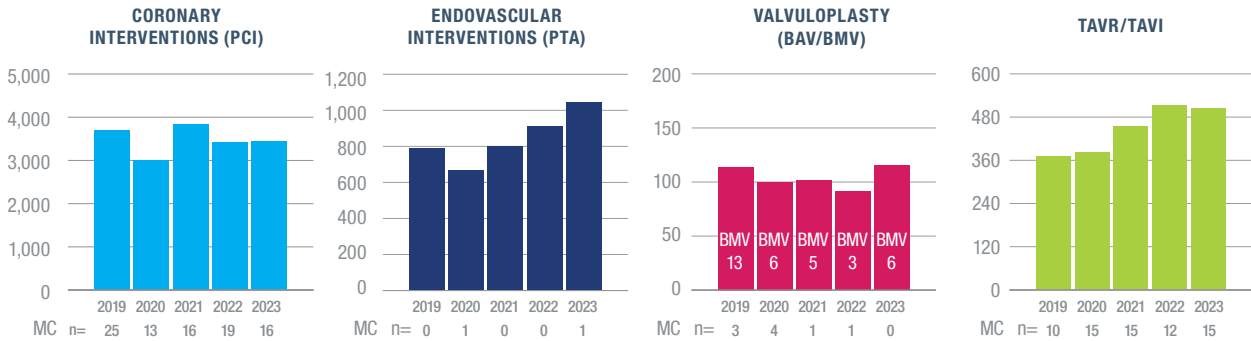
**62 Percent**

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

CARDIAC CATHETERIZATION LABORATORY VOLUME AT THE MOUNT SINAI HOSPITAL PROCEDURES OVER THE LAST FIVE YEARS



**INTERVENTIONAL VOLUME AND MAJOR COMPLICATIONS (MC) 2019–2023**



MC = Major Complications

**2023**

Septal Ablation = 6

TMVR = 8

TTVR = 2

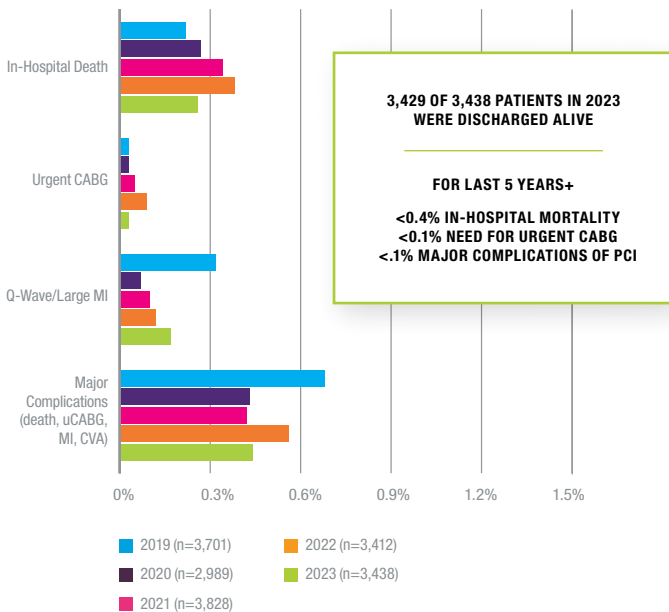
LAAO = 7

MitraClip = 101

TriClip = 12

PFO/ASD Closure = 30

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



**29 Percent of 3,438**

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

**38 Percent**

**OF PCIS AND 52 PERCENT OF DIAGNOSTIC CATHS WERE DONE VIA RADIAL ACCESS**



## Comparison of The Mount Sinai Hospital Interventional Outcomes with New York State Data: 2019–2023

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

Reports of 30-day risk-adjusted PCI mortality rates (RAMR) have consistently placed The Mount Sinai Hospital Cardiac Catheterization Laboratory or its interventionalists among the lowest for in-hospital and 30-day risk-adjusted mortality, receiving the double star denoting statistically significantly lower RAMR than the statewide average consistently over the last 24 years of New York State Department of Health PCI reporting.

NYS reports also showed that 30-day risk adjusted readmission rate post-PCI have been statistically lower than the statewide average, earning the double-star notation for the last six consecutive reports.

### NYS-DOH REPORT OF PCI 2019 DATA ON THE TOP 10 VOLUME CENTERS IN NY STATE 30-DAY RAMR

PCI Statistics 2019	# Cases	All Cases	Non-Emergency Cases
1. The Mount Sinai Hospital	3,666	0.76	0.43
2. Saint Francis Hospital	3,078	.067**	0.47
3. NYU Hospitals Center	2,484	0.79	0.41
4. North Shore University Hospital	2,428	1.26	0.76
5. Columbia Presbyterian Hospital	2,182	1.92*	1.21*
6. Saint Joseph's Hospital	2,124	1.22	0.87
7. Lenox Hill Hospital	1,990	0.46**	0.22**
8. Buffalo General Medical Center	1,498	1.30	0.71
9. Stony Brook University Hospital	1,438	0.98	0.71
10. Mount Sinai Beth Israel	1,427	1.20	0.71
<b>NYS Total</b>	<b>54,276</b>	<b>1.16</b>	<b>0.71</b>

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

\*\*Risk-Adjusted Mortality Rate (RAMR) significantly lower than NY statewide rate

\*Risk-Adjusted Mortality Rate (RAMR) significantly lower than NY statewide rate

### NYS-DOH REPORT OF PCI 2017-19 DATA ON THE TOP 10 VOLUME CENTERS IN NY STATE 30-DAY RAMR

PCI Statistics 2017-19	# Cases	All Cases	Non-Emergency Cases	Emergency Cases
1. The Mount Sinai Hospital	10,347	0.85**	0.50**	3.06
2. Saint Francis Hospital	8,750	0.93**	0.60	2.48
3. North Shore University Hospital	7,214	1.16	0.72	3.23
4. NYU Hospitals Center	6,634	0.97	0.57	3.25
5. Columbia Presbyterian Hospital	6,478	1.56*	1.03*	3.97
6. Saint Joseph's Hospital	6,151	1.17	0.76	3.14
7. Lenox Hill Hospital	5,557	0.61**	0.37**	1.73
8. Mount Sinai Beth Israel	4,416	1.00	0.55	3.46
9. Buffalo General Medical Center	4,350	1.18	0.59	3.54
10. Stony Brook University Hospital	4,247	1.44	0.90	4.01
<b>NYS Total</b>	<b>157,140</b>	<b>1.22</b>	<b>0.79</b>	<b>3.24</b>

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

\*\*Risk-Adjusted Mortality Rate (RAMR) significantly lower than NY statewide rate

\*Risk-Adjusted Mortality Rate (RAMR) significantly lower than NY statewide rate

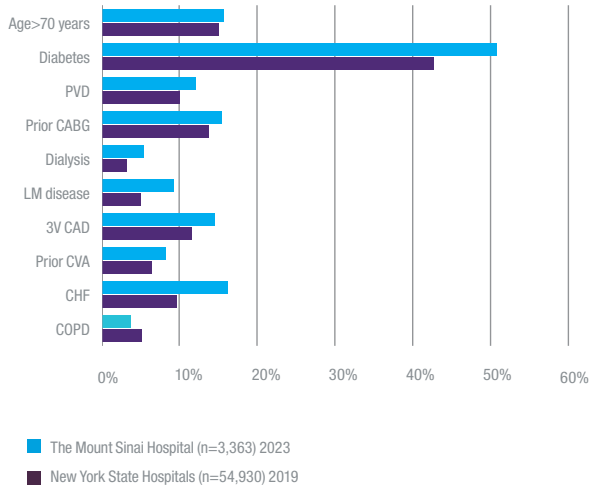
### MSH VS NY STATE PCI CASES, 30-DAY RISK-ADJUSTED READMISSION RATES (RARR) TO 2018

Hospital	# Cases	30-Day Readmission	All Cases RARR% Cases	95% CI for RARR
The Mount Sinai Hospital	2,873	179	6.69**	(5.75, 7.75)
<b>NYS Total</b>	<b>48,417</b>	<b>4,274</b>	<b>8.83</b>	

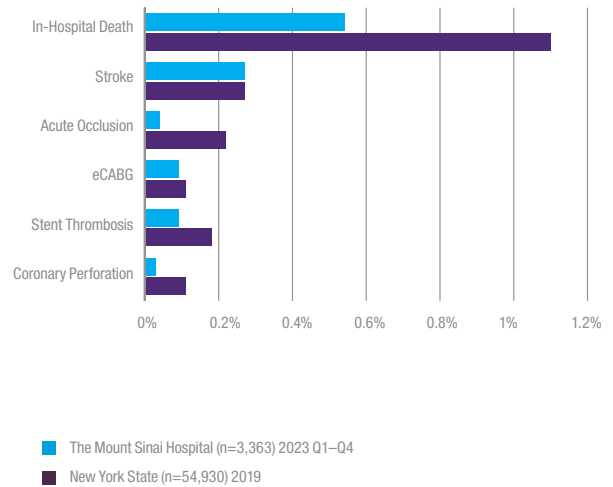
[www.nyhealth.gov](http://www.nyhealth.gov)

\*\*Risk-adjusted readmission rate significantly lower than NY statewide rate

**IMPORTANT BASELINE CLINICAL AND LESION CHARACTERISTICS OF PCI:**  
 NY STATE HOSPITAL DATA 2019–2023



**NYS-REPORTED MAJOR PCI COMPLICATIONS**



# 15,000+ Cases Per Year

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

# 24 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: 2023R4Q2 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 >1 million patients annually.

On the next page are the important baseline and procedure characteristics of The Mount Sinai Hospital (MSH) 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 2023R4Q2.

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 (AUC) of the American College of Cardiology and fractional flow reserve (FFR/iFR) guiding the decision-making for appropriately indicated PCI.

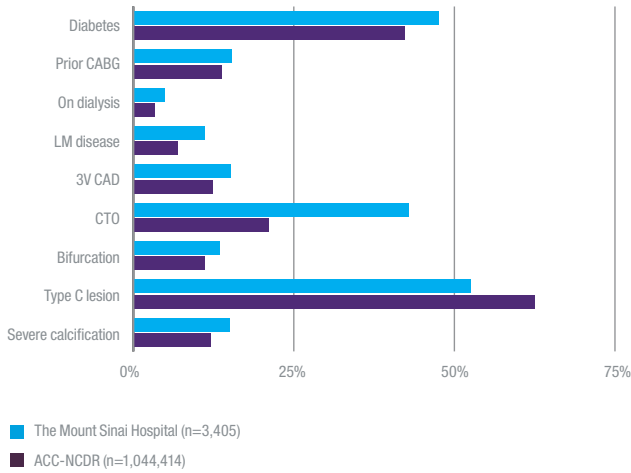
## Established protocols

AT MOUNT SINAI, WE HAVE ESTABLISHED EVIDENCE-BASED PROTOCOLS FOR PROPER EVALUATION OF CAD PATIENTS **BEFORE SCHEDULING CATHETERIZATION AND POSSIBLE INTERVENTION.**

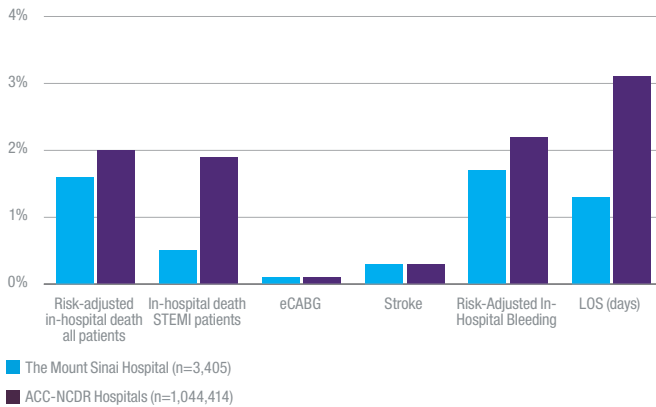
Samir K. Sharma, MD, Annapoorna S. Kini, MD, and Prakash Krishnan, MD, with the 2023–24 fellows.



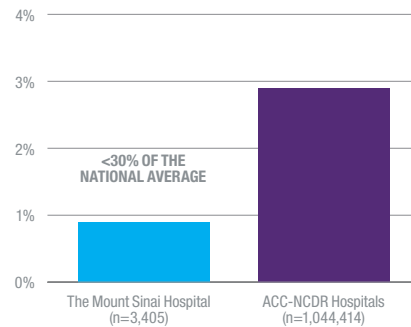
**IMPORTANT BASELINE CLINICAL AND LESION CHARACTERISTICS OF PCI:**  
ACC-NCDR DATA FOR 2023R4Q2



**PCI COMPLICATIONS:**  
MSH VS. ACC-NCDR HOSPITALS 2023 R4Q2



**NATIONAL PCI OUTCOME METRICS; MAJOR COMPLICATIONS:**  
COMPOSITE: PROPORTION OF PCI PATIENTS WITH DEATH, eCABG, STROKE OR eTVR; MSH VS. ACC-NCDR (N=1,600 HOSPITALS) FOR 2022 Q3-2023 Q2





# Complex High-Risk Percutaneous Coronary Interventions (PCI)

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

Earlier randomized clinical trials have suggested the benefits of coronary artery bypass graft (CABG) surgery in higher angiographic-complexity cases over percutaneous coronary intervention (PCI).

Based on data evidence, there is an increasing tendency at The Mount Sinai Hospital to recommend CABG for patients with more complex coronary artery disease (CAD). Ultimately, the decision to have either CABG 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 (≈ 50 percent) with complex CAD choose revascularization with PCI, due to lower short-term complications and relative ease of recovery compared to surgery.

As far as the left main (LM) CAD is concerned, a recent pooled-analysis of four randomized clinical trials comparing PCI to CABG in patients

with vs. without acute coronary syndrome (ACS), showed that for patients with ACS compared to non-ACS patients, PCI and CABG have similar rates of all-cause death over five and ten years but higher MI and repeat procedure after PCI compared to CABG.

The recent FAME-3 trial comparing FFR-guided PCI with CABG in three-vessel coronary artery disease found PCI to be inferior in the composite of death, myocardial infarction, or stroke at three-year follow-up versus CABG, but better outcomes in low Syntax Score patients.

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

- Three-vessel CAD and SYNTAX Score >32
- Diabetics with three-vessel CAD or complex two-vessel CAD with prox-mid LAD lesion
- Left main ± additional vessel

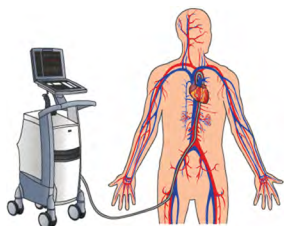
**Based on data evidence, there is an increasing tendency at The Mount Sinai Hospital to recommend surgery for patients with more complex coronary artery disease (CAD).**

CAD with SYNTAX Score >32

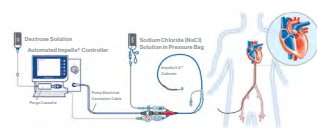
In addition to expertise in interventional treatment of complex CAD, our Catheterization Laboratory serves as a tertiary center for complex coronary intervention (bifurcation, calcified, left main, CTO, and/or vein graft lesions) and patients with low ejection fraction (LVEF <35 percent).

We use a variety of adjunct interventional techniques in these complex coronary cases, such as atherectomy (29 percent of lesions) and thrombectomy/distal protection devices (2 percent for thrombotic and vein graft lesions). In a small number of complex lesion patients (≈ 5 percent of PCI) many of the patients have reduced ejection fraction (LVEF <35 percent), we use LV assist devices such as IABP, Impella or ECMO CardioHelp to safely and dependably perform these high-risk PCIs (Protected PCI).

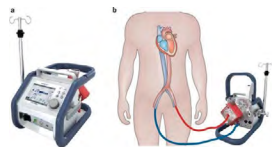
IABP SYSTEM



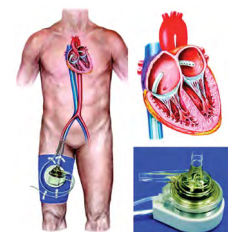
IMPELLA SYSTEM



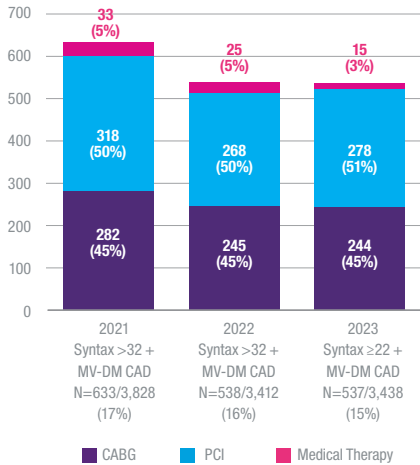
ECMO CARDIOHELP SYSTEM



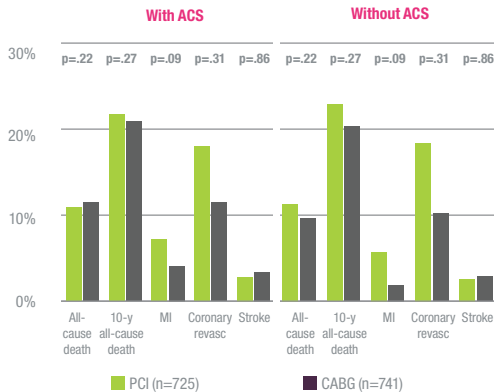
PERCUTANEOUS TRANSEPTAL VENTRICULAR ASSIST



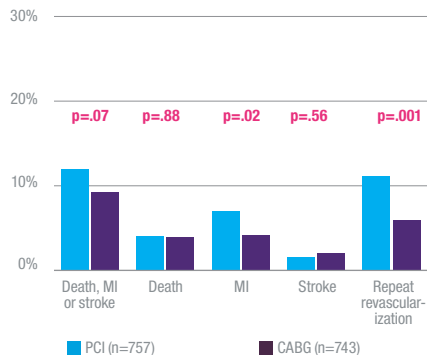
**REVASCULARIZATION CHOICES FOR COMPLEX CAD  
(HIGH SYNTAX SCORE AND/OR MV DIABETES):  
MSH DATA 2021–2023**



**CLINICAL OUTCOMES AFTER PCI VS CABG ACCORDING TO THE PRESENCE OR ABSENCE OF ACS IN PATIENTS WITH LM CAD**



**FAME 3 TRIAL: CLINICAL OUTCOMES AT 3-YEAR FOLLOW-UP**



# Hubert Yee

**Diagnosis:** Unstable angina, complex 3-vessel CAD

**Treatment:** PCI of LAD and LCx, and RCA



“It was relieving that I didn’t need open heart surgery with an extensive recovery.”

“After the 9/11 attacks, I was one of the first responders. Fast forward a couple decades, and a lot of our colleagues who were there were getting diagnosed with cancer, so we were encouraged to get a thorough checkup before we retired. I went in for my scan and everything came back clear for cancer, but one test showed a large calcium deposit in my heart. I was a little surprised because I had never had any cardiac symptoms. I’ve always been active and was consistently in the gym at the time.

“After the scan, I sought out a cardiologist. My friend recommended Dr. Sharma. I saw another cardiologist about a month out from my appointment with Dr. Sharma and a cardiac CT scan showed about a 100 percent blockage in one of my arteries—I was told to stop working out. I then had a catheterization, and the blockage was in a tough spot, so they could not complete the intervention and recommended I go for open heart surgery. I kept my appointment with Dr. Sharma and asked for a second opinion.

“Basically, I went in on the day of my consultation appointment and after looking at my charts for five minutes, he said he could stent it. There were two procedures to stent three separate arteries. I felt more comfortable getting stents than open heart surgery. It was a world of a difference between the hospitals I was at because Dr.

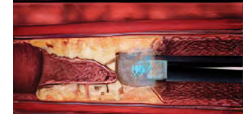
Sharma was confident that he could do the procedure without open surgery, and the other hospital had told me open heart was the only way to repair the blockage. I got my procedure only two days after my consultation with Dr. Sharma. He is a very efficient doctor. It was relieving that I didn’t need open heart surgery with an extensive recovery, I only had to stay one night for both procedures. After Dr. Sharma gave me the green light to go back to the gym, I did.”

VIEW A VIDEO OF HUBERT'S EXPERIENCE BY SCANNING THE CODE BELOW:





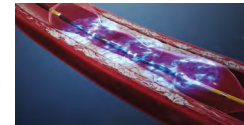
**ROTAPRO ROTATIONAL  
ATHERECTOMY SYSTEM (RA)**



**EXCIMER LASER  
ATHERECTOMY SYSTEM (ELCA)**

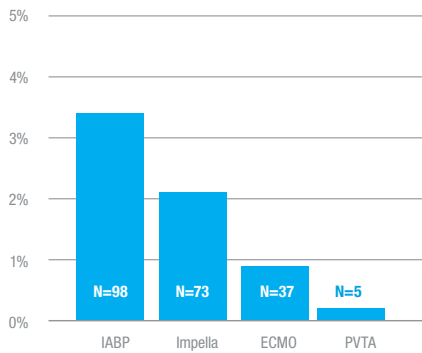


**DIAMONDBACK 360 ORBITAL  
ATHERECTOMY SYSTEM (OA)**

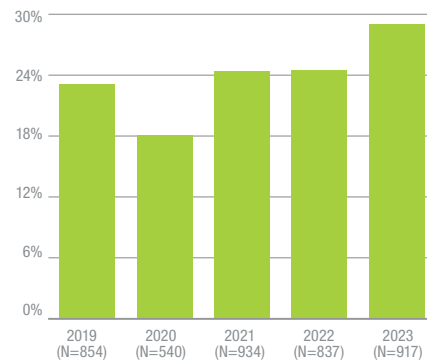


**SHOCKWAVE INTRAVASCULAR LITHOTRIPSY (IVL)**

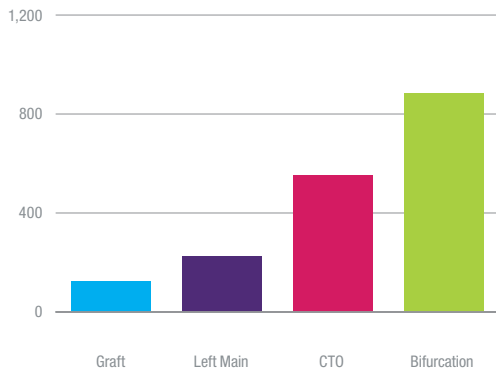
**HIGH RISK PCI WITH LV SUPPORT IN 2023  
AT THE MOUNT SINAI HOSPITAL: (N=3,438)**



**COMPLEX CORONARY INTERVENTIONS IN 2023 —  
ATHERECTOMY CASES**



**COMPLEX CORONARY INTERVENTIONS IN 2023  
(N=3,438)**



**References**

1. Fractional flow reserve-guided PCI or coronary bypass surgery for 3-vessel coronary artery disease: 3-Year Follow-up of the FAME 3 trial. Zimmermann, Ding, Pijls et al., *Circulation* 2023;148:950.
2. Percutaneous coronary intervention vs coronary artery bypass graft surgery for left main disease in patients with and without acute coronary syndromes: A pooled analysis of 4 randomized clinical trials. Gaba, Christiansen, Nielsen et al., *JAMA Cardiol* 2023;8:631

# Update in Management of In-Stent Restenosis

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

In-stent restenosis (ISR) is a condition where the blood vessels of the stented segment gradually narrow again with scar tissue that occurs mostly between 9 to 12 months after stent placement. Despite drug-eluting stents' (DES) technologies substantial improvement, incidence of ISR and repeat revascularization still occur in 2–10 percent of cases in the first year and then only 1–2 percent per year after. Most of the patients with ISR present with recurrent chest pain, but can also present as acute myocardial infarction. The management of ISR has witnessed significant progress, with a focus on technological innovations, targeted drug delivery, and personalized patient care. Mount Sinai has a high rate of procedural success, low rates of complications and lower rates of subsequent ISR despite a complex group of patient and ISR lesion subset we treat.

## Drug-Coated or Eluting Balloon (DCB or DEB) Technology

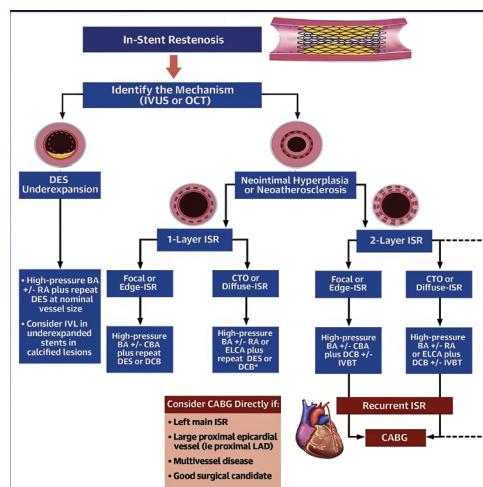
As the field continues to evolve, ongoing research and clinical trials will further refine existing strategies and introduce novel approaches to enhance the long-term success of coronary stent interventions. Recent significant advancements have emerged in the management of ISR. One

notable breakthrough involves the utilization of drug-coated balloons (DCBs), marking a paradigm shift in the approach to ISR treatment that is now FDA approved.

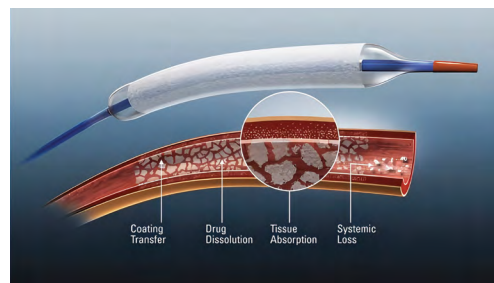
The FDA approval of DCBs for the management of ISR underscores the safety and efficacy of this innovative approach. These balloons are coated with drugs such as paclitaxel, sirolimus, or everolimus, which are released during balloon angioplasty targeting the restenotic tissue while minimizing systemic exposure. This targeted drug delivery aims to prevent excessive cell multiplication and reduce the risk of recurrent ISR, hence reducing the need for additional stent implantation and also subsequent restenosis. These innovative devices offer a less invasive and more target approach, demonstrating improved outcomes in ISR treatment. As research progresses, the integration of drug-coated balloons into clinical practice is expected to become more widespread, further shaping the landscape of ISR management.

Mount Sinai is participating in the Sirolimus-coated balloon trial which assesses the safety and effectiveness of the SELUTION SLR™ ISR drug eluting balloon in the treatment of patients with ISR. The Mount Sinai Hospital is the top enrolling site (52 patients) in the SELUTION SLR™ Trial.

A PROPOSED TREATMENT ALGORITHM FOR IN-STENT RESTENOSIS



## DRUG-COATED BALLOONS





# Susan Lambert

**Diagnosis:** Stable angina and 2-vessel CAD

**Treatment:** Successful PCI of RCA CTO and LAD



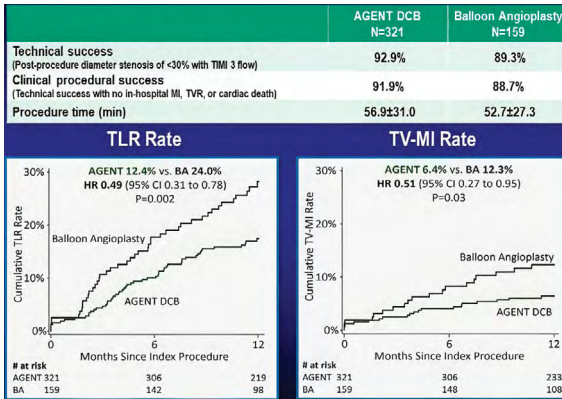
“Everything was wonderful there from start to finish and Dr. Sharma was very reassuring.”

“I have a history of heart disease in my family, and despite living a healthy life and not smoking, I had my first heart attack at the age of 35. In 2012, I had my first stent, and in 2016 I had my second stent placed. My most recent trouble began early last year, when I started having sporadic discomfort in my jaw and upper neck, specifically in the morning. At first, I thought nothing of it because at my last cardiac appointment all my tests had been fine. As the pain continued, however, I made another appointment with my cardiologist. Again, all tests came back normal. My cardiologist referred me to Dr. Sharma for a diagnostic catheterization to investigate further. My doctor assured me Dr. Sharma was one of the best—and was his own cardiologist. I was relieved knowing I would be in good hands.

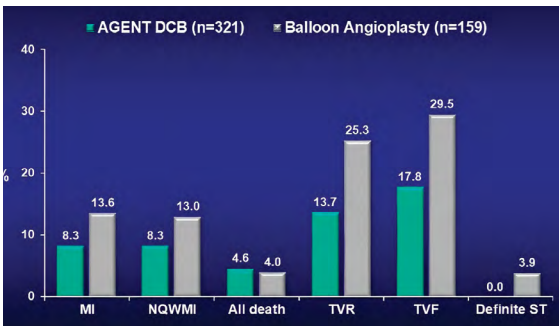
“The hour and a half drive proved so worth it. During the catheterization, Dr. Sharma found two blockages, one of which they stented that day. The other blocked artery was the one I had had stented in 2016, it was going to be a more complex one to fix, so they scheduled that procedure for a month later. After the second procedure my neck pain was finally rectified. I am forever grateful to Dr. Sharma and his incredible staff.

“I had overnight stays for both procedures. The recoveries were relatively fast. I had no other symptoms besides the neck and jaw pain most people don’t think that’s a sign of a heart issue, but it most certainly is. I am grateful I was informed enough to think it had to do with my heart based on my history. Mount Sinai is from now on my go to place for my cardiac care. If I need further work, I will definitely go to Mount Sinai. Everything was wonderful there from start to finish and Dr. Sharma was very reassuring. He really did give me the gift of life. He is an extraordinary interventionalist who works miracles.”

## AGENT IDE TRIAL: TLR AND TVR-MI AT 1 YEAR



## AGENT IDE TRIAL: ADDITIONAL ENDPOINTS AT 1 YEAR



AGENT Paclitaxel-Coated Balloon Becomes First DCB Approved to Treat Coronary Lesions in the US



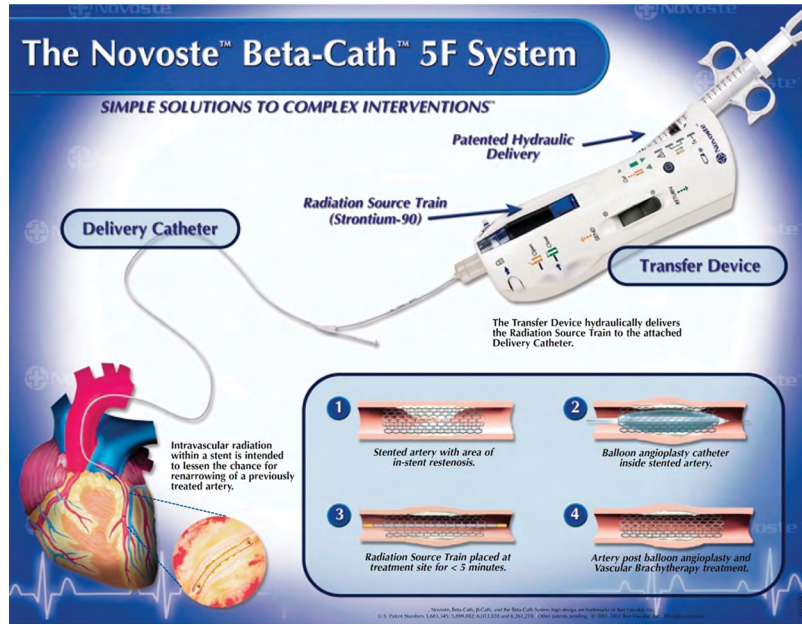
The U.S. Food and Drug Administration (FDA) has approved the AGENT drug-coated balloon (DCB) to treat coronary in-stent restenosis (ISR), marking the first time a DCB is available for commercial use in the U.S.

**Intravascular Brachytherapy (IVBT) For Multi-Layer Recurrent DES In-Stent Restenosis (ISR)**

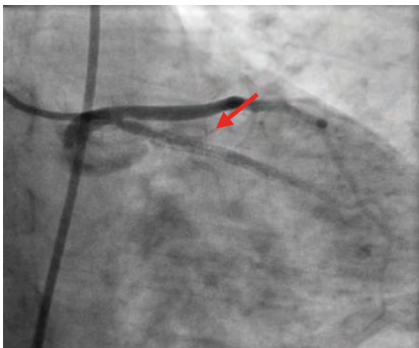
Patients with recurrent in-stent restenosis (ISR) of DES with more than two layers of stents are appropriate cases for IVBT using the Beta-Cath™ System to reduce subsequent restenosis by inhibiting intimal hyperplasia (scar tissue).

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 DES ISR without IVBT); reduction by 70 percent compared to routine treatment with similar value durability.

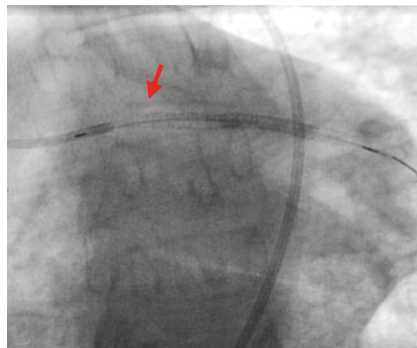
**NOVOSTE™ BETA-CATH™ 3.5F SYSTEM**



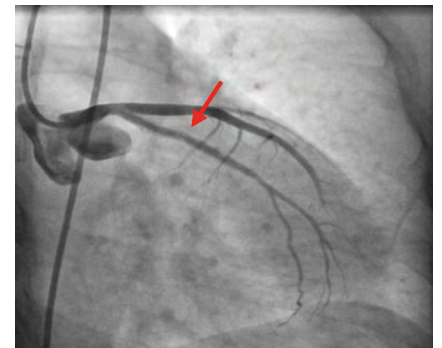
**INTRAVASCULAR BRACHY THERAPY TREATMENT**



Pre-IVBT

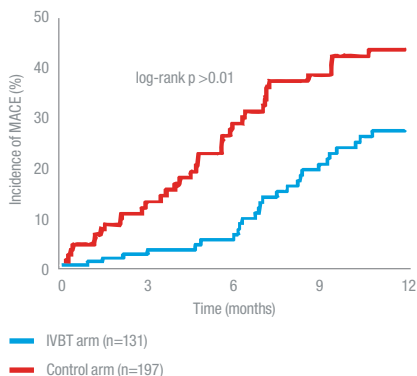


IVBT in place

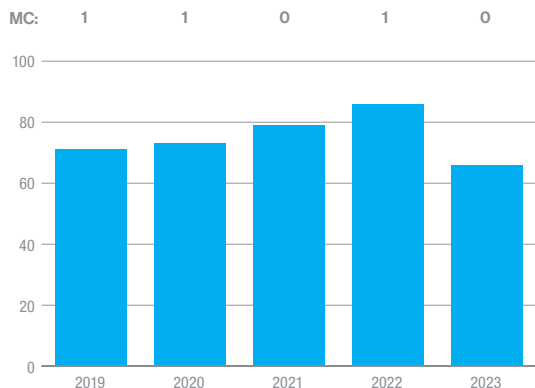


Post-IVBT

**MACE AT ONE YEAR AFTER IVBT + PCI OF RECURRENT DES-ISR: MSH EXPERIENCE**



**IVBT VOLUME AT THE MOUNT SINAI HOSPITAL**



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2. Paclitaxel-coated balloon vs uncoated balloon for coronary in-stent restenosis; The AGENT IDE randomized clinical trial. Yeh R, Shlofmitz R, Moses J et al., *JAMA* .2024;331:1015.
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# Iris Amaro

**Diagnosis:** Crescendo angina, 3-vessel CAD

**Treatment:** Successful PCI of RCA, LAD and LCX



“I haven’t had any weakness, and my jaw pain is gone. It was like I was never even sick”

“I had very bad pains in my jaw that were just atrocious. I couldn’t figure out what could have been causing that pain, so I went to see multiple doctors — all of them reported nothing was wrong. Finally, my son insisted on taking to his heart doctor, and I was told that I had a blockage in what they called the ‘widowmaker’ artery. I had never heard of that before but was relieved to have an answer. That doctor then sent me to another hospital for a procedure. When I went there the surgical team told me and my son, and daughter, it would be a 20-minute procedure, but I was in the operating room (OR) for more than three hours. Because of my age, I was awake during the whole procedure, and I felt every movement, it was so painful. There was a certain point where I was convinced, I wasn’t going to make it. So, I told the nurse to get my kids into the OR because I didn’t think I was going to make it, but she didn’t because they weren’t allowed in. I was so thankful after four hours when I got wheeled out of the operating room and got to see my children.

“Though it took longer than expected, the procedure was successful — but it wasn’t the end of my journey, I still had several more blockages. Before I left, someone gave me Dr. Sharma’s information. I called their office and scheduled an intervention. Dr. Sharma ended placing four stents on me during three separate operations. Each time, Dr. Sharma went in through the groin and while I was awake, I didn’t feel anything, unlike my previous experience. After my last operation I stayed at Mount Sinai for two or three days but overall, I had a fast recovery. All of the staff were very nice and attentive during my stay.

“Just four days later I felt like I bounced right back to my old self. Whatever Dr. Sharma did worked wonders. I haven’t had any weakness, and my jaw pain is gone, it was like I was never even sick. Dr. Sharma saved my life.”

# Imaging Success of Chronic Total Occlusions

ANNAPOORNA S. KINI, MD, AMIT HOODA, MD, AND KEISUKE YASUMURA, MD

Chronic total occlusion (CTO) represents a 100 percent blockage of the coronary artery with evidence of occlusion duration exceeding three months. CTOs are identified in approximately 20 percent of all patients undergoing diagnostic angiography in everyday practice in the Cardiac Catheterization Laboratory.

Significant advancements in dedicated equipment and techniques have resulted in a leap in CTO percutaneous coronary intervention (PCI) success rates from 50–70 percent to 85–94 percent over the past decade at centers with specialized expertise, including The Mount Sinai Hospital.<sup>1</sup>

Patients with CTOs often experience atypical symptoms, such as shortness of breath and exercise limitations, rather than the typical angina pain that occurs in patients with less severe blockages. The EUROCTO randomized trial has recently highlighted the superiority of CTO-PCI over medical therapy in improving patients' quality of life and physical function following high successful rates of recanalization of CTOs.<sup>2</sup>

The adoption of seven fundamental principles for CTO-PCI, based on recent global expert consensus,<sup>3</sup> ensures best practices:

1. Ischemic symptom improvement as the primary indication.
2. Essential dual coronary angiography for planning and safe execution.
3. The necessity of a microcatheter for optimal guidewire manipulation and exchanges.
4. Antegrade wiring as the initial technique, and application of retrograde approaches for more complex CTOs.
5. Prompt technique modification to improve the likelihood of success and efficiency.
6. Dedicated training and expertise to increase success rates and manage complications.
7. Intracoronary imaging, often with intravascular ultrasound (IVUS), to ensure optimal stent expansion and minimize risk. IVUS plays a specific role in CTO-PCI, such as facilitating the puncturing of the proximal cap in ostial CTO and aiding in antegrade re-entry, contributing to the precision and safety of the procedure.<sup>4</sup>

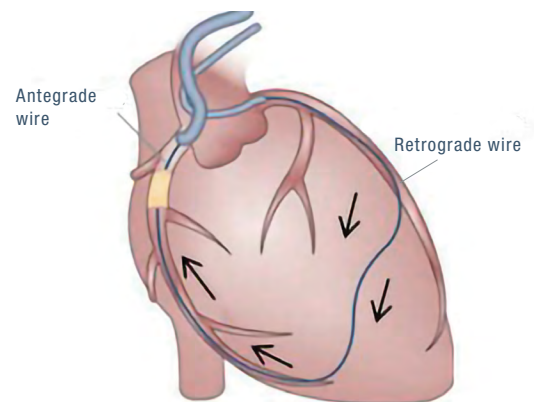


Figure 1: Retrograde Recanalization of CTO

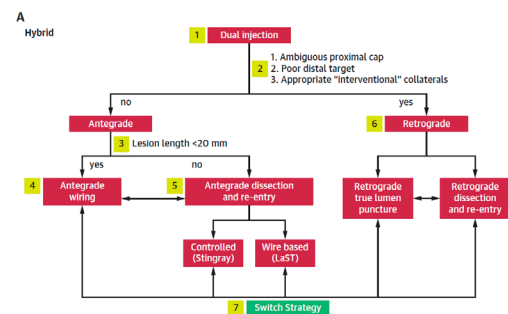


Figure 2: The Hybrid Algorithm of CTO Crossing Strategies



# Tracy Hojnacki-Koy

**Diagnosis:** Unstable angina

**Treatment:** Successful PCI of LAD



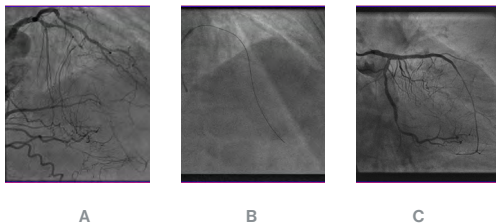
“I think that Dr. Kini is warm but also clear and direct. I like that about her. I think she is fabulous.”

“I knew women have different heart symptoms than men, but even with that knowledge, I never recognized the warning signs. The symptoms I didn’t pay attention to were feeling like I had indigestion that would last for more than a few minutes and shortness of breath—I thought I just needed to exercise more and change my diet, or perhaps my body was changing because I was getting older.

“I had a heart attack on the express bus going back home from work to Northern Manhattan. I was having the worst sharp pain in my chest, even more severe than childbirth. The driver hailed me a taxi to Mount Sinai. I was only in the ER for maybe 10 minutes before they took me to the Cardiac Catheterization Laboratory. I was calm through the whole process, because I knew I was in the right place. I remember Dr. Kini taking my hands and telling me she was going to be my doctor and take care of me. Due to it being an emergency operation the team caring for me said they wouldn’t yet know if I would need stents, or a bypass until I was on the operating table. The doctors did tell me though that they were going to do everything they could even though they didn’t know what yet. I still felt very safe and knew I was in good hands.

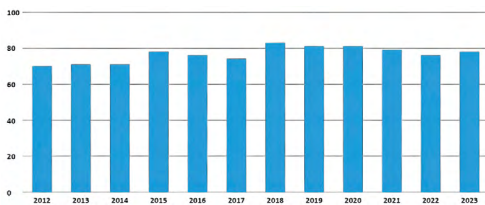
“The next thing I remember was waking up after my procedure. The heart floor is amazing. I was constantly checked on to make sure I was comfortable and was never hungry. The before and after pictures they showed me of my procedure were astounding. It gave me a clear idea of what had happened and how they had fixed it. Now, I have been operated on twice by Dr. Kini to clear three blocked arteries. I think that Dr. Kini is warm but also clear and direct. I like that about her. I think she is fabulous, and she saved my life. I’ve since influenced my other family members to visit doctors to check their hearts.”

We at Mount Sinai employ these globally recognized techniques and principles for our CTO-PCI, achieving high success rates in revascularizing CTO with both antegrade and retrograde approaches.



**Figure 3:** A representative case of antegrade LAD CTO-PCI

- Mid LAD CTO with collateral flow from RCA
- Recanalization of CTO with antegrade wire escalation
- Post-two DES implantation of Proximal to mid LAD



**Figure 4:** Procedural Success of PCI for CTO at the Mount Sinai Hospital

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# 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 levels of surgical risk (based on the STS Score) have shown TAVR as a viable therapeutic option for patients who have severe, symptomatic calcific aortic stenosis (AS) at all levels of surgical risk.

The NOTION trial, which compares surgical vs. transcatheter aortic valve replacement in low STS risk patients, showed no difference in the risk of major clinical outcomes after 10-year treatment.

A recent study (PROTECTED TAVR) using the 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 the SENTINEL device is associated with a lower risk of disabling stroke but not all strokes compared to the control group.

At our center, the SENTINEL device is now used in about 40–50 percent of TAVR 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 compared with other centers in the Transcatheter Valve Therapy (TVT) Registry with a three-Star

(★★★) rating according to the STS Registry.

There are some AS patients who have had a higher incidence of complications after implanting TAVR. These patients should preferably be referred to open surgical aortic valve replacement (SAVR); currently 20 percent of AS patients undergo SAVR at The Mount Sinai Hospital.

SAVR will be indicated in the following scenarios of severe AS;

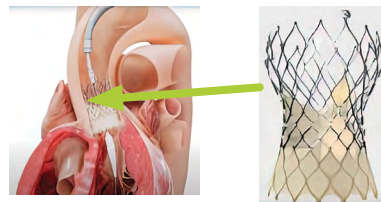
- Age <65 years old
- Low to intermediate STS risk and extensive/complex CAD
- Bicuspid AV with low STS risk
- Concomitant aortic root/aorta dilatation (>4.6cm)
- Heavy LVOT calcification (high chance of annular rupture)
- Low–Intermediate STS risk bi-prosthetic dysfunction
- Adverse anatomy (low coronary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

After excellent successful TAVR in severe aortic stenosis (AS) patients, TAVR is now being evaluated in moderate aortic stenosis under the FDA approved clinical trial—TAVR EXPAND II Pivotal Trial.

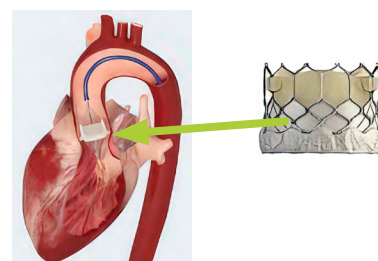
Nationally, TAVR volume has increased every year since 2011, and in 2023, TAVR volume surpassed (↑29%) all forms of AVR surgery concomitant to FDA approval of TAVR for low-risk patients.

## TRANSCATHETER AORTIC VALVES FDA-APPROVED DEVICES

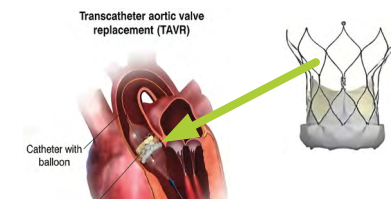
EVOLUT™ FX



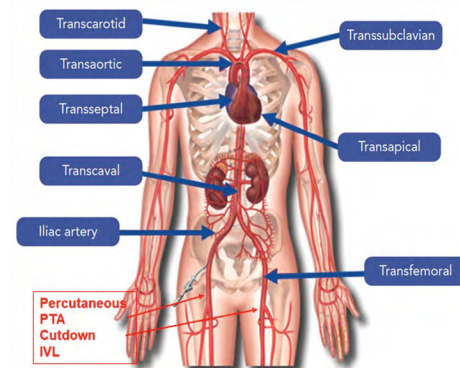
SAPIEN-3 Ultra RESILIA



Navitor™

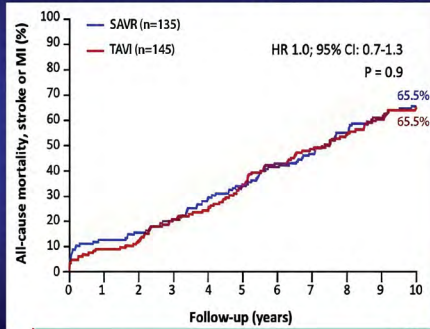


## OVERVIEW OF APPROACHES FOR TAVR

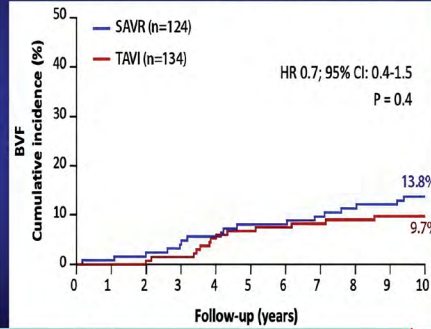


## NOTION Trial: Clinical and Aortic Bioprosthetic Valve Failure 10 Yrs After TAVR vs SAVR

All-Cause Mortality, Stroke, or MI



Bioprosthetic Valve Failure



	TAVR	SAVR	
Severe structural valve deterioration	1.5	10.0	P = 0.004

## Growing Structural Transcatheter Heart Interventions TAVR Procedures at MSH: 2019 to 2023



## PROTECTED TAVR: Stroke Within 72 h / Discharge (Primary Endpoint)



STS/ACC TVT Registry  
Public Reporting Metrics  
Patients with TAVR as of 2021 Q3  
Hospital 074256

Timeframe First TAVR Procedure Performed	My Hospital TAVR Volume <sup>1</sup> (commercial procedures only)		Distribution of Annual Hospital TAVR Volumes (Across all TVT Registry Hospitals)
	Cumulative	Annual volume (Oct 1, 2019 - Sep 30, 2021)	
May, 2012	2353	447	

My Hospital TAVR 30 Day Composite Site Difference <sup>2,3</sup> (95% Confidence Interval)	Eligible Patients (Oct 1, 2019 - Sep 30, 2021)	Participant Rating	Distribution of Participant Estimates
0.02 (0.01 to 0.03)	1128	★★★	

<sup>1</sup> Missing value (-) indicates that hospital does not meet eligibility criteria for reporting.

<sup>2</sup> 30 Day Composite consists of six ordered categories based on the worst possible outcome (30-day death) to the best possible outcome (e.g. alive and free of major complications) during hospitalization and the 30-day follow-up period as defined below:

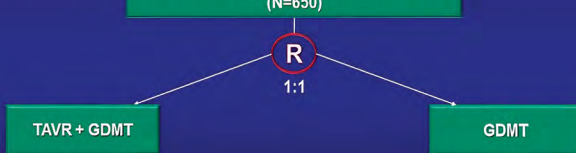
1. 30-day death
2. 30-day stroke
3. 30-day life-threatening or major bleeding
4. Acute kidney injury (stage III)
5. 30-day moderate to severe paravalvular aortic regurgitation (PVR)
6. None of the above

<sup>3</sup> The TAVR 30-day mortality/morbidity composite is reported as a "site difference":  
 >0 implies "My Hospital" has better than expected performance  
 <0 implies "My Hospital" has worse than expected performance

## TAVR Evolut™ EXPAND II Pivotal Trial

For Moderate Aortic Stenosis

Prospective, Randomized, International Trial (N=650)



Clinical Primary Endpoints: Death, Stroke, BARC 3-4 Bleeding, AKI IV, Rehop, Reinterv at 30-day follow-up

Primary Effectiveness Endpoint: All-cause Mortality, HF, AVR or re-interv at 2 years



In a report of repeat TAVR versus TAVR explanation from the Centers for Medicare and Medicaid Services (CMS), analysis from a large, nationally representative database showed;

- repeat TAVR was associated with acceptable short-term mortality in a high-risk population.
- repeat TAVR outcomes were superior compared to TAVR explanation at 30 days but not at one year.
- repeat TAVR becomes an important option for lifetime management of aortic valve disease.

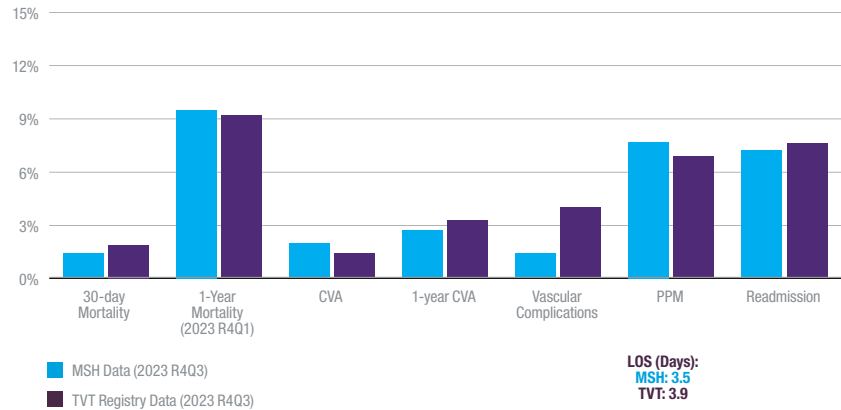
The FDA recently approved the trial of a new system to treat surgery-ineligible patients with severe aortic regurgitation, the Jenavalve Trilogy TAVI system. The Trilogy features three locators that allows the valve to clip onto the native leaflets to enable 100 percent anchoring thus allowing the device to be fixed and sealed in place once opened therefore avoiding the risk of valve migration and paravalvular leak.

**=98.8 percent of TAVR procedures at The Mount Sinai Hospital are done via femoral approach**

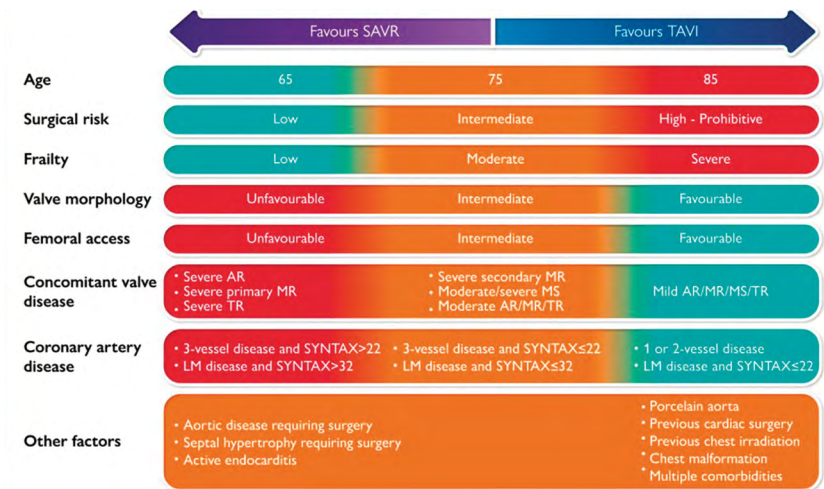


**EXCELLENT TAVR OUTCOMES 2023**

- N=504 (58% SAPIEN-3, 36% EVOLUT-R/FX COREVALVE, 6.0% NAVITOR, 0.6% ACURATE)
- 84.7% MAC; 15.3% GA. 38.6% SENTINEL
- 91.9% PERC FEMORAL; 6.9% CUTDOWN FEMORAL; 1.2% TRANSCAROTID;
- 4.0% VIV (N=20; 12 TAV-IN-SAV, 8 TAV-IN-TAV)
- 98.8% TF TAVR AT MSH IN 2023



**DECISION-MAKING PROCESS BETWEEN TAVR AND SAVR**

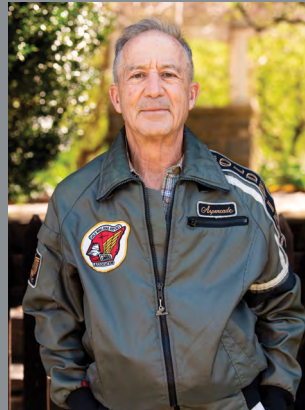
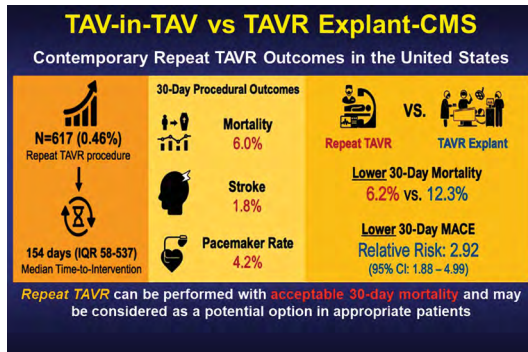




# Michael Dale

**Diagnosis:** Severe aortic stenosis

**Treatment:** Successful TAVR procedure



“I really put my faith in Dr. Sharma, I think he is a great doctor.”

### Jenavalve Trilogly TAVI System

- The Trilogly TAVI System features unique locators that align the THV with the native cusps of the valve and ensures anatomically correct alignment
- The locators “clip” onto the native leaflets, enabling anchoring in pure AR patients with non-calcified valves.

Jenavalve Trilogly Valve

Prosthesis with locators spread during implantation, seating locators in the sinuses

Jenavalve Trilogly valve after implantation with perfect position and no paravalvular regurgitation

“I swam in college and after college continued to swim in training intervals. Not too long ago, I began having chest pain during my training intervals and saw several doctors over the years because heart conditions run in my family. The doctors would give me pills to try to ease the pain, but it never went away.

“One of student’s parents recommended I see her cardiologist, and after a concerning result from a stress test, he sent me to Dr. Sharma. He cleared out the blockage, but didn’t put in a stent in at the time. A little while later I began having the pain again, so I went back to Dr. Sharma and he placed a stent. After that I was fine for 25 years. I went back to swimming, was very active and had no more complications.

“While living in Florida, I thought it would be a good idea to have a local team of doctors I could trust for regular check-ups. I was feeling fine but went in for a regular echocardiogram about two years ago that showed an issue with my aortic valve. With each follow-up visit it kept getting worse and worse. The doctors kept telling me it was severe but that we could wait. I didn’t want to wait so I decided to make another appointment to see Dr. Sharma. After about four hours of testing, it was decided I was a candidate for a TAVR procedure. Dr Sharma put in the aortic valve and before he did, he explained everything to me very well. While I was in surgery, he noticed the stent he had put in 25 years ago needed to be replaced. Two months after my valve surgery, he put a brand-new stent in for me where the old one had been. With the TAVR procedure I stayed overnight but when I got the new stent, I left that same day. Now, that was a year ago and I’ve never felt better. I have been able to do my workouts without a problem and am able to still do my swim intervals as well as keep up with my kids and grandkids. I really put my faith in Dr. Sharma, I think he is a great doctor.”

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# Growing Mitral Transcatheter Edge-to-Edge Repair (TEER) Procedures Using MitraClip and PASCAL Devices

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 multidisciplinary heart team evaluation

**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 backward.**

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, a cardiothoracic surgeon and heart failure specialist.

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 two 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 are 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, up to five years of followup. Also GDMT patients who received MitraClip after completion of the trial had similar outcomes as of the original MitraClip patients.

# Brain Martinico

**Diagnosis:** Severe mitral regurgitation

**Treatment:** Successful MitraClip procedure

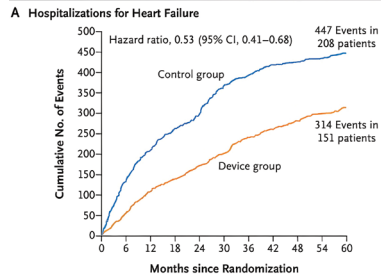


“No matter what role people were in, every single one of them were amazing.”

“I have needed cardiac care for a long time, but it really became an issue in 2019. I was experiencing a lot of physical weakness, I would get fatigued so easily that I kept having to take breaks taking the short walk from the bus stop to my apartment, which told me something was wrong. My cardiologist diagnosed me with arrhythmia and recommended I see the doctors at Mount Sinai. I had my arrhythmia resolved at Mount Sinai, but there were still issues. It took a while to figure out what was going on, but it turned out to be my mitral valve. I found out that there was a device that could help solve my problem. Dr. Kini placed a MitraClip. The MitraClip was really the key to giving me my life back.

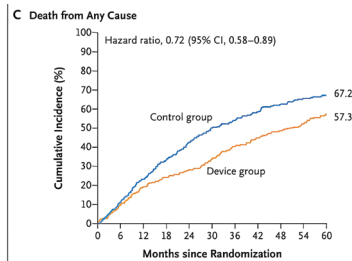
“Dr. Kini did my operation relatively quickly. It was about a month after I went to see her and the surgery was recommended. I recovered very quickly; I was surprised that it was such a breeze. As soon as I became conscious, I wanted to get up and start walking around whereas before I didn’t want to get out of bed because I was so fatigued from the moment I would wake up. Having heart complications really took a toll on my life and the illness felt like it was taking over. I am now able to just walk down the street without being exhausted, so I have truly gotten my life back. I had no social life due to the heart problems I was having but now I am able to get together with friends again and having that back is so important to me.

“I was very impressed with Dr. Kini for her way of articulating what she was going to do, she has a great presence and is a lovely human being. Her bedside manner is very engaging and caring, overall, she is very authentic. Dr. Kini’s staff are so wonderful I cannot express enough gratitude to her or them. No matter what role people were in, every single one of them were amazing. Going to the doctors is stressful but they make the process so much easier.”



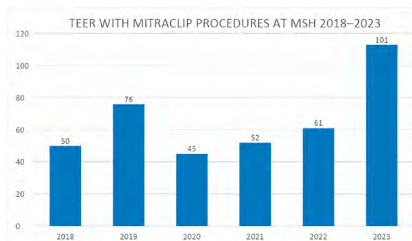
**No. at Risk**

	312	272	224	188	156	133	120	106	94	84	59
Control group	312	272	224	188	156	133	120	106	94	84	59
Device group	302	269	238	219	205	186	167	151	138	124	79



**No. at Risk**

	312	272	224	189	157	135	122	107	94	84	59
Control group	312	272	224	189	157	135	122	107	94	84	59
Device group	302	269	238	219	205	186	167	151	138	124	79



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# Emerging Transcatheter Tricuspid Valve Interventions

GILBERT TANG, MD, PARASURAM MELARCODE KRISHNAMOORTHY, MD, AND STAMATIOS LERAKIS, MD

Transcatheter tricuspid valve interventions have progressed rapidly over the past few years to treat symptomatic severe tricuspid regurgitation. Interventions range from transcatheter edge-to-edge repair (T-TEER) using the Abbott TriClip system (Figure 1: Panel A), PASCAL precision (Edwards Lifesciences) device (Figure 1: Panel B) and transcatheter tricuspid valve replacement (TTVR) with the Edwards Evoque Tricuspid valve (Figure 1: Panel C) which was recently approved by the FDA.

The TRILUMINATE pivotal trial, which randomized patients to optimal medical therapy versus TriClip G4 system repair was completed in 2023, and Mount Sinai was one of the leading sites in the New York area. The findings of the study (Figure 2) were presented during the TCT 2023 meeting. Overall results found T-TEER was superior to medical therapy alone, and increase of  $\geq 15$  points on the KCCQ overall summary score, with a win-ratio of 1.48. T-TEER significantly improved health status at one month compared with medical therapy alone (mean between-group difference in KCCQ 9.4 points, 95 percent CI 5.3-13.4), with a small additional improvement at one year (mean between-group difference 10.4 points, 95 percent CI 6.3-14.6). T-TEER patients

were also more likely to be alive and well at one year, than those assigned to medical therapy alone (T-TEER vs. medical therapy: 74.8 percent vs. 45.9 percent,  $p < 0.001$ ). The Edwards PASCAL tricuspid repair system has begun its pivotal trial as well. TEER with the TriClip G4 system is now a standard procedure and Mount Sinai has one of the most efficient procedural performances in the New York area using multimodality imaging.

Findings from the TRISCEND-II study, showed that TTVR using the EVOQUE system, effectively eliminated TR in a vast majority of patients and with less than expected major adverse events. Treatment of severe TR with the EVOQUE system also resulted in meaningful improvements in functional status and symptoms at six months. Hence, it led to the recent FDA approval of the EVOQUE system.

## Role of Intracardiac Imaging

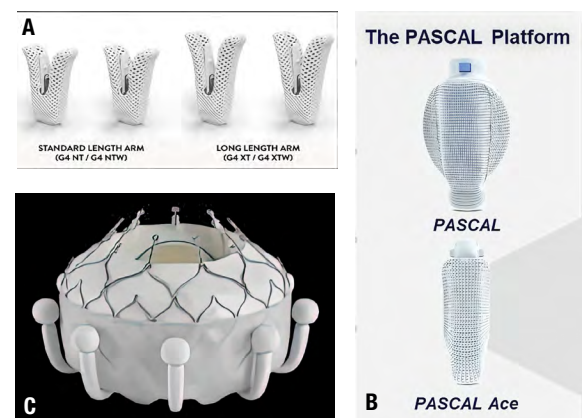
Three-dimensional intracardiac echo (ICE) improves the ability to image the tricuspid valve during the procedure to improve therapy expansion, and Mount Sinai is one of the leading sites in the country to use 3D ICE in conjunction with transesophageal echo (TEE) to guide transcatheter tricuspid interventions. Figure 3 is an

**Findings from the TRISCEND-II study, showed that TTVR using the EVOQUE system, effectively eliminated TR in a vast majority of patients and with less than expected major adverse events.**

echocardiographic representation of a patient who underwent successful T-TEER with TriClip under TEE and ICE guidance, showing severe TR before and trivial TR after implantation of three clips.

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**Figure 1:** Transcatheter Tricuspid Intervention Platform.  
**Panel A:** TriClip System  
**Panel B:** PASCAL Precision  
**Panel C:** EVOQUE TTVR



# Judee Wright

**Diagnosis:** Severe calcific aortic stenosis

**Treatment:** Successful TAVR Procedure



“[Dr. Kini] was easy to talk to and was an excellent listener. People flock around her to learn.”

“I’m a Texas cowgirl living in New York. My dad was a heart surgeon in Houston and while I was in college he discovered I had a heart murmur during a normal check-up. Since then, I have always monitored it.

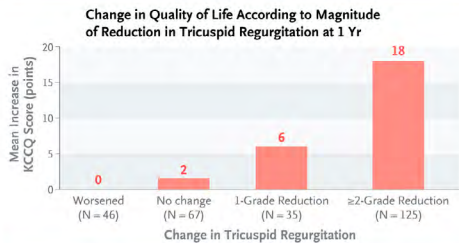
“I moved to New York after college and have been a flight attendant since 1977 for the same airline. I have always been a very active person, I used to swim, run and walk often, never once having any problems with my heart murmur. No pain, no shortness of breath, no symptoms of any complications. About 15 years ago, my primary doctor told me my heart murmur was getting louder so I began having echocardiograms monitored by a cardiologist every six months because a heart murmur can change overnight.

“In June of 2022 my cardiologist sent me to Dr. Kini for a valve replacement procedure. Leading up to the surgery, I remained active, still walking and working as a flight attendant. Instead of open heart surgery I had a TAVR procedure—they put a wire with a titanium valve up my artery up to my heart through my groin. I was in the hospital for only 12 hours, and they checked on me every 15 minutes. I was told I couldn’t run for about a week or two, so I didn’t damage the sutures. I had no pain which was incredible. After I recovered, I went back to my active lifestyle.

“I grew up with doctors all my life, so I know doctors. I am very picky about my doctors and like ones that think outside the box, which is why I liked Dr. Kini. She did a great job and explained everything well to me. She was easy to talk to and was an excellent listener. People flock around her to learn, which is amazing and speaks to her talent. I still work as a flight attendant, not just locally but traveling to European countries as well and am able to because of the intervention Dr. Kini performed.”

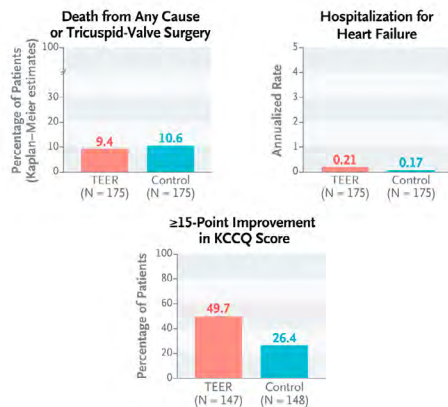
**Primary End Point**  
Win ratio, 1.48 (95% CI, 1.06–2.13); P = 0.02

	TEER Group (N = 175)	Control Group (N = 175)
Hierarchical composite no. of wins	11,348	7643

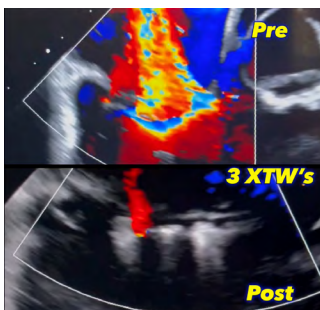


## CONCLUSIONS

In patients with symptomatic, severe tricuspid regurgitation, TEER was safe and was associated with a greater improvement in quality of life than medical therapy alone.



**Figure 2:** Schematic representation of the Triluminate Pivotal Trial



**Figure 3:** TEE showing severe TR prior and trivial TR post implantation of 3 TriClips (XTWs)

# CardyFit: Cardiovascular Disease Prevention Through Holistic Coverage of Wellness

ANNAPOORNA S. KINI, MD, AND ANDRIY VENGRENYUK

Heart disease is the leading cause of death worldwide. Americans live very busy and stressful lives, juggling work, bills and childcare, among other responsibilities. The busy schedules and mental fatigue faced by many Americans often hinder their patience to research trustworthy nutritional information and access exercise tutorials to maintain their health.

The Cardiac Catheterization Laboratory at The Mount Sinai Hospital receives a diverse array of patients suffering from various cardiovascular diseases. The dedicated practitioners do everything in their power to provide the best possible care for each patient by utilizing a wide range of diagnostic tests and the latest medical technology. However, once patients are discharged from the hospital, these experienced practitioners become powerless outside of traditional cardiac rehab.

To meet this complex challenge of helping patients maintain a healthy lifestyle after discharge, the concept of CardyFit was born, aiming to prevent cardiovascular diseases by establishing a bridge between cardiologists and patients outside the hospital.

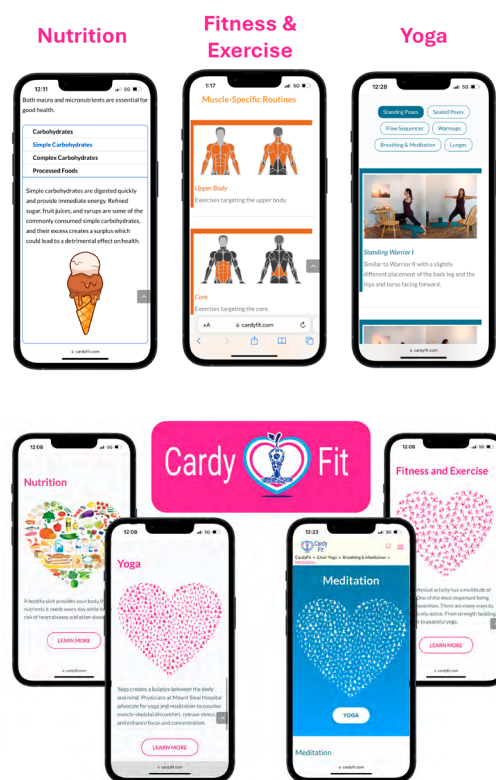
CardyFit is a comprehensive roadmap curated by cardiologists for patients on their journey to

maintain their health. It serves as an accessible and user-friendly platform with credible nutrition information and professional fitness tutorials. CardyFit caters to all populations, with information for individuals managing conditions such as diabetes, high blood pressure and peripheral artery disease, among others.

CardyFit offers a holistic approach to health, starting with detailed nutritional guides that encompass diet composition, types, and principles, empowering individuals to make informed daily dietary choices. CardyFit offers a wide range of video tutorials, from instructional yoga and chair yoga designed for all ages, to advanced strength exercises for seasoned fitness enthusiasts. Also including breathing and meditation tutorials to reduce stress, thereby reducing the risk of stress-induced habits linked to heart disease, such as smoking and overeating.<sup>1</sup>

## References

1. American Heart Association. (n.d.). Stress and heart health. Retrieved March 5, 2024, from <https://www.heart.org/en/healthy-living/healthy-lifestyle/stress-management/stress-and-heart-health>



To learn more about the program, visit [Cardyfit.com](https://www.heart.org/en/healthy-living/healthy-lifestyle/stress-management/stress-and-heart-health) or scan the QR code

# Renal Denervation for Refractory Hypertension

PRAKASH KRISHNAN, MD

Renal denervation (RDN) remains a captivating avenue in hypertension management, with recent clinical trials shedding light on its efficacy and potential. Notably, the SPYRAL HTN-OFF MED trial and the RADIANCE-HTN SOLO trial have contributed significant insights into the field, offering both promising results and areas for further exploration.

The SPYRAL HTN-OFF MED trial, a landmark study published in 2020, focused on patients with untreated hypertension, aiming to evaluate the efficacy of RDN without concurrent antihypertensive medication. In this randomized controlled trial, patients underwent RDN using a catheter-based approach targeting the renal arteries. The results demonstrated a notable reduction in systolic blood pressure (SBP) at three months post-procedure. The mean reduction in SBP was 8.0 mmHg greater in the RDN group compared to the sham control group ( $p < 0.001$ ). This reduction was sustained at six months post-procedure, highlighting the potential of RDN as a standalone treatment for hypertension.

The RADIANCE-HTN SOLO trial, published in 2018, focused on patients with mild to moderate hypertension who were either medication-naïve or not adequately responsive to antihypertensive medications. This trial evaluated the efficacy of ultrasound-based RDN compared to a sham procedure. The results revealed a significant reduction in both office and ambulatory blood pressure in the RDN group compared to the sham group. At two months post-procedure, the mean reduction in 24-hour ambulatory SBP was 4.7 mmHg greater in the RDN group compared to the sham group ( $p = 0.001$ ).

These trials underscore the potential of RDN as a viable treatment option for hypertension, particularly in patients who are medication-naïve or inadequately responsive to pharmacotherapy. While further research is warranted to elucidate long-term efficacy and safety, these trials provide compelling evidence supporting the role of RDN in hypertension management, offering hope for patients with resistant hypertension.

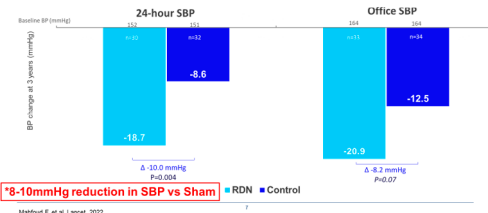


Simplicity Spyral™ renal denervation system



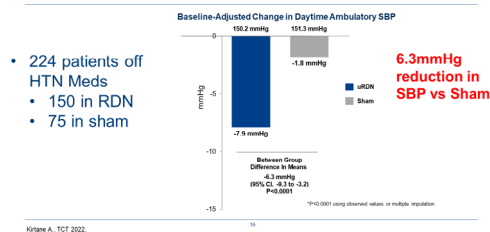
Recor Paradise™ renal denervation system

## SPYRAL HTN-ON MED Pilot Study Results: 3 Years

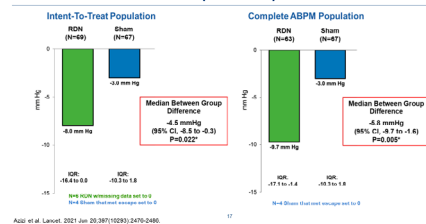


**Graph 1:** The SPYRAL HTN-ON MED trial illustrated a clear divergence in SBP between the RDN group and the control group over the three-year follow-up period, indicating the sustained efficacy of RDN in lowering blood pressure.

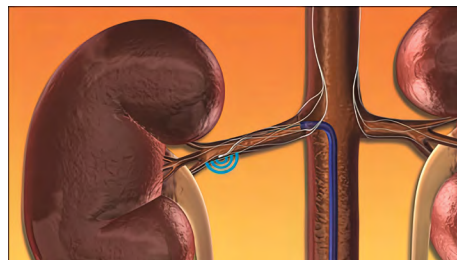
## RADIANCE 2 Pivotal (Off Med) Results: 2 Months



## RADIANCE-HTN TRIO (On Med) Results: 2 Months



**Graph 2:** The RADIANCE-HTN SOLO trial demonstrated a clear reduction in 24-hour ambulatory SBP in the RDN group compared to the sham group at two months post-procedure, emphasizing the efficacy of ultrasound-based RDN in lowering blood pressure.



# Utility of Left Atrial Appendage Occlusion (LAAO) Procedures

SAHIL KHERA, MD

Atrial fibrillation affects millions of adults and is associated with five-fold increased risk of ischemic stroke and arterial embolism. Stroke is also the fifth leading cause of death in the United States, and one in four strokes in the U.S. are attributed to atrial fibrillation. These clots tend to preferentially form in the small outpouching within the left atrium called the left atrial appendage. This heightened risk of cardioembolic stroke in patients with atrial fibrillation is mitigated by use of systemic anticoagulation.

Unfortunately, some patients are intolerant to anticoagulation and should be considered for LAAO. Systemic oral anticoagulation (warfarin, apixaban, rivaroxaban, edoxaban, dabigatran) is the mainstay pharmacotherapy for stroke prevention in patients with atrial fibrillation. Unfortunately, some patients cannot tolerate oral anticoagulation due to a myriad of factors—patient comorbidities or systemic barriers. Chronic anticoagulation therapy is also associated with significant bleeding (especially in elderly patients, patients with uncontrolled hypertension, abnormal kidney/liver function, alcohol abuse etc.). Bleeding episodes can lead to interrupted anticoagulation or a complete contraindication to oral

anticoagulation therapy. These issues have led to development of non-pharmacological therapies for stroke prevention in carefully selected patients with chronic atrial fibrillation.

Left Atrial Appendage Occlusion (LAAO) is a well-established stroke prevention strategy in these patients. There are two commercially available LAAO devices—Watchman FLX (Boston Scientific, MN) and Amulet Device (Abbott, IL). (Figure 1). Since its Food and Drug Administration (FDA) approval in the United States in March 2015, more than 100,000 patients have undergone LAAO with the Watchman device. In addition, the FDA approved the Amulet LAAO device in August of 2021 and both the devices have demonstrated excellent safety and efficacy outcomes in trials and registry data. (Figure 2). The Watchman FLX is a single lobe occluder system and the Amulet is a self-expanding disk-lobe device. Despite the differences in device design; standard practice involves a minimally invasive femoral venous procedure under general anesthesia using transesophageal guidance for device sizing, transseptal puncture, and assessment of final implant stability. Procedure time is 30–45 minutes and patients are discharged the next day and undergo a repeat echocardiogram at 45 days post

**Since its Food and Drug Administration (FDA) approval in the United States in March 2015, more than 100,000 patients have undergone LAAO with the Watchman device**

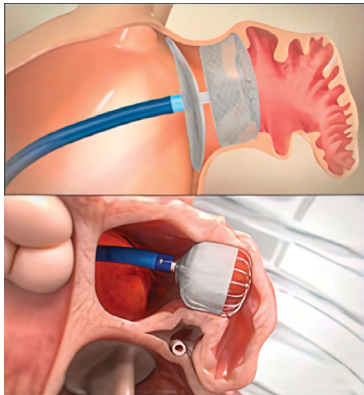
procedure for assessment of peridevice leaks. Anticoagulation can be stopped immediately after the device placement. Patients are maintained on 3–6 months of antiplatelet therapy (depending on bleeding risk profile) for complete device endothelialization to occur. Extremely high bleeding risk patients can expect to be on one month of antiplatelet therapy. Our robust and extremely high volume structural heart program is one of the few interventional cardiology sites in the nation that offer the Amulet LAAO device. (Figure 3). The Amulet device offers complete closure of the left atrial appendage and minimizes peridevice leak and risk of device related thrombosis. In the three-year follow-up of the AMULET IDE trial, 96 percent of patients in the Amulet group were free of chronic anticoagulation usage at three years. Left atrial appendage occlusion using the devices can be considered for patients who have a contraindication for oral anticoagulation, have had a prior bleeding event, are at high risk of falls, have uncontrolled or poorly controlled hypertension, at-risk of drug-drug interactions, or poor adherence to life-long anticoagulation.



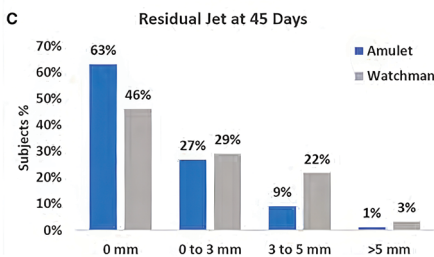
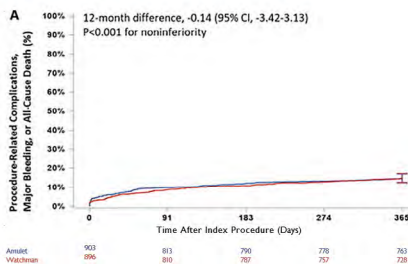
# Paul Shelly

**Diagnosis:** TIA, severe aortic stenosis, dizziness

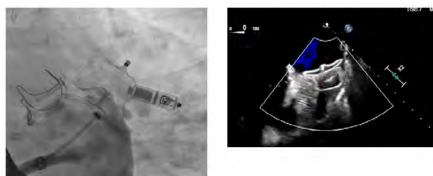
**Treatment:** Successful PFO closure procedure



**Figure 1:** A) Abbott Amulet Left Atrial Occlusion device and B) Boston Scientific Watchman FLX device



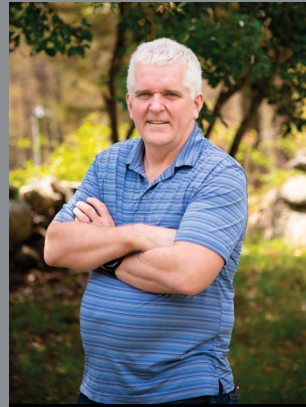
**Figure 2:** Data from Amulet IDE trial demonstrating excellent safety (A) and distribution of residual jets at 45 days (C)



**Figure 3:** A) Abbott Amulet Left Atrial Occlusion device implantation and B) Complete occlusion of the left atrial appendage on imaging at 45 days.

## References

1. Alkhouli, M, Ellis, C, Daniels, M. et al. Left Atrial Appendage Occlusion: Current Advances and Remaining Challenges. *JACC Adv.* 2022 Dec, 1 (5). <https://doi.org/10.1016/j.jacadv.2022.100136>



“Dr. Khera is very direct, which I liked. Even the food was good, and I felt well taken care of.”

“My family and I were scuba diving in Belize. After the dive I felt fatigued, and later I threw up. The crew got me to a doctor who said I likely had decompression sickness. Concerned it might be more, we called for a plane to take me to a hospital with a hyperbaric oxygen chamber. While we were on that plane, I lost consciousness. I had no pulse. The doctor was able to bring me back but, from then on we had to fly at a lower altitude so I wouldn’t lose consciousness.

“The plane took us to San Pedro where I had a couple of sessions in the hyperbaric oxygen chamber, and IV saline to bring my blood pressure back up. For the next 10 days, I had to rest completely, and then we went home. Back in the U.S., I got dizzy at a barbecue. I went to a hospital nearby and they found nothing wrong so at 2A.M. I went home. The next day I felt the same dizziness again and went back to the hospital. This time, they saw a slight increase on the right side of my heart on an ultrasound so they did a bubble test, which showed that I had a patent foramen ovale (PFO), which is a birth defect that is a small flaplike opening between the upper heart chambers. The diagnosis helped but that didn’t explain why I had nearly died in that plane, as PFOs are common.

“That hospital referred me to Dr. Khera at Mount Sinai. He discovered that my PFO was acting like a hole in my heart. That night my oxygen levels dropped to the 80s. Normal blood oxygen should be 100, meaning that you are getting 100 percent of the oxygen that you can get. A few days later I had surgery to repair the PFO. The whole process flowed smoothly though, which was a good experience. Dr. Khera is very direct, which I liked. Even the food was good, and I felt well taken care of. I didn’t have a long recovery. In two weeks I was back to walking three to four miles a day. After six weeks I was back to running and lifting weights.”

# Indications for Atrial Septal Defects and Patent Foramen Ovale Closure

SAHIL KHERA, MD, AND PARASURAM MELARCODE KRISHNAMOORTHY, MD

Atrial septal defects (ASD) are birth defects leading to a hole in that separates the upper chambers of the heart. In the United States, 1 in 1,800 babies are born with an atrial septal defect. Genetic and environmental factors are often implicated. In many cases, these are not recognized till 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 cardiac CT scan or cardiac MRI for further evaluation of these defects. They can be managed either surgically or percutaneously using a transcatheter approach.

Patent Foramen Ovale (PFO) is a small tunnel like opening between the upper chambers of the heart. PFO is a normal part of fetal circulation and closes soon after birth. However, it remains patent in 25-30 percent of 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. They can lead to strokes if lodged in the brain vasculature. Rarely, PFOs may be implicated in decompression sickness or bends in recreational and professional underwater divers. 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 ASDs or PFOs. We currently offer two commercially available transcatheter closure devices—Gore Cardioform and Abbott Amplatzer. Once referred, our team will determine if any further testing (right heart catheterization, transesophageal echocardiography, cardiac CT or cardiac MRI) is indicated. The procedure time is 15 minutes to an hour depending on the complexity of the case. The closure device is delivered through a tiny incision in the right groin vein and most of our patients go home the next day. Patients can return to regular activity soon after.



Figure 1: Patent Foramen Ovale in a young patient with recent stroke

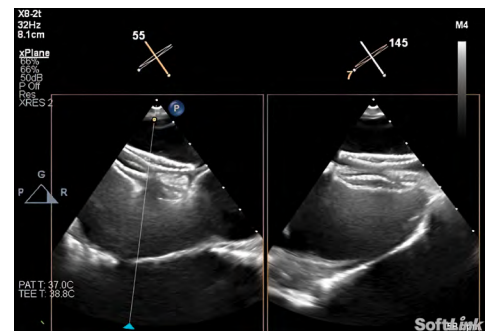


Figure 2: After transcatheter closure of the PFO



Figure 3: Gore Cardioform closure devices

## Donald Douglass

**Diagnosis:** Crescendo angina, calcified CTO RCA

**Treatment:** Successful laser atherectomy and stent of RCA

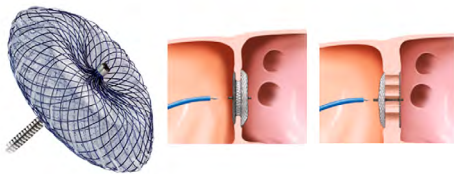


“I never believed anything like this could be done, but Dr. Sharma did it.”

“In January of last year after I had been suffering from pain running down my arm, I was told I had a pinched nerve in my neck. I went to physical therapy for it, but it never got better. I told my primary doctor during a visit about the pain and how it kept running down my arm. Unrelated, a bout with the flu landed me in the hospital for a few days due to dehydration. After I was discharged I got to the doctors for a follow up appointment, and I was in atrial fibrillation. They put me in an ambulance and took me to the closest hospital. The doctors tried what they could but ended up having to send me to a different hospital where they used the defibrillator to shock my heart back in rhythm. After I was stable, I had a catheterization, and they found a 100 percent blockage.

“They told me I wasn’t eligible for bypass surgery due to the severity of the blockage. The heart team at that hospital decided to attempt to drill through the hard, calcified blockage. Unfortunately, the surgery was unsuccessful, and I got sent home. Two days later the hospital called me and said they had found someone who could clear the blockage, but he was a few hours away in New York. My wife and children urged me to go and thank God I did.

“I went to meet Dr. Sharma on a Monday to review my charts, the surgery was the very next day on a Tuesday. I was back home by Thursday morning. I was in the procedure room for about four hours, and I am so grateful for my results. Dr. Sharma used a laser to get through the artery, which amazed me. I never believed anything like this could be done, but Dr. Sharma did it. I’m feeling great now. My recovery was a little slow, but I am now back to normal. My follow-up echocardiograms have shown improvement ever since the procedure with Dr. Sharma. It’s been a year since the operation and now I’m back to being busy, and fishing. I am careful not to overdo it, but I feel like my old self.”



**Figure 4:** Abbott Amplatzer Talisman occluder

# Esprit™ BTK Drug-Eluting Resorbable Scaffold\* for The Treatment of Infrapopliteal Lesions (LIFE-BTK Trial)

PRAKASH KRISHNAN, MD

The challenges associated with infrapopliteal artery revascularization in chronic limb-threatening ischemia (CLTI) patients include extensive medial calcinosis, long lesion lengths, acute lesion recoil and flow-limiting dissection after angioplasty. Various methods have not shown efficacy with respect to the maintenance of long-term patency and the reduction of undesirable long-term clinical events, such as reintervention and amputation.<sup>2</sup> Therefore, device success may require both the mechanical properties of a stent and an antiproliferative coating. Though not indicated in the U.S. for use in this anatomy, coronary drug-eluting stents with sirolimus analogues used in below-the-knee interventions have shown the most promise for maintaining primary patency. However, the permanent nature of these metal implants has made some clinicians wary of their routine use. Thus, mechanical drug-eluting scaffolding that resorbs over time may help avoid these limitations.<sup>2</sup>

Recently, a single-blind, randomized, controlled trial, LIFE-

BTK, was completed to evaluate the safety and efficacy of a new everolimus-eluting resorbable scaffold (Esprit™ BTK System\*, Abbott Vascular) (Figure 1) compared to balloon angioplasty for the treatment of infrapopliteal artery disease in patients with CLTI.<sup>1</sup>

Among patients with CLTI due to infrapopliteal artery disease, treatment with the Esprit™ BTK System\* was superior to balloon angioplasty in reducing reintervention and maintaining patency at one year in the LIFE-BTK IDE Trial (Varcoe et al. 2024; Varcoe, Parikh, and DeRubertis 2023). The primary efficacy endpoint was freedom from the following events at one year: amputation above the ankle of the target limb, total occlusion of the target vessel, clinically driven revascularization of the target lesion, and binary restenosis of the target lesion. The primary efficacy endpoint was found to be superior with a 30 percent absolute risk difference (ARD) and a number needed to treat (NNT)

**Among patients with CLTI due to infrapopliteal artery disease, treatment with the Esprit™ BTK System\* was superior to balloon angioplasty in reducing reintervention and maintaining patency at 1 year**

of 4 (Figure 2). In addition, the use of the scaffold was noninferior to angioplasty with respect to the primary safety endpoint of freedom from major adverse limb events at six months and from perioperative death (97 percent vs 100 percent;  $p=0.0019$ ). Currently, the trial and device are being evaluated by the Food and Drug Administration (FDA). If the Esprit™ BTK System\* is approved, this technology may provide a new option in infrapopliteal interventions with additional durability. This is likely to translate to improved clinical outcomes with fewer reinterventions.<sup>3</sup>



# Lula Hawkins

**Diagnosis:** Claudication, pain in right and left legs

**Treatment:** Successful PTA of right and left tibial arteries

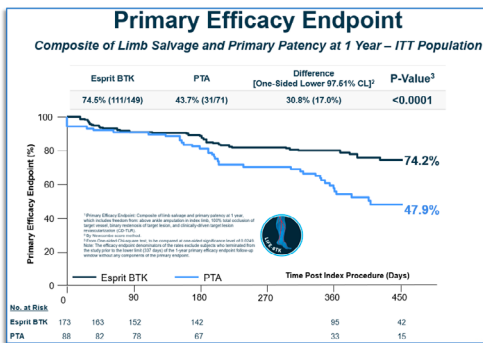
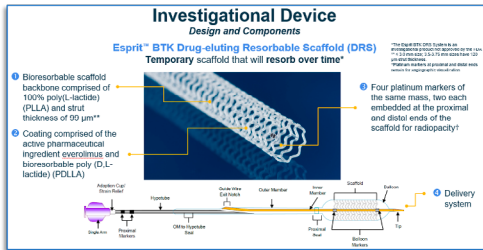


“Take my advice, and go see a cardiologist to help make it easier for you to walk again.”

“I have been a patient at Mount Sinai for close to 40 years. More recently, I came back to see a doctor about my legs because I have tiny veins that would give me pain when I walked and slept. So, I decided to see a cardiologist to help figure out what was going on. About a year ago, I had a procedure done on my left leg to help resolve the discomfort.

“Today, I feel great, and my legs feel much better. I am now able to walk further, whereas before I could only walk about a block and now, I can walk between 10 and 20 blocks. I have fourteen grandchildren and six great grandchildren, some of who live close by so it means a lot to me that I am able to go on long walks with them now. I am also able to kick a ball around for my chihuahua, Coco, with my left leg and am happy I can play with her more than I was able to before. Having the ability to do these things again brings me a lot of joy.

“If there are people having similar problems with their legs, take my advice, and go see a cardiologist to help make it easier for you to walk again.”



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\*CAUTION: Investigational Device. Limited by Federal (U.S.) law to investigational use only.

# Appropriate Antithrombotic Therapy Post-TAVR and Chronic Stable CAD

GEORGE DANGAS, MD

Cardiovascular diseases (CVD), including Coronary Artery Disease (CAD) and aortic stenosis, are leading causes of morbidity and mortality globally. The use of antithrombotic agents is an established pharmacological cornerstone to avoid adverse ischemic events, including myocardial infarction in these patients. However, these agents can also lead to an increased rate of bleeding. In the following, we describe the current approach with regard to antithrombotic strategies, which have the goal to strike the delicate balance of thrombotic and bleeding events, and aim to optimize patient outcomes.

## Coronary artery disease and antithrombotic treatment

CAD is an atherosclerotic disease entity, where gradual deposition of lipids within the coronary artery wall leads to plaque and subsequent compromised blood flow to the myocardium. In CAD antithrombotic medications such as aspirin are used to ensure coronary artery patency due to their inhibition of platelet aggregation via cyclooxygenase inhibition.

In some cases of stable CAD, a stent is usually inserted to restore adequate blood flow to the myocardium during percutaneous coronary intervention (PCI). This procedure necessitates the use of a second antithrombotic agent (most commonly a P2Y12 inhibitor such as clopidogrel, ticagrelor or prasugrel) to protect the device from occluding in the months following the procedure. P2Y12 receptor antagonists synergize with aspirin via inhibition of the platelet ADP-receptor, aiming to prevent occlusion and further adverse thrombotic events after stent implantation. Following this period of dual antiplatelet therapy (DAPT), a lifelong single antithrombotic treatment with either aspirin or a P2Y12 inhibitor is necessary for all patients with CAD without an indication for oral anticoagulation.

## Transcatheter aortic valve replacement and antithrombotic treatment

In aortic stenosis, a calcified and progressive narrowing of the aortic valve is present, which obstructs blood flow from the left ventricle to the aorta. Transcatheter Aortic Valve Replacement (TAVR) has

**Over the last few years, catheter-based radio-frequency renal artery denervation (RAD) has emerged as a promising treatment option for patients with refractory hypertension.**

emerged as a minimally invasive alternative to surgical aortic valve replacement for patients with severe symptomatic aortic stenosis. Post-TAVR, antithrombotic therapy is indicated to prevent ischemic complications. Practice guidelines recommend the use of antithrombotic agents for patients undergoing TAVR. Until recently, this was frequently being carried out via the use of DAPT for the first 3 to 6 months after TAVR, followed by a lifelong aspirin monotherapy.

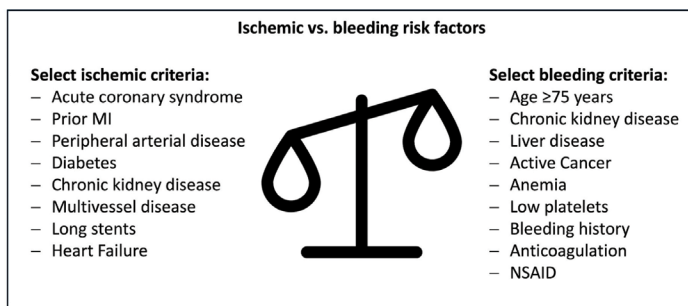
Risks, benefits and emerging approaches to antithrombotic treatments in stable CAD and post-TAVR

In general, the use of antithrombotics is associated with a decreased likelihood for ischemic events such as myocardial infarction and stent or valve thrombosis. However, risks associated with these agents include an increased rate for bleeding. Overall, the decision to initiate and maintain antithrombotic therapy in stable CAD and post-TAVR patients necessitates careful consideration of the ischemic and bleeding risk of the individual patient.<sup>1</sup> However, this tradeoff represents a significant challenge

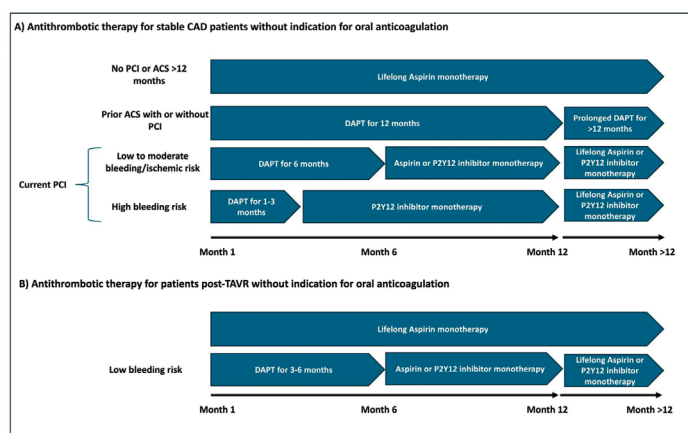
to the treating physician, as patients who are at high ischemic risk are also often considered to be at risk for bleeding (Figure 1).

The de-escalation of antithrombotic treatments has been investigated in various randomized controlled studies both in patients with CAD as well as after TAVR. Due to improved interventional as well as pharmacological approaches, the risk of stent thrombosis and other adverse cardiovascular events has substantially decreased, enabling an abbreviation in the length and also intensity of antithrombotic therapy. This has led to the recommendation in recent guidelines to implement tailored antithrombotic treatment regimens, also taking into account the individual patient risk for ischemic or bleeding events.<sup>2</sup>

In summary, both for patients with stable CAD as well as post-TAVR, a paradigm shift toward de-escalation aligns with the concept of personalized medicine, wherein therapeutic interventions are tailored to individual patient profiles to optimize risk-benefit ratios. By tailoring antithrombotic regimens based on procedural factors, patient characteristics, and bleeding as well as thrombotic risk, clinicians aim to strike a delicate balance between prophylaxis of thrombotic events and bleeding avoidance, thereby optimizing clinical outcomes and enhancing patient safety in this vulnerable CVD patient population.



**Figure 1:** Selected ischemic and bleeding risk factors after percutaneous coronary intervention. MI Myocardial infarction, NSAID Non-steroidal anti-inflammatory drugs.



**Figure 2:** Current approaches to antithrombotic treatments for patients with stable coronary artery disease (A) and after transcatheter aortic valve replacement (B) without any indication for oral anticoagulation. ACS Acute coronary syndrome; DAPT Dual antiplatelet therapy; PCI Percutaneous coronary intervention.

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# Protocol for Assessment of Coronary Microvascular Dysfunction in the Cardiac Cath Lab

JOSEPH SWEENY, MD

Patients with chest pain and non-obstructive coronary artery disease (NOCAD) continue to be a diagnostic and therapeutic challenge in the Cardiac Catheterization Laboratory and ambulatory clinics. Up to 50 percent of patients undergoing invasive coronary angiography for angina symptoms have no significant coronary artery disease defined by coronary artery stenosis  $\geq 50$  percent.<sup>1</sup> We are learning that a substantial number of these select patients without obstructive CAD have coronary microvascular dysfunction (CMD) and are at a higher risk of adverse clinical outcomes compared to the general population without CAD.<sup>2</sup>

The coronary microcirculation contributes significantly to the total coronary vascular resistance and through complex mechanisms contributes to the regulation of coronary blood flow and exchange of oxygen and metabolites to the myocardium during stress or demand. Dysfunction of this regulation can contribute to anginal symptoms as well as other cardiovascular disease states (ANOCA, MINOCA, and

HFpEF). The availability and safety of an invasive assessment of microvascular function, known as the Index of Microvascular Resistance (IMR) and other aberrations of coronary function such as vasospasm or myocardial bridging, has advanced our ability to accurately assess and diagnosis these patients at the time of invasive coronary angiography.

When evaluating a patient with chest pain in the Cardiac Catheterization Laboratory, it is paramount to continue to search for other causes of angina beyond just obstructive CAD. This requires a unique protocol designed to provide a comprehensive evaluation of

**When evaluating a patient with chest pain in the Cardiac Cath Lab, it is paramount to continue to search for other causes of angina beyond just obstructive CAD.**

microvascular function, coronary vasospasm, coronary flow reserve and identification of myocardial bridging (Figure 2). In doing so, we are able to identify certain etiologies of chest pain (endotypes) that go beyond just blocked arteries and more importantly prescribed tailored pharmacological therapy to help treat. (Figure 1).

While a comprehensive invasive coronary functional assessment requires time and dedication, it is important and frequently used at the Mount Sinai Cardiac Cath Lab as part of the work up for patients with chest pain without obstructive coronary artery disease which translates into better therapeutic options for our patients.

Coronary Microvascular Dysfunction	Microvascular Spasm	Endothelial Dysfunction	Epicardial Coronary Spasm	Myocardial Bridging
CFR <-2.5 and/or IMR $\geq$ 25 and/or HMR $\geq$ 2-2.5	Angina and ischemic ECG changes with acetylcholine, but without epicardial spasm	>0% to $\leq$ 90% narrowing and/or <50% $\Delta$ in coronary blood flow with acetylcholine	>90% spasm with acetylcholine with angina and ECG changes	Half-moon sign / $\geq$ 10% systolic compression by IVUS + dobutamine dFFR/IFR/RFr $\leq$ 0.76
Statin, Exercise, Weight Loss prn SLNTG	Statin, Exercise, Weight Loss prn SLNTG	Statin, Exercise, Weight Loss prn SLNTG	Statin, Exercise, Weight Loss prn SLNTG	Beta-Blocker CCB (non-DHP)
ACE Inhibitor	ACE Inhibitor	Long-Acting Nitrates	CCB (DHP/non-DHP)	
Beta-Blocker	CCB (DHP/non-DHP)			

Figure 1: Tailored Treatments for ANOCA Endotypes (3).



## Lauren Coleman

**Diagnosis:** Refractory angina, nonobstructive CAD

**Treatment:** Microvascular Dysfunction

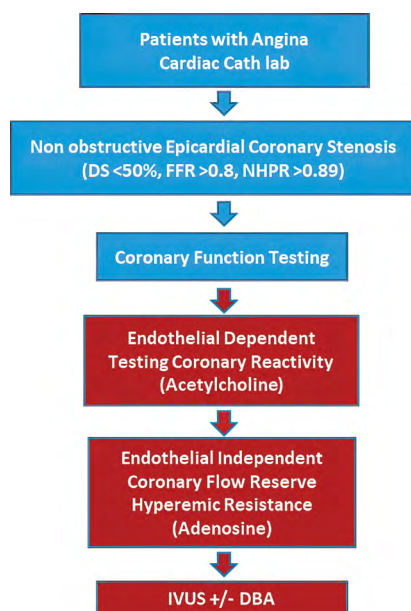


“Dr. Sweeny really made a difference in my life. I feel like a whole new person.”

“Back in 2007, I was at the gym and suddenly, I started to have heart attack symptoms. At first, I didn’t believe it because I was only 52 and very athletic. I went in an ambulance to the nearest hospital, and they kept me overnight, but everything came back normal. Then a week later, I went back with the same symptoms, they found a 97 percent blockage. I received a stent to open the blockage, but it didn’t help my chest pain. Further catheterization was inconclusive, I had no other blockages. It took me a year and a half to be able to begin working out again.

“Over time, I would still get chest pain in the evening but during the day I could go to the gym and walk for miles. In 2018, I had a rough year and that summer the chest pain was all the time, morning, day, and night. So, I went for another catheterization, and they found nothing. They switched my medication and things got a little better. Then, last year, the chest pain was back. I couldn’t exercise anymore. My cardiologist recommended I go see Dr. Sweeny, but I assumed based on my track record that they would find nothing. After the stress test came back negative, Dr. Sweeny explained to me that a lot more than a heart attack can cause chest pain and there were some tests he was going to do instead to see what else could be causing my pain. So, after the tests he found that I had these vasospastic arteries that were constricting in my heart causing the pain. It was a relief to finally get some answers. Dr. Sweeny switched my medications and I finally had reduced pain for the first time in years. I’m able to clean the house and do dishes without a second thought now. The difference was like night and day.

“He is amazing, the way he approached my treatment was so well explained and well understood that I felt so comfortable. He really made a difference in my life. I feel like a whole new person.”



**Figure 2:** Invasive and Diagnostic Treatment Pathway for Patients with Chest Pain Without Coronary Obstruction. DBA = Dobutamine. (3).

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# Impact of Intracoronary Imaging (OCT, IVUS) During PCI

PEDRO MORENO, MD

Coronary angiography is the main diagnostic tool to confirm obstructive CAD. Coronary angiography offers a very good display of the disease, with close approximations on location, severity, length, tortuosity, eccentricity, calcification and multiplicity of lesions. However, angiography has limitations, mostly on functional significance, plaque composition, vessel size, stent under-expansion, plaque protrusion, strut mal-apposition, and coronary dissections. To counteract these limitations, coronary angiography has now two great allies: fractional or instantaneous flow reserve (FFR/IFR), and intracoronary imaging.

The last decade provided sufficient data to demonstrate a significant benefit for FFR/IFR. Both techniques offer decisive information in the selection of coronary lesions that will improve outcomes when compared to angiography alone. This FFR/IFR decade consolidates the “first wave” of clinical improvement over angiographic-guided PCI, since Dr. Mason Sones inadvertently injected the RCA during an aortogram in 1958. However, IFR/FFR do not

help to optimize the procedure. Therefore, the limitations of angiography involving vessel size, plaque morphology and stent expansion require additional technology, i.e., Intracoronary Imaging.

## Intracoronary Imaging

Since the first in-vivo views of human vessels recorded by Yock and colleagues in 1988, intravascular ultra-sound (IVUS) has evolved significantly to produce excellent image quality. Enough penetration allows for complete cross-sectional and longitudinal visualization of the disease and the normal vessel wall. Furthermore, IVUS can delineate minimal lumen area, plaque burden, lesion calcification, positive remodeling and thrombus. Furthermore, IVUS can see through blood. Therefore, no contrast is needed during image acquisition. Its major limitation is radial resolution, which at its best may be around 100 microns.

Optical coherence tomography (OCT) uses near infrared light (NIR) instead of sound to reconstruct the images. OCT offers exquisite delineation and plaque characterization of the

**Optical coherence tomography (OCT) uses near infrared light (NIR) instead of sound to reconstruct the images.**

disease, as shown in Figure 1. The advantage of OCT over IVUS relies on its resolution, which is 10X better than IVUS. However, penetration is limited to the endoluminal morphology of the plaque. Furthermore, OCT needs to use dye to clear the blood, as NIR light is absorbed by hemoglobin.

## Benefits of Image-Guided PCI and the Concept of Optimal Stent Deployment

The main advantage of IVUS or OCT over angiography is the ability to confirm optimal stent deployment. Defined as minimal luminal area greater than 90 percent of the vessel reference diameter, optimal stent deployment has significant reductions in major adverse cardiovascular events (MACE).<sup>1</sup> When compared to OCT-guided PCI, angiography alone is associated with an increased incidence of sub-optimal stent deployment, as illustrated in Figure 2. Although operators may not realize, the incidence of sub-optimal stent deployment by angiography alone can be as high of 31 percent.<sup>1</sup>

Even though image-guided PCI is available for decades, their use

is below 20 percent in the US. The highest use is in left main PCI, up to 41 percent. The reason behind this under-utilization of image-guided PCI relies on the initial studies. Many of them were equivocal and fail to demonstrate significant reductions in death and myocardial infarction when compared to angiographic guided PCI. As such, operators were not convinced to use it routinely. Nevertheless, in the last three years, multiple studies have demonstrated significant reductions in death and myocardial infarction, consolidating the “second wave” of clinical improvement for coronary angiography to guide PCI.

### Clinical Benefit of Routine Imaging to Guide PCI

Three recent randomized trials demonstrated significant improvements in clinical outcomes when IVUS or OCT were used routinely during PCI. The ULTIMATE and IVUS-XPL trials showed 40 percent and 50 percent reductions in MACE, respectively. Their main benefits were driven by target vessel revascularization. However, a pooled analysis of these two trials showed a statistically significant, 57 percent reduction in cardiac death. The recent RENOVATE trial confirmed this observation, with a

53 percent reduction in mortality alone.<sup>2</sup> These pivotal studies used predominately IVUS, although the RENOVATE trial showed an OCT use in 25 percent of patients.

The comparison between OCT versus IVUS was evaluated in the ILUMIN Trial. The study showed significant reductions in stent thrombosis in favor of OCT, but the primary end-point failed to demonstrate superiority of OCT when compared to IVUS-guided PCI.<sup>3</sup> More recently, a meta-analysis of 22 trials enrolling 15,964 patients identified image-guided PCI (similar IVUS/OCT ratio as mentioned before) showed significant reductions in cardiac death, stent thrombosis, myocardial infarction and target lesion revascularization. In this meta-analysis, the outcomes were similar for OCT-guided and IVUS-guided PCI.<sup>4</sup>

### Conclusion

The routine use of intracoronary imaging to guide PCI is not controversial any more. Both techniques provide encouraging results. Under-utilization of these procedures should be an issue of the past. Image-guided PCI improves survival and freedom from MACE, enhancing both the long-term safety and effectiveness of coronary intervention.<sup>5</sup>

Figure 1. Optical Coherence Tomography

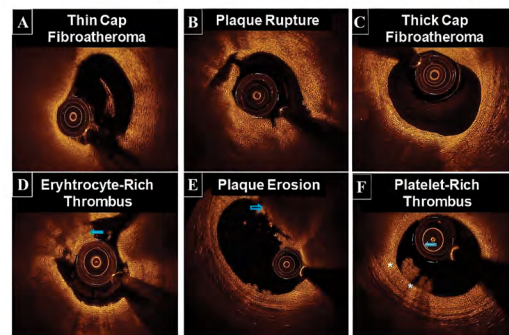
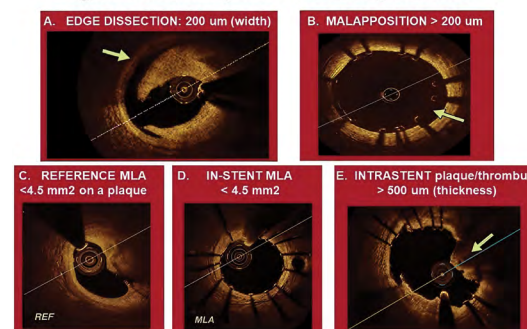


Figure 2. Sub-Optimal Stent Implantation



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# Risk Assessment and Using Therapies for Contrast-Associated Kidney Injury (CA-AKI)

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 (PCI), 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 CA-AKI and long-term impairment of renal function, 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, 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.

Further measures include the administration of sodium bicarbonate, which can alkalinize urine and decrease free radical formation, but results have been controversial. Similarly, the use of statins provided conflicting findings in randomized studies. More recently, the RenalGuard System was developed to achieve balanced hydration and diuresis via a computerized infusion system that balances fluid administration rate with real-time diuresis, with recent studies confirming the

**Conversely, procedural factors, such as the amount of contrast media, only had a marginal impact on the performance of our risk score.**

potential benefit provided by its use in preventing CA-AKI.

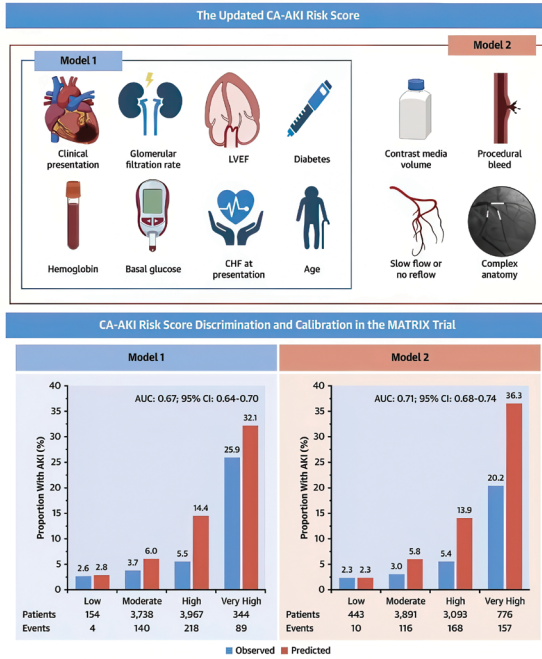
Based on the experience gained from high-volume tertiary-care center, our group developed a contemporary and user-friendly tool to quantify the risk of CA-AKI after PCI at bedside. By using only preprocedural readily available baseline variables (age, presenting symptoms, baseline eGFR, LVEF, Diabetes mellitus, anemia, glucose level, CHF), we can accurately predict the risk of CA-AKI. Elderly patients, those with congestive heart failure, impaired renal function, or presenting with an acute myocardial infarction exhibited the highest risk of developing CA-AKI. Conversely, procedural factors, such as the amount of contrast media, only had a marginal impact on the performance of our risk score. These features altogether make

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**CENTRAL ILLUSTRATION: Validation of the Updated Contrast-Associated Acute Kidney Injury Risk Score in the MATRIX Trial**

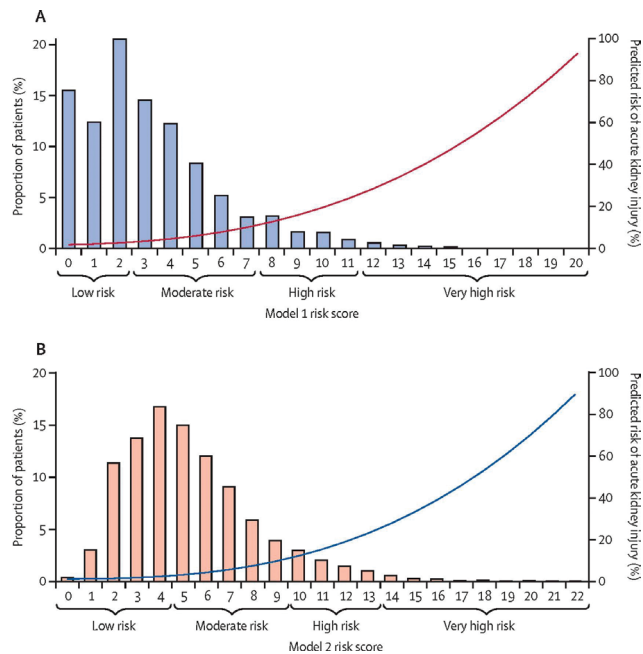


Landi A, et al. *J Am Coll Cardiol Interv.* 2023;16(15):1873-1886.

**Figure 1:** Features included in the updated CA-AKI risk score. The updated CA-AKI risk score includes 8 readily available preprocedural variables for model 1, whereas model 2 also encompasses procedural variables, assigning 0 to 8 points to each variable.

this novel risk score very practical and facilitate its implementation in daily practice.

From the clinician perspective, identification of high-risk patients prompts increased level of care and timely initiation of preventive strategies. Similarly, in case of low-risk patients, CA-AKI prevention measures may be abbreviated. The score has been tested and validated in several external cohorts, showing how it accurately identifies patients at incremental risks of CA-AKI and confirming how our risk score will help in a tailored approach aimed at applying appropriate CA-AKI preventive measures based on each patients' risk profile.



**Figure 2:** 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).

# Incorporation of ChatGPT in Noninvasive Procedures Reporting

JEFFREY BANDER, MD

The “Carnival” study at Mount Sinai Fuster Heart Hospital represents a pioneering leap in the intersection of quantum technology and cardiac care. Through the innovative CardiAQ magnetocardiography (MCG) device, developed by SandboxAQ, Mount Sinai is leading the way in revolutionizing the diagnosis of acute coronary syndrome (ACS) in emergency departments using quantum technologies.

The core of the study focuses on the implementation and efficacy of the CardiAQ device, a cutting-edge tool that employs quantum sensors for reliable, high-quality data capture. This device operates at room temperature without the need for shielding, making it perfectly suited for the fast-paced environment of emergency departments. Its integration into

patient care allows for the rapid and accurate evaluation of chest pain, significantly improving the triage process.

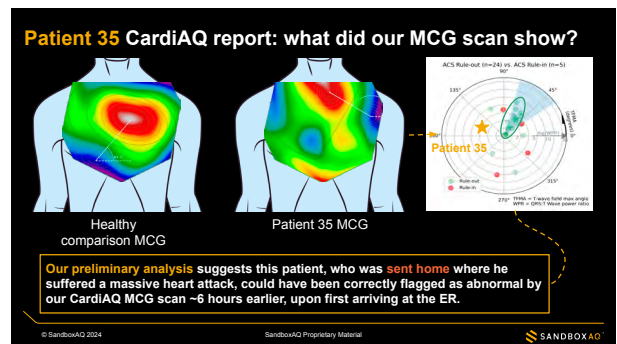
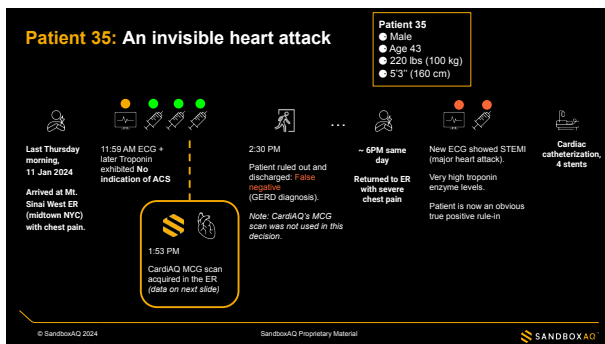
A highlighted case from the study, underscores the device’s potential to save lives. Despite presenting with chest pain and undergoing traditional evaluation methods like ECG and troponin tests, patient was initially discharged with no indication of ACS. However, when re-evaluated with the CardiAQ MCG scan, the patient was correctly identified as having suffered a heart attack, demonstrating the device’s superior diagnostic capability.

Mount Sinai’s commitment to integrating advanced technologies into patient care is evident through this study. The utilization of AI-enabled signal processing and data analysis further enhances the device’s diagnostic precision.

**The Carnival Recap highlights the team’s efforts in developing a mobile, user-friendly, and scalable MCG device, reinforcing Mount Sinai’s mission to provide cutting-edge care**

The Carnival Recap highlights the team’s efforts in developing a mobile, user-friendly, and scalable MCG device, reinforcing Mount Sinai’s mission to provide cutting-edge care.

This transformative research not only showcases Mount Sinai’s role as a leader in medical innovation but also represents a significant step forward in improving patient outcomes in cardiac care. Through the fusion of quantum technology and health care, Mount Sinai is setting new standards for the early diagnosis and treatment of heart conditions, underscoring our dedication to excellence in patient care and medical research.



# Appropriate Indications for ECMO

GREGORY SERRAO, MD

Extracorporeal Membrane Oxygenation (ECMO) is the most advanced form of life support and is able to replace the work of the heart and lungs. It requires the insertion of one or more large catheters, one of which drains blood from the body and another which reinfuses it into the body after oxygen has been added and carbon dioxide has been removed. These catheters are placed in the catheterization laboratory under continuous fluoroscopic guidance.

ECMO can be configured in two major ways: veno-arterial (VA), which is primarily used for cardiogenic shock, and veno-venous (VV), utilized for respiratory failure. ECMO can also be used as a salvage for cardiac arrest using a technique known as extracorporeal cardiopulmonary resuscitation (E-CPR). This has been proven to be superior to standard resuscitative techniques in several randomized control trials and is considered optimal care for patients with refractory ventricular arrhythmia requiring

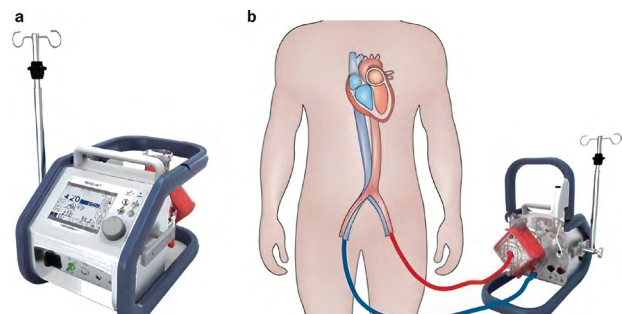
cardiopulmonary resuscitation.<sup>1,2</sup> In situations of end stage heart or lung failure, ECMO can be used as a tool to keep a patient healthy until a suitable organ can be identified for transplantation.

In the past, ECMO was a large device that required highly specialized intensive care units with multiple dedicated providers to manage. In recent years, technology has advanced significantly, and newer ECMO devices are small enough to be managed in an ambulance by a single operator. This enables our Cardiac Catheterization Laboratory to travel to other

**Newer ECMO devices are small enough to be managed in an ambulance by a single operator.**

hospitals in order to offer this life saving procedure followed by transportation back to Mount Sinai Hospital for continued management. This also allows for ECMO to be deployed in other smaller areas of the hospital including the emergency room, allowing for stabilization and transport of the patient to the catheterization laboratory for further treatment which may include primary percutaneous coronary intervention for acute myocardial infarction and percutaneous thrombectomy for pulmonary embolism.

ECMO CARDIOHELP SYSTEM



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# Protocol for Ambulatory Assessment of Peripheral Arterial Disease (PAD)

VISHAL KAPUR, MD

PAD often presents with symptoms such as intermittent claudication, characterized by pain, cramping, or fatigue in the lower extremities during physical activity. Patients may also report rest pain, numbness, tingling, or coldness in the legs or feet. However, a significant proportion of PAD cases are asymptomatic, especially in the early stages. Therefore, a high index of suspicion is crucial, particularly in patients with risk factors such as smoking, diabetes, hypertension, dyslipidemia, or a history of cardiovascular disease.

Ambulatory assessment of Peripheral Arterial Disease (PAD) involves a comprehensive evaluation of peripheral blood flow and associated symptoms in patients while they engage in their daily activities. This protocol outlines the steps for conducting ambulatory assessment of PAD, focusing on presentation and diagnosis.

An initial clinical assessment begins with a thorough medical

history and physical examination, focusing on symptoms suggestive of PAD such as claudication, leg pain at rest, or non-healing wounds. Assess for risk factors and comorbidities that contribute to vascular disease.

One of the first diagnostic testing in the evaluation of PAD is the Ankle-Brachial Index (ABI). ABI is a simple and non-invasive test widely used which compares blood pressure measurements at the ankle and arm to assess peripheral arterial circulation. A normal value is 1.0 and the ratio less than 0.90 is indicative of PAD. The lower the number, the worse is the disease and  $< 0.4$  is considered as critical limb ischemia.

In cases where resting ABI results are inconclusive, Treadmill exercise testing can be employed to assess functional impairment and confirm the presence of intermittent claudication. It involves measuring the distance walked and documenting the onset of symptoms.

**One of the first diagnostic testing in the evaluation of PAD is the Ankle-Brachial Index (ABI).**

In addition, when detailed anatomical information is required, additional imaging studies such as duplex ultrasound, computed tomography angiography (CTA), or magnetic resonance angiography (MRA) may be performed. These modalities provide detailed visualization of arterial anatomy, identifying stenoses, occlusions, or other abnormalities.

Regular follow-up assessments are crucial to monitor disease progression, treatment effectiveness, and the development of complications such as ulceration or gangrene.

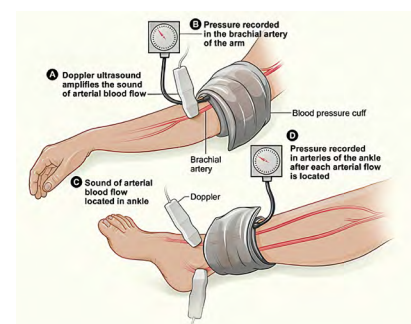


Figure 1: Ankle-Brachial Index

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# Anthony Valvano

**Diagnosis:** Unstable angina, 3-vessel CAD

**Treatment:** Successful PCI of left main, LAD and RCA

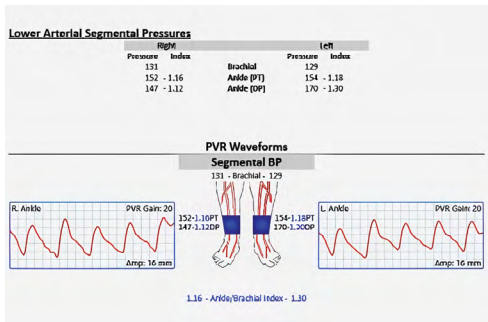


Figure 2: Lower Arterial Segmental Pressures

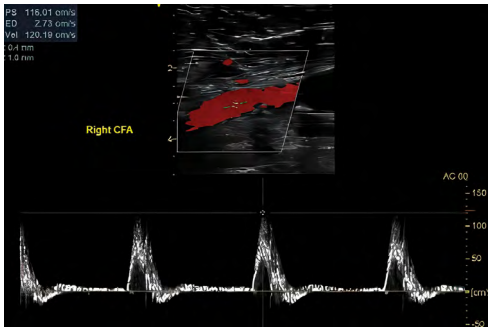


Figure 3: Ultrasound



Figure 4: CTA



“I highly recommend Dr. Sharma; I have recommended three of my close friends to him.”

“I am a public adjuster/builder by trade and the majority of my work is done on fire- and water- damaged properties. In 2014, as a result of Hurricane Sandy, I was working 80–100 hours a week. One morning I woke up, walked down the hallway and passed out. When I awoke, I was having trouble breathing and assumed it was due to my allergies. I went directly to my allergist, and he confirmed it had nothing to do with my prior history of allergies and advised me to see a cardiologist right away, whose office was right next to his. After being examined, they found blockages and due to the location of the blockages, I was told the only way to fix the problem would be open-heart surgery. I was surprised by the diagnosis since the only symptom I felt was angina after sitting for a while then getting up. Before I made the decision to go through with the open-heart surgery, I went for three more opinions, all from different hospitals. Each doctor agreed that the stent procedure was far too difficult and open-heart surgery would be needed. I decided one more opinion couldn't hurt, and I was referred to Dr. Sharma at Mount Sinai. After an extensive examination, Dr. Sharma said he could basically put the stents in with his eyes closed, no open-heart surgery needed. However, he did keep his eyes open when he did the procedure, and I was home the same day.

Dr. Sharma has done four stents for me in total since 2014. Everyone I encountered at Mount Sinai was extremely professional and very helpful. I highly recommend Dr. Sharma, his knowledge of heart issues is exceptional and I have recommended three of my close friends to him and he was able to help them as well. Thanks to Dr. Sharma, I am back to my regular daily activities with no problems. I'm able to walk the golf course frequently, play golf with my son, and on occasion get the opportunity to caddy for him.”

# Update in Carotid Artery Stenting

RAMAN SHARMA, MD

Carotid artery revascularization, particularly carotid artery stenting (CAS), continues to evolve as a vital intervention for patients with carotid artery disease, aiming to reduce the risk of stroke. This minimally invasive procedure involves placing a stent to widen the narrowed carotid artery, restoring blood flow to the brain. While traditional carotid endarterectomy (CEA) remains as the most common surgical option, CAS offers a less invasive alternative for patients deemed high risk for surgery or those with complex anatomy.

Two major clinical trials have significantly contributed to our understanding of CAS efficacy and safety. The CREST (Carotid Revascularization Endarterectomy vs. Stenting Trial) and the ACT-1 (Asymptomatic Carotid Trial) have provided valuable insights into the outcomes of CAS compared to CEA and optimal patient selection criteria.

CREST, a landmark trial, compared CAS with CEA in patients with symptomatic and asymptomatic carotid artery stenosis. The study found comparable rates of stroke, myocardial infarction, and death

between the two procedures at four years, indicating that CAS is a viable alternative to CEA for selected patients (Figure 1). CREST also highlighted the importance of patient selection, as outcomes varied depending on age, sex, and symptomatic status. Specifically, it was shown that patients with age greater than 70 years tended to do better with CEA as opposed to CAS, largely due to the burden of calcium which is associated with a higher periprocedural stroke risk (Figure 2).<sup>1</sup>

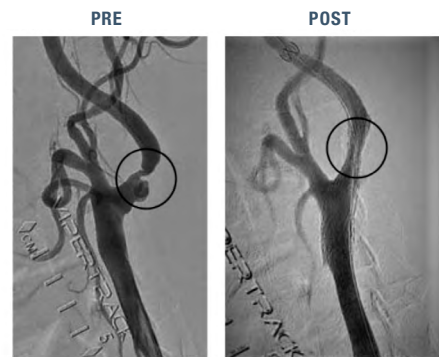
Similarly, the ACT-1 trial focused specifically on asymptomatic patients and compared CAS with optimal medical therapy alone. This trial demonstrated that CAS was not superior to medical therapy alone in preventing stroke in asymptomatic patients. However, it emphasized the importance of rigorous medical management, including aggressive control of risk factors such as hypertension, hyperlipidemia, and smoking cessation, in this patient population.<sup>2</sup>

Recent advancements in CAS techniques, including improvements in stent design, embolic protection devices, and

**At the Mount Sinai Cardiac Catheterization Laboratory, carotid artery stenting remains a valuable option for selected patients with carotid artery stenosis.**

operator experience, have further enhanced procedural safety and efficacy. Additionally, ongoing research continues to explore the role of CAS in specific patient subgroups, such as those with high-risk anatomy or comorbidities, to optimize patient outcomes.

At the Mount Sinai Cardiac Catheterization Laboratory, carotid artery stenting remains a valuable option for selected patients with carotid artery stenosis, offering a less invasive alternative to traditional surgery. Our multidisciplinary collaboration with vascular surgery and adherence to best practices allows us to choose the best patients for CAS with exceedingly excellent outcomes for over 20 years.



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# Managing Intense Learning With Physical Endurance and Motivation

ANTON CAMAJ, MD

The Mount Sinai Fuster Heart Hospital houses one of the busiest cardiac catheterization laboratories in the world, and with that, comes one of the busiest interventional cardiology fellowship programs in the world. Indeed, it is no place for the weary kind. The procedures are complex and abundant, and the training is incredibly hands-on. While this combination fosters an intense learning environment, it also promises a robust experience filled with exceptional learning opportunities for fellows-in-training.

It is well-established that complex catheter-based procedures confer distinct occupational hazards to cardiologists in the catheterization laboratory. Among them, orthopedic injuries and musculoskeletal pain, likely consequences of wearing heavy-lead aprons in order to reduce radiation risk, are the most common.<sup>1</sup> Additionally, the state of high arousal inherent to performing such complex procedures for long hours may also lead to stress and anxiety. Therefore, maintaining fellow

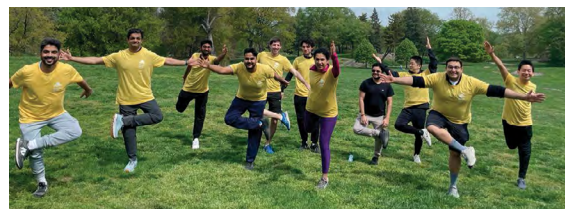
motivation and well-being in the face of these physical and mental stressors is a significant challenge for those leading interventional cardiology training programs.

Annapoorna Kini, MD, Director of the Cardiac Catheterization Laboratory, and Samin K. Sharma, MD, Director of Interventional Cardiology of the Mount Sinai Health System have been strong proponents of fellow wellness. In doing so they have taken on a multidimensional, evidence-based approach targeting physical endurance, nutritional well-being, sleep hygiene and mental health. For example, we have bi-weekly group well-being sessions with an expert consultant who address mental health issues and meditation. Additionally, our “Yoga in the Cath Lab” curriculum promotes improvements in core strength, back pain relief, stress management and relaxation. Other efforts include healthy breakfast, lunch and dinner options that are provided by program leadership, quarterly massage therapy sessions that help improve relaxation and reduce symptoms related to stress

**Maintaining fellow motivation and wellbeing in the face of these physical and mental stressors is a significant challenge for those leading interventional cardiology training programs.**

and anxiety,<sup>2</sup> and innovative scheduling that provides fellows with flexibility.<sup>3</sup> Finally, our leaders have encouraged collegial out-of-work hangouts and celebrations that promote fellow camaraderie.

All-in-all, managing intense learning with physical endurance and motivation is no walk in the park; however, with committed leadership and creative solutions, even the most demanding fellowship programs can be fellow-health conscious promoting fellow well-being, satisfaction and motivation.



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# Research and Clinical Trials

Study Title	Study Details	Sponsor	Principal Investigator(s) at MSH	Target Enrollment and Study Sites	Current Status/ Enrollment at MSH
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/ 58 randomized and 18 in registry
ELEVATE II	Early Feasibility Study (EFS) of the Magenta Elevate percutaneous Left Ventricular Assist Device (pLVAD) System in patients undergoing non-emergent, high-risk percutaneous coronary interventions (ELEVATE II)	Magenta Medical - Cordis	S. Sharma	15 (USA) 3 Centers	Completed/ 9 subjects enrolled
COSIRA-II Trial	Efficacy of the COronary Sinus Reducer in Patients with Refractory Angina II (COSIRA-II)	Neovasc Medical Inc.	S. Sharma	380 (USA) 50 centers	Ongoing/ 6 subjects enrolled
SELUTION ISR IDE	A Prospective Randomized Single Restenosis Blind Multicenter Study to Assess the Safety and Effectiveness of the SELUTION SLR 014 Drug Eluting Balloon in the Treatment of Subjects with In-Stent Restenosis-SELUTION ISR IDE	Cordis	S. Sharma	470 (Global) 52 Centers	Ongoing/ 48 subjects enrolled
ACURATE IDE Trial	ACURATE IDE: Transcatheter Replacement of Stenotic Aortic Valve Through Implantation of ACURATE neo2™ in Subjects Indicated for TAVR	Boston Scientific Corporation	A. Kini	640 (USA) 80 centers	Ongoing 14 subjects enrolled



Study Title	Study Details	Sponsor	Principal Investigator(s) at MSH	Target Enrollment and Study Sites	Current Status/ Enrollment at MSH
TRILUMINATE Study	Trial to Evaluate Treatment With Abbott Transcatheter Clip Repair System in Patients With Moderate or Greater Tricuspid Regurgitation	Abbott Laboratories	G. Tang	450 (Global) 30 Centers	Completed/12 randomized and 3 roll-ins
Complete TAVR	The COMPLETE TAVR Study: A Randomized, Comparative Effectiveness Study of Staged Complete Revascularization with Percutaneous Coronary Intervention to Treat Coronary Artery Disease vs Medical Management Alone in Patients with Symptomatic Aortic Valve Stenosis undergoing Elective Transfemoral Transcatheter Aortic Valve Replacement	The University of British Columbia (UBC)	S. Sharma	4,000 120 Centers	Ongoing/ 3 subjects enrolled
Manta Trial	Prospective Clinical Registry evaluating contemporary MANTA Outcomes (ACCESS MANTA Registry)	Essential Medical LLC (Teleflex)	S. Khera	250 10 centers	Ongoing/ 8 subjects enrolled
LIFE-BTK Study	LIFE-BTK Study is to evaluate the safety and efficacy of the ESPRIT BTK Everolimus-Eluting Bioresorbable Scaffold System for treatment of below-the-knee arteries in CLI patients	Abbott Laboratories	P. Krishnan	600 (USA) 30 centers	Ongoing/ 21 subjects enrolled
Disrupt PAD BTK II	Prospective, multi-center, single-arm study of the Shockwave Medical Peripheral Intravascular Lithotripsy (IVL) System for Treatment of Calcified Peripheral ARterial Disease (PAD) in Below-the-Knee (BTK) Arteries	Shockwave Medical	P. Krishnan	225 patients 65 global centers	Ongoing/ 7 subjects enrolled

# Top Ten Major Publications of 2023



## 1. Validation of UK-BCIS CHIP Score to Predict 1-Year Outcomes in a Contemporary United States Population

Gaurav Khandelwal, Alessandro Spirito, Richard Tanner, Anoop N. Koshy, Samantha Sartori, Negar Salehi, Gennaro Giustino, Vishal Dhulipala, Zhongjie Zhang, Jaime Gonzalez, Amit Hooda, Manish Vinayak, Asif Shaikh, Roxana Mehran, Annapoorna S. Kini, Samin K. Sharma. Validation of UK-BCIS CHIP Score to Predict 1-Year Outcomes in a Contemporary United States Population, *JACC: Cardiovascular Interventions*, Volume 16, Issue 9, 2023, Pages 1011-1020, ISSN 1936-8798. <https://doi.org/10.1016/j.jacc.2023.08.011>.

A complex high-risk indicated percutaneous coronary intervention (CHIP) score was recently developed from the British Cardiovascular Intervention Society (BCIS) database to define CHIP cases and their risk of in-hospital major adverse cardiac or cerebrovascular events (MACCE). In a large PCI registry, the BCIS-CHIP score had a good predictive value for MACCE at 1 year.



## 2. Rotational Atherectomy Combined with Cutting Balloon to Optimize Stent Expansion in Calcified Lesions: The ROTA-CUT Randomized Trial

Sharma, S. K., Mehran, R., Vogel, B., Hooda, A., Sartori, S., Hanstein, R., Feng, Y., Shlofmitz, R. A., Jeremias, A., Spirito, A., Cao, D., Shlofmitz, E., Ali, Z. A., Yasumura, K., Minatoguchi, S., Vengrenyuk, Y., Kini, A., & Moses, J. W. (2024). Rotational atherectomy combined with cutting balloon to optimise stent expansion in calcified lesions: the ROTA-CUT randomised trial. *EuroIntervention*, 20(1), 75–84. <https://doi.org/10.4244/eij-d-23-00811>

Percutaneous coronary intervention (PCI) of calcified lesions remains challenging for interventionalists. We aimed to investigate whether combining rotational atherectomy (RA) with cutting balloon angioplasty (RA+CBA) results in more optimal stent expansion. Combining RA with CBA resulted in a similar minimum stent area compared with RA followed by NCBA in patients undergoing PCI of moderately or severely calcified lesions. RA followed by CBA was safe with rare procedural complications and few clinical adverse events at 30 days.



## 3. Ticagrelor or Prasugrel Versus Clopidogrel in Patients Undergoing Percutaneous Coronary Intervention for Chronic Coronary Syndromes

Koshy, A. N., Giustino, G., Sartori, S., Hooda, A., Feng, Y., Snyder, C., Dasgupta, S., Kumar, K. R., Krishnamoorthy-Melarcodes, P., Sweeny, J., Khera, S., Serrao, G. W., Sharma, R., Dangas, G., Kini, A. S., Mehran, R., & Sharma, S. K. (2023). Ticagrelor or prasugrel versus clopidogrel in patients undergoing percutaneous coronary intervention for chronic coronary syndromes. *EuroIntervention*, 18(15), 1244–1253. <https://doi.org/10.4244/eij-d-22-00654>

Potent P2Y12 inhibitors such as ticagrelor and prasugrel are superior to clopidogrel in acute coronary syndrome (ACS) patients treated with percutaneous coronary intervention (PCI). Whether this benefit extends to a patient population with chronic coronary syndromes (CCS) is unclear. Ticagrelor and prasugrel are increasingly used in patients with CCS undergoing PCI with similar 1-year efficacy and safety when compared to clopidogrel.



## 4. Predictors of Suboptimal Lumen Expansion Following Intravascular Lithotripsy for Coronary In-Stent Restenosis

Yasumura, K., Koshy, A. N., Vengrenyuk, Y., Minatoguchi, S., Hooda, A., Sharma, R., Kapur, V., Sweeny, J., Sharma, S. K., & Kini, A. S. (2024). Predictors of suboptimal lumen expansion following intravascular lithotripsy for Coronary In-Stent restenosis. *JACC: Cardiovascular Interventions/JACC: Cardiovascular Interventions*, 17(2), 323–325. <https://doi.org/10.1016/j.jcin.2023.10.025>

Intravascular lithotripsy (IVL) is a safe and effective therapy for de novo calcified lesions by inducing calcium fractures. Despite its off-label application for in-stent restenosis (ISR), IVL offers a potential for addressing calcium-related ISR. In conclusion, our findings enhance the understanding of appropriate IVL use for ISR lesions and offer insights to optimize treatment strategies.



## 5. Revascularization Strategies for Patients With Femoropopliteal Peripheral Artery Disease

Serdar Farhan, Florian K. Enzmann, Patrick Bjorkman, Haroon Kamran, Zhongjie Zhang, Samantha Sartori, Birgit Vogel, Arthur Tarricone, Klaus Linni, Maarit Venermo, Daphne van der Veen, Herve Moussalli, Roxana Mehran, Michel M.P.J. Reijnen, Marc Bosiers, Prakash Krishnan, Revascularization Strategies for Patients With Femoropopliteal Peripheral Artery Disease, *Journal of the American College of Cardiology*, Volume 81, Issue 4, 2023, Pages 358-370, ISSN 0735-1097, <https://doi.org/10.1016/j.jacc.2022.10.036>.

No adequately powered studies exist to compare major clinical outcomes after endovascular therapy (EVT) with stent implantation vs bypass surgery (BSx) for symptomatic femoropopliteal peripheral artery disease. This study sought to perform a pooled analysis of individual patient data from all randomized controlled trials comparing EVT vs BSx. These findings further support the efficacy and safety of EVT as an alternative to BSx in patients with symptomatic femoropopliteal peripheral artery disease.

## 6. Drug-Eluting Resorbable Scaffold Versus Angioplasty for Infrapopliteal Artery Disease

Varcoe, R. L., DeRubertis, B. G., Kolluri, R., Krishnan, P., Metzger, D. C., Bonaca, M. P., Shishehbor, M. H., Holden, A. H., Bajajian, D. R., Garcia, L. A., Kum, S. W., Rundback, J., Armstrong, E., Lee, J., Khatib, Y., Weinberg, I., Garcia-Garcia, H. M., Ruster, K., Teraphongphom, N. T., Parikh, S. A. (2024). Drug-Eluting Resorbable Scaffold versus Angioplasty for Infrapopliteal Artery Disease. *New England Journal of Medicine/the New England Journal of Medicine*, 390(1), 9–19. <https://doi.org/10.1056/nejmoa2305637>



Among patients with chronic limb-threatening ischemia (CLTI) and infrapopliteal artery disease, angioplasty has been associated with frequent reintervention and adverse limb outcomes from restenosis. Among patients with CLTI due to infrapopliteal artery disease, the use of an everolimus-eluting resorbable scaffold was superior to angioplasty with respect to the primary efficacy end point.

## 7. Prevention and Management of Stroke After Transcatheter Aortic Valve Replacement: The Mount Sinai Stroke Initiative

Khera, S., Koshy, A. N., Tang, G. H. L., Moreno, P., Mehran, R., Dangas, G. D., Bronster, D., Kini, A. S., Fara, M., & Sharma, S. K. (2023). Prevention and management of stroke after transcatheter aortic valve replacement: The Mount Sinai Stroke Initiative. *Journal of the American Heart Association. Cardiovascular and Cerebrovascular Disease*, 12(4). <https://doi.org/10.1161/jaha.122.028182>



Stroke is a devastating complication following transcatheter aortic valve replacement (TAVR). Despite advancements in technology, procedural technique, operator experience, and use of cerebral embolic protection, stroke rates have remained unchanged. The Mount Sinai Stroke Initiative aimed to formalize institutional strategies to mitigate stroke risk in patients undergoing TAVR. Second, we proposed a streamlined protocol for the management of patients diagnosed with stroke after TAVR.

## 8. Safety and Efficacy of Ticagrelor Monotherapy in Patients With Acute Coronary Syndromes Undergoing Percutaneous Coronary Intervention: An Individual Patient Data Meta-Analysis of TWILIGHT and TICO Randomized Trials

Baber, U., Jang, Y., Oliva, A., Cao, D., Vogel, B., Dangas, G., Sartori, S., Spirito, A., Smith, K. F., Branca, M., Collier, T., Pocock, S., Valgimigli, M., Kim, B., Hong, M., & Mehran, R. (2023). Safety and Efficacy of Ticagrelor Monotherapy in Patients With Acute Coronary Syndromes Undergoing Percutaneous Coronary Intervention: an Individual Patient Data Meta-analysis of TWILIGHT and TICO Randomized Trials. *Circulation*. <https://doi.org/10.1161/circulationaha.123.067283>



Dual antiplatelet therapy with a potent P2Y<sub>12</sub> inhibitor coupled with aspirin for 1 year is recommended after PCI. As an alternative, monotherapy with a P2Y<sub>12</sub> inhibitor after a short period of dual antiplatelet therapy has emerged as a bleeding reduction strategy. These patients undergoing PCI who have completed a 3-month course of dual antiplatelet therapy, discontinuation of aspirin followed by ticagrelor monotherapy significantly reduced major bleeding without incremental ischemic risk compared with ticagrelor plus aspirin.

## 9. Accuracy of OCT Core Labs in Identifying Vulnerable Plaque

Gruslova, A., Singh, S., Hoyt, T., Vela, D., Vengrenyuk, Y., Buja, L. M., Litovsky, S., Michalek, J., Maehara, A., Kini, A., Akasaka, T., Garcia-Garcia, H., Jang, I., Dijkstra, J., Raber, L., Milner, T., & Feldman, M. D. (2022). Abstract 11941: Accuracy of OCT Core Labs in determining Coronary Artery plaque Composition. *Circulation*, 146(Suppl\_1). [https://doi.org/10.1161/circ.146.suppl\\_1.11941](https://doi.org/10.1161/circ.146.suppl_1.11941)



Intravascular optical coherence tomography (OCT) provides a high-resolution representation of coronary atherosclerosis. However, the accuracy of OCT image interpretation is unknown. We present a blinded study of histologically identified OCT human plaque composition by leading international OCT core labs. Results suggest that participating OCT core labs can accurately identify combined lipid categories (lipid pool, TCFA, and necrotic core), fibrous tissue and calcium. However, accuracy is reduced when reading more sophisticated unstable plaque components. Study results emphasize the need for the development of OCT plaque composition analysis with artificial intelligence.

## 10. Comprehensive Management of ANOCA, Part 2—Program Development, Treatment, and Research Initiatives: JACC State-of-the-Art Review<sup>†</sup>

Gruslova, A., Singh, S., Hoyt, T., Vela, D., Vengrenyuk, Y., Buja, L. M., Litovsky, S., Michalek, J., Maehara, A., Kini, A., Akasaka, T., Garcia-Garcia, H., Jang, I., Dijkstra, J., Raber, L., Milner, T., & Feldman, M. D. (2022). Abstract 11941: Accuracy of OCT Core Labs in determining Coronary Artery plaque Composition. *Circulation*, 146(Suppl\_1). [https://doi.org/10.1161/circ.146.suppl\\_1.11941](https://doi.org/10.1161/circ.146.suppl_1.11941)



Centers specializing in coronary function testing are critical to ensure a systematic approach to the diagnosis and treatment of angina with nonobstructive coronary arteries (ANOCA). Multidisciplinary care teams that can tailor and titrate therapies based on individual patient needs are critical to the success of comprehensive programs. As coronary function testing for ANOCA is more widely adopted, collaborative research initiatives will be fundamental to improve ANOCA care. These efforts will require standardized symptom assessments and data collection, which will propel future large-scale clinical trials.



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

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

### Clinical Interests:

Coronary Artery Disease  
 Interventional Cardiology  
 Atherectomy  
 Valvular Intervention

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Sam 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 major complication rate (less than 0.2 percent). He has received the prestigious two-star designation (significantly lower than expected mortality) numerous times from the New York State Department of Health, and the Governor's Award of Excellence in Medicine in 1996. 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. 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: 2023 Master Operator by India Live Conference, 2021-2022 Chief Guest, Times Square, Diwali Celebration; 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 2010–2022 Best Doctors

**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.**

by *New York Magazine*; 2008–2022 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 360 papers and 16 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 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 179 countries.

He also enjoys teaching other cardiologists and improving patient outcomes with his annual Complex Coronary Cases (CCC) Symposium and numerous other major scientific meetings, conferences, and live relays. 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  
 Director, Process Optimization System, Cardiac Catheterization Laboratory  
 Chief of Cardiac Catheterization Laboratory AI Strategy  
 Zena and Michael A. Weiner Professor of Medicine

### Clinical Interests:

Intravascular Imaging  
 Bifurcation PCI  
 Valvular Intervention  
 Artificial Intelligence

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Annapoorna S. Kini, MD is internationally recognized for her expertise in complex PCI such as left main bifurcation, chronic total occlusion, and heavily-calcified lesions. In addition to coronary interventions, Dr. Kini treats obstructive hypertrophic cardiomyopathy through alcohol septal ablation and more common valvular interventions.

Dr. Kini is the highest volume female interventionist in the United States, with an extremely low complication rate of less than 0.3 percent; an official report from The New York State Department of Health recognized Dr. Kini as one of the safest operators among 400 other physicians in the state of New York numerous times (2004-2019). 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 III study, which was presented at ACC 2023 as a LBCT, was an ambitious translational combination of multimodality imaging with clinically relevant cellular biology and comprehensive transcriptomics to better assess the effect of evolocumab on coronary plaque morphology. The genetic analysis of YELLOW III will be presented at the next national cardiac conference, shedding light on how individuals respond to lipid reduction therapy.

In the digital field, Dr. Kini has led the development of twelve free educational applications. Her STEMIcathAID application has been working to reduce the device time to reperfusion on vulnerable heart attack patients since July of 2021 and now is being deployed system-wide. Dr. Kini is an excellent

**Dr. Kini is the highest volume female interventionist in the United States, with an extremely low complication rate of less than 0.3 percent.**

teacher and is dedicated to both cardiologists worldwide as well as her 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. She is also the director of a monthly webcast program, *CCC Live Cases* ([www.ccclivecases.org](http://www.ccclivecases.org)), which started in 2009 and has an audience of more than 25,000 in 179 countries.

Introducing artificial intelligence solutions to old Catheterization Laboratory problems, Dr. Kini has projects in patient communication, automated quantitative assessment in coronary angiography, and new personalized models of risk prediction that can provide the tools to more accurately risk-stratify and treat patients. She believes that the recent AI boom has created a great opportunity in the Cardiac Catheterization Laboratory and is taking the initiative to push for advancements.

Dr. Kini's passion for wellness, for herself, her staff, and her patients, has recently culminated in the creation of a wellness website *CardyFit.com*. This website introduces the various tenants of wellness like diet, exercise, and lifestyle modifications that are critical for getting healthy and staying healthy. After treating nearly 20,000 patients in her career, she hopes to make a larger impact on primary prevention.



## Prakash Krishnan, MD, FACC

Director of Endovascular Services, Mount Sinai Health System  
 Associate Professor of Medicine (Cardiology)  
 Associate Professor of Radiology

### Clinical Interests:

Interventional Cardiology

Endovascular Intervention

Carotid Stenting

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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 Endovascular Services for The Mount Sinai Health System. Dr. Krishnan has been educating interventionalists globally via live satellite transmissions at national and international meetings, and with his live monthly webcast program showcased on [www.ccclivecases.org](http://www.ccclivecases.org). He served as the co-primary investigator in the ILLUMENATE Trial and is a leading authority in the performance of nonsurgical interventions for peripheral arterial disease. He has received numerous awards and honors: in 2018, The Reverend Dr. Martin Luther King Legacy Award for Physician Services from Clergy with a Purpose. In 2022, he was also recognized for his contributions in community service and honored by the Association of Indian Americans (AIA) at their annual gala event in September 2022 and this year at UK House of Commons, British Parliament in London, he will be receiving the Bharat Gaurav Award, given to people with extraordinary excellence in their fields.

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 NY Endovascular Summit (NYEVS) and The Mount Sinai Endovascular Fellows Course.

Dr. Krishnan is an internationally established leader in education. He has been both innovative and progressive, and recognized the

**Dr. Krishnan has received numerous awards and honors, most recently the Reverend Dr. Martin Luther King Legacy Award for Physician Services from Clergy with a Purpose.**

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 more than 25,000 views per month in 179 countries.

As a master educator, Dr. Krishnan started the Endovascular Fellowship program at Mount Sinai Fuster Heart Hospital in 2013. He was recognized with the Distinguished Teaching Award by the Interventional Fellows in June 2017, providing incomparable education in the field of peripheral arterial disease. The following year, he received the Mentorship in Endovascular Interventions Award by the Mount Sinai Interventional Cardiology Fellows. In 2018, he was nationally recognized by being named Co-Director of the annual Endovascular Fellows Course by SCAI (Society of Angiography and Interventions). He is currently working as the Program Director for the Women as One Foundation's Peripheral Vascular Disease Clinical Program to promote, educate, and support young women cardiologists to become leaders in the field of vascular disease and endovascular intervention.

**George D. Dangas, MD, PhD, MACC, MSCAI**



Director, Cardiovascular Innovation  
 Professor of Medicine (Cardiology)  
 Professor of Surgery (Vascular)

George D. Dangas, MD, PhD, 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 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.

He is currently the 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.

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**Joseph M. Sweeny, MD, FACC**



Medical Director, Ambulatory Cardiology Center

Associate Professor of Medicine (Cardiology)

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

**Clinical Interests:**

Acute Myocardial Infarction

Fellows Education

Coronary Intervention

Cardiology Center, which provides comprehensive ambulatory care with all modalities of noninvasive 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. In addition, he has a clinical interest in coronary microvascular disease and coronary physiology testing in the 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.

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**Pedro R. Moreno, MD, FACC**



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

Dr. Pedro R. Moreno is currently a Professor in Cardiology and Director of Quality Services at Mount Sinai Hospital in New York. Dr. Moreno is Director for Academic Promotions in Cardiology for the Mount Sinai Hospital and Director of the Cardiology fellowship program at Brooklyn General Hospital in New York.

**Clinical Interests:**

Coronary Artery Disease  
 Interventional Cardiology  
 Plaque Imaging

Trained at Harvard Medical School (Massachusetts General Hospital and Brigham and Women’s Hospital), Dr. Moreno is board certified in Cardiology, and Interventional Cardiology.

Dr. Moreno is a world-renowned expert in atherosclerosis and a pioneer in inflammation and acute coronary syndromes (ACS). Dr. Moreno described for the first time the role of macrophages in living patients with ACS. He also identified the role of macrophages and tissue factor, a membrane-bound protein responsible for the activation of coagulation in vivo, linking plaque rupture and coronary thrombosis. Dr. Moreno pioneer work in near-infrared spectroscopy contributed to measure lipid in plaques. His work in atherosclerotic animal modes of vulnerable plaques allowed for testing novel therapies as potential adjunctive treatment for vulnerable plaques.

Dr. Moreno received the prestigious double star award from the New York State Health Department for best interventionalist in the State of New York in 2012, 2019, and 2020. He is section editor of the Journal of the American College of Cardiology, and Circulation Cardiovascular Interventions two of the most prestigious cardiology journal in the world. Finally, is an excellent teacher and a mentor of clinical and research fellows at the Mount Sinai Fuster Heart Hospital in New York City.

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**Roxana Mehran, MD, FACC, FACP, FCCP, FESC, FAHA, MSCAI**



Director, The Women’s Heart and Vascular Center at Mount Sinai Fuster Heart

Director, Center for Interventional Cardiovascular Research and Clinical Trials

Endowed Mount Sinai Professor in Cardiovascular Clinical Research and Outcomes

Professor of Population Health Science and Policy

**Clinical Interests:**

Cardiovascular Disease in Women  
 Antithrombotic Therapy for Secondary Prevention  
 Contrast-Induced Acute Kidney Injury (AKI)

Roxana Mehran, MD, is an internationally renowned interventional cardiologist, clinical research expert and trialist in the field of cardiovascular disease. She

is among the most prolific researchers in the United States and is a globally-respected leader of an academic research center focused on designing and implementing randomized clinical trials, outcomes research projects, and high impact academic publications. She developed individual risk scores for bleeding and acute kidney injury, participates regularly in developing clinical guidelines, and has authored >2,000 peer-reviewed articles. She’s in Clarivate Analytics: “Most Cited Researchers – Top 1%” as well as “The World’s Most Influential Scientific Minds” (Thomson Reuters) for the past eight consecutive years and in the top 50 researchers in the world.

Dr. Mehran is leading the Lancet Commission on Women’s Cardiovascular Diseases, which bridge gaps in scientific discovery, clinical trials, and care for women with cardiovascular disease.

Dr. Mehran is a recipient of many awards including the Nanette Wenger Award from Women’s Heart for excellence in research and education, the Ellis Island Medal of Honor, and the European Society of Cardiology Silver Medal and Andreas Grüntzig Lecture plaque. In recent years, she received The Terry Ann Krulwich Physician-Scientist Alumni Award, the Linda Joy Pollin Heart Health Leadership Award, Doctor Honoris Causa Degree, Women in Cardiology Mentoring Award, and the Pulse-Setter Champion Award. On March 14th, 2024 she was honored with the Jacobi Medallion from Icahn School of Medicine at Mount Sinai. Cardiology Mentoring Award; and 2022 CRF Pulse-Setter Champion Award.

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**Vishal Kapur, MD, FACC, FSCAI, RPVI**



Director of Endovascular Services, Mount Sinai Morningside

Associate Director, Endovascular Services, The Mount Sinai Hospital

Associate 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 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.

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**Clinical Interests:**

Coronary Interventions

Peripheral Interventions

Non-Invasive Vascular Medicine

**Jeffrey Bander, MD, FACC**



Chief of Cardiology, Mount Sinai West

Medical Director, Network Development, Mount Sinai Hospital Network

Associate Director, Cardiovascular Institute

Associate Professor of Medicine (Cardiology)

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

**Clinical Interests:**

Clinical Cardiology

Cardiac Catheterization

Coronary Interventions

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.

Dr. Bander is currently working to create a large integrated research program at Mount Sinai West focusing on technology and artificial intelligence to advance cardiovascular care.

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**Yoav Niv Granot, MD**



Assistant Professor of  
Medicine (Cardiology)

**Clinical Interests:** Cardiovascular  
Imaging (echocardiography), Imaging  
for Structural Heart Interventions

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



Director, Mount Sinai  
Jackson Heights  
Assistant Professor of  
Medicine (Cardiology)

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

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**Nitin Barman, MD**



Director, Cardiac  
Catheterization Laboratory,  
Mount Sinai Morningside  
Assistant Professor of  
Medicine (Cardiology)

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

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**Srinivas Duvvuri, MD, FACC**



Clinical Associate Professor  
of Medicine (Cardiology)  
Network Senior Medical  
Director, Staten Island  
Director, Coronary  
Intervention at Richmond  
University Medical Center

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

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**Serdar Farhan, MD, FESC, FACC**



Assistant Professor of  
Medicine (Cardiology)

**Clinical interests:** Interventional  
Cardiology, Endovascular and  
Structural Heart Disease Interventions

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**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.

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### Sunny Goel, MD, FACC, FSCAI



Assistant Professor of  
Medicine (Cardiology)

**Clinical interests:** Complex  
Coronary Interventions, Primary  
PCI, Transcatheter Aortic Valve  
Replacement (TAVR), MitraClip™

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### Amit Hooda, MD, FACC, FSCAI



Assistant Professor of  
Medicine (Cardiology)

Assistant Director, Interventional  
Cardiology Fellowship Program

**Clinical interests:** Complex Coronary  
Interventions, AMI Intervention,  
Intravascular Imaging, Transcatheter  
Aortic Valve Replacement, MitraClip

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### Yumiko Kanei, MD, FACC, FSCAI



Associate Program Director,  
Cardiology Fellowship, MSBI  
Associate Professor of  
Medicine (Cardiology)

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

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



Interventional Director,  
Structural Heart Disease  
Program, MSH

Physician Lead, ADS Cardiology  
Inpatient Service, MSH

Assistant Professor of  
Medicine (Cardiology)

**Clinical interests:** TAVR, TMVR,  
Complex Coronary Interventions, ASD/  
PFO Closure, Left Atrial Appendage  
Occlusion (LAAO)

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### 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

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### Parasuram Melarcode Krishnamoorthy, MD, FACC, FSCAI



Associate Director, Structural  
Heart Disease Program

Assistant Professor of  
Medicine (Cardiology)

Medical Director, Cardiac Cath  
Lab, Brooklyn Hospital Center

Associate Program Director,  
Mount Sinai Brooklyn Hospital  
Center Cardiology Fellowship

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

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**Isha Ranadive, MD, MPH**



Assistant Professor of  
Medicine (Cardiology)

**Clinical interests:** Clinical  
Cardiology, Complex Coronary  
Interventions, Primary PCI, AMI  
Intervention

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**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

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**Lucy M. Safi, DO, FACC, FASE, FSCAI**



Assistant Professor of Medicine  
Imager for Structural  
Heart Interventions

**Clinical interests:** Structural  
Heart Disease, Imaging for  
Transcatheter Interventions, and AI in  
Echocardiography

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**Raman Sharma, MD, FACC, RPVI**



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

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**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

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**Joshua Shatzkes, MD, MS**



Director of Ambulatory Care,  
Cardiovascular Institute  
at Mount Sinai West

Medical Director of Community  
Outreach, Mount Sinai Network

Associate Professor of  
Medicine (Cardiology)

**Clinical interests:** Cardiovascular  
Disease Prevention, Noninvasive  
Cardiovascular Imaging, Peripheral  
Arterial Disease, Hypertension,  
Cholesterol

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## FULL-TIME ATTENDINGS

### Michael Alan G. Sicat, MD



Assistant Professor of  
Medicine (Cardiology)

**Clinical interests:** Clinical  
Cardiology, Echocardiography,  
Cardiac Catheterization

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### Javed Suleman, MD, FACC



Associate Clinical Professor  
of Medicine (Cardiology)

**Clinical interests:** Clinical  
Cardiology, Coronary Intervention,  
Primary PCI

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### 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

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## VOLUNTARY ATTENDINGS

### Karthik Gujja, MD, MPH



Director, Endovascular  
Services at Mount  
Sinai South Nassau

Assistant Professor of  
Medicine (Cardiology)

**Clinical interests:** Peripheral  
Artery Disease, Endovascular  
Intervention, Venous Interventions

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### Choudhury M. Hasan, MD, FACC, FSCAI



Associate Clinical Professor  
of Medicine (Cardiology)

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

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### Haroon Kamran, MD, FACC, FSCAI



Assistant Clinical Professor  
of Medicine (Cardiology)

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

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### José Meller, MD



Clinical Professor of  
Medicine (Cardiology)

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

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**Beth Oliver, DNP, RN, FAAN**



**Chief Nurse Executive  
Senior Vice President,  
Cardiac Services  
Mount Sinai Health System**

Dr. Oliver is responsible for the practice of nursing across Mount Sinai Health System. A nationally recognized cardiovascular leader, her top priorities are ensuring quality care for patients, advancing the professional development of nurses, transforming the care we provide around the needs of our patients and communities, and partnering on our transition from volume to value. For more than 28 years, Dr. Oliver has been a transformational cardiac nurse leader at The Mount Sinai Hospital, most recently serving as Senior Vice President of Cardiac Services for the Health System.

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**Thomas Geramita, PA-C**

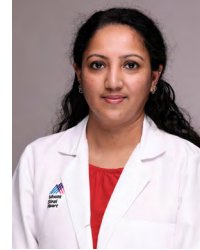


**Associate Director, Clinical  
Operations of Cardiac  
Catheterization Laboratory and  
Advanced Practice Providers**

Thomas Geramita started as a Senior Physician Assistant (PA) in the department of Electrophysiology at The Mount Sinai Hospital in October 2019. During his time as a Senior PA he began to develop process improvement and initiatives which led to an interest in leadership and an eventual promotion as the Advanced Practice Provider (APP) supervisor at Mount Sinai Fuster Heart Hospital. As the APP supervisor he led quality initiatives, standardized orientation, and initiated an APP focused cardiac educational lecture series which resulted in a promotion to an Associate Director. As Associate Director, he directs, oversees, and coordinates all administrative and clinical operations for the Cardiac Catheterization Laboratory and apps of Mount Sinai Fuster Heart Hospital.

**212-241-7114  
thomas.geramita@mountsinai.org**

**Neethu James, MSN, RN**



**Clinical Nurse Manager,  
Catheterization Laboratory  
and EP Laboratory**

Neethu James joined The Mount Sinai Fuster Hospital Cardiac Catheterization Laboratory and EP Laboratory in September 2023 as Assistant Nurse Manager. She transitioned to her current role as nurse manager in January 2024.

**929-687-2871  
neethu.james@mountsinai.org**

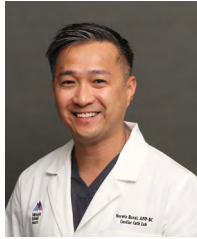


## NURSE PRACTITIONER TEAM

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**



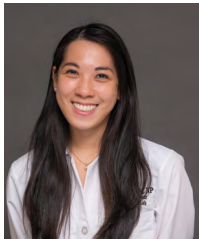
**Melissa Chang**



**Marichu Edimallo**



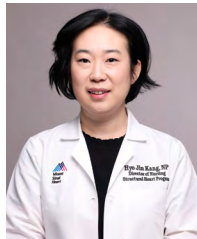
**Aira Fides  
Gonzales**



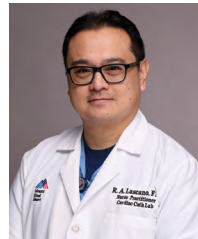
**Michelle Hang**



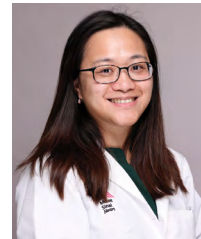
**Kristina Hartig**



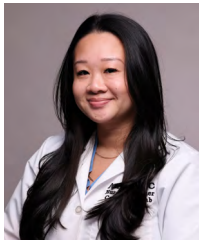
**Hyo Jin Kang**  
Clinical Director,  
Structural Heart Program



**Rheoneil Lascano**



**Shuk Fan  
Lau-McKee**



**Angela Li**



**Jessica Lim**



**Nelya Lozynska**



**Derek Pineda**



**Supawadee  
Pitakmongkolkul**



**Leah Riggs Capra**



**Indra Sinanan**



**Richard Ternemille**



**Shira Wender**



**Kevin Williams**



## INTERVENTIONAL CARDIOLOGY FELLOWS

Mount Sinai Fuster Heart Hospital'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.



**Chandrashekar Bohra, MD**  
Interventional Fellow



**Anton Camaj, MD**  
Interventional Fellow



**Tawseef Dar, MD**  
Interventional Fellow



**Vishal Dhulipala, MD**  
Interventional Fellow



**Yash Jobanputra, MD**  
Interventional Fellow



**Frank Kalaba, MD**  
Interventional Fellow



**Pier Pasquale Leone, MD**  
Interventional Fellow



**Rakhee Makhija, MD**  
Interventional Fellow



**Denizhan Ozdemir, MD**  
Interventional Fellow



**Bhavanadhar Penta, MD**  
Interventional Fellow



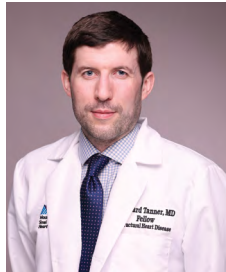
**David Power, MD**  
Interventional Fellow



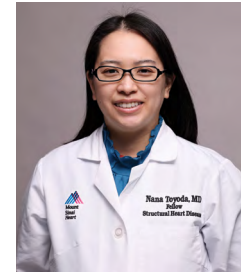
**Supawat Ratanapo, MD**  
Structural Fellow



**Rajeep Samtani, MD**  
Structural Fellow



**Richard Tanner, MD**  
Structural Fellow



**Nana Toyoda, MD**  
Structural Fellow



**Manish Vinayak, MD**  
Advanced Hemodynamic  
Care & Complex High-Risk  
Interventions Fellow



**David Song, MD**  
Endovascular Fellow



**Moinuddin Syed, MD**  
Endovascular Fellow



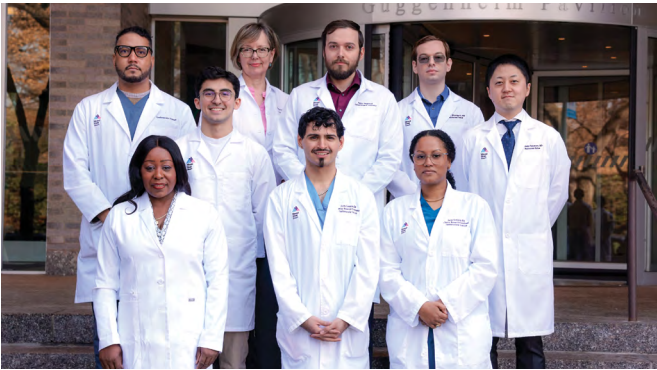
**Giulia Passaniti, MD**  
Structural Interventions  
Imaging Fellow



**Francesca Prandi, MD**  
Structural Interventions  
Imaging Fellow



## COLLABORATIVE TEAMS



### Research Team

**Back Row:** Miguel Vasquez, Kevin Oloomi, Yuliya Vengrenyuk, Andriy Vengrenyuk, Mariglen Jahaj, Keisuke Yasumura

**Front Row:** Nicole Saint Vrestil, Jaime Gonzalez, Chivelle Mendoza



### Supporting Staff

**Back Row:** Olivia Boos, Sianne Bosque, Jovic Cruz, Lucas Capra

**Middle Row:** Carol Henry, Celeste Caro, Andrew Emmanuel, Debra Bradley

**Front Row:** Era Zuberko, Maria Directo



### Interventional Database Team

**Back Row:** Pavan Gadhe, Elena Ramos

**Front Row:** Nikito Gurung, Sai VL Gujjarllamudi, Pooja Vijay, Roja Thapi



### Structural Heart Team

**From Left:** Shuk Lau-Mckee, Angela Gratereaux, Derek Fernandez, Hyo Jin Kang, Elizabeth Spears, JT Mallonga, Caroline Staccione, Maryam Akhtar

# Achievements

## 1 Castle Connolly Top Doctors



Samin K. Sharma, MD  
Annapoorna S. Kini, MD  
Prakash Krishnan, MD

Pedro Moreno, MD  
Roxana Mehran, MD  
George Dangas, MD

Joseph Sweeny, MD  
Javed Suleman, MD  
William Schwartz, MD

## 2 New York Magazine Best Doctors



Samin K. Sharma, MD  
(13 times in 18 years)  
Annapoorna S. Kini, MD  
(6 times in 7 years)  
Prakash Krishnan, MD  
(3rd year in a row)  
George Dangas, MD  
(9 times in 10 years)

Pedro Moreno, MD  
(8th year in a row)  
Roxana Mehran, MD  
(8 times in 10 years)  
Joseph Sweeny, MD  
(2nd year)  
Jeffrey Bander, MD  
(1st timer)

## 3 New York Times Super Doctors



Samin K. Sharma, MD  
(16th year in a row)  
Annapoorna S. Kini, MD  
(14th year in a row)  
George Dangas, MD  
(7th year in a row)

Srinivas Duvvuri, MD  
(3rd year in a row)  
Nitin Barman, MD  
(1st timer)

## 4 Dr. George Dangas becomes President of SCAI for 2023-2024



## 5 Dr. Annapoorna Kini Launches New Angio-Aid-3D app

This first-of-its-kind app simulates the key concepts of performing a diagnostic angiography. With features like control of diagnostic wire, coronary catheters, contrast syringe, C-Arm rotation, bed panning, monitor hemodynamics, and more, AA3D is a wonderful tool for new and prospective interventional fellows, or any healthcare professional with a desire to better understand diagnostic angiography.



# 6 Dr. Prakash Krishnan received the Bharat Gaurav Award



# 7 1<sup>st</sup> in Man/USA Procedures

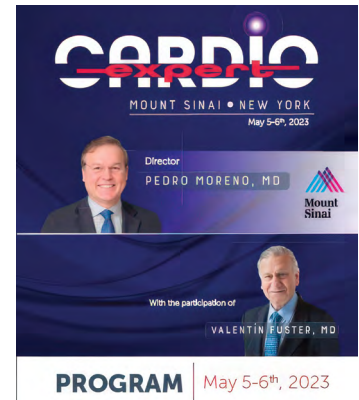
The Cardiac Catheterization Laboratory at The Mount Sinai Hospital was first in the U.S. to place the Magenta Elevate LVAD Pump as well as the Cordis Solutia4DeNovo. MSH was also the first to implement the Synchrony renal denervation system.



# 8 Dr. Roxana Mehran awarded 'Best Female Scientist Award on Research.com and Bahr Award of Excellence



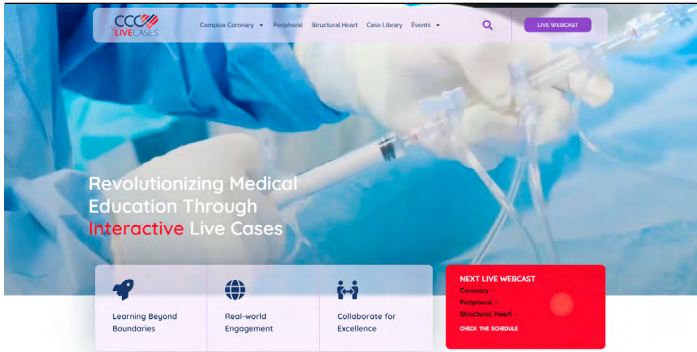
# 9 Dr. Pedro Moreno led the 1st annual Cardio-Expert Symposium with 80 Spanish Cardiologists traveling to NY to learn from Mount Sinai



# 10 Dr. Sharma receives 'Master Operator Award by India Live' – A Top Interventional Meeting in India







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**Complex Coronary**

Upcoming Case Topics :

- Bifurcation Lesion Intervention
- Chronic Total Occlusion Lesion Intervention
- Calcified Lesions in Unprotected Left Main

**EVERY THIRD TUESDAY OF THE MONTH AT 8AM ET**

**Peripheral**

Upcoming Case Topics:

- Calcified Popliteal and Infrapopliteal CTO using Orbital Atherectomy and Supera Stenting
- Chronic Total Occlusion of Iliac Artery with Radial and Ipsilateral Groin Access

**EVERY FOURTH WEDNESDAY OF THE MONTH AT 8AM ET**

**Structural Heart**

Upcoming Case Topics:

- TAVR
- TEER
- TriClip
- TTVR

**EVERY SECOND TUESDAY OF EVERY OTHER MONTH AT 9AM ET**



# Cardiac Catheterization Laboratory Educational Events

Mount Sinai Fuster Heart Hospital 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](https://ccclivecases.org/our-events) or email [info@gaffneyevents.com](mailto:info@gaffneyevents.com).

## SAVE THE DATE:

## Complex Coronary Symposium (CCC) June 12-13, 2025

The core objective of this course is to demonstrate a comprehensive, multi-device approach to revascularization in patients grappling with complex coronary artery disease focusing on calcified bifurcation lesions. The utilization of physiological and anatomical imaging to guide interventions will be thoroughly deliberated and underscored on a case-by-case basis. Technical intricacies encountered during the execution of complex interventions will be vividly demonstrated through live case presentations.

**Mount Sinai Endovascular  
Fellows Course**  
September 12, 2024

**NY Endovascular Summit**  
September 13-14, 2024

**Top Ten Topics in Clinical  
Cardiology**  
October 11, 2024

**NY Transcatheter Valves**  
December 5, 2024

# Mount Sinai Fuster Heart Hospital 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

## Contact Info



### To make an appointment:

Phone: 212-241-0884

### To refer a patient:

Phone: 212-241-5136

Scan the following  
QR code to request an  
appointment:



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- Dr. Samin K. Sharma Family Foundation
- Eternal Heart Care Foundation

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Marketing and Communications



**“A team is not only a group of people who work together, a team is a group of people who trust and respect 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.

