



2019

Outcomes and Innovation

Sanger Heart & Vascular Institute

WORLD-CLASS OUTCOMES FOR OVER 50 YEARS

For more than 50 years, Sanger Heart & Vascular Institute has delivered world-class care across a broad range of heart and vascular conditions. Today, that commitment to patients and the breakthroughs that help them live longer continues to thrive.

Every year, we closely monitor volumes and treatment outcomes to stay abreast of our progress and identify opportunities to improve.

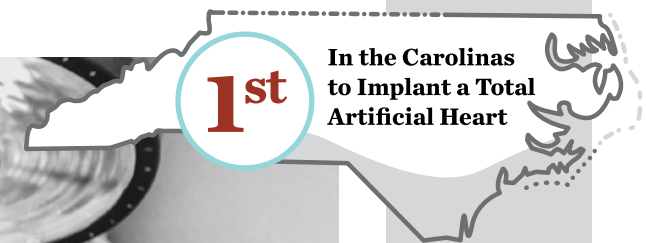
In this report we explore our broad range of specialties and showcase how our outcomes and clinical innovators place us among the nation's leaders. We publish our data annually across divisions, with a goal of serving as subject matter experts to external physicians – to help raise the bar on cardiovascular care.

Whenever possible, this report includes clinical outcomes measures. When those measures aren't available, we provide process measures and/or volumes measures to deliver insight into Sanger's expertise and the quality of our care.

This report relies heavily upon information from publicly reported databases from organizations including the Centers for Medicare and Medicaid Services, the National Cardiovascular Data Registry and the Society of Thoracic Surgeons. We supplement this with data gathered internally in order to deliver the most comprehensive, most transparent portrait of our care possible. We hope you find this data valuable, and we welcome your feedback.



Source:
Medtronic, 2019



EXCELLENCE ACROSS THE FULL SPECTRUM OF CARDIAC CARE

MORE EXPERIENCE IN MORE PLACES

Physicians
110+

Locations in the Carolinas
20+

Advanced Practice Providers
90+

Total Visits
306,049

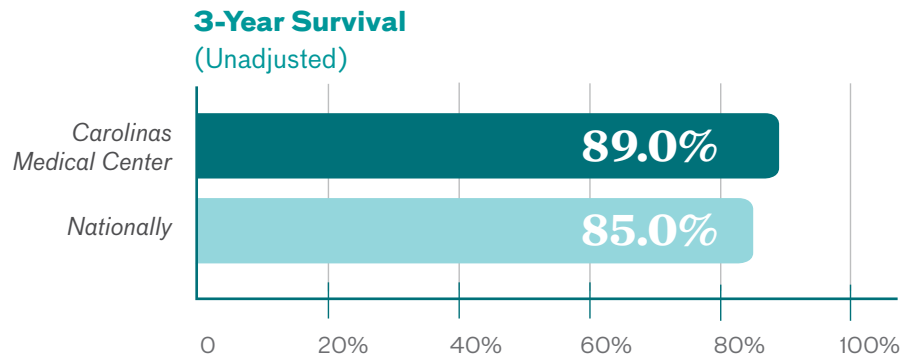
Source: Internal Data, 2019, Annualized

PUTTING PATIENTS AND FAMILIES FIRST

Inpatient HCAHPS Overall Rating
88th Percentile

Source: Press Ganey National Database, 1/2019 - 10/2019

TOP IN HEART TRANSPLANT



Source: Scientific Registry of Transplant Recipients, Published 7/2019

TAVR

Procedures
283

In-Hospital Mortality Rate
1.0%

Source: TVT Registry, 10/1/2018 - 9/30/2019



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ACUTE CORONARY SYNDROME

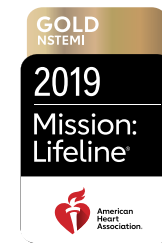
Sanger's 2019 door-to-balloon (D2B) times were among the nation's fastest, continuing a trend of having top D2B times for more than 20 years.

This reflects progress that began over two decades ago when we started pioneering ways to streamline, coordinate and accelerate acute coronary syndrome (ACS) treatment.



For example, **Sanger was among the first centers in the world to empower emergency medical services (EMS) personnel to activate the emergent catheterization team without a physician's direct input.** This enables EMS to route patients directly to the catheterization lab rather than stopping in the emergency department – saving time and heart muscle.

Each time we've developed an innovation like this, we've published papers and delivered international lectures to help reduce D2B times worldwide. Now we're finding ways to further elevate ACS treatment – by using the latest percutaneous coronary interventions and by developing protocols such as standardizing the medications that every ACS patient takes home.

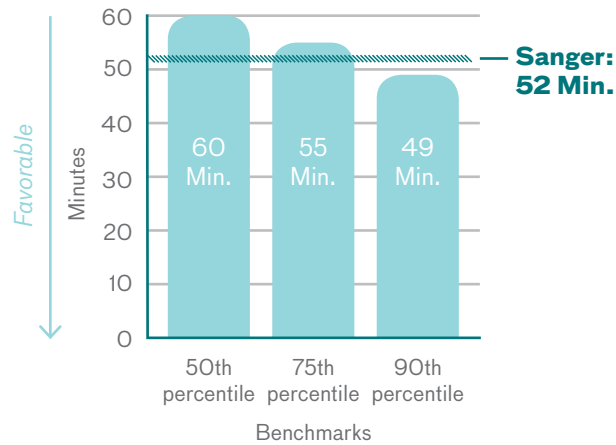


Sanger was recognized by the American Heart Association for implementing specific quality improvement measures at a regional level for treating patients who suffer severe heart attacks.

PCI OUTCOMES AND VOLUMES

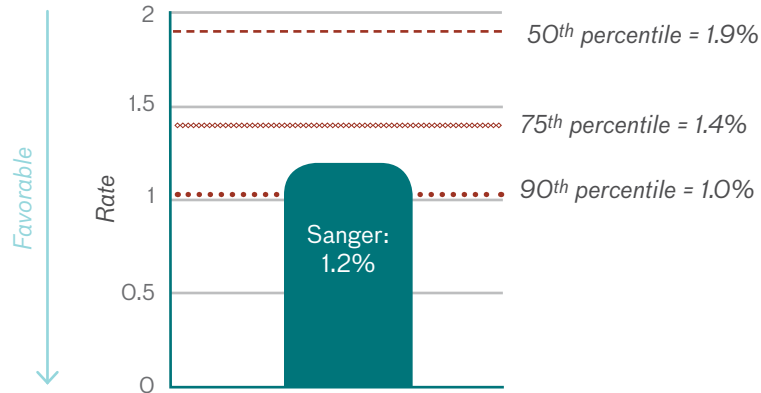
DOOR-TO-BALLOON

Median Door-to-Balloon Times



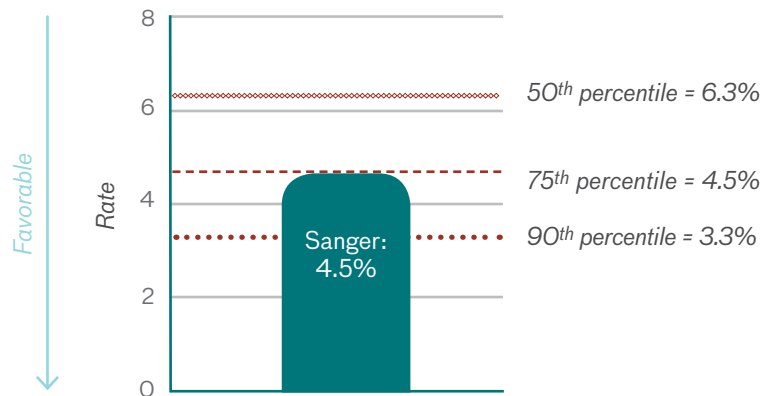
Source: NCDR Cath/PCI Registry Data, 2019

PCI In-Hospital Mortality Rate (Risk-Adjusted)



Source: NCDR CathPCI Registry, 2018 Q2 - 2019 Q1

STEMI In-Hospital Mortality Rate (Risk-Adjusted)



Source: NCDR CathPCI Registry, 2018 Q2 - 2019 Q1

Procedures

2,963

Source: NCDR CathPCI Registry, 2018 Q3 - 2019 Q2

Percent of PCIs Performed Via Radial Access

80%

Source: NCDR CathPCI Registry, 2018 Q3 - 2019 Q2

Same-Day Discharge for Elective PCI

59%

Source: Merge Hemo & EPIC Cube, 2019 Q1 - 2019 Q3

CARDIAC ELECTROPHYSIOLOGY

Our cardiac electrophysiology (EP) team has eliminated fluoroscopy from many ablation procedures, and we are one of the few EP programs that extends this minimal radiation approach to device-based therapies, including cardiac resynchronization therapy (CRT).

Typically, CRT requires extensive use of radiation. By maximizing use of our 3D mapping systems, we average only four minutes of fluoroscopy time per CRT implant – **a 65% reduction in fluoroscopy time compared to the conventional CRT implant method.**

Overall, we have reduced radiation exposure to our patients, the anesthesia team and the EP lab specialist. The EP team no longer has to wear lead for many of our procedures.

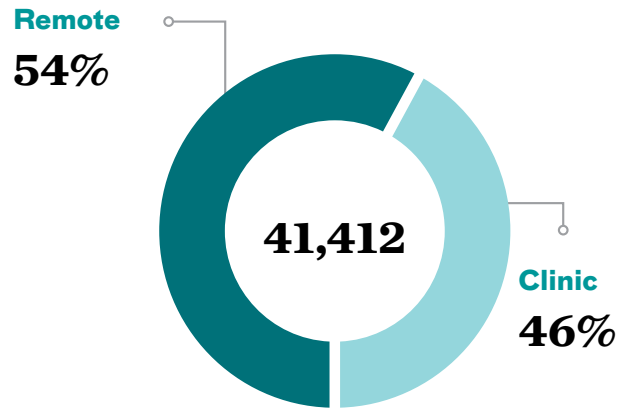
Sanger's innovative care includes:

- **Our Atrial Fibrillation Center of Excellence:** We provide comprehensive, integrated, patient-centered care. Our goal is to standardize care delivery to create seamless access and advance treatment. Our ablations for atrial fibrillation (AF) include cryoablation, radiofrequency ablation and hybrid AF ablation (a minimally invasive approach with combined catheter and surgical ablation).

- **Our Cardiac Rhythm Management and Remote Monitoring Program:** As one of the nation's largest device clinics, we follow nearly 12,000 patients with cardiovascular implantable electronic devices, including pacemakers and defibrillators. We offer 24/7 remote monitoring across nine locations in North and South Carolina. This enables us to detect signs of rhythm problems and heart failure at the earliest possible time, leading to a reduction in inappropriate ICD shocks and reduced heart failure hospitalizations. Practitioners from across the globe visit us to learn our innovative approach to device-based diagnostics and follow-up care.
- **Our Extraction Program:** Our EP team and cardiac surgeons collaborate as national leaders in the field of lead management and use the latest technology to safely perform lead extractions. **We have experienced zero deaths during lead extraction in the past 10 years.**

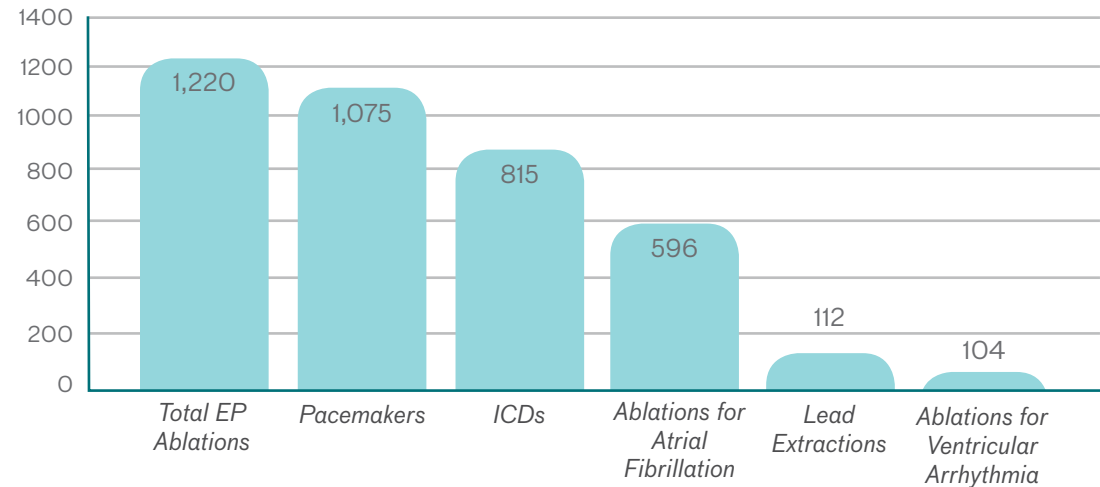
WORLD-CLASS ARRHYTHMIA CARE ACROSS ONE OF THE NATION'S BROADEST NETWORKS

Device Management Encounters



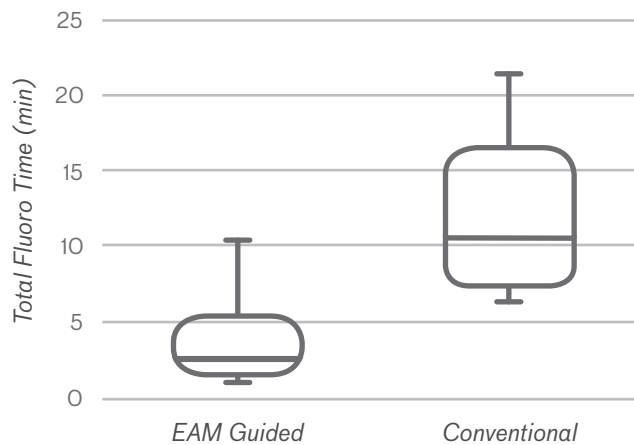
Source: Internal Billing Data, 2018

Procedures



Source: Merge Hemo Data Annualized and AF Ablation Database (Internal REDCap Database), 2018 Q4 - 2019 Q3

Total Fluoro Time



Source: Internal Data, YTD 2019

Lead Extraction In-Lab Mortality Rate

0%

Source: Internal Data, 10/1/2018 - 9/30/2019

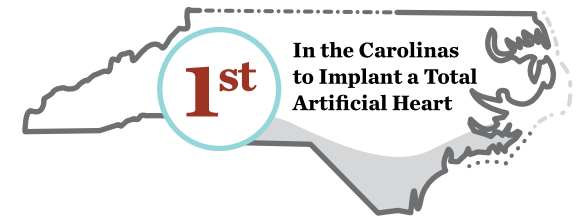
AF Ablation Complication Rate (Total Complications)

1%

Source: AF Ablation Database (Internal REDCap Database), 2018 Q4 - 2019 Q3

HEART FAILURE & TRANSPLANT

An increasing number of patients from across the region are traveling to Sanger for advanced heart failure and transplant care, drawn by a reputation for excellence that dates back to when we performed the first heart transplant in the Charlotte area more than 30 years ago.



The core of our approach is to have clinically strong, quality-driven physicians who not only care for heart failure patients but also bring on new technologies to advance the field.

Since then, we've used multidisciplinary expertise, a patient-centered approach, and a commitment to breakthrough

technologies to make sure our key outcomes metrics (including our three-year transplant survival rate) are significantly above the national average.

All of our physicians are board certified in advanced heart failure, and our advanced practice providers, nurses, pharmacists, dietitians and social workers have advanced training in this field.

Our experts recognize that achieving top outcomes starts with understanding not only each patient's medical history but also their personal situation. That's why our new patient appointments are 60 minutes and include a physician, pharmacist, nurse and social worker. This gives our team time to gain in-depth knowledge of a patient's background, family, quality of life and treatment goals.

We carry this information to our weekly multidisciplinary meeting, where we develop individualized treatment plans that often include the latest mechanical support devices.

Sanger is the only center in the Carolinas offering the total artificial heart. We've been a key contributor to groundbreaking clinical trials like MOMENTUM 3.

Once treatment starts, we stay with patients for the long term: We typically see each patient more than 16 times in the year following heart transplant or heart pump surgery. This helps ensure they're receiving the right medications, participating in cardiac rehabilitation, getting appropriate cancer screenings, staying up to date with primary care visits and insurance coverage, and seeing an improved quality of life.

EXPERTISE + INNOVATION = BEST-IN-CLASS OUTCOMES

HEART TRANSPLANTS

Transplants

Adult Only

22

Source: UNEt (UNOS), 2019 Annualized Data

Transplants

Since Inception of Program

602

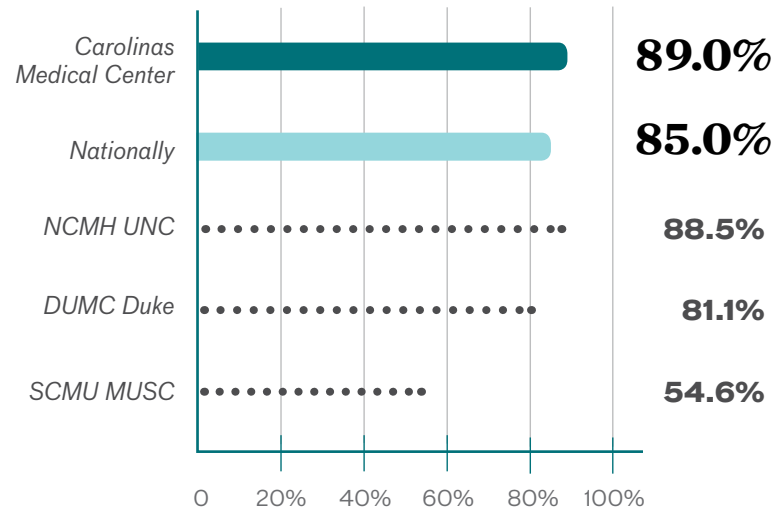
Source: UNEt (UNOS), 1/1/1987 - 10/21/2019

In-Hospital Length of Stay

11.5 Days

Source: SRTR, 7/2019 Program Report

3-Year Survival Rate (Unadjusted)



Source: Scientific Registry of Transplant Recipients, published 7/2019

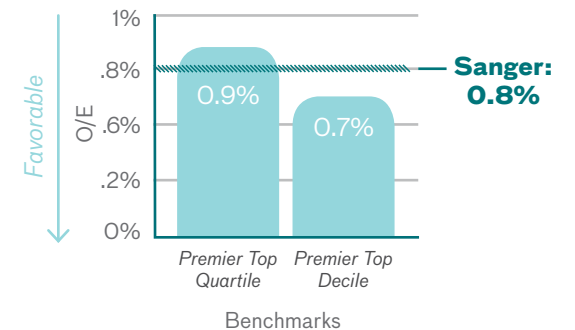
HEART FAILURE

All-Cause 30-Day Mortality Rate

5.5%

Source: Internal Data, 8/2018 - 9/2019

All-Cause 30-Day Readmission Rate



Source: Internal Data, 8/2018 - 7/2019

VAD IMPLANTS

Implants

43

Source: Internal Data, through 12/20/2019

Implants

Since Inception of Program

285

Source: INTERMACS, 1/1/2006 - 10/21/2019

Post-Implant Survival Rate for Continuous Flow Devices

95.7%

Source: INTERMACS, 2019 Q1 Recent Year Report, 1/1/2018 - 3/31/2019

HYPERTROPHIC CARDIOMYOPATHY

Sanger has been recognized as a Center of Excellence by the Hypertrophic Cardiomyopathy Association – one of just 37 nationwide and the first in North Carolina.

This designation reflects our program's comprehensive approach, which begins with the belief that it takes collaboration by an expert team – including cardiologists, cardiac surgeons, and specialists in imaging, heart failure and genetics – to achieve top outcomes.

Our team sees hundreds of hypertrophic cardiomyopathy (HCM) patients each year and uses a personalized approach to evaluate each case and develop tailored treatment plans that incorporate everything from medical therapy

to surgery. Our patients can receive the entire continuum of care, including specialized procedures like septal myectomy and alcohol septal ablation, while staying close to home. And our support continues after treatment via monthly education and support meetings as well as genetic counseling.

We're also actively involved in research; we played an integral role in recent trials of Mavacamten, an oral therapeutic treatment that targets biomechanical abnormalities behind HCM.

OBSTRUCTIVE CARDIOMYOPATHY PATIENT VOLUMES

New Patients

117

Returning Patients

334

Source: Internal Data, 2019 Q1 - Q3, Annualized

SEPTAL MYECTOMY

Procedures

21

In-Hospital Mortality Rate

0%

30-Day Readmission Rate

10%

Source: STS, 9/1/2018 - 8/31/2019



CARDIAC SURGERY

Sanger has assembled one of the nation's broadest subspecialty teams with expertise across the entire spectrum of modern cardiac surgery.



This includes complex aortic surgery, heart transplantation and mechanical circulatory support, and minimally invasive cardiac surgery. This enables us to deliver the full array of surgical options performed by experts who have the experience and training to achieve the best possible outcomes.

High-risk cases are reviewed twice weekly at our “Heart Team” conference attended by our surgeons, cardiologists and physicians from across multiple subspecialties. Much of the discussion centers around each patient’s risk profile and whether to pursue standard, minimally invasive or nonsurgical approaches. Our team works together to identify patients who are at high risk for coronary artery bypass surgery and may be better served with percutaneous coronary intervention or hybrid approaches that involve both surgery and stents. Once the treatment course is determined, patients are matched with a surgeon with extensive expertise in that subspecialty.

EXPERIENCE WHERE IT COUNTS

Cardiac Surgery Volumes
1,113

Isolated CABG Procedures
556

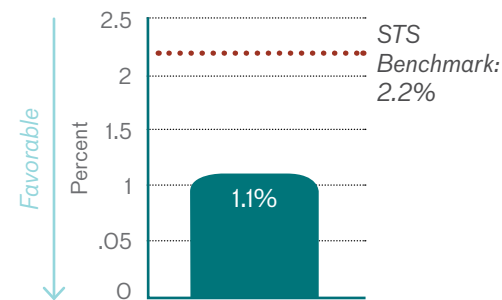
Combined CABG Procedures
85

Total CABG Procedures
641

Source: ARMUS Starmetrix, 10/1/2018 - 9/30/2019

ISOLATED CABG PROCEDURES

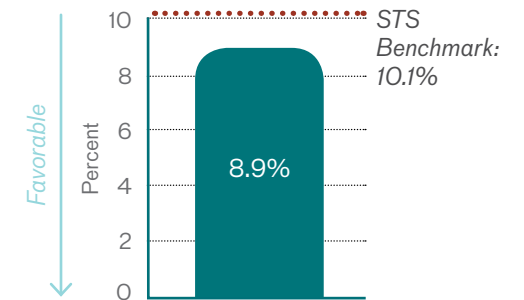
30-Day Mortality Rate
Risk Adjusted



Mortalities 6/571 Risk Adjusted 1.1%

Source: Cedaron Database — Risk Adjusted, Rolling Year 7/11/2018 to 7/10/2019, All Facilities Combined

30-Day Readmission Rate



Lower 95% 0.3, Upper 95% 1.3

Source: ARMUS Metric Library, 10/1/2018 - 9/30/2019 and STS Report Ending 3/31/2019

VALVE & STRUCTURAL HEART DISEASE

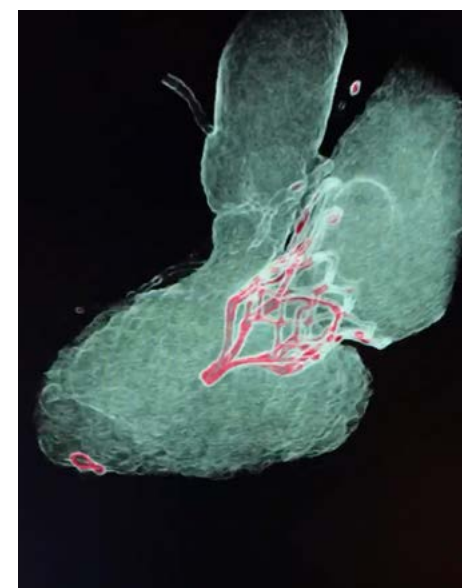
Our Center for Advanced Heart Valve Therapies has earned an international reputation as a leader in treating complex structural heart and valve conditions.

We're often the first center in our region to offer investigational transcatheter devices, and we're leaders in:

Transcatheter Mitral Valve Repair and Replacement (TMVR): Our team has performed TMVR longer than any other center in North and South Carolina, and our TMVR program is the largest in the Carolinas. Our physicians were closely involved in the EVEREST II trial that led to FDA approval of MitraClip, and we were a top enroller in the COAPT trial that showed this device significantly reduces heart failure hospitalizations and can be applied to clinically significant secondary mitral regurgitation. Sanger's extensive TMVR experience means we also have the expertise to offer TMVR to patients who are not good MitraClip candidates.

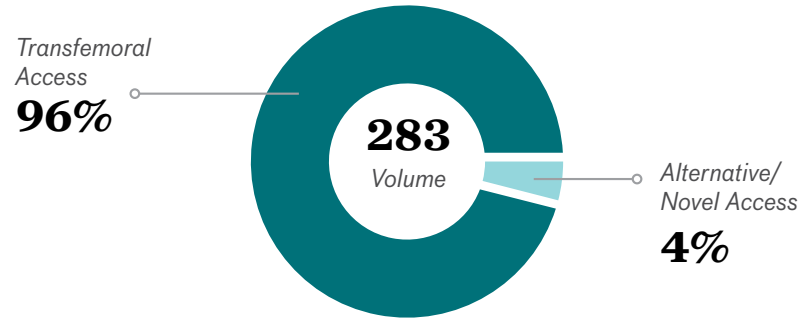
Transcatheter Aortic Valve Replacement (TAVR): Our team has performed TAVR since its FDA approval in 2012, and we have the highest TAVR volumes in the Carolinas – along with survival rates that exceed the national average. We're also the region's first center to use cerebral embolic protection devices to further reduce stroke risk during TAVR. Our cerebral embolic protected cases have a stroke rate of less than 1%.

Left Atrial Appendage Occlusion: Sanger was the region's first center to implant the WATCHMAN device for left atrial appendage (LAA) occlusion, and we played a key role in trials that led to the device's approval. We've implanted nearly 200 WATCHMAN devices, and transesophageal echocardiography imaging has shown it effectively seals the LAA in approximately 95% of our patients. We also pioneered the use of CT as procedural guidance in preparation for the procedure, which ensures precise device positioning. This enables our excellent outcomes: no deaths, no procedural strokes and just one pericardial effusion to date.



LEADERS IN TRANSCATHETER INNOVATION

TAVR



Procedures

Since Inception of Program

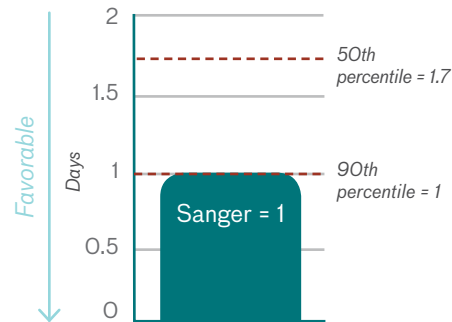
1,110*

In-Hospital Mortality Rate (Unadjusted)

1%

50th percentile: 1.3%
90th percentile: 0%

Median Post-Procedure Stay



Source: TVT Registry, 10/1/2018 - 9/30/2019 and 11/1/2011 - 9/30/2019*

MITRAL VALVE

Procedures

66

30-Day Observed Mortality Rate

0%

In-Hospital Mortality Rate

0%

Stroke Rate

0%

50th percentile: 1.3%
90th percentile: 0%

Acute Procedural Success MR grade <=2+

86.4%

Source: TVT Registry, 10/1/2018 - 9/30/2019

LEFT ATRIAL APPENDAGE OCCLUSION (LAAO)

Complication Rate

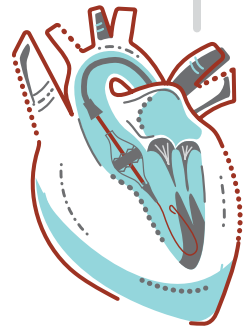
0%

50th percentile: 1.7%
90th percentile: 0%

Source: LAAO Registry, 2018 Q3 - 2019 Q2

KEY CLINICAL TRIALS

- Summit
- CLASP IID/IIF
- ASAP II
- Early TAVR
- PARTNERS 3



AORTIC DISEASE

Sanger's Center for Aortic Disease draws international referrals from physicians who seek the most innovative treatments for their patients.

Our talented cardiac and vascular surgeons work in coordinated teams to manage aortic aneurysms and aortic dissections, as well

We pioneer new aortic techniques, from championing endovascular suture aneurysm repair to being the first to implant a branched stent graft for thoracic aortic aneurysm.

as occlusions of the aorta and its branches throughout the body. They have access to all currently approved technologies as well as investigational devices to manage all aortic syndromes. These include penetrating aortic ulcers, aortic transections and aortic coarctations. When it comes to complex open surgeries, our surgeons have considerable experience and expertise in aortic root repair and aortic arch reconstruction with circulatory

arrest and in thoracoabdominal repair for patients with connective tissue disorders, including Marfan syndrome. A multidisciplinary approach is taken to achieve the best outcomes.

We are improving these outcomes by developing new approaches. We developed rapid-response code rupture and code dissection programs that enable us to quickly assess and treat patients, which has led to a 20% improvement in survival. Additionally, to continually improve care, our team of surgeons participates in valuable research and clinical trials, publishing our results and presenting our methods at major conferences around the world.

Recent Publications

1. Arko FR 3rd, Stanley GA, Pearce BJ, Henretta JP, Fugate MW, Mehta M, Torsello G, Panneton JM, Garrett HE Jr. Endosuture aneurysm repair in patients treated with Endurant II/IIIs in conjunction with Heli-FX EndoAnchor implants for short-neck abdominal aortic aneurysm. *J Vasc Surg.* 2019 Sep;70(3):732-740. doi: 10.1016/j.jvs.2018.11.033. Epub 2019 Mar 6.
2. Madjarov JM, Katz MG, Madjarova S, Madzharov S, Arko FR 3rd, Miller DW, Robicsek F. Right Atrial Anomalous Muscle Bundle Presenting with Acute Superior Vena Cava Syndrome and Pulmonary Embolism: Surgical Management. *Ann Vasc Surg.* 2018 Oct;52:314.e17-314.e20. doi: 10.1016/j.avsg.2018.03.035. Epub 2018 May 22.
3. Briggs CS, Sibille JA, Yammine H, Ballast JK, Anderson W, Nussbaum T, Roush TS, Arko FR 3rd. Short-term and midterm survival of ruptured abdominal aortic aneurysms in the contemporary endovascular era. *J Vasc Surg.* 2018 Aug;68(2):408-414.e1. doi: 10.1016/j.jvs.2017.12.037. Epub 2018 Mar 8.
4. Yammine H, Briggs CS, Stanley GA, Ballast JK, Anderson WE, Nussbaum T, Madjarov J, Frederick JR, Arko FR. Retrograde Type A Dissection After Thoracic Endovascular Aortic Repair for Type B Aortic Dissection. *J Vasc Surg.* 2019 Jan 1;69(1):24-33. doi: 10.1016/j.jvs.2018.04.047.
5. Yammine H, Krcelic D, Ballast JK, Briggs CS, Stanley GA, Nussbaum T, Frederick JR, Arko III FR. Cocaine Abuse is Associated with Worse Outcomes after TEVAR in Patients with Type B Aortic Dissections. *J Vasc Surg.* 2019 Jul;70(1):60-66. doi: 10.1016/j.jvs.2018.10.061.

UNPARALLELED EXPERTISE IN COMPLEX AORTIC SURGERIES

Expanding Treatment Horizons

- Sanger is **1 of 2** U.S. centers with access to two arch branched stent grafts for minimally invasive treatments.
- We were **2nd** in the world to implant a new type of thoracic stent graft after FDA approval – and 1st to use it for an acute aortic dissection.
- We were **1st** to champion endovascular suture aneurysm repair, particularly for short neck indications.
- We are the region's **only** program that participated in the Valiant Mona LSA clinical trial, and we continue to help lead research for the Gore and Valiant trials.
- Physicians from around the world (including Japan, Australia, China, India and Vietnam) visit our center to watch and learn our physicians' techniques.



Source: Medtronic, 2019

EVAR

Procedures

92

Source: M2S, 2018 Q4 - 2019 Q3

Procedures

Since Inception of Program

893

Source: M2S, 2011 Q1 - 2019 Q3

In-Hospital Mortality Rate

(Elective Only)

0%

Source: M2S, 2018 Q4 - 2019 Q3

TEVAR

Procedures

(Elective Only)

62

Source: M2S, 2018 Q4 - 2019 Q3

Procedures

Since Inception of Program

576

Source: M2S, 2012 Q1 - 2019 Q3

In-Hospital Mortality Rate

(Elective Only)

1.6%

Source: M2S, 2018 Q4 - 2019 Q3

VASCULAR DISEASE

Sanger's vascular team values a multidisciplinary approach in the management of our patients.

Our comprehensive peripheral arterial disease (PAD) program utilizes evidence-based medicine to provide individualized care developed to address the severity of each patient's disease.

The span of treatments includes non-surgical options, such as a supervised walking program, to highly complex revascularization procedures for patients with critical limb ischemia (CLI). Since the inception of our limb salvage program in 2012, we have seen a 150% decline in major amputations. We attribute this to collaboration with other key specialists, focusing on management and modification of risk factors that contribute to the disease.

Leading the way in advanced procedures, we were pivotal contributors to the ROADSTER 2 trial and have performed more than 100 transcarotid artery revascularization (TCAR) procedures, with a stroke rate of 1% over the past three years.

As members of the Vascular Quality Initiative (VQI), our providers collaborate with vascular surgeons throughout the region to improve the quality and safety of vascular care. Our seven non-invasive vascular labs, accredited through the Intersocietal Accreditation Commission (IAC), provide high-quality diagnostic ultrasound testing; our IAC accredited Vein Center, one of only a handful in the region, was one of the highest enrollers in the ABRE venous stent trial.

Our group of providers has expertise in the entire spectrum of vascular disease. As an integrated healthcare system, we use a team approach to treat the entire vascular system in each patient utilizing the most advanced medical, interventional and surgical approaches to ensure the greatest quality.

We are among a small handful of U.S. centers to be named as a TCAR Center of Excellence two years in a row.

CAROTID ENDARTERECTOMY

Procedures

149

In-Hospital Mortality Rate

0%

Stroke Rate

(Elective Only)

0.7%

In-House MI Rate

(CMC and Pineville Campuses)

0%

Source: M2S, 2018 Q4 – 2019 Q3

COMPLETE VASCULAR CARE ACROSS THE CONTINUUM

TCAR

Procedures

58

Source: M2S, 2018 Q4 - 2019 Q3

Stroke Rate

(Symptomatic and Elective)

1.7%

Source: M2S, 2018 Q4 - 2019 Q3

KEY VOLUMES

Non-Invasive Vascular Lab Ultrasound Studies

25,506

Source: Merge Data 2019 Annualized

OR and Invasive Vascular Lab Procedures

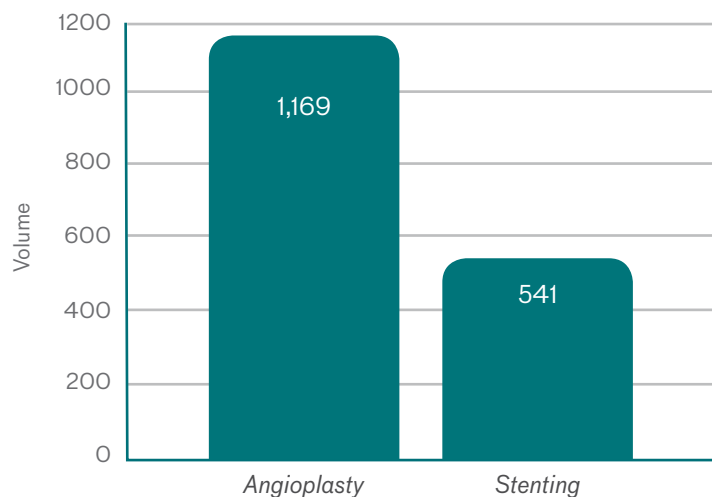
2,351

Source: Surginet/Merge Data 2019
Annualized

LOWER EXTREMITY PERCUTANEOUS INTERVENTIONS

Procedures

(Emergent and Elective)



Source: M2S, 2018 Q4 - 2019 Q3

Patients

427

In-Hospital Mortality Rate

1.2%

Source: M2S, 2018 Q4 - 2019 Q3

LOWER EXTREMITY REVASCULARIZATION

Bypass Procedures

121

Source: Surginet Data 2019 Annualized

Outpatient Venous Interventions

399

Source: Self-Reported Data,
2019 Annualized

THORACIC SURGERY

Thoracic surgery volumes are surging at Sanger, due to our expertise and outcomes in minimally invasive robotic lung surgery.

We work closely with pulmonologists, oncologists and radiation specialists at Atrium Health's Levine Cancer Institute to incorporate the most advanced treatment options, including robotic surgery for lung cancer.

We're also leaders in diagnosing and treating a wide range of complex thoracic conditions, including:

We do more robot-assisted thoracic surgeries than any other center in our region, with some of the nation's lowest rates for converting to open surgery.

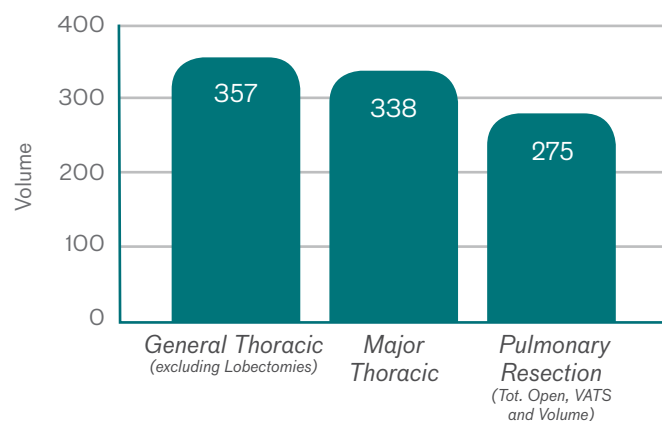
- Tertiary-level care for complex gastroesophageal reflux and esophageal disease
- A multidisciplinary pleural effusion program that offers the latest surgical and catheter-based drainage treatment options
- Treatment for mediastinal and thymic tumors, as well as many other thoracic tumors

Upon completion of surgery, we optimize care during recovery via an Enhanced Recovery After Surgery (ERAS) program that launched in 2018. As a result of this program, our median length of stay for lung resections has dropped by nearly two days, and we've simultaneously reduced narcotics use and lowered costs.

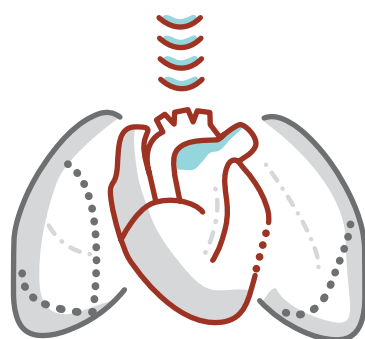
OPTIMIZING CARE VIA THE MOST EFFECTIVE, LEAST INVASIVE APPROACHES

THORACIC SURGERY

Surgery Volumes



Source: Cedaron DBase, 10/1/2018 - 9/30/2019



ROBOTIC-ASSISTED THORACIC SURGERY

Procedures

205

30-Day Readmission Rate

5.4%

30-Day Mortality Rate

1.5%

Source: Cedaron DBase, 10/1/2018 - 9/30/2019

PULMONARY RESECTION FOR LUNG CANCER

Procedures

171

Source: Cedaron DBase, 10/1/2018 - 9/30/2019

Minimally Invasive Lobectomy for Clinical Stage 1 Cancer

94.3% (vs. STS avg. of 78.8%)

Source: STS Spring Report 2019, 1/1/2016 - 12/31/2018

Post-Op Length of Stay

3.0 days (vs. STS median of 4.0)

Source: STS Spring Report 2019, 1/1/2016 - 12/31/2018

LCDT LUNG CANCER SCREENING

Number of Patients Screened

Since Inception of Program

~4,600

Source: Internal Data, 8/2017 - 8/2019

ADULT CONGENITAL HEART DISEASE

Our adult congenital heart disease (ACHD) program is at the forefront of meeting the unique needs of this growing patient population.

Sanger's ACHD specialists aim to improve the quality of life of all adults with congenital heart disease. We help patients transition from pediatric to adult care and offer management and guidance through milestones such as employment, pregnancy and physical activity.

We are one of the region's largest ACHD programs, with three

Our program has performed 178 ACHD surgeries over the last four-year STS reporting cycle with a 1.6% operative mortality.

board-certified ACHD cardiologists, three boarded congenital heart surgeons, specialty-trained cardiac anesthesiologists, critical care specialists and heart failure/transplant specialists.

Our program has extensive experience delivering the full spectrum of care to adult patients with either repaired or unrepaired congenital heart defects.

Our ACHD program offers access to:

- **Comprehensive Surgery:** We offer the full spectrum of surgery, including pulmonary valve replacement, aortic valve surgery, tetralogy of Fallot surgery and heart transplant.
- **Innovative Devices:** We perform multiple catheterizations in adults with complex congenital heart disease. Our interventional cardiologists place transcatheter pulmonary valves using both the Melody and Edwards Sapien valves. We're one of the most experienced centers in the world to perform transcatheter atrial septal defect closure using the recently approved Gore Cardioform ASD Occluder. We also have the region's only 3D printing program to create models that assist with planning interventional catheterization and surgical procedures.
- **Complex Arrhythmia Management:** Our congenital electrophysiology team has the experience and the expertise to manage all the arrhythmia needs of ACHD patients. We offer innovative approaches to address their very unique atrial or ventricular arrhythmias, including transbaffle or transconduit puncture, high-definition arrhythmia mapping, contact force radiofrequency ablation, anti-tachycardia pacing and His bundle pacing.
- **High-Risk Obstetrics:** Our ACHD cardiologists and high-risk obstetricians work closely with our patients in all aspects of care, from conception counseling to contraception to close monitoring during all phases of pregnancy, labor, delivery and post-partum care.

PERSONALIZED INTERVENTION, FROM EVALUATION TO FOLLOW-UP

Surgeries
(Since 2014)

178

Source: STS Reporting Cycle, 2014-2018

Mortality Rate
(Since 2014)

1.6%

Source: STS Reporting Cycle, 2014-2018

Cath Lab Procedures

87

Source: Internal Data, 2019 Annualized

Clinic Visits
(Since 2014)

5,697

Source: Internal Data,
2014 to 2019 Annualized

Clinic Visits

1,246

Source: Internal Data,
2019 Annualized

New Patients

160

Source: Internal Data,
2019 Annualized

In-Hospital Mortality Rate

0%

Source: CardioAccess STS Cong DBase,
10/1/2018 - 9/30/2019

CARDIOVASCULAR IMAGING

Our cardiovascular imaging team is equipped with the latest technologies, and we work hand in hand with providers throughout Sanger to improve patient outcomes.

At Sanger, imaging is an integral part of delivering comprehensive care.

We're taking steps to remain at the forefront of improving

Our advanced imaging capabilities with cardiac CT, cardiac MRI and 3D TEE guide our specialists in structural heart disease through the process of planning, intervention and follow-up care.

imaging accuracy by investing in advanced cardiovascular imaging technologies. Sanger is a national leader in CT imaging and FFRCT. Also, our new automated cardiac ultrasound systems enable us to quickly obtain 3D images, as well as volume, size and ejection fraction measurements.

The systems also perform automated measurements of longitudinal strain. This automation saves time while reducing variability between scans.

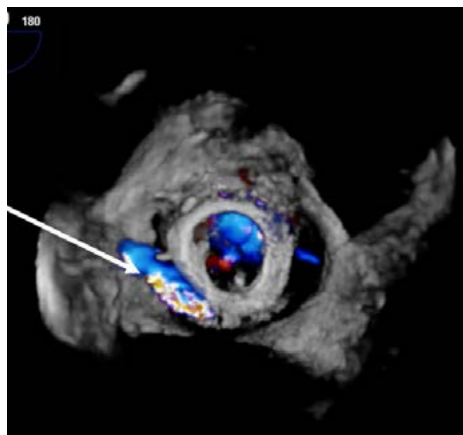
Sanger is also a magnet site for imaging; outside physicians and programs come here to learn about our innovative approaches.

We've also created a quality improvement program that elevates accuracy by emphasizing education, peer review and feedback. The process begins with a quarterly review to identify improvement opportunities. Tailored educational contact,

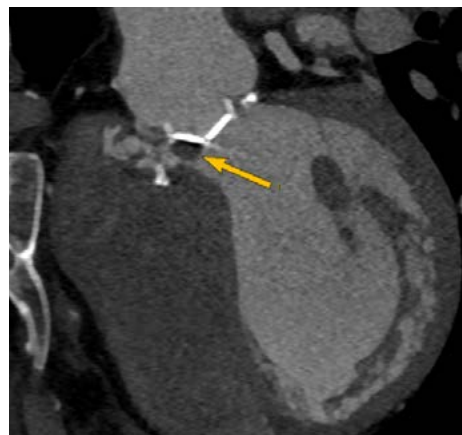
individual feedback performance and the development of point-of-care decision support have contributed to a culture of quality. This translates into objective excellence in multiple imaging domains.

Our quality improvement initiative was born because we needed a systematic way to assess overall quality. It couldn't be anecdotal – it had to be regimented and done on a regular basis.

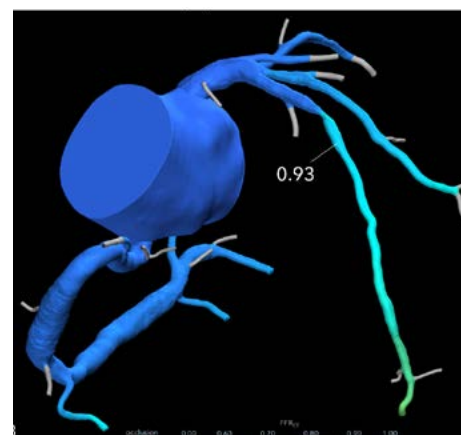
USING THE LATEST TECHNOLOGIES TO ADVANCE OUTCOMES



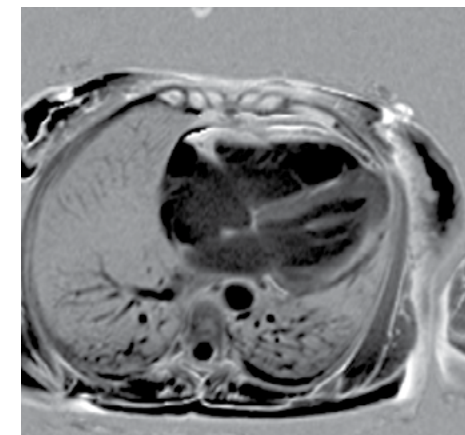
Echocardiograms
76,884



Cardiac CT Scans
4,677



**Fractional Flow Reserve CT
(FFRCT) Procedures**
305



Cardiac MRI Scans
1,266

Source: Internal Data, 2019 Annualized

CARDIAC REHABILITATION

Thanks to innovative solutions that address key barriers to participation, approximately 60% of Sanger patients enroll in cardiac rehabilitation – compared to a national average of approximately 25%.

For example, we've created cardiac rehabilitation scholarships for patients who need financial help, and we launched a remote rehab program that patients can do on their own time at home.

Patients also enroll in Sanger's rehabilitation programs quickly: Our average discharge to orientation time is approximately three to five days for nonsurgical patients. Automatic referrals and strong physician partnerships have been essential to this success, with rehabilitation appointments scheduled prior to discharge.



COMPREHENSIVE REHABILITATION THAT ENHANCES LONG-TERM OUTCOMES

Our program offers access to:

- **Supervised Exercise Sessions:** Exercise physiologists work one-on-one with patients to provide exercise feedback and create personalized plans.
- **Nutrition Counseling:** Our dietitians work with patients to develop healthy eating plans, as well as strategies for managing weight and cholesterol.
- **Psychosocial Support:** We offer services to help patients manage depression, anxiety and stress.
- **Supervised Exercise Training for Peripheral Artery Disease (PAD):** This exercise-based program is designed to help patients with PAD walk longer and without pain.
- **Cardiac Rehab “To Go”:** We offer a mobile app that gives patients who are not able to attend cardiac rehab in person access to the cardiac rehab team through a structured home-based program. A Bluetooth-enabled blood pressure cuff and scale send data back to our exercise physiologists, helping them adjust care as needed.



New Starts

2,068

All 5 Programs (Carolinas Medical Center, Pineville, Union, Cabarrus, Cleveland)
Source: Epic, Annualized 2019



Total Visits

43,912

All 5 Programs (Carolinas Medical Center, Pineville, Union, Cabarrus, Cleveland)
Source: Epic, Annualized 2019



Combined Readmission Rate

2.3%

Source: AACVPR Registry, 1/1/2019 - 9/30/2019

CARDIO-ONCOLOGY

Our advanced cardio-oncology program incorporates timely comprehensive care to minimize cardiovascular risks and avoid interruptions during cancer treatment, while focusing on long-term health and wellness.



Sanger's cardio-oncology team is integrated into Levine Cancer Institute (LCI), which has some of the region's highest cancer volumes. We provide advanced care for LCI's patients, whether they have heart conditions before their cancer diagnosis or need advanced screening and management for potential cardiovascular and cardiometabolic toxicities associated with the rapidly growing array of cancer treatments.

We offer access to:

Specialized Care Across 20+ Locations: Our cardio-oncology experts use a hub-and-spoke approach to educate other staff cardiologists about the latest cancer treatments and their potential cardiac implications. We advise our cardiologists about how to evaluate cancer patients' hearts and about which heart treatments are appropriate. This enables patients to receive the best possible care while staying close to home via a network that spans more than 20 locations.

State-of-the-Art Imaging: We offer the latest imaging technologies – including CT, cardiac MRI and echocardiogram with strain imaging – at multiple locations. This array of imaging tools allows us to pinpoint whether cardiotoxicity is causing a decline in heart function so we can deliver appropriate treatment and help patients resume chemotherapy.

Supportive Therapy: LCI is home to one of the nation's first supportive oncology departments, with expertise spanning everything from nutrition to mental health. Sanger's cardio-oncology team has a clinic within that department, and we use this clinic to teach cancer patients how to optimize their heart health and minimize cardiovascular risks during cancer survivorship.

RESEARCH & CLINICAL TRIALS

Sanger physicians are setting a new standard by pioneering device trials, leading multicenter studies and spearheading innovative clinical protocols.

For instance, some of our physicians were coauthors on the COAPT study – published in the New England Journal of Medicine – that led to FDA approval of the MitraClip device for certain heart failure patients with secondary mitral regurgitation. Our physicians also serve in leadership roles in several other national trials, including the ABRE iliofemoral venous stent, Valiant Mona LSA thoracic stent graft system and AltaValve transcatheter mitral valve replacement device.

Our research extends beyond industry-sponsored studies. We recently created an outcomes research group to support investigator-initiated research within Sanger. This has sparked studies on a range of questions, including research that showed the Sentinel™ Cerebral Protection System can reduce stroke risk during transcatheter aortic valve replacement (TAVR). **Now we're the region's only center using embolic protection with every anatomically favorable patient, and our TAVR stroke rate is less than 1%.**

INDUSTRY-SPONSORED TRIALS

Sanger's trials participation includes:

ACURATE IDE: TAVR trial

AltaValve: Early feasibility study to treat severe mitral regurgitation in patients with high surgical risk

ECG Belt: Uses the ECG Belt Research System at implant of a defibrillator device to help choose pacing site and programmed vector

RelayPro: Thoracic stent graft system in patients with acute complicated Type B aortic dissection or traumatic injury of the descending thoracic aorta

NODE: Use of Etripamil nasal spray to stop spontaneous episodes of paroxysmal supraventricular tachycardia

INVESTIGATOR-INITIATED OUTCOMES RESEARCH

Projects launched in 2019 include:

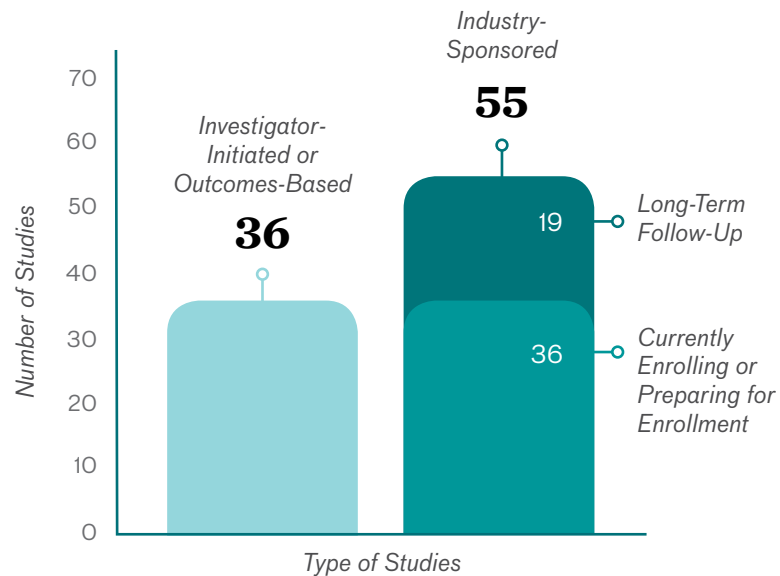
The Carolinas Cardiogenic Shock Initiative: A multicenter study led by Sanger

Lead Extraction Registry: A study that began at Sanger and expanded into a multicenter study

Use of embolic protection devices in TAVR: Sanger is leading this multicenter study

SETTING A NEW STANDARD FOR HEART AND VASCULAR CARE

Active Studies
91 Total



Total Number of Enrolled Patients
890

Total Number of Publications
41



Source: Internal Data, 2019

INNOVATION & VALUE-BASED CARE

Our value-based care initiative has helped improve patient satisfaction and control costs while reducing retesting and readmission rates.

This initiative reflects Sanger's commitment to providing timely, safe, effective and efficient patient-centered cardiovascular care to all.

Our latest progress includes:

Launching the Perfect Care initiative: This is one of the nation's first remote-monitoring programs aimed at lowering complications and readmissions after cardiac surgery. The initiative includes standardization of care

during the hospital stay. It then uses Bluetooth-enabled devices to monitor things like a patient's blood pressure, weight and activity after they go home. A nurse navigator reviews patients' data on a daily basis. This lets our team quickly identify warning signs and intervene to change things like a patient's blood pressure medication or diuretic dose without an in-person evaluation.



Developing an emergency department (ED) pathway for atrial fibrillation (AF) patients: This pathway's goal is to optimize AF care and reduce hospitalizations. It includes detailed instructions for ED providers about how to get AF patients on anticoagulants and slow their heart rates within just a few hours, avoiding unnecessary hospitalizations. We also automatically schedule follow-up appointments and see each patient within two days.

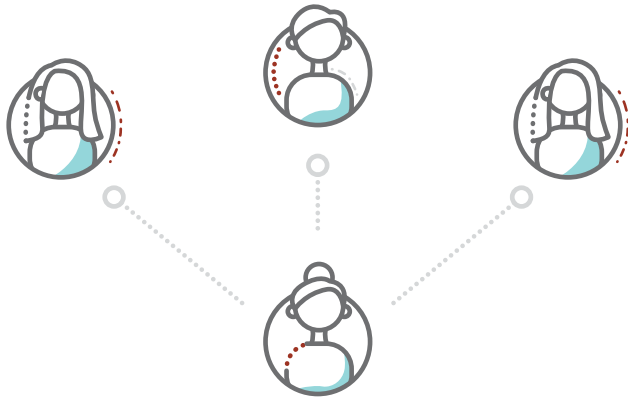
Creating a separate ED pathway for chest pain:

This aims to help physicians and advanced clinical practitioners evaluate and triage patients with symptoms similar to ACS. This pathway uses the HEART assessment tool to help providers determine which patients are unlikely to progress to ACS, so these patients can avoid unnecessary tests and hospitalizations – making care far more convenient and affordable.



MAKE A REFERRAL

Collaboration and patient-centered care are at the heart of our provider referral process.



When you refer your patients to Sanger Heart & Vascular Institute, we'll work together closely until we can transition each patient back to you for ongoing care post-treatment. And no matter where you're located – in the Carolinas or beyond – we'll find the right specialist for your most complex cases.

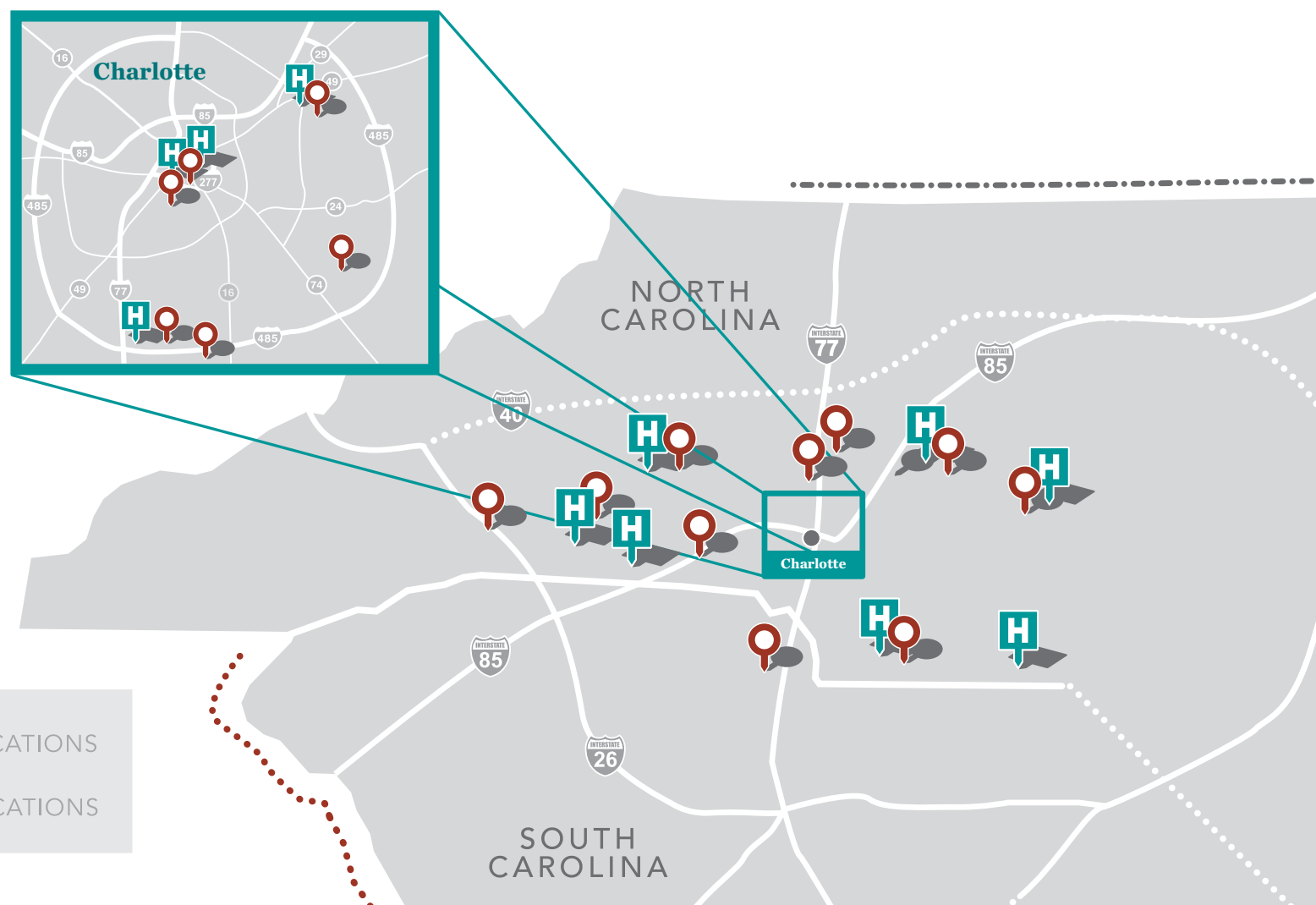
Our Global Healthcare Services program makes it easy for patients coming from all over the world. We coordinate medical appointments, travel needs and any other arrangements so patients and their families can focus on their treatment.

**To make a referral to any
Sanger Heart & Vascular Institute
location, contact a referral coordinator at:
877-999-7484**



A NETWORK DESIGNED FOR BETTER CARE

Sanger Heart & Vascular Institute functions as a coordinated network across a broad geography, seamlessly delivering care that patients need.

At any one of our 20+ locations across the Carolinas, patients receive more than just conveniently located expert care. They gain access to **internationally recognized physicians, emerging technologies and major clinical trials** that can't be found anywhere else in the region.



MAP KEY

-  HOSPITAL LOCATIONS
-  PRACTICE LOCATIONS