

ANNUAL REPORT 2021



TEXAS HEART[®] INSTITUTE



EXCEPTIONAL PATIENT CARE

DISCOVERY

COMMITMENT TO LEARNING



Overview

INTRODUCTION

Message From the President and Chief Executive Officer (p.4)

Message From the Medical Director (p.7)

MILESTONES

Texas Heart Medical Group (p.10)

U.S. News & World Report 2021 (p.12)

Texas Heart Institute and Baylor St. Luke's Medical Center Receive Houston's First American College of Cardiology (ACC) Transcatheter Valve Certification (p.13)

Our Global Influence:
Dr. Ourania Preventza Partners with Renowned Surgeons and the *Annals of Cardiothoracic Surgery* (p.14)

RESEARCH

By the Numbers (p.18)

Translational Research - Five Thematic Areas (p.20)

Artificial Heart & Heart-Assist Devices

A Practical Artificial Heart Is Closer Than Ever (p.23)

Creativity Meets Innovation in the New THI IDEA Lab (p.24)

THI Launches New Innovation Partnerships (p.26)

Dr. O.H. Frazier Receives 2021 AATS Scientific Achievement Award (p.28)

Regenerative Medicine & Gene Therapy

Gene Therapy for Heart Failure (p.30)

New Therapeutic Strategy for Peripheral Arterial Disease (p.31)

Advances in the Recellularization of Heart Scaffolds (p.32)

Director Spotlight:
James F. Martin, MD, PhD (p.33)

Drug Discovery & Development

Small-Molecule Drug Completes Phase I Trial (p.34)

Enhancing Vaccine Immune Responses (p.34)

Unique Discovery:
Anti-Inflammatory Drug with Reduced Cardiovascular Toxicities (p.35)

Biosystems Modeling for Personalized Medicine (p.36)

Electrophysiology

TexCaLaBR – A Catheter Lab-on-the-Bench (p.39)

Developing New Technology for Patients on Ventilation (p.39)

Clinical Research: Identifying Arrhythmia Triggers (p.39)

Clinical Practice: A Hybrid Atrial Fibrillation Program Is Born (p.40)

Cell Therapy & Clinical Trials

Clinical Research Goes Virtual During the Pandemic (p.42)

Therapeutics for Inpatients with COVID-19 (p.42)

A New Direction for Cell Therapy (p.45)

Continued Leadership in Stem Cell Clinical Trials (p.45)

THI Center for Women's Heart & Vascular Health (p.47)

Stem Cell Policy Partnership: Texas Heart Institute and Rice University Baker Institute Continue Series (p.48)

Texas Heart Institute Journal (p.54)

Dr. Zvonimir Krajcer Assumes Role of Editor-in-Chief (p.54)

School of Perfusion Technology (p.58)

Our Global Reach (p.60)

ACKNOWLEDGMENTS

Professional Staff

Leadership

Medical Executive Committee

Physician Members

Research Scientist Members

Physician Associates

THI Senior Leadership

Board of Trustees

Board Members

Board Trustee Emeritus

Board, Ex Officio

THI Journal Editorial Board & Consultants

Fellows & Teaching Staff

Introduction

Message From the President and Chief Executive Officer

Since our founding in 1962 by the world-renowned cardiac surgeon, Dr. Denton A. Cooley, the Texas Heart Institute has been synonymous with excellence and innovation in cardiovascular medicine, ground-breaking discovery, and outstanding training opportunities for the next generation of clinicians and scientists. Over the years, we have embraced new technologies and treatments and explored exciting areas of research with a singular goal - to define a new future of cardiovascular health.

We have been fortunate over the years to couple our bold and lasting vision with an outstanding Professional Staff, a visionary Board of Trustees, and the support of our community.

Today, the Texas Heart Institute is vibrant and growing. We are expanding our clinical and scientific expertise, developing innovative programs, and pioneering the *next first* – all in keeping with our promise of service to those with cardiovascular disease.

[Interview with Dr. Joseph G. Rogers “A Vision for the Future”](#)





*Joseph G. Rogers, MD
President and CEO
Texas Heart Institute*

A professional portrait of Emerson C. Perin, MD, PhD, Medical Director of the Texas Heart Institute. He is a middle-aged man with short, graying hair, smiling slightly. He is wearing a white lab coat over a light blue dress shirt and a red and blue patterned tie. His arms are crossed. The lab coat has "Perin, MD, PhD" and "Interventional Radiology" embroidered on the left chest, and the Texas Heart Institute logo and name on the right chest. The background is a bright, out-of-focus indoor setting with a large window and a framed picture on the wall.

*Emerson C. Perin, MD, PhD
Medical Director
Texas Heart Institute*

Perin, MD, PhD
Interventional Radiology

TEXAS HEART INSTITUTE

Message From the Medical Director

Over the past 3 years, there has been a concerted effort to reorganize the Texas Heart Institute Professional Staff, whose members play a vital role in fulfilling the mission of the Institute. With the guidance of the Board of Trustees, I am proud to announce that the THI Professional Staff has now been completely reconstituted (members listed on pages 50-51).

THI has now expanded its activities beyond research and education to include clinical care, and this is embodied by the Texas Heart Medical Group (THMG). We believe this is a fundamental step that places THI along the path set forth by its founder 60 years ago. The clinical excellence that is traditionally found in cardiovascular surgery, anesthesiology, and cardiology is now the brightest beacon of excellence in cardiovascular care in the Texas Medical Center.

THI continues to break barriers in its research and education initiatives with deep expertise in innovative areas of translational research, clinical investigation, and medical education. THE NEXT FIRST continues to be the research priority at THI.

Milestones





tones

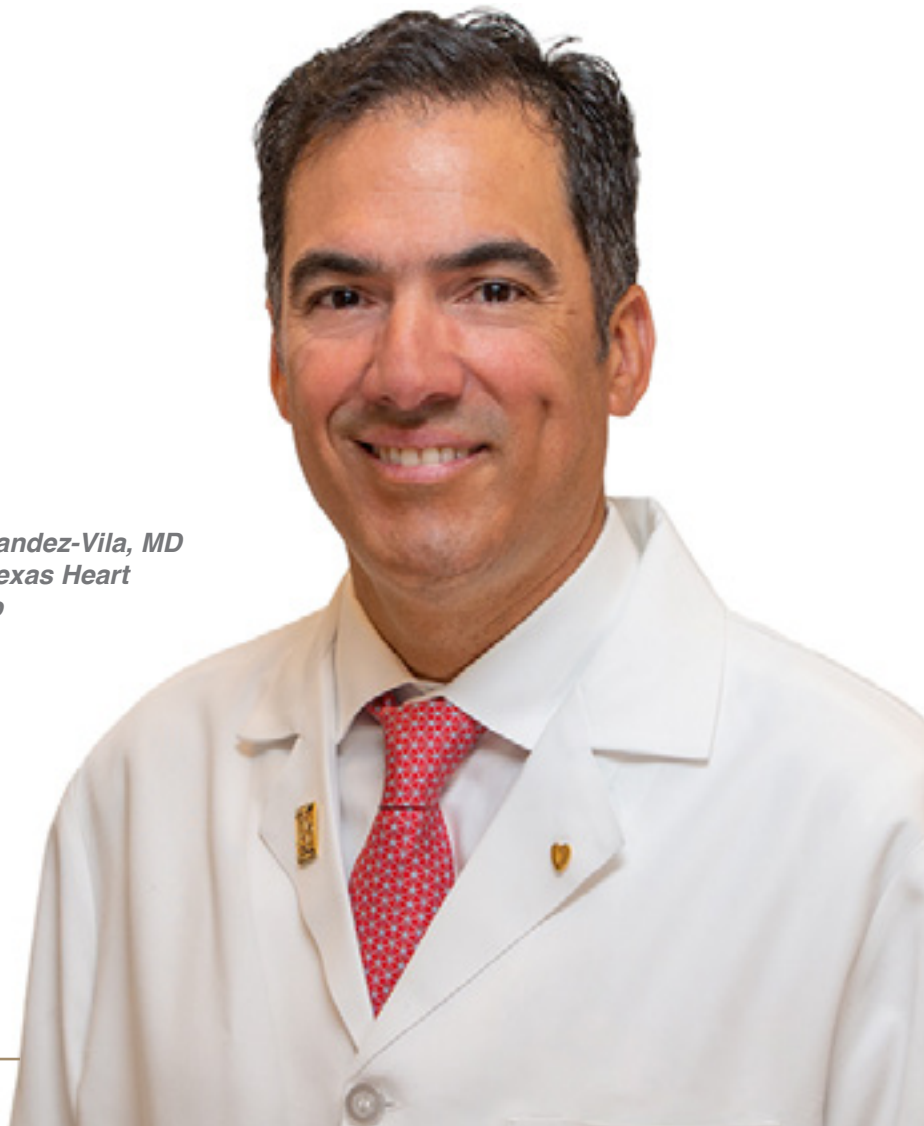
TEXAS HEART MEDICAL GROUP

When Denton A. Cooley, MD, established the Texas Heart Institute nearly 60 years ago, his mission was simultaneously simple and bold: namely, to reduce the devastating toll of cardiovascular disease through innovative programs in research, education, and improved patient care. THI's mission statement has evolved—now to deliver the future of cardiovascular health through exceptional patient care, discovery, and a commitment to learning—but the focus on excellence in cardiovascular care remains unchanged. Launched on October 1, 2020, the Texas Heart Medical Group (THMG) continues to exemplify Dr. Cooley's original vision as the clinical practice specializes in cardiovascular care, with the singular mission to provide the highest-quality medical care in a sophisticated, welcoming, patient-oriented atmosphere.

“With the launch of Texas Heart Medical Group, THI ushered in a dynamic new era as it enters the clinical care arena,” stated Texas Heart Institute Board Chair [Eric D. Wade](#). He added, “Texas Heart Medical Group will tap into THI's long-standing and relentless pursuit of excellence that began with the historic breakthroughs under Dr. Cooley's leadership and vision. I am confident in saying that he would be proud of and excited for this new chapter in THI's dramatic story.”

— Eric D. Wade
Texas Heart Institute Board Chair

Eduardo Hernandez-Vila, MD
President of Texas Heart
Medical Group





[Texas Heart Announces New President of Its Clinical Practice, the Texas Heart Medical Group \(THMG\)](#)

This year, Eduardo Hernandez-Vila, MD, was named President of the Texas Heart Medical Group. A practicing cardiologist since 2000, Dr. Hernandez specializes in coronary and peripheral arterial disease – as well as venous disease – focusing on both medical and interventional management.

“Dr. Hernandez is widely respected by his peers, his patients, and the broader cardiology community in equal measure,” stated Texas Heart Institute President and CEO Joseph G. Rogers, MD. Dr. Rogers added, “I look forward to Dr. Hernandez’s leadership as the group expands to provide outstanding, patient-centered care in convenient locations for our community.”

The practice serves as a home base for twelve outstanding cardiologists who are leaders in general and preventative cardiology, cardiac imaging, interventional cardiology, peripheral vascular disease, electrophysiology, and heart failure. Together, Texas Heart Medical Group’s physicians embody the totality of Texas Heart Institute as a fully integrated clinical cardiology practice encompassing the areas of education, research, and direct patient care.

The Texas Heart Medical Group will move its offices to a newly renovated suite on the 26th floor of the historic St. Luke’s Medical Tower in 2022. Appointments can be made by calling (713) 790-9401.



Texas Heart Institute at Baylor St. Luke's Medical Center Recognized as Houston's Highest-Ranking Center for Adult Cardiology & Heart Surgery by *U.S. News & World Report* in 2021

Texas Heart Institute at Baylor St. Luke's Medical Center ranked 13th in the nation among Adult Cardiology & Heart Surgery hospitals, making it the highest-ranking heart care center in Houston. As a global leader in patient care for nearly six decades, Texas Heart Institute at Baylor St. Luke's has ranked among the top cardiovascular centers in the United States by *U.S. News & World Report* since the rankings first launched over 30 years ago.

The Cardiology & Heart Surgery ranking is based on analysis of patient outcomes in the medical and surgical treatment of cardiovascular disease, the volume of high-risk patients, patient experience, nurse staffing, public transparency, and use of advanced clinical technologies.

In the Cardiology & Heart Surgery category, *U.S. News* evaluated 592 hospitals and ranked the top 50 that care for patients who required challenging heart and vascular treatments, including heart transplants, implantation of cardiac devices such

“For patients and their families suffering from the most complex cardiovascular conditions or who have significantly heightened risk, these rankings provide a valuable resource for locating skilled sources of care.

Today, we are proud to uphold the commitment to excellence and quality of care that is synonymous with the Texas Heart Institute.”

— Joseph G. Rogers, MD
President and CEO of THI

as pacemakers and defibrillators, major chest procedures, and treatments for complex cardiovascular diseases such as endocarditis, heart failure, and circulatory issues.

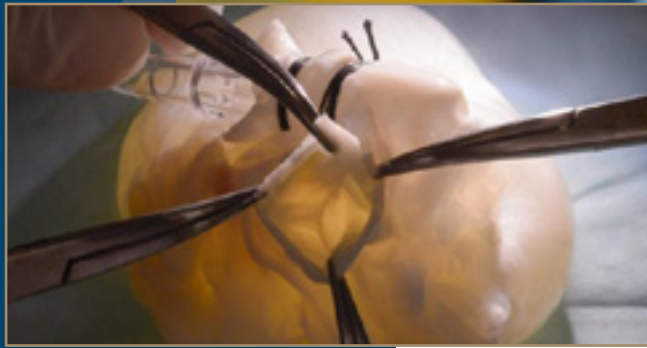
“For patients and their families suffering from the most complex cardiovascular conditions or who have significantly heightened risk, these rankings provide a valuable resource for locating skilled sources of care,” said Joseph G. Rogers, MD, President and CEO of the Texas Heart Institute.

This year, in addition to being ranked 13th in Cardiology & Heart Surgery, Texas Heart Institute at Baylor St. Luke's

Medical Center received the highest possible ratings for all complex cardiovascular conditions and treatments, including heart failure, abdominal aortic aneurysm repair, aortic valve surgery, heart bypass surgery, transcatheter aortic valve replacement (TAVR), and heart attack.

[THI Rankings](#)





Transcatheter Aortic Valve Replacement (TAVR) Center of Excellence

“We are proud of this designation. It validates the expertise of our team, the patient care processes we have implemented, our ability to track key performance metrics, and our commitment to continuous improvement. Our TAVR team has performed 2150 procedures in the past 9 years and is dedicated to the highest standards of quality and safety. This focus translates to superior clinical outcomes for our patients.”

— R. David Fish, MD
Interventional Cardiology,
Texas Heart Medical Group

Texas Heart Institute and Baylor St. Luke’s Medical Center Receive Houston’s First American College of Cardiology (ACC) Transcatheter Valve Certification

Experts at the Texas Heart Institute and Baylor St. Luke’s Medical Center have earned a prestigious American College of Cardiology (ACC) accreditation as a transcatheter aortic valve replacement (TAVR) Center of Excellence, making their program the first in Houston to be recognized for this level of quality and clinical outcomes.

“This distinction underscores our commitment to excellence and the treatment of patients with complex cardiovascular disease,” said Texas Heart Institute’s [Stephanie Coulter, MD](#).

The comprehensive external review and certification process acknowledges the highest standards for training, team-based care, patient-focused decision-making, and clinical performance. Earning the certification also requires participating in a TAVR national clinical database.

Centers that earn ACC Transcatheter Valve Certification follow best practices for using evidence-based medicine to support decision-making in the care of individual patients.

OUR GLOBAL INFLUENCE

Dr. Ourania Preventza Partners with Renowned Surgeons and the *Annals of Cardiothoracic Surgery*

This past year, Texas Heart Institute surgeon [Ourania Preventza, MD](#)—the first female cardiac surgeon to be granted the title of Professor of Surgery at Baylor College of Medicine—was invited to be Guest Editor of three consecutive issues of the *Annals of Cardiothoracic Surgery*.

All three issues are focused on non-open heart, minimally invasive treatments for cardiovascular disease. The first issue, published in September 2021, was dedicated to highly specialized use of transcatheter valve devices; the second and third issues, from November 2021 and January 2022, focused on treatments for thoracic aortic disease. The issue included articles written by Dr. Preventza and other THI surgeons and cardiologists. Also included

are systematic reviews, Keynote Lecture Series, featured articles, editorials, and Masters of Cardiothoracic Surgery videos that Dr. Preventza solicited from experts around the world.





Dr. Preventza Invited to be Guest Editor of
Three Consecutive Issues of ACS

Already, the issues have drawn significant attention in the cardiac surgery, vascular surgery, and cardiology communities, drawing substantial praise.

Also, in October 2021, Dr. Preventza became the first woman president of the International Society of Endovascular Specialists.

The ISEVS is a multidisciplinary society of cardiac surgeons, vascular surgeons, cardiologists, and interventional radiologists. It was founded by revolutionary cardiac surgeon Edward B. Diethrich in 1992.

Under Dr. Preventza's leadership, ISEVS con-

tinues to enhance global education and clinical expertise in the treatment of cardiac and vascular diseases around the world. One of her most important accomplishments in the ISEVS has been establishing the society's ninth chapter, in Lagos, Nigeria, with Herbert Oye, DO, as chapter president.

Dr. Preventza is the first female cardiac surgeon to be granted the title of Professor of Surgery at Baylor College of Medicine

Ourania Preventza, MD
Teaching Staff, Thoracic
Surgery Residency, and
Physician Ambassador of the
Center for Women's Heart &
Vascular Health



Research



Research

2021 BY THE NUMBERS.....

Publications

354

Intellectual Property and Technology Transfer

5

INVENTION
DISCLOSURES
MADE

5

PROVISIONAL
PATENT
APPLICATIONS
SUBMITTED

4

PATENTS
ISSUED

2

OPTION
AGREEMENTS
EXECUTED

\$310,000

INTELLECTUAL
PROPERTY & MILESTONES

7

LICENSED
TECHNOLOGIES
IN CURRENT
PORTFOLIO

2

OPTIONED
TECHNOLOGIES
IN CURRENT
PORTFOLIO

Office of Research Administration

over
100

CONTRACTS,
PROJECTS, AND
SPONSORED
RESEARCH
AGREEMENTS

16%

RESEARCH
INVESTIGATOR
MEMBERS OR
FELLOWS OF
THE NATIONAL
ACADEMY OF
INVENTORS®

42

TOTAL GRANT
PROPOSALS
SUBMITTED
(FEDERAL AND
NON-FEDERAL)

\$26M

TOTAL FUNDING
AMOUNTS FOR
SUBMITTED
GRANTS

18

ONGOING
GRANTS IN
POST-AWARD
MANAGEMENT

Center for Clinical Research

22

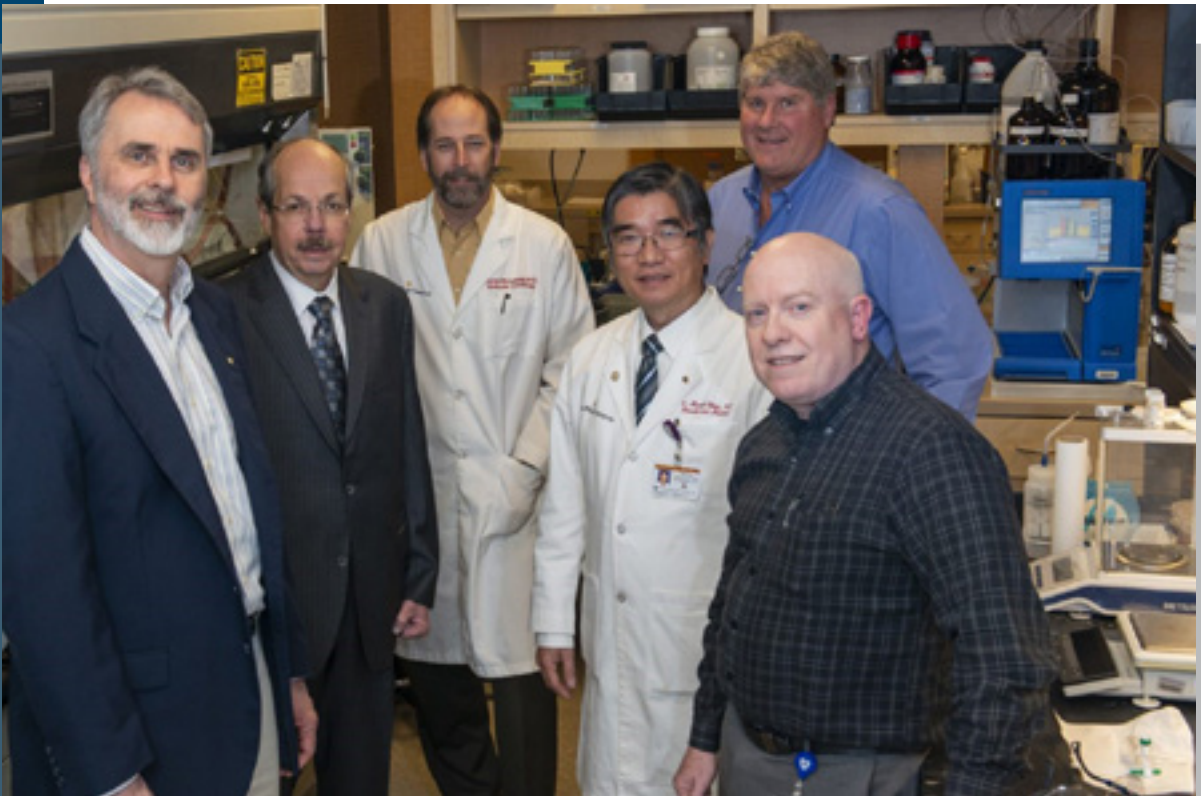
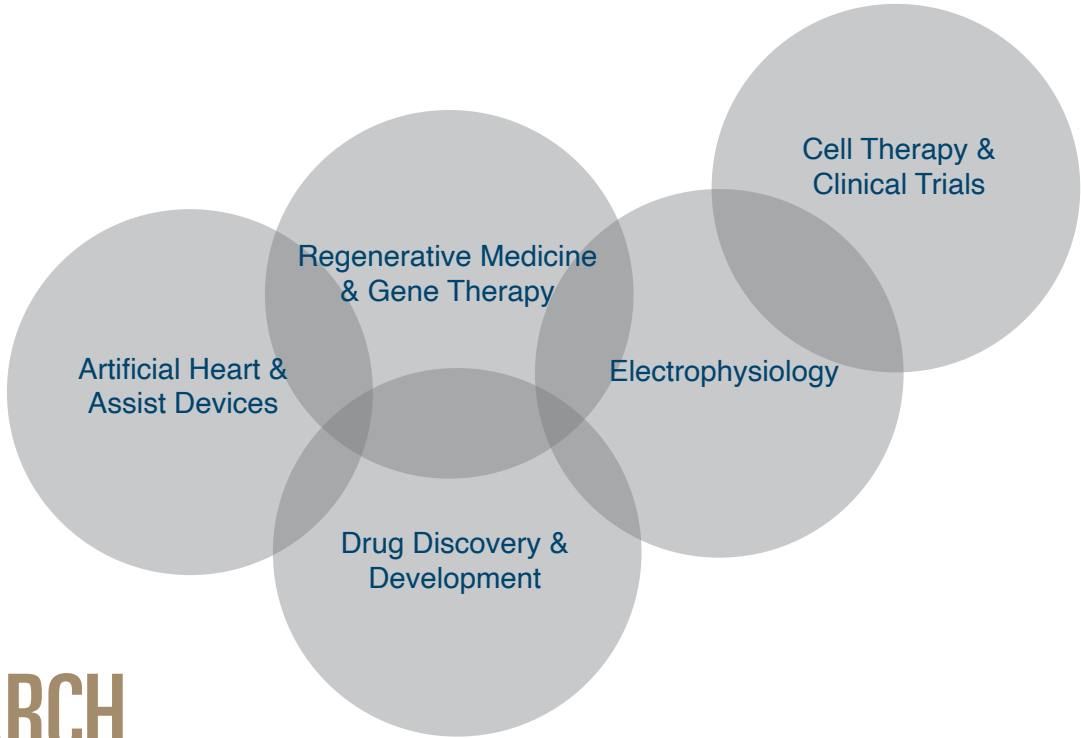
ACTIVE STUDIES SUPPORTED BY INDUSTRY SPONSORS AND FEDERAL GRANTS, AND THI INVESTIGATOR-INITIATED STUDIES

20

STUDIES IN ACTIVE STUDY START-UP (GREATEST NUMBER IN START-UP SINCE THI CENTER FOR CLINICAL RESEARCH'S INCEPTION)

FIVE THEMATIC AREAS RESEARCH

Translational research integrates discovery science, personalized medicine, and patient- and population-based research into a multidisciplinary framework to improve health. It is the capstone of Texas Heart Institute's mission and underlies THI's worldwide reputation as an innovator in cardiovascular therapies. Five thematic areas are the focus of THI's translational research efforts:



Artificial heart and heart-assist devices – All the left ventricular assist devices (LVADs) that are in clinical use throughout the world today were tested and refined in THI labs. Continuing this tradition, current efforts are focused on developing a permanent total artificial heart and miniaturizing heart-assist devices for children.

Regenerative medicine and gene therapy – Researchers at THI are pioneering ways to use cutting-edge gene therapy and gene editing technologies to develop new treatments for heart disease. THI scientists are also refining biotechnologies and developing molecular tools to advance the field of bioartificial tissues and organs. And, by taking advantage of the latest research in heart and organ development, THI scientists are leading efforts to develop the world’s first gene therapy designed to turn on naturally occurring repair mechanisms in the heart to repair damaged tissue after a heart attack and to treat heart failure—effectively making the heart better able to heal itself.

Drug discovery and development – Drugs discovered at THI are being developed to enhance stem cell transplantation, noninvasively image atherosclerosis, treat inflammation in cardiovascular disease, and enhance vaccines that combat infections that attack the heart. These efforts, led by experienced pharmaceutical teams with proven track records, have resulted in successful out-licensing of technologies and phase I clinical trials.

Electrophysiology – U.S. Food and Drug Administration (FDA) approval and commercialization of the Early Bird bleed-detection system (Saranas, Inc., Houston, Texas) is a perfect example of THI electrophysiologists advancing innovative science into clinical practice. Groundbreaking translational research in managing cardiac arrhythmias is following a similar path, including the development of wireless pacemakers and bioengineered conductive nanofibers to manage and treat heart disease.

Cell therapy and clinical trials – Clinical research at THI is advancing the science of medicine in the same pioneering spirit that inspired the Institute’s founding nearly 60 years ago. From first-in-man clinical trials of cell-based therapies for heart failure and other cardiovascular diseases, to our selection as a site for international clinical trials of new treatments for COVID-19 patients, our clinical research center’s reputation of excellence strengthens our ability to advance cardiovascular medicine and benefit patients.



BIVACOR



A New Documentary Chronicles the Development of the Permanent Artificial Heart

Doctors and multimedia and communications specialists at the Texas Heart Institute (THI) worked with award-winning New York-based filmmaker [Brian Schildhorn](#) on a documentary titled [*Permanent Artificial Hearts are Closer Than You Think.*](#)

[Watch the Documentary Here](#)



ARTIFICIAL HEART & HEART-ASSIST DEVICES

Texas Heart Institute's Cardiovascular Surgery Research Laboratory—now the cornerstone of the THI Center for Preclinical Surgical & Interventional Research—has pioneered the development of cardiovascular devices, surgical procedures, and mechanical circulatory support approaches to treat patients with heart disease. There are an estimated 26 million people worldwide living with heart failure, with approximately half of those patients dying within 5 years of receiving their diagnosis. Although some patients with end-stage heart failure receive a heart transplant, the limited supply of donor hearts (or a patient's ineligibility for transplantation) makes circulatory support devices such as ventricular assist devices (VADs) or total artificial hearts (TAHs) an important treatment alternative. Investigators at THI continue to build on their strong history of advances in this field as they develop and test novel support devices to provide improved treatment options to adults and children with heart failure and congenital heart diseases.

A Practical Artificial Heart Is Closer Than Ever

BiVACOR Total Artificial Heart one beat closer to use in humans – BiVACOR, Inc. and the Texas Heart Institute's Center for Preclinical, Surgical, and Interventional Research, led by [O.H. Frazier, MD](#), were awarded a National Institutes of Health (NIH) phase II SBIR grant for Good Laboratory Practice (GLP) testing of the total artificial heart. GLP testing is the final stage of preclinical work before petitioning the U.S. Food and Drug Administration (FDA) to initiate clinical trials.

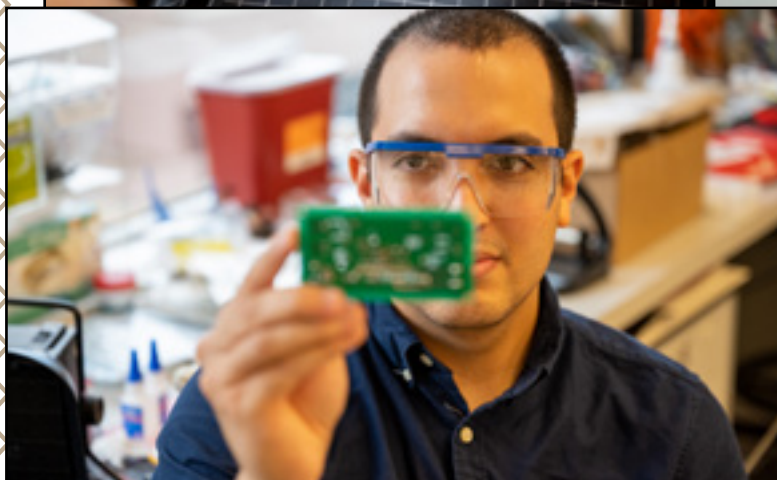
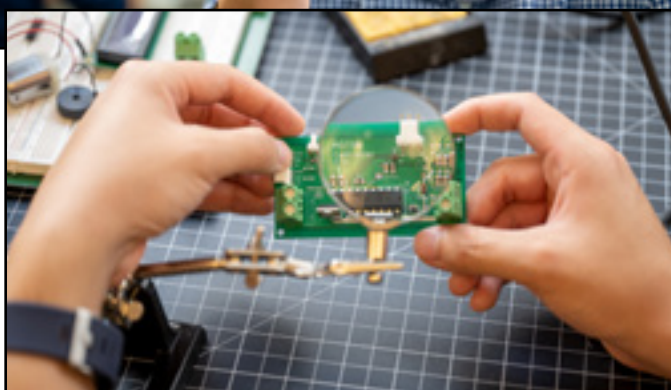
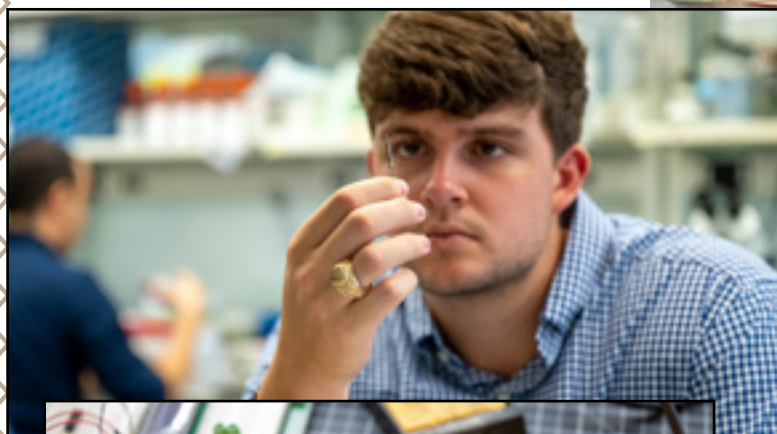
Funded by a separate, \$700K NIH Phase II SBIR grant, THI performed proof-of-concept studies in which, for the first time, the BiVACOR Total Artificial Heart was successfully implanted in a preclinical model that represents pediatric patients. If shown to be safe and durable, this technology has the potential to be transformative for both adult and pediatric patients with heart failure.

Creativity Meets Innovation in the New THI IDEA Lab

The [Texas Heart Institute Innovative Device & Engineering Applications](#) (IDEA) Laboratory is where creativity and innovation meet healthcare. This was the first full year of opera-

tion of the IDEA Lab, whose mission is to discover and implement innovative solutions in the development of cardiovascular devices. Led by [Yaxin Wang, PhD](#), and working in close col-

laboration with O.H. Frazier, MD, a major focus of the group is on ventricular assist devices for pediatric populations with heart failure, for whom current treatment options are extremely

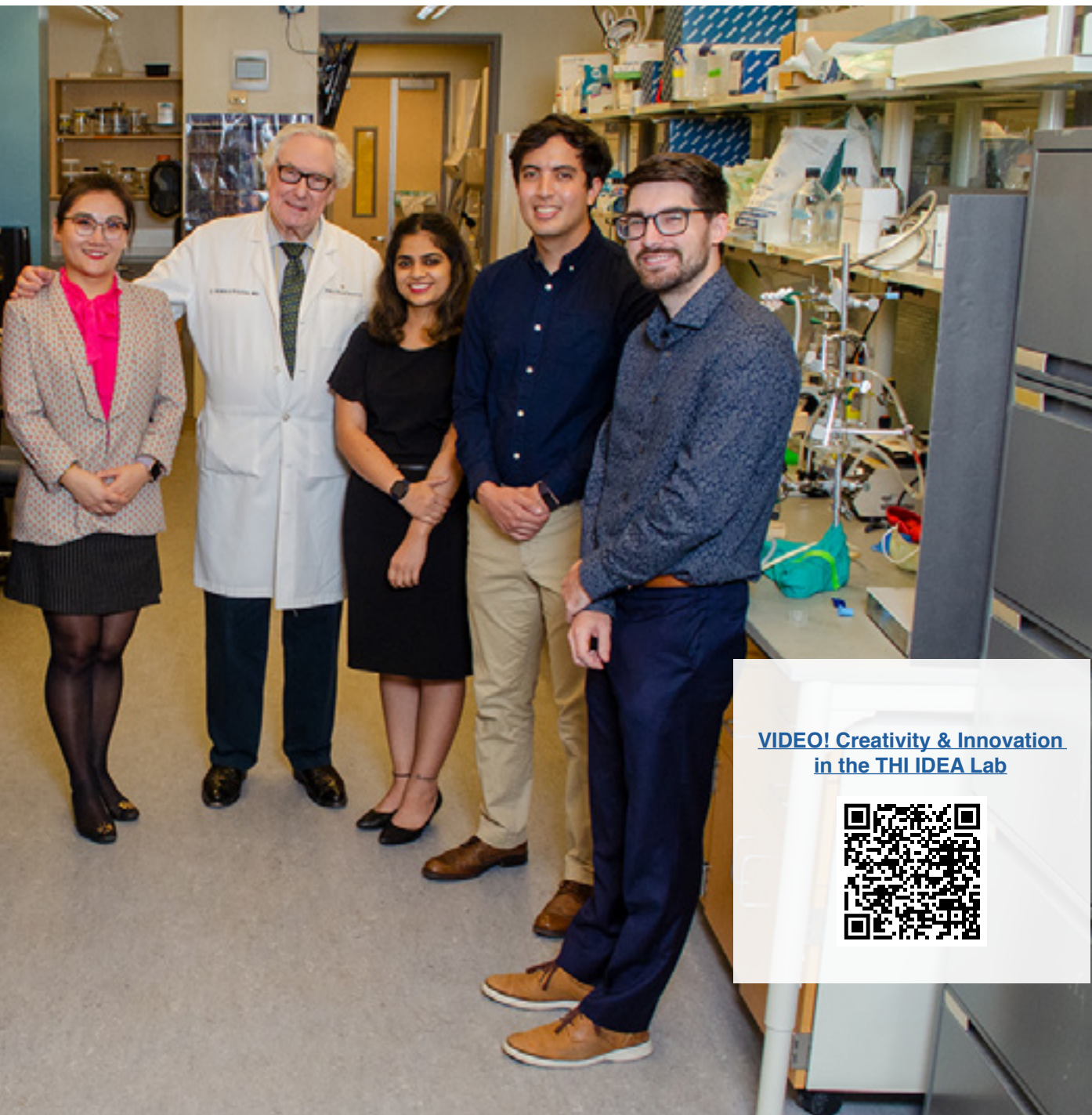


...where creativity and innovation meet healthcare.

limited. The lab is also exploring miniaturized pump designs to help adult patients who were born with a single heart ventricle and who underwent surger-

ies as children to provide “Fontan” circulation. Other areas of investigation include improving systems for ex vivo lung perfusion to increase the pool of do-

nor lungs that are acceptable for transplant. The IDEA lab is funded through an NIH R01 grant and through foundation grants that were awarded in 2021.



**VIDEO! Creativity & Innovation
in the THI IDEA Lab**





TMC BIODESIGN TMCx ACCELERATOR NEW PARTNERSHIPS

THI Launches New Innovation Partnerships

Texas Heart Institute's new Innovation Partnerships program seeks to develop new medical technologies by facilitating THI partnerships with outside entities and launching spin-out companies from THI labs. In this spirit, THI worked closely with the Texas Medical Center's TMC Innovation (TMCi) to provide mentorship and research services to healthcare startups from around the world. THI personnel collaborated with participants in two TMCi programs, TMC Biodesign and the TMCx Accelerator program, to advance the development of cardiovascular-focused products. These partnerships resulted in both preclinical and clinical research contracts with THI, maintaining THI's position on the cutting edge of breakthroughs in patient care. As a result of THI's mentorship, THI and TMCi jointly filed a patent on technology to be licensed to a startup that has already raised \$500,000. Notably, this was the first time TMCi has filed for intellectual property in conjunction with another institution. THI was also an official sponsor with the Ignite Accelerator, a program focused on addressing gender parity in the healthcare industry. As a customer sponsor, THI provided mentorship and feedback to a female-led health tech start up, resulting in a pilot study with the Texas Heart Medical Group. [Allison Post, PhD](#), THI bioengineer and manager of the Innovation Partnerships program, also discussed THI's innovation plans with the Houston InnovationMap podcaster Natalie Harms. Dr. Post's Houston Innovators Podcast interview was selected by the editor as one of the top 7 she conducted in 2021. THI Innovation Partnerships will continue to build on this momentum in 2022.

[Listen to Podcast Here](#)





*Allison Post, PhD
THI Bioengineer and
Manager of the
Innovation
Partnerships program*

Dr. O.H. Frazier Receives 2021 AATS Scientific Achievement Award

The Singular Honor Further Cements the Texas Heart Institute Surgical Pioneer's Generational Legacy

[O. H. Frazier, MD](#), was the recipient of the 2021 Scientific Achievement Award from the [American Association for Thoracic Surgery](#) (AATS). Established in 1994, the Award serves to honor individuals who have made scientific contributions to the field of thoracic surgery worthy of the highest recognition that the Association can bestow. Previous Houston recipients include Michael DeBakey, MD (1999) and Denton Cooley, MD (2000), two of the most distinguished cardiothoracic surgeons in the history of the field.

THI held a ceremony in Dr. Frazier's honor, and the First Lady of Houston, Elyse Lannier, presented Dr. Frazier with a City of Houston Proclamation on behalf of Mayor Sylvester Turner. Surgeons from around the world attended virtually and shared their gratitude for Dr. Frazier's immeasurable contributions to advancing cardiovascular care, which have improved lives around the world.

"As the cornerstone of one of the most dominant and innovative cardiac programs in the world, Dr. O.H. Frazier is a true cardiovascular pioneer whose impact

on patients and the specialty is immeasurable. The leadership, innovation, and ingenuity that he has modeled throughout his career have revolutionized the field of heart transplantation and cardiac assist devices. It is truly a distinct honor of my career for the opportunity to present the 2021 Scientific Achievement Award to Dr. Frazier," said Marc R. Moon, MD, President of the American Association for Thoracic Surgery.



For more than 40 years, Dr. Frazier has been dedicated to improving the treatment of severe heart failure and advancing heart transplantation and artificial devices that substitute for or assist with the pumping action of the human heart. He served on the NIH National Heart, Lung, and Blood Institute Advisory Committee and chaired the original committee that initiated the first federal allocation system for the distribution of hearts for transplantation. As a result of his work, Dr. Frazier is one of the top transplantation and mechanical circulatory support surgeons in the world. Throughout the 1970s and 1980s, Dr. Frazier conducted experimental work toward developing an implantable LVAD. In 2011, he implanted the first successful continuous-flow total artificial heart by using two second-generation HeartMate II LVADs to replace a patient's failing heart.



“Being recognized by one’s peers is something I value to the utmost degree,” Dr. Frazier noted. He added, “I have long respected the work of the AATS and am grateful to the entire organization for selecting me out of so many other worthy individuals. It is an honor to join two of

my mentors, Drs. Cooley and DeBakey, in receiving the Scientific Achievement Award. Any award that includes even one of them, let alone both, among its recipients is one that anyone in the medical field would feel immeasurable pride in receiving.”



REGENERATIVE MEDICINE & GENE THERAPY

Gene Therapy for Heart Failure

In the United States, approximately 6 million patients over age 20 suffer from heart failure. Heart failure is irreversible and worsens over time. The 5-year survival rate for patients with Stage D heart failure, the most advanced form of the disease, is only 20%.

The dismal outcomes for patients with heart failure are largely due to the fact that the heart is a nonregenerative organ; cardiac muscle cells, known as cardiomyocytes, are highly specialized and have a limited capacity for self-renewal. Patients suffering from heart failure have very limited treatment options, and up to this point, it has been essentially impossible to heal injured heart muscle in humans regardless of available technology and knowledge. [James F. Martin, MD, PhD](#), and his [Cardiomyocyte Renewal Laboratory](#) at THI could change this.

THI scientists have discovered a gene therapy-based approach that could eventually lead to a new treatment strategy for heart failure. By directly administering viral vectors that target genes involved in organ development into heart muscle, the group showed that they could repair failing hearts in animal models. This work was published in the prestigious journal [Science Translational Medicine](#). The technology behind this innovative treatment approach has been

licensed to YAP Therapeutics, Inc., which is currently planning phase I clinical trials in humans.

“These findings from Dr. Martin and his team at the Texas Heart Institute Cardiomyocyte Renewal Laboratory and its newest venture, the McGill Gene Editing Lab, cannot be overstated in their magnitude,” noted [Emerson Perin, MD, PhD](#), THI’s Medical Director and a co-investigator. He added, “The practical application of YAP101 gene therapy is significant, and it has the potential to become a paradigm-changing treatment for heart failure.”

YAP Therapeutics is a company co-founded by Dr. Martin with the late [James T. Willerson, MD](#), former President of the THI, and Olav Berghem, Founder and Managing Director of the life science venture accelerator Fjord Ventures, to develop and commercialize medicines that treat severe diseases through tissue regeneration. According to Dr. Martin, “The plan is to advance our gene therapy, take it to clinical trials, and ultimately treat people. The goal here is to translate the work of our research teams at Texas Heart and at [Baylor College of Medicine](#) into a life-changing medicine, labeled YAP101, for people with heart failure.”

New Therapeutic Strategy for Peripheral Arterial Disease

The ability of muscle to regenerate itself gradually declines with age. This decline poses a fundamental challenge to the repair of damaged skeletal muscle in older patients with peripheral arterial disease (PAD). Despite the high incidence of PAD, current therapies for it are ineffective in replacing damaged muscle tissue with new, functional muscle. Therefore, identifying new treatment approaches for PAD is the focus of a collaborative effort between investigators in THI's Cardiomyocyte Renewal Laboratory and [Molecular Cardiology Research Laboratories](#). Drs. James F. Martin, [Richard A.F. Dixon](#), and their teams demonstrated for the first time that inhibiting the Hippo pathway in a mouse model of PAD resulted not only in neovascularization (new blood vessel growth) and improved blood flow in the hind limb but also skeletal muscle regeneration from resident stem cells, which improved running endurance. This strategy may overcome the current limitation of functional skeletal muscle regeneration in aged populations with PAD or muscle injury. This study was published in the journal *Stem Cells*.

[Read the Study Here](#)





REGENERATIVE MEDICINE

RESEARCH DEPARTMENT

Advances in the Recellularization of Heart Scaffolds

Investigators in the [Regenerative Medicine Research Department](#) at THI seek a long-term solution to the donor heart shortage through whole-organ bioengineering, as well as novel tissue-engineering approaches to advance cardiovascular disease research. Led by [Camila Hochman-Mendez, PhD](#), the group has focused on specific milestones that will advance the regenerative medicine field toward the ultimate goal of recellularizing human hearts for transplant. Recent advances include recellularization of the left ventricle of a rabbit heart scaffold at a cellular density and a level of structural integrity surpassing anything previously reported. This work was recently published in *Acta Biomaterialia*, one of the top 5 materials science journals worldwide.

[Read the Study Here](#)



“Our work represents a major clinical breakthrough that could lead to a treatment to reverse heart failure and effectively cure the number one cause of death in America.”

– James F. Martin, MD, PhD
Director, Cardiomyocyte Renewal Laboratory

DIRECTOR SPOTLIGHT

Bringing New Life to Damaged Hearts

Over his career as a researcher, Dr. Martin has authored more than 170 peer-reviewed papers in top scientific journals such as *Nature*, *Science*, *Cell*, *Developmental Cell*, *PLOS Genetics*, *Development*, and *PNAS* (H-index 79). Recently inducted into the 2021 class of Senior Members at [The National Academy of Inventors \(NAI\)](#), he holds 9 U.S. patents and applications, including one provisional application. Dr. Martin’s research has received support from numerous granting agencies and

foundations, including the National Institutes of Health’s National Heart, Lung, and Blood Institute; Department of Defense; the State of Texas; Vivian L. Smith Foundation; The Brown Foundation, Inc.; Saving *tiny* Hearts Society; Roderick D. MacDonald Research Fund; American Heart Association; LeDucq Foundation’s Transatlantic Networks of Excellence in Cardiovascular Research; and Additional Ventures.

Dr. Martin and his team in the Cardiomyocyte Renewal Laboratory share the goal of providing new treatment options for patients with heart failure or heart injury, and those born with congenital heart defects, especially those with severely underdeveloped left hearts. The team’s fundamental dis-

covery of the Hippo “stop growth” genetic pathway and their insights into its molecular mechanisms have provided a novel approach to heart muscle regeneration. In animal models of heart disease, inhibition of this pathway leads to “direct cardiogenesis” and repair of injured heart muscle by stimulating the multiplication of existing heart cells. In keeping with THI’s historical focus on translational research – transforming laboratory discoveries into new therapies and medical devices – Dr. Martin, his team, and their collaborators have developed a targeted gene therapy that shows promising heart-repair results in animals. Dr. Martin also seeks to use cutting-edge gene editing technology to develop novel cardiac therapies.



James F. Martin, MD, PhD
Director, Cardiomyocyte
Renewal Laboratory

DRUG DISCOVERY & DEVELOPMENT

Scientists and researchers in Texas Heart Institute's [Molecular Cardiology Research Laboratories](#) (MCRL) are ideally positioned to discover and develop new cardiovascular drugs. The team approaches clinical challenges using a two-pronged approach: They combine their detailed insights into the molecular mechanisms of heart and vascular diseases with the drug-discovery expertise they honed while working in the pharmaceutical industry. By discovering novel drug compounds and then developing promising candidates, the team produces unique small-molecule drugs and compounds that can improve the diagnosis, treatment, and prevention of cardiovascular disease. MCRL investigators collaborate across departments, disciplines, and research institutions to identify unmet clinical needs and devise new treatment options for patients.

Small-molecule Drug Completes Phase I Trial

An NIH-sponsored Phase I clinical trial in healthy volunteers was completed that evaluated the safety and bioavailability of the first small-molecule drug developed at THI to enter human testing. The drug, a novel integrin activator, was found to be safe and well-tolerated, with no serious adverse events detected. It can be taken by mouth (orally bioavailable); two 50-mg soft gel capsules yielded the targeted optimal pharmacokinetic dose. In preclinical studies, the drug has been shown to enhance stem cell transplant, as well as to improve the body's immune response to vaccines (see below) and cancer immunotherapies. The results from this Phase I study will be used to support future trials of the drug for these clinical indications.

Enhancing Vaccine Immune Responses

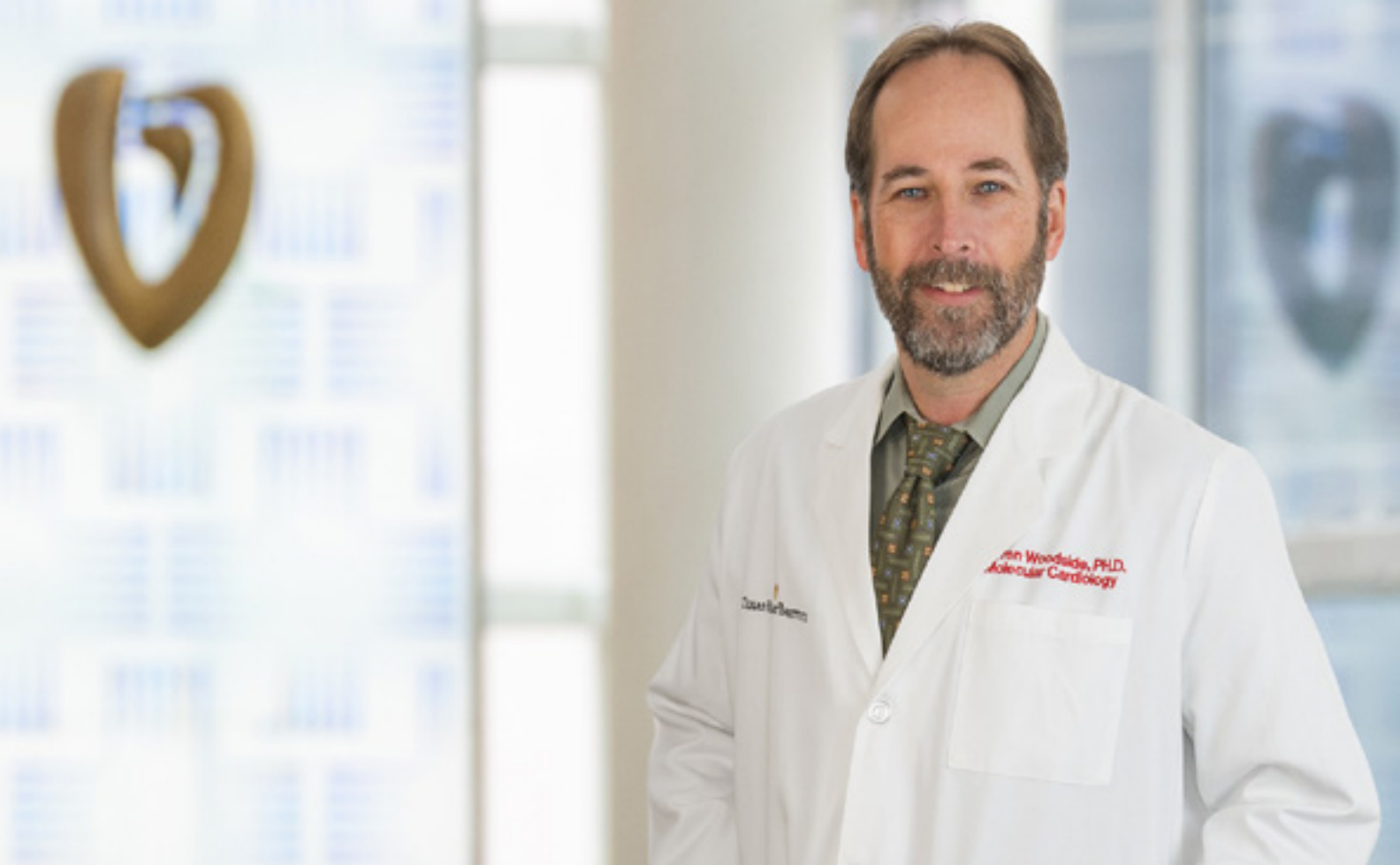
A strong correlation exists between certain infectious diseases and cardiovascular complications. These diseases include influenza, COVID-19, and Chagas disease. In the case of influenza and COVID, elderly people are particularly susceptible, as the ability of the immune system to respond to infections becomes compromised with age. Although vaccines have proven effective in greatly reducing the

“Although Chagas is not an overly common ailment, it is a very serious disease that can cause heart failure and stroke with lethal consequences. The study speaks to the power of multidisciplinary scientific collaboration and would not have been possible without the efforts of the talented individuals at 7 Hills Pharma and UTMB.”

– Darren G. Woodside, PhD
Vice President for Research

risk of infection and serious illness in the general population, the immune response

to many vaccines, including those targeting influenza and COVID-19, is not as robust in



elderly or immunocompromised patients.

MCRL investigators and their collaborators have discovered a simple way to enhance the immune response to vaccines against infections linked to cardiovascular disease. They have developed a drug that has proven safe and orally available

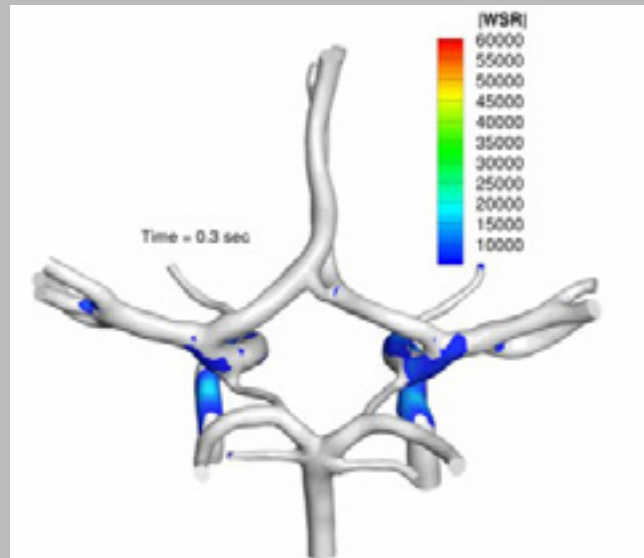
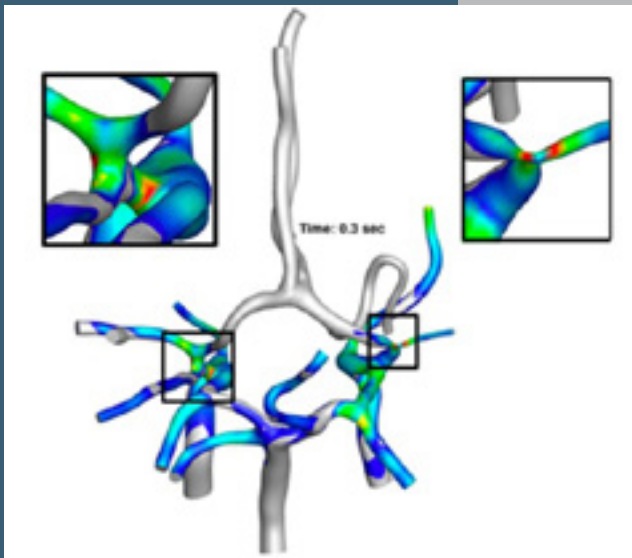
in clinical trials (see above) and that has been shown in pre-clinical models to enhance the immune response to influenza, COVID-19, and Chagas vaccines when dosed systemically, separate from the vaccine. This suggests that the drug could be combined with numerous vaccines that have already been formulated and stockpiled. A

[proof-of-concept study](#) with an experimental Chagas vaccine was published this year in the journal *Vaccines*. Unlike flu and COVID-19, no Chagas vaccine is currently approved for clinical use, and no adjuvant had yet proved effective in enhancing the response to the particular vaccine used in this study.

UNIQUE DISCOVERY

Anti-inflammatory Drug with Reduced Cardiovascular Toxicities

Inhibiting the signaling pathways of cellular receptors involved in physiological responses is a common approach to treat inflammatory diseases. However, drugs targeting kinase pathways are notoriously non-selective, leading to unwanted side effects that often include cardiovascular toxicities, or damage to the heart and blood vessels. MCRL investigators have identified small-molecule compounds that can inhibit a kinase called “Syk” that binds to the cytoplasmic tails of a class of cell adhesion receptors called integrins. This interaction is key to triggering an inflammatory response. The compounds inhibit signaling by Syk and decrease expression of inflammatory cytokines by leukocytes, a type of immune cell. This discovery is unique in that the drugs do not bind at the conserved kinase binding sites typically targeted by the pharmaceutical industry and thus show better selectivity—or the ability to produce the intended effect—and, therefore, fewer potential toxicities. This [work](#) was published in *Frontiers in Immunology*.



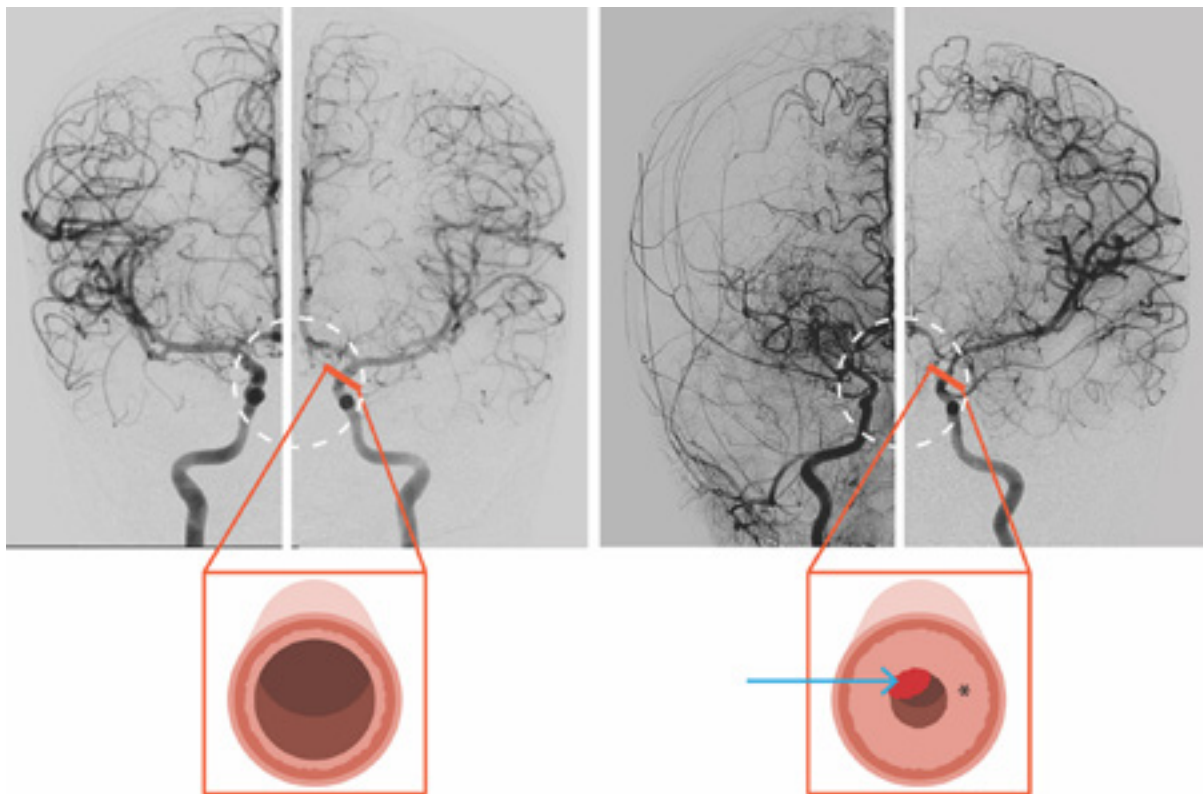
Blood flow simulations in the circle of Willis models constructed from patient imaging data. Results show the spatial distribution of critical wall shear rate (WSR) exceeding the coagulation limit ($> 5000 \text{ s}^{-1}$) of a pediatric patient with moyamoya disease (left) who presented with a right-sided stroke, and an age- and sex-matched control subject (right) at peak systole ($t = 0.3 \text{ s}$). Extreme WSRs (about 9 times higher than that in the control subject) in the blood vessels of the left side of the brain signify an increased risk of thrombus formation, potentially leading to ischemic events. This patient, for example, had a left-sided stroke two months later.

Biosystems Modeling for Personalized Medicine

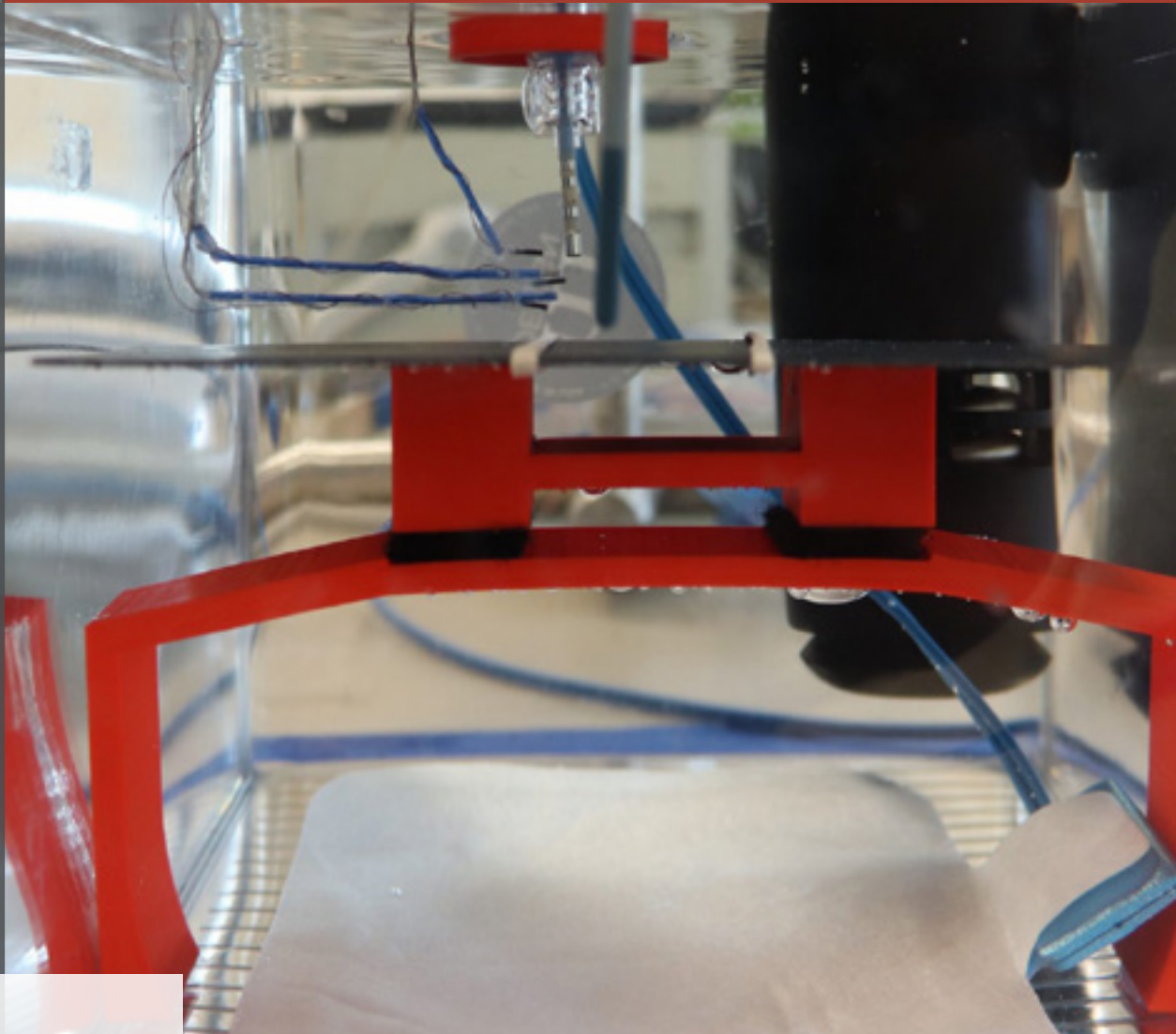
In an NIH-supported collaborative project with Texas Children's Hospital and the University of Texas Health Science Center Houston, an image-based computational modeling toolset was developed to noninvasively assess stroke risk in pediatric patients suffering from moyamoya disease (MMD), a cerebrovascular condition that causes narrowing of the arteries that supply the brain, leading to recurring ischemic and hemorrhagic strokes. By using the imaging data from a patient who had suffered a right-sided stroke, blood flow was simulated in the circle of Willis (CoW), a branch point that distributes oxygenated blood throughout the brain. This modeling illuminated several mechanisms that led to a subsequent left-sided stroke and that could be predictors of future stroke. Ideally, such patient-specific biosystems modeling could be used to help ensure that patients at risk of recurrent stroke are properly followed up and treated before strokes occur. The [study](#) was published in *Biomechanics and Modeling in Mechanobiology*.

"Angiograms of a normal pediatric brain and the brain of a patient with moyamoya disease with characteristic vessel that look like a 'puff of smoke' due to compensatory collateralization—the formation of extra blood vessels to make up for reduced blood supply to the brain. The dashed circle highlights the circle of Willis territory. Insets show a schematic of the cross-section of a normal artery and vessel occlusion."

— Shaolie S. Hossain, PhD
Assistant Investigator



Angiograms from a healthy subject (a) and a pediatric MMD patient (b). The patient's angiogram shows the characteristic "puff of smoke" due to compensatory collateralization. The dashed circle highlights the CoW territory. Insets show a schematic of the cross-section of a normal artery (c) and that of an MMD patient (d). Vessel occlusion in MMD results from a combination of hyperplasia of smooth muscle cells (*) and luminal thrombosis (arrow).



[VIDEO! The Heart Beat:
What's Next for XN Health?](#)



Above: TexCaLaBR – A Catheter Lab on-the-Bench

ELECTROPHYSIOLOGY

The [Electrophysiology Clinical Research & Innovations](#) (EPCRI) department provides infrastructure for translational and clinical cardiac arrhythmia research and innovation at the Texas Heart Institute. Led by Director [Mehdi Razavi, MD](#), EPCRI's team of physicians and research engineers focuses on translational research to develop novel devices and techniques to detect, manage, and treat various cardiac conditions, particularly heart-rhythm diseases. Importantly, the group shares their expertise in engineering and medical device development to help advance projects beyond cardiac applications, with the broader goal of improving healthcare outcomes and quality of life for patients. The team has helped make THI an internationally recognized leader in the field of cardiac arrhythmia research and management. This past year, they forged new partnerships with the TMC and accelerators, launched several new initiatives, and expanded existing research collaborations.

TexCaLaBR – A Catheter Lab-on-the-Bench

Clinical and preclinical settings provide only limited opportunity to directly evaluate and characterize the effects of ablation techniques on cardiac tissue. The EPCRI department has created TexCaLaBR, a versatile benchtop system for training physicians and testing ablation input parameters in an ex vivo, tissue-based experimental model. The team hopes that test studies performed using TexCaLaBR will yield insights that improve heart ablation techniques and reduce procedural complications, such as potentially life-threatening damage to the esophagus during ablation. Recently established relationships with the medical device companies Biosense Webster, Inc. and Boston Scientific have set the stage to initiate an electrophysiology physician-training program that will service the entire Southwest region of the United States.

Developing New Technology for Patients on Ventilation

Dr. Razavi and the engineers in EPCRI provided prototyping services to Houston-based XN Health as a part of the Roderick D. MacDonald Research Fund grant awarded to the EPCRI to advance the life-support weaning technology so critical to COVID-19 patients requiring ventilator support. The nerve-stimulation technology is designed to prevent a harmful side-effect of mechanical ventilation known as ventilator-induced diaphragm dysfunction (VIDD). THI and XN Health collaborated closely with TMC Innovation (TMCi), which filed a new patent with THI that is being licensed out to XN Health.

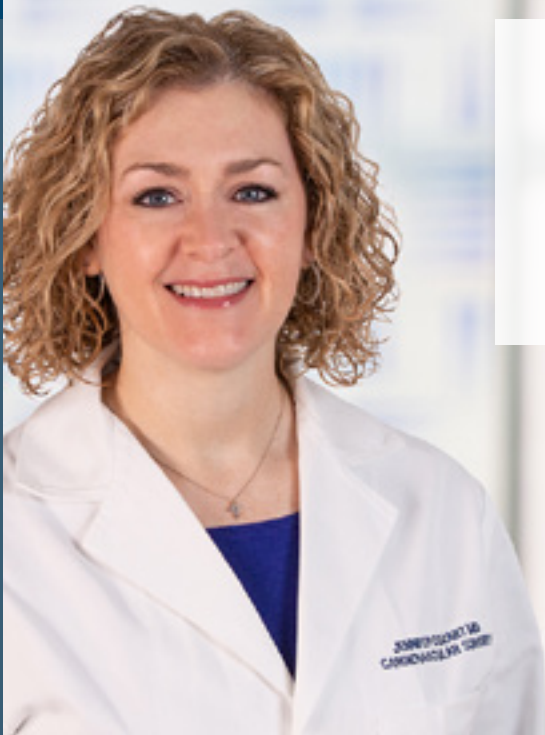
Clinical Research: Identifying Arrhythmia Triggers

EPCRI investigators and their collaborators have taken a big-data approach to understanding the factors that can trigger cardiovascular events, with an added emphasis on the effects of coronaviruses on the cardiovascular system. Over the past 7-8 years, THI Research Scientist Payam Safavi-Naeini, MD, has worked in collaboration with Mohammad Madjid, MD, at the McGovern Medical School at The University of Texas Health Science Center at Houston (now at the David Geffen School of Medicine, UCLA) to identify triggers of cardiovascular events.

The investigators analyzed the Zio cardiac-monitoring patch database, which contains data from more than 800,000 arrhythmia cases, to discover what role influenza plays in triggering different types of arrhythmias. In addition, the investigators reviewed the Medtronic database (which has data from more than 160,000 cases) to determine the extent to which influenza and COVID-19 can trigger arrhythmias. They published their findings in [JAMA Cardiology](#).

[JAMA Cardiology Review: COVID-19 and Potential Effects on the Heart & Vascular System](#)

4th most cited paper in *JAMA*, with more than 1400 citations.



“Atrial fibrillation affects over 33 million people around the globe, and we now have emerging technologies to treat advanced stages of the disease.”

— Jennifer Cozart, MD
Cardiothoracic and Vascular Surgeon

PROGRAM Atrial Fibrillation NEW SYSTEM

Clinical Practice: A Hybrid Atrial Fibrillation Program Is Born

Patients with long-standing persistent atrial fibrillation have been waiting for breakthrough treatments, and in 2021, a promising hybrid procedure gained U.S. Food and Drug Administration (FDA) approval to help patients in advanced stages of the disease. Abdi Rasekh, MD, and [Jennifer Cozart, MD](#), developed and implemented a new Hybrid Atrial Fibrillation Program at THI that leverages cutting-edge technologies.

The AtriCure EPI-Sense System enables a surgeon to perform minimally invasive, closed-chest epicardial ablation (ie, from outside the heart muscle) for patients with atrial fibrillation. In the hybrid procedure, this technique is combined with endocardial radiofrequency ablation (ie, from inside the heart) performed by an electrophysiologist. Results of the CONVERGE (Epi/Endo Ablation For Treatment of Persistent Atrial Fibrillation (AF)) clinical trial showed that use of the hybrid procedure was superior to endocardial ablation alone in patients with advanced atrial fibrillation. The FDA’s approval of the Epi-Sense system is aligned with the hybrid treatment program created by Drs. Cozart and Rasekh, demonstrating how collaborative efforts between cardiac surgeons and electrophysiologists can help to improve outcomes for these patients.

[Read About the New Program Here](#)





CELL THERAPY & CLINICAL TRIALS

The Texas Heart Institute (THI) [Center for Clinical Research](#) (CCR) supports all areas of cardiovascular clinical research, from protocol development to trial facilitation and post-trial assessment and reporting. Our team of experts supports clinical research management activities for all THI research departments, in addition to clinical research management activities outsourced by private-practice and academic clinicians. Currently, CCR supports clinical research in all areas of cardiovascular medicine, including cardiovascular surgery, electrophysiology, interventional cardiology, infectious disease, devices, pharmaceuticals, biologics, and diagnostics.

Clinical Research Goes Virtual During the Pandemic

THI CCR joined the fight against COVID-19 in 2020 and continued its efforts in 2021.

In the midst of COVID, CCR participated in the center's first DeCentralized Trial (DCT). The DCT study was an opportunity to bring a virtual, patient-centered approach to a traditional clinical trial design using diagnostic wearables, virtual patient interactions, and other forms of technology. THI participated in the **CHIEF-HF** (Canagliflozin: Impact on Health Status, Quality of Life and Functional Status in Heart Failure) DCT, which completed enrollment in 2021.

Therapeutics for Inpatients with COVID-19

Under the leadership of [Emerson C. Perin MD, PhD](#), who is serving as the study Principal Investigator, CCR is actively enrolling patients in a trial named **ACTIV-3 TICO** (A Multicenter, Adaptive, Randomized, Blinded Controlled Trial of the Safety and Efficacy of Investigational Therapeutics for Hospitalized Patients with COVID-19). Sponsored by the National Institutes of Health (NIH), TICO is a unique master protocol research platform used to evaluate the safety and efficacy of multiple investigational agents for treating patients with COVID-19. Investigational drugs being tested under the TICO platform of studies have included monoclonal antibodies, DARPIn proteins, and other antiviral drugs. TICO is a collaborative project with Baylor College of Medicine.

[Learn More About Our
Clinical Trials Here](#)



ACTIV-3TICO





INFLAMMATION Heart Attack & Stroke CELL THERAPY

“This cell therapy uniquely targets inflammation as a core mechanism of the disease and is designed to be an additive treatment option to what are already the best evidence-based heart failure medicines available to patients. I am extremely encouraged by these clinical findings that extend the benefits of cells to preventing heart attack and stroke in addition to having local benefits in the heart.”

– Emerson C. Perin, MD, PhD
Principal Investigator, DREAM-HF Trial



A New Direction for Cell Therapy

Treating inflamed hearts with cells may lead to broader health benefits

Cell therapy reduces risk of heart attack and stroke in heart failure patients with underlying inflammation –

(DREAM-HF; Efficacy and Safety of Allogeneic Mesenchymal Precursor Cells for the Treatment of Heart Failure) was presented by Emerson C. Perin, MD, PhD, at the American Heart Association 2021 Scientific Sessions. DREAM-HF is the single largest trial of cell-based therapy for heart failure, with 565 patients enrolled across 51 sites throughout the US and Canada with a mean follow-up of 30 months. In heart failure

patients on the best guideline-directed medical therapy, treatment with cells injected directly into their hearts proved to have local and systemic benefits. The study demonstrated reductions in heart attack and stroke of up to 80% in patients with high levels of inflammation. A pivotal phase III trial based on these findings is currently being planned and could shepherd in a new era in treatment strategies for heart failure patients. Cell therapies in ongoing trials at THI include treatments for drug-induced cardiomyopathy in cancer patients and for non-ischemic dilated cardiomyopathy. Also in

2021, **CONCERT-HF** (Combination of Mesenchymal and C-kit+ Cardiac Stem Cells as Regenerative Therapy for Heart Failure) trial results were published in the *European Journal of Heart Failure* and showed that directly injecting two different types of stem cells into the heart could reduce the risk of major cardiac adverse events and improve patients' quality of life. This study concluded THI's 12-year participation in the NIH-funded Cardiovascular Cell Therapy Research Network (CCTRN).

Continued Leadership in Stem Cell Clinical Trials

In conjunction with The University of Texas MD Anderson Cancer Center, the CCR is participating in a trial funded by the Texas Medical Center titled "Trial With MSCs vs Standard of Care in Cardiomyopathy: Randomized 3-Arm Trial with Standard of Care Alone vs Either Intravenous Infusion or Transendocardial Injection of Allogeneic Bone Marrow Derived Multipotent Mesenchymal Stromal Cells (MSCs) plus Standard of Care in Patients with Anthracycline-Associated Cardiomyopathy." This study is evaluating the safety of adding mesenchymal stem cells (MSCs) to standard-of-care drugs for patients with heart failure caused by anthracyclines (a type of chemotherapy drug). The stem cells are derived from the bone marrow of healthy donors. Patients receive MSCs injected into the heart through a catheter or in an IV.

CCR also is participating in a study funded by the US Department of Defense and sponsored by the University of Miami: A Phase IIB Randomized, Placebo-Controlled, Multicenter Study of the Comparative Efficacy and Safety of Transendocardial Injection of Allogeneic-MSC Versus Placebo in Patients with Non-Ischemic Dilated Cardiomyopathy (**DCM II**). The purpose of the DCM II trial is to determine whether giving allogeneic human mesenchymal stem cells (hMSCs) transendocardially to patients with nonischemic dilated cardiomyopathy (NIDCM) is safe and whether treatment with hMSCs produces greater improvement in heart function in some patients than in others because of their genetics. CCR is working closely with the Department of Stem Cell Transplantation and Cellular Therapy at MD Anderson Cancer Center, which is handling the processing of the stem cells for the research patients at THI.



Credit: Cody Duty

WOMEN-FOCUSED
Clinical Research
SINCE 2010



THI Center for Women's Heart & Vascular Health

Under the direction of [Stephanie Coulter, MD](#), the [THI Center for Women's Heart & Vascular Health](#) seeks to answer unmet clinical needs related to the prevention, diagnosis, and treatment of women's heart and vascular disease. THI Women's Center investigators, volunteers, and community partners strive to reduce the impact of heart disease on women and their families through a combination of outreach, patient and professional education, and research.

The Center has placed a special emphasis on women-focused clinical research since its founding in 2010, particularly through its ongoing **Houston HeartReach (HHR)** research registry. Women who attend HHR health screening events can consent to have their health data included in the registry; when their data is analyzed together, it can help identify heart disease trends and risk factors across an ethnically and culturally diverse population of women. The data also helps Women's Center investigators and their collaborators identify trends that will shape further hypothesis-driven research into the specific factors affecting women's cardiovascular health.

In 2021, the Women's Center embarked on two new areas of research that will benefit women *and* men. An extensive database was created to include all percutaneous valve procedures performed at the Texas Heart

Institute. This new database is the ideal tool to assess quality and outcomes from percutaneous valve procedures conducted at our institution. Multiple investigators are using the data to conduct outcomes studies or as a point of reference to evaluate new ways to approach valve disease.

Women's Center investigators are also taking a data-based approach to improve cardiovascular care for patients with obesity, which has reached epidemic proportions in America. Over 70% of the US population is currently considered overweight or obese. Self-reported obesity statistics by state show 16 states—including Texas—have populations with average body mass indexes (BMIs) above 25 kg/m². By race, Hispanic and Non-Hispanic Black people have the highest risk of obesity.

Obesity can cause high blood pressure, Type 2 diabetes, coronary heart disease, heart failure, and other health problems. Studies have found a relationship between higher BMI and mortality, but larger database analyses are needed to understand the impact of concomitant conditions on study findings. THI now aims to evaluate behavior and risk stratification in obese patients with cardiovascular disease by analyzing its database registry of over 186,000 surgical and cardiac cases. This new initiative will enable THI to develop a unique reference point for new guidelines and preventive measurements that could benefit obese patients who may be at higher risk with certain procedures.

Dr. Briana Costello and Dr. Stephanie Coulter discuss heart disease, increased risk with weight gain, heart attack, stroke, and more.



Stem Cell Policy Partnership: Texas Heart Institute and Rice University Baker Institute Continue Series

Texas Heart Institute Partners with Rice University's Baker Institute for Fifth Annual Stem Cell Policy Panel Session as Part of Ongoing Lecture Series


[Texas Heart Institute](#) has aligned its thought leadership in cardiology research with the internationally renowned [Baker Institute for Public Policy](#) at [Rice University](#) for an insightful and thought-provoking panel session. Dating back to 2016, the policy lecture series has covered various topics related to the intersection of stem cell research and public policy. This year's session focused on the importance of clinical trials, new data on uses of cell-based therapies to treat heart disease, and the risks associated with unproven stem cell treatments.

During the course of the virtual webinar, THI Medical Director [Emerson C. Perin, MD, PhD](#), and Mayo Clinic Associate Professor of Biomedical Ethics [Zubin Master, PhD](#), assessed the landscape for stem cell therapies and collectively reflected on how unproven stem cell treatments can negatively affect patient health, clinical research, and the perceptions of policymakers—ultimately slowing the development of future cell-based therapies.

The annual stem cell policy lecture series is co-sponsored by the Baker Institute's [Center for Health and Biosciences](#) and THI. Support for the program has been provided by a grant from the [George and Mary Josephine Hamman Foundation](#). To date, the series has held five events and produced two research papers. In 2019, the event *Texas' Stem Cell Future: Accessing Outcome Data from Experimental Interventions* was held at the Texas State Capitol in Austin, Texas.

A video recording of the May 2021 panel session can be accessed [HERE](#). All Past Events [HERE](#)

Read Related [Article](#) in the *Texas Heart Institute Journal*.

A photograph of Emerson C. Perin, MD, PhD, speaking at a podium. He is a middle-aged man with grey hair and a beard, wearing a dark suit jacket, a light blue shirt, and a red and white striped tie. He is gesturing with his right hand while speaking into a microphone. The background is a solid dark color.

*Emerson C. Perin, MD, PhD
Medical Director
Texas Heart Institute*

Credit: Michael Stravato for Rice University's Baker Institute

Professional Staff

The Texas Heart Institute Professional Staff consists of cardiologists, cardiovascular surgeons, scientists, and specialists in related disciplines who are committed to the educational and research mission of the Institute. THI Professional Staff members are approved by the THI Medical Executive Committee and THI Board of Trustees.

Leadership

Emerson C. Perin, MD, PhD, FACC
Stephanie Coulter, MD, FACC, FASE

THI Medical Executive Committee

Jennifer Cozart, MD
R. David Fish, MD
Joggy K. George, MD
Eduardo Hernandez-Vila, MD
Mehran Massumi, MD
Mehdi Razavi, MD
John Seger, MD
George Younis, MD



Physician Members - Cardiology

Jonathan Aliota, MD
Paolo E. Angelini, MD
Salman Bandeali, MD
Bruce E. Barnum, MD
Arthur W. Bracey, MD
Jie (Jay) Cheng, MD, PhD
Benjamin Cheong, MD
Andrew Civitello, MD
Patrick J. Cook, MD
Briana Costello, MD, FSCAI
Reynolds Delgado III, MD
Jorge Escobar, MD
Sayed F. Feghali, MD
Jorge Garcia-Gregory, MD

Joggy K. George, MD
Jorge Guttin, MD
Eduardo Hernandez-Vila, MD
Patrick Hogan, MD
Surendra K. Jain, MD
Zvonimir Krajcer, MD
D. Richard Leachman, MD
J. Alberto Lopez, MD
Roberto Lufschanowski, MD
Mehran Massumi, MD
Andres Mesa, MD
Maher M. Nasser, MD
Atasu K. Nayak, MD
Alireza Nazeri, MD

Emerson Perin, MD, PhD, FACC
Alexander Postalian, MD, FSCAI
Saleem Raslan, MD
Mehdi Razavi, MD
Joseph G. Rogers, MD
Mark Schnee, MD
John Segar, MD
Samar Sheth, MD
Neil Strickman, MD
John Tyler, MD
Robert P. Walmsley, MD
Amy Woodruff, MD
George Younis, MD

Physician Members - Cardiothoracic Surgery

William E. Cohn, MD
Jennifer Cozart, MD
O.H. Frazier, MD

Charles H. Hallman, MD
James J. Livesay, MD
Marc Moon, MD

Research Scientist Members

Ronald J. Biediger, PhD
L. Maximilian Buja, MD
Karla Campos-Arce
Chu-Huang (Mendel) Chen, MD, PhD
Gil Costas
Richard A. F. Dixon, PhD
Abdelmotagaly Mohamed
Elgalad, MD, PhD

Camila Hochman-Mendez, MSc, PhD
Shaolie S. Hossain, PhD
Ke Li, MD
Xiao Li, PhD
Shijie Liu
James F. Martin, MD, PhD
Dianna Milewicz, MD, PhD
Raja Muthupillai, PhD

Payam Safavi-Naeini, MD
Ana Maria Segura, MD, MPH
Heinrich Taegtmeier, MD, DPhil
Peter Vanderslice, PhD
Jun Wang, PhD
Darren G. Woodside, PhD
Yong-Jian Geng, MD

Physician Associates - Cardiology

David Aguilar, MD
Mahboob Alam, MD
Christie Ballantyne, MD
Yochai Birnbaum, MD
Jose Diez, MD
Sheila K. Heinle, MD
Srikanth Koneru, MD

Nilesh Mathuria, MD
Warren Moore, MD
Ajith P. Nair, MD
Joseph P. Navarajo, MD
Selby Oberton, MD
Juan Carlos Plana, MD
Abdi Rasekh, MD

Joanna Molina Razavi, MD
Mourad Senussi, MD
Scott R. Sherron, MD
Guilherme V. Silva, MD
Leo Simpson, MD
Raymond Stainback, MD

Physician Associates - CV Anesthesia

James M. Anton, MD
Joshua B. Cohen, MD
John R. Cooper, Jr., MD
Joseph Creo, MD
Jose Diaz-Gomez, MD, FCCM

Kishan Dwarakanath, MD
Katherine Gordon, MD
Kirk Jackson, MD
Ali Khalifa, MD
Wanda C. Miller-Hance, MD

Thomas Powell, MD
Daniel Tolpin, MD
Byron E. Tsusaki, DO

Physician Associates - Cardiothoracic Surgery

Subhasis Chatterjee, MD, FACS
Joseph S. Coselli, MD
Ravi Ghanta, MD
Scott A. LeMaire, MD

Kenneth Liao, MD
Gabriel Loor, MD
Vicente Orozco-Sevilla, MD
Ourania Preventza, MD, FACS, MBA

Todd K. Rosengart, MD
Alexis E. Shafii, MD

Physician Associates - Other

Barry R. Davis, MD, PhD
William Goins, MD

Diana Guerra, MD
Marcia A. Kielhofner, MD

Barry J. Zeluff, MD

THI Senior Leadership

Joseph G. Rogers, MD (President & CEO)

Emerson C. Perin, MD, PhD

Howard K. Schramm, MBA

Keri Sprung, MBA

Darren Woodside, PhD

Board of Trustees

Eric D. Wade (Chair)

Alfred C. Glassell, III (Vice Chair)

Members

Robert T. Blakely

Reed Morian

David M. Grimes, II

David A. Ott, MD

T. Douglas Lawson, PhD

Mark Parrington

Bradley T. Lembcke, MD

Randa Safady, PhD

Gina A. Luna*

Marc Shapiro***

Rodney H. Margolis**

Alan M. Speir, MD

Thomas McGinn, MD

Liz Youngblood, MBA, RN, FACHE

THI Board Trustee Emeritus

David M. Carmichael

Jerome E. Granato, MD

THI Board, Ex Officio

Joseph G. Rogers, MD

* Served through April 2022

** Served through December 2022

*** Joined April 2022



St. Luke's
Texas Heart Institute



Texas Heart Institute Journal

167 Countries

READING THE JOURNAL



>1.2 Million

UNIQUE READERS/YEAR



>1.8M

AVERAGE ARTICLE
PAGE VIEWS/YEAR



>4800

ORIGINAL ARTICLES
PUBLISHED ON PUBMED

Dr. Zvonimir Krajcer Assumes Role of Editor-in-Chief

In 2021, Zvonimir Krajcer, MD, assumed the role of Editor-in-Chief of the *Texas Heart Institute Journal*, a peer-reviewed journal published by THI as part of its medical education program.

Since 1974, the *Journal* has reached millions of readers around the world, with an emphasis on disseminating information to physicians in practice. For more information, visit texasheart.org/education/thi-journal.

The *THI Journal's* former editors—Drs. Robert J. Hall, James J. Ferguson III, and James T. Willerson—were committed to providing physicians and healthcare professionals with information related to all aspects of treating patients who have cardiovascular disease. Their standards for quality and integrity were high, and Dr. Krajcer will build upon the strong foundation they established.



Dr. Krajcer is an interventional cardiologist at the Texas Heart Medical Group, a member of THI's Professional Staff, and an active member of the THI Cardiovascular Disease Fellowship Program at Baylor St. Luke's Medical Center. He is an internationally recognized pioneer in his field and the Immediate Past President of the International Society for Endovascular Specialists (ISEVS).

Editorial Board and Consultants

Editor-in-Chief

Zvonimir Krajcer, MD

Associate Editors

Stephanie A. Coulter, MD
José G. Díez, MD
Emerson C. Perin, MD, PhD
Alexander Postalian, MD

Assistant Editors

Briana Costello, MD

Former Editors

Robert J. Hall, MD
James J. Ferguson III, MD
James T. Willerson, MD

Editorial Board

Ali F. AbuRahma, MD | *Charleston, West Virginia*
H. Vernon Anderson, MD | *Houston, Texas*
Paolo Angelini, MD | *Houston, Texas*
Gary M. Ansel, MD | *Columbus, Ohio*
Stephen R. Bailey, MD | *Shreveport, Louisiana*
Yochai Birnbaum, MD | *Houston, Texas*
Joseph S. Coselli, MD | *Houston, Texas*
Tony Das, MD | *Dallas, Texas*
Reynolds M. Delgado III, MD | *Houston, Texas*
O.H. Frazier, MD | *Houston, Texas*
Hemal Gada, MD | *Harrisburg, Pennsylvania*
Jaafer Golzar, MD | *Oak Lawn, Illinois*
Michael R. Jaff, DO | *Boston, Massachusetts*
John L. Jefferies, MD, MPH | *Memphis, Tennessee*
James J. Livesay, MD | *Houston, Texas*
Gabriel Loor, MD | *Houston, Texas*

Editorial Consultants

Benjamin Y.C. Cheong, MD | *Houston, Texas*
Richard A.F. Dixon, PhD | *Houston, Texas*
Eduardo A. Hernandez-Vila, MD | *Houston, Texas*
Roberto Lufschanowski, MD | *Houston, Texas*
Warren H. Moore, MD | *Houston, Texas*
Steven E. Nissen, MD | *Cleveland, Ohio*

Section Editors

Structural Heart Disease

Juan Carlos Plana, MD
Michael J. Reardon, MD

Electrophysiology

Gerald V. Naccarelli, MD
Mohammad Saeed, MD

Congenital Heart Disease

Dhaval Parekh, MD

Peripheral Vascular Disease

Miguel Montero-Baker, MD

Cardiovascular Surgery

Ourania Preventza, MD

Imaging

Srikanth Koneru, MD

Coronary Interventions

Alexander Postalian, MD
George A. Younis, MD

Carotid Artery Disease

Gary S. Roubin, MD

Cancer

Jean-Bernard Durand, MD

David D. McPherson, MD | *Houston, Texas*
Leslie W. Miller, MD | *Tampa, Florida*
Gustavo S. Oderich, MD | *Houston, Texas*
Constantino Peña, MD | *Miami, Florida*
William C. Roberts, MD, MACC | *Dallas, Texas*
Todd K. Rosengart, MD | *Houston, Texas*
Raymond F. Stainback, MD | *Houston, Texas*
Sherif Sultan, MD | *Galway, Ireland*
Vinod Thourani, MD | *Atlanta, Georgia*
Giovanni Torsello, MD | *Münster, Germany*
Ramon L. Varcoe, MBBS | *Randwick, Australia*
Ron Waksman, MD | *Washington, DC*
Christopher J. White, MD | *New Orleans, Louisiana*
Edward T.H. Yeh, MD | *Little Rock, Arkansas*
Thomas Zeller, MD | *Bad Krozingen, Germany*

Igor F. Palacios, MD | *Boston, Massachusetts*
Abdi Rasekh, MD | *Houston, Texas*
Mehdi Razavi, MD | *Houston, Texas*
Guilherme V. Silva, MD | *Houston, Texas*
Robert D. Simari, MD | *Kansas City, Kansas*

Fellowship Program and Faculty

Over the past 50 years, the THI Fellowship program has evolved and grown organically to meet the needs of our trainees while providing vital support to our clinical affiliate hospital. The fellows are deployed in a learning strategy that promotes excellence while improving patient length of stay and quality metrics at our hospital partner.

The structured curriculum has become the backbone of the cardiac unit at the Texas Heart Institute and promotes comradery between the fellows, faculty, and clinical staff. The Noon Conferences and institution-wide Cardiology Grand Rounds feature local, regional, and national leaders in their fields from around the country to enhance the academic experience.

The program structure benefits the learning environment, as faculty, fellows, and staff have the opportunity to jointly attend numerous educational lectures, case conferences, subspecialty conferences including cardiac catheterization, echocardiography, electrophysiology, heart failure, and STEMI conferences, journal clubs, quality/metrics sessions, and morbidity and mortality discussions.

“THI fellows are based at a single facility, which is a luxury for a fellowship program. Our institution-based fellowship program encourages the culture of a single institution and fosters collegiality among staff cardiologists, fellowship peers, nurses, and other support staff.”

— Stephanie Coulter, MD
Fellowship Program Director

Fellows

Texas Heart Institute is dedicated to training the next generation of physicians, researchers, and specialists. Meet the fellows currently participating in our various Fellowship & Residency programs.

Cardiovascular Disease Fellows

Javid Alakbarli, MD
Joseph Allencherril, MD
Anish Badjatiya, MD
Isabel Balachandran, MD
Adam Brouillard, MD
Jordan Gales, MD
Lauren Golden, MD

Milad El Hajj, MD
Michael Hermelin, MD
Kim-Trang Ho, MD
Sudeep Kuchibhotla, MD
Kaleb Lambeth, MD
Jason Liu, MD
Patrick Marcus, MD

Robert Paisley, MD
Saad Rehman, MD
Matthew Segar, MD
Mitch Tan, MD
Brian Yum, MD

Clinical Cardiac Electrophysiology Fellows

Gilad Birnbaum, MD
Grant Heberton, MD

Austin Howard, MD
Robert Paisley, MD

Interventional Cardiology Fellows

Robert Bagwell, MD

Michael Harms, MD

Numan Khan, MD

Thoracic Surgery Residents

Ahmed Ali, MD
Peral Baral, MD
Alin Cheran, MD
Matthew Egyud, MD

Sarah Foyil, MD
Nabeel Gul, MD
Mohammad Jafferji, MD
Abraham Katz, MD

Chibueze Onyemkpa, MD
Krishna Patel, MD
Vivekkumar Patel, MD
Hoang-Vu Tran, MD

Advanced Heart Failure & Transplant Medicine

Tamer Amer, MD

Salman Bandeali, MD

Cardiovascular Disease Faculty

The institute boasts a robust faculty of over 70 clinical cardiologists within every practice model, including single- and multi-subspecialty cardiologists, private, academic, and hybrid models. This provides a unique training opportunity for fellows in the program and is a large part of what makes our program outstanding. Stephanie Coulter, MD, FACC, is the Program Director for the THI Cardiovascular Disease Fellowship, and George Younis, MD, is the Associate Program Director.

Cardiovascular Disease Program Directors

Stephanie Coulter, MD, FACC, FASE George Younis, MD

Cardiology Subspecialty Fellowship Program Directors

R. David Fish, MD Mohammad Saeed, MD Andrew Civitello, MD

Cardiology Service Teaching Staff

David Aguilar, MD	Sheila K. Heinle, MD	Atasu K. Nayak, MD
Paolo E. Angelini, MD	Eduardo Hernandez-Vila, MD	David Paniagua, MD
Salman Bandeali, MD	Surendra K. Jain, MD	Dhaval Parekh, MD
Bruce E. Barnum, MD	Carlos Jessurun, MD	Emerson C. Perin, MD, PhD, FACC
Alexander Butkevich, MD	Zvonimir Krajcer, MD	Juan Carlos Plana, MD
Mihail G. Chelu, MD, PhD, FHRS	Wilson Lam, MD	Alexander Postallian, MD
Jie (Jay) Cheng, MD, PhD	D. Richard Leachman, MD	Rupa Puttappa, MD
Benjamin Cheong, MD	J. Alberto Lopez, MD	Abdi Rasekh, MD
Andrew Civitello, MD	Pablo Lozano, MD	Mehdi Razavi, MD
Patrick J. Cook, MD	Roberto Lufschanowski, MD	Mohammad Saeed, MD
Briana Costello, MD	Mehran Massumi, MD	Mark Schnee, MD
Stephanie A. Coulter, MD, FACC, FASE	Nilesh Mathuria, MD	John Seger, MD
Reynolds Delgado III, MD	Andres Mesa, MD	Priyanka Sen, MD
Jose Diez, MD	Michael McArdle, MD	Samar Sheth, MD
Sidney Edelman, PhD	Michael Mihalick, MD	Guilherme V. Silva, MD
Peter Ermis, MD	Madjid Mirzai-Tehrane, MD	Leo Simpson, MD
Jorge Escobar, MD	Joanna Molina Razavi, MD	Raymond Stainback, MD
Sayed F. Feghali, MD	Warren Moore, MD	Neil Strickman, MD
R. David Fish, MD	Ali Mortazavi, MD	Bernardo Treistman, MD
Joggy K. George, MD	Ajith P. Nair, MD	Robert P. Walmsley, MD
Jorge Garcia-Gregory, MD	Maher M. Nasser, MD	Amy Woodruff, MD
Mohammad Ghalichi, MD	Joseph P. Navarijo, MD	George Younis, MD

Electrophysiology Cardiology Teaching Staff

Mihail G. Chelu, MD, PhD, FHRS	Nilesh Mathuria, MD	Mehdi Razavi, MD
Jie (Jay) Cheng, MD, PhD	Joanna Molina Razavi, MD	Mohammad Saeed, MD
J. Alberto Lopez, MD	Abdi Rasekh, MD	John Seger, MD

Interventional Cardiology Teaching Staff

Paolo E. Angelini, MD	Eduardo Hernandez-Vila, MD	Priyanka Sen, MD
Salman Bandeali, MD	Surendra K. Jain, MD	Guilherme V. Silva, MD
Andrew Civitello, MD	Ali Mortazavi, MD	Leo Simpson, MD
Briana Costello, MD	Maher M. Nasser, MD	Samar Sheth, MD
Sayed F. Feghali, MD	Atasu K. Nayak, MD	Neil Strickman, MD
R. David Fish, MD	Emerson C. Perin, MD, PhD, FACC	Robert P. Walmsley, MD
Joggy K. George, MD	Alexander Postallian, MD	George Younis, MD

Advanced Heart Failure and Transplant Cardiology Teaching Staff

Alexander Butkevich, MD	Ajith P. Nair, MD	Ziad A. Taimeh, MD
Andrew Civitello, MD	Selby Oberton, MD	Lola Xie, MD
Reynolds Delgado III, MD	Priyanka Sen, MD	
Joggy K. George, MD	Leo Simpson, MD	

Echocardiology Teaching Staff

Stephanie Coulter, MD, FACC, FASE	Madjid Mirzai-Tehrane, MD	Rupa Puttappa, MD
Sheila K. Heinle, MD	Ali Mortazavi, MD	Raymond Stainback, MD
Carlos Jessurun, MD	Joseph P. Navarijo, MD	Amy Woodruff, MD
Michael Mihalick, MD	Atasu K. Nayak, MD	

Nuclear Teaching Staff

Pat Ford, MD Warren Moore, MD



THI School of Perfusion Technology

The THI [School of Perfusion Technology](#) was established in 1971 to train cardiovascular perfusionists, who play a critical role in operating the circulation equipment that sustains patients during open-heart surgery and other medical procedures. The school was the first of its kind to be accredited in the United States. Led by Director and Clinical Coordinator [Deborah Lowery Adams, LP, CCP](#), the program offers a post-baccalaureate certification in perfusion technology; this 18-month schedule combines academic coursework and clinical rotations to prepare trainees to become a Certified Clinical Perfusionist. In March 2021, the Perfusion School established an educational partnership with Dell Children's Medical Center and UT Health Austin to provide a unique clinical experience for student perfusionists in a pediatric setting. Perfusion students from THI will have the opportunity to perform a 4-week clinical rotation at Dell Children's Medical Center in Austin, Texas, in coordination with the Heart Transplant and Clinical Perfusion programs in Dell Children's Texas Center for Pediatric and Congenital Heart Disease.

School of Perfusion Technology Students

Amanda Anderson
Laura Baggaley
Reese Besse
Jocelyn Breckon
Garrett Corcoran
Alexander Diaz
Hillary Dressler
Joshua Finch
Jonathan French
Taylor Garcia
Kelsey Greiner
Kyle Guster
Sydney Kor
Frances Lewis
Esteban Lopez
Liming Luan
Mihail Moshailov
Duc Nguyen
Colby Robertson
Marshall Seals
Aarish Wadia
Zachary Wurtz



“SCIENCE ISN’T FINISHED
UNTIL IT IS COMMUNICATED.”

— SIR MARK WALPERT

Sharing scientific discoveries advances the Texas Heart Institute’s mission and contributes important knowledge to the field globally. The ultimate goal is to improve further discovery and share outcomes to advance patient care.

In 2021, Texas Heart Institute members published 354 articles in reputable scientific and medical journals around the world with the help of the Texas Heart Institute Scientific Publications, Visual Communications, Library & Learning Resource Center, and Continuing Medical Education support teams, who provide the researchers with professional, scientific editorial, and multimedia services.

OUR GLOBAL REACH



For over 40 years, THI's Office of Continuing Medical Education (CME) has been recognized as an accredited provider of relevant, effective, and practice-based CME activities that support the improvement of health care quality around the world. THI collaborates with its clinical partners to provide physicians and medical professionals with comprehensive and innovative CME activities that are designed to increase medical knowledge and skills and change practice behavior to improve patient care. These goals are accomplished by recruiting program directors and speakers for a series of high-quality CME offerings.

14 Accredited live virtual CME symposia

13 Regularly scheduled series

3 Journal CME activities

38 Online enduring programs certified

5,503 Physicians participated in THI's CME-accredited activities

3,434 Non-physicians participated in THI's CME-accredited activities

96 Physicians earned American Board of Internal Medicine Maintenance of Certification points from THI



240 Countries, Territories & Dependencies Accessing Website

400 Heart Health Topics & Articles in Spanish & English

THI Website 2021

Texasheart.org



8.1 Million Pageviews



5.5 Million Site Users



12.85 Million Organic Search Visits

Advisory Committee

Joseph G. Rogers, MD
President and CEO

Emerson C. Perin, MD, PhD
Medical Director

Howard K. Schramm, MBA
Chief Administrative Officer &
Chief Financial Officer

Darren G. Woodside, PhD
Vice President for Research

Keri Sprung, MBA
Vice President for
Communication and Education

Design & Layout

Heather M. Pierson, MA
Graphic Design Manager

Content Contribution & Editing

Sonya E. Fogg, MLS
Assistant Director of Digital
Communications

Christine A. Lanzisera, BA
Managing Editor
Texas Heart Institute Journal

Stephen Palmer, PhD, ELS
Manager and Senior Scientific
Medical Writer

Daynene M. Vykoukal, PhD
Assistant Director
Communications & Publications

Photography & Videography

Joseph C. Brewton
Videographer/Multimedia
Specialist

Ramon Bernal
Manager, Visual Communications
& Multimedia Productions

Ren-Nessa Clarke
Production Assistant



TEXAS HEART[®] INSTITUTE

6770 Bertner Avenue
Houston, Texas 77030

texasheart.org

FOLLOW US ON SOCIAL MEDIA



Facebook



Twitter



LinkedIn



flickr



Pinterest



YouTube



Vimeo



Instagram

 TEXAS HEART[®] INSTITUTE