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SURGERY POLIZE BATTON



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The mission of
The Thoracic Surgery
Foundation is to foster
the development of
surgeon-scientists in
cardiothoracic surgery;
increasing knowledge
and innovation to
benefit patient care.

The Foundation is the charitable arm of The Society of Thoracic Surgeons.



2020 TSF Annual Report thoracicsurgeryfoundation.org/donate

A Message from the President



Dear Colleagues, Patients, and Friends:

It has been my privilege to serve as President of The Thoracic Surgery Foundation (TSF) for the past year. Despite the economic and societal disruptions caused by the COVID pandemic, our Foundation's work was not halted. 2020, in fact, was a very successful year.

The Foundation received 66 applications from surgeon-scientists in 2020, further demonstrating the urgent need for research grant offerings. To meet

the demand, TSF issued \$680,000 in research awards. TSF research funding has steadily increased, and we aim to continue this trajectory. Research, education, and surgical outreach awards totaled \$1,047,500 for the year.

I would also like to personally thank each of you for stepping up to the plate for TSF. Surgeon donations hit an all-time high in 2020, topping almost \$359,000! This amount was matched by The Society of Thoracic Surgeons (STS), so thank you for helping us maximize this opportunity in a most difficult year.

Since the Foundation's inception, we have raised approximately \$19 million for cardiothoracic surgery initiatives. Because of generous donors like you, funds have supported 227 cardiothoracic surgery research and fellowship grants and 408 educational scholarships. The Foundation's established role as the charitable arm of STS has strengthened our fundraising potential and covered our administrative costs, so 100% of every dollar raised from you was directed toward award funding.

TSF is truly Your Foundation. Research grants, fellowships, and educational scholarships from TSF represent all of our disciplines (cardiac, general thoracic, and congenital) and surgeons at all career stages. The Foundation's awards have been instrumental in developing hundreds of young surgeons by providing the support needed for their career advancement. These awards also have been important stepping stones in furthering innovation in cardiothoracic surgery.

You can read recipient testimonials about the impact of their awards, as well as other Foundation accomplishments, in this Annual Report. It is an incredible and lasting footprint within our profession, and we could not have accomplished this without your help.

Thank you for your continued support.

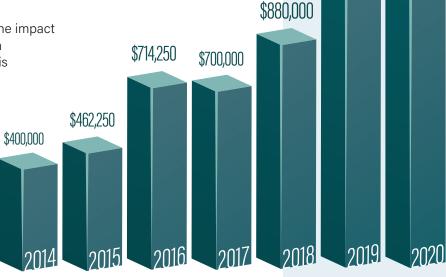
Joseph E. Bavaria, MD, FRCS(Ed) 2019-2021 TSF President



TSF TOTAL AWARDS DISPERSED

\$1,296,600* \$1,047,500

\$1,141,500



* 2020 total would have been \$1,296,600, but due to COVID-19, some grants were not awarded.

2020 TSF Award Offerings



Research Awards

TSF Research Award

This award provides operational support of original research efforts by cardiothoracic surgeons who have completed their formal training and who are seeking initial support and recognition for their research program. Awards of up to \$40,000 per year for a maximum of 2 years are granted to support the work of early career cardiothoracic surgeons (within 7 years of first faculty appointment at the time of application deadline).

STS Research Award

This award provides operational support of original research efforts by cardiothoracic surgeons who have completed their formal training and who are seeking initial support and recognition for the research program. Awards of up to \$40,000 per year for a maximum of 2 years are granted to support the work of early career cardiothoracic surgeons (within 7 years of first faculty appointment at the time of application deadline). The STS Research Award designation is given to the highest-ranking research application awarded by TSF based on merit as judged by a rigorous peer-review process.

Nina Starr Braunwald Research Fellowship Award

This award supports up to \$30,000 per year for a maximum of 2 years for a female resident working in a cardiac surgical clinic or laboratory research program who has not yet completed cardiothoracic surgical training.

STSA Resident Research Award

This award provides up to \$30,000 per year for a maximum of 2 years to support a research fellowship for a resident who has not yet completed cardiothoracic surgical training. During the fellowship, the resident will work in a cardiothoracic surgical clinical or laboratory research program. Membership in the Southern Thoracic Surgical Association (STSA) is not required; however, applicants must meet STSA membership eligibility requirements.

TSF Resident Research Fellowship Award

This award provides up to \$30,000 per year for a maximum of 2 years to support a research fellowship for a resident who has not yet completed cardiothoracic surgical training. During the fellowship, the resident will work in a cardiothoracic surgical clinical or laboratory research program.

The American Lung Association (ALA)/TSF Lung Cancer Research Award

This award provides support to investigators conducting research related to lung cancer. Awards of up to \$40,000 per year for a maximum of 2 years are granted to support the work of early-career cardiothoracic surgeons, pulmonologists, or research scientists. This award is co-sponsored by TSF and the American Lung Association.

Education Awards

Advanced Robotic Cardiac Surgery Fellowship*

This award provides \$25,000 to a surgeon and their institution to support and facilitate the successful initiation of a high-quality robotic cardiac surgery program at his/her home institution. The applicant and first assistant must have attended an STS course on robotic surgery, meet specific requirements confirming institutional support and resources, and have experience performing mitral valve repair and replacement and/or have significant off-pump coronary artery bypass experience. This fellowship is supported by the generosity of Intuitive.

Carolyn E. Reed Traveling Fellowship Award

Carolyn E. Reed, MD, was a cardiothoracic surgeon, educator, and successful researcher who died while still in her prime. She served as the first female chair of The American Board of Thoracic Surgery (ABTS) and also was president of STSA and STS (posthumously). This award in her name provides support of up to \$10,000 for a clinically established female cardiothoracic surgeon or resident in her last year of cardiothoracic surgery residency to travel to another institution for the purpose of learning a new skill or technology.

Michael J. Davidson Structural Heart Fellowship Award

Michael J. Davidson, MD, was an outstanding cardiothoracic surgeon and teacher who was murdered in January 2015 at Brigham and Women's Hospital in Boston. The tragedy profoundly affected the cardiothoracic community and brought to light Dr. Davidson's achievements in mastering sophisticated catheter skills and advocating for a future that would meld the cardiac catheterization lab with the operating theater. This award in his name provides annual support of up to \$50,000 for a deserving young early career cardiothoracic surgeon (within 7 years of first faculty appointment at the time of application deadline) committed to the vision of innovative and collaborative cardiovascular care that Dr. Davidson helped pioneer.

*Canceled in 2020 due to COVID-19

Education Awards (continued)

Robert L. Replogle Traveling Fellowship Award

Robert L. Replogle, MD, was a talented pediatric cardiac surgeon, as well as an educator, researcher, and national leader in cardiothoracic surgery. The purpose of the Replogle Fellowship is to facilitate the continuing education of deserving young faculty surgeons or residents committed to the treatment of congenital heart disease in neonates, infants, children, and adults. The award is intended for travel to another institution for the purpose of learning a novel technique, adapting innovative technology, and/ or fostering collaboration among surgical investigators in order to further the progress of congenital heart surgery at the recipient's home institution. This award in Dr. Replogle's name provides support of up to \$10,000 for a maximum of 2 weeks for early career congenital heart surgeons who are within 7 years of ACGME-accredited congenital heart surgery fellowship completion (or its equivalent).

Sarns Terumo Perfusion Education Fellowship Award

The purpose of the Sarns Terumo Perfusion Education Fellowship is to facilitate the continuing education of a deserving board-certified perfusionist who is committed to expanding cardiovascular perfusion education and knowledge. This \$10,000 award will support travel to another institution for the purpose of learning unique techniques, simulation approaches, and innovative technology to improve care for cardiothoracic surgery patients at the recipient's home institution. This fellowship is supported by the generosity of Terumo and Rich and Norma Sarns.

Saha Scholarship (New in 2021)

This scholarship provides the opportunity for two cardiothoracic surgery residents, one from India and one from North America (United States or Canada), to attend the STS Annual Meeting. The award covers the cost of registration (including the President's Reception), lodging at an STS Annual Meeting block hotel (3 nights), meals, ground transportation (taxi service), and coach class air transportation. This award is made possible by the generosity of Sibu P. Saha, MD, MBA.

Leadership Awards

Alley-Sheridan Scholarships*

Ralph D. Alley, MD, was a Founder Member of STS and served as its 1975–1976 President. David Sheridan was an inventor and close friend of Dr. Alley, who held more than 50 patents for innovations that have improved health care. Moved by his collaborator and friend's commitment to cardiothoracic surgery, Sheridan created the Alley-Sheridan Fund, which provides scholarships of \$2,500 toward the cost of tuition to attend the Leadership Program for Health Policy and Management at the Heller School of Public Policy and Management at Brandeis University in Massachusetts.

Levi Watkins Innovation and Leadership Development Scholarship

Levi Watkins, MD, was an accomplished cardiothoracic surgeon and social activist at The Johns Hopkins Medical Center who made medical history by working with innovative physicians and engineers to implant the first automated internal cardiac defibrillator in a human being. The Watkins Scholarship supports travel to a center of excellence for the purposes of acquiring clinical, translational, or leadership training to enhance skills and practice in an area of innovation or surgical significance. This award in Dr. Watkins's name provides support of up to \$5,000 for a maximum of 2 weeks for cardiothoracic surgeons (within 7 years of first faculty appointment at the time of application deadline).

Surgical Outreach Awards

TSF Every Heartbeat Matters Award

The Foundation, through the generosity and philanthropy of the Edwards Lifesciences Foundation, offers support of up to \$37,500 for qualified surgeons with proven track records of volunteer experience conducting charity work for underserved regions/populations. Awards are designed to provide support for sustainable programs that educate, screen, and/or treat underserved populations to reduce the global burden of heart valve disease or support other programs that advance health care and address underserved populations.

TSF Travel Awards*

These awards of \$1,000 provide cardiothoracic surgeons who treat underserved patients and demonstrate a financial need with the opportunity to attend the STS/EACTS Latin America Cardiovascular Surgery Conference. Underserved people are those who have a health disparity as defined by the Centers for Disease Control and Prevention and lack awareness of, or access to, medically appropriate health care. These scholarships are made possible by the Edwards Lifesciences Foundation and W.L. Gore & Associates.

TSF International Medical Volunteer Scholarship*

The Foundation, through the generosity and philanthropy of the Edwards Lifesciences Foundation, offers travel scholarships of \$2,500 for qualified cardiothoracic surgery residents and early career cardiothoracic surgeons (within 7 years of CT surgery residency completion) who wish to gain a global cardiothoracic surgery volunteer experience under the mentorship of experienced surgeon volunteers. TSF International Medical Volunteer Scholars will have the opportunity to join a TSF International Cardiac Surgical Outreach Award mission trip team.

TSF Research Awards Program



A message from the Research Chair

TSF Research Awards support the development of academic and research careers of the future leaders in cardiothoracic surgery. These awards identify, promote, and fund talented young cardiothoracic surgeons and residents working to create the future of our specialty through research and innovation. This year, the Foundation funded \$680,000 in research awards supporting projects in topics as diverse as improving the outcomes of heart transplantation through the induction of tolerance and mitochondrial transplantation, the use of artificial intelligence/machine learning for echocardiogram interpretation and risk stratification, and cell transfer as a therapy for lung cancer. These and other innovative projects funded by TSF will have a profound impact on our specialty and improve the care of our patients.

Grants from TSF are funded through contributions by hundreds of cardiothoracic surgeons, STS, and numerous corporations. Their philanthropy and generosity allow these outstanding researchers to implement their ideas and further their careers. Since its inception, TSF funding has provided the initial support that later allowed multiple cardiothoracic surgeons to attract larger grants by the National Institutes of Health, National Science Foundation, and other agencies.

I'd like to recognize the selfless efforts and dedication of the TSF Research Committee. Members spent innumerable hours reviewing, scoring, and discussing the 2020 Research Award applications, which will help promote cardiothoracic surgery research, accelerate the careers of our future leaders, and—most importantly—the care of our patients.

I'd also like to congratulate the 2020 TSF Research Award recipients, who are acknowledged in this report, and express my most profound gratitude to the donors, and TSF as a whole, for the privilege and honor to serve as Chair.

Juan A. Crestanello, MD 2020 TSF Research Chair





Arman Arghami, MD Pavan Atluri, MD Faisal G. Bakaeen, MD Ankit Bharat, MD Matthew J. Bott, MD Yvonne M. Carter, MD Edward Cantu III, MD Juan A. Crestanello, MD* Jonathan D'Cunha, MD, PhD Elizabeth A. David, MD Jessica S. Donington, MD Cherie P. Erkmen, MD Farhood Farjah, MD Mark K. Ferguson, MD Mario F.L. Gaudino, MD Ravi K. Ghanta, MD

Danielle Gottlieb Sen, MD
James Jaggers, MD
Tsuyoshi Kaneko, MD
Robert L. Kormos, MD
Mark J. Krasna, MD
Bradley G. Leshnower, MD
Kevin W. Lobdell, MD
Stephen H. McKellar, MD
Meena Nathan, MD
David D. Odell, MD
Sahar Saddoughi, MD, PhD
Toshiharu Shinoka, MD, PhD
Mark S. Slaughter, MD
Ram Kumar Subramanyan, MD, PhD
Paul C. Tang, MD

Patricia A. Thistlethwaite, MD, PhD

Frederick A. Tibayan, MD
Robert F. Tranbaugh, MD
Elaine Tseng, MD**
Harma K. Turbendian, MD
Prashanth Vallabhajosyula, MD
Jennifer D. Walker, MD
Grayson H. Wheatley III, MD
Abby White, MD
Bryan A. Whitson, MD, PhD
Dennis A. Wigle, MD, PhD
Berhane Worku, MD
Bo Yang, MD, PhD
Sai S. Yendamuri, MD
Joseph B. Zwischenberger, MD

*2020 TSF Research Chair **2020 TSF Vice Research Chair

2020 Research Award Recipients



"I am deeply grateful to TSF for this award which will allow me to explore complex interactions of cancer-associated macrophages in the surrounding tumor microenvironment. We hope to identify novel pathways and targets that will improve outcomes in advanced-stage lung malignancies."

Feredun S. Azari, MD

Hospital of the University of Pennsylvania, Philadelphia

"Tumor-Associated Neutrophils (TANs) - A Key Player in the Tumor Microenvironment?"

TSF Resident Research Fellowship Award, \$60,000

"Funding from this award supports important translational research on protective and therapeutic measures to improve the recovery and function of donor hearts after circulatory death.



This award also supports my career as a surgeon-scientist, focused on improving the lives of my patients from the bench to the operating room."

Renee M. Cholyway, MD

Virginia Commonwealth University, Richmond

"Mitochondrial Transfusion to Recover Function in Donor after Circulatory Death Hearts"

STSA Resident Research Award, \$48,000



"I am extremely grateful to TSF for this award. It will not only support my current project to improve automatic TTE interpretation, but also help launch my career incorporating automation and

machine learning in the care of cardiac surgical patients."

Keith A. Dufendach, MD

University of Pittsburgh Medical Center, PA

"Weakly Supervised Machine Learning for Automated Transthoracic Echocardiogram Interpretation"

TSF Resident Research Fellowship Award, \$60,000

"This grant will allow us to fabricate and test a new generation of patch designed for heart valve repair that replicates the architecture and the function of a native valve leaflet. We hope that these results will allow us to develop a new generation of biomimetic biomaterials that can be used to perform surgical valve repair with a better long-term durability."

David M. Kalfa, MD, PhD

Columbia University, New York, NY

"Development of an Innovative Biomimetic Patch to Improve the Durability of Valve Repairs"

TSF Research Award, \$80,000





This grant allows us to merge catheter-based skills with extracorporeal membrane oxygenation. We hope it will allow transplant clinicians an elegant way to bridge high-risk patients to lung transplantation. The transseptal cannulation strategy may also be a platform for use in other clinical situations."

Ian A. Makey, MD Mayo Clinic, Rochester, MN "Atrial Transseptal ECMO Cannulation" TSF Research Award, \$40,000





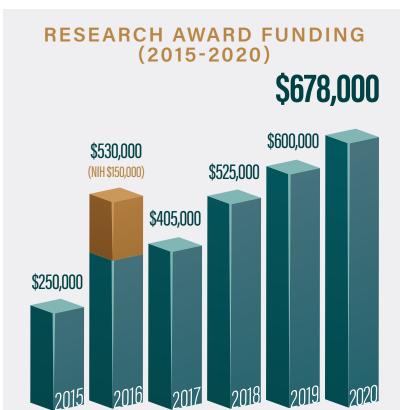
"I am honored to receive this prestigious and impactful award, which will provide support for important translational research on mechanisms of long-term induction of tolerance in

heart allografts, with the ultimate goal of improving the lives of heart transplant recipients. I would like to express my appreciation to TSF and my mentor, Dr. Joren Madsen, for this tremendous opportunity."

Cynthia L. Miller, MD Massachusetts General Hospital, Boston

"Induction of Heart Allograft Tolerance in Cynomolgus Macaques via En Bloc Thymus Transplantation"

Nina Starr Braunwald Research Fellowship Award, \$60,000



"I feel honored to be awarded the Nina Starr Braunwald Research Award. Dr. Braunwald was a pioneer and trailblazer whose career opened the doors to so many before me. I am humbled to be a part of this legacy and only hope that I can richly pay it forward as I advance in my career. I am grateful to TSF and my mentors and colleagues at MGH and The University of Texas Medical Branch at Galveston for their continued support of my work."

Navyatha Mohan, MD

Massachusetts General Hospital, Boston

"Leveraging Machine Learning Algorithms to Develop Risk Models in Cardiac Surgery"

Nina Starr Braunwald Research Fellowship Award, \$30,000





"I am honored to be recognized among the distinguished ranks of previous awardees. Receipt of this award is a reflection of the unwavering support I've had from my family and mentors. TSF's generosity validates my aspirations of becoming a surgeon-scientist, but the greater impact of this grant allows us the opportunity to broaden the applications of stem cell therapy in thoracic disease."

Albert C. Pai, MD

University of Iowa Hospitals and Clinics, Iowa City

"Effects of Severe Lung Injury from Airway Stem Cell Implantation"

TSF Resident Research Fellowship Award, \$30,000





"This award will help fund my investigations focused on achieving cardiac allograft tolerance in non-human primates. These studies could someday result in more patients receiving heart transplants and the transplants lasting longer. In terms of my career, it will serve as an important stepping stone towards my goal of becoming an academic congenital cardiac surgeon."

Parth M. Patel, MD

Massachusetts General Hospital, Boston/Emory University, Atlanta, GA

"Achieving Tolerance in NHP Heart Transplant Recipients with Donor Exosomes"

TSF Resident Research Fellowship Award, \$30,000



"This support will allow our team to continue developing next-generation immunotherapy in the form of enhanced cellular products for adoptive T-cell transfer therapies. Through these efforts, we strive to improve the antitumor efficacy of metastatic tumor-reactive T cells and translate basic research findings for the treatment of advanced lung cancer."

Adam C. Soloff, PhD

University of Pittsburgh, PA

"Enhancing the Functionality of T Cells for Next-Generation Adoptive Cell Transfer Therapy for Advanced Lung Cancer"

American Lung Association/TSF Lung Cancer Research Award, \$80,000



"My principal research aim is to extend the application and improve the therapeutic potential of heart transplantation for children and adults with a specific focus on novel preservation strategies and cellular-based therapies for both myocardial injury prevention and rehabilitation. I am sincerely grateful to TSF and STS for the support of our research."

Matthew L. Stone, MD, PhD University of Colorado School of Medicine, Aurora

"Improving Heart Transplantation Outcomes with Sphingosine-Targeted Therapies"

STS Research Award, \$80,000



"I am honored to have been the recipient of the TSF Research Award and would like to thank the Foundation and its donors for their generous support. Realizing the significant challenge of obtaining National Cancer Institute funding as a surgeon-scientist, this financial support will be critical to strengthen our preliminary data for future successful federal grant submissions."

Matthew D. Taylor, MD

Penn State College of Medicine, Hershey

"Targeting Metastasis Suppressor 1 Regulation as a Novel Therapy for the Prevention of Metastasis in Lung Adenocarcinoma"

TSF Research Award, \$80,000

2020 Education Award Recipients

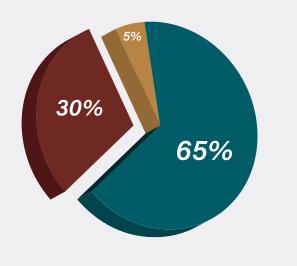


'Men, women, and children with heart diseases in sub-Saharan Africa are among the most underserved patient populations in the world. I am delighted to receive this award that will be used to fund travel to the Madgi Yacoub Heart Center in Aswan, with the aim of discovering how we may learn from each other to more effectively meet the needs of patients who suffer with heart diseases in this region."

Robert C. Groom, MS, CCP, FPP Tenwek Hospital, Bomet, Kenya

Sarns Terumo Perfusion Fellowship Award, \$10,000

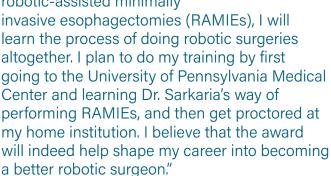
2020 AWARDS DISPERSED BY TYPE - TOTAL \$1,047,500



Research	\$678,000
Surgical Outreach (Underserved Regions)	\$315,000

Education. \$54,500

"I am extremely honored and thrilled to receive the Carolyn E. Reed Traveling Fellowship Award. It will give me an opportunity to enhance my robotic skills at a prestigious institution, where, besides just learning to perform robotic-assisted minimally



Puja G. Khaitan, MD MedStar Washington Hospital Center, DC "Robotic Esophageal Surgery"

Carolyn E. Reed Traveling Fellowship Award, \$7,000



"I would like to thank the TSF committee for awarding me this fellowship." I am very humbled and grateful to TSF for allowing young surgeons such great opportunities. I am extremely excited to visit Stanford and learn techniques for unifocalization and complex single ventricle VADs."

Raghav A. Murthy, MD Mount Sinai Hospital, New York

"Management of MAPCAs, Complex Tracheal Surgery, and Complex Single Ventricle VADs"

Robert L. Replogle Traveling Fellowship Award, \$10,000





"I am honored to receive the TSF Robert L. Replogle Traveling Fellowship Award. This opportunity will improve my clinical and operative skills related to the Cone operation for Ebstein anomaly and strengthen

the relationship between Nemours Children's Hospital and the University of Pittsburgh. In an era where congenital heart surgeons and programs are under intense scrutiny, partnerships like this one, and the collaborative quality improvement opportunities that will result, are exceedingly valuable. I am excited and honored to learn from world experts in the Cone procedure, and I am confident that my patients will benefit."

Jennifer S. Nelson, MD
Nemours Children's Hospital, Orlando, FL
"Cone Repair for Ebstein Anomaly"

Robert L. Replogle Traveling Fellowship Award, \$10,000

"I am so grateful for the support of TSF in awarding me the Carolyn E. Reed Traveling Fellowship. This award will allow me to learn new techniques to treat and study early stage esophageal cancer; I feel incredibly



privileged to have this opportunity to honor the legacy of Dr. Reed and follow in her passion to treat patients with esophageal cancer; for scientific research in this field. Thank you to everyone who has donated in Dr. Reed's honor and to the selection committee which has made this experience possible for me."

Uma M. Sachdeva, MD, PhDMassachusetts General Hospital, Boston

"Resection and Lab-Based Techniques for Treatment and Study of Early Stage Esophageal Cancer"

Carolyn E. Reed Traveling Fellowship Award, \$10,000

2020 Leadership Award Recipients



"It is an honor to receive the Levi Watkins Innovation and Leadership Development Scholarship. Dr. Watkins was a pioneer, innovator, and social activist whose contributions shaped the lives of many cardiac surgery patients and paved the way for countless cardiothoracic surgeons. My plan is to carry on the legacy of Dr. Watkins in the subspecialty of congenital heart surgery with a specific focus on pediatric mechanical circulatory support (MCS). Through my experience at Texas Children's Hospital, one of the busiest centers for MCS, I will acquire expertise in some of the innovative techniques for ventricular assist devices implantation in single ventricle patients."

Immanuel I. Turner, MD

Joe DiMaggio Children's Hospital Heart Institute, Hollywood, FL

"Innovation in Mechanical Circulatory Support"

The Levi Watkins Innovation and Leadership Development Scholarship, \$5,000

TSF Every Heartbeat Matters Award

\$29,000



Ganesh Kumar K. Ammannaya, MD Lokmanya Tilak Municipal Medical College & General Hospital Underserved Region: India



Jessica Forcillo, MD Montreal University Hospital Centre Underserved Region: South Africa



Reza A. Khodaverdian, MD Eisenhower Medical Group Underserved Region: Nigeria



Mubashir A. Mumtaz, MD UPMC Pinnacle Underserved Region: Pakistan



Harma K. Turbendian, MD University of Pittsburgh Medical Center – Wolfson Children's Hospital Underserved Region: Armenia

\$30,000



Carmelo A. Milano, MDDuke University
Underserved Region: Honduras

\$35,000



Adanna C. Akujuo, MD Albany Medical Center Underserved Region: Nigeria



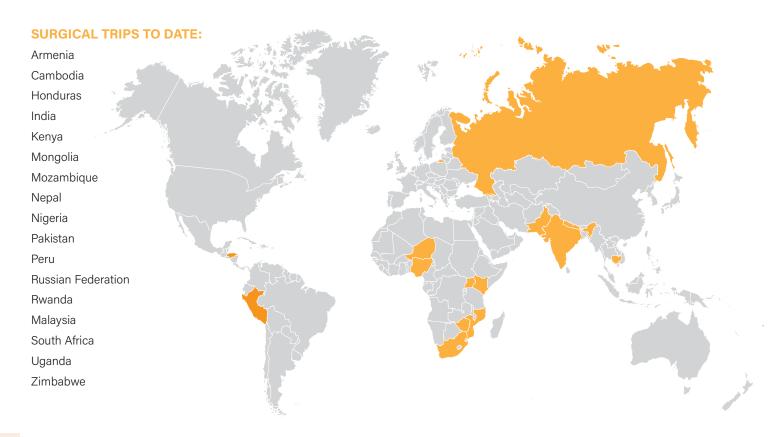
Zachary O. Enumah, MDCardiac Surgery Intersociety Alliance
Underserved Region: Sub-Saharan Africa



Lyle D. Joyce, MD, PhDMedical College of Wisconsin
Underserved Region: Kenya



Jay D. Pal, MD, PhD University of Colorado Underserved Region: Nepal





In March 2020, with support from the TSF Every Heartbeat Matters program and other charitable organizations, Craig Sable, MD, Pranava Sinha, MD, and others from Children's National Health System in Washington, DC, carried out a lifesaving surgical mission trip to Uganda.

The mission continued a 20-year effort to advance heart surgery in the East-Central African nation and focused primarily on children with heart valve disease.

Rheumatic heart disease (RHD) impacts more than 39 million people globally, causing approximately 300,000 deaths per year. RHD is the result of frequent, untreated streptococcal throat infections in childhood that ultimately cause the body's immune system to damage heart valves. Although preventable, the majority of the world's children live in impoverished and overcrowded conditions, where a lack of medical care leads to advanced disease.

An RHD registry in Uganda includes more than 600 children. Approximately 40% will die within 4 years; the median survival time from enrollment in the registry is only 9 months. For these patients, heart surgery is the only viable solution for long-term survival and normal quality of life.

Although the Uganda Heart Institute (UHI) has been performing one or two heart valve surgeries every

2 weeks over the last few years, this trip allowed for additional skill transfer, treatment of more complex patients, and an increased surgical capacity. The ultimate goal is for UHI to perform at least 1,000 annual operations. In addition, the mission trips enable groundbreaking research focused on the prevention of RHD within the next few decades.

For the March 2020 trip, eight cases were scheduled, including seven children (18 months to 18 years of age) and one adult. A portion of the team arrived first to work out the necessary logistics; however, before the remainder of the team was scheduled to arrive, COVID-19 cases in the US soared from a few hundred to several thousand. Uganda, which had no confirmed cases at the time, closed its borders to US citizens, making it impossible for the rest of the team to arrive. In addition, a travel ban implemented by the US threatened to make it difficult for the five team members already in Uganda to return home if they remained.

Despite this threat, the team stayed because patients and families had been waiting for heart surgery for months or even years. The team ultimately operated on five patients, rescheduled the other three, and had the UHI local team step up their involvement in the cases—all were successful.

Your Funds at Work

I would like to thank TSF for awarding me the Robert L. Replogle Traveling Fellowship, which I used to spend 2 weeks at the Lucile Packard Children's Hospital Stanford in Palo Alto, California. Apart from being a magnificent facility, the people working at this institution make this place phenomenal. Dr. Frank Hanley and his team run the best pediatric cardiac surgery program I have ever witnessed. The variety and complexity of the cases I observed here has provided me with several fresh perspectives on these diseases. I also was very excited to pick up special technical skills that I will incorporate into my surgical practice.

Raghav A. Murthy, MD

TSF Award Helps Advance AI, Machine Learning Research



Arman Kilic, MD

In 2019, Arman Kilic, MD, from the University of Pittsburgh in Pennsylvania, received the TSF Research Award. This 2-year award is being used to research artificial intelligence (AI) and machine learning in cardiothoracic surgery in the hopes of improving risk prediction and patient outcomes.

Al and Its Place in CT Surgery

Al is part of a growing field that incorporates a variety of algorithms to model data and predict outcomes. Machine learning is a form of Al that refers to the ability of systems to learn from data, identify patterns, and automate analytic model building.

According to Dr. Kilic, there is a huge and largely untapped potential for both in clinical medicine. He has a longstanding interest in clinical risk modeling and big data, and the rapidly expanding application of AI and machine learning to health care spurred his interest in applying these tools to cardiac surgery, where risk modeling plays an important role.

The alignment between Dr. Kilic's research background and experience, as well as the growing potential of Al in medicine was further augmented by the collaborative environment in which Dr. Kilic found himself. "I've been fortunate to have world-class collaborators who are internationally recognized experts in Al," he said.

Risk prediction in adult cardiac surgery is important because it can have profound implications. For example, the current STS National Database risk models are able to accurately state that 10% of a certain population will have operative mortality, but cannot identify specifically which patients are included in that percentage, Dr. Kilic explained. This is an area in which AI and machine learning may be able to make a difference.

This research examines machine learning algorithms to help identify risk prediction in adult cardiac surgery. Dr. Kilic said he hopes that, through the use of machine learning, surgeons will be able to provide individualized counseling to cardiac patients and determine whether there are more sophisticated methods of risk modeling in adult cardiac surgery.

Dr. Kilic envisions AI and machine learning impacting cardiothoracic surgery in several other ways, particularly how it relates to predictive analytics, automated imaging interpretation, and natural language processing.

According to Dr. Kilic, the ability to improve the predictive performance of imaging tests using Al and machine learning will be worthwhile. Chest x-rays, echocardiograms, and angiography routinely are used in cardiothoracic surgery, thus the ability to develop Al algorithms and software to interpret these representations with acceptable accuracy and improved efficiency would be appealing, especially from a triaging perspective. "There would likely be financial, logistical, and patient care benefits," he said.

In the project's first year of research, the team has collected and analyzed data from more than 11,000 patients undergoing cardiac surgical operations. The initial findings culminated in a manuscript published in *The Annals of Thoracic Surgery*.

"We continue to work on refining and working with these algorithms, and applying them to various outcomes," Dr. Kilic said. The STS National Database—considered the gold standard in clinical outcomes registries—has served as a major data source for research.

Importance of TSF Research Award

Receiving the 2019 TSF Research Award has played an important role in helping Dr. Kilic develop his research career, and he encourages other cardiothoracic surgeons to apply for TSF awards and scholarships.

"It's provided the funds and support to lay the groundwork for my research, and it's allowed me to initiate, not just the funded project, but other research projects, as well. This award not only allowed me to compile preliminary data, but perhaps, more importantly, helped solidify collaboration with AI experts and national leaders in cardiothoracic surgery," he said.

"This type of funding and support can be integral when trying to initiate research projects or focus, and it provides recognition in the world of cardiothoracic surgery. It's a premier funding mechanism for thoracic surgery, and in that focused space, it gives you recognition among your peers," said Dr. Kilic.

Adapted from an article in the fall 2020 edition of STS News.

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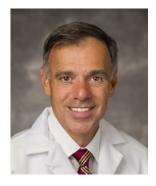
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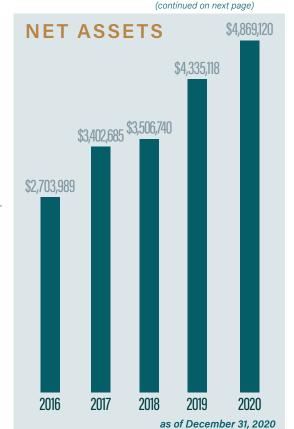
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WHY I GIVE: I give to the Foundation to honor my mentors in the US and many that are around the world. Being very fortunate to travel the world and see a variety of surgeons and clinical settings that provide great care for their people has only motivated me more to support TSF so others may have these opportunities. The ability of surgeon-scientists to educate, perform research, and innovate needs to be supported as our specialty continues to evolve and provide care globally.



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