



# Barrow

Neurological Foundation

You  
Make It  
Possible

FISCAL YEAR 2022 IMPACT REPORT

## With Tremendous Gratitude

Each year, we take the time to report back to you on the impact of your generous philanthropy. It's a pleasure to do so, as there are so many important and fulfilling endeavors currently underway at Barrow Neurological Institute. Of course, and it needs to be said over and over, thanks to you, you make it all possible.

A highlight of this year's report is under the leadership of President and CEO Michael T. Lawton, MD. Barrow has expanded its global footprint to bring life-saving neurological care and training to developing countries, a significant step on the way to Barrow being recognized as the world's leading neuroscience institute. These efforts are being funded by a transformational gift from Bill and Carolyn Franke and the Franke family to establish the Franke Global Neuroscience Education Center. This groundbreaking educational endowment is funding international programs to recruit doctors from developing countries to train with our renowned neurosurgeons and neuroclinicians. These doctors will then take what they learned back to their home countries to treat patients from significantly underserved populations. In addition, the endowment funds an undergraduate research program that enables Barrow to introduce brilliant young minds to career opportunities in neuroscience.

Of course, that's just one of the many innovative initiatives taking place at Barrow thanks to you. In this report, you will read about the unique research taking place through the efforts of Anna D. Burke, MD, and Marwan Sabbagh, MD, who are investigators in the first-ever study of a vaccine to slow the development of Alzheimer's in those with Down syndrome, who are seven times more likely to develop this deadly disease. The findings from this study also may lead to treatment for Alzheimer's in general. You make this possible.

You'll read about a medication-based approach to preventing aneurysm ruptures pioneered by Tomoki Hashimoto, MD, and how Rita Sattler, PhD, is studying overlapping mechanisms of diseases such as Alzheimer's, ALS, frontotemporal dementia (FTD), and Lewy body dementia in order to draw parallels to others in the hope of developing therapies for multiple patient populations. You make this all possible.

You'll read about the miracle story of Morgan Bailey, whose three arteriovenous malformations (AVMs) ruptured at once and left her with little margin for survival. Thanks to the expertise of Dr. Lawton and the dedication of the Barrow Neuro-Rehabilitation Center, Morgan not only survived, but is now thriving in her recovery. You make this possible.

And, you'll read about the exciting areas in which Barrow is investing in future growth, including construction on the Ivy Brain Tumor Center's new global headquarters.

As you read each important aspect of this report, please remember that it is your generosity, dedication, and belief in Barrow's ability to save people's lives that have helped it become the world-renowned neuroscience institute that it is today. After all, you make it all possible.



With tremendous gratitude,

A handwritten signature in blue ink that reads "Katie Cobb".

Katie A. Cobb, President  
Barrow Neurological  
Foundation



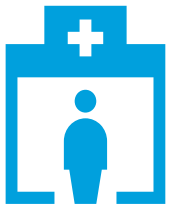


Rita Sattler, PhD

AXIO

CAUTION  
LED RADIATION  
DO NOT STARE  
OR APPROXIMATELY

Cover: Robert Bowser, PhD, with undergraduate intern. This page: Rita Sattler, PhD, with high school intern.



**91,800+**  
total number of  
patient visits



**397**  
active research  
studies



**32**  
combined total of  
neurosurgery residents  
and fellows

**78**  
international  
research  
fellows and visiting  
scholars



**2,352**  
individuals impacted  
through Alzheimer's  
outreach programs



**10**  
Ranked in top 10 best  
specialized hospitals  
by *Newsweek*

**14**  
\$14 million in  
federal research  
grant support



**7**  
Latin American countries  
reached through global  
neurosurgical education  
course



**1st**  
patient implanted  
with spinal cord  
stimulator to treat  
diabetes



**13**  
centers  
of excellence



**5,593**  
brain and spine  
surgeries



**44**  
U.S. and international  
students completed  
summer internships



# BARROW BY THE NUMBERS



**791**  
patients  
enrolled in  
clinical trials



**560+**  
patients impacted by  
Domestic Violence  
Brain Injury Program



**450+**  
neuroscience  
nurses



**16**  
telestroke sites  
throughout Arizona



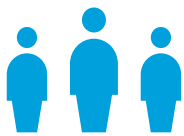
**11**  
cutting-edge  
neurosurgery-dedicated  
operating rooms



**14**  
countries reached  
through Legacy Care  
Program



**37**  
combined total of  
neurology residents  
and fellows



**2nd**  
ranked No. 2 in  
neurosurgery residency  
programs



## DONOR IMPACT

FY2022



**\$42,000,000**  
TOTAL RAISED AND PLEDGED



**3,776**  
TOTAL DONORS

**\$20,000,000+**  
TOTAL DISTRIBUTED TO BARROW  
NEUROLOGICAL INSTITUTE

**\$3,500,000**  
DESIGNATED TO CENTERS/PROGRAMS

**\$15,400,000**  
BASIC, CLINICAL, AND TRANSLATIONAL  
RESEARCH

**\$1,500,000**  
ENDOWMENTS

# You inspire future leaders in neuroscience.



Barrow neurosurgery resident Arnau Benet, MD, speaks at a course in Lima, Peru.



From training top residents and fellows to introducing high school and undergraduate students to the many aspects of neuroscience, Barrow has long been a leader in educating the next generation of neuroscience specialists. Barrow will now extend its expertise globally thanks to a generous endowment from the Franke family to establish the Franke Global Neuroscience Education Center.

## WORLD-CLASS MEDICAL EDUCATION GOES WORLDWIDE

Barrow Global was established to help address the health care needs of underserved populations across the globe, as well as to improve access to advanced neurosurgery in the developing world by educating and training physicians at partner sites.

In 2021, the Franke family created a transformational \$21 million endowment to strengthen neuroscience

education through national and international education outreach programs. In recognition of their generosity, Barrow has established the Franke Global Neuroscience Education Center. As a part of Barrow Global, the Center serves as a platform for building neuroscience care and clinical education programs in developing countries around the world.

In July 2022, Barrow led an acclaimed course on neurosurgical anatomy and techniques in Lima, Peru, with Barrow neurosurgery resident Arnau Benet, MD, serving as the course director. The course reached 120 people from the Latin American countries of Peru, Chile, Bolivia, Ecuador, Brazil, Colombia, and Mexico. Forty participants were able to gain hands-on neurosurgical training, thanks to 3D-printed skull models developed by the Barrow Innovation Center and a virtual reality system developed by the Barrow Neuroscience Publications Department.

## INTERNATIONAL STUDENTS EXPERIENCE BARROW

Barrow welcomed its first two international students supported through the Franke Global Undergraduate Internship Program in summer 2022. Students interned at Barrow throughout the duration of the 12-week program.

Aline Valeria Sousa Santos came to Barrow from Brazil and interned with Rita Sattler, PhD, in the Department of Translational Neuroscience. She reflects on her experience at Barrow: “I now feel much more prepared to start my PhD at an international institution and return to my country capable of occupying a leadership position. For being a minority in my country, a black woman, and being the first person in my family to enter higher education, these plans are huge and ambitious, and now I feel that they are actually possible.”

Gerardo Gomez Castro came to Barrow from Mexico and interned with Brian Kelly, PhD, in the Spinal Biomechanics

“Access to emergent neurosurgical care is still not a human right, but just by being here, we are inspiring change. It is an honor to be a Barrow representative.”

– Arnau Benet, MD  
Barrow neurosurgery resident





International interns Gerardo Gomez Castro and Aline Valeria Sousa Santos with Volker Sonntag, MD.

Laboratory. He reflects on his experience at Barrow: “I learned a lot about the impact of spine surgery on spinal biomechanics, the advantages and disadvantages of many approaches to surgery, and the importance of testing implantable devices. But most importantly, I learned the importance of having a multidisciplinary team to find cures and solutions for neurological disorders.”

## NEUROSCIENCE EDUCATION FOR ALL LEVELS OF LEARNING

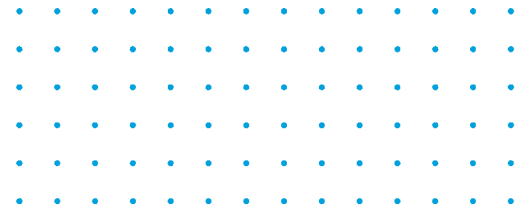
Barrow is committed to inspiring and introducing brilliant young minds to all components of neuroscience. With support from the Garcia Family Foundation, Barrow teaches and trains these talented young students, regardless of their socioeconomic or geographic status.

Led by Rita Sattler, PhD, the Undergraduate Summer Research Internship Program and the High School Research Program familiarize students with different aspects of the neuroscience field and provide them access to top Barrow surgeons, physicians, and researchers. Students have the opportunity to actively participate in neuroscience research in a Barrow laboratory or participate in hands-on projects in departments throughout Barrow.

They also attend weekly seminars, learn about career options in health care, and present their work at Barrow symposiums.



Summer undergraduate students with Rita Sattler, PhD, and program coordinator Karis Miller.

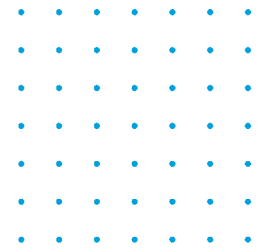


“ Education is vital to the advancement of life-saving care for patients with devastating neurological conditions. The Franke Global Neuroscience Education Center will allow Barrow to develop a legacy of learning that will have a global impact. We are pleased to be the catalyst of this effort. – Bill Franke

(Carolyn and Bill Franke pictured far right)



# You helped a college graduate get a second chance at life.



Morgan Bailey had a lot to look forward to going into the summer of 2021. She had just graduated from college and received her acceptance letter to the Sandra Day O'Connor College of Law at Arizona State University. The future seemed bright, and Morgan felt as though nothing could stop her from achieving her dreams. Then, the unthinkable happened. In a matter of seconds, Morgan's life changed forever.

On May 30, 2021, Morgan was attending a graduation when a piercing pain sliced through her head. Her vision blurred, and the world suddenly went dark. Panicked voices filled the air as everyone around her tried to figure out what was happening. The horrifying realization hit Morgan's mother, Robin Bailey, instantly.

Four years prior, when Morgan was a senior in high school, she fell one day at school and hit her head. What at first seemed like a minor incident became a dire situation when she woke up the next morning paralyzed on one side of her body. Morgan then received a troubling diagnosis: she had three arteriovenous malformations (AVMs) – abnormal tangles of blood vessels – in her brain. However, because of their size and location, surgery was not a viable option.

In that moment, Robin knew that what she had feared most had come true: all three of Morgan's AVMs





had ruptured at once. This caused severe hemorrhaging in her brain at an alarming rate. By the time the paramedics got there, Morgan had gone into cardiac arrest and needed to be intubated. With every second that passed, Morgan's life hung in the balance as the bleeding intensified. Recalling the terrifying experience, Robin says, "I knew immediately that we had to get Morgan to Barrow, and quickly. It was the only place I knew of that specialized in this type of thing. It was our only hope."

Once Morgan was stabilized, she was transferred to Barrow Neurological Institute. There, President and CEO Michael T. Lawton, MD, performed an emergency surgery to stop the bleeding. He saved Morgan's life. "Thank God we got her to Barrow and that Dr. Lawton was there to do the surgery. We were in the best place and in the best hand possible," Robin says.

**“ Thank God we got her to Barrow and that Dr. Lawton was there to do the surgery. We were in the best place and in the best hands possible.**

– Robin Bailey

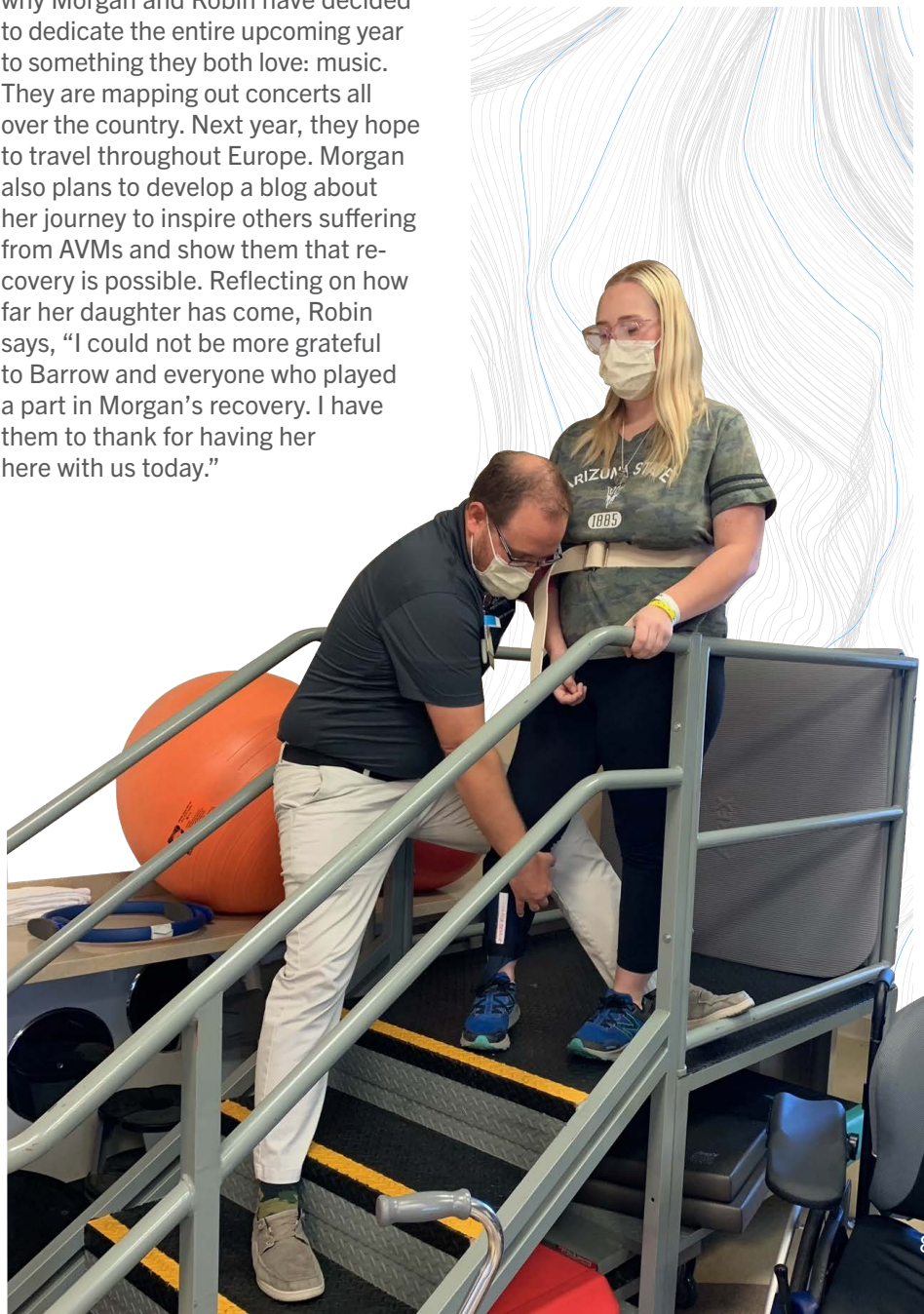
Morgan spent weeks in the Neuro-ICU at Barrow recuperating from the surgery, and Robin says the care couldn't have been better. "Everything was phenomenal. The Neuro-ICU nurses were truly some of the most amazing people I've ever met, and they were so good about explaining everything and updating me." From there, Morgan worked with Barrow Neuro-Rehabilitation therapists to relearn how to walk and use the right side of her body, which was paralyzed after the AVMs ruptured. For someone whose chances of survival were so slight at first, Morgan's recovery was a true miracle.

A little over a year later, Morgan is still making tremendous strides in her recovery. The entire experience has



inspired her to live life to the fullest and enjoy every moment of it. That's why Morgan and Robin have decided to dedicate the entire upcoming year to something they both love: music. They are mapping out concerts all over the country. Next year, they hope to travel throughout Europe. Morgan also plans to develop a blog about her journey to inspire others suffering from AVMs and show them that recovery is possible. Reflecting on how far her daughter has come, Robin says, "I could not be more grateful to Barrow and everyone who played a part in Morgan's recovery. I have them to thank for having her here with us today."

The Barrow Aneurysm and AVM Research Center (BAARC), led by Dr. Lawton, aims to develop new, less invasive, and more effective treatments for aneurysms and AVMs, so patients like Morgan can have a second chance at life. Your support of BAARC allows brilliant researchers like Tomoki Hashimoto, MD, and S. Paul Oh, PhD, to continue pioneering novel pre-clinical models to identify and test drug targets for a medication-based approach to preventing aneurysm and AVM ruptures. This can be life-saving for patients whose risks associated with aneurysm and AVM surgery are greater than the risk of an actual rupture.



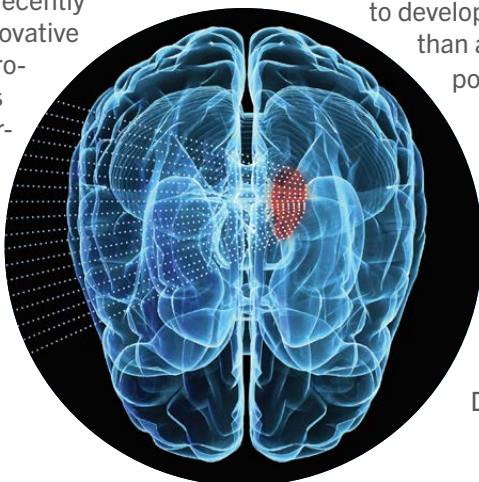


Nader Sanai, MD, director of the Ivy Brain Tumor Center.

### GROUNDBREAKING RESEARCH AT THE IVY BRAIN TUMOR CENTER

Brain tumors present unique challenges because they are highly complex and each tumor is slightly different. Even cell types within a single tumor are diverse, making them incredibly difficult to treat. Glioblastomas are especially challenging because they have built-in resistance mechanisms against treatment, making a recurrence likely in 70 percent of patients.

Support from donors makes it possible for researchers at the Ivy Brain Tumor Center to constantly push the boundaries of research and care for brain tumor patients to increase survival and quality of life. For example, the Ivy Center recently initiated an innovative liquid biopsy program that gives doctors a never-before-seen scientific snapshot of the tumor's response to treatment, ultimately preventing patients from



wasting precious time on ineffective therapies. An Ommaya reservoir placed under the scalp during the patient's tumor resection allows Ivy Center researchers to biopsy and analyze the cerebrospinal fluid at monthly clinic visits. Because this technique can identify individual tumor cells, it detects tumor regrowth even when advanced medical imaging such as an MRI scan does not. This enables action to be taken at the earliest possible opportunity.

Additionally, the Ivy Center has launched a series of clinical trials focused on increasing the efficacy of radiation treatment, which is currently the only modality proven to work in all glioma patients. Radiation works by damaging the tumor DNA strands. However, glioma tumor cells have super-repair machinery that goes in and quickly restores the breaks in the DNA strands. Ivy Center researchers hope to see a more promising biological outcome in patients by identifying the best new drugs that can penetrate the blood-brain barrier and block the ability of cancer cells to repair DNA damage after radiation treatment.

### VACCINE FOR DOWN SYNDROME WITH ALZHEIMER'S

Finding new therapies for populations that are at high risk for developing Alzheimer's disease may hold the key to unlocking groundbreaking treatments for Alzheimer's in general. For example, individuals with Down syndrome are seven times more likely to develop Alzheimer's disease than are of the general population.

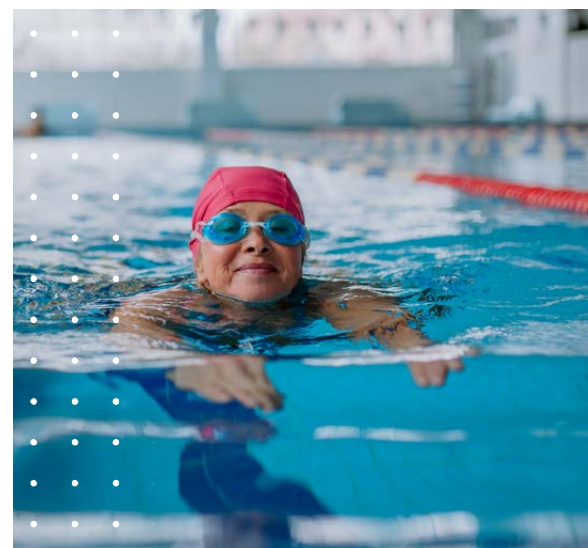
Anna D. Burke, MD, and Marwan Sabbagh, MD, were both investigators in the first-ever study of an anti-Abeta vaccine for people living with Down syndrome.

Initial results demonstrated that the vaccine resulted in an anti-Abeta immune response. It was also safe and well-tolerated in all patients. This landmark study has the potential to slow disease development in those with Down syndrome and provide treatment insight for Alzheimer's in general.

### CORRELATING EXERCISE WITH REDUCED RISK OF DEMENTIA

Neuropsychiatrist Yonas E. Geda, MD, and his team of international investigators are studying the role of lifestyle factors in neuropsychiatric symptoms associated with dementia.

In 2022, Dr. Geda received the prestigious Alzheimer Award from



the *Journal of Alzheimer's Disease* for a paper he co-authored on the impact of physical activity on cognitive changes in older adults. His team observed that study participants who engaged in moderate physical activity, such as walking or biking, showed less cognitive decline with time. Initial results from the study demonstrated that moderate physical activity at least three times per week reduces the risk of mild cognitive impairment, which is often a precursor for dementia, by 25 percent in those 70 years of age and older.



# You contribute to tomorrow's treatments and cures.

## PREVENTING ANEURYSM RUPTURE WITH MEDICATION

When an aneurysm ruptures, it causes significant bleeding in the brain that can lead to lifelong disability, or even death. However, surgery to prevent aneurysm ruptures can be extremely invasive and risky. Tomoki Hashimoto, MD, is working on developing a medication-based approach to preventing aneurysm ruptures using a unique preclinical model.

Dr. Hashimoto is currently investigating the role of the protein Sirtuin-1 in reducing cell senescence as a

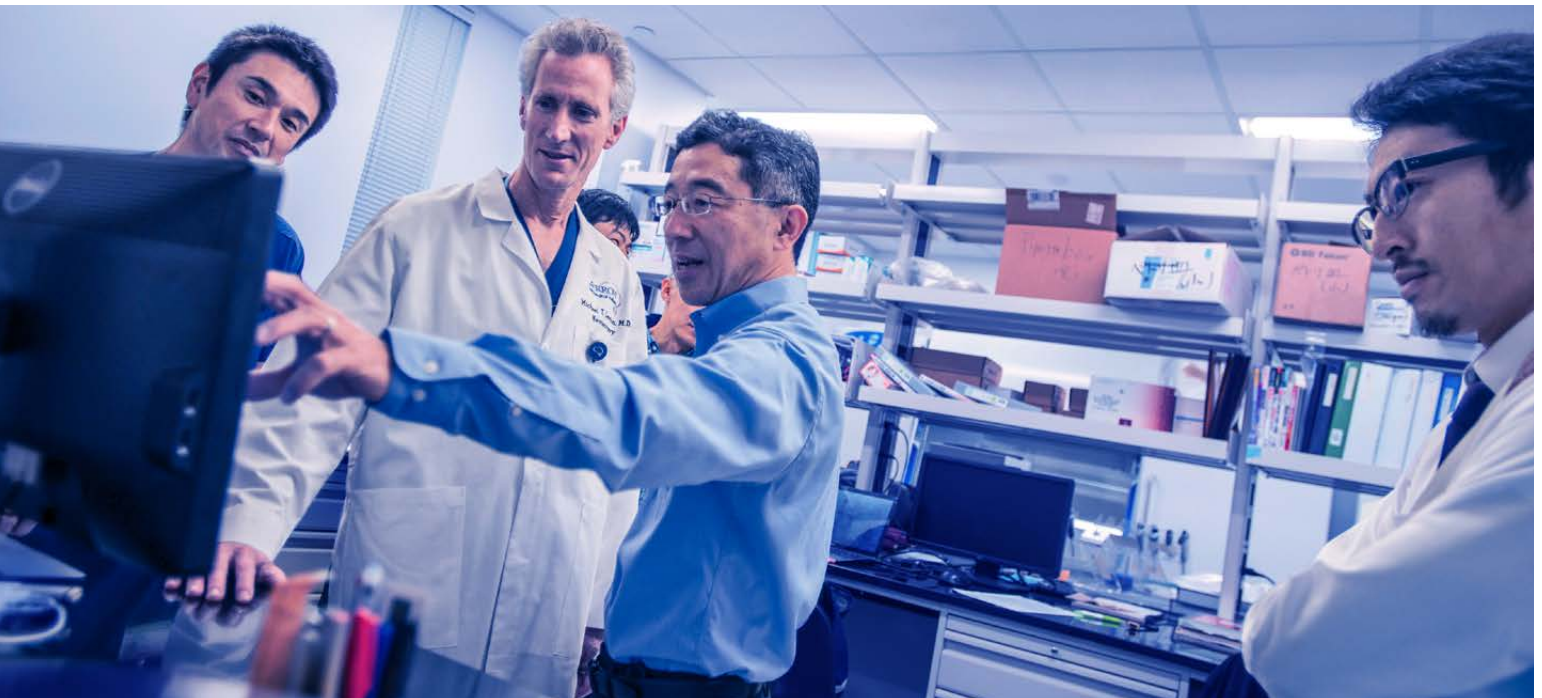
potential drug target. Cell senescence occurs when cells stop dividing due to aging and begin secreting inflammatory proteins, which can trigger an aneurysm rupture. A medication-based approach to preventing aneurysm rupture could be lifesaving for patients whose risks associated with surgical treatment may outweigh the risk of a rupture.

## UNCOVERING THE UNDERLYING MECHANISMS OF NEURODEGENERATIVE DISEASES

The overlapping mechanisms of diseases such as Alzheimer's,

amyotrophic lateral sclerosis (ALS), frontotemporal dementia (FTD), and Lewy body dementia (LBD) are still not fully understood. Rita Sattler, PhD, aims to identify the cellular and molecular mechanisms by which these diseases develop in order to discover novel therapeutics that could lessen or prevent symptoms.

Most of these diseases have overlapping pathogeneses, so uncovering mechanisms for one disease may enable scientists to draw parallels to others and develop therapeutic interventions that could be applicable to multiple patient populations.



Michael T. Lawton, MD, and Tomoki Hashimoto, MD, in the Barrow Aneurysm and AVM Research Center.

## NOVEL THERAPEUTIC APPROACH FOR ALS

Robert Bowser, PhD, deputy chief scientific officer at Barrow, is collaborating with Fredric Manfredsson, PhD, on research to develop a novel treatment for amyotrophic lateral sclerosis (ALS). The scientists aim to use a viral vector-based approach to target specific inflammatory cells involved in ALS and “flip” them from causing cell death to becoming more neuroprotective. This groundbreaking study builds on Dr. Bowser’s previous research on chitinases, proteins that occur in higher levels in ALS, as well as in cells that control inflammation in nervous tissue.

Dr. Bowser and Dr. Manfredsson are also working to validate their tools for measuring chitinases in the blood and cerebrospinal fluid of patients. These tools can then be used to evaluate how well viral vector-based treatments are working, which could have broader applications for diseases such as Parkinson’s and Alzheimer’s, which also present increased levels of chitinases.



## PUSHING THE BOUNDARIES OF NEUROIMAGING TO REVERSE PARALYSIS IN VETERANS

The Neuroimaging Innovation Center strives to advance imaging technology for improved patient care and diagnosis. Recognizing the critical role imaging plays in neurological care, Ellen and Howard Katz have generously endowed a chair in the Neuroimaging Innovation Center at Barrow. This will allow the Center to continue conducting life-changing and life-saving neuroimaging research.

One such study, led by Richard Dortch, PhD, seeks to improve the lives of military veterans suffering from severe nerve trauma sustained in combat. While modern body armor saves lives, it is also believed to contribute to increased nerve trauma. When peripheral nerve damage results in paralysis or loss of sensation, surgical repair is often required to regain function. However, many of these surgeries fail due to the limited ability to monitor nerve health both after injury and surgery, which

results in an increased likelihood of permanent paralysis.

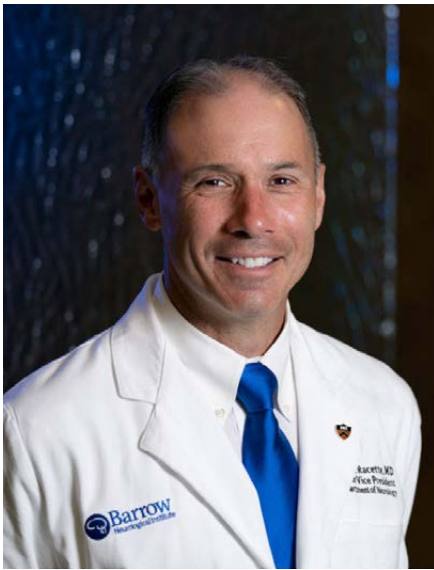
Dr. Dortch and his team are developing new MRI methods to identify nerves that are good candidates for surgery and to detect failed surgeries earlier to determine if a second one is needed. Preliminary study results indicate that their methods are reliable, report on injury severity, and are sensitive to failed nerve repairs. Ultimately, this research can lead to a reversal of paralysis and restored sensation in veterans with nerve trauma.



*Richard Dortch, PhD, leads Barrow veterans' research*







## BRAD A. RACETTE, MD, CHAIR DEPARTMENT OF NEUROLOGY

In April 2022, Barrow welcomed Brad A. Racette, MD, as the new Kemper and Ethel Marley Professor and Chairman of Neurology. As a movement disorders specialist, Dr. Racette views himself as a medical detective, whether he’s investigating why people get neurological diseases or assembling clinical clues to diagnose a movement disorder. He isn’t deterred by the challenge of finding answers to difficult questions; he’s motivated by it. That motivation led him to the helm of the Department of Neurology at Barrow Neurological Institute.

## BECOMING A ‘MEDICAL DETECTIVE’

During his neurology residency at the Washington University School of Medicine in St. Louis, Dr. Racette had a strong mentor in the subspecialty of movement disorders. He had also developed some personal interest in Parkinson’s disease after his grandmother’s diagnosis. One of the aspects of movement disorders he found most intriguing is that the diagnosis involves piecing together clinical patterns – that concept of being a medical detective.

“You look at people, and you use your senses,” he says. “There aren’t tests for most of these conditions. What people often like most about neurology is that you can do so much with just a neurological exam, and movement disorders is sort of like an extreme version of that.”

He also yearned to understand why people get neurodegenerative diseases like Parkinson’s. That question inspired him to focus his research efforts on risk factors for the disease, particularly those in the environment.

## SHAPING A VISION

One of the reasons Dr. Racette was drawn to the department chair position at Barrow was that he wouldn’t simply be managing faculty and “keeping the wheels on the bus.” As an institution that embraces innovation, Barrow would empower Dr. Racette to create and implement an impactful vision. Since assuming the role of chair, he has been learning about the department and shaping his vision for its future, starting with four goals.

One is to establish a premier program in data science within the department and facilitate the analysis of health care data to discover new insights that improve patient care.

Second, Dr. Racette hopes to position Barrow as a destination for neurology residents who are interested in global health, both clinically and academically. For about 15 years, he has collaborated with researchers in South Africa to study manganese toxicity and, more broadly, Parkinson’s risk factors affecting rural communities. Dr. Racette has also worked with researchers in Finland for about five years, examining the possible link between exposure to certain solvents and developing Parkinson’s disease.

“I think it’s essential for our young physicians to understand their place in the global neuroscience environment,” he says. “I think they will be better, more rounded physicians if they have a global experience.”

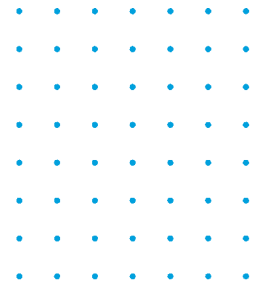
For this third goal, Dr. Racette sees the potential for the department to become a leader in health equity, not only in patient care, but also in education and research.

Finally, Dr. Racette plans to grow the department’s portfolio of clinical research funded by the National Institutes of Health and other government entities. He believes this will enable Barrow to continue performing research that could have a widespread impact on human health across the spectrum of neurological diseases.





# In his own words, a Deaf grandfather's healing journey.



**M**y family means everything to me. I am a proud husband, father of nine, and grandfather of 21. I am also Deaf. But that has never stopped me from living a full, happy life. I use sign language to communicate and connect with others. My wife, who is also Deaf, and all of my children are fluent in sign language; it's what makes our bond so special. In September 2021, a horrific car accident took away my ability to communicate with my family, leaving me without the use of my hands.

The first thing I remember after the accident is waking up groggy and disoriented, followed by blinding pain. Slowly, things came into focus. I realized I had a breathing tube down my throat and was hooked up to so many machines. I tried to move my feet. Nothing. I tried to move my hands. Again, nothing. Panic gripped me as I struggled to put together what had happened.

Then, my children came into the room and told me I had been involved in a rollover car accident and had to be airlifted to Barrow Neurological Institute. I had broken my neck and had sustained massive head trauma. The final diagnosis was incomplete quadriplegia, the loss of movement in all four limbs.

## YOU HELPED MAKE VIRTUAL REALITY A REALITY IN NEUROSURGERY EDUCATION.

My whole world shifted in that moment. I thought I would never be able to use my hands or walk again, but the team at the Barrow Neuro-Rehabilitation Center assured me that they would fight as hard as they could to help me recover.

Communicating was extremely challenging at first. All I could do was blink or shake my head when my children signed a question. I felt trapped. I had my friends and family, all these people that I loved. I couldn't imagine going the rest of my life without being able to communicate with them.

Every day, I met with the Barrow Neuro-Rehabilitation specialists and worked hard on exercises to regain movement in my hands. Slowly, I began to move my fingers. Then, my hands and my arms. After little over a month, I was finally able to sign again. I cannot describe the overwhelming joy and relief I felt being able to tell my family how much I loved them and how much their presence meant to me. I didn't stop there, either. My physical therapist continued working with me until I could stand on my own and walk with the help of the robotic exoskeleton.

My recovery has been nothing short of a miracle. At one point, I thought I wouldn't be able to move anything past my neck. Now, not only can I sign again, but I can also hug my children and play with my grandchildren again. None of this would have been possible without my team at the Barrow Neuro-Rehabilitation Center, who even learned some signs so they could communicate with me better. I will treasure the bond I formed with them forever.

With gratitude,  
Arturo Monroy

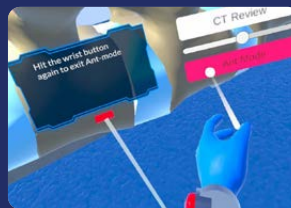


Scan to see the full story.

The Sonntag Spine Center team had a vision to create a virtual reality laboratory that would provide advanced training for residents and fellows across a wide breadth of spinal procedures. Thanks to the support of generous donors, that vision became a reality.

The Virtual Reality (VR) Spine Lab stands at the forefront of virtual surgical education, creating an immersive 3D environment simulating an operating room and spinal anatomy. Working with this true revolution in neuro-surgical education, residents and fellows practice spine surgeries within a virtual space replicating a live operating room. The virtual instruments have the same weight and feel as the ones they are accustomed to, and tactile feedback reproduces the same pressure as operating on a real bone.

This technology is not limited only to on-site training in the VR Spine Lab. With VR headsets, neurosurgical trainees can practice complex spine surgeries and techniques anywhere, anytime, and without involving patients. This will benefit neurosurgery training worldwide, especially in developing countries where access to anatomy models and surgical tools is limited. Continued advancements in the VR Spine Lab have the potential to disrupt and improve current training paradigms, pushing the entire field of neurosurgery forward.







# You foster hope and healing for all.



Kerry Knievel, DO, and Jan Lewis

## JAN AND TOM LEWIS CONTINUE TRANSFORMING HEADACHE CARE

Although you can't see headache pain, it can be truly incapacitating. Before coming to Barrow, Jan Lewis had suffered from chronic, often debilitating, migraine pain for years. Thanks to Kerry Knievel, DO, and her comprehensive approach to migraine treatment, Jan is now able to enjoy traveling, visiting her friends, and playing with her grandchildren. To honor the impact Barrow made on her life, Jan and her husband, Tom Lewis, established the Jan and Tom Lewis Migraine Treatment Program at Barrow in 2017.

In 2022, Jan and Tom Lewis committed an additional \$3 million in support of headache care at Barrow. In honor of their generosity, Barrow renamed the Program the Lewis Headache Center to reflect a broadening of research and patient care. The Lewis Headache Center aims to become a premier global destination for comprehensive headache patient care.

In addition to offering cutting-edge medications and therapies, it will further diversify care by expanding its wellness program, which currently includes physical therapy and yoga, dietitian consultations, mindfulness, and social work.

## DOMESTIC VIOLENCE BRAIN INJURY PROGRAM

*"It dawned on me: Holy, like I've probably been hit way more times than the average football player."*

— Becky, a survivor of domestic violence

In spring 2022, the *New York Times Magazine* published a story about the hidden epidemic of TBI caused by domestic violence, in which the Domestic Violence Brain Injury Program is featured prominently. The story details Becky's struggle with debilitating TBI symptoms after leaving her abuser of 20 years and how she came to find Glynnis Zieman, MD, at Barrow Neurological Institute, who gave her the tools and confidence



**6,300+**  
new headache patients since 2017



**38,600+**  
individuals impacted by Lonnie & Muhammad Ali Legacy Care Program



**560+**  
patients impacted by Domestic Violence Brain Injury Program



**18,000+**  
seen annually at the Muhammad Ali Parkinson Center



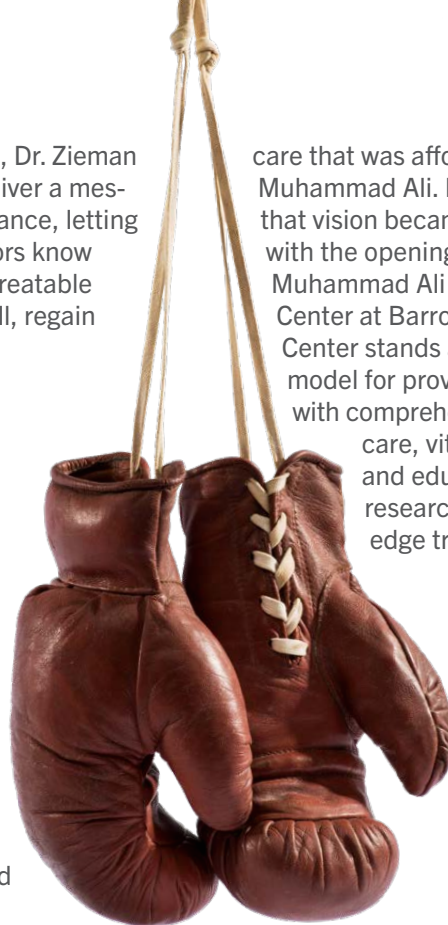
to reclaim her life. Dr. Zieman sees many patients struggling with symptoms similar to the ones Becky experienced. That is why the Program is dedicated to providing compassionate clinical care that focuses on treatments and strategies to address cognitive issues survivors of domestic violence may be experiencing. It also partners with local shelters to offer speech therapy sessions and Brains Club, a cognitive retraining workshop for survivors of domestic violence.

Through every interaction, Dr. Zieman and her team strive to deliver a message of hope and reassurance, letting domestic violence survivors know that their symptoms are treatable and that they can, and will, regain control of their lives.

**LONNIE ALI  
REFLECTS ON  
25 YEARS OF  
UNSURPASSED  
PARKINSON'S CARE**

Lonnie and Muhammad Ali had a vision to create the world's greatest Parkinson's center. One that would be dedicated to providing every patient with the same expert and compassionate

care that was afforded to Muhammad Ali. In 1997, that vision became a reality with the opening of the Muhammad Ali Parkinson Center at Barrow. Today, the Center stands as a national model for providing patients with comprehensive clinical care, vital support and education, and research into cutting-edge treatments.



It's more than just the building and patient programs, however, that make the Center an example of Muhammad's spirit. It's all the incredible doctors, nurses, therapists, and support staff who are dedicated to providing all patients with the best possible care. They care for patients in a way that allows them to maintain their dignity, independence, and quality of life while battling this disease. They are also the ones who reassure both patients and caregivers that they have someone by their side fighting for them and they will never be alone in this journey. That is the lasting impact of Muhammad's legacy.

— Lonnie Ali

**25<sup>th</sup> Anniversary**  
**Muhammad Ali  
Parkinson Center**

A Parkinson's Foundation Center of Excellence

# You help build Barrow.

## FOUNDATION DONORS FUEL THE FUTURE OF NEUROSCIENCE

Through support from generous donors, the Foundation raised \$42 million in fiscal year 2022 (July-June), including a transformational \$21 million endowment from the Franke family to fund national and international education outreach programs at Barrow. In recognition of their support, Barrow has named the Franke Global Neuroscience Education Center. The Foundation distributed more than \$20 million to the Institute, including \$15.4 million to support research, \$3.5 million designated for specific programs, and \$1.5 million in endowments.



(Left to right) Carrie Hall; Michael T. Lawton, MD; Jacquie Dorrance; and Katie Mueller

## WOMEN'S BOARD RAISES RECORD-BREAKING FUNDS FOR BARROW

The Women's Board of Barrow Neurological Foundation raised a record-breaking \$10.4 million for the Institute through the 2022 Barrow Grand Ball. Under the leadership of Chairman Carrie Hall, Women's Board members Jacquie Dorrance and Katie Mueller co-chaired the event, inspiring members and donors to give generously during these unprecedented times. To date, the Women's Board has raised more than \$93 million to support research at Barrow.

Each year, the Women's Board supports a special project meaningful to its membership and important to the future of Barrow. In 2022, the Grand Ball committee chairs selected the innovative research of Zaman Mirzadeh, MD, PhD, a researcher and neurosurgeon at Barrow, as its project. Dr. Mirzadeh is investigating brain-based approaches to controlling blood sugar that have the potential to pave the way for new, groundbreaking therapies for those battling type 1 and type 2 diabetes.



Nancy Hanley Eriksson, Ronald Eriksson, Nan Howlett, Zaman Mirzadeh, MD, PhD

## 'SPEED DATING' WITH DOCTORS AT THE GENIUS BAR

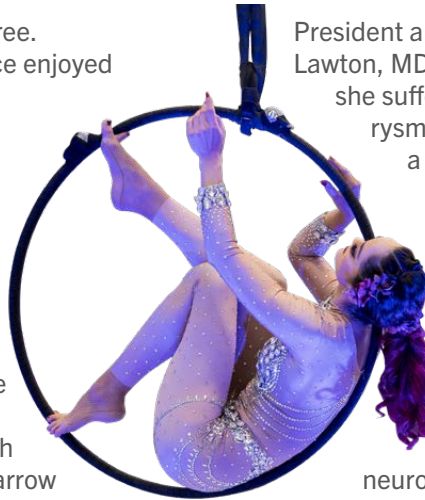
Last year, Barrow Beyond members had the chance to attend the 2022 Genius Bar, a fun and fast-paced evening of "speed dating" with Barrow Geniuses. The Genius Bar





Cheryl Najafi, Sharon Stone, Donna Johnson, Michael T. Lawton

Neuro Night Honoree. Those in attendance enjoyed live entertainment, immersive art installations, exquisite culinary creations, and a dynamic live auction. The highlight of the evening came when Sharon Stone took the stage and inspired guests with her story of how Barrow



President and CEO Michael T. Lawton, MD, saved her life after she suffered a ruptured aneurysm that eventually led to a massive stroke. This Neuro Night was a truly special event celebrating the opening of the new Barrow Neuroplex and recognizing Barrow's advancements in treating the most debilitating neurological conditions.

featured 10 Barrow neuroscientists and researchers who rotated from table to table in seven-minute increments as guests learned more about their groundbreaking programs and asked questions.

### INAUGURAL NEURO NIGHT EVENT

To celebrate the opening of the Barrow Neuroplex, the new global headquarters of Barrow Neurological Institute, the Foundation hosted its inaugural Neuro Night event on March 4, 2022. Thanks to generous donors, Neuro Night raised more than \$4.3 million to support groundbreaking research. The intimate, star-studded event was co-chaired by Foundation Board members Donna Johnson and Cheryl Najafi, with award-winning actress, *New York Times* best-selling author, and Foundation Board member Sharon Stone as the



Award-winning actress, New York Times bestselling author, and Foundation Board member Sharon Stone.



**IVY CENTER'S NEW HEADQUARTERS WILL SHINE AS A BEACON OF HOPE**

The Ivy Brain Tumor Center is well on its way to completing the construction of its new headquarters, which is scheduled to open in fall 2023. The new five-story, 75,000-square-foot building will be the world's largest translational research center dedicated solely to brain tumor drug development and treatment. It will be home to the Ivy Center's scientists, investigators, clinicians, and operational staff. In addition to laboratory space, the new building will include space for trials infrastructure, space for multidisciplinary clinical consultation, an MRI-guided ultrasound suite, and a video teleconference auditorium. The continued growth and success of the Ivy Brain Tumor Center is made possible through the unwavering leadership, support and vision of Catherine Ivy.

**DONOR-FUNDED MEADOW ART INSTALLATION REMINDS ALL THAT HEALING HAPPENS HERE**

The Barrow Neuroplex was designed with the Institute's mission of healing through world-class patient care, research, and education in mind. This includes displaying exceptional art throughout the building. Gracing the Virginia G. Piper Charitable Trust Atrium is 'Meadow', an art installation featuring 18 mechanical flowers moving together in harmony to create a six-minute choreographed show that runs on a loop. 'Meadow' originates from the Netherlands-based studio Drift and was designed by the artists Lonneke Gordijn and Ralph Nauta. This enchanting piece of public art was commissioned by Barrow Neurological Foundation's Art Council and a generous gift from Foundation Board member Malcolm Jozoff in honor of his wife, Jane Jozoff.



*The public art installation "Meadow" hangs in the Virginia G. Piper Charitable Trust Atrium in the Barrow Neuroplex.*





# Barrow brings neurosurgery education to Tanzania.



When Dilan Ellegala, MD, neurosurgeon and medical co-director of Barrow Global, first visited Tanzania, East Africa, in 2006, there were only two neurosurgeons for a population of 50 million. Today, that number has increased to 18 neurosurgeons for an estimated population of 70 million. While the basic skills of these 18 neurosurgeons are good, there is a large gap between their capabilities and what is considered adequate in the Western world.

Through the generosity of the Franke Family in establishing the Franke Global Neuroscience Education Center, Barrow is now in a position to significantly reduce this gap by building a Center of Clinical and Training Excellence within Tanzania. This will include having Tanzanian neurosurgeons applying U.S.-level neurosurgical skills in patient care, as well as training other regional and local neurosurgeons. Additionally, Barrow neurosurgical fellows will have the

opportunity to spend one year at the Tanzania center training local partners. “My working overseas has made me a better surgeon, a better doctor, and quite frankly, a better person,” says Dr. Ellegala. “That’s what I’d like to see our young residents, medical students, and fellows gain from a global neurosurgical experience.”

“Barrow Neurological Institute, with the Franke family’s endowment, has made it possible for us to create a global neurosurgical program with its first sites in East Africa and Tanzania.”

– Dr. Ellegala

To this end, Barrow has selected Kilimanjaro Christian Medical Centre (KCMC) as the site for this first-of-its-kind neurosurgical partnership.

While KCMC is a fairly large hospital, serving a catchment area of 15 million people, it has never had trained neurosurgeons, and only limited neurosurgical cases have been done by general surgeons. The first site visit at KCMC took place in June 2022, with Dr. Ellegala; Barrow Emeritus Chair of Neurosurgery Robert Spetzler, MD; Nancy Spetzler; Foundation Board of Trustees President Mike Hecomovich; Past-Chairman of Barrow Women’s Board Sandy Hecomovich; and 2022- 2023 Barrow Women’s Board Chairman Diane Might.



Dilan Ellegala, MD (center) at KCMC.



# Meet Rita Sattler, PhD



Rita Sattler, PhD, runs the renowned Sattler Laboratory at Barrow, which conducts research into the cellular and molecular mechanisms of neurodegenerative diseases, such as Alzheimer's, amyotrophic lateral sclerosis (ALS), and frontotemporal dementia (FTD). Using a unique "brain-in-a-dish" model, along with advanced molecular, cellular, and imaging technology, Dr. Sattler and her team aim to discover specific drug targets that can be utilized to develop new treatments for these devastating diseases.

When Dr. Sattler isn't conducting groundbreaking research, she's busy educating future generations of neuroscientists. She has been the director of Barrow's Undergraduate Summer Research Internship Program and High School Research Program since 2019 and is responsible for much of their current growth and success. She is also the co-director of the ASU-BNI Interdisciplinary Graduate Program in Neuroscience. Dr. Sattler shares what drives her to provide meaningful neuroscience education to students at all levels of learning.

## ***Why are you passionate about making science accessible to younger students?***

I want to make sure that high school and undergraduate students have the opportunity to learn about science and see how exciting it can be. When I was growing up, I didn't know how incredible science was until after high school. Looking back, I would have loved for someone to provide me with the opportunities to make that road a little clearer. I want to be that person for these students.

## ***Why are these programs important to the field of neuroscience?***

The work we do as scientists is often overlooked in the field of translational neuroscience. However, without it, clinicians wouldn't be able to treat patients and surgeons wouldn't be able to perform complex operations. It's important that younger generations see the impact of scientific research and how it is a crucial aspect of providing medical care and treatment to patients today and in the future.

## ***How do these programs contribute to Barrow as a whole?***

It is important that Barrow is recognized not just as a place of exceptional patient care, but also as a place where novel ideas are formed and discoveries are made that will have an impact on how neurological diseases are treated down the road. These programs serve as a platform for that.

## ***Will you speak to the importance of bringing international students to Barrow?***

International education opportunities are so valuable for students because it takes them out of their comfort zone and allows them to overcome the fear of going out on their own. One of the most rewarding experiences in my personal education journey was studying abroad in Singapore for a year when I was an undergraduate student, which was only made possible through a fellowship. It is an indescribable feeling to know that I am now helping to provide similar opportunities here at Barrow for international students.





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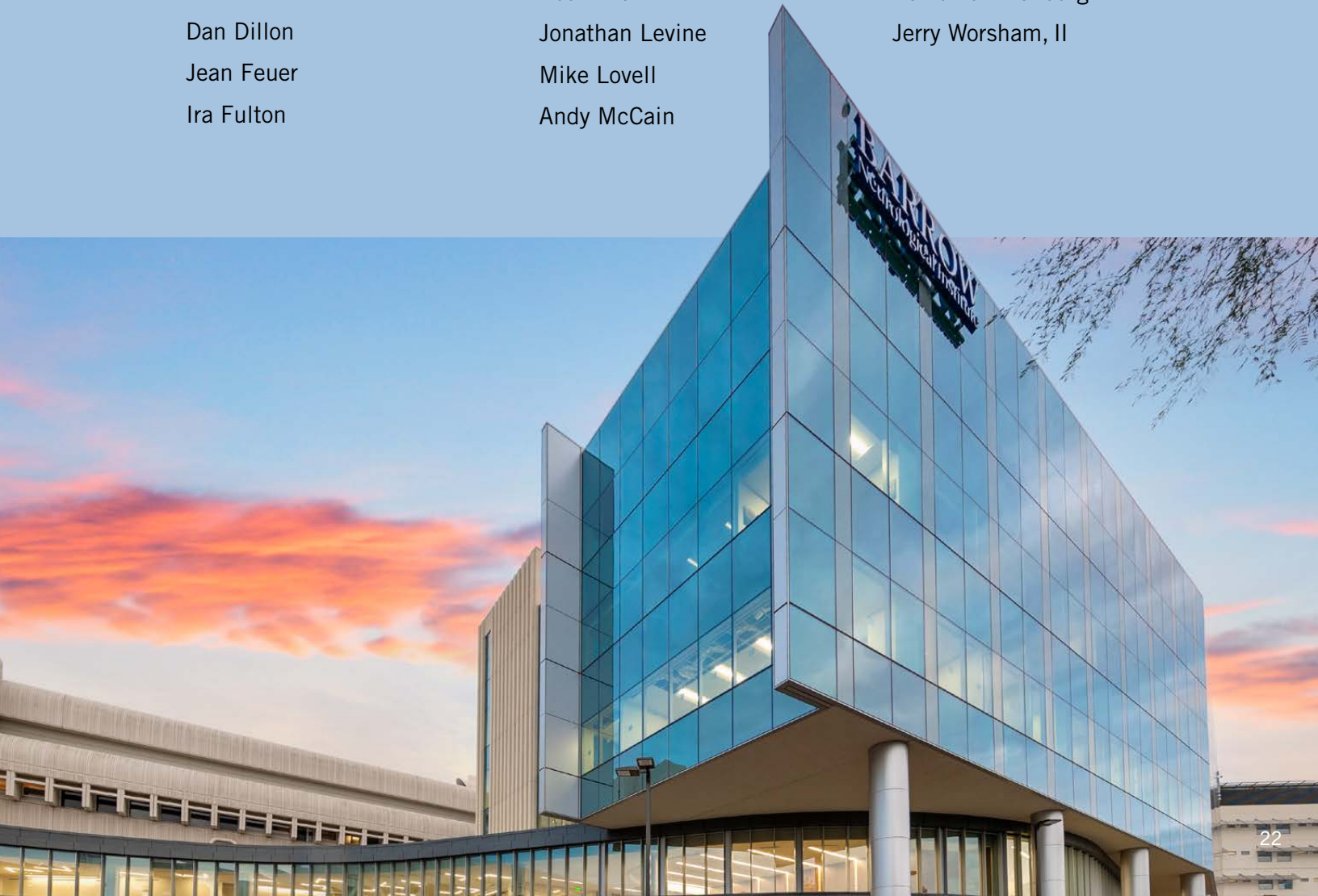
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