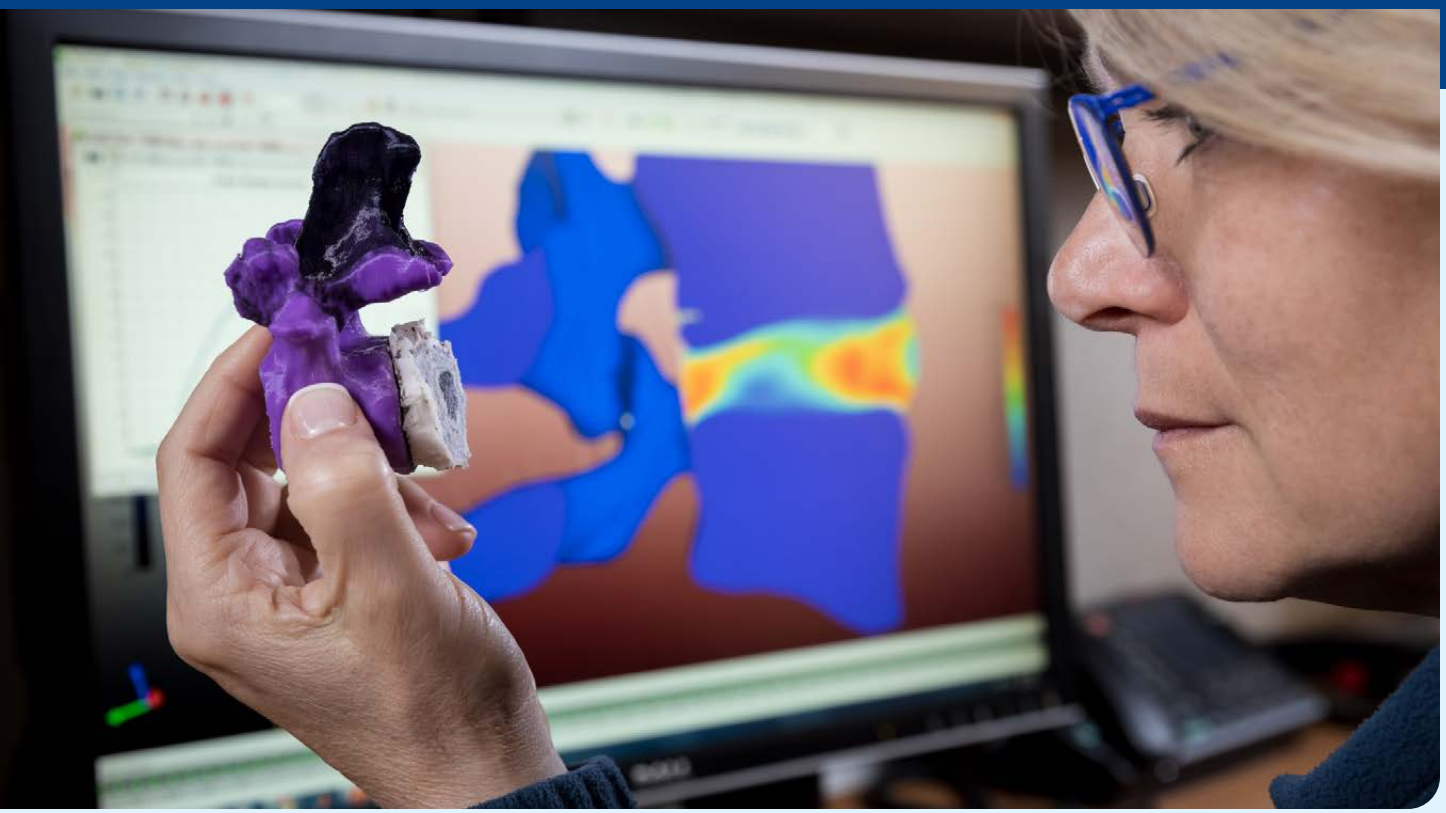
Barrow Neurological Foundation

FISCAL YEAR 2023 STEWARDSHIP REPORT

Thurston Innovation Center



EVERY GREAT ADVANCEMENT in neurosurgery can be traced back to a novel procedure or technology that challenged existing standards of care. The Thurston Innovation Center at Barrow Neurological Institute aims to train the next generation of neurosurgical innovators while eliminating barriers to developing revolutionary new technologies. The Center provides all the necessary equipment, personnel, and information required to transform concepts into functional devices.

Leadership in the Thurston Innovation Center includes Barrow President and CEO Michael T. Lawton, MD, and Barrow Chief Scientific Officer Robert Bowser, PhD. Brian Kelly, PhD, Spinal Biomechanics Laboratory Director, serves as the technical advisor, and Dakota Graham serves as the Center's lead research engineer.

22
ongoing projects

14
projects transformed from concept to prototype

4
new patent applications filed

BARROW NEUROLOGICAL INSTITUTE BY THE NUMBERS

CLINICAL IMPACT

117,700+
total number of patient visits

5,800+
brain and spine surgeries

14
Centers of Excellence

GLOBAL IMPACT

59
research fellows and visiting scholars: Argentina, Austria, Brazil, Chile, China, Colombia, Czech Republic, Denmark, Finland, Germany, India, Italy, Jordan, Mexico, Pakistan, Peru, Portugal, South Korea, Spain, Taiwan, Turkey, United Kingdom

TRANSFORMING CARE THROUGH INNOVATION

Over the past year, the Center has supported more than 22 projects, transforming 14 from concept to prototype. The following are some of the Center's resident-led projects, made possible through philanthropic support from Barrow Neurological Foundation donors.

Neurostimulator device: To measure a coma patient's level of consciousness, clinicians use the Glasgow Coma Scale (GCS), which relies on the manual application of painful stimuli. Neurosurgery resident Brandon Fox, MD, developed a novel device that provides an electrical stimulus, limiting potential injury and providing more consistency in how the exam is administered. Dr. Fox received funding from the Barrow Neurological Foundation Board of Trustees to expand his work into clinical studies. He also was awarded a grant from the Flinn Foundation to transform his prototype into an FDA-approved medical device, marking the first time a resident-led project has received external funding.

Medication extraction device: Nimodipine is a critical medication for patients with cerebral vasospasm, a narrowing of the arteries in the brain. However, it is only available in pill form, and nurses are required to extract the contents of the pill into a syringe by stabbing it with a needle. Oftentimes, the needle will slip and stab the nurse's finger. Neurosurgery resident Cyrus Elahi, MD, developed a device that guides the needle through the capsule and away from the nurse's fingers. The device, which is being tested in two Barrow neuro-ICU departments, is the first resident-led project approved for clinical use outside of neurosurgery.

Shunt flow detector: A shunt is a device surgically placed in the brain to drain excess cerebrospinal fluid (CSF). However, shunt failure is very common and can lead to a buildup of fluid that causes swelling of the brain. Currently, methods for determining shunt failure are expensive, invasive, and fraught with uncertainty. Barrow neurosurgery resident Steve Cho, MD, is developing a device that will allow any hospital with access to an ultrasound system to detect shunt failure non-invasively. Dr. Cho's shunt flow detector utilizes a movable lever that changes orientation based on the presence of CSF flow, which can be observed on an ultrasound.

Neurosurgical cranial models: Chief neurosurgery resident Arnau Benet, MD, PhD, is working to develop 3D-printed neurosurgical training models. Over the past year, Dr. Benet's models have undergone several major advancements, including the addition of major cranial muscle groups, cervical vertebrae, a jaw, a highly detailed skin model, and improved

haptics. These models will be available to residents at Barrow, as well as for neurosurgical education courses in developing countries that do not have access to human cadavers for training.

ACADEMIC AND INDUSTRY COLLABORATIONS

The Thurston Innovation Center is collaborating with biomedical engineering graduate students at Arizona State University and patent law students at the Lisa Foundation Patent Law Clinic. Over the past year, it has increased its outreach to potential industry partners with nine Confidential Disclosure Agreements to allow for licensing discussions. Its three studies evaluating projects for real-world impact also have drawn the attention of several device manufacturers.

The Center also provides services to research laboratories and departments throughout Barrow. For example, the Center works closely with the Neuro-Publications Department on developing hardware for augmented reality spine surgery training systems; the Mirzadeh Laboratory on developing sensor racks, enclosures, and stereotaxic components; the Spinal Biomechanics Laboratory on developing x-ray centering devices; and many more.

In addition, the Center holds monthly design reviews with engineering, clinical, and patent law partners to provide residents with feedback on their projects. These strategic collaborations both within Barrow and with outside partners would not be possible without philanthropic support.

ON THE HORIZON

To support the continued growth of the Thurston Innovation Center, the team plans to recruit additional engineers and project coordinators, as well as form more university and industry partnerships. As the Center pursues more ambitious projects, it will need advanced technology to keep pace. This includes acquiring a metal 3D printer; a CNC mill to produce highly accurate prototypes; heat-resistant injection molds to make intricate, small-scale devices; and a digital anatomy base unit to print complex networks of blood vessels.

BARROW NEUROLOGICAL INSTITUTE BY THE NUMBERS

RESEARCH

327
active research studies

200+
peer-reviewed journal publications

$12 MILLION
in new federal research grant support

DONOR IMPACT

3,898
total donors

$44 MILLION
distributed to Barrow Neurological Institute, including:

$25.4 MILLION
designated to the Ivy Brain Tumor Center

$5.3 MILLION
designated to specific centers/programs

$11.9 MILLION
for basic, clinical, and translational research

$1 MILLION
in endowments

THANK YOU FOR YOUR SUPPORT

Thank you for your generous support of the Thurston Innovation Center. What started as a simple idea has now transformed into a multistate, multidisciplinary entity that has generated substantial intellectual property and educational opportunities. Since its inception, the Center has filed more than 120 provisional patents, described 10 surgical procedures, and published more than 30 articles. This would not have been possible without your support.

Your generosity also allows us to foster new ideas and collaborations that are transforming patient care. This includes devices aimed at improving the reliability of neurological assessments, reducing procedure times and infection risk, and making neurosurgical education accessible to underserved communities across the globe.

Because of you, we are able to provide future surgeon-scientists with the skills, knowledge, and opportunity to revolutionize the field of neurosurgery and save lives. Thank you.

With gratitude,

Michael T. Lawton, MD
President and CEO, Barrow Neurological Institute

The mission of Barrow Neurological Foundation is simple: to be the catalyst of our donors' passion for transformation by providing the resources for Barrow Neurological Institute to achieve its mission of saving human lives through innovative treatment, groundbreaking research, and educating the next generation of the world's leading neuroclinicians.

Barrow
Neurological Foundation

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