

Innovation Center



The Barrow Innovation Center uses 3D printing to model complex spine cases so surgeons can practice their procedures.

→ **AT BARROW NEUROLOGICAL INSTITUTE,** visionary neurosurgeons reject norms in hope of finding better treatments. As part of their education, Barrow neurosurgery residents are taught the same thing, and they develop their own ideas on how to push boundaries to bring their ideas to life. The Barrow Innovation Center is the result. With modest start-up capital and strong faculty and institutional support, the center has grown from a simple idea to a multistate, multidisciplinary collaboration generating substantial intellectual property, educational opportunities, business entities, and, most importantly, better care for patients. By continuing to advance the Barrow Innovation Center and its core mission of innovation education, we will advance the field of neurosurgery by providing the next generation of neurosurgeons with the skills, knowledge, and opportunity needed to revolutionize the field.



50

provisional
patents filed



20

functional medical devices
created and tested



10

new surgical
procedures defined

ABOUT BARROW
NEUROLOGICAL INSTITUTE



#1 IN ARIZONA
#11 IN THE UNITED STATES
for neurology and neurosurgery



CLINICAL IMPACT

92,515

BNI Clinic visits

3,135

number of neurosurgeries

1,578

number of spine surgeries

\$2.8 MILLION

amount of charity care



GLOBAL IMPACT

54

visiting scholars, research fellows and observers from Mexico, India, Egypt, Pakistan, UK, Russia, China, Chile, Spain, Brazil, Japan, France, Italy, Kingdom of Saudi Arabia, Indonesia, Turkey, Germany, Poland, Colombia, Philippines, Israel, Argentina and Thailand.



PROGRAM ACCOMPLISHMENTS

Since its inception four years ago, the Barrow Innovation Center has seen exponential growth in productivity and output. To date, nearly 50 provisional patents have been filed, 22 of which have been converted to non-provisional, internationally protectable patent applications. Two patents have been licensed to industry partners, one patent has been formally awarded by the United States Patent and Trademark Office, and one patent is responsible for the creation of a company currently funding 80 percent of the center through sales of 3D printed surgical training models. The center's prototyping laboratory has generated and tested over 20 functional medical devices, 10 of which have been used in the operating room or outpatient procedure rooms for the delivery of patient care. We have also defined 10 new surgical procedures, which have been performed on nearly 40 patients across three institutions in Arizona, Washington, and Texas. These innovative procedures inspired a new annual meeting between spine surgeons and plastic surgeons to discuss better ways of preventing the most common complications in patients undergoing spine procedures. Barrow Innovation Center projects involve sub-specialty areas of neurosurgery, neurology, rehabilitation, and more. The center has established working relationships with the Ira A. Fulton Schools of Engineering and the Sandra Day O'Connor College of Law at Arizona State University, as well as California Polytechnic State University and Texas A&M University.

In order to meet a growing demand for 3D-printed training models and to expand its capacity for collaboration, the Barrow Innovation Center moved into a new laboratory in January 2019. The space is three times larger than the previous lab with updated equipment. Sarah McBryan, MSE, a biomedical engineer who now runs the laboratory space, is on staff full-time to help surgeons bring their ideas to fruition.

RESEARCH ADVANCES

The Innovation Center has generated more than 20 peer-reviewed publications and numerous presentations at national and international meetings. One paper demonstrates that 3D-printed synthetic spines can be used in place of cadaver spines for training and education.

Over the summer, the center had its first Barrow-funded undergraduate research intern. Dhrasti Dalal is a biomedical engineering student at Arizona State University. She worked with Michael Bohl, MD, chief neurosurgery resident and founder of the Barrow Innovation Center, to formulate synthetic muscle as a realistic training tool for lateral approach spine surgery. The research is ongoing.

ON THE HORIZON

Michael Lawton, MD, President and CEO of Barrow, is creating a craniotomy model to improve surgical education and give Barrow residents the opportunity to gain valuable experience in realistic simulations.

The Innovation Center is teaming up with the Barrow Cleft and Craniofacial Center for a variety of projects. The center will print models from the intra-oral scanner as well as images from our existing iCat system. The three-dimensional iCat scan, from the eyebrows down to the jaw, will allow surgeons to prepare for surgery. Additionally, the two centers are working on printing stents necessary to repair cleft palates. In both examples, printing models on-site would produce real-time results, and improve care and accuracy. This partnership will streamline the process by providing the models more efficiently and at reduced cost.

Patricia Beals, DMD, (top left) and the team at the Barrow Cleft and Craniofacial Center are working with the Barrow Innovation Center to print models to help surgeons prepare for surgery and to create stents for cleft palates.



RESEARCH

320

active research studies

839

patients enrolled in clinical trials

\$9 MILLION

in federal research grant support



DONOR IMPACT

\$3.98 MILLION

for basic and translational research

\$3.65 MILLION

for strategic initiatives including Barrow Aneurysm & AVM Research Center, Barrow Artificial Intelligence Center, neuroimaging and stroke

\$1.26 MILLION

for education and fellowship programs

\$2.52 MILLION

for community outreach programs



THANK YOU FOR YOUR SUPPORT

Because of the support of Barrow Neurological Foundation donors, the center provides a creative outlet for our residents and the resources to see an idea through development. We have the opportunity to make an impact on the quality of healthcare and we cannot thank you enough.

With Gratitude,
Michael Bohl, MD

↑ *In 2019, the Barrow Innovation Center moved into a new laboratory space and hired new staff to expand its operations.*

Barrow Neurological Foundation raises awareness and funding for patient care, medical education, community outreach and research offered at Barrow Neurological Institute. Barrow is an internationally-recognized leader in neurology, neurosurgery and neuroscience research, treating patients with a wide range of conditions, including brain and spinal tumors, concussion and brain and spinal traumas, neuromuscular diseases, stroke, cleft and craniofacial disorders, and cerebrovascular disorders. It is home to several centers of excellence, including the Ivy Brain Tumor Center, Muhammad Ali Parkinson Center and Gregory W. Fulton ALS and Neuromuscular Disease Center. www.SupportBarrow.org



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