Richard Warme, a 67-year-old Long Island painter, was in the middle of a job when he suddenly didn’t feel well and had to sit down. As he stepped off a scaffold, half the world around him went black. “It was as if I suddenly turned blind on one side,” he recalls. “I could see from one eye, but not from the other.” His friends called an ambulance, and his primary care physician advised him to go to Stony Brook University Hospital.
PERSONALIZING BRAIN SURGERY

After a series of brain scans, Warme learned that his brain, his aneurysm had a very large.

Warme’s brain images, he instantly knew neither personalized medicine tool. Vascular Simulations developed a process that allows 3D-printing replicas of patients’ brain structures.

The ability to practice a surgical procedure without making a single cut on a human.

So while Warme’s brain was still recovering from the stroke, its replica was being prepped for a test surgery. Creating a silicone aneurysm is a complex feat that takes about 36 hours, requires a lot of disease and involves both physicians and material engineers. The staff members at Vascular Simulations helped Warme’s brain scale on the computer and 3D-printed the blood vessel in plastic. Once the white-figured, structure hardened, they were coated with silicone and later sprayed with a special chemical solution to make them as slippery on the inside as human arteries typically are — otherwise the catheter threading experience would not be realistic. And when they were ready, Warme’s aneurysm opsite went into Weadley.

After a few trials, Weadley determined exactly the size of the device needed for Warme. He also knew that it was a perfect solution for the active Long Islander who still worked, fished, and prior to the stroke, captained a boat. However, the only way to get treated with the epidural mesh was by joining a clinical trial, and Warme didn’t qualify because of a heart condition. There wasn’t anything left to try. Weadley could ask the device maker to lobby the Food and Drug Administration on his behalf for a one-time compassionate use exemption. Weadley would have to convince both parties that the mesh plug was indeed Warme’s only road to recovery.

The establishment of the Cerebrovascular Center transformed healthcare standards for the entire region. "In just a few years we went from having no neurointerventionalists to having what probably is one of the largest practices for cerebrovascular diseases in the Tri-State area," Woas says.


Neurointerventionalists treat delicate and dangerous conditions occurring within brain vessels, where even minor errors can have catastrophic effects. Yet, unlike other professionals, brain surgeons never had a safe test environment in which they could try a new approach or polish their skills. Until recently, building solid clinical judgment still came from surgeons’ experience with difficult scenarios and unexpected complications.

Vascular Simulations, a startup company launched by Drs. Henry Woo and David Fiorella with Barry Lieber in 2011 and based at Stony Brook’s Long Island High Technology Incubator, has changed that. Similarly to how pilots hone their skills on flight simulators, Vascular Simulations lets neurosurgeons practice operating complex, life-threatening cases before making a single incision on their patients. By replicating patients’ individual arrangement of blood vessels, the company creates a reliable test bed for every patient’s case, no matter how unique or complex. The old method of using the same technique on every patient no longer works, says Woo. “Every patient’s anatomy is different, and we have to account for that.”

After months of writing letters and filling out forms on Warme’s behalf, Woo was finally granted a one-time compassionate use exemption by the FDA in the fall of 2015. As he expected, the results from the practice surgeries done on the simulator had clearly demonstrated that the new endovascular device was perfect for Warme. His surgery date was set quickly — December 7, so he could be home for Christmas. Warme was calm and confident about the operation. “It’s a big decision to do a surgery like that and you have to consider a lot, but Dr. Woo explained everything so well, and he had practiced on that machine.”

Warme says, “I trusted him, and I knew he was doing the right thing.”

Warme’s surgery went fast and easy because Woo had rehearsed it so many times, he knew every little twist of Warme’s anatomy by heart. “He got out from under the anesthesia a lot quicker because the device was the right size and it went right in, thanks to all this preplanning,” Eusemides says, adding that Warme’s overall recovery was also quite speedy. “One month later he was going about his usual business.”

Warme recalls in amazement how well he fell when he woke up in the recovery room. “I had no pain, no complications, not even a headache!” he says. “Dr. Woo has truly magical hands.” Three months after the surgery, “I get compliments that I look better and younger than before.” His life is pretty much back to normal. He’s doing painting work again and is looking forward to the upcoming fishing season and being on the boat this summer. When he retires a big catch, he shares the fish with his friends and primary care physician. This year, he might bring some to Dr. Woo.

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Above: Richard Warme with a replica of the aneurysm that Dr. Woo treated. “I explained everything, and he had practiced on that machine,” Warme says. “I trusted him.”

Vascular Simulations creates silicone-based replicas of human blood vessels and aneurysms by reconstructing them from CT scans or MRIs. Surgeons from around the world can choose from a long list of off-the-shelf vessels, available on the company’s website, or upload custom images of their own patients. Within a few days the corresponding arteries and aneurysms arrive by mail. The surgeons can then “snap” them into their own Headleys and practice multiple surgeries. By using the simulators surgeons can narrow their choice of embolization devices from a gamut of options to what fits each patient best. Even a few years ago, such highly personalized treatment and testing was unheard of, but today it is on its way to becoming the norm. In a field where an individualized medicine approach used to amount to thinking quickly on one’s feet and solving complications while the patient was still under anesthesia, Vascular Simulations is changing the way cerebrovascular diseases are treated around the world. With the level and precision of presurgical testing the company offers, it is quickly building a new standard of neurointerventional care, appropriate for the modern era of personalized medicine.