

# New device could benefit treatment of hand injuries

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PRIME could revolutionize the diagnosis and treatment of hand injuries and neurological disorders, specifically carpal tunnel syndrome. Credit: Rice University

A team of Rice University bioengineering students who invented a device to measure intrinsic hand muscle strength has won two prestigious honors for their patent-pending creation, PRIME. The device could revolutionize the diagnosis and treatment of hand injuries and neurological disorders, specifically carpal tunnel syndrome.

The OrthoIntrinsics team won first place and \$10,000 at IShow, an innovation competition for graduate and undergraduate students sponsored by the American Society of Mechanical Engineers in Palm Desert, Calif., this June.

They were then named one of five winners in a student design competition sponsored by the National Science Foundation at the Rehabilitation Engineering and Assistive Technology Society of North America conference in New Orleans in late June. The top five, unranked, were selected from more than 60 entries.

Graduates Caterina Kaffes, Matthew Miller, Neel Shah and Shuai "Steve" Xu invented PRIME, or Peg Restrained Intrinsic [Muscle](#) Evaluator, for their senior project. They are working with the Rice Alliance, which aids early stage technology ventures, and the Jones Graduate School of Business to refine their business plan while validation of the device is under way at two leading Texas Medical Center institutions, the Methodist Hospital and Shriners Hospital for Children.

The challenge presented by Gloria Gogola, an orthopedic [hand](#) surgeon specializing in pediatrics, was to create a device that accurately measures intrinsic hand muscles, which allow humans to play a piano or perform any task that requires dexterity and precision.

"Twenty percent of all ER admissions are hand-related," Xu said. "Neuromuscular disorders like [spinal cord injuries](#), Lou Gehrig's, diabetes, multiple sclerosis -- all these diseases affect the intrinsic hand muscles."

For starters, the team is honing in on carpal tunnel syndrome. "U.S. surgeons will perform over 500,000 procedures for carpal tunnel this year. We spend \$2 billion per year treating this disease but up to 20 percent of all surgeries need to be redone. Our invention can be used across the spectrum of care from diagnosis to outcome measurements," Xu said.

Anybody who's ever had a checkup knows how doctors routinely test

strength -- hold up a hand, push this way, push that way. The assessment is by feel, nothing quantifiable. Xu said previous devices lack the repeatability to be useful and do not adjust for small hands or unusual morphologies.

PRIME is intended to fill that gap. The device has three elements: a pegboard restraint, a force transducer enclosure and a PDA custom-programmed to capture measurements.

In a five-minute test, a doctor uses pegs to isolate a patient's individual fingers. "You wouldn't think it works as well as it does, but once you are pegged in, you can't move anything but the finger we want you to," Miller said.

A loop is fitted around the finger, and when the patient moves it, the amount of force generated is measured. "PRIME gets the peak force," Xu said. "Then the doctor can create a patient-specific file with all your information, time-stamped, and record every single measurement." PRIME integrates with existing systems in a manner compliant with the Health Information Portability and Accountability Act, better known as HIPAA, he said.

Xu hopes it will help hospitals and rehabilitation clinics compare the effectiveness of surgical interventions and diagnose neuromuscular degenerative diseases. "There's so much applicability, it's hard to pinpoint our market size," he said.

Gogola said PRIME has found a home in her clinic. "We've been using it on patients, and it's working very nicely.

"This particular student group worked extremely hard on the project, and they went above and beyond the course requirements. They took this from a concept to an actual working, clinically useful device."

Source: Rice University ([news](#) : [web](#))

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