International Group Studying Novel Robotic Hand

Current myoelectric prosthetic hands generally fall into two categories: single-grasp, three-digit hands and multigrasp anthropomorphic hands. While the former are often easier to control, lighter in weight and more affordable than their more-advanced counterparts, they are also more limited in function because they are only able to form a single, rigid grasp.

The Pisa/IIT SoftHand is a novel robotic hand. Because of its grasping versatility, its control simplicity and robustness, the design principles of the SoftHand offer a potential for the development of a radically new prosthetic device called the SoftHand Pro (Figure). Mayo Clinic researchers are currently involved in a joint research project to optimize use of the SoftHand Pro for people with upper limb amputations. Collaborators on this project include the Fondazione Istituto Italiano di Tecnologia (IIT), of Genova, Italy; the Istituto Nazionale per l’Assicurazione contro gli Infortuni sul Lavoro (INAIL) of Bologna, Italy; and Arizona State University (ASU), of Tempe, Arizona.

The SoftHand design allows the hand to adopt various grasps as it molds around objects, without the need for the user to consciously select a specific grasp. “We believe the SoftHand may provide an excellent alternative to the prosthetic options currently available to our patients,” says physiatrist Karen L. Andrews, M.D., of Mayo Clinic’s campus in Rochester, Minnesota, and director of Mayo Clinic’s Amputee Rehabilitation Service. The project’s three principal investigators are Dr. Andrews; Marco Santello, Ph.D., Arizona State University; and Antonio Bicchi, M.D., IIT.

Additional Mayo Clinic researchers involved in this project include Kristin D. Zhao, Ph.D., director of Mayo Clinic’s Assistive and Restorative Technology Lab; occupational therapist Amanda B. Theuer, O.T.; and Tyson L. Scrabeck, clinical research coordinator.

Funded by a generous grant made to Mayo’s Rehabilitation Medicine Research Center, the goal of this project is to develop a functional prototype and measure the mechanical and functional capabilities of it. It will then be further optimized for clinical trials and comparison with similar prostheses.
To meet the growing demand for orthopedic expertise among patients with diverse goals — from general fitness and functional rehabilitation to professional performance enhancement — Mayo Clinic is opening a new 20,000-square-foot Sports Medicine Center in downtown Minneapolis in partnership with two professional basketball teams, the Minnesota Timberwolves and Lynx. Located on the third floor of a now-defunct building at 600 Hennepin Ave., the newly remodeled shared-space facility will be named Mayo Clinic Square and is adjacent to the Target Center and Target Field. It is scheduled to open in the fall of 2014.

Under the partnership, the teams will also develop a new practice facility at the site — including four practice courts — and Mayo Clinic Sports Medicine Center specialists will be the preferred provider of medical care. Mayo Clinic specialists will diagnose, treat and rehabilitate musculoskeletal injuries, as well as implement programs for optimal performance and injury prevention. The teams’ marketing platforms will help Mayo Clinic provide public education on a variety of wellness topics, including nutrition and physical fitness.

Collaboration is key
Collaboration with the Timberwolves and Lynx will utilize the teams’ international reach to educate the public on health and wellness topics, according to Michael J. Stuart, M.D., of Mayo Clinic’s campus in Rochester, Minnesota. Dr. Stuart is Mayo Clinic Sports Medicine Center co-director, as well as USA Hockey chief medical officer and U.S. men’s Olympic ice hockey team physician, most recently in Sochi, Russia.

“This partnership provides an excellent opportunity to extend the Mayo Model of Care to Twin Cities residents,” Dr. Stuart explains. “We’re also thrilled to have the privilege of interacting closely with world-class athletes of the Timberwolves and Lynx with the goal of helping them optimize performance and avoid injury. Through our relationship with these fine athletes, we hope to inspire the public to learn more about evidence-based fitness and health practices.”

The new center will be similar to the new 25,000-square-foot Mayo Clinic Sports Medicine Center expansion at Mayo’s Dan Abraham Healthy Living Center in Rochester.

“We are proud to provide a team of renowned clinical experts, including orthopedic and physical medicine and rehabilitation specialists, who care for elite level professional and Olympic athletes,” says Edward R. Laskowski, M.D., Physical Medicine and Rehabilitation, and co-director, Mayo Clinic Sports Medicine Center. “We want to have this same level of care available to meet the fitness and performance needs of all ages and types of athletes and individuals interested in improving their overall fitness.”

Advanced services
Mayo staff on-site will include physicians who specialize in orthopedics and physical medicine and rehabilitation. Other staff members include physical therapists, athletic trainers, and strength and conditioning experts. A Mayo Clinic employee will be available to help navigate scheduling for patients seeking to integrate their sports medicine work-up with integrated care at Mayo Clinic in Rochester, Minnesota, 80 miles south of the new center.

Mayo Clinic Sports Medicine Center offerings include:
- Sports injury evaluation and treatment
- Sport-specific training and conditioning
- Health and well-being programs
- Diagnostic imaging, including digital radiographs, MRI and musculoskeletal ultrasound
- Injury prevention
- Performance-solution programs for elite and amateur athletes
- Regenerative medicine
- Ongoing orthopedic and sports medicine research

“The partnership reflects Mayo’s strong commitment to serving the needs of patients in the Twin Cities and our core value of sharing knowledge to improve people’s health and well-being around the nation and world,” says John T. Wald, M.D., Mayo Clinic radiologist and medical director for marketing and public affairs.
Information and Communication Technology Helps Improve Patient Access to Physical Medicine and Rehabilitation Care

The use of information and communication technology to provide patients living in rural areas with easier access to specialized medical care has been growing across Mayo Clinic. Patients can now access a variety of physical medicine and rehabilitation services without traveling long distances.

Traumatic brain injury (TBI) increases risk of chronic medical conditions that can be minimized with early identification and treatment. Missing this early connection to specialized services after TBI is the most common need identified by individuals hospitalized for TBI and their families, increasing their risk of poor outcomes while adding to personal and societal costs. In the Upper Midwest, rural dwellers, the elderly and Native Americans have the highest risk of TBI and are more likely to have limited access to specialized services.

Research testing a novel use of technology to improve patients’ access to specialized brain rehabilitation services is just one of several projects that Mayo Clinic’s TBI Model System Research Program has undertaken in recent years. The CONNECT trial uses information and communication technology components to test whether remote coordination of brain rehabilitation services improves outcomes for individuals who experience TBI in four Upper Midwest states. Funded by the National Institute on Disability and Rehabilitation Research (NIDRR), the CONNECT trial aims to remotely connect the patients, their families and their local providers to Mayo brain rehabilitation specialists and to each other using traditional (telephone, mail) and other (Web-based, email, smartphone, text, social media, Skype) communication technology.

According to Mayo Clinic brain rehabilitation specialist Allen W. Brown, M.D., project director of Mayo’s TBI Model System Center and CONNECT trial principal investigator, the community-based clinical trial will test whether this model of care leads to better outcomes when compared with a matched group of patients who receive usual care in their communities. “This trial directly addresses the long-expressed needs of patients, their families and local providers for better access to specialty brain rehabilitation services. We hope to show that their participation in roles important to them will improve because of it, by connecting them to our expertise and resources and to each other for support,” says Dr. Brown.

Mayo is conducting this first-of-its-kind study in Minnesota, Iowa, North Dakota and South Dakota. Research subjects are being identified through collaboration with the Department of Health in Minnesota, Department of Public Health in Iowa, Trinity Health in North Dakota and Regional Health in South Dakota. As the study progresses, Mayo researchers are hoping to learn more about the possible benefits associated with this approach. “If we find that this model of care is beneficial, it will provide evidence to expand the use of this practice model throughout the region and even test it nationally through our collaboration with the other 15 TBI Model Systems centers around the nation,” says Dr. Brown.

A recent move by Mayo Clinic Health System’s Northwest Wisconsin Region to use telemedicine for patients’ rehabilitation appointments is another example of how telemedicine services can help improve patient access to comprehensive rehabilitation services.

Initially, Catherine K. Schmidt, D.O., Physical Medicine and Rehabilitation, Mayo Clinic Health System in Eau Claire, Wisconsin, wasn’t sure if telemedicine appointments would work for her patients. “Physical medicine is very hands-on,” she says. “But, then I thought about how difficult it is for patients who’ve had a stroke, for example, to travel to Eau Claire from our more distant sites.”

Dr. Schmidt’s team began working with Mayo Clinic Health System sites in Barron and Rice Lake, Wisconsin, to offer telemedicine appointments in July 2013. In addition to technology preparations, Bethany A. Miller, Rehabilitation Services — Physical Therapy, who is an athletic trainer at Mayo Clinic Health System — Northland in Rice Lake, spent time in Eau Claire with Dr. Schmidt and Jay Loftsgaarden, M.D., Physical Medicine and Rehabilitation, for training. The team also tested a mock telemedicine appointment successfully.

When patients arrive in Barron or Rice Lake for physical medicine telemedicine appointments, Miller rooms them, takes their vitals, verifies the information in the electronic medical record, and then calls the specialist, who “enters the room” via telemedicine videoconference. “If Dr. Schmidt requests special tests or assessments, such as range of motion, manual muscle testing, dermatomes and myotomes, ligamentous testing — anything that tests the function of the affected limb or region — I perform them,” says Miller. “I act as her hands.”

Allen W. Brown, M.D.

Catherine K. Schmidt, D.O.
Patient response to the program has been positive. “One of our patients drives to Rice Lake from Ashland, Wisconsin, about two hours away, for his appointments,” says Miller. “The drive to Eau Claire would be another hour. The patients appreciate the effort to bring their rehab closer to home.”

Dr. Schmidt also is sold on the program. “I actually like the telemedicine visits, because the patients are much more focused in on the appointment,” she says. “And, the trainer at the site is very much focused on what the patient needs, because they’re involved in the visit. Rather than reading my notes, the trainer knows exactly what’s going on with the patient.”

The program is offered as an option, and Dr. Schmidt presents appropriate patients with the opportunity to participate in telemedicine appointments at their home clinics. In addition to saving patients time, telemedicine saves staff time. Specialists were driving up to 60 miles to from Eau Claire to other sites in the Northwest Wisconsin Region. Telemedicine has helped reduce driving time without requiring additional staff.

Kristy A. Hanson, Administration, leads the telemedicine project for the region and says that telemedicine is growing in the region, with eight clinics in the region now offering specialty services via telemedicine. “There are a few minor processes that need tweaking, but, generally, we’ve had good feedback from patients and providers,” she says.