Speeding along the technology superhighway

Ten years ago, "Skype" wasn't part of our vocabulary. Global Positioning Systems (GPS) were used primarily by the military, and there was no such thing as a "smartphone" or a "tablet computer." Today, it's hard to imagine our personal lives without these conveniences. Yet the tremendous advances in information and communications technology since the new millennium have resulted in even more dramatic changes in the field of rehabilitation. And the way we deliver health care.

In every department of the School of Health and Rehabilitation Sciences, new technologies are making a difference in how clinicians interact with each other and their patients. We see evidence of technology having a positive impact on research and education, clinical assessments, new treatment modalities and patient care.

In the Department of Communication Science and Disorders (CSD), for example, third-year doctoral student Tom Kovacs is utilizing new Brain Computer Interface (BCI) technology in a collaborative study designed to help people diagnosed with late-stage ALS (Lou Gehrig's disease) communicate longer and more fully.

The study, which is funded by the U.S. Department of Veterans Affairs, is the first major clinical demonstration project that collects language samples and performance data from individuals who utilize BCI systems that are built into their Augmentative and Alternative Communications (AAC) devices.

Kovacs says the unit looks a lot like a shower cap, with electrodes that attach to the user's scalp. "The BCI system can detect a response from the patient. It then uses the response to select letters to generate meaningful messages."

An important component of the BCI unit is a Language Activity Monitor (LAM). This groundbreaking software function was developed in 1999 by Associate Professor Katya Hill, Department of Communication Science and Disorders. Today, it is invaluable in its ability to collect log files to produce transcripts that allow the clinician to understand the variables influencing language performance and note changes in the user's language function.

When integrated with the BCI system, LAM offers tremendous opportunities for clinicians to measure and improve language performance.

"The language data collection system in the BCI is very cutting edge," boasts Kovacs. "For the first time we're able to collect and analyze patient language, and use what we've learned to guide treatment."

Because of its in-depth knowledge of LAM, Pitt and Hill's core VA lab has been selected to analyze language data captured across all five sites participating in the trial.

Although the study is in its early stages, Kovacs believes the technology holds much promise. "Since ALS is a degenerative disease, patients often lose their ability to communicate. With the new BCI system, they hopefully will be able to continue to communicate with their loved ones at the end stages of their lives."

New destinations through collaboration

When technology and rehabilitation intersect, Professor Katherine D. Seelman, associate dean of Disability Programs, suggests the need for more interdisciplinary collaboration.

"Rehabilitation traditionally involves a broad range of fields, including audiology and speech pathology, engineering and assistive technology, physical and occupational therapy and psychology and counseling," comments Seelman. "Now, Health Information Management (HIM) professionals play a vital role as well, connecting clinical, operational and administrative functions, and affecting the quality of patient information and patient care at every touch point in the health care delivery cycle. HIM professionals also support clinicians in the development and use of electronic health records."

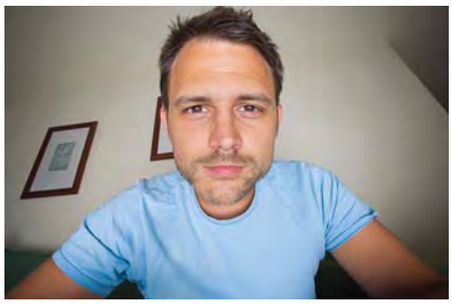
According to Associate Professor Bambang Parmanto, Department of Health Information Management, regular faculty meetings at SHRS foster collaboration and fruitful discussions that lead to innovation.

"Together we can develop applications that meet specific needs across a wide range of disciplines."

"We're very fortunate to have a collaborative faculty here at Pitt," explains Parmanto. "Together we can develop applications that meet specific needs across a wide range of disciplines."

Professor John Durrant, vice chair, Department of Communication Science and Disorders, was excited when Parmanto described a new technology – VISYTER – at a staff meeting.

"I told my colleagues about it immediately," Durrant declares "I had an idea of how it could be applied in



our department, and invited them to think of other uses."

VISYTER, a high-quality, high-speed multi-window televideo conferencing tool that requires no specialized hardware, quickly became the platform that supports a Virtual Observation Room (VOR) that opened in fall 2011.

Durrant sees the VOR being used for both clinical and educational purposes.

"VISYTER allows us to provide nearly on-site quality observations of working clinicians and their clients to students," he explains. "The clinician can be in Forbes Tower, in Children's Hospital, in rural Pennsylvania or around the world."

A webcam provides a "talkback" feature to the clinician in the treatment room, and permits pre- and post-treatment interactions among instructor, students and on-site clinician.

Thanks to a remotely steerable camera, "we will not only have the best seat in the house, but we'll be able to look around and monitor facial expressions and other body language," observes Durrant.

Durrant plans to use the facility for instructional role-playing and distance learning; "This is how you bring a whole classroom of people into the clinic." The platform also allows for the digital capture of information, so observations can be archived for future use by students and instructors.

The VOR is housed in the CSD lab operated by Associate Professor J. Scott Yaruss. He credits the ease of use and high-quality signals of the state-of-the-art VOR system with enhancing the Department's ability to support training, supervision, collaboration, observation, assessment and even treatment for individuals in remote locations.

"This system opens up new opportunities for interaction between clinicians, patients, teachers and researchers, while simultaneously increasing our ability to assess the validity and efficacy of telehealth applications in rehabilitation," remarks Yaruss.

The road to wellness and self-management

Another platform, known as iMHere (mobile health and rehabilitation), was recently developed by the Department of Health Information Management to assist individuals with chronic diseases, and give them access to clinical support. The platform was developed by Parmanto, the Health and Rehabilitation Informatics (HARI) lab lead.

According to the platform developer, third-year doctoral student Gede Pramana, Department of Health Information Management, iMHere has two main and totally integrated components – a smartphone application and a health portal.

Pramana states that iMHere is different from current health-related apps on the market today. "The iMHere apps are capable of sending monitoring data to and receiving self-care plans from the health portal," says Pramana.

Andrea Fairman, adjunct faculty member and doctoral candidate in the Department of Rehabilitation Science and Technology and former executive director of the Spina Bifida Association of Western Pennsylvania, is collaborating with Dr. Brad Dicianno, medical director of UPMC's Adult Spina Bifida Clinic, on a study of this technology among patients with spina bifida. The usability portion of the project is currently under way, and will be followed by a clinical trial with patients at the clinic. Fairman believes this intervention is client-centered, and empowers the individual to become an active partner in his or her health care.

"Our study will help to determine if smartphone technologies like iMHere will help patients with spina bifida develop self-management skills and provide support in the environments where they live, work, learn and engage in leisure activities," Fairman reports.

For example, iMHere provides spina bifida patients with apps to help them manage their medicines, monitor their skin conditions, and track bowel and catheterization schedules.

Daihua X. Yu, a fourth-year doctoral student in the Department of Health Information Management, is responsible for developing and refining the apps used in the study. She is also conducting research on how to adjust the smartphone apps to the patients' disabilities and preferences.

Yu describes the benefits of the interactive nature of the platform; "This mobile health technology will improve the relationship between patients and providers. All the information the patient enters on the smartphone will be automatically uploaded to the clinical monitoring portal on the Web. This real-time, daily evidence support will certainly help providers make the right suggestion for treatment. Similarly, patients will easily and quickly receive comments and suggestions from their clinicians through their smartphones."

Feedback from patients in the usability study has been positive. One young adult praised the app because he could see its potential to "help me even more in my already independent life."

Fairman goes on; "A persistent problem for persons with spina bifida is that the lack of self-management skills or inconsistent adherence to self-care routines quickly results in serious secondary medical issues. Through telerehabilitation, patients can be supported from a distance. With the development of self-management skills and appropriate support, many of these patients are capable of living healthy, productive lives while residing in the community."

She points out that the study will also be measuring the cost-effectiveness of telerehabilitation in light of the current shortage of health care professionals.

As new treatment and accessibility challenges arise, new technologies will emerge to solve them, thanks to the dedication of the researchers and scientists at SHRS.

Reflecting on her decision to enter the field, Yu notes, "When I found the significant difference that technology could bring to people with impairments, I chose to deepen my study in a program where I could use my knowledge and skills to improve health care through rehabilitation."

COMING TO TERMS

A quick guide to some of the many acronyms that are part of today's health care vocabulary.

ICT = Information and Communications Technology
ICT is an umbrella term that includes any communication device or application. It may include radio, television, cellular phones, computer and network hardware and software, satellite systems and so on, as well as the various services and applications associated with them, such as videoconferencing and distance learning. Many consider ICT to be the backbone of telerehabilitation because the delivery of telerehab services depends on ICT devices and hardware and software systems.

TR = Telerehabilitation
TR is the application of telecommunication (ICT) technology to support rehabilitation services.

HIT = Health Information Technology
HIT is broadly defined as the use of information and communication technology (ICT) in health care. HIT allows the transfer and linkage of data well beyond the walls of the health care facility. This technology supports the conversion of patient records to Electronic Health Records (EHR) and EHR systems.