For more than two decades, physician-scientist Pablo Celnik has studied how people acquire new motor abilities and what makes those abilities stick around. To this end, he’s used noninvasive brain stimulation techniques including transcranial direct current stimulation (tDCS) and transcranial magnetic stimulation (TMS). Because he found that applying stimulation enhances the ability to acquire new motor skills, retain them longer and improve function in neurological patients, he opened a comprehensive Noninvasive Brain Stimulation Program geared to enhance the effects of rehabilitation—the only one of its kind in the U.S. and one of few in the world that offer this kind of intervention.

“We’re continuing our research in this area, but our ultimate goal has always been to help patients,” says Celnik, who also directs the Johns Hopkins Department of Physical Medicine and Rehabilitation and the Center of Excellence in Stroke Treatment, Recovery and Rehabilitation.

Celnik’s body of work includes the first study that demonstrated patients with stroke can perform motor actions better under the effects of tDCS, as well as a landmark study, published in PNAS in 2009, which showed that healthy volunteers remembered a newly learned motor task better and with more accuracy if they received tDCS while learning it, compared with those who didn’t receive this stimulation. Additional studies by Celnik’s group and others have suggested that the effects are mediated by modulation of neurons with receptors for the inhibitory neurotransmitter gamma-aminobutyric acid (GABA) as well as long-term potentiation-related changes, although the exact mechanism remains unclear.

The Noninvasive Brain Stimulation Program is aimed at patients who have motor, language, cognitive and other deficits stemming from brain injuries and disorders, such as stroke, traumatic brain injury and Parkinson’s disease.

Patients who qualify participate in a pilot that involves three weeks of either tDCS or TMS, depending on the type of neurological condition, combined with high-intensity physical or occupational therapy or speech-language therapy. This combination approach of brain stimulation and high intensity rehabilitation represents a unique program and a marked difference from the low-intensity therapy that’s typically offered as a standard of care for these conditions.

Although the stimulation is applied for just a brief part of each session, Celnik adds, his and other research shows the modulation of brain plasticity lingers for at least an hour and a half. A significant number of patients have shown substantial improvement from this program. For the small remainder of patients who don’t improve over the three-week pilot, Celnik typically recommends continuing with standard therapies.

Celnik says he’s seen some patients go from having significant difficulty walking to using a cane or no assistance at all; patients who’ve had trouble with manual dexterity and balance can stand and dress themselves.

“It’s so rewarding to be able to put the science and knowledge we’ve been gathering over the years to practical use in patients,” says Celnik, “but it feels even greater to see people improve.”
New Location Provides Total Cancer Care

In summer 2018, the Cancer Rehabilitation Program started providing cancer rehabilitation services in a state-of-the-art rehabilitation gym in the new Skip Viragh Outpatient Cancer Building, where complete cancer care is delivered in one location across 10 floors. The building is a key hub of cancer services and clinical research at Johns Hopkins, and is the embodiment of team science and precision medicine, bringing the very best treatment plan and supportive care to each patient. It offers 38 exam rooms, 38 infusion rooms, six consultation rooms, a cafe and sweeping views of Baltimore’s skyline. The new location is one of several places within the Johns Hopkins Rehabilitation Network that offers cancer rehabilitation services.

Rehabilitation Throughout the Cancer Journey

Because of the aggressive nature of many cancer treatments—and the tremendous increase in survival for many cancer types in the past several years—patients are living longer with treatment complications. That’s why Johns Hopkins physical therapist Laurie Fitz, physiatrists Samuel Mayer and Dorianne Feldman, and a group of specially trained physical and occupational therapists and psychologists operate the Johns Hopkins Cancer Rehabilitation Program. The program offers rehabilitation therapy before, during and after cancer treatments on both an inpatient and outpatient basis, all precisely customized to patients’ needs.

“We see as many impairments from the treatments as we do from the cancer itself,” says Mayer. These include physical issues such as lymphedema from breast cancer surgery or scar tissue from other cancer surgeries, burns or nerve damage from radiation, or neuropathies or musculoskeletal pain from chemotherapy. Cancer treatments can also affect cognition and memory, the phenomenon known as “chemo brain.”

To help head off some of these issues, patients referred to the program by their oncologists will often receive “prehab,” Mayer explains, or exercises before treatment to make sure side effects don’t compound problems that already exist. For example, physical therapists might examine a breast cancer patient’s range of shoulder motion and prescribe flexibility exercises before radiation to make sure that resulting scar tissue won’t impact the patient’s ability to reach overhead or behind the back.

Fatigue, both mental and physical, is one of the most common side effects during cancer treatments, Fitz adds. To combat this issue, occupational therapists work with patients to develop strategies to boost memory and concentration, while physical therapists can help patients begin or continue walking and other exercise programs.

“Patients may have pain or fatigue,” says Fitz. “But the last thing we want people doing is becoming sedentary.”

Fitz explains that numerous studies have shown that exercise during cancer treatment can help relieve some of these side effects and prevent further impairment or dysfunction down the road. Being able to stay active after treatment has been shown to reduce the risk of recurrence of certain cancers, such as breast and colorectal. In addition, getting in shape before treatment starts can help optimize outcomes.

To get patients into therapy sooner—when overall results tend to be better—Fitz, Mayer and their team are working to implement systematic assessments that nurses or other practitioners can administer to detect functional decline in their patients. If a patient’s physical status changes significantly between appointments, it can be used as a trigger for prescribing rehabilitation. These assessments are currently being piloted in radiation oncology for head and neck, brain, and breast tumors.

After cancer treatment ends, the therapies can continue to help patients achieve the best possible quality of life as cancer survivors or while living with chronic disease.
Growing Demand Spurs New Outpatient Rehabilitation Clinics

Johns Hopkins Rehabilitation Network has opened four new outpatient therapy clinics, with more expansions and openings on the way. Over the last few years, clinics have opened along Baltimore’s perimeter: in Odenton, White Marsh and within the acac Fitness and Wellness Center in Timonium, where therapists have access to an indoor aquatic therapy pool. In addition, a specialized clinic for musicians and dancers has opened at The Peabody Institute of The Johns Hopkins University.

In 2019, Columbia, Maryland, will get a fully integrated clinic with orthopaedic surgery, physiatry, pain management and rehabilitation therapies. A 24,000-square-foot Johns Hopkins Musculoskeletal Center will also open in 2019 in the new Pavilion III building of Green Spring Station, north of Baltimore, and the existing 6,000-square-foot Pavilion II clinic will be upgraded to focus on oncology, neurology, pelvic health and other specialties.

The new locations will help grow the Johns Hopkins Rehabilitation Network—a network of PM&R services across the Mid-Atlantic region consisting of three inpatient locations, 10 outpatient locations and specialized pediatric services. “The new clinics will increase community access to physical therapy, occupational therapy and speech language therapy, where we anticipate patient volumes of 100,000 or more visits per year,” says Ken Johnson, director of outpatient rehabilitation therapy.

Reasons for increased demand, says Johnson, include an aging population, the strong reputation of Johns Hopkins and recognition that patients benefit when they stay within Johns Hopkins facilities as they transition from inpatient care to outpatient therapy.

“Our reach and our reputation are bringing patients from farther and farther away,” he says. One such patient is Olivia Kane, a Princeton University soccer midfielder sidelined with chronic myofascial pain.

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Facility and Residents Develop Software to Enhance Interaction, Facilitate Precision Education

Medical residents in the Department of Physical Medicine and Rehabilitation (PMR) at The Johns Hopkins Hospital say there’s never enough time for questions during busy clinical rotations with attending physicians. To address the problem, the two groups developed an online interface where they can communicate without the restraints of time or space.

“It’s time-effective for me because the resident will send a question that I can quickly respond to when I have a few minutes,” says Samuel Mayer, a physiatrist on the team developing the software.

Called WeLearnON, the software provides a place for residents to ask questions—and physicians to answer—at anytime from anywhere using a desktop or mobile device. Users create posts and comment on posts all in one place.

The team started working on the concept in late 2017 and launched a prototype in mid-2018. Since then, users have initiated hundreds of conversations.

For Stephanie Van, a PMR resident on the team that developed the software, WeLearnON provides an open door for communication as well as access to a searchable database of questions and answers from other residents and attending physicians.

When a resident writes a post, keywords bring up any related conversations for review. When the post is complete, the resident designates an attending physician, who then receives a notification to answer the post. Any post can include an attachment or ask a librarian to find a resource.

Alexis Coslick, another PMR resident developing the software, appreciates being able to see what other people ask as well as learn from conversations about rotations she hasn’t completed. “It allows residents to be interactive, not only with their attendings, but with each other. You can chime in on any of the posts.”

Aside from communication, WeLearnON enables medical education to be tailored to learners. For example, if a resident wants to learn more about respiratory function and pain medications, she or he asks a question in the interface. Data from this post, along with data from all the other posts, is analyzed by the software to create visual representations of topics that come up most, types of questions asked most and which learners ask which questions.

“Attending physicians can choose to dedicate in-person teaching time to a topic if it comes up through capacitive and resistive tissues), MyACT (myofascial acoustic compression therapy) and photobiostimulation with laser. He uses an anti-gravity treadmill to analyze Olivia’s gait.

Johnson, who is in frequent contact with Olivia’s Princeton trainers, also uses surface sensors and biofeedback to help the 19-year-old strengthen her hips and legs.

(continued on page 4)
Growing Demand Spurs New Outpatient Rehabilitation Clinics (continued from page 3)

After a year of unsuccessful therapy elsewhere, the Kanes turned to Johns Hopkins, the only clinic with the equipment and expertise they wanted.

The ambulatory clinic growth is particularly beneficial to patients who require highly trained therapists, says Marlis Gonzalez-Fernandez, vice chair of the department’s clinical operations. In addition to advanced therapy services for sports medicine, it is also important to consider the specialized programs that the network can offer patients with special needs.

“I tell my patients with amputations not to choose a clinic that only does orthopaedic therapy,” Gonzalez-Fernandez says. “They need to learn how to use the device, what it can and can’t do, and how to put it on. If they get therapy at one of our sites, I know if the intervention is helping or not, and we can manage their care accordingly.

“The good thing is, as we get more and more sites, my patients will have more options.”

Faculty and Residents Develop Software to Enhance Interaction, Facilitate Precision Education (continued from page 3)

frequently or is particularly important,” says Mayer. “The data can also be applied to inform how to work with a particular student or how to shape a curriculum.”

Van is excited to apply the tool in other Johns Hopkins residency programs such as general surgery. “Hopkins has a deep history in revolutionizing resident education, and everyone in this group believes this is a revolutionary learning tool,” she says. “It has flexibility to help learners in all sorts of specialties, so we are excited to share it.”

Save the Date: March 11-12

Workshop: Implementing an Inter-professional Culture of Mobility Across the Hospital

Baltimore, MD

For more information, visit bit.ly/hopkinsampworkshop

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Hopkins Access Line (HAL)
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For CME Programs:
hopkinscme.cloud-cme.com
410-955-2959
cmenet@jhmi.edu

A newsletter from Johns Hopkins Physical Medicine and Rehabilitation

Johns Hopkins Medicine
Marketing and Communications
901 S. Bond St., Suite 550
Baltimore, MD 21231

This newsletter is one of the many ways we seek to enhance our partnership with our referring physicians. Comments, questions and thoughts on topics you would like to see covered in upcoming issues are always welcome.

Physical Medicine and Rehabilitation
Pablo Celnik, M.D., Director and Editor
Email: pcelnik@jhmi.edu

Marketing and Communications
Lisa Rademakers, Editor
Christen Brownlee, Karen Nitkin, Lisa Rademakers, Writers
Kristen Caudill, Designer
Keith Weller, Photographer

For questions or comments, contact: Lisa Rademakers at lradema1@jhmi.edu or 443-287-2527.

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Pablo Celnik, M.D., Director and Editor
Email: pcelnik@jhmi.edu

Marketing and Communications
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cmenet@jhmi.edu