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Message from the Chair

Dear Colleagues,

Innovation. It is a word that is thrown around a lot these days. However, at the University of Pittsburgh and UPMC, innovation is something that fuels our everyday work. A community that has reinvented itself from an industrial steel town to a hotbed of biotechnology, medical advances, and state-of-the-art education, the city of “Meds and Eds” is now an exciting and vibrant center for innovation.

Rich and productive collaboration and a strong work ethic are behind our success, and continue to attract the nation’s top talent. Our Rehabilitation Institute both contributes to, and benefits from, this fertile culture. From engineering marvels to biologic breakthroughs, from pragmatic research influencing today’s clinical practice to software developments that will shape tomorrow’s clinical practice, the only constant is change.

Never has there been a more exciting time in medicine and science, and never has there been a more exciting time at the UPMC Rehabilitation Institute. I am proud to share with you some of our most recent innovations, and I welcome you to visit us in Pittsburgh and explore all that we have to offer.

With kind regards,

Gwendolyn Sowa, MD, PhD

Director, UPMC Rehabilitation Institute

Chair, Department of Physical Medicine and Rehabilitation



Affiliated with the University of Pittsburgh School of Medicine, UPMC Presbyterian Shadyside is ranked among America’s Best Hospitals by *U.S. News & World Report*.

UPMC LIFE CHANGING MEDICINE

Targeted Interventions to Prevent Chronic Low Back Pain in High Risk Patients: A Multisite Pragmatic RCT

Low back pain (LBP) is a common problem among many adults in the United States. Anthony Delitto, PhD, PT, dean of the School of Health and Rehabilitation Sciences, and professor in the Department of Physical Therapy, is leading the TARGET study to compare treatments for preventing patients with acute LBP from developing chronic LBP. This study is funded by the Patient-Centered Outcomes Research Institute (PCORI) for \$12,174,689.

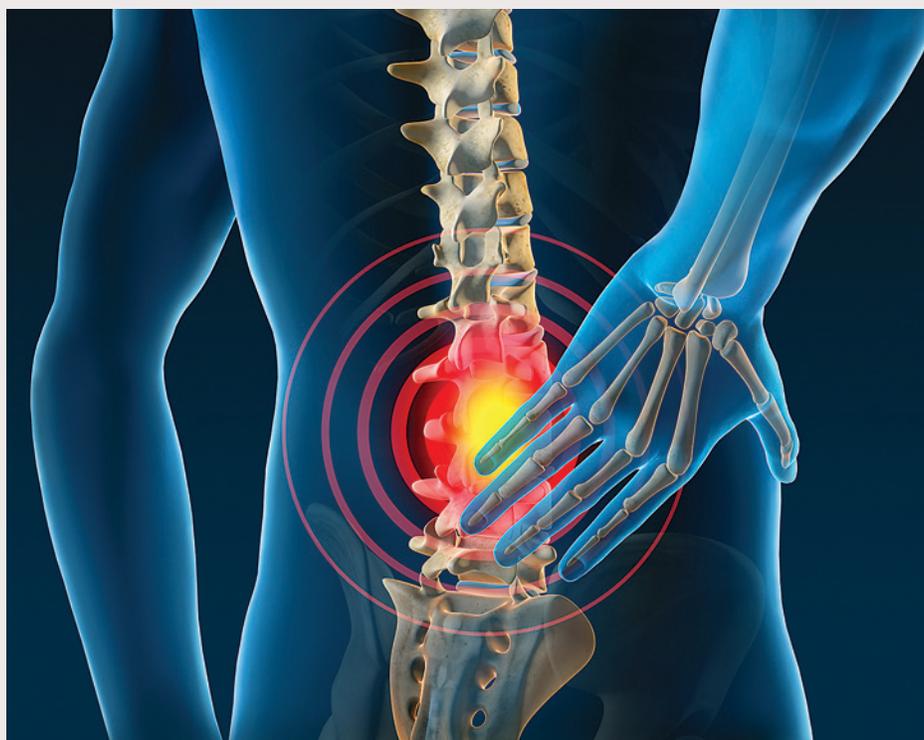
Twelve Primary Care Physician (PCP) clinics will participate across five regional sites: Pittsburgh, Pennsylvania; Salt Lake City, Utah; Boston, Massachusetts; Baltimore, Maryland; and Charleston, South Carolina. A randomized trial approach will determine two types of treatment. Both approaches will provide the PCP with information concerning the patient's risk of transitioning from acute to chronic LBP. The first approach will be usual care from the PCP, per accepted clinical guidelines. The second approach will have the PCP work with physical therapists to deliver cognitive behavioral therapy (CBT) for patients with a high risk of transitioning to chronic LBP. This psychologically informed physical therapy intervention is intended to help patients overcome barriers to recovery.

All patients will start the trial in the acute LBP phase. After six and 12 months, patients will be compared based on how they perform various activities, such as walking, sitting, standing, traveling, lifting, and sleeping. The number of low back-related x-rays, MRIs, surgeries, and other medical procedures also will be measured.

"In comparison to usual primary care, a psychologically informed physical therapy approach matched to 'high-risk' patients may be more effective for preventing patients with acute LBP from developing chronic LBP, improving functional outcomes, and reducing LBP-related medical utilization," explains Dr. Delitto.

This trial began in 2015 and will run through September 2020. Recruitment at 33 UPMC primary care facilities began in May 2016. Primary care has screened and stratified more than 4,800 patients presenting for treatment of low back pain. Of the 4,800 patients presenting, approximately 25 percent have been electronically referred to our integrated system for physical therapy. With a less than 5 percent rate of opting out, patients have been very accepting of participation.

Citing the IMPaCT (IMplementation to improve Patient Care through Targeted treatment) Back Study (Foster NE, Mullis R, et al), Dr. Delitto and his team have designed a clear stratification of patients, using a screening tool, into high, medium, and low risk for transitioning to chronic back pain. If a patient scores a 4 or greater, they are considered at high risk of converting to chronic low back pain. "In European environments, the stratified approach appears to correctly identify patients with low back pain who are at high risk for persistent pain and directs them to effective treatments," says Dr. Delitto. "In the TARGET study, we hope to accomplish the feasibility and effectiveness of the stratified approach in the United States in preventing acute low back pain from transitioning to chronic low back pain. In this pragmatic trial, the real-life environments allow us to assess the feasibility and acceptability of our approach."



Research and Publications

Recent select publications from faculty in the Department of Physical Medicine and Rehabilitation.

Hiremath SV, Tyler-Kabara EC, Wheeler JJ, Moran DW, Gaunt RA, Collinger JL, Foldes ST, Weber DJ, Chen W, Boninger ML, Wang W. Human Perception of Electrical Stimulation on the Surface of Somatosensory Cortex. *PLoS One*. 2017; 10: 12(5):e0176020. doi: 10.1371/journal.pone.0176020. eCollection 2017.

Boninger ML, Field-Fote EC, Kirshblum SC, Lammertse DP, Dyson-Hudson TA, Hudson L, Heinemann AW. Research Progress From the SCI Model Systems (SCIMS): An Interactive Discussion on Future Directions. *J Spinal Cord Med*. 2017; 18: 1-7. doi: 10.1080/10790268.2017.1314879. [Epub ahead of print]

Myaskovsky L, Gao S, Hausmann LR, Bornemann KR, Burkitt KH, Switzer GE, Fine MJ, Phillips SL, Gater D, Spungen AM, Boninger ML. How Are Race, Cultural, and Psychosocial Factors Associated With Outcomes in Veterans With Spinal Cord Injury? *Arch Phys Med Rehabil*. 2017; Jan 25. pii: S0003-9993(17)30025-4. doi: 10.1016/j.apmr.2016.12.015. [Epub ahead of print]

Popchak AJ, Hogaboom NS, Vyas D, Abt JP, Delitto A, Irrgang JJ, Boninger ML. Acute Response of the Infraspinatus and Biceps Tendons to Pitching in Youth Baseball. *Med Sci Sports Exerc*. 2017; 49(6): 1168-1175.

Lai S, Panarese A, Lawrence R, Boninger ML, Micera S, Ambrosio F. A Murine Model of Robotic Training to Evaluate Skeletal Muscle Recovery After Injury. *Med Sci Sports Exerc*. 2017; 49(4): 840-847.

Myaskovsky L, Gao S, Hausmann LR, Bornemann KR, Burkitt KH, Switzer GE, Fine MJ, Phillips SL, Gater D, Spungen AM, Worobey L, Boninger ML. Quality and Equity in Wheelchairs Used by Veterans. *Arch Phys Med Rehabil*. 2017; 98(3): 442-449.

Kryger M, Wester B, Pohlmeier EA, Rich M, John B, Beaty J, McLoughlin M, Boninger M, Tyler-Kabara EC. Flight Simulation Using a Brain-Computer Interface: A Pilot, Pilot study. *Exp Neurol*. 2017; 287(Pt 4): 473-478.

Lin RJ, Munin MC, Rosen CA, Smith LJ. Effect of Intralaryngeal Muscle Synkinesis on Perception of Voice Handicap in Patients With Unilateral Vocal Fold Paralysis. *Laryngoscope*. 2017 Jan 20. doi: 10.1002/lary.26390. [Epub ahead of print]

Farrokhi S, Jayabalan P, Gustafson JA, Klatt BA, Sowa GA, Piva SR. The Influence of Continuous Versus Interval Walking Exercise on Knee Joint Loading and Pain in Patients With Knee Osteoarthritis. *Gait Posture*. 2017 May 17; 56: 129-133. doi: 10.1016/j.gaitpost.2017.05.015. [Epub ahead of print]

Piva SR, Almeida GJ, Gil AB, DiGioia AM, Helsel DL, Sowa GA. A Comprehensive Behavioral and Exercise Intervention Improves Physical Function and Activity Participation After Total Knee Replacement — A Pilot Randomized Study. *Arthritis Care Res*. 2017 Feb 19; doi: 10.1002/acr.23227. [Epub ahead of print]

Russo F, Hartman RA, Bell KM, Vo N, Sowa GA, Kang JD, Vadalà G, Denaro V. Biomechanical Evaluation of Transpedicular Nucleotomy With Intact Annulus Fibrosus. *Spine (Phila Pa 1976)*. 2017 Feb 15; 42(4): E193-E201.

Krishnan S, Vodovotz Y, Karg PE, Constantine G, Sowa GA, Constantine FJ, Brienza DM. Inflammatory Mediators Associated With Pressure Ulcer Development in Individuals With Pneumonia After Traumatic Spinal Cord Injury: A Pilot Study. *Arch Phys Med Rehabil*. 2017 Jan 25. pii: S0003-9993(17)30028-X. doi: 10.1016/j.apmr.2016.12.018. [Epub ahead of print]

Cui LR, LaPorte M, Civitello M, Stanger M, Orringer M, Casey F 3rd, Kuch BA, Beers SR, Valenta CA, Kochanek PM, Houtrow AJ, Fink EL. Physical and Occupational Therapy Utilization in a Pediatric Intensive Care Unit. *J Crit Care*. 2017 Mar 7; 40: 15-20. doi: 10.1016/j.jcrc.2017.03.003. [Epub ahead of print]

Chien AT, Kuhlthau KA, Toomey SL, Quinn JA, Okumura MJ, Kuo DZ, Houtrow AJ, Van Cleave J, Landrum MB, Jang J, Janmey I, Furdyna MJ, Schuster MA. Quality of Primary Care for Children With Disabilities Enrolled in Medicaid. *Acad Pediatr*. 2017; 17(4): 443-449.

Pulcini CD, Zima BT, Kelleher KJ, Houtrow AJ. Poverty and Trends in Three Common Chronic Disorders. *Pediatrics*. 2017; 139(3). pii: e20162539. doi: 10.1542/peds.2016-2539. Epub 2017 Feb 13.

Bendixen RM, Houtrow A. Parental Reflections on the Diagnostic Process for Duchenne Muscular Dystrophy: A Qualitative Study. *J Pediatr Health Care*. 2017 May - Jun; 31(3): 285-292. doi: 10.1016/j.pedhc.2016.09.002. Epub 2016 Oct 12.

Hoagwood KE, Zima BT, Buka SL, Houtrow A, Kelleher KJ. State-to-State Variation in SSI Enrollment for Children With Mental Disabilities: An Administrative and Ethical Challenge. *Psychiatr Serv*. 2017 Feb 1; 68(2): 195-198. doi: 10.1176/appi.ps.201600118. Epub 2016 Oct 3.

SHRS Rankings

The University of Pittsburgh School of Health and Rehabilitation Sciences (SHRS) is a nationally ranked program for rehabilitation professions. Students receive hands-on training working alongside health care professionals in clinical and classroom settings. Pitt students have priority for clinical internships based on the strong relationship between Pitt and UPMC. We are proud to announce the latest *U.S. News & World Report* rankings of our SHRS divisions:

- Physical Therapy ranked #1 in the nation
- Occupational Therapy ranked #4 in the nation
- Audiology and Speech-Language Pathology ranked #7 in the nation
- Rehabilitation Counseling ranked #18 in the nation



Amy Houtrow, MD, PhD, MPH, associate professor and vice chair of Pediatric Rehabilitation Medicine, is the 2017 recipient of the prestigious American Congress of Rehabilitation Medicine Edward Lowman Award.

This award was established in honor of Edward Lowman, MD, who recognized the importance of multidisciplinary teams in rehabilitation. This award is for individuals whose careers reflect an energetic promotion of the spirit of interdisciplinary rehabilitation.

UPMC and Microsoft Collaboration

Microsoft is focusing on a new health care initiative, developing technologies for people to live healthier lives. UPMC will be the first strategic research partner working with Microsoft on their Healthcare NExT initiative, which aims to deeply integrate research done without previous constraints and health technology product development.

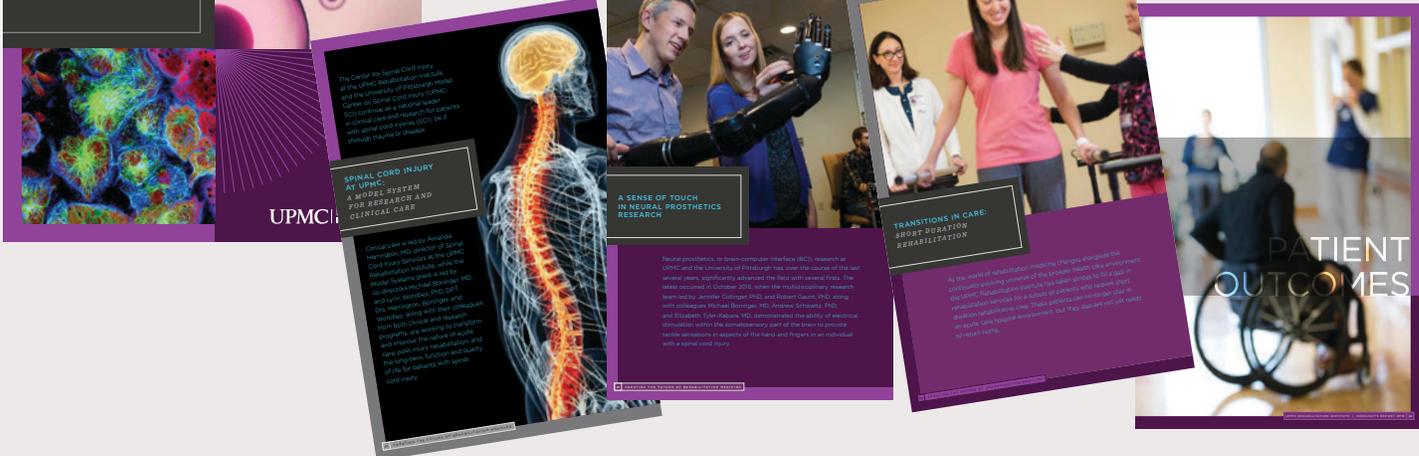
A main goal of this collaboration is to transform clinician empowerment and productivity. Some of the biggest issues in the health care industry right now are poor communication with patients, disconnected

information systems, and physician burnout. Reducing unnecessary paperwork and data entry with tools such as speech and language recognition technology will allow physicians to focus more on patient care. With the clinical, research, and product development knowledge of UPMC paired with Microsoft's skill in business optimization tools, the cloud, and artificial intelligence (AI), new products will be built and piloted at UPMC by UPMC Enterprises.



UPMC Rehabilitation Institute 2016 Highlights Report

The 2016 UPMC Rehabilitation Institute *Highlights Report* is available for viewing and download by visiting UPMCPhysicianResources.com/Rehab. The report highlights new research and clinical care programs within the UPMC Rehabilitation Institute and Department of Physical Medicine and Rehabilitation.



STAT Madness Competition

The University of Pittsburgh Brain-Computer Interface (BCI) team won the STAT Madness contest with their invention of a prosthetic arm with brain-computer interface. Similar to the NCAA March Madness, this STAT Madness competition featured a bracket-style contest pairing research developments among 32 accredited universities to determine the best innovation in the country. The University of Pittsburgh, Johns Hopkins, Stanford, and Yale are just a few of the institutions that competed to find the best innovation in science and medicine.

Throughout March, voters picked their favorite innovation from a list of matchups. There were five rounds of voting and nearly 60,000 total votes. In the final round, Pitt beat out the University of Michigan to win the competition.

The University of Pittsburgh study from the Department of Physical Medicine and Rehabilitation allowed a subject with tetraplegia to feel the sensation of touch using a prosthetic arm. Scientists implanted electrodes below the surface of the subject's brain and connected them to sensors on the prosthetic arm. Testing allowed the subject to feel when researchers touched the robotic arm.

Former President Barack Obama witnessed this technology firsthand before he left office. At the White House Frontiers Conference in Pittsburgh in October, President Obama could *shake hands* with the subject who was using a prosthetic arm.

The screenshot shows the final results of the STAT Madness competition. At the top, it says 'STAT' with a close button 'x'. Below that, it indicates 'Prev | Next' and 'Final' with a 'Share Matchup' link. The main heading is 'University of Pittsburgh/UPMC' with a 'Vote Total — 1,836'. The text below describes their research on a rapid diagnostic test for sepsis. Below that, it lists 'University of Michigan' with a 'Vote Total — 1,314' and describes their research on prosthetics responsive to brain signals.

Human Engineering Research Laboratories

The Human Engineering Research Laboratories (HERL) is a partnership among the University of Pittsburgh, the VA Pittsburgh Healthcare System, and UPMC that is devoted to wheelchair and mobility research. HERL leadership includes Rory Cooper, PhD, who is the founding director and VA Senior Research Career Scientist, as well as a distinguished professor in the Department of Rehabilitation Science and Technology. Brad Dicianno, MD, is the medical director of HERL and an associate professor in the Department of Physical Medicine and Rehabilitation. "The biggest accomplishments of PM&R and HERL working together are the impacts we make every day by providing rehabilitation care and technology to allow people to live as independently as possible," says Dr. Dicianno.

Since 1994, HERL has been working to improve the function and mobility of veterans and other people with disabilities through advanced engineering in clinical research and medical rehabilitation.

Robotics, virtual reality, 3D computer modeling, machining, and printing are some of the different technologies researchers use. A few areas of focus include wheelchair transfer efficiency, robotics in assistive technology, and athletics in rehabilitation.

In collaboration with the Walter Reed National Military Medical Center, HERL also hosts State of the Science Symposia to educate health care professionals on information needed to treat people with disabilities. HERL also offers educational and transitional services for veterans with

its innovative Experiential Learning for Veterans in Assistive Technology and Engineering (ELeVATE) and Advancing Inclusive Manufacturing (AIM) programs.

One example of collaboration between HERL and PM&R is the Center for Assistive Technology (CAT). CAT provides assistive technology for mobility, hearing, speech, and other everyday needs to individuals with disabilities. "Because our clinical team is involved in academics and teaching, clinical care, and research, the relationships between CAT and HERL have steadily evolved to allow patient care to inform research priorities, and conversely, research to be translated to the clinic so that it directly impacts our clients," explains Dr. Dicianno.

New Research Study — Recruiting Participants

The Human Engineering Research Laboratories at the University of Pittsburgh is recruiting participants for phase two of its study titled "Identifying Unmet Wheelchair Related Needs and the Future of Mobility Technology," led by primary investigator Rory A. Cooper, PhD.

The study is seeking volunteers who are:

- 18 years of age or older, and
- Use one or more assistive devices for mobility, such as a cane, walker, manual wheelchair, power wheelchair, scooter, or lower extremity prosthesis.

Volunteers are asked to complete a brief research questionnaire that will ask them about the devices they currently use and their opinions on the future availability of devices.

To participate in the study, volunteers can access the survey at <http://tiny.cc/mobilitytech>. For additional information or questions, or volunteers who do not have access to the internet but wish to participate, please contact the study Clinical Coordinators at 412-822-3700.

SAVE THE DATE — 8TH ANNUAL CURRENT CONCEPTS IN BRAIN INJURY REHABILITATION

November 11, 2017 — Pittsburgh, Pa

The Current Concepts in Brain Injury Rehabilitation annual conference has proven to be a successful venue for cultivating knowledge and expertise among brain injury rehabilitation professionals. As a designated member of the Traumatic Brain Injury Model Systems, we are teamed with leading centers across the country in basic and clinical research to bring the latest rehabilitation practices to you.

Program Agenda

- **Improving the Significance of Sleep Management in Moderate to Severe TBI**
Risa Nakase-Richardson, PhD, FACRM
James A. Haley Veterans Hospital,
Polytrauma TBI Rehabilitation
- **Rehabilomics Research: A Biomarkers-Based Methodology for Precision Rehabilitation Initiatives Within Populations With TBI**
Amy K. Wagner, MD
- **Therapeutic Use of Self in Traumatic Brain Injury Rehabilitation**
Amy Berryman, OTR/L
Craig Hospital
- **Exercise in TBI**
Kirk Lercher, MD
Mount Sinai Medical Center
- **Substance Use Disorders and Mental Health Illness in the Traumatic Brain Injury Patient**
Kristina Curci, MD
- **A Matter of Time: Anoxic Brain Injury Case Studies – An Overview**
Allyson Yukevich, OTR/L;
Terry Breisinger, PT
- **Applying Challenge Point Theory to Maximize Neurological Recovery in Pediatric Rehabilitation**
Rebecca Flowers, CCC-SLP;
Erik Trentrock, PT, DPT
- **Support Groups for Acquired Brain Injury**
Olivia Houser, OTR/L; Stacey Davis, OTR/L;
Lynne Marshall, COTA; Kathleen Seiler,
RN, BSN, SCRNP

Note: Program subject to change.

To register for the conference visit <https://ccehs.upmc.com/home.jsf>.

Conference handouts will be available after November 7, 2017 and can be downloaded from RehabMedicine.Pitt.Edu.

To learn more about the UPMC Department of Physical Medicine and Rehabilitation, please visit UPMCPhysicianResources.com/Rehab.

UPMC
PHYSICIAN RESOURCES

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UPMC Physician Resources
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School of Health and Rehabilitation Sciences, Department of Rehabilitation Science and Technology
www.shrs.pitt.edu/rst

UPMC Center for Assistive Technology
UPMC.com/CAT

Human Engineering Research Laboratories
herl.pitt.edu

A \$16 billion world-renowned health care provider and insurer, Pittsburgh-based UPMC is inventing new models of patient-centered, cost-effective, accountable care. UPMC provides more than \$900 million a year in benefits to its communities, including more care to the region's most vulnerable citizens than any other health care institution. The largest nongovernmental employer in Pennsylvania, UPMC integrates 80,000 employees, more than 30 hospitals, 600 doctors' offices and outpatient sites, and a 3.2 million-member Insurance Services Division, the largest medical insurer in western Pennsylvania. As UPMC works in close collaboration with the University of Pittsburgh Schools of the Health Sciences, *U.S. News & World Report* consistently ranks UPMC on its annual Honor Roll of America's Best Hospitals. UPMC Enterprises functions as the innovation and commercialization arm of UPMC, and UPMC International provides hands-on health care and management services with partners on four continents. For more information, go to UPMC.com.