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# REHAB Progress

## Word of the Day: “Kvell”



This issue of *Rehab Progress* contains news of recent awards I’ve been fortunate to receive. I feel lucky to be in a field that recognizes achievement. When I get an award, all I want to do is thank everyone who has enabled my success — see the Winter 2013 edition on pulling out the hook to get me to stop. So, for this article, I will just say a broad, emphatic thank you!

I’ve been asked which award means the most — what I’m most proud of. It’s an easy answer. Although it’s a stretch to say I had anything to do with it, what I’m most proud of by far are the accomplishments of the brilliant scientists and physicians I have mentored. Like the list of people to thank, I’m fortunate that it’s a long list. From being a doctoral advisor, to the Rehabilitation Medicine Scientist Training Program that John Whyte and I run together, I’m so fortunate to have mentorship as a part of my job. In fact, I would argue that a good department chair should be a mentor above all things. It’s about the growth and happiness of the faculty.

This issue of *Progress* allows me to provide one poignant case related to my pride: the featured article on the groundbreaking **strategy training** work of Beth Skidmore. Beth’s research shows that when patients set their own specific goals and see their own failures and successes, they make greater gains. It is fantastic, NIH-funded work. The article also notes that Dr. Skidmore is the chair of the Department of Occupational Therapy at the University of Pittsburgh, one of the best in the country. It doesn’t say that I was a mentor on her first NIH grant.

Am I old enough to have mentored scientists who are now chairs? Unbelievable. This is happening more as my faculty, students, and RMSTP fellows move into leadership positions across the country. How I feel when I learn of their success reminds me of the smile my mom would give at my accomplishments. My mom, who spoke Yiddish, would say she can’t stop kvelling, which Merriam-Webster defines as rejoicing pride.

I can’t stop kvelling.

**Michael L. Boninger, MD**

Director, UPMC Rehabilitation Institute

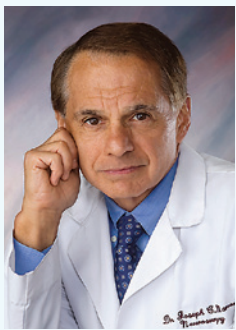
Professor and UPMC Endowed Chair

Department of Physical Medicine and Rehabilitation

# Professional Contact Sport Athletes With Persistent Cervical Cord MRI T2 Hyperintensity Following Trauma May Safely Return to Play

Zachary J. Tempel, MD, Jeffrey W. Bost, PA-C, and Joseph C. Maroon, MD

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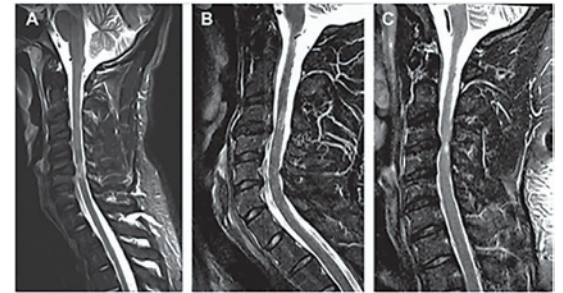


In professional sports, the management of cervical spine injury presents a unique challenge due to the potentially devastating medical and economic consequences facing the athletes and their sports organizations. Return-to-play (RTP) decisions after injury are always complex, but much more so if significant radiographic abnormalities remain. The significance of persistent MRI T2 hyperintensity within the cervical spine following sports-related trauma is even more obscure.

Traditionally, the presence of T2 hyperintensity on MRI in the acute post-traumatic period is believed to be indicative of edema following a transient insult to the spinal cord. Previous reviews have reported relative contraindication to RTP that includes residual presence of T2 hyperintensity on MRI, with or without persistent injury-related symptoms or signs. In our recent review article published in *Neurosurgery* in March 2015, we reported on five cases of professional athletes who presented with sports-related traumatic transient cervical neurapraxia along with persistent T2 MRI cord hyperintensity. Four of these athletes were eventually released to return to contact sport.

The athletes presented with various degrees of congenitally small cervical canal, spondylosis, stenosis, and disc herniation, along with focal cord T2 hyperintensity. Four of the five athletes required stabilization of the affected level via single level anterior cervical discectomy and fusion (ACDF). Clearance for return to play preceded complete resolution of MRI T2 hyperintensity in three of four athletes. Of the athletes that returned to contact sport, none (as of the date of publication) had suffered any further cervical spine injuries. The return to play for this unique group of professional athletes with persistent T2 MRI hyperintensity included being completely symptom-free, having a normal examination, and no evidence of radiographic spinal instability. Additional observations are needed to confirm this approach due to the small series size reported in the literature thus far.

Much of the literature on cervical cord T2 hyperintensity relates to degenerative spine conditions. For example, several studies have examined the evolution of intramedullary T2 hyperintensity following ventral decompressive surgery for CSM. Some studies have found that resolution of T2 hyperintensity in subjects with CSM who undergo



**Figure 1.** Preoperative sagittal T2-weighted MRI demonstrated T2 hyperintensity within the spinal cord in (A) a professional wrestler after a hyperflexion injury; (B) an NFL defensive end after an axial loading and hyperflexion injury; and (C) an NFL defensive tackle after an axial loading and hyperflexion injury.

ventral decompressive surgery correlates with improved functional outcomes. Other studies have found little correlation with postoperative outcome.

In the setting of severe spinal cord injuries, such as central cord syndrome, T2 hyperintensity correlates with acute intramedullary hemorrhage. However, in these patients, the signal abnormality is often diffuse, spans several levels, and correlates with severe deficits. This is in contrast to athletes with transient neurapraxia and a focal T2 signal abnormality.

In contact sports, the cervical spine is most susceptible to injury when the mechanism involves substantial axial loading forces applied to the head while the neck is in flexion or extension. If the force is great enough to compromise the integrity of the discovertebral complex or ligamentous elements, direct injury to the spinal cord may occur due to disc herniation or buckling of the ligamentum flavum posteriorly. Acute neural element compression may be transient; however, studies with athletes involved in contact sports have shown a greater prevalence of pre-existing chronic compressive pathology, such as congenital spinal stenosis, that may predispose them to this type of event. Spondylosis with canal stenosis increases the risk of spinal cord injury due to limited functional reserve within the canal.

# Promoting Independence for Individuals With Cognitive Impairments After Stroke

Elizabeth Skidmore, PhD, OTR/L

Depending on how one defines and measures cognitive impairments, 20% to 50% of individuals with stroke sustain impairments in basic cognitive functions including attention, language, memory, and visuospatial function. Some estimates are as high as 75% to 80% when assessing impairments in executive function after stroke. These impairments are associated with significant long-term disability, elevated health care costs and utilization, and elevated risks for institutional (as opposed to community) placement. Therefore, effective interventions that reduce disability and promote independence among individuals with cognitive impairments have the potential to make a significant impact on personal and public health after stroke. The best time to initiate stroke rehabilitation appears to be in the acute phase of stroke recovery. However, the best intervention to address cognitive impairments in the acute phase remains unclear. Strategy training is an intervention that shows promise for reducing disability and promoting independence and is currently under investigation.

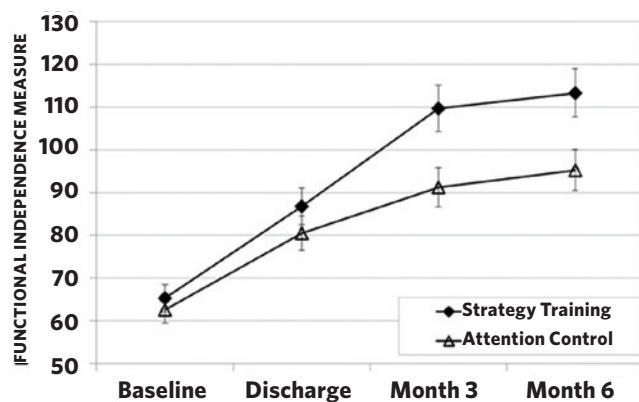


Figure 1. Functional Independence Measure Total Scores by Group.

## What Is Strategy Training?

Strategy training is derived from cognitive, behavioral, and educational learning theories. Strategy training encourages participants to select their own goals based on problems they encounter performing daily activities. Evidence suggests that individuals with cognitive impairments learn best when they have the opportunity to learn through personally salient activities rather than seemingly irrelevant “drill and practice” exercises. Strategy training provides participants the opportunity to identify barriers to performance and develop their own plans to promote improvements rather than allowing therapists to directly provide this information to participants. Participants learn from successful and failed approaches. Evidence suggests that individuals with cognitive impairments learn best when they have the opportunity to face difficult challenges and identify their own solutions. In this model, the therapist’s role is to facilitate

learning by using prompting questions and ensuring the participants’ safety without impeding opportunities for learning. Strategy training is delivered at the participants’ pace, allowing for slowed pace and extra practice for those who need it. This training teaches participants to apply their learning to novel situations through discussion and workbook materials, encouraging generalization and maximizing the likelihood of improvements over time.

## What Does the Evidence Say?

Strategy training and similar interventions have been studied in a variety of clinical populations (e.g., attention deficit hyperactivity disorder, learning disability, major depressive disorder, acquired brain injury) as an intervention to address a variety of clinical outcomes (e.g., independence, productivity, self-regulation). Strategy training also has been examined as a promising intervention for reducing disability in individuals with chronic stroke. Yet, until recently, strategy training had not been systematically examined in individuals with acute stroke.

Our early phase clinical studies have demonstrated significantly greater reductions in disability at six months as measured with the Functional Independence Measure. This improvement is attributed to strategy training relative to a dose-matched attention control intervention delivered during inpatient rehabilitation (Figure 1). The strategy training group demonstrated significantly greater improvements in selected domains of executive function (cognitive flexibility, cognitive fluency, and inhibition), as well as significantly lower burden of apathy symptoms. When comparing strategy training to direct skill teaching, our team observed significantly greater reductions in disability with a large effect size at six months. Because these early phase studies showed promise for reducing disability and promoting independence, a confirmatory trial that incorporates six inpatient rehabilitation units within the UPMC Rehabilitation Institute is underway.



Elizabeth Skidmore, PhD, OTR/L, is chair in the Department of Occupational Therapy, School of Health and Rehabilitation Sciences at the University of Pittsburgh. Dr. Skidmore is a recipient of the 2016 Presidential Early Career Award for Scientists and Engineers, the highest honor bestowed by the United States government on science and engineering professionals in the early stages of their independent research careers. She holds secondary appointments in the Department of Physical Medicine and Rehabilitation and the Clinical and Translational Science Institute at the University of Pittsburgh School of Medicine.

## AWARDS

**Michael Boninger, MD**, professor and PM&R chair, has been named the 2016 Distinguished Academician by the Association of Academic Physiatrists (AAP). This prestigious award is given to honor a physiatrist who has achieved distinction and peer recognition nationally by virtue of excellence as a teacher, researcher, and administrator.



**Dr. Boninger and Kathryn Stolp, MD, AAP Past President.**

Dr. Boninger received both his BS (Mechanical Engineering) and MD from Ohio State University, Columbus, Ohio, and completed his PM&R residency at the University of Michigan Medical Center, Ann Arbor, Michigan. In August 1993, he began an Engineering and Rehabilitation Technology Fellowship at the University of Pittsburgh. Dr. Boninger was instrumental in transforming a division comprised of three faculty

members into the current PM&R department of well over 50 faculty, consisting of physiatrists, bioengineers, and neuropsychologists. Under his leadership, four faculty members have received the AAP's Young Academician Award, an award he himself received in 1998.

In a career that spans almost 23 years, Dr. Boninger has been involved in more than 60 research projects as PI or Co-PI and mentored over 100 students, ranging from undergraduates to medical students, and doctoral and postdoctoral trainees. This group of students has won more than 50 competitions, including a host of awards from the Rehabilitation Engineering and Assistive Technology Society of North America (RESNA) and AAP for scientific papers, conference presentations, and poster designs and presentations.



**Members of the UPMC Rehabilitation Institute Sled Hockey Team.**  
Left to Right: Michael Boninger, MD, Justin Berthold, DO (2014 alum), Shaun Darrah, MD (PGY4).

Dr. Boninger holds five United States patents. He was inducted into both the Institute of Medicine of the National Academies of Sciences, Engineering, and Medicine (2013) and the Spinal Cord Injury Hall of Fame of the National Spinal Cord Injury Association (2006). Dr. Boninger has received numerous other honors including: the American Spinal Injury Association Sell Lectureship (2015); ACRM John Coulter Stanley Award (2015); Breakthrough Award for Brain-Computer Interface Research from *Popular Mechanics* (2012); Estin Comarr Award for Distinguished Clinical Service from the Academy of Spinal Cord Injury Professionals (2006); and the VA Stars and Stripes Healthcare Network Annual Award for Research Achievement (2003).

In addition to his responsibilities to the department, University, and UPMC Rehabilitation Institute, Dr. Boninger volunteers his time to various committees and boards in national organizations. He is devoted to his family and is a member of the UPMC Rehabilitation Institute Sled Hockey Team, which competes annually against the Pittsburgh Mighty Penguins Sled Hockey Team.



**Corina Bondi, PhD**, assistant professor in the department of PM&R, will be honored for her outstanding achievements in 2015 during the University's 40th annual Honors Convocation. Dr. Bondi received the inaugural IBNS Early Career Award from the International Behavioral Neuroscience Society. She also was honored with the Distinguished Citizen Award from the mayor

and local government of Calarasi City, Romania, for professional excellence and positive representation at the international level.



**Tracy Knippel, MD**, 3rd year PM&R resident, received the 2016 Electrode Store Best Paper Award in the Resident category for "Ten-Year Trends in Pediatric Inpatient Rehabilitation: Predicting Length of Stay and Rehabilitation Outcomes Using WeeFIM Data." The award was received at the Annual Association of Academic Physiatrists on February 20, 2016, in Sacramento, California.

Dr. Knippel's faculty mentor is **Amy Houtrow, MD, PhD, MPH**, vice chair and associate professor of pediatric rehabilitation medicine. The winning abstract appears on Page 5.



## Award-Winning Abstract:

# Ten-Year Trends in Pediatric Inpatient Rehabilitation: Predicting Length of Stay and Rehabilitation Outcomes Using WeeFIM Data

Tracy Knippel, MD, and Amy Houtrow, MD, PhD, MPH

### Objectives

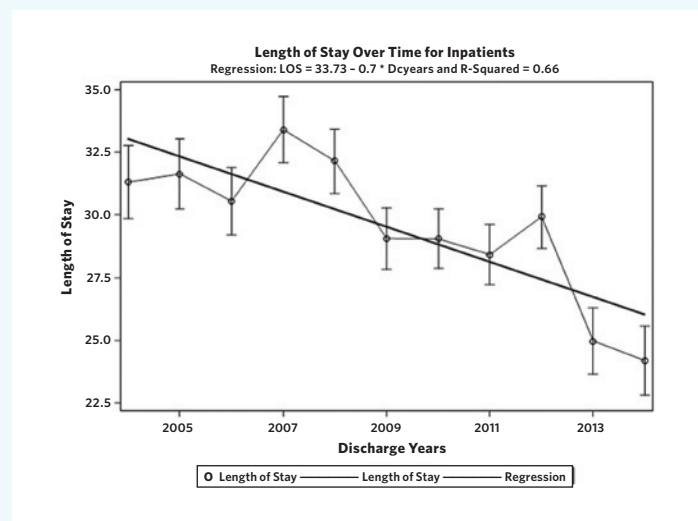
With the changing landscape of health care, it is important to determine how to make rehabilitation as efficacious as possible in an efficient, cost-effective manner. There is no consensus on the optimal delivery of rehabilitation care, especially in pediatrics. Recent studies have highlighted discrepancies in the structures and processes of pediatric rehabilitation care both within and between different rehabilitation facilities. Other researchers have attempted to define outcome and length of stay (LOS) determinants for children admitted to inpatient rehabilitation programs. Taken as a whole, these have shown age, diagnosis, and admission functional status are all predictive of LOS and functional outcomes. However, national data trends are not available. This project intends to help fill the gaps in our knowledge and has several objectives. First, we sought to evaluate overall trends in pediatric inpatient rehabilitation over a 10-year period to examine how care is changing with regard to patient demographics, their health and functional characteristics, as well as characteristics of facilities in which care is delivered. Secondly, we sought to identify characteristics of patients and facilities that predict LOS and rehabilitation efficiency. Finally, we characterized regional variations in rehabilitation care.

### Design

We used a retrospective analysis of existing Uniform Data Systems (UDS) WeeFIM data collected from all participating pediatric inpatient rehabilitation programs in the United States from 2004-2104. Descriptive statistics were calculated for inpatient pediatric rehabilitation facilities and patients over the study period. Variability in LOS over the entire decade was examined. At the patient level, changes over time in LOS, admission WeeFIM scores, WeeFIM gain, and WeeFIM efficiency were analyzed using one-way ANOVAs and Tukey HSD post hoc comparisons. We examined the effects of patient age and diagnosis on the outcomes variables (LOS, admission WeeFIM scores, WeeFIM gain, and WeeFIM efficiency) using one-way ANOVAs and Tukey HSD post hoc comparisons. Hierarchical linear modeling was used to determine predictors of WeeFIM efficiency using 11 different independent variables [LOS, age (0-3, 3-5, 5-7, 7-10, >10), number of medical comorbidities (0-6), gender, race, facility region (Northeast, Midwest, South, West), insurance type (public, private), admission WeeFIM score, facility type (freestanding, hospital unit based), facility size (based on number of beds), and discharge year]. At the facility level, we examined the growth of hospital-based rehabilitation units compared to freestanding inpatient rehabilitation facilities over time. Specific impairment groups were then evaluated. We analyzed how each impairment group changed as a percentage of total inpatient rehabilitation admissions over time. For all analyses in the study, missing data were excluded from the models.

### Results

Between 2004 to 2014, 67 facilities reported WeeFIM data to UDS, representing 42,702 inpatient rehabilitation admissions over the study period. At the individual level, LOS varied widely. The mean length of stay was 28 days, median 19 days, range 1 to 944 days. Just over 10% of children had a length of stay of 60 days or longer. From 2004 to 2014, mean LOS decreased significantly ( $F=27.6$ ,  $p<0.0001$ ). The average LOS in 2014 was 24 days, compared to 31 days a decade earlier.



Admission mean Total WeeFIM Score was relatively stable over the ten-year period (range 49.62 - 52.36). WeeFIM efficiency improved significantly over time ( $F=23.3$ ,  $p<0.0001$ ), but WeeFIM gain decreased significantly over the ten-year period ( $F=6.9$ ,  $p<0.0001$ ). The average WeeFIM gain in 2004 was 24.6, compared to 22.5 in 2014. WeeFIM efficiency showed a nearly linear increase over the study period.

Using hierarchical linear modeling, length of stay, age, region, insurance type, admission WeeFIM score, facility type, number of comorbidities, facility size, and discharge year were significant predictors of rehabilitation efficiency ( $R^2 = 0.22$ ). Older age, having private insurance, shorter LOS, and facilities in the Northeast were predictive of greater WeeFIM efficiency. These four variables (age, insurance, LOS, and region) contributed most strongly to the model.

At the facility level, the total number of freestanding units remained stable over time, but decreased as a percentage of total facilities providing pediatric rehabilitation services (from 26% in 2004 to 20% in 2014).

## Recent Publications

**Development of mHealth System for Supporting Self-Management and Remote Consultation of Skincare.** Parmanto B, Pramana G, Yu DX, Fairman AD, Dicianno BE. *BMC Med Inform Decis Mak.* 2015 Dec 30;15(1):114. doi: 10.1186/s12911-015-0237-4.

**Behavioral Assessment of Sensitivity to Intracortical Microstimulation of Primate Somatosensory Cortex.** Kim S, Callier T, Tabot GA, Gaunt RA, Tenore FV, Bensmaia SJ. *Proc Natl Acad Sci USA.* 2015 Dec 8;112(49):15202-7. doi: 10.1073/pnas.1509265112. Epub 2015 Oct 26.

**Measuring Static Seated Pressure Distributions and Risk for Skin Pressure Ulceration in Ice Sledge Hockey Players.** Darrah SD, Dicianno BE, Berthold J, McCoy A, Haas M, Cooper RA. *Disabil Rehabil Assist Technol.* 2016 Apr;11(3):241-6. doi: 10.3109/17483107.2014.921939. Epub 2014 May 29.

**Neural Stem Cell Therapy and Rehabilitation in the CNS: An Emerging Partnership.** Ross HH, Ambrosio F, Trumbower RD, Reier PJ, Behrman AL, Wolf SL. *Phys Ther.* 2016 Feb 4. [Epub ahead of print]

**Early Detection of Pressure Ulcer Development Following Traumatic Spinal Cord Injury Using Inflammatory Mediators.** Krishnan S, Karg P, Boninger M, Vodovotz Y, Constantine G, Sowa G, Brienza D. *Arch Phys Med Rehabil.* 2016 Jan 25. pii: S0003-9993(16)00037-X. doi: 10.1016/j.apmr.2016.01.003. [Epub ahead of print]

**Brain-Derived Neurotrophic Factor (BDNF) in Traumatic Brain Injury-Related Mortality: Interrelationships Between Genetics and Acute Systemic and Central Nervous System BDNF Profiles.** Failla MD, Conley YP, Wagner AK. *Neurorehabil Neural Repair.* 2016 Jan;30(1):83-93. doi: 10.1177/1545968315586465. Epub 2015 May 15.

**Chronic Inflammation After Severe Traumatic Brain Injury: Characterization and Associations With Outcome at 6 and 12 Months Postinjury.** Kumar RG, Boles JA, Wagner AK. *J Head Trauma Rehabil.* 2015 Nov Dec;30(6):369-81. doi: 10.1097/HTR.000000000000067.

**Randomized, Placebo-Controlled Trial of IncobotulinumtoxinA for Upper-Limb Post-Stroke Spasticity.** Elovic EP, Munin MC, Kaňovský P, Hanschmann A, Hiersemenzel R, Marciniak C. *Muscle Nerve.* 2016 Mar;53(3):415-21. doi: 10.1002/mus.24776. Epub 2015 Dec 15.

**Ultrasound Combined With Electrodiagnosis Improves Lesion Localization and Outcome in Posterior Interosseous Neuropathy.** Winger YD, Buckalew NA, Kaufmann RA, Munin MC. *Muscle Nerve.* 2015 Dec;52(6):1117-21. doi: 10.1002/mus.24782. Epub 2015 Sep 10.

**A Dopamine Pathway Gene Risk Score for Cognitive Recovery Following Traumatic Brain Injury: Methodological Considerations, Preliminary Findings, and Interactions With Sex.** Myrta JM, Failla MD, Ricker JH, Dixon CE, Conley YP, Arenth PM, Wagner AK. *J Head Trauma Rehabil.* 2015 Nov 17. [Epub ahead of print]

**Factors Associated With Mobility Outcomes in a National Spina Bifida Patient Registry.** Dicianno BE, Karmarkar A, Houtrow A, Crytzer TM, Cushman KM, McCoy A, Wilson P, Chinarian J, Neufeld J, Smith K, Collins DM. *Am J Phys Med Rehabil.* 2015 Dec;94(12):1015-25. doi: 10.1097/PHM.0000000000000404.

**Decoding Brain States Based on Magnetoencephalography From Prespecified Cortical Regions.** Zhang J, Li X, Foldes ST, Wang W, Collinger JL, Weber DJ, Bagic A. *IEEE Trans Biomed Eng.* 2016 Jan;63(1):30-42. doi: 10.1109/TBME.2015.2439216.

## Ten-Year Trends in Pediatric Inpatient Rehabilitation Continued from Page 5

Certain diagnoses are becoming more or less commonly admitted to inpatient rehabilitation over time. In 2004, debility accounted for 0% of inpatient rehabilitation admissions, and increased to 5% by 2014. In 2004, musculoskeletal disorders accounted for 15% of admissions, and decreased to 8.6% by 2014. By comparison, acquired brain injury represented 49% of inpatient rehabilitation admissions in 2004 and 47.7% in 2014.

### Conclusions

The way in which pediatric inpatient rehabilitation services are being delivered is changing over time. In our study period, we found that while LOS is quite variable on an individual basis, overall LOS is decreasing (Figure 1 on Page 5). There is a trend toward delivery of rehabilitation care in a hospital unit based setting versus in a freestanding facility. While children have shorter stays, they are not necessarily being admitted with higher functional levels, as shown by the relatively stable admission WeeFIM scores over time. WeeFIM efficiency is improving over time,

but this rate of change is not keeping pace with the decreasing LOS, as evidenced by decreasing WeeFIM gains over time. This means that children were being discharged home with more functional limitations, shifting recovery to the outpatient sector.

In our hierarchical model, nine of the 11 variables entered were significant predictors of WeeFIM efficiency, but LOS, facility region, and insurance type were the most predictive. More research is needed to precisely define and quantify these factors and their interrelationships. Doing so will advance our understanding of variables that impact pediatric rehabilitation LOS and rehabilitation efficiency. Understanding how the various factors that impact WeeFIM efficiency may provide a starting point for interventional measures aimed at reducing length of stay and improving efficiency across pediatric rehabilitation units nationwide. We believe this is important because health care as a whole is moving toward standardizing the processes of care delivery.

## Upcoming Events



### 2nd Annual Current Concepts in Spinal Cord Rehabilitation Conference

UPMC Mercy — May 14, 2016

Each year, about 12,000 people sustain spinal cord injuries (SCI) that change their lives forever. A successful reintegration of individuals with SCI into the community is the ultimate goal of acute rehabilitation and requires the use of many resources.

Our Current Concepts in Spinal Cord Injury Rehabilitation annual conference focuses on the successful collaborative approach utilized at the UPMC Rehabilitation Institute. The conference faculty consists of physiatrists, nurses, physical and occupational therapists, and rehab psychologists who specialize in the complexities of SCI. For more information on this conference, please visit [www.rehabmedicine.pitt.edu](http://www.rehabmedicine.pitt.edu).

### Rehabilitation Institute Research Day 2016 (RIR Day)

University of Pittsburgh, William Pitt Student Union — May 18, 2016

RIR Day highlights rehabilitation research on the leading edge of technology and the natural sciences by University of Pittsburgh students. Students from schools, departments, and labs such as psychology, bioengineering, physical therapy, and orthopaedic surgery and from the School of Nursing, Safar Center for Resuscitation Research, and Human Engineering Research Laboratories contribute abstracts to be judged by faculty. On average, 60 abstracts are submitted from which Best Rehabilitation Research presentations are delivered by students from each of the following award categories:

- Undergraduate student
- Medical student
- Postdoctoral Trainee I (PM&R Resident)
- Predoctoral student
- Postdoctoral Trainee II (Other Resident, Clinical Fellow, Research Fellow)

RIR Day also includes a poster grand round session with awards presented in the same categories.

In addition to student presentations, the Department of Physical Medicine and Rehabilitation and the School of Health Sciences each sponsor a lecture from a leader in rehabilitation science.



### 2016 Brenes Lecturer: David J. Reinkensmeyer, PhD

*Department of Mechanical and Aerospace Engineering  
Department of Biomedical Engineering  
University of California, Irvine*

Professor Reinkensmeyer's research interests are in neuromuscular control, motor learning, robotics, and rehabilitation. A major focus is developing physically interacting robotic and mechatronic devices to help the nervous system recover arm, hand, and leg movement ability after neurologic injuries, such as stroke and spinal cord injury. Professor Reinkensmeyer's laboratory has developed a variety of robotic devices for manipulating and measuring movement in humans and rodents. These devices are being used to investigate the role of mechanical assistance in retraining arm movement following stroke, the feasibility of providing movement training remotely using the Internet, and the role of sensory information in locomotor plasticity after spinal cord injury.



### 2016 SHRS Lecturer: Joel Stein, MD

*Physical Medicine and Rehabilitation  
New York-Presbyterian*

Dr. Stein's clinical and research interests are in the rehabilitation of stroke and other neurological disorders. He has a particular focus on the use of exercise as a treatment, and on the use of robotic and other technologies to facilitate recovery of motor function after stroke. He has authored or coauthored two books on stroke recovery and rehabilitation for stroke survivors and their families.

## UPMC VIDEO ROUNDS AND GRAND ROUNDS

*Video Rounds* is a series of informative and educational short videos created for physicians and covering a variety of medical and surgical disciplines, including:

### Creating a Medical Home for Musculoskeletal Conditions

Gwendolyn Sowa, MD, PhD

Dr. Sowa is leading the newly created musculoskeletal medical home. This model aims to provide patients with a comprehensive approach to care, advance recovery, and improve quality of life. Please visit [UPMCPhysicianResources.com/VideoRounds](http://UPMCPhysicianResources.com/VideoRounds).

### UPMC Rehab Grand Rounds Winter 2016

#### Diagnosing Running Injuries: A Primer for Physiatrists

To view this issue of *Rehab Grand Rounds*, please visit [UPMCPhysicianResources.com/Rehab](http://UPMCPhysicianResources.com/Rehab).



# UPMCPhysicianResources.com/ Rehab



## About the UPMC Rehabilitation Institute

- UPMC is ranked by *U.S. News & World Report* as one of the top hospitals in the country for rehabilitation.
- Stroke rehabilitation at the UPMC Rehabilitation Institute is certified by The Joint Commission.
- Our experts combine extensive clinical experience with advanced technology and research to offer our patients cutting-edge treatments.
- We are one of only seven institutions with both SCI and TBI Model System designations from the NIDRR.

A world-renowned health care provider and insurer, Pittsburgh-based UPMC is inventing new models of patient-centered, cost-effective, accountable care. It provides more than \$888 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 60,000 employees, more than 20 hospitals, more than 500 doctors' offices and outpatient sites, a 2.9-million-member health insurance division, and international and commercial operations. Affiliated with the University of Pittsburgh Schools of the Health Sciences, UPMC ranks No. 13 in the prestigious *U.S. News & World Report* annual Honor Roll of America's Best Hospitals. For more information, go to [UPMC.com](http://UPMC.com).

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