Let me explain. At a recent dinner, the conversation turned to the question, “What is your favorite punctuation mark?” Glady, it wasn’t the only subject of conversation that night. Actually, I learned something from it: the interrobang. What is the interrobang? According to the definitive source for all things, Wikipedia, the interrobang is a punctuation mark that combines the functions of the question mark and the exclamation mark. Needless to say, having learned of this new means of punctuation, I needed to find an opportunity to use it, hence the title of this column. Recent events at UPMC bear me out. But first, another question:

What are the ideal attributes of the hospital administrative partner to a rehabilitation medicine department? If you ask a department chair, the initial answer is likely to be, “Someone who says yes to all my requests.” Perfectly reasonable, right? We are, however, all responsible for the bottom line; it is our margin that often allows us to pursue our broader mission. So, what are the ideal attributes? Not a hard list: We want our administrative partners to be good at their jobs. We want great people with management skills able to fight for resources, and adept at maneuvering in a complex political setting. All perfectly reasonable, but if we could really come up with the ideal attributes, wouldn’t a fundamental understanding of the practice of rehabilitation be high on the list?

Recently, UPMC announced that Margaret Reidy, MD, would be the new president of our seven-unit, 157-bed inpatient rehabilitation network. A physician hospital president? Yes, and guess what, she is a physiatrist. She gets rehab at her core. Further, she has been on the hospital side of administration for years and has been highly successful, possessing the ideal package of administrative skills. As a president within UPMC, an $8 billion global health enterprise, she is one of the highest ranking physicians in the UPMC administrative team. Did I mention she was a physiatrist?

Michael L. Boninger, MD
Director, UPMC Rehabilitation Institute
Associate Dean for Medical Student Research
University of Pittsburgh School of Medicine
Professor and Chairman
Department of Physical Medicine and Rehabilitation
Department of Physical Medicine and Rehabilitation fellowships

Since 2000, 55 residents have successfully completed the University of Pittsburgh’s Department of Physical Medicine and Rehabilitation (PM&R) residency program, and 18 have pursued specialty postdoctoral fellowships in Pittsburgh and across the country. Our accredited Spinal Cord Medicine Fellowship and the Brain Injury Fellowship were launched in 2001 and 2003, respectively. Between the two programs, we have trained 11 fellows to date. A major milestone for this 10th anniversary year is the addition of two new fellowship programs: the accredited Pediatric Rehabilitation Fellowship and the Musculoskeletal, Sports, and Spine Fellowship. Our fellowships offer qualified candidates the opportunity to work and study at one of the leading hospital systems in the country, interacting with other top-ranked programs, such as neurosurgery, transplantation medicine, and orthopaedics. With the exception of the two-year Pediatric Rehabilitation Fellowship, all fellowships are one year in length.

Spinal Cord Medicine Fellowship

The Spinal Cord Medicine Fellowship is closely aligned with the SCI Model System funded by the National Institute on Disability and Rehabilitation. We are one of 14 such designated sites in the country; only four other SCI Model site institutions share the distinction of an accredited spinal cord medicine fellowship.

John Horton, MD, is both director of the clinical Spinal Cord Injury and Disease Program and the SCI Medicine Fellowship. The primary training site is the Spinal Cord Injury and Disease Program located at the UPMC Rehabilitation Institute’s UPMC Mercy location. The fellowship greatly benefits from exposure to patients immediately after injury, because our health system has three Level 1 trauma centers at UPMC Mercy, UPMC Presbyterian, and Children’s Hospital of Pittsburgh of UPMC. Moreover, the training program includes ample instruction with intrathecal baclofen pump refills/management, nerve block and chemodenervation treatments for spasticity, and assistive technology interventions. Adult and pediatric outpatient clinics treating neurologic and medical conditions associated with SCI are also part of the training.

Brain Injury Fellowship

The brain injury fellow will gain management experience in both the acute care phase at UPMC Presbyterian, and the rehabilitation phase at the UPMC Rehabilitation Institute. Special learning opportunities are available in assistive technology, neuropharmacology, and neuroradiology.

Exposure to clinics such as the Spasticity Evaluation and Treatment Center is also available. A unique feature of the fellowship is exposure to the UPMC Outpatient Concussion Clinics, which treats local and professional athletes with medications to facilitate return to sports or classroom. The center was featured in the summer 2009 UPMC Rehab Grand Rounds article, “Physiatric Approach to Sports Concussion.” A copy can be downloaded at http://pmr.medicine.pitt.edu/content/pdfs/RGR_4_09.pdf.

Pediatric Rehabilitation Fellowship

One of two new UPMC fellowships established in 2010, the Pediatric Rehabilitation Fellowship is one of 15 accredited pediatric rehabilitation fellowships offered nationwide. The program is a two-year clinical fellowship. Mary Louise Russell, MD, fellowship director, is trained in pediatric medicine and physical medicine and rehabilitation. She was instrumental in developing pediatric rehabilitation programs in spina bifida, muscular dystrophy, and cerebral palsy, and either directs, co-directs, or is chief of the programs in Pittsburgh.

The specialized fellowship training is centered at Children’s Hospital of Pittsburgh of UPMC, and The Children’s Institute, two leading pediatric health centers. Children’s Hospital of Pittsburgh of UPMC opened its new clinical and research campus in May 2009. Children’s Hospital is one of the first fully digital hospitals in the country and is in line for LEED (Leadership in Energy and Environmental Design) certification for sustainable and green design. The hospital serves as the site for training in acute care pediatrics, outpatient pediatrics, subspecialty pediatrics, and acute care inpatient rehabilitation consults.

Children’s Hospital is a Level 1 pediatric trauma center and was one of only eight pediatric hospitals in the United States named to the U.S. News & World Report 2010 Best Children’s Hospitals Honor Roll.

The Children’s Institute is an independent pediatric rehabilitation facility with inpatient and outpatient facilities. The fellowship includes a three-month rotation for each of the two years at the institute.

Continued on Page 8
Amanda L. Harrington, MD, is associate director of the Center for Spinal Cord Injury at UPMC Rehabilitation Institute’s UPMC Mercy location and assistant professor in the University of Pittsburgh School of Medicine Department of Physical Medicine and Rehabilitation. She is board-certified in both physical medicine and rehabilitation and spinal cord injury medicine.

Over the last 10 years, I have volunteered in medical outreach trips to rural Haiti through Project Medishare. In June, I returned to Haiti for the first time since the devastating earthquake of January 12, 2010. As a longtime medical volunteer in Haiti, I knew what to expect in terms of poverty and disease. I had prepared myself for the physical destruction throughout Port-au-Prince and I had watched enough news coverage to expect the massive tent cities that had become home to so many Haitians. I also knew that many people injured in the earthquake were still being treated and many more were learning to adjust to life with disability. I was surprised to see that as a result of the earthquake the Haitian health care community was developing a better system to address trauma and rehabilitation.

I traveled to Port-au-Prince with three outstanding therapists who work in inpatient rehabilitation at UPMC Mercy: Kimberly Belkowski, Elizabeth Stanley, and Briana Kelly. We treated pediatric patients with orthopaedic injuries and developmental disabilities, and adults with spinal cord injury, traumatic brain injury, stroke, burns, and orthopaedic injuries. Orthopaedic equipment is in very limited supply and these therapists showed great ingenuity in fabricating custom splints and braces from nontraditional materials. Together we joined with other volunteers in moving patients, supplies, and equipment from the temporary Project Medishare field hospital at the airport to Bernard Mevs Hospital, Haiti’s first and only critical care and trauma hospital. At Bernard Mevs we began the process of educating Haitian nurses about management of important rehabilitation issues, such as neurogenic bowel and bladder. We also participated in education sessions for patients with spinal cord injury. These sessions will continue under the newly trained Haitian health care professionals.

One patient’s experience stands out as an example of the benefits of the education, teamwork, and resourcefulness I experienced during my stay in Haiti. Michael was in his mid-60s, with tetraplegia from a recent fall. When our team met Michael, he had not been out of bed since his injury a week earlier and was dependent on others for all aspects of daily care. With the help of the ingenious therapists who accompanied me to Haiti, he was fitted with a one-of-a-kind dorsal wrist splint with a makeshift universal cuff. By the end of the week, he had become accustomed to spending portions of the day in a wheelchair, was able to engage in self-feeding, and through our education efforts, his wife became competent in management of his bowel program. With so few resources available and/or out-of-date — Michael’s wheelchair was at least 20 years old — it was quite remarkable to see how much could be accomplished in just a single week.

As a team we were amazed at the resilience of the Haitian people, despite the high prevalence of posttraumatic stress experienced by many of the patients, families, and Haitian staff. We were moved by the enthusiasm of people to help with the care of their family members, and the eagerness of Haitian medical personnel to learn more about rehabilitation medicine. The resourcefulness of other volunteers we met was encouraging, and we were excited by the determination of Project Medishare to establish sustainable support through the move to and staffing of Bernard Mevs Hospital.

There is ongoing need for volunteers in all areas of rehabilitation: physicians, nurses, and therapists. I encourage those interested in helping to visit www.projectmedishare.org for more information and to register to volunteer.

Volunteers from UPMC — Top row, second from left: Elizabeth Stanley. Second row, from left: Briana Kelly; third from left, Amanda Harrington. Front row, from left: Kimberly Belkowski. Others in photo are volunteers from hospitals and Project Medishare.
Environmental enrichment to promote recovery after traumatic brain injury

Traumatic brain injury (TBI) affects an estimated 1.7 million Americans each year and results in 52,000 deaths and 120,000 cases of long-term neurological disabilities. In addition to the morbidity and mortality, acute and chronic medical and rehabilitative care, along with loss of productivity due to inability to return to the work force, TBI imposes a significant monetary burden estimated at greater than $50 billion per year. Therefore, TBI is a significant public health care concern.

In order to combat this problem, a variety of relatively invasive therapeutic approaches, such as the administration of various pharmacological agents, neurotrophins, and hypothermia have been evaluated. Noninvasive therapeutic approaches, such as rehabilitation, also can be very effective. Laboratory models that mimic clinical rehabilitation post-TBI, such as exercise and environmental enrichment (EE), have been developed.

In experimental studies in animals with TBI, EE involves an enlarged living space, increased social interaction, and novel stimuli that together provide physical and cognitive stimulation (Figure 1). The notion that enrichment may be beneficial has been entertained since the late 1940s, when Donald Hebb reported anecdotally that rats he had taken home as pets exhibited marked behavioral improvement over their littermates kept in standard (STD) cages in the laboratory. However, it was not until the early 1960s that EE was first introduced as an empirical scientific concept by Rosenzweig and colleagues when they, and subsequently others, reported significant EE-induced (vs. STD) plasticity-associated events, such as increases in neurotrophin expression, dendritic arborization, and cortical thickening. Since then, EE has been studied extensively in “normal” rats (rats with no impairments) as well as in various central nervous system (CNS) injury models. EE has been shown to facilitate learning and memory and to improve motor performance after TBI, thus establishing it as a reasonable rodent correlate of human rehabilitation.

The majority of research assessing the potential of EE to mimic rehabilitation after TBI consists of continuous exposure to the living milieu. However, clinical rehabilitation after brain injury consists of a limited amount of physical and occupational therapy. In many instances patients must be able to tolerate at least three hours of therapy per day to qualify for inpatient rehabilitation, but in practice, the length of time (intensity) in therapy after TBI varies from a minimum of one hour up to a maximum of eight hours per day, depending on the rehabilitation setting. Thus, while the extent of clinical rehabilitation may be longer than the three-hour minimum, it is certainly shorter than the continuous nature of typical EE. The difference between the relatively short duration of daily clinical rehabilitation after TBI and the continuous nature of EE emphasizes a disparity between the experimental model and the clinical situation it attempts to model.

Anthony E. Kline, PhD
Associate Professor
Department of Physical Medicine and Rehabilitation

Figure 1. Photograph of the environmental enrichment (EE) cage with multiple levels and wide array of sensory stimuli (balls, ramps, tubes, and nesting materials). Ten rats, which included both TBI and sham controls, were continuously housed with the exception of brief removal for behavioral assessments.
In an effort to address this issue, my laboratory, which is housed in the Safar Center for Resuscitation Research of the University of Pittsburgh School of Medicine, has been working on determining the therapeutic window of EE efficacy to further understand its potential relevance for clinical rehabilitation. We have recently completed a study evaluating two, four, or six hours of EE per day, which may be viewed as more akin to clinical rehabilitation. The data showed that the six-hour EE groups performed comparably to the continuous EE group (Figure 2), thus supporting our hypothesis. However, the two-hour and four-hour EE groups did not benefit from the limited exposure and were not different from the STD controls. Taken together, these results indicate that continuous EE is not necessary for optimal functional recovery after TBI, but also suggest that there is a certain threshold of enrichment that is necessary to elicit neurobehavioral recovery.

A study elucidating the importance of the individual components of the enriched environment was published in the June 2010 issue of the *Journal of Neurotrauma* and suggests that a multidisciplinary therapeutic setting is more efficacious than single modalities.11

Taken together, these EE studies are providing critical information regarding the importance of initiation and amount of timing for recovery of function after experimental TBI, and importantly, will further establish the EE paradigm as a relevant rehabilitation model.

References


![Figure 2. Mean (±S.E.M.) time (sec) to locate either a hidden (submerged) or visible (raised) platform in a water maze. Shorter time to attain the task indicates better cognitive recovery. The data indicate that both the continuous (24-hr) EE and the six-hour EE groups were able to learn the location of the escape platform significantly faster than the STD or two-hour and four-hour EE groups, but did not differ from one another.](image-url)
Recent contributions by UPMC Rehabilitation Institute faculty

Following is a sampling of recent presentations by UPMC Rehabilitation Institute faculty members.

American Academy of Physical Medicine and Rehabilitation
Seattle, Wash., November 2010

Courses
Updates of Spasticity Assessment and Management, Michael Munin, MD, course faculty.
Current Concepts in Pediatric Sports Medicine, Gary Chimes, MD, PhD, course faculty.
Resident Program: Introduction to Musculoskeletal Ultrasound, Gary Chimes, MD, PhD, course faculty.

Posters
“Alterations in Intervertebral Disc Matrix Homeostasis by In Vivo Dynamic Compression,” presented by Gwen Sowa, MD, PhD.
“Identifying Biomarkers in Older Adults with Low Back Pain,” presented by Gwen Sowa, MD, PhD, with co-authors Wan Huang, MD, PhD, Barrett Woods, MD, MaryBeth Kusturiss, MEd, Bernard Bechara, Alejandra Camacho-Soto, Cara Davies, and Debra Weiner, MD.
“Barriers to Exercise in Chronic Lower Back Pain,” presented by Geeta Sathe, MD, co-authored with Gwen Sowa, MD, PhD.
“Impact of Heterotopic Ossification in Lower Limb Amputation and Not-Traumatic Etiologies,” presented by Mohammed Khan, MD, with co-authors Sheila J. McNeill Ingham, MD, Christian Niyonkuru, MS, Michael L. Boninger, MD, and Michael Munin, MD.
“Incidence of Heterotopic Ossification in Patients with Lower Extremity Amputation,” presented by Sheila McNeill Ingham, MD, with co-authors Mohammed Khan, MD, Christian Niyonkuru, MS, Michael Boninger, MD, and Michael Munin, MD.
“Herpes Varicella Zoster (HVZ) Presenting as Radiculopathy: A Case Series,” presented by Eric Helm, MD, with co-author Mary Ann Miknevich, MD.

Academy for Neurotraumatology Eighth International Congress on Traumatic Brain Injury and Spinal Cord Injury
Stowe, Vt., May 2010
“TBI Monitoring and Diagnostic biomarkers: TBI Biomarkers and Neuro-rehabilitation,” presented by Amy Wagner, MD.

16th Annual Kentucky Spinal Cord and Head Injury Research Trust Symposium
University of Kentucky, June 2010
“Dopamine Neurotransmission after TBI,” presented by Amy Wagner, MD.

National Neurotrauma Symposium
Las Vegas, Nev., June 2010
“Neuroendocrine Involvement in Neurotrauma: Hormones as Biomarkers for Pathology and Prognosis in TBI,” presented by Amy Wagner, MD.

Federation of American Societies for Experimental Biology (FASEB) Skeletal Muscle Satellite and Stem Cells Conference
Carefree, Ariz., July 2010
“Electrical Stimulation: A Clinically Relevant Method to Rejuvenate Aged Skeletal Muscle Healing after a Severe Contusion Injury,” presented by Josh Plassmeyer, graduate student of Fabrisia Ambrosio, PhD, assistant professor, Department of PM&R, with co-authors Cao Z, Ferrari R, Fitzgerald GK, Boninger M, and Huard J.

American Association of Neuromuscular and Electrodiagnostic Medicine (AANEM)
Quebec City, Canada, October 2010
“Turns to Amplitude Analysis in Recurrent Laryngeal Mononeuropathy,” by Michael Munin, MD, Melissa Statham MD, and Sanjeev Nandedkar, PhD.

North American Sports and Spine (NASS)
Orlando, Fla., October 2010
“Glucosamine Decreases Inflammatory Gene Expression in Intervertebral Disc Cells Exposed to Inflammatory or Mechanical Stress,” presented by Gwendolyn Sowa, MD, PhD, with co-authors Paulo Coelho, MS, Kasey Komperda, Nam Vo, PhD, Judith Balk, MD, Harry Preuss, Rebecca Studer, PhD, and James Kang, MD.

Awards

The Pennsylvania Association of Rehabilitation Facilities (PARF) recognized Gilbert Brenes, MD, with the Individual Distinguished Service Award during the annual meeting in State College.
Dr. Brenes, certified in spinal cord injury medicine, has made a lifelong commitment to advancing the field of spinal cord injury (SCI) rehabilitation. He specializes in bowel and bladder dysfunction and management of pressure ulcers resulting from SCI.
Dr. Brenes is assistant professor in the Department of Physical Medicine and Rehabilitation.

A group of Human Engineering Research Labs (HERL) graduate students — Cheng-Shiu Chung, Jui-Te Lin, Maria Toro, Nahom Beyene, and Yasmin Garcia — were selected as one of five Student Design Competition finalists by the Rehabilitation Engineering and Assistive Technology Society of North America (RESNA). As part of their work with Rory Cooper, PhD, chair of the Department of Rehabilitation Science and Technology at the University of Pittsburgh, they developed the Uniform Throwing Chair for Seated Throwing Sporting Events. Their achievement was recognized at the RESNA annual conference in Las Vegas, Nev., in June. Their work can be seen at http://aac-recr.psu.edu/wordpressmu/TW/2010/05/13/uniform-throwing-chair-for-seated-throwing-sporting-events.

Recently published

A small sample of representative papers by UPMC Rehabilitation Institute faculty members


Dr. Camiolo Reddy is an assistant professor at the University of Pittsburgh and director of the department’s Brain Injury Fellowship program, as well as associate director of the Center for Brain Injury. Additional presentations were:

- “Vestibular and Balance Impairments,” presented by Susan Whitney, PhD, associate professor at the Department of Physical Therapy and director of rehabilitation at the Center for Vestibular Disorders and Centers for Rehab Services, UPMC.

- “TBI Biomarker and Outcomes Research,” presented by Amy Wagner, MD, associate professor and vice-chair of research, Department of Physical Medicine and Rehabilitation, addressing the newest research into the role of gender, cascading brain injury, and biomarkers of brain injury.

- “Rehabilitation of the Minimally Conscious Patient,” presented by Gary Galang, MD, along with Kim Belkowski, PT, dealt with the different levels of consciousness within the broader classifications of coma, vegetative states, and the emergence from these into the minimally conscious state.

The second annual Current Topics in Brain Injury Rehabilitation will be held April 2, 2011 at the UPMC Rehabilitation Institute’s UPMC Mercy location. For information, e-mail Mary Synnott at synnott@upmc.edu.
Fellowships (continued from Page 2)

Musculoskeletal, Sports, and Spine Fellowship

The UPMC Musculoskeletal, Sports, and Spine Fellowship offers instruction from highly experienced and trained professionals across a broad spectrum of specialties. This new fellowship, directed by Gary Chimes, MD, PhD, emphasizes several core areas: spine (including spine injections with both fluoroscopic and ultrasound guidance), sports medicine, biomechanics and the kinetic chain, peripheral joint and neurological evaluation, electrodiagnostic medicine, and musculoskeletal ultrasound. The goal is to develop concrete skills to be a complete musculoskeletal specialist who can handle all aspects of musculoskeletal, sports, and spine care.

Fellowship training is centered at UPMC’s outpatient facility in Monroeville, Pa., where PM&R physicians interact with specialties including radiology, orthopaedic surgery, sports medicine primary care, neurosurgery, rheumatology, neurology, endocrinology, and concussion care. The fellow also will receive training in spine injections (including cervical, thoracic, and pelvic), ultrasound (both diagnostic and guided procedures), and electrodiagnostic medicine, using established guidelines to ensure quality control.

Collegiate-level on-field athletic management, including management of emergency conditions, treatment of acute injuries, event planning, and triage of mass events at the collegiate sports level, is a core part of the training through an agreement with the athletic department and team physician at the California University of Pennsylvania.

For more information regarding UPMC rehabilitation fellowships, contact:

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June 2, 2010 marked the sixth annual UPMC Institute for Rehabilitation and Research Day (IRRDay) at the University of Pittsburgh for all students, residents, and fellows involved in rehabilitation research. This year, nearly 200 students and faculty attended, making it the most highly attended IRRDay in the event’s history. The Department of Physical Medicine and Rehabilitation proudly hosted the event.

This year, 58 abstracts were submitted, and the following research awards were presented:

Best Rehabilitation Research by an Undergraduate
“The adverse effect on spatial learning following chronic administration of haloperidol or risperidone after experimental brain trauma is long-lasting,” by Rashid Ahmed, University of Pittsburgh, School of Arts and Sciences, mentored by Anthony Kline, PhD.

Best Rehabilitation Research by a Predoctoral Student
“Unilateral spatial neglect may not impede upper extremity recovery in individuals with subacute stroke,” by Emily S. Grattan, MS, OTR/L, School of Health and Rehabilitation Sciences, Department of Occupational Therapy, mentored by Elizabeth Skidmore, PhD.

Best Rehabilitation Research by a Resident
“Noninvasive tools to assess molecular response to treatment for disc degeneration,” by Barrett Woods, MD, PGY-2, Department of Orthopaedic Surgery, mentored by Gwendolyn Sowa, MD, PhD.

Best Rehabilitation Research by a Postdoctoral Fellow
“Single-unit activity recorded using nonpenetrating electrode arrays on cat lumbar DRG surface,” by Robert Gaunt, PhD, postdoctorate associate, Department of Physical Medicine and Rehabilitation, mentored by Douglas Weber, PhD.

A complete list of student winners and the day’s activities can be seen on the IRRDay 2010 page at the Department of Physical Medicine and Rehabilitation website, www.rehabmedicine.pitt.edu.