

# Frontiers In Rehabilitation

A Newsletter for Physicians | Fall 2008



## Working in Tandem to Improve Quality of Life

Interdisciplinary Efforts Target Parkinson's Disease Symptoms, Falls Prevention

# Dear Colleague,

This is an exciting time for our department. In this issue, you will read about our new leadership for the Department of Physical Medicine and Rehabilitation, and about our successful research partnerships within Cleveland Clinic.

I am proud to announce that Vernon Lin, MD, PhD, has accepted the position of Chair of our department. Dr. Lin returns to Cleveland, where he completed residency training in PM&R, bringing with him almost two decades of experience in research, academic and medical leadership. His recruitment is testimony to the Cleveland Clinic's commitment to world-class research and clinical care that benefits persons with disabilities.

Although he is an accomplished neuroscience researcher, I am quick to point out that his work has also impacted healthcare on a wider scope. Most recently, he helped create a consortium of high schools, nursing schools and hospitals to develop a "fast track" nursing degree program to address the critical shortage of nurses in California. Many of you know Dr. Lin, and will agree that we are lucky to have attracted such a competent and humble leader to our department.

You will also read about some of our ongoing partnerships with Cleveland Clinic colleagues whose work touches the field of rehabilitation. We present initial findings from our programs that study the potential of exercise to reduce symptoms of Parkinson's disease. Also, we feature a program developed with our internal medicine colleagues, aimed at prevention of injuries sustained in falls. By utilizing best-practice concepts, and a unique flag in an electronic medical record that connects 37,000 Cleveland Clinic employees in every care setting, we hope to find the most cost-effective means of addressing a problem that plagues elderly patients.

Over the last three years, our department has realigned itself with the other major clinical divisions within Cleveland Clinic in adopting a disease-based (and patient-centered) institute model of care. The Rehabilitation Institute directs the rehabilitative care of patients in hospitals, acute rehabilitation units, and skilled and subacute centers throughout our health system. Our institute also oversees home care, case management, outpatient rehabilitation and hospice care. The Department of Physical Medicine and Rehabilitation is the singular, traditional academic department within the Institute, giving us a big platform to achieve our goals.

I hope you enjoy this issue, and that you will feel free to contact me if you would like more information about how our work here can assist you, and your patients.



Sincerely,



Frederick Frost, MD  
Interim Chair, Physical Medicine  
and Rehabilitation  
Vice Chair, Rehabilitation Institute

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**Hospice of Cleveland Clinic** 216.444.9819 or  
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*Frontiers in Rehabilitation*, published by the Cleveland Clinic Rehabilitation Institute, provides updates on new diagnostic and therapeutic techniques as well as current research for physiatrists, neurologists, neurosurgeons, orthopaedists and primary care practitioners.

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The Rehabilitation Institute is one of 26 institutes at Cleveland Clinic that group multiple specialties together to provide collaborative, patient-centered care. The institute offers full cross-disciplinary rehabilitation for people with physical, psychosocial, cognitive and vocational impairments. Patients receive coordinated care across a continuum that spans inpatient rehabilitation, skilled nursing, outpatient therapy and home care. Cleveland Clinic is a nonprofit, multispecialty academic medical center. Founded in 1921, it is dedicated to providing quality specialized care and includes an outpatient clinic, a hospital with more than 1,000 staffed beds, an education institute and a research institute.

*Frontiers in Rehabilitation* is written for physicians and should be relied upon for medical education purposes only. It does not provide a complete overview of the topics covered, and should not replace the independent judgment of a physician about the appropriateness or risks of a procedure for a given patient.

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# Study Indicates Cycling is Effective Therapy for Parkinson's Disease

Patients with Parkinson's disease who performed "forced" exercise on a stationary bicycle experienced improved motor function, according to a Cleveland Clinic study. Improvements in upper extremity motor function persisted four weeks after patients ceased the forced exercise regimen.

"Our initial data suggest that Parkinson's patients need to complete forced exercise, in which they exercise at a rate faster than they can achieve on their own," explains Cleveland Clinic biomedical engineer Jay Alberts, PhD. "In our study, the patient rode a stationary tandem cycle with a healthy trainer who regulated the rate of pedaling."

Dr. Alberts and Cleveland Clinic colleagues randomized 10 patients with Parkinson's disease to either a voluntary or a forced exercise group. The forced exercise group cycled on a stationary tandem bicycle for eight weeks with a trainer at speeds of 80 to 90 revolutions per minute. These patients were forced to pedal at greater speed because their pedals were mechanically linked to those of the trainer.

Patients in the voluntary exercise group pedaled at their own speed on a stationary cycle.

Clinical upper extremity tests were used to measure overall motor function and dexterity. While both groups displayed improvements in aerobic fitness, patients in the forced exercise group showed a 35 percent improvement in motor function. There was virtually no change in motor function for those in the voluntary exercise group.

Bimanual dexterity also improved for the forced exercise group. Again, no change in function was observed for the voluntary exercise group.

"With forced exercise intervention, patients pedaled at rates 40 to 60 percent faster than they could achieve on their own," says Dr. Alberts. "Such driving of the central nervous system may be necessary to produce the underlying biochemical changes that need to occur to improve motor function."

Why forced exercise led to changes that improved Parkinson's symptoms is still unclear. Dr. Alberts suggests that pedaling at a faster rate "may have produced an increase or improvement in the quantity and quality of sensory information provided to the brain."

"Previous studies in patients recovering from stroke have shown that increasing the levels of sensory information is helpful in facilitating neuroplasticity," he adds. In the functional MRI study described at right, cortical recruitment increased in those Parkinson's disease patients undergoing forced exercise.

Dr. Alberts next plans to examine changes in the cortical activation patterns of patients with Parkinson's disease who participate in forced and voluntary exercise protocols. The forced exercise will be delivered using a motorized cycle.

"The next steps are to understand the mechanisms underlying the improved function, the minimum of exercise needed for improvements to occur, whether these effects are long-lasting, and if this kind of forced exercise can slow the progression of Parkinson's disease," he says.

The original study was inspired by Dr. Alberts' observation of a relationship between pedaling at a faster rate and improved Parkinson's motor symptoms during and after a week-long 450-mile bicycle ride across Iowa. One participant with Parkinson's disease reported that she forgot that she had her condition during the ride and that her hand tremor had lessened.

*Dr. Alberts is a member of the Department of Biomedical Engineering; physicians may reach him at 216.445.3222 or [albertj@ccf.org](mailto:albertj@ccf.org).*

**Dr. Jay Alberts (right), an avid cyclist, with a Parkinson's disease patient**





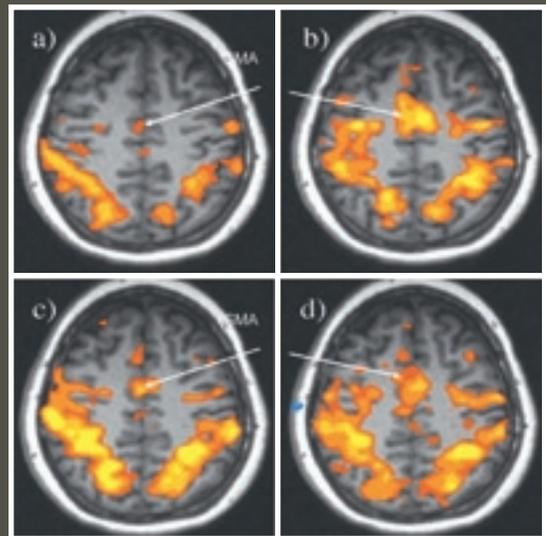
## Forced Exercise in Parkinson's Disease: fMRI Reveals Cortical Recruitment

By Mark J. Lowe, PhD

The neuroimaging literature suggests that effective drug therapy in Parkinson's disease is associated with recruitment of additional cortical motor regions during motor task performance. We performed a study involving six patients with Parkinson's disease in order to understand if forced exercise therapy resulted in a similar pattern of cortical recruitment.

The subjects underwent two 90-minute fMRI examinations at Cleveland Clinic on separate days. One exam was performed several hours after the subject had completed a forced-exercise therapy session. The other examination was performed on a day that the subject did not have a forced therapy session.

The order of the sessions (i.e., whether the first fMRI session followed therapy or preceded it) was randomized across subjects.



The scans above show fMRI results before and after therapy. The red/orange regions show brain areas involved in the performance of a constant, forced task involving the thumb and index finger of the dominant hand. After exercise, it was clear that additional motor regions – particularly the supplementary motor area (SMA) – were recruited for task performance. This is consistent with previous observations made in Parkinson's disease patients responding to drug therapy and suggests that forced exercise may play a role in brain biochemistry similar to that of drug therapies.

*Dr. Lowe is Director of High-Field MRI at Cleveland Clinic. Physicians may contact him at 216.445.2661 or at [lowem1@ccf.org](mailto:lowem1@ccf.org).*

# Falls Prevention is Goal of Cleveland Clinic Pilot Program

## Short-Course Physical Therapy Ideal for Geriatric Patients

Falls can cost elderly patients their independence, but intervention can reduce the risks of falling. Cleveland Clinic Physical Medicine and Rehabilitation specialists are piloting a program that identifies patients at risk of falling and steers them to the appropriate interventions.

"We find that short courses of targeted physical therapy improve patients' mobility and increase their confidence in getting out of the house. This stalls a downward spiral of immobility and fear," says Frederick Frost, MD, Vice Chair of the Rehabilitation Institute and Associate Professor in Cleveland Clinic Lerner College of Medicine.

"We know that intensive intervention is probably not cost-effective; yet minimal interventions (such as handing out brochures describing steps to take at home) don't prevent falls either. So we are testing the effectiveness of a falls prevention strategy of intermediate intensity."

Dr. Frost and internal medicine specialist Stephen Hayden, MD, lead a multidisciplinary team developing a protocol for patients over 65 seeing internists and family physicians at four Cleveland Clinic sites. Members of the Nursing Quality Department, Geriatric Medicine Program, and Regional Medical Practice and Information Technology divisions take part.

### Making the process painless

"We wanted the assessment to be as painless for physicians as possible, to take seconds in an office visit that might only last minutes. So it is structured in a way that easily stratifies decision-making," says Dr. Frost.

Patients are first asked by a nurse if they have fallen twice in the last year or have fallen once and sustained injuries. "We let the patient define 'injury,'" explains Dr. Hayden, who oversees the pilot program. "It can be as serious as a broken hip or as minimal as bruising."

### Flagging the medical record

Patients who say "yes" undergo a brief physical assessment by the nurse to evaluate balance and equilibrium. Those who fail are flagged in the electronic medical record for the physician's attention. If the physician deems their risks of falling to be minimal, the patient may be offered a list of community resources, including local Tai Chi classes or Arthritis Foundation exercise programs.

Those with multiple risk factors may be referred for physical therapy. "Some may be reluctant to seek out these services themselves because they don't want to bother family members to drive them," notes Dr. Hayden. "But when a physician recommends it, their interest goes up."

Patients with orthopaedic, neurological or spinal disorders causing significant mobility deficits are referred to Physical Medicine and Rehabilitation for follow-up. There, staff members have observed that many older patients resist the standard 15 Medicare PT sessions recommended. "They are reluctant to inconvenience family members, who have their own children to drive around, for rides to the therapy gym," says Dr. Frost. So physiatrists and physical therapists collaborated on a short course of therapy targeted at falls prevention.

### Compliance 'through the roof'

"When you tell patients that they only need to go to three or four PT sessions, compliance rates go through the roof," says Dr. Frost. "And when an adult son or daughter hears that a short course of therapy will help, they encourage the parent to go."

In the first session, physical therapists specializing in falls prevention evaluate patients' gait and balance. Then they teach simple exercises to do at home to improve their performance. Patients are re-tested at the third or fourth visit to see how much they have improved. This brief PT regimen is offered at four community locations.

### Aging patients are motivated

"Patients invariably report improved mobility and confidence in their walking. Contrary to what many people believe, older people will do the exercises you recommend for them. They have the time and they're motivated. They want to keep their freedom," Dr. Frost says.

Patients who require medication adjustments, who suffer from progressive frailty or other aging issues, or who have little social support are referred to Cleveland Clinic geriatricians. "A geriatric consultation simplifies and organizes their care," he says.

### Tracking results

Dr. Hayden notes that compiling follow-up outcomes data is a key component of the pilot program: "For example, we need to know how many patients go to physical therapy and what their incidence of falls was afterward."

Dr. Frost's department plans to compare compliance with short-course physical therapy to that of longer-term therapy, and to gauge physician satisfaction with the simple, electronic decision tree for management of falls risk.

*For more information, physicians may contact Dr. Frost at 216.445.2006 or [frostf@ccf.org](mailto:frostf@ccf.org), or Dr. Hayden at 216.444.5377 or [haydens@ccf.org](mailto:haydens@ccf.org).*

# International Leader Chairs Physical Medicine and Rehabilitation



**Vernon Lin, MD, PhD**, has been appointed Chair of the Department of Physical Medicine and Rehabilitation (PM&R) in the Cleveland Clinic Rehabilitation Institute.

The internationally acclaimed neuroscience researcher was Associate Chief of Staff, and Director of the Spinal Cord Institute, Functional Magnetic Stimulation (FMS) Laboratory and Spinal Cord Regeneration Laboratory at

the VA Long Beach Healthcare System (VALBHS) in California. As Professor in Residence at the University of California (UC), Irvine, he directed the Spinal Cord Injury Medicine Residency Program.

Dr. Lin and his colleagues have pioneered spinal cord repair strategies using peripheral nerve grafts and growth factors for restoring lower limb function in rodents and, more recently, in primates.

"This exciting breakthrough paves the way for clinical trials that adopt similar strategies in humans, bringing hope that many patients with severe spinal cord injury may experience significant functional recovery," says Dr. Lin.

As Director of the FMS Laboratory, he successfully applied a noninvasive stimulation technology to restore breathing, coughing, gastric emptying, colonic transit, bladder and bowel emptying, and fibrinolysis (preventing deep venous thrombosis) in patients with spinal cord injury.

"In the next few years, portable magnetic stimulator units will be available for patients with spinal cord injury or other disabilities," Dr. Lin predicts. "These externally applied noninvasive devices will

be very useful clinical tools for restoring vital functions in neurologically impaired individuals."

More recently, Dr. Lin and his collaborators have begun to work on projects that will bypass the spinal cord using signals from the motor cortex. They are designing wireless implantable neural systems and neural prostheses that will lead to safe standing and walking in patients with severe spinal cord injury.

Dr. Lin just completed a VA-sponsored project demonstrating effective cough generated by placing microelectrodes in the backs of canines. He is planning to initiate clinical trials at Cleveland Clinic.

His achievements have been recognized with awards from the American Paraplegia Society, the Western Paralyzed Veterans of America and the VALBHS. Dr. Lin also holds five patents in biomedical engineering.

Dr. Lin earned degrees in Medicine, and Mechanical and Biomedical Engineering, from UC, Davis, where he completed an NIH Research Fellowship in the Pulmonary Division. He completed his PM&R residency at MetroHealth Medical Center/Case Western Reserve University.

The widely published researcher serves as Editor-in-Chief of "Spinal Cord Medicine: Principles and Practice," and as a reviewer for the *NIH/NICHD Scientific Review*, *Archives of Physical Medicine and Rehabilitation*, and other important journals.

*Physicians may reach Dr. Lin at Cleveland Clinic at 216.445.7350 or at [linv@ccf.org](mailto:linv@ccf.org).*

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The Cleveland Clinic Rehabilitation Institute offers a full continuum of care, from acute rehabilitation and discharge planning to skilled nursing care, outpatient therapy and home physician visits. Visit our website to view our Staff Directory, program details and service locations.



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