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Dear Colleague,

As Chairman of Cleveland Clinic’s Department of Physical Medicine and Rehabilitation, I am tremendously gratified by the proliferation of clinical innovations and research initiatives among the physicians, therapists and researchers who make up our department. I’m pleased to share some of these activities in this issue of Frontiers in Rehabilitation.

On the clinical front, our cover story tackles one of the most exciting developments in sports medicine: widespread use of the validated Cleveland Clinic Concussion app for the iPad®. We have so far used the app to perform baseline function testing in nearly 6,000 youth athletes who play contact sports in our region. After baseline data are collected, the app can be deployed for concussion assessment immediately after a head injury during play. We have also made the app available for post-injury assessment among an additional 6,000 youth athletes managed by our athletic trainers. We hope to soon extend the app’s reach more broadly.

Other clinical innovations run the gamut of rehabilitation care. Here are just a few examples:

• On page 4, we report how our collaboration with Boston University on a short-form version of their AM-PAC™ instrument has helped direct our therapists to the hospitalized patients who need them most.

• On page 6, one of our critical care medicine colleagues shares insights from implementation of an inexpensive decision support system to prioritize rehab needs among ICU patients.

• On page 10, we recount how Cleveland Clinic’s recently adopted Stroke Carepath has been designed to maximize stroke patients’ readiness for rehabilitation.

Our research colleagues have compelling news to share as well. On page 16, Matthew Plow, PhD, outlines the AM-PAC™ instrument that allows for interaction with the data.

This information to clinicians in a meaningful manner on a point-of-care basis can change the trajectory of concussion care by enabling objective, affordable, point-of-care assessment of the multiple symptoms associated with concussion and providing this information to clinicians in a meaningful manner on a device that allows for interaction with the data.

Why an iPad App?

When we began exploring a software-based model to monitor concussions, we knew that measurement of motion and acceleration would be key. When the iPad 2 came along, with a built-in gyroscope and accelerometer, it fit the bill. The Cleveland Clinic Concussion (C3) app works by collecting position and time-series data, along with linear and angular acceleration data, to assess balance and concussion symptoms while an athlete performs clinical balance tests with an iPad attached to the waist (see photo on page 3). The app analyzes data to provide objective and specific measures of cognitive and motor function as well as balance and postural stability. Validation studies have shown that the app measures balance and postural stability with an accuracy equivalent to that of the system considered the gold standard for such testing (but which is expensive, large and nonportable). The concussion-related factors assessed by the app include:

• Information processing
• Reaction time (both choice and simple)
• Working memory
• Dynamic visual acuity
• Postural stability
• Visual memory

Into the Clinic and Onto the Field

After the validation studies, we systematically evaluated the C3 app for use in the performance of a clinical balance test often used in concussion: the Balance Error Scoring System (BESS). During BESS testing, subjects stand on varying surfaces and in varying postures to allow assessment of their processing of visual information, somatosensory (tactile) information and vestibular information from the inner ear. Whereas the traditional BESS test depends on a clinician’s subjective judgment, our study showed that the C3 app enables highly objective, quantitative BESS scoring that is also more sensitive than scoring by clinical observation alone, allowing greater discrimination between various concussion conditions. This study is now in press.

Next came a preliminary field study using the C3 app to gather baseline postural stability and functional data from 120 Cleveland-area high school and college athletes. The aim was to provide a benchmark to compare against in case any of them later sustained concussion. Twelve of these athletes suffered concussions during the season.

Concussion App Promises to Change Trajectory of Sports-Related Concussion Care

By Jay L. Alberts, PhD, and Richard Figler, MD

The management of concussion in young athletes too often follows a scenario like this:

An athlete sustains a blow to the head in a Friday night game. He’s taken out of the game but “shakes it off” without going to the emergency room. He’s assessed for concussion by an on-site athletic trainer, but not in a well-documented way. What documentation there is rarely makes it to the electronic medical record. A few days later, the athlete’s mother is troubled that he’s “still not quite right,” so they go to a physician who must piece together conflicting recollections of what happened. The physician puts the athlete through a battery of tests three days after the injury. Without baseline data, it’s difficult to know the extent and focus of the patient’s impairment or how much recovery has taken place. Management is hampered by this uncertainty, and the athlete’s family grows dissatisfied, bouncing from one provider to another. Even worse, he may be cleared prematurely because even though his functional test scores may look good, there is no way to know if he has fully returned to normal function.

Cleveland Clinic has a vision of how to change this model of sports concussion care, and we are extending the benefits of this vision to nearly 12,000 young athletes in Northeast Ohio. The vision centers on our proprietary concussion application (app) for Apple’s iPad® 2, a collaboration among our Concussion Center, Department of Biomedical Engineering and Center for Sports Health. We believe it can change the trajectory of concussion care by enabling objective, affordable, point-of-care assessment of the multiple symptoms associated with concussion and providing this information to clinicians in a meaningful manner on a device that allows for interaction with the data.

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studied. We have learned from these 12 cases that concussion appears to leave a distinct "fingerprint" in different individuals in terms of the functions most affected. For instance, some individuals have substantial impairment in dynamic visual acuity, whereas others have none, and some individuals suffer major balance impairments while balance is unaffected in others. We are also examining the rate of recovery of these affected functions over time to see how that fits into the broader concussive fingerprint. A manuscript on this study is in development.

‘Performance Polygon’ Guides Clinical Care

Our studies of functional return following concussion are facilitated by a method of data visualization we call the “performance polygon.” It plots an individual’s scores in nine performance domains (Figure) on the first post-concussion iPad assessment and periodically thereafter to allow easy visual monitoring of recovery to baseline levels (outer trace in Figure) over time. Depicting all domains in a single view makes the relative impairments in — and rates of recovery of — various domains readily apparent. This is valuable to clinicians for pinpointing the functional domains of concern and guiding the most appropriate therapy (be it physical therapy, vestibular rehab, cognitive therapy, etc.), and it helps patients easily understand what the treatment priorities are and why.

The clinical utility of this polygon tool underscores the importance of obtaining the athlete’s baseline assessment as well as assessments immediately after the injury and then frequently thereafter to monitor recovery.

Equally important is complete documentation of what happened at the time of injury, which the C3 app enables by providing the athletic trainer with a comprehensive questionnaire that elicits essential information about the incident and initial symptoms, which may later be valuable to a treating physician. It does so in a systematic way using drop-down menus and numeric coding to allow direct integration into the electronic medical record. The data are also integrated into Cleveland Clinic’s Knowledge Program interactive clinical database, which promotes management using our Concussion Carepath, an online evidence-based protocol to reduce variability of care across the health system and improve patient outcomes.

Current and Next Steps

In 2012, Cleveland Clinic has used the C3 app to complete baseline functional assessments in nearly 6,000 young athletes who play contact sports (e.g., football, men’s and women’s soccer) at the more than 50 high schools and colleges across Northeast Ohio that have Cleveland Clinic certified athletic trainers. We are using these baseline data to realize our vision for optimal care should any of these athletes sustain a head injury. We are also making the C3 app available for post-injury assessment among an additional 6,000 young athletes who are managed by our athletic trainers but who play non-contact sports or have not yet been scheduled for baseline assessment. Our next aim is to explore broader deployment of the app, together with our Concussion Carepath, for coordinated use by schools and hospitals across the country. Together these highly transferable tools have the potential to take much of the guesswork out of concussion assessment and care, allowing physicians to realize our vision for optimal care should any of these individuals in terms of the functions most affected. For instance, some individuals have substantial impairment in dynamic visual acuity, whereas others have none, and some individuals suffer major balance impairments while balance is unaffected in others. We are also examining the rate of recovery of these affected functions over time to see how that fits into the broader concussive fingerprint. A manuscript on this study is in development.

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How much rehabilitation therapy, and to whom? This question has long been at the core of rehabilitation care in the acute hospital setting. To better address this enduring issue, Cleveland Clinic has adopted an electronically administered short-form functional measure we call the “6 Clicks AM-PAC Short Form” (6 Clicks). Although it typically takes less than 15 seconds for a physical or occupational therapist to complete, 6 Clicks yields discrete patient data that helps us distribute our rehabilitation resources rationally and ensure that we discharge patients to the venue most suited to their rehabilitation needs.

The Quest for a Tool to Match the Task

Our efforts to develop 6 Clicks stemmed from heavy demand for rehabilitation evaluations of our hospitalized patients and the absence of a functional measurement tool that shared a pedigree with community-based outcomes measurements. Other tools we considered came from a heritage of inpatient rehabilitation metrics. Because only 2 to 4 percent of patients discharged from the hospital go to inpatient rehabilitation facilities (IRFs), these tools seemed poorly suited to the acute hospital setting. Hospitals use case-mix indexes to gauge the intensity of patients’ medical needs. With more than 700 rehabilitation evaluations a week, we lacked a similar “footprint” to allow us to track the rehabilitation needs of a very diverse group of patients. Several criteria guided our efforts to improve the objectivity of our hospital discharge-setting recommendations. A tool for this purpose had to:

• Be relevant across various care venues ranging from the hospital to skilled nursing facilities (SNFs) to outpatient rehabilitation to the patient’s home.
• Capture patient-reported outcomes, as patient empowerment was a priority, yet it had to be validated for implementation by proxy respondents in view of the limitations of many patients in the acute hospital setting.
• Be quick and easy to use at the bedside. It needed to be specific to the primary evaluation questions — Can the patient go home? If not, to which setting should the patient be discharged? — while setting a minimum quality standard for evaluations and establishing a functional baseline for the patient.

How It Works

In collaboration with our Boston University colleagues, we programmed 6 Clicks to reside in the MedLink® clinical management system, which feeds discrete (searchable) data into Cleveland Clinic’s Epic electronic medical record. This platform also enabled us to set up the 6 Clicks questionnaire as a script to prompt a proxy respondent to cover the essentials of a quality patient evaluation for PT or OT using the precise language used in the original AM-PAC tool. At the end of a patient evaluation, the physical or occupational therapist completes the 6 Clicks questionnaire electronically, scoring the patient on a scale from 1 to 4 for each of the six questions, which yields functionality scores ranging from a low of 6 to a high of 24. Scoring can be based on the therapist’s clinical judgment of patient functionality, so patients need not be asked to perform all the tasks assessed. Completion generally takes less than 20 seconds.

Early Results and Insights

We implemented 6 Clicks in acute hospital units on Cleveland Clinic’s main campus hospital in May 2011. From then until the end of 2011, the 6 Clicks questionnaire was completed for 96 percent of the 11,000 PT evaluations on these units and 96 percent of the 7,000 OT evaluations. Our analysis of this wealth of descriptive data yielded two main findings, as detailed below.

Opportunities to rationalize resource use. First, we documented that a sizable number of the patients we were evaluating did not need any follow-up therapy. For OT evaluations, the mean 6 Clicks score (on a scale from 6 to 24) was 17.9 and the median was 18; a full 18 percent of patients had a score of 24, indicating excellent physical functionality. For PT evaluations, the mean 6 Clicks score was 16.6 and the median was 17; 11 percent of patients had a score of 24.

These findings prompted us to reeducate the medical staff about the distinctions between PT and OT and the indications for each. Because we are able to identify hospital units where requests for evaluations of physically capable patients are frequent, we can target our education where it is most needed and will make the most difference. As a result, we have been able to consult more intelligently and deploy our therapists — particularly our occupational therapists — to spend more time treating patients who need them and less time evaluating patients who won’t need them. We are also now able to more easily identify patients whose disability is mainly cognitive and steer them to appropriate resources.

Good guidance for discharge disposition. We also found that 6 Clicks is highly useful as a tool to help objectify discharge disposition. We have seen that discharge to different venues is associated with discrete mean 6 Clicks PT scores (Figure), which allows us to quickly identify patients who will need post-acute care and help us gauge the level of care they will likely need. A retrospective comparison showed that discharge recommendations for level of care (based on 6 Clicks PT scores) matched patients’ actual discharge settings in a large majority of cases, as follows (by discharge destination):

• Home, 75 percent
• Outpatient PT/OT, 80 percent
• Home PT/OT, 70 percent
• IRF, 69 percent
• SNF, 74 percent
• Long-term acute care (LTAC), 80 percent

6 Clicks is not used to measure change in functional status in a given patient over the course of a brief acute hospitalization. This narrow six-item instrument was not designed to gauge longitudinal functional changes. When patients are discharged, they are engaged with more standard assessments, such as the full AM-PAC instrument or the Inpatient Rehabilitation Facility Patient Assessment Instrument (IRF-PAI), to measure their functional course.

Validation Under Way as Adoption Expands

Two types of validation studies of the 6 Clicks instrument are now underway. One is assessing subject-proxy agreement in the acute hospital setting, comparing patient responses with therapist responses. The other is a pragmatic trial of interrater reliability in which patients are scored independently by two therapists on successive days.

Within a year of its introduction on Cleveland Clinic’s main campus, 6 Clicks was implemented at all 10 acute care hospitals in the Cleveland Clinic health system as well as in SNFs within the system. Adoption in the SNFs came at the request of the therapists themselves, who have found 6 Clicks to be of great utility as a speedy shorthand functional measure — even in the face of their other documentation responsibilities.

Looking ahead, we anticipate that the objective data derived from 6 Clicks will help optimize refine staff deployment and drive additional practice improvements as we are able to better target attention to the patients who stand to benefit most from our therapy.
Deploying a Decision Support System to Prioritize ICU Patients’ Rehabilitation Needs

By Madhu Sasidhar, MD, and Frederic S. Frost, MD

To provide early rehabilitation for ICU patients, Cleveland Clinic has developed a clinical decision support system (DSS) that analyzes patient data and identifies ICU patients who are candidates for therapy. Each day the DSS generates an electronic list of these patients for the Department of Physical Medicine and Rehabilitation. Using this system, the first decision support tool developed for this purpose, we have provided rehabilitation services to an increased number of ICU patients and appear to be achieving better outcomes. It is well-documented in the literature that ICU patients who have prolonged bed rest experience deconditioning and weakening, and may develop profound neuromuscular weakness, a syndrome known as ICU-acquired weakness. This is particularly true for mechanically ventilated patients, who may be immobilized for days or weeks. Symptoms such as proximal muscle weakness and fatigue can persist over time, leading to functional impairment and inability to resume a normal routine, including returning to work. As survival rates have improved for ICU patients, quality of life has become a major concern.

The Shift Toward Early Mobilization

Historically, ICU care has focused on stabilizing physiologic deterioration, which was thought to require immobilization; ICU patients were considered too ill to withstand mobilization and rehabilitation. In recent years, studies have shown that physical and occupational therapy for ICU patients is feasible and safe and offers significant benefits. In response, ICU care is starting to move away from prolonged bed rest toward physical mobilization.

Providing early rehabilitation to ICU patients can be challenging, however. These patients have complicated medical issues requiring multiple interventions, so rehabilitation often is not a major priority. Also, their condition can easily deteriorate, changing their rehabilitation status. In response to these challenges, we decided to develop our clinical DSS to provide an efficient way to determine which ICU patients are candidates for rehabilitation and to match our physical therapy resources to the patients who need them most.

This type of DSS does not require a major investment, as it runs on a workstation using an application that analyzes existing discrete data.

Developing and Testing the DSS

In developing the system with the Department of Quantitative Health Sciences, clinicians from our two departments — Physical Medicine and Rehabilitation (PMR) and Pulmonary, Allergy and Critical Care Medicine — first established criteria for rehabilitation. Patients are to be considered only after a four-day ICU stay and cannot be unstable or need a high level of ventilation. Most ICU patients are considered for physical therapy, including the 80 percent of patients on mechanical ventilators and those with other medical issues, such as sepsis and kidney failure, who are not on ventilators. We created a profile of the optimal candidate for therapy based on 30 criteria similar to those used at the bedside (see Table for criteria categories).

The system accesses patient data from the electronic medical record (EMR) and laboratory results, and analyzes those data using search technology and data-mining techniques similar to those used by a platform like Facebook. After comparing the patient data to the criteria, the system selects appropriate candidates and scores them based on how well they match the criteria compared with the optimal candidate. During initial testing of the system in November 2011, we performed a manual audit of the data for the patients selected and found that the system was exceptionally accurate, working exactly as anticipated.

Implementation in the ICU

In January 2012, we implemented the DSS in the 50-bed MICU on Cleveland Clinic’s main campus, one of the largest ICUs in the nation. Every morning by 7:45, PMR clinicians are emailed a list of candidates for therapy and typically begin treatment by 8:00. Treatment is delivered by rehabilitation therapists, who consult with physicians as needed. As we have gained experience using the system, which can be changed in real time, we have added further criteria, such as high risk of bleeding.

We are in the process of analyzing preliminary data to assess improvements in clinical outcomes and to determine whether there have been reductions in length of ICU stay, which would make the therapy cost-effective (in addition to being good practice). So far, we have been able to provide physical therapy to a greater number of ICU patients than before DSS implementation, and these patients’ functional status measures show promising trends.

Preliminary Results, Future Plans

We plan to conduct a formal study of the DSS and its impact on ICU patient care and rehabilitation. By converting discrete patient data routinely collected in the EMR into knowledge, the DSS is creating new value for the ICU, the Department of Physical Medicine and Rehabilitation, and Cleveland Clinic overall.

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Dr. Frost is Chair of the Department of Physical Medicine and Rehabilitation and Executive Director, Cleveland Clinic Rehabilitation and Sports Therapy. He can be reached at 216.445.2006 or frostf@ccf.org.

Table. Data Categories for the Decision Support System’s 30 Assessment Criteria

<table>
<thead>
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<th>Criteria</th>
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<tr>
<td>&gt; ICU length of stay and readmission measures</td>
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<tr>
<td>&gt; Hemodynamic parameters</td>
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<tr>
<td>&gt; Cognitive status</td>
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<tr>
<td>&gt; Ventilator settings</td>
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<tr>
<td>&gt; Presence of medical red flags (e.g., renal dialysis)</td>
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Cleveland Clinic at Home Drives Down Readmissions While Expanding Its Reach

By William Zafirau, MD, and Cindy Vunovich, RN, BSN, MSM

An increasing number of patients need home-based medical care. These include patients who require follow-up services after being hospitalized, are at the end of life, have complex diseases, or have comorbid conditions and limited mobility. Providing medical care and rehabilitation at home, rather than at a healthcare institution, is not only cost-effective but results in positive outcomes. Over the past few years, Cleveland Clinic at Home (CC at Home), through the Center for Home Care and Community Rehabilitation, has seen a dramatic reduction in hospital readmissions as well as other positive outcomes, including increased patient satisfaction.

Nine CC at Home physicians are supported as faculty members within the Department of Physical Medicine and Rehabilitation, and 150 home care rehabilitation therapists benefit from close collaboration with Cleveland Clinic Rehabilitation and Sports Therapy, which operates systemwide.

Expanding Services, Increasing Access

Established in 1999, CC at Home is closely integrated with the Cleveland Clinic health system: All providers can access the same electronic medical record for patients, and all operations are in the same building, which facilitates communication and collaboration.

Our mission is to provide care to patients who need it most but often have great difficulty accessing it. We offer a comprehensive, ever-expanding array of home-based services, as detailed in the sidebar. Patient education is an integral part of CC at Home: We teach patients and their caregivers the skills to provide ongoing care, which improves outcomes.

CC at Home served 18,000 patients in 2011 and currently serves 2,000 patients a month. Our reach is increasing further as we have begun providing care remotely through telemedicine, which enables patients to transmit their vital signs — blood pressure, peak flows and blood sugar — to their primary care physician and specialists, and soon will allow them to have teleconferences with these providers.

Substantial Declines in Home Health Acute Hospitalizations

Between early 2008 and early 2011, acute care hospitalization rates for CC at Home patients declined from 29 percent to 18 percent, and they remained at that reduced level through late 2011 (Figure), according to publicly reported data from the Centers for Medicare & Medicaid Services (CMS). Our acute care hospitalization rate of 18 percent in late 2011 compared favorably with the national average of 27 percent for the same period (Figure). We attribute these outcomes to our responsiveness to patient needs: We visit patients soon after discharge, thoroughly review care plans with patients and caregivers, and respond quickly by phone and home visit when problems arise. Additionally, we work diligently to ensure that patients receive the right care at the right time across the continuum, which includes medical care at home, home health, palliative consultation and hospice at home. Working in concert with Cleveland Clinic’s Infection Pharmacy at Home service, we provide complex infusions, nutrition support with total parenteral nutrition, and pain management in the home setting.

In 2011, CC at Home met or exceeded national benchmarks in 18 of 21 process-of-care, outcome and utilization outcome measures for rehabilitation care, according to publicly reported CMS data. Moreover, our patients appreciate receiving care at home: 86 percent gave CC at Home a satisfaction rating of 9 or 10 (out of 10), which compares favorably with the home care services of other leading medical centers.

Chosen for the CMS ‘Independence at Home’ Demonstration Project

Cleveland Clinic is one of 16 healthcare organizations nationwide selected to participate in the CMS demonstration project known as Independence at Home. CC at Home will work with CMS to test new models of healthcare delivery and measure the quality of care and patient outcomes. Independence at Home will expand and build on existing CC at Home services. If the project succeeds in improving quality measures while generating savings for the Medicare program, medical practices will receive incentive payments to further support and develop their home-based care programs.

Future Plans

In the coming years, as the senior population grows, we anticipate an increased need for home-based care and will expand CC at Home services to meet it.

Dr. Zafirau is Medical Director of Cleveland Clinic at Home under the Neurololgical Institute’s Center for Home Care and Community Rehabilitation. He can be contacted at 216.636.8742 or zafiraw@ccf.org.

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Cleveland Clinic at Home is one of 16 organizations selected to participate in Independence at Home, a CMS demonstration project to test new delivery models and measure care quality and outcomes.

Services Offered by CC at Home

Skilled nursing, our most commonly used service, provides physical, occupational and speech-language therapy. Respiratory Therapy at Home provides home oxygen, nebulizers and aerosol medications to patients with a range of lung and heart conditions.

Heart Care at Home blends innovative telehealth monitoring with home health services to support patients following hospitalization for heart disease or heart surgery. Registered nurses provide health coaching, and advanced practice nurses make home visits to high-risk patients.

Infusion Pharmacy at Home is a licensed pharmacy service that provides medications, nutritional support, infusion pumps and comprehensive infusion therapy management. Therapies may be administered intravenously, subcutaneously or through an epidural line.

Hospice at Home assists patients and families in preparing physically, spiritually and emotionally for the end of life; it includes the Palliative Care Consultation Program for patients with incurable or advanced diseases. Our team of specially trained clinicians includes physicians, nurses, social workers and chaplains.

Medical Care at Home provides geriatric consults and primary care to patients with serious chronic conditions who have difficulty getting to a medical office, have memory disorders or behavioral health issues, or have been recently discharged from a medical facility. This is the newest and fastest-growing CC at Home service, currently serving 500 patients with chronic impairments.

Additional specialty services include in-home nutrition assessments by registered dietitians; medical social services; and in-home diabetics management, wound care, and pre- and postnatal care.
Cleveland Clinic’s Stroke Carepath Maximizes Patient Readiness for Rehabilitation

By Irene Katzan, MD, MS, and Frederick S. Frost, MD

The Neurological Institute has been at the forefront of Cleveland Clinic’s initiative to develop comprehensive care protocols called “Carepaths,” and stroke was the first condition we applied the concept to. We are now seeing our Stroke Carepath pay dividends for patients throughout their rehabilitation as well as during the acute phases of care.

Carepaths at a Glance

Carepaths are comprehensive care protocols that emerged from our Knowledge Program, a health information technology initiative we created to help quantitatively measure the effectiveness of medical decisions or processes for our patients. Through this program, we have embedded care protocols directly into our electronic medical record to ensure that a systematic approach is followed in the care of each patient (see sidebar). Carepaths incorporate documentation tools and disease-specific reminders that allow rapid treatment adjustments. They generate real-time warnings that enable us to adjust care. Carepaths incorporate documentation tools and disease-specific reminders that allow rapid treatment adjustments. They generate real-time warnings that enable us to adjust care.

By standardizing all major aspects of our approach to the care of stroke patients, we help ensure that all patients receive similar, appropriate management during their acute hospital stay. The Stroke Carepath, which we rolled out in late 2010, also improves our ability to perform tasks such as providing documentation required by The Joint Commission for primary stroke center certification and tracking quality measures over time. It is reshaping the way we apply data, conduct comparative research, identify effective strategies and reduce extraneous care.

Optimizing Readiness for Rehab

Under our Stroke Carepath, when the time comes for rehabilitation, patients have been optimized for it in multiple ways:

- They have received stroke education from expert nursing educators.
- They have had their need for physical and occupational therapy assessed, with daily ongoing monitoring of their progress and precise documentation of their functional status in the acute hospital via our novel short-form assessment derived from Boston University’s Activity Measure for Post-Acute Care.
- They have been evaluated by a rehabilitation physician to determine which rehabilitation venue is most appropriate for them.
- They have had their medication use reviewed and coordinated to reduce their risk of recurrent stroke.
- They have been given a copy of their discharge summary form if they are going home, which includes advice on managing their personal stroke risk factors (e.g., blood pressure, weight and cholesterol) as well as information on stroke warning signs and symptoms.

Patients are also provided an appointment for their first follow-up visit with the Neurological Institute before their discharge, because we know the transition from hospital to a rehabilitation facility or home can be difficult. Patients who are told to schedule that appointment after discharge often forget or lose the phone number or struggle to navigate the phone appointment system. We have found that this one step greatly improves the number of patients who return within 30 days after discharge.

At the time of hospital follow-up, patients complete short electronic questionnaires that allow providers to better understand how they are doing. This information can be compared with the information collected during the hospitalization so patients and providers can objectively assess progress. In short, every aspect of the Neurological Institute’s approach to stroke care is designed to prepare the patient for an easier, faster and more efficient rehabilitation process.

Beyond ‘Meaningful Use’

By integrating these standards of care into the electronic medical record, we are making the electronic medical record much more than just a document repository, going far beyond the federal government’s “meaningful use” goal. The Carepath process has been well-accepted by our providers, who tend to view it as an asset that enhances their ability to frame each patient’s needs and that makes documentation more efficient.

The process is also being extended beyond the inpatient arena. It is now being integrated into all venues, including ambulatory therapy centers and subacute and rehabilitation facilities, to allow us to follow patients through the entire course of their medical and rehabilitative care.

In the wake of this and other initial Carepaths, Cleveland Clinic is in the process of extending Carepaths to other conditions and procedures, including congestive heart failure, hip and knee replacement, obstetric care, dementia, and concussion care.

Dr. Katzan directs the Knowledge Program and the Neurological Institute’s Center for Outcomes Research and Evaluation. She played a primary role in developing the Stroke Carepath. She can be reached at 216.445.2616 or katzani@ccf.org.

Dr. Frost is Chair of the Department of Physical Medicine and Rehabilitation and Executive Director, Cleveland Clinic Rehabilitation and Sports Therapy. He can be reached at 216.445.2006 or frostf@ccf.org.
A one-time intraspinal injection of fibronectin immediately after spinal cord injury (SCI) produces persistent inhibition of mechanical allodynia in an experimental rat model. This novel finding, recently published by a collaborative research group directed out of Cleveland Clinic’s Department of Neurosciences and Department of Physical Medicine and Rehabilitation, raises the prospect of a potential role for intraspinal fibronectin in inhibiting chronic pain in humans.

Why Fibronectin?

New approaches to inhibit chronic pain after SCI are desperately needed, as approximately 90 percent of the 1 million U.S. patients who have sustained SCI suffer from such pain. Many patients find the pain more debilitating than the paralysis that may result from SCI. Mechanical allodynia — pain from normally innocuous stimuli — is a common form of chronic pain related to SCI. The mainstays of current treatment for SCI-related pain lack sufficient strength for many patients and are limited by their addictive potential and significant side effects.

By Ching-Yi Lin, PhD

Chronic Pain After Spinal Cord Injury: Inhibition with Fibronectin in Rat Model Paves Way for Human Studies

Fibronectin-induced blockade of mechanical allodynia persisted over an eight-month observation period in the rat, which is comparable to 25 years in humans.

The mechanisms underlying pain following SCI are complex. Injury to the spinal cord increases the permeability of the blood-spinal cord barrier, which permits the invasion of inflammatory cells and the development of chronic pain. Also, dorsal column injury is known to reduce levels of serotonin, a neurotransmitter critical to pain perception, in the superficial dorsal horn.

We chose to study fibronectin, an endogenous glycoprotein that helps anchor cells in place, because it is known to support the survival and growth of neurons in the spinal cord. Two of fibronectin’s receptors (integrins alpha4beta1 and alpha1beta1) are involved in maintaining the vasculature and regulating infiltration of inflammatory cells into the spinal cord following SCI. These receptors are also present in primary afferent neurites that mediate pain.

Our Study at a Glance

Rats that undergo dorsal column crush at the dorsal aspect of the C8 spinal cord segment develop mechanical allodynia over the ensuing five weeks — the pain emerges slowly, as it does in humans. For our study, dorsal column crush was induced by creating a lesion at C8 through insertion and squeezing of a forceps to a depth of 1 mm. Fibronectin (50 µg/mL) was then injected into the lesion space and both 1 mm rostral and 1 mm caudal to the lesion. We injected additional rats with the connecting segment-1 (CS-1) motif of fibronectin to assess whether this was responsible for fibronectin’s pain-blocking activity.

When we monitored the rats’ hind-paw withdrawal to assess sensitivity to non-noxious stimuli, we found that fibronectin injection resulted in a significant increase in withdrawal thresholds, indicating blockade of mechanical allodynia. We found that these effects were dependent on the CS-1 motif of fibronectin. Notably, this effect persisted over an eight-month observation period (Figure), which is comparable to 25 years in humans.

Further, fibronectin diminished inflammation and blood-spinal cord barrier permeability in areas surrounding the injury site, providing evidence that fibronectin treatment maintains the integrity of this barrier.

No apparent adverse effects were observed with the fibronectin therapy.

Immunohistochemical Confirmation

Following dorsal column crush, glial fibrillary acidic protein (GFAP) and the microglia/macrophage marker ED1 were observed in areas surrounding the lesion, which suggests that astrocytes and inflammatory microglia and macrophages are activated in the days after SCI. Immunohistochemical staining showed that fibronectin treatment blocked SCI-induced upregulation of GFAP and ED1, which is consistent with a role for fibronectin in suppressing the inflammatory response after dorsal column injury and preventing secondary damage induced by inflammation.

Additional immunohistochemical testing confirmed a decrease in serotonin immunoreactivity in the superficial dorsal horn following dorsal column crush, suggesting that the pathogenesis of mechanical allodynia may involve serotonin. Notably, immunostaining also showed that injection of fibronectin into the rat spinal cord normalized the SCI-induced decrease in serotonin levels.

Future Research Directions: Delayed Administration, Other Pain Types

Our study, which was the first demonstration that fibronectin can induce plasticity in the spinal cord following SCI, is fueling further investigations at Cleveland Clinic to better elucidate the mechanisms underlying the development of SCI pain and better understand fibronectin’s pain-inhibiting properties. We aim to eventually test fibronectin treatment for chronic pain inhibition after SCI and other disorders in humans, particularly in the setting of delayed fibronectin administration, given the impracticality of immediate treatment. We are encouraged by indications from studies to date that this therapy may be effective at later time points as well as very shortly after injury.

Our ultimate hope is that this research can lead to more effective treatment of other types of pain, including pain associated with inflammatory conditions, cancer pain and neuropathic pain.

REFERENCE


Dr. Lin is an assistant staff member in the Department of Neurosciences in Cleveland Clinic’s Lerner Research Institute and a member of the Department of Physical Medicine and Rehabilitation research staff. She can be contacted at linc@ccf.org.
Too often in hospital-based rehabilitation medicine, recommendations are made as much out of fear as out of what’s best for the patient. The use of thickened liquids for patients with dysphagia is a case in point. For the past 40 years, oral intake of thin liquids has been restricted for patients swallowing difficulties, out of fear that liquids pose too great a risk of being aspirated (Figure) and causing pneumonia. As a result, countless patients have had to endure regimens of utterly unappealing thickened coffee and juices that leave them dehydrated. Filling the oral cavity with starch- and gum-based thickeners, without the use of water for oral irrigation and toothbrushing, creates the ideal culture medium for pathogenic bacteria. We know that dysphagic patients aspirate their saliva throughout the day. Is it better to intermittently aspirate clean water or to consistently aspirate filthy oral secretions?

Cleveland Clinic Rehabilitation Hospitals have joined a growing group of rehabilitation centers in developing and implementing a water protocol as an option for carefully chosen patients with dysphagia. Although water protocols have been around for decades, they are poorly studied. This may be due, in part, to allegiance to conventional dysphagia management. Thus, water protocols lacked the scientific evidence to gain widespread acceptance. Patient and family nonadherence to thin-liquid restrictions, along with the real risk of dehydration and its sequelae, were keys in our decision to implement the water protocol. Rather than pretend that our patients were adherent, our aim was to engage our team of speech-language pathologists (SLPs) to safely reintroduce thin liquids in a controlled, supervised environment.

A Different Pathway for Patients with Dysphagia

Under this practice, all patients admitted to the inpatient rehabilitation unit with dysphagia who have been ordered to receive thickened liquids or nothing by mouth are evaluated by the unit’s SLP, who recommends whether they are appropriate candidates for the water protocol (see Table for key criteria). For those patients, a physician order is generated based on the SLP’s recommendations for the quantity and frequency of water administration.

Nursing staff then implements the protocol, which involves periodic consumption of water after aggressive oral hygiene (brushing of teeth, tongue, gums and roof of mouth with a chlorhexidine gluconate oral rinse for one to two minutes), along with observation for signs and symptoms of aspiration with each administration of water. Because aggressive oral hygiene before each administration of water is a hallmark of the program, the protocol requires an unwavering commitment from nursing staff. The unit’s nurses have been trained thoroughly by the SLP to direct patients through a sequence of steps for safe oral rinsing and swallowing of water. Nurses also educate patients and family members on how to continue the protocol’s techniques after discharge, to empower patients to safely maintain their hydration on their own and build on their progress.

Background and Rationale

The initial water protocol for patients with dysphagia was developed nearly 30 years ago at the Frazier Rehab Institute in Louisville, Ky., after its staff recognized the nonadherence to thin-liquid restrictions by patients and their families both in the hospital and after discharge. The Frazier team recognized that dysphagic patients aspirate frequently regardless of what they ingest, and they believed aspiration of water was far preferable to aspiration of the bacteria-ridden mouth secretions promoted by thickened fluids.

Initial studies were inconclusive as to whether outcomes with the water protocol were better or worse than those with conventional dysphagia management. Thus, water protocols lacked the scientific evidence to gain widespread acceptance. Patient and family nonadherence to thin-liquid restrictions, along with the real risk of dehydration and its sequelae, were keys in our decision to implement the water protocol. Rather than pretend that our patients were adherent, our aim was to engage our team of speech-language pathologists (SLPs) to safely reintroduce thin liquids in a controlled, supervised environment.

Table. Key Criteria in Assessing Candidates for the Dysphagia Water Protocol

| Is the patient alert and oriented? |
| Is the patient able to follow commands? |
| Is the patient free of oral infections and mouth sores? |
| Does the patient have stable respiratory status? |
| Can the patient tolerate oral hygiene? |

Figure. Series of images, taken one second apart, showing aspiration during a modified barium swallow study.

Current Status, Future Steps

After extensive planning and training among SLPs, nurses and rehabilitation physicians, a pragmatic trial of the protocol was implemented at Cleveland Clinic’s main campus in March 2012. Patients have since been enrolled at the rate of two or three per month. As we gain further experience with the protocol, we look forward to extending it to other acute hospital units on main campus and to our rehabilitation facilities at other hospitals in the Cleveland Clinic health system.

Meanwhile, we are tracking hydration, nutritional status and health outcomes of our patients as part of our standard care for dysphagic patients both on and off the protocol.

Hospital Dysphagia Management: Time to Be Open About the Option of Water Protocols

By Frederick S. Frost, MD, and Cynthia A. Sutton, BSN, RN, CRRN

Dr. Frost is Chair of the Department of Physical Medicine and Rehabilitation and Executive Director, Cleveland Clinic Rehabilitation and Sports Therapy. He can be reached at 216.445.2006 or frostf@ccf.org.

Ms. Sutton is a nurse manager of an acute rehabilitation unit at Cleveland Clinic’s main campus. She can be reached at 216.444.0470 or suttonc2@ccf.org.
Recognizing the Benefits of Exercise in MS

It was once recommended that people with MS not engage in physical activity because it could exacerbate the disease process. This advice was likely based on the temporary worsening of symptoms, such as fatigue, that people with MS often experience after a single bout of activity. However, increases in symptoms usually subside after rest, and there is no published evidence that physical activity is unsafe for people with MS. In fact, cumulative evidence from systematic literature reviews now indicates that physical activity has beneficial effects on mobility and health-related quality of life in adults with mild to moderate MS impairment. At the same time, research also indicates that the population with MS is extremely inactive. It is understandable that common MS symptoms can compromise patients’ ability and motivation to engage in physical activity. Yet, given the documented benefits of engaging in physical activity, the question becomes how to design interventions to promote long-term adherence to physical activity programs.

A Telehealth Trial Supported by the MS Society

The National Multiple Sclerosis Society has recognized the importance of asking such questions. It has funded our research team — which includes Marcia Finlayson, OT, PhD, and Robert Mott, PhD, from the University of Illinois, and Francois Bethoux, MD, from Cleveland Clinic’s Mellen Center for Multiple Sclerosis Treatment and Research — so we can conduct the largest randomized clinical trial to date examining the effects of an intervention to promote lifestyle physical activity among adults with mild to moderate MS impairment. The study’s specific purpose is to examine the effectiveness of a telehealth intervention that supports individuals with MS in managing fatigue and increasing physical activity.

The study is novel because it represents a multidisciplinary effort to merge two promising lines of MS research: fatigue management and physical activity promotion. The idea is that if people with MS can effectively manage their fatigue, they may be more likely to engage in physical activity. The goal is to recruit approximately 189 people with MS in Ohio to participate in the study. Participants will be randomized to one of three interventions: (1) physical activity only (comparison intervention arm), (2) fatigue management plus physical activity (treatment intervention arm) and (3) social support (“contact control” arm). Each arm involves a 12-week intervention period followed by a 12-week noncontact period to assess whether effects persist. Intervention strategies to promote lifestyle physical activity will consist of a novel yet simple approach: encouraging goal-setting and self-monitoring with a pedometer. Intervention strategies to reduce fatigue impact involve teaching energy-conservation principles (e.g., emphasizing the importance of rest throughout the day), setting priorities, activity analysis and modification, and living a balanced lifestyle. No intervention arm is focused solely on fatigue management because there is ample evidence supporting this intervention, and including such an arm would add needless recruitment challenges.

Intervention involves exposure to topics typically discussed in expert-led support groups, such as information on MS, disease-modifying medications, preventive screening, community organizations, nutrition and supplements, cognitive issues, and recognizing symptoms of depression and chronic stress. As all interventions will be conducted over the telephone, they promise to offer accessibility and potential for dissemination if shown to be effective. Ultimately, we hope to show through this trial that cost-effective telehealth interventions to promote physical activity and reduce fatigue impact will improve quality of life and well-being in individuals with MS.

By Matthew Plow, PhD

Cleveland Clinic began offering a home-based palliative medicine program in 2010 through Cleveland Clinic Medical Care at Home in collaboration with Cleveland Clinic Hospice at Home, a multidisciplinary service based in the Neurological Institute and the Department of Physical Medicine and Rehabilitation. Our physician-run service caters to a large variety of patients at home, as well as in nursing homes and assisted living facilities, who have advanced diseases (both cancer and noncancer illness). Most of these patients are not yet eligible or willing to enroll in a hospice program, as they are undergoing rehabilitation and also seeking therapeutic, curative treatment, but they still need supportive symptom management. We serve patients in a seven-county area in Northeast Ohio who have trouble traveling to and from multiple doctor visits, by bringing the hospital to them whenever possible.

A Range of Life-Limiting Conditions

Our patients are seen by staff physicians with expertise in palliative medicine for pain in palliative patients and symptom management. Additional care, individualized and customized to patient needs, is provided as appropriate by a team of experts in areas such as physical therapy, wound care, social work, nursing and other ancillary services. In addition to taking care of patients, we also support their families during the difficult time of the illness.

Many of the patients we care for have very high-acuity conditions. While many of our patients have cancer, many others have noncancer life-limiting conditions such as end-stage dementia, chronic obstructive pulmonary disease, amyotrophic lateral sclerosis, congestive heart failure, multiple sclerosis, end-stage renal disease, HIV infection, stroke complications, coma, interstitial lung disease and Parkinson disease.

By Mohammed Ahmed Khan, MD

In an effort to identify initiatives that will reinforce program strengths and target areas for improvement, we are conducting a retrospective chart review of patients who received palliative care at home from Cleveland Clinic physicians between January and December 2011. The characteristics and outcomes of patients in the palliative medicine program are being analyzed and reported, and data on patient demographics, referrals, disease characteristics, interventions and outcomes are being evaluated. We look forward to sharing these data as they become available, to provide much-needed evidence to guide the development of the nascent field of home-based palliative medicine.

Dr. Ahmed Khan specializes in palliative medicine, hospice care, supportive oncology and cancer pain management. He can be reached at 216.636.8780 or akhanmd@ccf.org.

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Ongoing Outcomes Research

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Home-Based Palliative Medicine Program Begins Bringing the Hospital to the Patient

By Mohammed Ahmed Khan, MD

Cleveland Clinic began offering a home-based palliative medicine program in 2010 through Cleveland Clinic Medical Care at Home in collaboration with Cleveland Clinic Hospice at Home, a multidisciplinary service based in the Neurological Institute and the Department of Physical Medicine and Rehabilitation. Our physician-run service caters to a large variety of patients at home, as well as in nursing homes and assisted living facilities, who have advanced diseases (both cancer and noncancer illness). Most of these patients are not yet eligible or willing to enroll in a hospice program, as they are undergoing rehabilitation and also seeking therapeutic, curative treatment, but they still need supportive symptom management. We serve patients in a seven-county area in Northeast Ohio who have trouble traveling to and from multiple doctor visits, by bringing the hospital to them whenever possible.

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Dr. Ahmed Khan specializes in palliative medicine, hospice care, supportive oncology and cancer pain management. He can be reached at 216.636.8780 or akhanmd@ccf.org.
One reason post-stroke outcomes remain suboptimal is poor daily living compromise stroke survivors’ ability to perform activities of daily living.

Over the past several decades, rehabilitation practices have evolved in response to insights into the principles of motor learning that are believed to optimize motor recovery. Key components of motor learning that evolved in response to these insights include (1) meaningful feedback at regular intervals, (2) high repetition and intensity of activity, (3) incorporation of movement into functional tasks, and (4) sufficient quality and intensity to facilitate neuroplasticity. These insights into neuroplasticity and motor recovery have guided our evolving efforts in post-stroke rehabilitation therapy.

Potential Benefits of Telerehabilitation in Stroke

In major metropolitan areas and other locations with multidisciplinary stroke teams, rehabilitation starts immediately after a stroke and may continue for weeks, months or even years. However, many patients, especially those in rural settings or with limited insurance or transportation resources, lack access to comprehensive stroke rehabilitation programs, which may limit their functional recovery and contribute to long-term disability. With advances in technology, telerehabilitation has emerged as a viable adjunct to traditional rehabilitation care by making therapy more accessible to rural populations (16 to 20 percent of the U.S. population) and others with limited access to care. Preliminary evidence indicates that telerehabilitation may be a feasible and effective way to improve the health and function of stroke patients while supporting caregivers’ needs in assisting patients with self-care activities, mobility and transportation.

Despite advances in rehabilitation approaches, most stroke survivors continue to experience unilateral upper extremity weakness, sensory loss or coordination deficits months to years after stroke. These sensory and motor declines compromise stroke survivors’ ability to perform activities of daily living.

One reason post-stroke outcomes remain suboptimal is poor access to effective rehabilitation therapy for a number of patient populations, especially those in rural and underserved settings. Another reason lies in the constraints of traditional rehabilitation environments and reimbursement models to provide the quantity and intensity of therapy believed to optimize motor recovery. In response to these limitations, Cleveland Clinic is leading a study of efforts to combine a telerehabilitation intervention with robot-assisted therapy for stroke survivors with upper limb impairment.

This article describes the study’s rationale, design and objectives.

Best Practices for Motor Recovery

Over the past several decades, rehabilitation practices have evolved in response to insights into the principles of motor learning that facilitate neuroplasticity. Key components of motor learning that are believed to optimize motor recovery following stroke include:

- Active vs. passive activities to engage the patient
- Progressively increasing task difficulty based on patient performance
- High repetition and intensity of activity
- Meaningful feedback at regular intervals
- Incorporation of movement into functional tasks

The underlying mechanisms of neuroplasticity are thought to occur through increased neural activity, synaptic activity and cortical reorganization in the motor cortex. These insights into neuroplasticity and motor recovery have guided our evolving efforts in post-stroke rehabilitation therapy.

Combining Telerehabilitation and Robot-Assisted Therapy

Several studies have found that robot-assisted therapy is at least as effective as traditional therapy programs for upper extremity rehabilitation after stroke. In an effort to better serve stroke survivors, Jay Alberts, PhD, of Cleveland Clinic’s Department of Biomedical Engineering and Center for Neurological Restoration, is conducting a study in conjunction with Emory University in Atlanta and Kinetic Muscles Inc. in Arizona to investigate robot-assisted therapy used in a telerehabilitation model. The study is specifically evaluating the use of a home-based robot-assisted device designed to improve movement and control of the distal upper limb in stroke survivors who have limited access to comprehensive stroke rehabilitation. The goal is to assess the device’s ability to provide accessible, effective and affordable care to these populations.

Those eligible to participate have had a stroke within the prior six months and continue to have upper limb weakness. Qualifying participants are randomized to exercise alone or to treatment with a commercially available robotic device, the Hand Mentor Pro® (Kinetic Muscles Inc., Tempe, Ariz.), to assist with wrist and hand movement in conjunction with an exercise program (treatment group).

Innovative Home Monitoring System Extends Reach of Stroke Rehabilitation

By Susan Linder, PT, DPT, NCS, and Anson Rosenfeldt, PT, DPT

Reach of Stroke Rehabilitation

In an effort to emphasize the motor learning principles of repetition and intensity to facilitate neuroplasticity and (3) monitoring home activity program, all participants are urged to incorporate functional, everyday tasks into their home exercise program.

The therapist educates the patient and caregiver on the study intervention during a home visit and conducts weekly phone calls to monitor exercise adherence, address barriers or other issues, and assess functional progress. Data from the robotic device are transmitted wirelessly to a secure server at Cleveland Clinic. This remote monitoring capability allows the therapist to track adherence to device use and progress with the prescribed program.

Addressing Key Challenges

This study aims to address three major challenges to rehabilitation after stroke: (1) providing access for patients in rural locations or with limited insurance or transportation resources, (2) providing therapy of sufficient quality and intensity to facilitate neuroplasticity and (3) monitoring home exercise programs. Results from this and other telerehabilitation studies will shape the future of rehabilitation therapy delivery. As length of stay in hospital and formal rehabilitation settings continues to decrease, telerehabilitation may be an effective way to facilitate motor recovery after stroke.

Cleveland Clinic is leading a study using telerehabilitation to provide therapy of sufficient quality and intensity to facilitate neuroplasticity.

The robotic device consists of a control box with a touch screen, a pneumatic arm unit and a communication device for data transmission. The touch-screen box provides a variety of programs similar to video games to engage the patient while providing visual feedback. The programs range from spasticity reduction to video game-based applications that facilitate controlled, repetitive, goal-directed movements of the hand and wrist. A potentiometer and pressure transducer within the device detect changes in movement and pressure. These data are used to adjust the speed, resistance and range of motion goals of each program according to patient performance. A pneumatic pump is activated to facilitate movement and help the patient achieve target goals. The objective of using the robotic device is to increase active range of motion and control in the distal upper extremity.

Participants in both the treatment and control groups are asked to perform three hours of activity five days a week to emphasize the motor learning principles of repetition and intensity. The treatment group spends two hours using the robotic device and one hour performing an exercise- and task-based activity program, while the control group spends all three hours on the exercise- and task-based activity program. To facilitate functional recovery, all participants are urged to incorporate functional, everyday tasks into their home exercise program.

The study described here is supported by grant RC3NS070564 from the National Institute of Neurological Disorders and Stroke.

Susan Linder, PT, DPT, NCS, is a clinical specialist in the Department of Biomedical Engineering in Cleveland Clinic’s Lerner Research Institute. She can be reached at 216.445.9815 or linders@ccf.org.

Anson Rosenfeldt, PT, DPT, is a physical therapist in the Department of Physical Medicine and Rehabilitation in Cleveland Clinic’s Neurological Institute. She can be reached at 216.445.3277 or rosenfal@ccf.org.
‘Partners in Mobility’ Protocol Promotes Swifter Inpatient Recovery and Greater PT Satisfaction

By Mary Stilphen, PT, DPT

A shift in the protocol for improving hospital patient mobility has resulted in shorter hospital stays, fewer falls and more discharges directly home for many patients hospitalized at Cleveland Clinic’s main campus. It also has freed time for our physical therapists (PTs) to focus on the patients most in need of their services, increasing PT satisfaction in the process.

Broadening Responsibility for Mobility Assistance

Our new protocol, dubbed “Partners in Mobility,” arose from a need to relieve PTs of bearing sole responsibility for helping hospitalized patients become mobile. It has resulted in the more direct involvement of nurses and other caregivers in this important piece of a patient’s recovery. Movement toward the protocol took place over the past few years, in part due to brainstorming meetings we have held with physicians, hospital leadership and physical therapy professionals at Johns Hopkins Hospital and Mayo Clinic. Both of these institutions, which shared similar challenges, are working toward similar new protocols.

As of the spring of 2010, Cleveland Clinic’s Department of Physical Medicine and Rehabilitation was receiving as many as 500 requests for physical therapy evaluations each week. Not all these requests required the assistance of a PT to help a patient walk or move around the nursing unit. In response to this situation, one of our staff members, Kathleen Vass, DPT, took it upon herself to teach nurses on one unit — the liver transplant unit — the importance of patient mobility in recovery and how to help patients begin moving in a safe manner.

This therapist also developed tools to encourage patients to move themselves to move. For example, patients are given cards with free weights, pedometers for tracking footsteps and bicycle pedals for patients to use in their rooms, along with free weights, pedometers for tracking footsteps and walkers (the latter are provided in rooms on the orthopedic floor as well). A recumbent bike is available for use in the lounge. Although we have not yet collected outcomes data on the lung transplant or orthopedic units, anecdotal evidence indicates improvement in length of stay, number of falls and discharges directly home in these areas as well.

Further Rollout and Studies Under Way

These findings led us to pilot the Partners in Mobility model of care on other units, where additional mobility interventions are tailored to the specific patient population. On the lung transplant unit, for instance, we provide bicycle pedals for patients to use in their rooms, along with free weights, pedometers for tracking footsteps and walkers (the latter are provided in rooms on the orthopedic floor as well). A recumbent bike is available for use in the lounge. Although we have not yet collected outcomes data on the lung transplant or orthopedic units, anecdotal evidence indicates improvement in length of stay, number of falls and discharges directly home in these areas as well.

Payoff in PT Satisfaction

In the meantime, as a part of the Partners in Mobility model, PTs are embedded in the healthcare team on multiple units throughout the hospital. Having a dedicated PT working with nurses on the units enables the provision of more consistent care to patients. This has both helped promote patient recovery and resulted in increased satisfaction among therapists. PTs report that they no longer feel like they are recipients of “orders” but instead serve as proactive, respected members of the patient’s healthcare team.

Mary Stilphen, PT, DPT, is Senior Director, Cleveland Clinic Rehabilitation and Sports Therapy and a member of the Department of Physical Medicine and Rehabilitation. She can be contacted at 216.444.8610 or stilphm@ccf.org.

We are currently conducting a six-month pilot to refine the Partners in Mobility model and further study its impact on patient outcomes. The unit chosen for the pilot has a mix of surgical patients, a higher volume of hospital transfers, a relatively long mean length of stay and patients with complex functional needs. The pilot includes use of a mobility technician, a trained (but unlicensed) health-care professional who assists patients with physical activities as directed by a PT. This staff member is supervised by nursing management on the unit.

Table. Impact of Partners in Mobility on Patient Outcomes on Liver Transplant Unit

<table>
<thead>
<tr>
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<th>Baseline group (n = 116)</th>
<th>Intervention group (n = 93)</th>
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<tbody>
<tr>
<td>Falls (percentage of patients falling)</td>
<td>6.9</td>
<td>5.4</td>
</tr>
<tr>
<td>Length of stay (days)*</td>
<td>13.29 ± 8.38</td>
<td>10.85 ± 6.41</td>
</tr>
<tr>
<td>Percentage of patients discharged home</td>
<td>68.1</td>
<td>77.4</td>
</tr>
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*P < .004 for the difference between groups
SCI Medicine: An Intensive Review Yields Broad and Enduring Impact on Spinal Injury Care

Hundreds of physicians who specialize in spinal cord injury (SCI) medicine across the country owe at least a bit of their clinical acumen to SCI Medicine: An Intensive Review, the perennial preconference workshop to the annual meeting of the Academy of Spinal Cord Injury Professionals. By extension, they can thank the workshop’s developer, Vernon W.H. Lin, MD, PhD, who has served as course director for each annual offering of the daylong workshop over its 15-year history. For the past several years, Dr. Lin has directed the workshop from his position on the staff of Cleveland Clinic’s Department of Physical Medicine and Rehabilitation.

Identifying a Need

Soon after the subspecialty of SCI medicine was established by the American Board of Physical Medicine and Rehabilitation in 1998, Dr. Lin saw the need for a board review course for the subspecialty. He went to great lengths to assemble a national faculty to address all major topics in SCI medicine, and he hasn’t stopped since. SCI Medicine: An Intensive Review has become a well-established prelude to the Academy of Spinal Cord Injury Professionals conference, and it remains the only board review course in the nation designed to prepare physicians for the Spinal Cord Injury Medicine Subspecialty Certification and Maintenance of Certification Examination. To date, more than 600 physicians from a variety of medical specialties have achieved subspecialty certification.

Taking ‘Intensive’ Seriously

The workshop packs nearly two dozen lectures and other presentations into its 12-hour agenda for the approximately 60 physicians who attend each year. While most attendees are preparing for the board examination, the workshop is valuable for any healthcare professional who wants an intensive and comprehensive review of spinal cord medicine.

The curriculum addresses the latest in assessment, management and rehabilitation in patients with spinal cord injuries or disorders. A sampling of topics from the 2012 workshop agenda includes spasticity management, imaging of the spinal cord, psychosocial adjustment to SCI, and sexual dysfunction and infertility. Instruction is provided by a dozen or more expert faculty from across the United States and beyond, including Dr. Lin.

The workshop has also served as the foundation for Spinal Cord Medicine: Principles and Practice, a respected textbook edited by Dr. Lin that is now in its second edition.

A Labor of Love

The workshop’s longevity and its one-of-a-kind status in SCI medicine have helped establish Dr. Lin as a leader in the subspecialty, as evidenced by his receipt of the 2006 Excellence Award from the American Paraplegia Society and the extensive network of colleagues he taps as faculty from around the nation.

“Each year the workshop involves a huge amount of work, planning and coordination by Dr. Lin and Cleveland Clinic staff,” says Frederick S. Frost, MD, Chairman of the Department of Physical Medicine and Rehabilitation at Cleveland Clinic. “But it’s clearly a labor of love. Dr. Lin’s vision for and commitment to education in spinal cord injury medicine are a great asset to our organization.”

He adds that Dr. Lin’s enthusiasm for the workshop shows no sign of waning, which carries the promise of many more years of sharpened clinical judgment for hundreds more SCI medicine physicians.

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Cleveland Clinic's Referring Physician Center has established a 24/7 Referrals Hotline — 855.REFER.123 (855.733.3712)

Hospital Transfers
800.553.5056

On the Web: clevelandclinic.org/refer123

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About Cleveland Clinic
Cleveland Clinic is an integrated healthcare delivery system with local, national and international reach. At Cleveland Clinic, 2,800 physicians represent 120 medical specialties and subspecialties. We are a main campus, 18 family health centers, eight community hospitals, Cleveland Clinic Florida, the Cleveland Clinic Lou Ruvo Center for Brain Health in Las Vegas, Cleveland Clinic Canada, Sheikh Khalifa Medical City, and Cleveland Clinic Abu Dhabi.

In 2012, Cleveland Clinic was ranked one of America's top 4 hospitals in U.S. News & World Report's annual “America's Best Hospitals” survey. The survey ranks Cleveland Clinic among the nation’s top 10 hospitals in 14 specialty areas, and the top hospital in three of those areas.

Resources for Physicians
Referring Physician Center and Hotline
Cleveland Clinic’s Referring Physician Center has established a 24/7 hotline — 855.REFER.123 (855.733.3712) — to streamline access to our array of medical services. Contact the Referring Physician Hotline for information on our clinical specialties and services, to schedule an appointment, and confirm patient appointments, for assistance in resolving service-related issues, and to connect with Cleveland Clinic specialists.

Physician Directory
View all Cleveland Clinic staff online at clevelandclinic.org/staff.

Track Your Patient’s Care Online
DrConnect is a secure online service providing real-time information about the treatment your patient receives at Cleveland Clinic. Establish a DrConnect account at clevelandclinic.org/deconnect.

Critical Care Transport Worldwide
Cleveland Clinic’s critical care transport teams and fleet of vehicles are available to serve patients across the globe.

• To arrange for a critical care transfer, call 216.448.7000 or 866.547.1467 (see clevelandclinic.org/criticalcaretransport).

• For STEMI (ST elevated myocardial infarction), acute stroke, ICH (intracerebral hemorrhage), SAH (subarachnoid hemorrhage) or aortic syndrome transfers, call 877.379.CODE (2633).

Outcomes Data
View clinical Outcome Books from all Cleveland Clinic institutes at clevelandclinic.org/outcomes.

Clinical Trials
We offer thousands of clinical trials for qualifying patients. Visit clevelandclinic.org/clinicaltrials.

CME Opportunities: Live and Online
The Cleveland Clinic Center for Continuing Education’s website offers convenient, complimentary learning opportunities. Visit ccf.cme.org to learn more, and use Cleveland Clinic’s myCME portal (available on the site) to manage your CME credits.

Executive Education
Cleveland Clinic has two education programs for healthcare executive leaders — the Executive Visitors’ Program and the two-week Samson Global Leadership Academy immersion program. Visit clevelandclinic.org/executiveeducation.

Same-Day Appointments
Cleveland Clinic offers same-day appointments to help your patients get the care they need, right away. Have your patients call our same-day appointment line, 216.444.CARE (2273), or 800.223.CARE (2273).

Resources for Patients
Medical Concierge
For complimentary assistance for out-of-state patients and families, call 800.223.2273, ext. 55580, or email medicalconcierge@ccf.org.

Global Patient Services
For complimentary assistance for national and international patients and families, call 001.216.444.8184 or visit clevelandclinic.org/gps.

MyChart®
Cleveland Clinic MyChart® is a secure, online personal healthcare management tool that connects patients to their medical record. Patients can register for MyChart through their physician’s office or by going online to clevelandclinic.org/mychart.

MyConsult
Cleveland Clinic offers online medical second opinions for more than 1,000 life-threatening and life-altering diagnoses. For more information, visit clevelandclinic.org/myconsult or call 800.223.2337, ext. 43223.

About the Department of Physical Medicine and Rehabilitation
The Department of Physical Medicine and Rehabilitation is part of the Neurological Institute, one of 26 institutes at Cleveland Clinic that group multiple specialties together to provide collaborative, patient-centered care. The department offers full cross-disciplinary rehabilitation for patients with physical, psychosocial, cognitive and vocational impairments. Patients receive coordinated care across a continuum that spans inpatient rehabilitation, skilled nursing and outpatient therapy at Cleveland Clinic facilities throughout the region.

The department includes Cleveland Clinic Rehabilitation Hospitals, which offer coordinated acute inpatient rehabilitation care at Cleveland Clinic’s main campus, Euclid Hospital and Lakewood Hospital. Together with our complement of hospital services at Cleveland Clinic Children’s Hospital for Rehabilitation, they provide a full range of inpatient rehabilitation services across 120 beds for patients of any age.

Cleveland Clinic Rehabilitation and Sports Therapy works in concert with the Department of Physical Medicine and Rehabilitation and Cleveland Clinic’s Orthopaedic & Rheumatologic Institute to engage a team of more than 750 specialty-trained occupational, physical and speech therapists to provide seamless rehabilitation services from the acute hospital setting through post-acute treatment and home care. Our team’s services are patient-centered and built around disease conditions, transcending traditional barriers between hospital, nursing home and outpatient care.

Cleveland Clinic at Home, in the Center for Home Care and Community Rehabilitation, employs more than 600 medical and support professionals to extend nursing and rehab services across approximately 300,000 patient visits each year. With specialized rehab, hospice, infusion and oxygen services, Cleveland Clinic at Home ensures integration of acute and postacute services through the use of unified electronic medical records and specialty-based Carepaths.

To learn more about the Department of Physical Medicine and Rehabilitation, visit clevelandclinic.org/rehab and find profiles of our services, physicians, locations, research initiatives and more.

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Cleveland Clinic Excels in
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The 2012 “America's Best Hospitals” survey recognized Cleveland Clinic as one of the nation’s top 4 hospitals. For more details, visit clevelandclinic.org.

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