FOCUS ON
Rehabilitation

ALTHOUGH STILL CONSIDERED in its infancy, robotic technology is becoming an increasingly common and efficient complement to traditional therapy in the outpatient and inpatient rehabilitation settings. Hemiparesis, muscle weakness, poor coordination and ambulatory difficulty can significantly hinder the functioning and quality of life of patients who have experienced neurological insult. But with additional research and continued clinical application, robot-assisted rehabilitation may offer a new and unique approach to enhancing traditional therapy, potentially helping patients achieve treatment goals faster and more effectively.

Body of Work

From a technological design standpoint, robotic devices currently available for use in rehabilitation settings are relatively simple. Their general purpose is to support limbs that are either nonfunctional because of neurological damage, including stroke, spinal cord injury, traumatic brain injury or multiple sclerosis, or to support extremities that are functional but limited by weakness, reduced range of motion, poor endurance or other factors.

Initial robotics were created predominantly for the upper extremities. Some are designed to allow for repetitive motions of the entire arm while others support repeated movements of specific joints of the arm, like the shoulder or the elbow. Technology focusing on more complex functional motions (such as movements of the hand, wrist or fingers) is emerging.

Devices for lower extremities and locomotion training also are available and are particularly beneficial for stroke and other populations for whom coordination or gait pattern, rather than severe weakness, is problematic. Some of the technology is intended to improve overall mobility and walking, such as with semi- and full exoskeleton robotics that fit around the lower extremities and provide ample support for overground walking or body-weight-supported treadmill training. Other locomotive equipment serves as a bracing device, usually for individuals who can generally walk on their own but can benefit from assistance to improve gait mechanics. These bracing robotics help patients achieve proper leg positioning, for

(continued on page 7)
A “FRENEMY” IS SOMEONE WHO is both a friend and an enemy, simultaneously a colleague and a competitor. Frenemies are rampant in the post-acute care world. Inpatient rehabilitation hospitals/units (IRH/Us) are friends with short-term acute care hospitals (STACHs), depending on each other for referrals. But some STACHs have rehabilitation units, making enemies of IRHs as they compete for patients. Looking downstream, a nursing home may receive patient referrals from an IRH/U but also compete as a “rehabilitation center.”

Yet if we are to meet the Triple Aim in health care—improving care for individuals, improving the health of populations, and reducing the per capita costs of care—we need to better embrace the “friend” element and find ways to enhance care coordination throughout the post-acute continuum.

That includes collapsing the current, siloed state of post-acute care, which inhibits our ability to coordinate treatment. The continuing care hospital model included in the Patient Protection and Affordable Care Act could meet each of these goals. Unfortunately, it has not yet been implemented.

Still, the changing health care system has other opportunities for coordination, including:

• Improve transitions of care. The Medicare readmission penalty has motivated hospitals to partner with post-acute providers to improve transitions and the quality of care after STACH discharge. IRH/Us should identify partnership opportunities and take a proactive role in these efforts.

• Expand health information exchange. Post-acute care facilities were not eligible for funds under the Health Information Technology for Economic and Clinical Health (HITECH) Act. Nonetheless, STACH and other post-acute care systems need to “talk to each other” to provide better access to medical records and test results to enhance efficiency and effectiveness of care.

• Partner with accountable care organizations (ACOs). These new models rely on coordination across care settings to maximize quality and reduce costs. Reaching out to ACOs and encouraging them to consider the entire post-acute spectrum is important.

• Participate in bundled payment systems. Medicare is experimenting with bundled payments in which it provides a single reimbursement from three days prior to admission to 30 to 60 days after discharge. Finding a way to embrace this new methodology could contribute to long-term success for the IRH/U.

Achieving the Triple Aim demands a détente in the friend/enemy pattern. It requires that we work together to provide the right care for the right patient at the right time without insisting it occur in a particular setting that may not be appropriate for that individual.

For instance, we could place rehabilitation nurse liaisons or physicians inside the STACH to assess patients early in their acute illness or injury. This can help ensure that they transition to the most appropriate care at an optimal time. Similar interactions with discharge placements commonly utilized by the IRH/U should also be explored.

Frenemies. It’s time to retire the word and learn to work together.

Bruce M. Gans, M.D.
Chief Medical Officer
CHRONIC WOUNDS are a swiftly growing health problem, affecting more than 8 million Americans. Spinal cord injury, traumatic brain injury, stroke and other neurological as well as musculoskeletal disorders place individuals at an increased risk for sores, skin ulcers and other complications. While specialized wound clinics are available in many communities, patients frequently have explicit clinical issues and treatment goals that are often served best by integrating wound management with rehabilitation expertise and services.

In November, Kessler Institute for Rehabilitation took an important step toward meeting these unique patient needs by opening the Kessler Center for Wound Care.

**The Relevance of Rehabilitation**

Rehabilitation patients commonly experience nonhealing medical issues such as pressure ulcers; traumatic wounds; peristomal skin irritations; and venous, arterial and neuropathic ulcers. This is due in large part to the direct sequelae of sustaining musculoskeletal and neurological injuries, including reduced mobility and sensation, persistent skin pressure, constant compression of body parts, compromised blood circulation, peripheral edema and incontinence. Furthermore, comorbid conditions common in rehabilitation populations, like peripheral vascular disease and diabetes, heighten the risk of chronic irritations and lesions.

Wounds can become a significant source of disability, pain and reduced quality of life. And the resulting discomfort and immobility brought on by sores and lesions can limit activity and hinder participation in therapy, causing a cycle of disability that impedes on overall functioning and well-being. Thus, including wound treatment with rehabilitation may not only facilitate healing but may also allow patients to benefit fully from therapies and efforts to maximize activity.

When patients with neurological and musculoskeletal disabilities receive wound care outside the rehabilitation setting, they could be less likely to be given focused, integrative services. Routine wound treatment in the community may be restricted in scope and focused attention. Depending on the patient, this limited approach might be inadequate for significant results. For example, hyperbaric oxygen therapy generally requires daily visits for several weeks, underscoring the importance of a clinic that provides both the infrastructure and clinical experience for such an intervention.

**Customized Care**

It is critical to understand the patient’s needs and the best approach for treating any given lesion, based on the individual’s medical condition and the characteristics of the wound. Toward this goal, the Kessler Center for Wound Care has partnered with experts from Healogics, the world’s largest wound care management organization.

Specialists at the new wound care center also believe that optimal assessment and treatment for this population stem from utilizing a more holistic approach. They gather multidisciplinary input from physicians, nurses, occupational therapists, physical therapists and more—all of whom tailor their protocols to patients’ specific needs.

For example, a stroke can result in swallowing deficits that may lead to poor nutrition and increase the risk of pressure ulcers or add to the challenge of ulcer healing; this points to the importance of possibly including swallowing and nutritional services in wound care. Individuals in wheelchairs may need specialized seating and attention to repositioning movements to improve blood flow and avoid prolonged tissue compression. And edema management can be beneficial for people with compromised circulation. Such examples of expert services not only promote wound healing but also help patients optimize outcomes from rehabilitation by allowing them to continue participating in their full treatment programs with maximum effort and minimal disruption.

To meet these complex needs, the Kessler Center for Wound Care also offers advanced, evidence-based treatments, including the use of bioengineered tissue substitutes, growth factor therapies and hyperbaric oxygen therapy. Patient and family education play an equally strong role in ensuring individuals understand their treatment protocol and how to implement therapy at home. Rather than use a cookie cutter approach, this array of strategies allows the Kessler Center for Wound Care to effectively address the distinctive clinical circumstances of a lesion and facilitate successful patient outcomes.

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Rehabilitation in long-term acute care: New opportunities for collaboration

Q&A WITH SAMUEL (BUDDY) HAMMERMAN, M.D., MMM

AT KESSLER INSTITUTE for Rehabilitation, therapy protocols are continually honed and refined, which creates opportunities to work more closely with acute care hospitals and other post-acute providers to advance patient recovery. To learn about greater collaboration and coordination of services taking place in the post-acute care world, specifically with long-term acute care hospitals, Focus on Rehabilitation spoke with Samuel (Buddy) Hammerman, M.D., MMM, chief medical officer of the Long-Term Acute Care Hospital Division at Select Medical.

Focus on Rehabilitation: Can you elaborate on what you mean by collaboration opportunities?

Samuel Hammerman, M.D., MMM: Within the long-term acute care (LTAC) environment there has been a concordance of processes that provide the patient with the best chance for recovery. We know that mobilization is critical to reversing muscle weakness. Therefore, initiating physical therapy as soon as possible is an essential component of recovery. This example is just one of many that have become routine practice in a long-term acute care hospital (LTACH). However, the same is not always true in an intensive care unit (ICU) setting, where rehabilitation therapy services may be challenged by staffing or expertise. Since the ICU and the LTACH treat similar patients, it makes sense that we should share the same best practices.

Focus: When you say collaboration, do you mean sending staff into the rehabilitation or ICU setting to care for patients?

Hammerman: Not necessarily. The thought is to develop a model that would include regular communication allowing for remote assessment and treatment. The physiatrist or therapist would identify patient-specific therapy needs, mentor on therapy techniques and procedures, and continue patient care when they arrive at the LTACH. The idea is to start the rehabilitation therapy earlier in recovery. With frequent patient evaluations, the therapies used in an LTACH can be started at a more optimal time.

Focus: What type of therapies might be involved?

Hammerman: In the forefront is the issue of physical therapy. In ICU patients, especially those on mechanical ventilators, physical therapy is critical to achieving a positive outcome. We also know that a patient with a tracheostomy tube will need speech therapy, and an ICU patient will need a strength assessment to determine whether occupational therapy will be necessary. Specialists in all areas of rehabilitation should be involved, including physical, cognitive, speech, occupational and behavioral therapies, as well as psychology.

Focus: How soon should rehabilitation therapy start in an ICU?

Hammerman: Recovering from catastrophic illness is not always straightforward. Patients often have comorbid conditions that add to the complexity of their condition. Our patients are classified more accurately as chronically critically ill (CCI). They have a unique physiology that differs from acutely critically ill patients in other ICU beds. However, we know that patients in the ICU can show signs of cognitive decline within days. Frequent communication between the ICU physician and the physiatrist, and eventually LTAC physicians, will be needed to establish the collaboration that works best.

Focus: Within an ICU, who will identify when to start rehabilitation?

Hammerman: Caring for patients who have mechanical ventilation, antibiotic use, delirium and metabolic issues relies on a team approach that includes the physician, a bedside nurse, a respiratory therapist, and an array of caregivers and therapists. Theoretically, anyone on the hospital team will be able to identify when a key indicator has been reached that will trigger the start of a particular rehabilitation therapy. This will naturally flow into the LTAC setting.

Focus: What type of patients might benefit from this collaboration?

Hammerman: Many individuals who are chronically critically ill will be transferred to an LTACH. The one-year survival in CCI patients is between 40 percent and 50 percent. Collaboration would recognize the essential therapies needed for rehabilitation and allow for an earlier intervention with the hope of promoting an earlier and more complete recovery.

Focus: Do you anticipate that patient outcomes will improve as a result of collaboration between an LTACH and an acute care hospital?

Hammerman: Just like a research project, we anticipate that outcomes will improve, but need to confirm our hypothesis. After working 20 years in the ICU and eight years in the LTAC setting, I’ve learned that it is difficult to predict patient outcomes. Patients who show no signs of hope can have a miraculous recovery and you thank goodness that you’ve hung in there and done your best. These patients need diligence and

perseverance from their clinical staff, something we do extremely well at Kessler Institute for Rehabilitation and Select Medical’s LTACHs.

**Focus:** What evidence is there that intervening sooner in patient care with rehabilitation services will provide benefit?

**Hammerman:** Rehabilitation in the LTAC setting has been poorly researched in the past. No significant studies have been undertaken in LTAC patients, although a recent study by E. Wesley Ely, M.D., MPH, at Vanderbilt University Medical Center followed patients for 12 months after ICU discharge. The investigators reported that one in three people who survived critical illness acquired a cognitive deficit similar to that of moderate Alzheimer’s disease. In their study of 821 medical and surgical ICU patients, more than 50 percent of the survivors had memory issues that lasted for an entire 12-month follow-up. Longer ICU stays were correlated with low scores for global cognition and executive function. Sedatives or analgesic medications were not associated consistently with the change in cognition. Although this study does not suggest that early intervention will reduce the degree of cognitive decline or achieve an earlier recovery, it identifies a problem that needs to be studied further.

**Focus:** Are there any collaborations of this nature currently in place with Kessler?

**Hammerman:** Right now we have a skin integrity model set up between nursing, administrative and clinical personnel. This virtual task force has begun discussions regarding the standardization of processes, best practice opportunities, outcomes, prevention and treatment. There is also a model of cognitive treatment for rehabilitation in discussion for future implementation.

**Focus:** Are other opportunities for collaboration on the horizon?

**Hammerman:** The Johns Hopkins Hospital sponsored a conference in November 2013 on improving ICU patient outcomes through collaboration with rehabilitation colleagues. This gathering increased awareness at the ICU level about the skill available in rehabilitation settings, and potentially LTACHs will hopefully help establish working groups to move forward in working together.

**Focus:** Are patients in the ICU the only ones who might benefit from collaborative services?

**Hammerman:** The model for cooperation with the ICU is popular right now, but certainly not the only option. Opportunities exist between any rehabilitation care and LTAC setting. The possibilities are limitless to develop best practice models.

**Focus:** What challenges do you anticipate as collaborations are established?

**Hammerman:** The first challenge, one of increasing awareness among ICU physicians about the rehabilitation therapies used in LTAC, is being addressed. Discussion among clinicians in both care settings has been opened. We hope that both parties recognize the benefits to patient care resulting from collaboration. However, we are paving new ground, and the dialogue will expand beyond physicians. All the administrative logistics and clinical processes will need to be in place before teamwork can be established. As with any new program, frequent feedback and change will be expected as programs evolve.

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**POST-ACUTE COLLABORATIONS**

The earlier patients can participate in their rehabilitation, the better, typically, are their outcomes, leading to improvements in their quality of life. Collaboration among post-acute care providers can help initiate rehabilitation for patients more quickly and coordinate their treatment. Select Medical offers myriad services, including 15 post-acute care facilities to support patients and work with other providers along the entire continuum of post-acute care.

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WHEN REPORTERS ASKED
Willie Sutton why he robbed banks, he was widely reported to have said: “Because that’s where the money is.” The same phenomenon seems to be in effect in health care reform: We need to change the health care system because that is where a good chunk of the discretionary federal budget lies. By comparison, 21 percent of this budget goes toward defense spending, and 27 percent to health care.

Change is needed. That requires understanding the three factors that influence such a transformation and their role in health care:
1. Technical: What changes do we need and why?
2. Political/social: Can we agree on the changes?
3. Economic: Can we afford them?

In health care, the technical problems are clear: questionable outcomes compared with other countries, coupled with the highest per capita costs in the industrialized world; a fragmented system with little coordination across settings; a high-tech/low-touch pattern; and a population that, by and large, does not take personal responsibility for its health.

The Political Landscape
On the political/social side, we have vast disparities in access to health care based on insurance or socioeconomic status. We also have competing political ideologies: Is health care a right to which everyone is entitled or a privilege for those who can afford it? Should the majority fund health care for the minority?

Then there are the economic challenges: perceived out-of-control costs; an underperforming system that does not provide value; and waste and redundancy. Of course, in reality, much of the “unnecessary” health care expenditure only becomes known after the fact, not while the expenses are incurred. For example, while the health care cost for the last 30 days of life is extremely high, can we rely on accurate and precise predictors of when life will end to help us determine when to constrain spending?

One factor typically dominates in the process of any major change, whether it is the most important or not. For example, when home video recorders first emerged, two formats competed for the industry standard: Betamax and VHS. Betamax was a superior technology (technical domain) and there were no significant differences in cost (economic domain). Yet VHS prevailed. Why? Politics among the manufacturers proposing the standard.

The need to contain health care costs appears to dominate the discussion despite the rhetoric about improving quality.

The need to contain health care costs appears to dominate the discussion despite the rhetoric about improving quality.

Thus, Sutton’s law in action: “Why health care reform? Because that’s where the money is.”

Economic Reform
For those of us in the post-acute care world, this means we need to position our efforts for reform in economic terms, not just technical, social and political. We need to acknowledge that dollars are the driving force for change.

Since the enactment of the Patient Protection and Affordable Care Act, the field has urged implementation of the continuing care hospital (CCH) model mandated in the law. Recently, the American Medical Rehabilitation Providers Association, in conjunction with investigators from the Brookings Institution and others, submitted a proposal to the Centers for Medicare & Medicaid Services for a CCH demonstration model. Eighteen organizations nationwide (none affiliated with Kessler Institute for Rehabilitation) have volunteered to take part. The participants agreed to accept an immediate 3 percent reduction in their current Medicare payment rates to show their commitment to the concept and to appeal to the primary economic rationale Medicare seems to require to implement innovative care models.

Still, the CCH proposal responds to all the imperatives: economic attractiveness; technical care innovation and improvement; and consensus across a substantial number of organizations.

So remember Sutton’s law as you implement your own reforms: Follow the money.
Robotic therapy: Advancing neurological recovery
(continued from page 1)

example, to facilitate a more natural, balanced motion.

A third type of lower extremity robotic technology uses electrical stimulation units to activate peripheral nerves at proper sequences in the gait cycle, allowing muscles to contract correctly and enhancing the body’s ability to retrain itself to walk correctly.

Unique Advantages
Nearly all of today’s rehabilitation robotics are designed to improve clinical outcomes based on the forced-use theory. This reasoning posits that when an individual with impaired neurological function repeatedly engages in a given motion enough times, new neural pathways will be stimulated, essentially “retraining” the brain and allowing the individual to regain function or movement. One advantage of robotics is that audiovisual features can be incorporated to reinforce or “reward” the user for continually engaging in a target behavior, making adherence more likely and therefore more effective. Many robotic devices are interfaced with video games shown on a computer monitor. As a patient watches the screen and moves a part of the body in a certain motion or a particular distance or with a given amount of force, the game provides feedback that encourages the person to repeat the behavior, up to hundreds of times in some cases.

These devices are also highly efficient in terms of endurance, especially in comparison with humans. A physical or occupational therapist who is assisting a patient in performing the same motion again and again is susceptible to mental and physical fatigue, particularly over extended periods. And since high repetition of task-specific exercises is key to post-injury motor relearning and to activating new neural pathways, the tirelessness of robotics is highly relevant to achieving optimal outcomes.

Furthermore, robotic devices are extremely accurate and reliable in providing quantitative measurements on each motion, including strength, range of motion and power. Consequently, they are highly suitable for assessing improvement in treatment goals from baseline to follow-up.

While these benefits are informative for the future study and continued use of rehabilitation robotics, they do not indicate an intent or a need to replace traditional therapy from human experts. Despite their capabilities, robots at this point cannot be programmed to effectively “think” like therapists, such as assessing functional gains or knowing how to qualitatively analyze how much motion a patient is exhibiting. Humans also are needed to set up, program and maintain the equipment. Thus, robotic therapy is largely viewed as a method to enhance rather than supplant conventional rehabilitation.

Scientific Support
Several lines of evidence on clinical and patient outcomes of robotic therapy appear promising. In certain activities, like engaging in monotonous, repetitive motions, patients tend to fare better with robot-assisted treatments versus traditional or sham robotic therapy. Functional gains, improvements in strength and range of motion, and pain reduction have been reported and often will persist much longer with robotic therapy. This is thought to be attributable to the effectiveness of the repetitive motions in reprogramming and rehardwiring the central nervous system. Even after therapy ends and patients practice engaging in repetitious movements on their own, improvements appear to continue.

A 2008 meta-analysis on robot-assisted therapy for stroke populations indicated significant gains in motor control versus standard therapy but no specific benefit in achieving activities of daily living. In terms of locomotor training, a 2011 review of robotic therapies reported greater progression in walking independence than with traditional therapy and similar improvements in gait speed.

In general, patient satisfaction and acceptance also appear to be positive, although this has not been studied extensively. Anecdotally, people tend to be enthusiastic about participating in novel research and utilizing cutting-edge technology. And the video game interface included with many robotic treatments helps increase patient engagement and participation.

As robotic technology improves in complexity, cost, size and program-mability, its application in the rehabilitation setting will likely increase, giving patients and clinicians yet another tool for optimizing recovery.

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Getting social: A health care perspective

BY ANTHONY LEE, M.D.

THE FORCE OF social media grows every day, especially in health care. It is quickly becoming not only a tool for communication about physical medicine and rehabilitation but also a component of recovery for some patients.

Sharing Through Social Media

Social media refers to a variety of Web-based tools used to create and share content in real time with individuals and organizations, including Facebook, LinkedIn, Twitter, Instagram, YouTube and Pinterest. Patients can use social media to express themselves and share the story of their condition and rehabilitation. This can increase awareness of both the circumstances leading up to the diagnosis as well as the care received during recovery.

Social media connects patients with individuals in similar situations, creating a virtual peer support relationship. It can also be a networking tool for patients and caregivers to find information about physicians, therapists and facilities. Finally, social media can serve as a platform for community outreach and promoting events that support rehabilitation causes. For example, social media was used to promote the grand opening of the Neuroimaging Center at Kessler Foundation last fall.

Maintaining professional distance is one of the challenges facing clinicians in the age of social media, including in the rehabilitation setting. Acute rehabilitation may last weeks, sometimes months, and patients are often cared for by the same doctors, therapists and nurses during their stay. Strong bonds form. Caregivers and patients may wish to stay in touch through social media with the intention of monitoring additional recovery and progress together. This could, however, invite a more casual relationship to develop, with possible consequences to the image of the individual and the health care facility.

On a related note, epidemiologic studies show that certain rehabilitation cases, such as traumatic spinal cord injury and traumatic brain injury, often involve people in their teens or 20s. Younger patients with these conditions are already well versed in social media. As a result, they may be more likely to stay in touch with their physicians, therapists, nurses and other caregivers via social media.

Protecting PHI

Individual hospitals have policies on the use of social media and the workplace. For example, at Kessler Institute for Rehabilitation, no employees should engage in social media during working hours, and anything posted on social media personally should not directly identify the individual’s affiliation with Kessler. In addition, it should be universally understood that health care professionals must not reveal any protected health information (PHI). Social media is about sharing information, which may pose a risk to PHI privacy. Health care providers must be mindful about communicating through social media, while recognizing its ever-expanding influence.

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