Late recovery in spinal cord injury

Recent attention to late recovery raises some interesting questions: What are the chances for “late” spinal cord injury recovery? And what treatments are currently available to help improve outcomes?

Steve Kirshblum, M.D., and Barbara T. Benevento, M.D.

Recovery in spinal cord injury (SCI) falls into two separate categories: actual neurologic recovery and functional change. Although significant changes in neurologic recovery of chronic SCI have yet to be realized, functional changes are possible with the use of new therapeutic interventions.

Motor recovery

The extent of initial motor recovery depends on whether the injury is neurologically complete or incomplete. To classify SCI injuries, 10 key muscle groups on each side of the body (five in the upper and five in the lower extremity) are examined. Sensory neurologic testing evaluates light-touch and pinprick response in 28 areas of the body. The neurologic examination can help determine if there is any sacral sparing, which reveals whether the patient has a complete or incomplete injury.

Testing also allows us to categorize the injury using the American Spinal Injury Association (ASIA) Impairment Scale, which indicates the degree of injury to the spinal cord. (See chart on page 7.)

This assessment is important because individuals with complete injury (ASIA level A) usually recover one level of function during the first year after injury. While they may regain additional strength in some of the...
LETTER FROM THE EDITOR

CLOSING THE GAP on medical errors

The Institute of Medicine’s 1999 To Err Is Human report ripped the lid off that guarded secret we’ve known since our training: Health care is riddled with errors that harm thousands of patients every year.

The IOM report turned a harsh light on wrong-site surgeries and sloppy handwriting that can turn deadly. More important, it argued that the vicious cycle of medical mistakes will only continue unless health care systems are designed with protocols to report and analyze errors.

Exposing errors is the first step to preventing them. But a huge set of mistakes threatening our patients has received far less attention: those that occur when patients are transferred from acute care hospitals to rehab facilities.

How many patients arrive with pages missing from their medical records? How many get transferred just as they start a new medication, without being monitored for drug reactions?

And how many get handed off with an emerging condition that has been deliberately obscured? Too often, patients arrive with apparently normal vitals, only to spike a fever for which they got a double dose of aspirin just before discharge. We are constantly dealing with what I call “interface” errors caused by gaps in communication between different health care facilities.

Why do these errors persist? The shortage of time and money in acute care is certainly a factor. The vulnerability of our patients is another. Overwhelmed by a catastrophic event, they come to us in a state of crisis, lacking the critical vigilance they need to protect themselves against mistakes.

And many of these errors result from desperately skewed incentives. In the DRG world of acute care (and, unfortunately, rehabilitation’s new PPS reality), the economic incentive is to empty a bed instead of work up a problem.

How do we close the gap? First, let’s make sure our own house is in order, with internal systems that foster communication and limit potential errors. Fortunately, physical medicine has long been a team discipline—the ideal culture, it turns out, to prevent and catch errors.

We also need to develop mechanisms we can use to communicate back to referring facilities when mistakes of judgment, communication, action or inaction take place. Government and hospital officials are now deciding how to best design error reporting systems. Physiatrists need to participate in creating those designs and reporting loops, with the goal of being able to send what we now call “protected health information” (PHI) across institutional boundaries.

We can best accomplish this, I believe, by lobbying for expanded peer review protection and broader privileged status for communications between health care organizations. That would protect the confidentiality of vital information flowing between—not just within—health care facilities.

These are ambitious goals, to be sure. But without bold innovations, we won’t turn the tide of errors that now threatens our patients’ trust. In the meantime, we can double our efforts to educate patients to take a more aggressive role in their own care—an effective barrier against medical errors.

—Bruce M. Gans, M.D., Editor-in-Chief
Starting an acute rehabilitation hospital
Meeting a community’s need for rehabilitation services is a monumental effort that requires teamwork, patience and dedication.

Terence P. Sheehan, M.D.

What does it take to create an acute rehabilitation hospital? It begins with a need in the community, such as the one that existed in Montgomery County, Maryland, for physical medicine and acute rehabilitation services.

Because the county lacked an acute rehabilitation facility, the state granted a certificate of need to the Adventist Healthcare System. Adventist formed a partnership with Kessler Rehabilitation Corporation to benefit from Kessler’s expertise in physical medicine and rehabilitation. Together, the two groups constructed and now operate the Kessler Adventist Rehabilitation Hospital, a 55-bed, state-of-the-art facility that offers acute care and rehabilitation services to patients with stroke, spinal cord injury, brain injury, orthopedic conditions and other diagnoses.

Facing challenges head on
A leadership team was formed to get the project under way. This included the directors of various groups: the administrator, the chief financial officer, the medical director, the director of rehabilitation services and the director of nursing. In the early stages of construction, directors and group members found it important to communicate daily, and they continue to do so.

Success is often in the details. Each piece, however small, had to be carefully thought out and put into place, from designing entire hospital units to deciding where the needle box would go in an examination room. The first floor of the hospital was designed for outpatient services, administrative offices and the outpatient gym. The second floor houses the inpatient unit.

Working to make the grade
More daunting than design and construction was the critical task of developing the bylaws that would govern the hospital, as was putting the hospital’s services. To spread their message, staffers gave presentations in local acute-care hospitals, participated in local outreach projects and worked closely with the county Aging and Disability Commission, which helps to address specific needs in the community. Kessler Adventist also hosts support groups for patients and family members dealing with amputation, spinal cord injury or stroke. The hospital also participates in several community activities, including sponsorship of a wheelchair basketball team in the area.

These efforts have been well rewarded. Today the hospital receives very positive feedback from community members as well as from referring physicians and hospitals. More than 1,500 inpatients have been admitted to Kessler Adventist since it began operations. In addition, the hospital recently added two more physiatrists to the staff and plans to open an acute rehabilitation unit and extend acute rehabilitation services further in the county.

From design and planning to approvals and construction to “grand openings” and day-to-day operations, the process of starting a new rehabilitation hospital requires great energy and effort on the part of hundreds of people. All of this is based on one central goal: providing needed rehabilitation services to the people in the community.

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A SHOT OF RELIEF: Botox injections ease spasticity for stroke patients

The beauty of Botox injection to control wrist and hand spasticity is in its low side effects profile and reversibility.

The origin of Botox can be traced back to 1895, when a group of musicians ate raw ham at a wedding and woke up paralyzed the next day, says Elie P. Elovic, M.D., co-director of traumatic brain injury research at the Kessler Medical Rehabilitation Research and Education Corporation. The result was the isolation of clostridium botulinum, the organism that produces the paralyzing botulinum toxins. Today, researchers working with the potentially fatal toxin concentrate on its medical benefits. Dr. Elovic was a co-author of an August 2002 New England Journal of Medicine article describing how Botox (Botulinum toxin type A) injections reduce wrist and finger spasticity and improve a number of important functional measures for stroke patients.

FOCUS: Why is controlling spasticity important?

ELOVIC: Spasticity does not always have to be treated, but treatment can be beneficial if the spasticity interferes with comfort or function. Spasticity can lead to complications such as pain, sleep disturbance, pressure sores and pneumonia. Left untreated, it can cause muscle contractures, joint dislocation and other orthopedic problems. Also, controlling spasticity may potentiate and unleash other muscles that were not firing before the injections were given. This can give patients greater passive function, as in range-of-motion, or greater active function, such as improvement in walking, or both.

FOCUS: What improvements did you measure in the Botox study?

ELOVIC: Unlike previous studies, we focused on improvement in functions that the subjects themselves identified as most important to them. For example, one-third of the subjects chose improved limb position as a principal target. We used these measures because of the growing emphasis on identifying functional patient-specific treatment goals, as opposed to simply reducing muscle tone. We found not only that Botox reduced muscle tone, but also that participants who received Botox treatment had improvement in the functional disability targets they chose.

FOCUS: What benefits does Botox offer patients?

ELOVIC: Botox has two very beneficial attributes: Treatment can be placed focally, and it is reversible after three to four months. Some patients may require only one treatment to benefit from physical therapy. Others may be helped by receiving the injections periodically throughout their life.

FOCUS: If the patient requires continued spasticity control, how often are injections given?

ELOVIC: Injections are generally given every three to four months. The size of the dose depends on the severity of the spasticity and the size of the muscle being targeted.

FOCUS: Can Botox be used for all patients?

ELOVIC: No. Patients with motor end plate diseases such as ALS (amyotrophic lateral sclerosis) are not candidates. Botox can be used in patients with spasticity due to a variety of conditions, including stroke, multiple sclerosis, spinal cord injury, and cerebral palsy.

The results of one Botox injection versus placebo for 126 patients with increased flexor tone in the wrist and finger following a stroke described in the New England Journal of Medicine article “Intramuscular Injection of Botulinum Toxin for the Treatment of Wrist and Finger Spasticity After a Stroke” (August 8, 2002; 347:395-400). At six weeks after treatment, the Botox injection was shown to safely reduce spasticity and improve function. Co-author Elie P. Elovic, M.D., has lectured and published extensively on neuropharmacology, management of hemiparesis and spasticity, epidemiology of traumatic injury and behavioral management.
trophic lateral sclerosis, known as Lou Gehrig’s disease) and those taking certain antibiotics that affect motor end plates, including aminoglycosides, cannot use Botox. This is because its control of spasticity is mediated by blocking the release of acetylcholine at the motor end plate, which causes muscles to contract.

**FOCUS:** Are there any serious risks?

**ELOVIC:** Adverse reactions are generally mild and transient and include slight bruising at the site of injection and some muscle weakness. Patients may also complain of fatigue, headache or flu-like symptoms, and atrophy in nearby muscles may occur. Resistance to the toxin may develop, the probability increasing with higher dosing and/or more frequent administration. In those cases, a related toxin—botulinum toxin type B—can be used instead of Botox, a type A toxin.

**FOCUS:** What were you and the other researchers able to conclude from your investigation of the use of Botox?

**ELOVIC:** We found that at six weeks after a single Botox injection, both spasticity of the wrist and finger muscles and disability in these areas were reduced. The treatment also significantly improved the scores for both the physician’s and the patient’s or caregiver’s global assessment. The study suggested that Botox may improve tone, function and quality of life in patients with spasticity of the fingers and wrist after a stroke.

**FOCUS:** Are there other conditions that cause spasticity that could benefit from Botox injections?

**ELOVIC:** Botox can be used for spasticity secondary to neurologic illness, including, for example, brain injury, multiple sclerosis, cerebral palsy, spinal cord injury and brain or spinal cord tumor.

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**New therapy holds promise for MS patients with cognitive dysfunction**

*John DeLuca, Ph.D.*

Too often, cognitive dysfunction secondary to multiple sclerosis (MS) is written off as a progressive symptom that is not responsive to treatment. As a result, few studies have focused on interventions, and little hope is offered to those with cognitive dysfunction and MS. A new study on memory training offers hope, however, and casts doubt on the belief that the dysfunction is inevitable and cannot be treated. The research also highlights the need for further study in this important area.

Two-thirds of MS patients experience cognitive dysfunction, and the most common complaint is memory failure. This symptom can range from mild to very severe. The key to the memory training method lies in the fact that memory actually involves two very different functions: the act of acquiring the information and the act of retrieving it. While most researchers and clinicians once believed that patients with MS had difficulty retrieving information, it is now believed that they often have problems with its acquisition.

To help test this belief, our randomized, double-blind pilot study of 29 subjects with both MS and cognitive dysfunction focused on improving subjects’ acquisition skills. During eight sessions given over four weeks, participants were taught a memory technique that has been used successfully for other patients undergoing cognitive rehabilitation. The technique involves visualizing information, as well as placing it into a specific context. When this is done, rather than using rote memory, a process of “deep encoding” is believed to take place—a type of encoding that allows for better storage of information, thus easier retrieval.

For example, to memorize the word “house” in a list of words, participants were taught to hold a picture of a house in their minds. They were also told to associate the house within a specific context; for instance, to picture their own home during a particular time of the year, such as in the winter when there is snow on the roof. The participants were then asked to memorize lists of words and repeat the lists a few hours later. Those who used the method performed significantly better compared with controls.

Because multiple sclerosis generally affects people in the prime of life, improved memory function can mean remaining at work and living a more productive life. This symptom can range from mild to very severe. The key to the memory training method lies in the fact that memory actually involves two very different functions: the act of acquiring the information and the act of retrieving it. While most researchers and clinicians once believed that patients with MS had difficulty retrieving information, it is now believed that they often have problems with its acquisition.

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Because multiple sclerosis generally affects people in the prime of life, improved memory function can mean remaining at work and living a more productive life. However, this study illustrates that the method can be an important part of MS treatment. It also suggests that cognitive dysfunction due to MS may be a more fertile area for research than previously believed.

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As physiatrists, we may be congratulating ourselves on dodging the growing malpractice insurance crisis that is engulfing other specialties.

Unlike some physicians, we do not have to take extended work leaves to call attention to skyrocketing premiums or curtail our practices, as a growing number of obstetricians are forced to do. Rehab units are not closing, and no physiatrists I know are taking early retirement because they can no longer afford coverage.

Instead, we enjoy the lowest risk rating of all medical specialties, and our hospitals are the cheapest health care facilities to insure. Underwriters recognize that our patients—who have already suffered some catastrophic medical event—are at little risk of being further injured under our care. As a result, the money I spend on liability insurance every year is a fraction of what my colleagues in other specialties must pay.

Two sides, one problem

As advocates for patients who are sometimes victims of malpractice, we support their right to sue for reasonable compensation. Often, those jury awards or court settlements are all our patients have to cover extraordinary medical expenses, feed their families while they’re being rehabilitated or plan a life in which they may never work again.

But if we think the liability insurance crisis doesn’t affect us, we are fooling ourselves. As more insurers abandon the medical liability market, we may find it increasingly difficult to purchase policies at any price.

We stand to be hurt by the increasing amount of defensive medicine practiced in other specialties. The alarming escalation of health care costs—driven in part by tests and procedures ordered to protect physicians, not improve patient care—may be the rationale regulators use to drive already dwindling reimbursements down even further.

But most important, the liability insurance crisis threatens our patients’ access to care. Increasingly, they may find themselves traveling farther to find services, or not finding them at all.

Liability insurance problems also jeopardize our patients’ ability to achieve the best possible outcomes. If emergency services continue to be rolled back, for instance, injured patients will sustain even further harm, as untreated spinal fractures turn into long-term spinal cord injuries. Perversely, that would lead to an increased demand for our expertise in physical medicine—but at a cost of human suffering that, as a medical specialty and a society, we cannot afford to bear.

It is time to recognize that we are also stakeholders in the debate over what’s fair for both physicians and patients. Instead of feeling relieved about our relative freedom from crushing premiums and lawsuits, we need to join with other physicians and push for reasonable tort reforms.

Many voices, one goal

In calling for reform measures, we should make our opinions known both as individual practitioners and as members of professional groups. Lobbying for reforms needs to be part of the legislative agendas of our national and regional specialty societies, a fact we need to convey to those organizations. And all of us should start taking part in the grassroots reform efforts being launched by state and local medical societies.

If the medical community unites in calling for reform, that call may be heard by sympathetic ears in Congress. The House last year passed a bill containing several key tort reform measures, and we should lobby our Senators to follow suit. The White House has also come out in support of tort reform, an important step forward in solving this problem at the federal level.

Just as critically, we need to focus our efforts on state legislators and officials to impress upon them the need to contain outlandish jury awards, frivolous lawsuits and runaway legal fees. Elect ed officials need to hear from us that if liability insurance isn’t available, patients’ access to rehabilitation services will be reduced. That will drive up medical costs and exact an even greater toll on our patients and their families.

At the same time, we should continue to argue for preserving patients’ right to litigate, making sure they get their day in court when they are harmed by medical malpractice. Taking a more visible and vocal role in the malpractice insurance debate is something we owe to our fellow physicians—some of whom are fighting for their professional lives—and, more important, to our patients.

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Late recovery in spinal cord injury  continued from page 1

weakened muscle groups after the first year, muscle groups with no strength usually do not show additional recovery. Persons with incomplete injury, however, may achieve a great deal of muscle recovery at all levels below the injury in the first year, with recovery of muscle strength occurring faster than in those with a complete injury. Patients with incomplete injury may show strength gains after the first year, but the majority of gains are seen early on.

The literature lacks well-controlled prospective studies on the degree of “late conversion” after SCI; i.e., changing from a complete to an incomplete injury. (Most consider major neurologic changes after one year to be late recovery.) In the few studies that exist, late conversion can occur in up to 10 percent of patients, but this does not lead to major changes in functional activities.

Interventions can enhance late function

Major neurologic changes one year after injury are generally small, and fewer pharmacological interventions are being studied to enhance late neurological recovery. Nonetheless, pharmacological, surgical and rehabilitative interventions may help to enhance recovery and function.

One large pharmacological investigation is the Phase III study on fampridine-SR, a long-acting formulation of 4-aminopyradine (4-AP) that enhances conduction along demyelinated axons by blocking the fast-voltage-sensitive potassium channels, increasing the amount of neurotransmitter released through the injury site and improving neurologic function. Fampridine-SR, shown in previous trials to improve bowel and bladder function, spasticity, pain and sexual function, is available in this formulation only for research purposes.

Surgical interventions are also being studied. One Phase I trial is studying the effect of porcine fetal neural stem cells transplanted into the spinal cord of persons injured for longer than 2 years. A trial of human embryonic spinal cord tissue transplanted into humans with a post-traumatic syrinx (a cavity in the spinal cord or brain) showed that the procedure is safe, feasible and obliterates the cyst, but neurological function was not recovered. Stem cell research will replace such procedures.

Another trial has been initiated on peripheral nerve bridging to the bladder. More controversial procedures to enhance neurologic recovery have included omentum transposition and shark embryo cell transplants to the spinal cord.

Rehabilitation techniques for recovery

Today there are new rehabilitation interventions for persons with chronic SCI. One is weight-supported ambulation, which has been shown in studies to improve walking in incomplete SCI patients. With this technique, the patient, in a harness, “walks” with therapists moving his or her legs. The therapy is based on the finding that walking can be generated by a group of cells at the base of the spinal cord, referred to as a central pattern generator. This seems to allow information from the periphery to be transmitted to the spinal cord, where it is mediated to produce a stepping pattern without input from the brain. Several clinical trials are testing the effectiveness of this technique.

Functional electrical stimulation, both peripherally and in the central nervous system, has also been used to improve functional capability. This includes trials with the FreeHand and Vocare systems to enhance function of the hand in C5 and C6 patients and bladder control, respectively. Newer systems include those for bladder and mobility control, as well as others to enhance mobility, including standing and ambulation.

Current trials involve implantation of an electrical stimulator in the lumbar enlargement of the spinal cord (L2 locomotor center), where it is believed to activate locomotion.

Despite recent research efforts and the knowledge gained from them, decisive changes in neurologic recovery of individuals with chronic SCI have yet to be realized. Until a cure for SCI is achieved, patients will continue to benefit from advances in rehabilitation.

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Recognizing and managing depression in the elderly rehabilitation patient

Alfred C. Tomaio, M.D., and Thomas Galski, Ph.D.

Elderly rehabilitation patients are at particular risk for depression, which can be easily confused with the effects of aging, medication side effects or disease. Recognition and treatment are crucial, as depression may prevent the patient from gaining the full benefit of treatment, complicate recovery and diminish quality of life.

Depression that interferes with function or rehabilitation goes beyond the “normal depression” felt by most rehabilitation patients. In the elderly, depression often manifests as physical symptoms. Clinicians should therefore watch for symptoms that occur even in the presence of medical problems or without a clear-cut physiologic basis, as well as changes in sleep habits or appetite. Behavioral symptoms, including lack of participation with family members or acting out by inappropriate anger, are also important to consider. Sadness or despair, often typical of depression, may not be obvious. More common are memory problems, worry, poor personal hygiene, crying or suicidal thoughts.

When depression is suspected, promptly refer patients to a psychiatrist or psychologist. Treatment may include:

- Changing or eliminating medications that may cause or exacerbate depression.
- Emphasizing exercise and a balanced diet.
- Prescribing antidepressant drugs. In the elderly, our general guideline is to “go low and slow” with dosages, especially in cases of brain injury. Side effects are a special concern.
- Referring patients to support groups. Older patients, who may not be comfortable talking about themselves in front of others, should be encouraged to interact in a supportive setting and reduce their sense of isolation. Information on support groups can be obtained through community mental health centers or departments on aging.

Finally, communication among team members, including the physiatrist and the psychologist, is vital since rehabilitation involves treating the whole person. This team approach can better integrate patient goals into an overall care plan for treating the elderly rehabilitation patient.

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