

Rehabilitation

SUMMER 2007

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Caring for the Wounded

Brain injury rehabilitation and the military

■ JONATHAN FELLUS, M.D.

More than 1 million U.S. military personnel have served or are serving in Iraq or Afghanistan, and 28,000 additional troops will be deployed there within the next few months. Since operations began in 2001, more than 26,000 service members have been injured, with 60 percent to 70 percent of the injuries affecting the brain. This translates to as many as 18,000 individuals needing specialized acute care and rehabilitation services for brain injury.

Blast injuries—from bombs, improvised explosive devices (IEDs), mines, grenades and motor/armored vehicle collisions—are the leading cause of traumatic brain injury (TBI) among active-duty military personnel serving in combat zones. Often accompanied by penetrating trauma from shrapnel and bullets or fragments, these injuries not only cause structural damage to the brain, but also result in severe memory, language, sensory and motor-skill impairment (see sidebar on page 7). The most severe types of blast injury are complicated by burns and multiple trauma to the rest of the body, increasing the risks for infection and amputation.

Even when service members are not directly injured from exploding materials, they can still sustain concussive injuries from being thrown against objects or being blown back from the force of an explosion. In general, these injuries are more common and milder than penetrating TBI, affecting the function of the brain but not necessarily its structure.

Whereas the symptoms of TBI resulting from blast injury are obvious, those that occur

in milder brain injury may be subtle or even silent. The findings on computed tomography (CT) scans and other diagnostic tests may be normal, but cognition or behavior and other processes can be impaired. In other cases, the symptoms may overlap with those of post-traumatic stress disorder (PTSD). As a result, every service member returning from a combat zone should be screened for mild brain injury.

Identifying Noncombat Injuries

Not all brain injuries that occur among service members are due to active combat. The normal operations of most military bases can pose a risk for personnel, including accidents involving motor vehicles, aircraft and explosives used during training. What's more, the risks of everyday life, such as strokes, motor vehicle accidents and violent trauma, remain upon discharge. In one case, an airman who had returned from Iraq, injury-free, was shot while he happened to be driving to school. The team at Kessler Institute for (continued on page 7)



FOCUS ON

Rehabilitation

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McMURRY



Facilitating Change from Within

A few weeks ago, I found myself sitting in a witness chair in a U.S. Senate hearing room, waiting to testify before the Committee on Veterans' Affairs. As I prepared to speak on behalf of rehabilitation services for the men and women in our military, I couldn't help but reflect on what I had done in the past that had led to that moment.

Over the years, I have had the privilege to influence public policy in a number of ways: civil rights legislation for persons with disabling conditions (ADA); Medicare policies that affect access to medical rehabilitation (75 Percent Rule); rehabilitation research funding (NIH and NIDRR); and most recently, access to rehabilitation services for men and women in the armed forces and veterans (VA and DOD services). In thinking about what it takes to cause change, I'd like to pass along some suggestions for those of you who also would like to change the world in ways that matter most to you.

First, identify what you really care about that requires change. It is not enough simply to be critical of the status quo; you need to offer positive ideas and better solutions.

Second, study the current system, learning how it works and identifying the control points where you can effect change. Some people prefer revolution to evolution. Personally, in our democracy, I prefer to work from within to evolve change rather than to alter our systems radically from the outside.

Once you identify tools to make change, get involved. For example, I realized early on that major professional organizations, such as the American Academy of Physical Medicine and Rehabilitation and, more specifically, its Health Policy and Legislation committee, could have a voice in public policy. I became actively involved in that committee, eventually assuming the role of chairman and, ultimately, becoming Academy president.

This long process brought me to a position where I could not only influence the organization's goals but also advocate for key issues on its behalf. I had similar experiences with the American Hospital Association, the Association of Academic Physiatrists, the American Board of PM&R and the American Medical Rehabilitation Providers Association. I got involved with these organizations, started working with committees that were active in areas that interested me and eventually took on leadership roles. If you are willing to devote time to this type of effort, chances are good that one day you'll find yourself working within an organization to help direct change. Not only will you be part of developing a consensus about the ways in which your organization can make a difference, you will also find yourself in a position to help make that change a reality from a tactical standpoint.

Upon defining your passion and identified opportunities to make change, I urge you to persevere. Do not stop the first time you fail. Instead, keep pushing forward and learn from failure, always seeking out that next opportunity. It is important to be consistent without being dogmatic. Have a constancy of purpose and stay focused on those things that matter most to you in trying to make change.

Finally, I urge you to do all of this in ways that allow you to stay true to your core values. Long ago, I identified rehabilitation as one of my core values. I believe strongly in the benefits that rehabilitation services offer people with disabilities and society as a whole. I think you'll agree that it is worth fighting for these issues, and I hope my suggestions spur you to take those first small steps toward effecting continued change. I look forward to the day when you join me at the table in Congress, waiting to testify about issues that concern us so deeply.

Bruce M. Gans, M.D.



When Memories Rebel

Identifying and treating post-traumatic stress disorder

■ MONIQUE TREMAINE, PH.D.

A recent *Archives of Internal Medicine* study found that as many as 13 percent of recent veterans are diagnosed with post-traumatic stress disorder (PTSD). Caused by exposure to trauma, PTSD is a condition characterized by debilitating fear and anxiety. Those who suffer from PTSD frequently revisit the event in their thoughts, trying to recall extensive details. Some become excessively paranoid about recurrence and many experience increased vulnerability and inefficacy, different from their past behavior. Symptoms usually begin within days or weeks after the traumatic event, but PTSD is not diagnosed until the individual has been symptomatic for six consecutive months.

About 10 percent of patients with traumatic brain injury (TBI) develop PTSD, with a higher prevalence among uniformed professions, such as military and police, who are at increased risk of experiencing frightening or dangerous events. Compounding the problem, service men and women, in particular, often develop acute stress symptoms, but are returned to battle without the benefit of treatment. And while PTSD affects both genders equally, their manifestations differ. Traditional expectations dictate that men are taught to defend others, to be tough and strong. Incidences that cause a breakdown in that role put them at risk

for PTSD. By comparison, traumatic events affecting personal security often lead to PTSD among women.

Regardless of gender, research shows that people with PTSD are more vulnerable to repeat trauma that is cumulative in terms of brain physiology over time. Left untreated, the anxiety and depression common to PTSD become more refractive to therapy.

Identifying and Treating PTSD

Physiologically, PTSD is associated with a "fight or flight" response. The stress symptoms, flashbacks and repeat trauma lead to greater concentrations of cortisol, a natural stress hormone. Over time, high concentrations of cortisol affect the memory areas in the brain, particularly the hippocampus, leading to atrophy and impaired cognition. Memory deficit is common in people with PTSD, and particularly prevalent in soldiers.

Early recognition of symptoms is key to managing PTSD. When this happens, patients are taught to reframe their experience within a therapeutic context and are provided with tools to assist them in managing emotional and physiological responses to real and imagined threats. Cognitive behavioral therapy (CBT) in conjunction with stress management techniques, such as guided imagery and progressive muscle relaxation, has proven beneficial in early stages.

Once a patient develops full-blown PTSD, referral to a specialist is necessary. With these patients, a combination of cognitive therapy and eye movement desensitization and reprocessing (EMDR) has proven effective. The latter helps patients express right-sided brain thoughts when words cannot convey emotion. Relaxation techniques also are employed to moderate the cortisol response. When these options prove ineffective, computer-based biofeedback training may be necessary.

Whether diagnosed early or in later stages, PTSD will not resolve itself. If left untreated, patients become dysfunctional, living in fear and engaging in maladaptive coping strategies such as social withdrawal and substance abuse, which often make the condition worse. This has been a particular challenge among those who have served in the military. For this reason, recognition and treatment of PTSD should be an essential service of all rehabilitation programs.

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SYMPTOMS OF POST-TRAUMATIC STRESS DISORDER

- 1. RE-EXPERIENCING** Ongoing thoughts about combat or feeling as if one is still in combat.
- 2. AVOIDANCE AND NUMBING OF EMOTION** Unwillingness to discuss the traumatic event, feelings of detachment from others, or feeling shut down emotionally.
- 3. AROUSAL** Difficulties relaxing, feeling "on guard" or jumpy, unable to sleep or concentrate, excessive concerns about security, quick to anger.

Source: National Center for PTSD

Translating Science into Treatment

Kessler joins forces with seven leading rehabilitation centers as part of the NeuroRecovery Network

Kessler Institute for Rehabilitation and Kessler Medical Rehabilitation Research and Education Corporation (KMRREC) are partnering to develop and implement activity-based therapies that promote functional recovery in individuals with spinal cord injury (SCI). The collaboration is part of the NeuroRecovery Network (NRN), a cooperative of seven leading rehabilitation centers funded by the Centers for Disease Control and Prevention and the Christopher and Dana Reeve Foundation (CDRF).

We sat down with the co-principal directors of Kessler's NRN program, Sue Ann Sisto, P.T., M.A., Ph.D., and Gail Forrest, Ph.D., to understand the details of this important undertaking.

Sisto: Teaming KMRREC, a nonprofit medical research organization, and Kessler, a for-profit rehabilitation hospital, has paved new roads in the past. With the NRN, we're working in concert

with physicians Steven Kirshblum, M.D., and Monifa Brooks, M.D., to once again combine our clinical and research expertise with the hospital's knowledge and resources for optimum patient outcomes.

The NRN grant is a bit unusual in that it supports a clinical program rather than a traditional research program. The funds are intended to translate a research intervention into a clinically feasible model of an activity-based therapy called locomotor training (LT) for patients with incomplete SCI.

A therapy developed by Hugues Barbeau, P.T., Ph.D.; Susan Harkema, Ph.D.; and Andrea Behrman, P.T., Ph.D., locomotor training consists of three parts: body weight-supported treadmill training, called step training; over-ground practice of standing and walking; and community-based or home exercises.

Traditional therapy sometimes involves compensatory therapy in which a patient might be supplied a walker or prescribed a lower-limb brace to assist during walking. By comparison, LT holds



off on the compensatory approach as long as possible to retrain walking. Studies have shown that the nervous system can interact with the appropriate sensory input associated with locomotion to retrain patients to walk. This input is provided through practice of optimal walking patterns on the treadmill with the assistance of therapists and rehabilitation technicians.

MONEY MATTERS

Pat Judd, P.T., MHA, Kessler's assistant vice president of Outpatient Services, joined the NRN team as the financial administrator. Here's her "numbers" perspective on the program.

Judd: The challenge, from my perspective, is to develop a financially feasible model so that we can deliver locomotor training (LT) on an ongoing basis.

The goal is not to use the NRN funds as a safety net, but, instead, to learn how to deliver this service in a way that is financially feasible on a long-term basis. We must be cost efficient and demonstrate successful outcomes to third-party payers in order to support increased reimbursements.

What will be the long-term benefits to the patient and to society? It's not just that patients are walking. Many other associated changes are being documented,

such as improved quality of life and reduced overall burden of care to the patient, family and society. The big picture is what makes this type of cutting-edge treatment, from a reimbursement perspective, worthwhile for insurance companies and beneficial for all of us to support. To me, it is what makes this project exciting.

That it makes the leap from research model to clinical model is another standout aspect of this project. I can't stress enough how difficult this is, and, as a result, how rarely it occurs. With the NRN, we have a unique collaboration among clinicians, administrators and research scientists that will enable us to actually make this transition happen. It is truly groundbreaking.

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With the help of physical therapists and rehabilitation technicians, a patient practices optimal walking patterns on a treadmill to effect neural retraining.

The primary purpose of LT is to provide sensory cues to retrain the neural patterns to produce effective walking. Locomotor training can also combat secondary effects of SCI, such as low bone mineral density, muscle atrophy, poor circulation, spasticity and cardiovascular function. It is standard therapy in countries such as Germany, Norway and Switzerland for people with incomplete SCI; however, there are several challenges that have limited widespread successful translation of LT to rehabilitation in the United States.

Forrest: We have been doing research in LT at KMRREC over the past five years, a huge strength that helped us get this grant.

Sisto: When we render LT as part of the NeuroRecovery Network, we do so as a clinical program, with the treatment provided under a physical therapy plan of care and funded using third-party insurance reimbursement. In general, insurance companies are looking for functional outcomes, so if the person “plateaus,” and no longer meets medical necessity guidelines for continued treatment, he or she has to be discharged.

In this program, if the therapist sees potential for improvement, the CDRF

grant funds can be used to extend the therapy. For example, after the standard number of treatment sessions, such a patient may be starting to show independent movement of the legs yet may still require moderate assistance by the therapist. In this case, additional treatment sessions (beyond what is allowable by third-party payers) may benefit the patient’s functional capabilities. The NRN funding will cover those additional sessions.

The ultimate goal for this project is to change the Current Procedural Terminology (CPT) and procedure coding of LT such that the billing for it represents the true effort required by practitioners to render this therapy. But changing coding allowances accepted by insurance companies is a major challenge.

We currently have one code for gait training, but LT goes well beyond traditional gait training. The intervention is time and labor intensive. Third-party payers are currently underpaying for LT, even though we are providing it in the most efficient way possible.

Ideally, the NRN data will provide evidence that intense, activity-based therapies improve functional outcomes, thus allowing us to overcome reimbursement and treatment obstacles.

Forrest: To support our goals, we are collecting a variety of functional outcome measures to detect improvement in the patients’ physical performance and quality of life.

Sisto: Yes, and standardization is key. To join the NRN, we had to make a commitment to standardize both LT and the collection of outcome measurements. This enables all of the centers to combine their data to have a greater chance of determining the actual benefits and true costs of the therapy.

Forrest: Each site electronically forwards data to a central database. The database of outcome measures is quite unique. It gives us a way to quantitatively measure improvements, not only in terms of walking, but also with balance, autonomic function, blood pressure, pain, quality of life and more.

Sisto: Because of HIPAA requirements, the data are de-identified, and a wide variety of security measures has been put in place so that patient identities are protected and the data are secure.

Forrest: We hope the outcome data will enable us to justify the benefits of LT and, ultimately, translate our research into clinical usefulness to improve treatment for our patients. The seven centers in the NRN are providing a large combined pool of patient data to test this, and they are also serving as an example of how collaboration among rehabilitation hospitals can advance the field of rehabilitation as whole.

Sisto: Another part of the project is to train other practitioners to render LT. In the second and third years of the study, we will provide national training, including guidance in implementing the program.

Forrest: The wonderful thing is that our research on LT will be translated into the clinical environment as a viable patient treatment. But for that to happen, we also must show that LT is fiscally sound.

Sisto: The CDRF funds support the NRN centers for about three years. During that span, it is important that we develop a clinically feasible program that insurance will support; although, as stated, the ultimate goal is to change the perception and reimbursement patterns of insurance companies to support more intense activity-based therapies such as LT. Given that reimbursements continue to shrink, this is a challenge. We hope to be able to change the reimbursement system by showing that this more intense therapy provides better functional gains.

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Injured Service Members and the U.S. Medical Rehabilitation Field Are in Crisis

■ Bruce M. Gans, M.D.

The current media attention on our troops who have suffered traumatic brain injuries has exposed the serious limitations of our military and veterans' healthcare systems in offering high-quality, state-of-the-art brain injury rehabilitation services close to their homes.

In the civilian medical care system, there is a well-established and well-distributed approach to providing medical and cognitive rehabilitation services to individuals who have suffered these types of injuries. To those of us who offer these services, it seems obvious that we should be embraced by the military and veterans systems as a logical extension of their capacity to handle the problems

Now, however, the civilian rehabilitation hospital capacity is being similarly threatened with drastic reductions due to the shortsighted policies being pursued by the Centers for Medicare and Medicaid Services (CMS). This organization is pursuing a misguided agenda that will dramatically reduce the nation's inpatient rehabilitation hospital beds by applying regulations that drastically limit which specific diagnostic categories of patients may be admitted to rehabilitation hospitals. The most draconian of these is the "75 Percent Rule," a policy that mandates that the majority of patients who are admitted to a rehabilitation hospital must be suffering from one of only 13 "allowable" conditions.

The overall capacity of this nation to provide medical rehabilitation care is being dismantled just when we expect the need to be growing at an unprecedented pace.

being faced by our returning troops. Unfortunately, little collaboration has been achieved, despite many outreach efforts by medical rehabilitation.

The Dangers of Shortsightedness

The reason so little capacity exists in the Veterans Affairs (VA) system is that it has been actively dismantled over the last dozen years due to cost-cutting moves and reorganizations of the Department of Veterans Affairs. In retrospect, this was obviously a short-sighted action.

In the last year alone, more than 8 percent of the nation's capacity has been shut down, and the field expects dramatically larger numbers of closures as the CMS regulations phase in to full impact over the next two years.

The overall capacity of this nation to provide medical rehabilitation care (such as that needed by our returning service members) is being dismantled just when the need is growing at an unprecedented pace. In addition to our military men and women, a surge of baby boomers will soon require the

services that rehabilitation hospitals uniquely provide.

The Need for Research—and Collaboration

Experts in the field of medical rehabilitation have been conducting research studies to demonstrate the need and value of hospital-level rehabilitation, but federal funding to find newer, better and more cost-effective ways to rehabilitate people has not been forthcoming. Ironically, the policies of the CMS have further impeded the ability to mount important research studies, since requests for regulatory waivers for specific research activities being made by the National Institutes of Health (NIH) have gone unheeded.

There is a solution to these problems, but it requires a radical change to common practice: We need collaboration among the military, VA, CMS, NIH and the field of medical rehabilitation. While congressional action may be needed to allow and fund these changes, it would be relatively easy to accomplish the following:

- Establish a regionalized contracted network of civilian brain injury rehabilitation programs to work with the military and VA health systems to provide coordinated care to our service members and their families close to their homes.
- Revise the current policies of the CMS to stop forcing the closure of rehabilitation hospitals and restraining needed research projects.
- Enhance the funding of medical rehabilitation research according to a well-planned agenda to improve its effectiveness and efficiency.

If this plan were followed, our military men and women would have immediate access to a consistently higher standard of rehabilitation services that would be more conveniently located, our civilian rehabilitation capacity would be preserved for current and future patients who need it, and the overall cost of delivering this care would be reduced by providing the right care at the right time in the right place.

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Caring for the Wounded

(continued from page 1) Rehabilitation provided this veteran with inpatient, then outpatient, care for the language deficit and partial blindness that resulted from the injury he sustained at home.

Complexities of Care

In general, the number of service members being managed for TBI has increased substantially. During the first three years of the current war, military and civilian physicians had already seen more injured service personnel than during the first five years of the Vietnam conflict, reflecting the change in combat from fewer air-based missions to more ground-based operations. For each service member who has died in the current war, seven have survived with injuries. In fact, more service members are surviving combat injuries today, a testament to improvements in protective gear, combat medicine and screening programs.

For service members with TBI, a primary concern is the damage that can result from swelling of the brain within the skull. Young people, who represent the bulk of military personnel, are more prone to this complication because their brains contain relatively more fluid or less atrophy than the brains of older individuals.

Based on research originally performed in persons with stroke, early decompressive craniectomy has become a treatment of choice to accommodate such brain swelling in response to injury. In this procedure, a section of the cranium is either pulled back from the skull to create a flap or removed entirely (often placed in the abdominal wall to keep it viable). Once the swelling has receded, which can take weeks or months, the flap is put back in place, the section of removed cranium is reattached, or the patient is fitted with a titanium or hard plastic plate to cover the gap in the bone. This technique has been highly successful.

Many service members returning with TBI will also have spinal cord injuries. This combination calls for comprehensive, integrated rehabilitation protocols like those offered at Kessler's new NeuroRehabilitation Pavilion. In

this unique facility, patients with TBI, spinal cord injury or both have access to multidisciplinary specialists, cutting-edge research and the latest in robotic and orthotic assistive equipment.

A Team Effort

Regardless of how an injury occurs or its severity, each patient should be evaluated by a core group of rehabilitation professionals, including a physiatrist

or neurologist, neuropsychologist, and physical, occupational and speech therapists. Based on their evaluation, the rehabilitation treatment plan might include physical, occupational and speech therapies, therapeutic recreation and a neuropsychology assessment. A specialized service that may be particularly applicable to injured service members is the Cognitive Rehabilitation Program, comprehensive outpatient treatment designed to meet the needs of patients preparing to return to work, school, their homes and their communities. Kessler's program helps patients resume their lives by improving deficits, such as poor concentration, reasoning, problem-solving, memory, and planning and organizational skills.

To best serve individuals recovering from TBI/multi-trauma (including concomitant TBI and spinal cord injury), rehabilitation should integrate both inpatient and outpatient programs, with all of the facility's relevant research and clinical resources brought to bear on behalf of each patient, for as long as the recovery and follow-up processes may take.

Our service members deserve no less.

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Side Effects

Common consequences of blast injuries include:

- Brain injury
- Amputation
- Fractures
- Lacerations
- Psychological disturbances (PTSD)
- Crush injuries
- Burns
- Impaired hearing and balance
- Blindness
- Impaired speech
- Renal damage
- Pulmonary damage
- Cardiovascular complications (shock)
- Other organ damage
- Pain
- Neuropathies



When Stroke Strikes the Young

Risk factors, symptoms and rehabilitation treatments vary ■ URI ADLER, M.D.

Every 45 seconds, someone in the United States has a stroke, and every three to four minutes, the condition results in a death. Most people who experience a stroke are over the age of 65. However, as many as 2.5 in 1,000 people will have a stroke before age 55.

Younger patients who experience a stroke are much more likely to be African-American, Hispanic or Native American than white. In fact, the rate of stroke among African-American women is three times higher than that of white women.

The factors contributing to stroke are also different in the younger population. Instead of the typical smoking, hypertension and high cholesterol levels that serve as risk factors in older patients, younger patients are more likely to have acute or congenital risk factors (see "Risk Factors for Stroke in Younger People").

Similar to the older population, most strokes in younger patients are ischemic, although some groups—such as African-American men and pregnant women during and just after birth—are at higher risk for hemorrhagic stroke. When a younger patient does have a hemorrhagic stroke, it tends to be a lobar hemorrhage less often than in older patients.

The symptoms of stroke are generally similar in younger versus older patients, with a few significant differences. In the case of a bleeding aneurysm (subarachnoid hemorrhage), younger persons

are more likely than older ones to report having a "terrible headache." Nonfluent aphasia is also more common in younger patients.

Treatment Options

Treatment of stroke in younger patients is often aimed at the underlying cause, such as correcting a cardiac defect or treating a hypercoagulation disorder. The process of rehabilitation after a stroke is similar with younger and older patients, although the goals may differ based on the patient's stage of life. Rehabilitation programs for younger persons, for example, might be geared more toward returning to the workforce or being able to care for children.

Special services that may be of particular value to younger patients with stroke include cognitive rehabilitation, work hardening, robotic therapy and body weight-supported treadmill ambulation. Younger patients also may benefit from programs providing driving training as part of a comprehensive rehabilitation regime.

Access to care and financial issues also differ among stroke patients. While younger patients may have more capable support, they are often unavailable to attend lengthy rehabilitation programs since they are also in the workforce. And because younger patients with stroke are not typically covered by Medicare, employment status may determine insurance availability.

Fortunately, younger stroke patients tend to recover faster and more thoroughly than older ones. They typically have fewer complex medical problems and their brains are generally healthier. This gives them a better starting point when working toward recovery.

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RISK FACTORS FOR STROKE IN YOUNGER PEOPLE

- Patent foramen ovale (congenital heart defect)
- Hypercoagulable states
- Pregnancy (venous thromboses)
- Vertebral artery dissection
- Lupus and other similar autoimmune conditions
- Sickle cell disease
- Bleeding aneurysms
- Kawasaki disease
- Brain tumors
- Renal disease

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