



The neurologist's job need not end shortly after an episode. Knowing what

When a patient is in the acute stage of a stroke, the neurologist is the most important person in his life. This is the physician with the expertise to direct the etiological workup, suggest whatever treatments are the most appropriate and advise the family on the patient's prognosis, depending on the specific nuances of the situation. Then he or she makes the recommendations for follow-up care, whether it means a discharge to a rehabilitation center or home for further monitoring if neurologic stability is not yet achieved, and suggests how the patient can prevent another stroke.

If a patient goes into rehabilitation, from the neurologist's perspective it's as if the patient is put into a "black hole." The

acute care neurologist rarely sees the patient again, and if they do they may see the improvement without knowing what happened over the intervening months. As an outsider to the rehabilitation process, it's hard to appreciate the hundreds of hours of work the physiatrists, physical therapists, speech-language pathologists and other specialists put in to help the patient regain the best quality of life possible.

Even though they seldom take part in the rehabilitation process, neurologists need to know what happens after a patient is discharged from the hospital. There have been many significant advances in this area, and also some new techniques that should be considered critically in the absence of definitive clinical trial results. Knowing what to look for in a rehabilitation cen-



By Brendan Conroy, MD and Alexander W. Dromerick, MD, Washington, DC

AFTER THE STROKE: A Walk Through the Rehab Process

happens next will help you keep tabs on the patient's long-term outcome.

ter can help a neurologist pick the best center for a referral. And knowing more about the aftermath of a stroke can broaden your understanding of this condition and improve your ability to discuss realistic outcomes with the patient and family.

In this article, we'll look at what we, as stroke rehabilitation specialists who deal with hundreds of stroke patients a year, feel neurologists should know about stroke rehabilitation.

Disabilities by the Numbers

Stroke is the third leading cause of death in the United States, and every 3.3 minutes someone in the US dies from it. Of those who survive the initial episode:

- 15 percent will die shortly afterwards

- 10 percent will require care in a nursing home or other long-term care facility

- 40 percent will experience moderate to severe impairments requiring special care

- 25 percent will recover with mild impairments, and

- 10 percent will recover almost completely.

Some of the most common impairments are easy to detect. Hemiparesis is the most common presentation, usually associated with reduced coordination. Cognitive disorders are also very common, and noting what side the stroke occurred on can indicate what sort of disturbance to expect. Damage to the right side can cause substantial cognitive disturbances, that may be less obvious at first, including reduced insight, atten-

Stroke Rehabilitation

tion problems, reduced spatial reasoning and neglect syndromes. Other functions such as drive and motivation, memory, judgment and impulse control may also be affected. Fatigue is also very common, and patients may have little energy and nap frequently. These impairments can make it very difficult to bathe, dress, control the bowel and bladder, communicate intelligently and learn how to walk again.

Approximately 40 percent of patients will suffer a communication disorder. The most common speech disorder is dysarthria, an imprecision or “slurring” of speech that results from a reduced strength in the muscles of the lips, tongue, cheeks, vocal cords, and respiratory system. Apraxia of speech is the second most common, and this occurs when the patient maintains the muscle strength but has difficulty following through with the sequence of movements needed to make a sound. The most common disorder of language is aphasia, when the patient suffers a reduced ability to understand or express thoughts in words, following injury to the left side perisylvian brain tissue.

An estimated 40 to 60 percent of patients also suffer a degree of dysphagia from sensory and motor deficits. This can present in problems with taking, holding, controlling, chewing, moving, and safely swallowing foods and liquids. Most hospitals have a speech therapist or train nurses to screen for this condition to reduce the potential risks of aspiration, malnutrition and dehydration.

Ready for Rehab

Experienced neurologists may remember when patients were usually kept in the hospital for observation up to two weeks after the stroke to be sure they were neurologically stable. Lately, though, the trend has been to get patients into rehabilitation to begin their training as quickly as possible. In some cases, the patient could be ready to begin treatment the day after a stroke.

The decision of when and where to discharge is typically based on the type of stroke and its severity. A patient is considered neurologically stable if there are no new apparent impairments for at least 24 hours; in large stroke centers, the NIH Stroke Scale may be used to make this determination. If the patient’s score remains within one to two points a day after the incident, he or she is considered stable; if the change is greater, the patient may warrant more observation or intervention.

Neurologists are frequently asked to prognosticate the patient’s functional recovery, and as Niels Bohr noted, “prediction is difficult, especially about the future.” But there are some useful rules of thumb. Patients with pure motor strokes usually become independent in basic activities of daily living, regardless of the severity of hemiparesis or the degree of permanent motor recovery. Thus, such individuals can often be left

unsupervised for hours at a time while the caregiver is at work or running errands. The addition of persistent cognitive impairments, such as neglect or apraxia, is generally associated with a less than independent outcome, and the patient will need close supervision. Persons with severe receptive aphasias can be particularly difficult for families to manage, and may need constant supervision. How much improvement a patient will experience after rehabilitation is of course variable, and can depend on prior neurological and medical status, lesion characteristics, medical complications, and depression. Many of the existing therapies can help with motor impairments, such as spasticity. Cognitive defects may be harder to handle, and these can also impair the patient’s efforts to “relearn,” although there are strategies that can help patients compensate for these deficits. As a rule, patients with fewer cognitive defects have a better outcome.

The average patient stay in a rehabilitation center is 20 days. Most patients are not walking independently by the end of this period. The goal of inpatient rehabilitation is not complete recovery, but to get patients to the point where they are manageable in a home setting in preparation for outpatient therapies. This distinction is often lost on family members, who sometime perceive rehab as a panacea.

Planning the Recovery

The specific post-stroke considerations addressed in rehabilitation centers are often thought of in two categories: impairment, which encompasses the neurologic deficits associated with the stroke; and disability, which refers to the loss of ability to perform specific tasks and the basic activities of daily living. The overarching goal is to reintegrate the patient back into society by improving their ability to return to the workplace, community and family.

To combat impairment, efforts include strengthening the affected side with motor therapies or reducing cardiovascular deconditioning by aerobic training. Disabilities can be targeted through teaching those with hemiparesis to dress with one arm, using a cane or brace to improve walking, or the use of gestures or devices to improve communication in the presence of language impairment such as a non-fluent aphasia. Participation can be increased by changing the physical environment (*e.g.*, curb cuts, elevators, transportation) or the social milieu with the use of vocational rehabilitation interventions at the workplace.

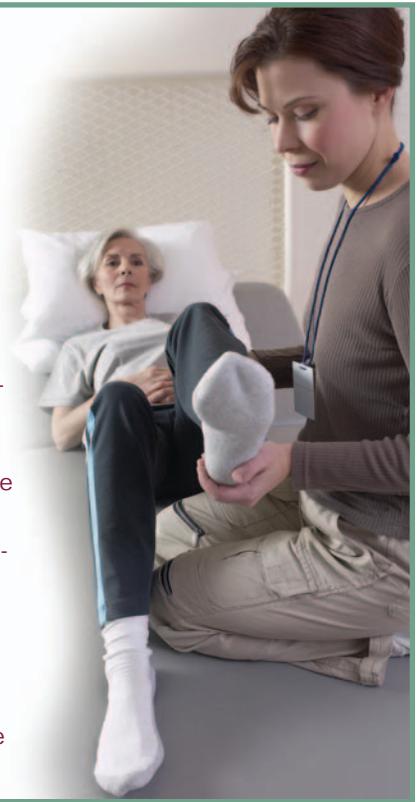
Although each case is unique, there are a few commonly accepted rules of thumb. Patients without voluntary movement in the arm within two weeks of stroke rarely experience a full recovery, and those without voluntary movement at three weeks rarely regain any functional use of the arm.¹ Walking with some degree of assistance and/or equipment occurs in a

Worth the Referral

Finding a good rehabilitation center is analogous to finding a good acute stroke care program, because in both situations you want to confirm a high level of expertise and excellence. Figuring out which one is the best in your area may take some investigation.

Here's how to assess the quality of a rehabilitation center:

1. Look for a high volume of stroke rehabilitation patients. A place with a geographically defined unit that specializes in post-stroke care will have more to offer than one with a more general focus.
2. Look to see whether specific physicians, therapists and nurses are assigned to stroke patients. The more stroke patients they treat, the stronger their collective experience is likely to be.
3. Ask if they have access to diagnostic technology, such as a laboratory or a CT scanner. These can prove invaluable for catching any problems that may arise during the patient's stay.
4. Evaluate the quality and timeliness of the rehabilitation center's outpatient program. Are there therapists who specialize in neurological conditions? Can you patient be seen within a week or so of discharge home?
5. Accreditation by the Commission on Accreditation of Rehabilitation Facilities, especially with the CARF's Stroke Specialty Program. This designation is the highest level of recognition of a facility's commitment to quality in rehabilitation by an outside objective survey process. CARF is the equivalent to an acute care facility earning recognition in JCAHO's Stroke Center Certification program.



remarkably large proportion of patients, as high as 85 percent of those in inpatient settings, and about half will be discharged as independent ambulators.² Mortality is high in those who initially present with leg paralysis, but about 20 percent will walk independently.³ Urinary incontinence persists at six months in 10 to 20 percent of patients, and this may be single largest detriment to quality of life at six months after stroke.⁴

Some overall statements can be made about patterns of recovery after stroke based mostly on data comes from large cohort studies in Denmark, the United Kingdom and the United States.⁵⁻⁷ In these studies, the service provided was the usual and customary care; few studies can inform us of the untreated natural history of stroke. For the group of all stroke survivors, recovery was considered completed in 95 percent of patients at 12.5 weeks.⁸ Recovery plateaus sooner for those with relatively mild deficits and later (four to six months) for patients with larger hemispheric injuries.⁹ These statements must be tempered by the understanding that the studies were done using simple scales that are sensitive only to relatively large changes.¹⁰ No large-scale studies exist to allow the physician to predict recovery based on lesion size or location,¹¹ though a few studies that focus on specific brain regions have found some differences.¹²⁻¹³

In this context, “usual and customary care” typically

includes three hours of physical therapy, occupation therapy and speech therapy. The patient receives individual sessions five or six days a week as well as around-the-clock rehabilitation nursing care. Psychologists, social workers, recreation therapists and rehabilitation specialists are involved as needed.

Technology and Pharmacology

Patients who achieve stability after a stroke are likely to still suffer from a multitude of health problems. Dehydration is very common. It can be due to dysphagia, paralysis that prevents the patient from simply picking up a glass of water, neglect, or even lack of initiation in persons with frontal lobe injuries. An overnight IV fluid infusion can have very noticeable effects. Physicians in rehabilitation centers also check for infections when they see a patient, particularly bladder infections. Most stroke survivors experience some degree of cardiovascular deconditioning.

Rehabilitation is a cooperative process, and no matter how involved the physiatrists and physical therapists are, the patients have to actively relearn activities that used to be unconscious for them, such as walking or even eating. The cognitive disorders that frequently follow stroke can make this particularly complicated. Some of the newer anti-psychotics, particularly olanzapine and risperidone, can effectively “calm

down” agitated post-stroke patients, but should be used sparingly and only when behavioral interventions are unsuccessful. Some rehabilitation physicians use cholinesterase inhibitors and anti-depressants in hopes of overcoming some cognitive deficits and facilitating the learning process.

Stimulants, amphetamines and methylphenidate (Ritalin) may seem like promising treatments for cognitive deficits. Many centers do use them, but it is important to note these treatments have not been demonstrated to have an effect in randomized controlled trials. There are few data evaluating these treatments in the context of stroke rehabilitation, and most well done studies show no benefit in patients. Granted, there have been some studies where these efforts have worked in animal models, but were conducted under very specific laboratory conditions. It is also important to note that stimulants can elevate blood pressure and effect the seizure threshold.

Lately there have been many new methods being tested for motor rehabilitation. There are some different approaches to physical therapy, such as constraint-induced movement therapy, where the affected upper extremity is trained using so-called “shaping” paradigms. In addition, the less affected limb is constrained to encourage the patient to attempt to use the impaired side. It is not clear that constraint therapy is more effective than equal doses of more traditional treatments, and patients who seek this treatment should be cautious.

Interactive mechanical solutions also present some interesting directions, such as the Lokomat, a robotic body-weight supported training system designed to offer just enough assistance and/or resistance to improve deviations in the patient’s gait. Another technological approach is the use of cortical stimulation, where electrical or magnetic impulses are sent into the centers of the brain that control motor function. While these devices may make for interesting reading in the medical journals, there is still little data supporting their use in a clinical setting. If these techniques were developed like pharmacological treatments, they would still be in early Phase II development.

Below Par for the Course

Usually the neurologist will notice a significant improvement in the patient after a couple of months of rehabilitation. However, there may be cases where the patient seems to be getting less than a full benefit from therapy. When this occurs, there may be some unexpected hindrances at work and the clues can be found in either a look at the patient’s treatment regimen or in a more directed physical examination.

Some pharmacological treatments may have detrimental effects on post-stroke patients. Benzodiazepines, some of the older anti-psychotics such as haloperidol and thiorazine, and older anticonvulsants such as phenytoin and phenobarbital may

potentially slow the patient's recovery. Although there are few data confirming this as of yet, it may be best to be cautious and use alternatives such as newer anticonvulsants or antipsychotics, and avoiding sleeping meds as much as possible.

Depression can also interfere with the relearning process. Sixty to 70 percent of stroke survivors will have this condition or a depressed mood during the rehabilitation time frame. Some of the newer anti-depressants such as escitalopram have become popular treatment choices for this condition. It is not clear whether post-stroke depression responds to medications in the same way as depression in normals; drugs that have been shown to be effective specifically in randomized trials of post-stroke depression include nortriptyline, citalopram, fluoxetine, and trazodone.

If there are no apparent cognitive problems but the patient is slow to show signs of motor recovery, it may be time to check for pain. Many patients simply do not admit the presence of pain in a quick initial physical examination, but following event post-stroke central pain is common and one shoulder is weakened. Shoulder pain in the affected arm is particularly common, and is worth referring to a physiatrist for aggressive musculoskeletal management, particularly when there is residual motor function in the affected arm. Shoulder subluxation is not a cause of pain but is a sign of impaired musculo-skeletal function that is vulnerable to damage from traction and subsequent pain.

Degenerative arthritis pain may also develop, especially when one considers the average age of stroke patients. Following an event, the body's musculoskeletal balance is disturbed, which may lead to the joints on one side (the side without paralysis) becoming overused. Irritation and pain often follows, but again patients are sometimes silent about this.

If a neurologist would like to see what the patient is going through in the course of rehabilitation, he or she is free to call and pay a visit. Sometimes this is not practical due to the distance the center is from the practice or the demands of a schedule, and in this situation a quick phone conversation with the physiatrist and therapist is often enough to share all relevant information. Rehabilitation specialists will not contact the neurologist if all is going well, and it is very rare that they encounter a problem they cannot handle.

Thank You, Please Don't Come Again

The first stroke is easier for a patient to recover from than subsequent strokes, and during rehabilitation a great deal of emphasis is put on preventing a second episode. While the physicians in an acute care often only have a few minutes to educate the patient and caregivers about the need to minimize the risk of a subsequent stroke, we in rehabilitation have days to make our points about how to handle this life-altering

event. In an inpatient facility, we can also show what to do while we tell.

Rehabilitation nurses and therapists work with the patient to minimize all the risk factors that can be controlled. On a voluntary level, this means encouraging patients to abstain from smoking, drinking or using drugs. There is also a great deal of education offered on how to control conditions such as high blood pressure, atrial fibrillation or diabetes that can raise stroke risk. Use of antiplatelet or antithrombotic therapy prescribed by the neurologist is reinforced.

The rehabilitation process itself can go a long way towards implementing healthier habits in patients' lives. Patients get exercise while in physical therapy, and in an inpatient setting they get an optimal diet. Hopefully they will carry these habits back to their home setting upon discharge. The physicians also teach these techniques to the patient's family or caregivers to get their support in the move towards a healthier lifestyle.

Before the patient is discharged, a physician will often evaluate the pharmaceutical regimen to see what preventive treatments have generic substitutes. Reducing the costs of therapy can go a long way towards ensuring compliance. **PN**

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Brendan E. Conroy, MD is a physiatrist and Medical Director of the stroke recovery program at the National Rehabilitation Hospital in Washington, DC.

Alexander W. Dromerick, MD is a neurologist and Director of the Neuroscience Research Center at the National Rehabilitation Hospital in Washington, DC.