

## **Post-Stroke Rehabilitation**

In the United States, more than 700,000 people suffer a stroke each year, and approximately two-thirds of these individuals survive and require rehabilitation. The goals of rehabilitation are to help survivors become as independent as possible and to attain the best possible quality of life. Even though rehabilitation does not "cure" stroke in that it does not reverse brain damage, rehabilitation can substantially help people achieve the best possible long-term outcome.

### **What is post-stroke rehabilitation?**

Rehabilitation helps stroke survivors relearn skills that are lost when part of the brain is damaged. For example, these skills can include coordinating leg movements in order to walk or carrying out the steps involved in any complex activity. Rehabilitation also teaches survivors new ways of performing tasks to circumvent or compensate for any residual disabilities. Patients may need to learn how to bathe and dress using only one hand, or how to communicate effectively when their ability to use language has been compromised. There is a strong consensus among rehabilitation experts that the most important element in any rehabilitation program is carefully directed, well-focused, repetitive practice — the same kind of practice used by all people when they learn a new skill, such as playing the piano or pitching a baseball.

Rehabilitative therapy begins in the acute-care hospital after the patient's medical condition has been stabilized, often within 24 to 48 hours after the stroke. The first steps involve promoting independent movement because many patients are paralyzed or seriously weakened. Patients are prompted to change positions frequently while lying in bed and to engage in passive or active range-of-motion exercises to strengthen their stroke-impaired limbs. ("Passive" range-of-motion exercises are those in which the therapist actively helps the patient move a limb repeatedly, whereas "active" exercises are performed by the patient with no physical assistance from the therapist.) Patients progress from sitting up and transferring between the bed and a chair to standing, bearing their own weight, and walking, with or without assistance. Rehabilitation nurses and therapists help patients perform progressively more complex and demanding tasks, such as bathing, dressing and using a toilet, and they encourage patients to begin using their stroke-impaired limbs while engaging in those tasks. Beginning to reacquire the ability to carry out these basic activities of daily living represents the first stage in a stroke survivor's return to functional independence.

### **What disabilities can result from a stroke?**

The types and degrees of disability that follow a stroke depend upon which area of the brain is damaged. Generally, stroke can cause five types of disabilities: paralysis or problems controlling movement; sensory disturbances including pain; problems using or understanding language; problems with thinking and memory; and emotional disturbances.

Paralysis or problems controlling movement (motor control) Paralysis is one of the most common disabilities resulting from stroke. The paralysis is usually on the side of the body opposite the side of the brain damaged by stroke, and may affect the face, an arm, a leg or the entire side of the body. This one-sided paralysis is called

hemiplegia (one-sided weakness is called hemiparesis). Stroke patients with hemiparesis or hemiplegia may have difficulty with everyday activities such as walking or grasping objects. Some stroke patients have problems with swallowing, called dysphagia, due to damage to the part of the brain that controls the muscles for swallowing. Damage to a lower part of the brain, the cerebellum, can affect the body's ability to coordinate movement, a disability called ataxia, leading to problems with body posture, walking, and balance.

### **Sensory disturbances including pain**

Stroke patients may lose the ability to feel touch, pain, temperature or position. Sensory deficits may also hinder the ability to recognize objects that patients are holding and can even be severe enough to cause loss of recognition of one's own limb. Some stroke patients experience pain, numbness or odd sensations of tingling or prickling in paralyzed or weakened limbs, a condition known as paresthesia.

Stroke survivors frequently have a variety of chronic pain syndromes resulting from stroke-induced damage to the nervous system (neuropathic pain). Patients who have a seriously weakened or paralyzed arm commonly experience moderate to severe pain that radiates outward from the shoulder. Most often, the pain results from a joint becoming immobilized due to lack of movement and the tendons and ligaments around the joint become fixed in one position. This is commonly called a "frozen" joint; "passive" movement at the joint in a paralyzed limb is essential to prevent painful "freezing" and to allow easy movement if and when voluntary motor strength returns. In some stroke patients, pathways for sensation in the brain are damaged, causing the transmission of false signals that result in the sensation of pain in a limb or side of the body that has the sensory deficit. The most common of these pain syndromes is called "thalamic pain syndrome," which can be difficult to treat even with medications.

The loss of urinary continence is fairly common immediately after a stroke and often results from a combination of sensory and motor deficits. Stroke survivors may lose the ability to sense the need to urinate or the ability to control muscles of the bladder. Some may lack enough mobility to reach a toilet in time. Loss of bowel control or constipation may also occur. Permanent incontinence after a stroke is uncommon. But even a temporary loss of bowel or bladder control can be emotionally difficult for stroke survivors.

### **Problems using or understanding language (aphasia)**

At least one-fourth of all stroke survivors experience language impairments, involving the ability to speak, write, and understand spoken and written language. A stroke-induced injury to any of the brain's language-control centers can severely impair verbal communication. Damage to a language center located on the dominant side of the brain, known as Broca's area, causes expressive aphasia. People with this type of aphasia have difficulty conveying their thoughts through words or writing. They lose the ability to speak the words they are thinking and to put words together in coherent, grammatically correct sentences. In contrast, damage to a language center located in a rear portion of the brain, called Wernicke's area, results in receptive aphasia. People with this condition have difficulty understanding spoken or written language and often have incoherent speech. Although they can form grammatically correct sentences, their utterances are often devoid of meaning.

The most severe form of aphasia, global aphasia, is caused by extensive damage to several areas involved in language function. People with global aphasia lose nearly all their linguistic abilities; they can neither understand language nor use it to convey thought. A less severe form of aphasia, called anomia or amnesic aphasia, occurs when there is only a minimal amount of brain damage; its effects are often quite subtle. People with anomia may simply selectively forget interrelated groups of words, such as the names of people or particular kinds of objects.

### **Problems with thinking and memory**

Stroke can cause damage to parts of the brain responsible for memory, learning and awareness. Stroke survivors may have dramatically shortened attention spans or may experience deficits in short-term memory. Individuals also may lose their ability to make plans, comprehend meaning, learn new tasks, or engage in other complex mental activities. Two fairly common deficits resulting from stroke are anosognosia, an inability to acknowledge the reality of the physical impairments resulting from stroke, and neglect, the loss of the ability to respond to objects or sensory stimuli located on one side of the body, usually the stroke-impaired side. Stroke survivors who develop apraxia lose their ability to plan the steps involved in a complex task and to carry the steps out in the proper sequence. Stroke survivors with apraxia may also have problems following a set of instructions. Apraxia appears to be caused by a disruption of the subtle connections that exist between thought and action.

### **Emotional disturbances**

Many people who survive a stroke feel fear, anxiety, frustration, anger, sadness, and a sense of grief for their physical and mental losses. These feelings are a natural response to the psychological trauma of stroke. Some emotional disturbances and personality changes are caused by the physical effects of brain damage. Clinical depression, which is a sense of hopelessness that disrupts an individual's ability to function, appears to be the emotional disorder most commonly experienced by stroke survivors. Signs of clinical depression include sleep disturbances, a radical change in eating patterns that may lead to sudden weight loss or gain, lethargy, social withdrawal, irritability, fatigue, self-loathing and suicidal thoughts. Post-stroke depression can be treated with antidepressant medications and psychological counseling.

### **What medical professionals specialize in post-stroke rehabilitation?**

Post-stroke rehabilitation involves physicians; rehabilitation nurses; physical, occupational, recreational, speech-language, and vocational therapists; and mental health professionals.

### **Physicians**

Physicians have the primary responsibility for managing and coordinating the long-term care of stroke survivors, including recommending which rehabilitation programs will best address individual needs. Physicians also are responsible for caring for the stroke survivor's general health and providing guidance aimed at preventing a second stroke, such as controlling high blood pressure or diabetes and eliminating risk factors, such as cigarette smoking, excessive weight, a high-cholesterol diet and high alcohol consumption.

Neurologists usually lead acute-care stroke teams and direct patient care during hospitalization. They sometimes remain in charge of long-term rehabilitation.

However, physicians trained in other specialties often assume responsibility after the acute stage has passed, including physiatrists, who specialize in physical medicine and rehabilitation.

### **Rehabilitation nurses**

Nurses specializing in rehabilitation help survivors relearn how to carry out the basic activities of daily living. They also educate survivors about routine health care, such as how to follow a medication schedule, how to care for the skin, how to manage transfers between a bed and a wheelchair, and special needs for people with diabetes. Rehabilitation nurses also work with survivors to reduce risk factors that may lead to a second stroke, and provide training for caregivers.

Nurses are closely involved in helping stroke survivors manage personal care issues, such as bathing and controlling incontinence. Most stroke survivors regain their ability to maintain continence, often with the help of strategies learned during rehabilitation. These strategies include strengthening pelvic muscles through special exercises and following a timed voiding schedule. If problems with incontinence continue, nurses can help caregivers learn to insert and manage catheters and to take special hygienic measures to prevent other incontinence-related health problems from developing.

### **Physical therapists**

Physical therapists specialize in treating disabilities related to motor and sensory impairments. They are trained in all aspects of anatomy and physiology related to normal function, with an emphasis on movement. They assess the stroke survivor's strength, endurance, range of motion, gait abnormalities, and sensory deficits to design individualized rehabilitation programs aimed at regaining control over motor functions.

Physical therapists help survivors regain the use of stroke-impaired limbs, teach compensatory strategies to reduce the effect of remaining deficits, and establish ongoing exercise programs to help people retain their newly learned skills. Disabled people tend to avoid using impaired limbs, a behavior called learned non-use. However, the repetitive use of impaired limbs encourages brain plasticity and helps reduce disabilities.

Strategies used by physical therapists to encourage the use of impaired limbs include selective sensory stimulation such as tapping or stroking, active and passive range-of-motion exercises, and temporary restraint of healthy limbs while practicing motor tasks. Some physical therapists may use a new technology known as transcutaneous electrical nerve stimulation (TENS), which encourages brain reorganization and recovery of function. TENS involves using a small probe that generates an electrical current to stimulate nerve activity in stroke-impaired limbs.

In general, physical therapy emphasizes practicing isolated movements, repeatedly changing from one kind of movement to another, and rehearsing complex movements that require a great deal of coordination and balance, such as walking up or down stairs or moving safely between obstacles. People too weak to bear their own weight can still practice repetitive movements during hydrotherapy (in which water provides sensory stimulation as well as weight support) or while being partially supported by a harness. A recent trend in physical therapy emphasizes the effectiveness of engaging in goal-directed activities, such as playing games, to

promote coordination. Physical therapists frequently employ selective sensory stimulation to encourage use of impaired limbs and to help survivors with neglect regain awareness of stimuli on the neglected side of the body.

### **Occupational and recreational therapists**

Like physical therapists, occupational therapists are concerned with improving motor abilities. They help survivors relearn motor skills needed for performing self-directed activities — *occupations* — such as housecleaning, gardening, and practicing arts and crafts. Therapists can teach some survivors how to adapt to driving and provide on-road training. They often teach people to divide a complex activity into its component parts, practice each part, and then perform the whole sequence of actions. This strategy can improve coordination and may help people with apraxia relearn how to carry out planned actions.

Occupational therapists also teach people how to develop compensatory strategies and how to change elements of their environment that limit goal-directed activities. For example, people with the use of only one hand can substitute Velcro closures for buttons on clothing. Occupational therapists also help stroke survivors learn how to use assistive devices, such as canes, walkers or wheelchairs. Finally, many occupational therapists teach people how to make changes in their homes to increase safety, remove barriers and facilitate physical functioning, such as installing grab bars in bathrooms.

Recreational therapists help people with a variety of disabilities to develop and use their leisure time to enhance their health, independence and quality of life.

### **Speech-language pathologists**

Speech-language pathologists help stroke survivors with aphasia relearn how to use language or develop alternative means of communication. They also help people improve their ability to swallow.

Many specialized therapeutic techniques have been developed to assist people with aphasia. Some forms of short-term therapy can improve comprehension rapidly. Intensive exercises such as repeating the therapist's words, practicing following directions, and doing reading or writing exercises form the cornerstone of language rehabilitation. Conversational coaching and rehearsal, as well the development of prompts or cues to help people remember specific words, are sometimes beneficial. Speech-language pathologists also help stroke survivors develop strategies for circumventing language disabilities. These strategies can include the use of symbol boards or sign language. Recent advances in computer technology have spurred the development of new types of equipment to enhance communication.

Speech-language pathologists use noninvasive imaging techniques to study swallowing patterns of stroke survivors and identify the exact source of their impairment. Difficulties with swallowing have many possible causes, including a delayed swallowing reflex, an inability to manipulate food with the tongue, or an inability to detect food remaining lodged in the cheeks after swallowing. When the cause has been pinpointed, speech-language pathologists work with the individual to devise strategies to overcome or minimize the deficit. Sometimes, simply changing body position and improving posture during eating can bring about improvement. The texture of foods can be modified to make swallowing easier; for example, thin

liquids, which often cause choking, can be thickened. Changing eating habits by taking small bites and chewing slowly can also help alleviate dysphagia.

### **Vocational therapists**

Approximately one-fourth of all strokes occur in people between the ages of 45 and 65. For most people in this age group, returning to work is a major concern. Vocational therapists perform many of the same functions that ordinary career counselors do. They can help people with residual disabilities identify vocational strengths and develop résumés that highlight those strengths. They also can help identify potential employers, assist in specific job searches, and provide referrals to stroke vocational rehabilitation agencies.

Most important, vocational therapists educate disabled individuals about their rights and protections as defined by the Americans with Disabilities Act of 1990. This law requires employers to make "reasonable accommodations" for disabled employees. Vocational therapists frequently act as mediators between employers and employees to negotiate the provision of reasonable accommodations in the workplace.

### **Where can a stroke patient get rehabilitation?**

Rehabilitation should begin as soon as a stroke patient is stable, often within 24 to 48 hours after a stroke. This first stage of rehabilitation usually occurs within an acute-care hospital. At the time of discharge from the hospital, the stroke patient and family coordinate with hospital social workers to locate a suitable living arrangement. Many stroke survivors return home, but some move into some type of medical facility.

### **Inpatient rehabilitation units**

Inpatient facilities may be freestanding or part of larger hospital complexes. Patients stay in the facility, usually for two to three weeks, and engage in a coordinated, intensive program of rehabilitation. Such programs often involve at least three hours of active therapy a day, five or six days a week. Inpatient facilities offer a comprehensive range of medical services, including full-time physician supervision and access to the full range of therapists specializing in post-stroke rehabilitation.

### **Outpatient units**

Outpatient facilities are often part of a larger hospital complex and provide access to physicians and the full range of therapists specializing in stroke rehabilitation. Patients typically spend several hours, often three days each week, at the facility taking part in coordinated therapy sessions and return home at night. Comprehensive outpatient facilities frequently offer treatment programs as intense as those of inpatient facilities, but they also can offer less demanding regimens, depending on the patient's physical capacity.

### **Nursing facilities**

Rehabilitative services available at nursing facilities are more variable than are those at inpatient and outpatient units. Skilled nursing facilities usually place a greater emphasis on rehabilitation, whereas traditional nursing homes emphasize residential care. In addition, fewer hours of therapy are offered compared to outpatient and inpatient rehabilitation units.

**Home-based rehabilitation programs**

Home rehabilitation allows for great flexibility so that patients can tailor their program of rehabilitation and follow individual schedules. Stroke survivors may participate in an intensive level of therapy several hours per week or follow a less demanding regimen. These arrangements are often best suited for people who lack transportation or require treatment by only one type of rehabilitation therapist. Patients dependent on Medicare coverage for their rehabilitation must meet Medicare's "homebound" requirements to qualify for such services; at this time, lack of transportation is not a valid reason for home therapy. The major disadvantage of home-based rehabilitation programs is the lack of specialized equipment. However, undergoing treatment at home gives people the advantage of practicing skills and developing compensatory strategies in the context of their own living environment.

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