From the above description of neurologic practice, it is apparent that physical therapists will no doubt encounter diversity in their patients, work settings, and patient management. This is a major change from the early days of physical therapy practice and even from 20 years ago, when physical therapists practiced under physician orders only and followed prescriptions for massage, electrotherapy, thermal agents, hydrotherapy, and exercises. Today the physical therapist is an autonomous member of the health care team and in many states practices under direct access. The role of the therapist today is to evaluate, treat, and prevent problems, as well as to consult with and educate health care team members, families, and patients regarding those problems. This chapter describes the practice of physical therapy as it relates to disorders of the nervous system.

**Stroke**

Stroke or cerebrovascular accident (CVA) refers to the neurological problems arising from disruption of blood flow in the brain. This disruption may be caused by hemorrhage (bleeding) or a blockage that results in ischaemia (decreased oxygen) due to a clot. The type and severity of symptoms will depend on the area of brain tissue involved. The most common symptom is a complete paralysis or partial weakness on the side opposite the site involved. Depending on the site of the lesion, the paralysis may be accompanied by symptoms such as neglect of the affected side and difficulty speaking or understanding the spoken word. Approximately 30 percent of patients die during the first month. Of the survivors, approximately 30 to 40 percent will have severe disability. A major psychological problem post-stroke is depression, which can have a great impact on management. Recovery from stroke occurs most rapidly during the first six months, but functional gains can be seen for up to two years or longer.

The purpose of physical therapy is to facilitate and enhance functional recovery occurring in response to the resolution of neurologic changes. Once functional recovery plateaus, the therapist and assistant will teach the patient and family to adapt and compensate for the residual deficits in order to function at the optimal level possible within the constraints of the condition.

Figures 8-1 and 8-2 illustrate the preventive and functional training aspects of management respectively for a patient with left-sided paralysis due to a stroke.
Fig. 8-1. Positioning for a patient with a stroke to prevent secondary problems in shoulder and hand on the paralyzed (left) side.

Fig. 8-2. Gait training for a patient with left-sided paralysis due to a stroke.

Traumatic Brain Injury

Traumatic brain injury (TBI) is most often caused during motor vehicle accidents or due to falls and violence. Because of the nature of the injury, there may be fractures, dislocations, lacerations, etc., associated with brain trauma. The groups most commonly affected are children and young adults, with TBI being the most common cause of death and disability in this age group. Early management is focused on preservation of life and prevention of further damage. The diffuse nature of the brain injury usually results in problems with multiple brain functions and mechanisms. A complex picture is common, with varying deficits in motor and sensory capabilities, intellectual and cognitive functions, and emotional and psychological functions. Because of the complexity
and variability of problems that may be encountered with each patient. Management and treatment require an individualized plan and a multidisciplinary team approach in which each team member plays a specific and significant role. Currently, there is not enough data available about long-term outcomes or valid and reliable measures that may help predict outcomes. Hence, this area provides several opportunities for research to answer questions important to patients and their families.

**Spinal Cord Injury**

Spinal cord injuries (SCI), like traumatic brain injuries, most often result from motor vehicle accidents, falls, violence (especially gun shot wounds), and sports (diving and football). The age group most often affected is between 15–25 years of age and men are affected four times as much as women. Spinal cord damage can occur due to other diseases and conditions also, and in those instances, older patients are affected more commonly. Depending on the level of injury, all limbs may be affected (quadriplegia) or the lower trunk and legs may be affected (paraplegia). If the lesion is complete, there is no residual sensory or motor function below the level of the lesion (-plegia). When the cord is not completely severed, some distal motor and/or sensory functions may be preserved (-paresis).

As with TBI, SCI may be accompanied by multiple injuries and the early goal of management is preservation of life and prevention of further damage to the neural tissue. Further damage is prevented through internal immobilization of the area by fusing the vertebrae with bone grafts, rods, and wires—or externally with devices like body jackets or casts.

While this healing process occurs, it is important to maintain mobility in the joints of the extremities, strength in the unaffected muscles, cardiorespiratory capacity, and endurance. Figure 8-3 illustrates one of the types of body jackets used to provide stability. The patient is working on strengthening the upper extremity and trunk muscles. Once medical and orthopaedic clearance is obtained, more vigorous functional training is begun.
As illustrated in Figures 8-4 and 8-5, the patients are learning mat table-to-wheelchair transfers and wheelchair manipulation skills. Simultaneously, equipment needs and environmental adaptations need to be identified. For example, most patients use a wheelchair as a primary means of mobility. These need to be custom ordered for each patient with specific size and adaptation requirements. Figure 8-6 shows a patient with quadriplegia using an electric wheelchair for mobility and a special device that allows him to write. The home will need to be made accessible to the chair with ramps and other modifications. Thus, a therapist plays a major role not only in the treatment, but also management, of patients with SCI by providing family education and consultation on many related issues.
Multiple Sclerosis

Multiple sclerosis (MS) is a disease in which patches of demyelination occur in the nervous system, leading to disturbances in conduction of messages along the nerves. The condition most often manifests between the ages of 15 and 45 years, affecting women more often than men. The specific cause is still unknown. The disease can present with a variety of symptoms based on the location of the patches of nerve demyelination. Common symptoms include weakness, fatigue, alteration in sensation, disturbances of eye movements, and speech. The course in the early stages is unpredictable. Eventually, the course may take one of four forms: (1) benign, in which the disease seems to go into remission, and the patient is relatively symptom-free, with no functional disabilities; (2) exacerbating-remitting, in which the patient undergoes periods of worsening followed by periods of improvement; (3) remitting-progressive, which is similar to the above except that improvement after the worsening is not as complete and each episode leaves a residual problem or increase in problems, causing a general progression of the disease; and (4) progressive, in which the disease progresses unremittingly, causing severe disability.
The role of the therapist with this group of patients is more consultative and educational. Patients may benefit from active treatment during an acute exacerbation but otherwise require periodic evaluations and recommendations based on their changing functional needs.

**Parkinson's Disease**

This is a progressive condition first described by James Parkinson in 1817. It is also referred to as paralysis agitans and idiopathic (cause unknown) parkinsonism and is commonly seen with advancing age. Parkinson’s disease is characterized by a classic triad of symptoms. Tremor (alternating contractions of opposing muscle groups), usually affecting the hands and feet, tends to occur at rest (e.g., when the part is not being used or moved). Rigidity, a disturbance of muscle tone, manifests as a resistance when the limbs are passively moved. Bradykinesia, a slowness of movements, and/or akinesia, a poverty of movements, completes the triad.²

This condition results from a deficiency of dopamine, a neurotransmitter (chemical messenger) which is produced in a region of the brain called the substantia nigra. The specific cause for this depletion is unknown. Even though a cure is not available, medications that restore the neurochemical balance are available and help alleviate the symptoms. Unfortunately, the effectiveness of the medications diminishes over the years, and the symptoms continue to worsen.

The tremor, rigidity, and bradykinesia have a great impact on the patient’s ability to maintain balance and perform activities like walking, stair climbing, reaching, etc. Patients tend to develop a stooped posture, walk with short, shuffling steps, and loose reciprocal arm movements. The role of the therapist is to educate the patient and family about the secondary problems that result from the basic deficits and teach the patient compensatory strategies to maintain function and prevent/minimize further problems.

**Amyotrophic Lateral Sclerosis**

Amyotrophic lateral sclerosis (ALS), also known as “Lou Gehrig’s disease” (after the famous baseball player), is a rapidly progressive neurological disorder associated with a degeneration of the motor nerve cells. Its cause is unknown. The median age of onset is in the fifties.³ It is characterized by weakness, atrophy (loss of muscle bulk), and fasciculations (muscle twitches). The weakness can be present in the limb muscles (leading to difficulty with functional activities) or in muscles involved with speech, swallowing, and breathing (causing difficulties with those activities). Regardless of where it begins, eventually all muscles are involved. Currently there is no cure for this disease, and the rate of survival is about four years from diagnosis to death.

The role of the therapist is to provide preventive and supportive care for the secondary problems of weakness. To recommend appropriate devices and equipment to keep the patient as independent as possible, and to educate the family and caregivers regarding handling of the patient. (See also Chapter 8, “Pediatric Physical Therapy,” and Chapter 11, “Physical Therapy for the Older Adult” for additional neurological conditions common to those age groups.)