

# TIRR MEMORIAL HERMANN STROKE PROGRAM





## **ABOUT THE COVER**

### **Barry Oakes Makes a Comeback**

On Sept. 18, 2010, 49-year-old Barry Oakes collapsed in his home while walking to the bathroom in the middle of the night. Awakened by a pounding on the wall, his wife, Nicole, called 9-1-1. An EMS team rushed him to Christus St. Catherine Hospital in Katy, Texas, where doctors diagnosed a massive ischemic stroke and administered tPA.

Oakes quickly regained his speech and was transported by air ambulance to St. Luke's Episcopal Hospital in the Texas Medical Center for observation. "I met him in intensive care with a change of clothes and sneakers, assuming the worst was over," his wife recalls. "But by the time I arrived, his speech had begun to slur again." The stroke left him with a large basilar artery thrombosis in the brainstem, which is associated with a very poor prognosis.

Oakes was in surgery for three hours. He spent over a week in intensive care battling pneumonia while his care team worked to reduce swelling in his brain. "Barry could move his head and feet a little, blink his eyes and squeeze my hand every so often," Nicole Oakes says. "He was in and out of consciousness and on a ventilator. The doctors told me we had a long road ahead and advised me not to expect too much. They could tell Barry was a fighter and encouraged me to be patient. Ultimately, they said the first three months would be critical in determining the prospects for and extent of his recovery." A week after the stroke, Nicole learned she was pregnant.

Although Oakes could barely move, his cognitive ability was unimpaired. Once he could hold a marker, he communicated using a white board. In October, he transitioned from St. Luke's to a local long-term care facility, where he worked with physical, occupational and speech therapists several hours daily. In the evenings, he and Nicole continued the work together.

"Our goal was always to get to TIRR Memorial Hermann," Nicole says. "We were unfamiliar with the name, but family, friends and doctors at St. Luke's described it as the place where miracles happen." Oakes was admitted to the rehabilitation hospital on Nov. 2, 2010, under the care of attending physiatrist Luz Tastard, M.D.

Oakes remembers his first day at TIRR Memorial Hermann, "They start by asking you what your goals are. I'm a very goal-oriented person, so this approach worked well for me. We had moved into a new home just two weeks before my stroke. One of my goals was to be able to walk upstairs to the media room. So on my first day of physical therapy, my therapist said, 'Okay, let's go climb some stairs.'" With assistance, he climbed 10 steps, and never looked back.

Oakes left the hospital with a wheelchair and a walker, but he never again used the wheelchair. "We're forever indebted to the dedication of the staff at TIRR Memorial Hermann. You very quickly get the feeling that you're part of a big family," says his wife.

In June 2011, Oakes returned to work fulltime at ConocoPhillips, where he manages the United States refinery supply. Today, he leads conference calls and travels at least once a month for business. In his free time, he works out at the gym, jogs, plays golf and spends time with his wife, his two sons, Sean and Ryan, and his new twin daughters, Stella and Maddie, who were born May 12, 2011. In March 2012, he finished the Memorial Hermann Sugar Land half marathon.

## ABOUT TIRR MEMORIAL HERMANN



A 134-bed not-for-profit rehabilitation hospital, TIRR Memorial Hermann has been named one of “*America’s Best Hospitals*” by *U.S. News & World Report* each year since the survey began in 1990. TIRR Memorial Hermann provides rehabilitation services for adults and adolescents with spinal cord injuries, brain injuries, stroke, amputations, neuromuscular disorders and multiple trauma.

In May 2006, TIRR Memorial Hermann joined the Memorial Hermann Health System, a not-for-profit community-owned system dedicated to providing high-quality services to improve the health of Southeast Texans.

*This manual is dedicated to the patients and caregivers who inspire us every day.*

## WELCOME TO TIRR MEMORIAL HERMANN



On behalf of all the staff, I would like to welcome you to TIRR Memorial Hermann. Our dedicated team of affiliated doctors, nurses, therapists, psychologists, social workers and case managers has a combined experience that rivals any rehabilitation hospital in the world. TIRR Memorial Hermann has consistently been ranked as one of the top rehabilitation hospitals in the country for many years, an accomplishment that is only possible because of the clinical expertise of our staff combined with the passion and commitment to provide exceptional care for each of our patients.

This manual was prepared to help you and your family become familiar with the Stroke Program at TIRR Memorial Hermann. Patient and family education is one of the most important parts of a successful rehabilitation program. Our goal is to help you understand the medical issues and therapy needs following a stroke, and much of this education involves a “hands-on” approach.

Our goal is to help you and your family learn the skills and gain the confidence to discharge home safely. The majority of patients are able to discharge home with their families around three weeks after admission and then continue a treatment program as an outpatient. Because of this short time frame, we will start working with you and your family right away to learn about the community resources and insurance benefits that will help you continue your rehabilitation as an outpatient.

As we work with you to overcome obstacles and learn new skills, we remember the words of rehabilitation pioneer Howard Rusk: “Medicine adds years to life, and rehabilitation adds life to years.” We look forward to working with you to achieve your rehabilitation goals and a successful reintegration into the community.

Please let us know how we can help you and your family during your stay with us.

With warm regards,

MONICA VERDUZCO-GUTIERREZ, M.D.

Clinical Chief of the Brain Injury and Stroke Program

*Clinical Co-Director, Outpatient Medical*

*Clinic at TIRR Memorial Hermann*

*Assistant Professor, Physical Medicine and Rehabilitation at McGovern Medical School at UTHealth*

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William A. Spencer, M.D.  
Founder

*“The purpose of rehabilitation is to protect the individuality of the person facing disability and to provide opportunities to pursue goals, expectations and dreams that are important to that individual. That’s what makes you a person. Having some control over your existence is a basic human right. My vision was guided by how much people could do in spite of tremendous losses.*”

*In reflecting on what rehabilitation should be today, I don’t think the key areas are any different. Individualization of care is fundamental to protect the individuality of the person and provide opportunities for a productive and rewarding life. The resources are different today, including personnel, technology and financing, but the need remains fundamental: to find the means to reach ends that matter. My vision is symbolized by Prometheus, who is reaching upward in spite of being chained – rehabilitation is about finding resources and ways to reach valued goals in spite of difficulties and constraints.”*



TIRR (The Institute for Rehabilitation and Research) was founded by William A. Spencer, M.D., in 1959. Previously, TIRR was known as the Southwestern Poliomyelitis Respiratory Center in Houston, one of the first polio treatment centers in the United States. Dr. Spencer’s efforts in treating polio survivors led to the donation of funds for a not-for-profit hospital in the Texas Medical Center. Originally named Texas Institute for Rehabilitation and Research, the hospital later became The Institute for Rehabilitation and Research. The knowledge and skills that Dr. Spencer gained while treating polio survivors became the foundation for treatment of patients with a broad range of disabilities caused by illness and injury. Dr. Spencer believed in helping people become as independent as possible and achieve the best possible quality of life. His commitment to treatment, research, education and the community continues to be the guiding force at TIRR Memorial Hermann and can be seen daily in the work of the Stroke Program.

In addition to patient care, TIRR Memorial Hermann provides educational opportunities for many healthcare professions. We are affiliated with two medical schools, UTHealth Medical School and Baylor College of Medicine. We also work with many universities across the country to provide clinical training and supervision for students of nursing, pharmacy, physical therapy, occupational therapy, speech-language pathology, neuropsychology, optometry, music therapy, therapeutic recreation, social work, health information management and other disciplines.

Research is also part of the TIRR Memorial Hermann mission. We have been funded as a Model System for Spinal Cord Injury since 1972. We also were awarded one of the five original Traumatic Brain Injury (TBI) Model Systems of Care grants in 1987 and continue to be funded as a Model System for TBI. Doctors and staff members continue to participate in major research projects and grants.

The Stroke Program was developed in the 1980s when Robert Campos, M.D., started treating a small number of stroke patients. In 1986, Catherine Bontke, M.D., began the Brain Injury Program specifically for individuals with traumatic brain injury. Over time, the programs combined and expanded to their current size. In 2003, the Brain Injury Program was formally renamed the Brain Injury and Stroke Program. Because of the large number of patients with stroke, a separate and distinct Stroke Program was established in 2007. TIRR Memorial Hermann continues to be a pioneer in both brain injury and stroke rehabilitation.

A strong commitment on the part of patients, families and caregivers is essential to recovery from stroke, which may result in significant physical deficits and changes in language, memory, thinking, behavior and personality. The Stroke Program at TIRR Memorial Hermann maximizes each patient's outcome by providing specialized medical management, nursing and therapy services in a hospital setting.

Comprehensive interdisciplinary care provides reinforcement of treatment goals throughout the day for patients at all levels of functioning. Individual therapy, group treatment and community outings address the patient's functional abilities. TIRR Memorial Hermann also provides support groups, counseling and individualized training to prepare families and caregivers to assume the additional responsibilities of caring for their loved one after discharge.



**THE STROKE PROGRAM PHILOSOPHY**

We provide rehabilitation to individuals with strokes of all levels of severity and are committed to seeing the potential in every person. We provide opportunities to those who have no other options. We respect the dignity of our patients and understand their individual needs and differences.

In our commitment to developing a patient's full potential, goal setting and treatment planning are creative and aggressive. Our goals include maximizing independence, restoring function and improving the quality of life for patients and their families. We strive to provide our patients and families with the information and skills they need to transition successfully to other settings. Recognizing that patients' resources are often limited, we are committed to the responsible management of their lifetime resources.

We have a team-based approach to rehabilitation and believe that the patient and family are the center of the rehabilitation team. Each team member is a valuable contributor. We respect and listen to one another, share our passion for our work and our patients, and are dedicated to the professional growth of every member of the team.

We acknowledge our responsibility to lead in the field of neurorehabilitation by practicing innovative and state-of-the-art approaches, supporting and participating in research efforts, educating the rehabilitation community, and advocating on a local, state and national level for persons affected by stroke.

**Purposes of Rehabilitation**

- To help people learn to function as independently as possible
- To lessen any medical complications caused by the injury or illness
- To provide stroke education to our patients and their families
- To provide information about community resources to our patients and their families
- To train family members and other caregivers to provide appropriate care
- To provide appropriate referrals for care following discharge

## THE CONTINUUM OF CARE

### Inpatient Programs

The inpatient Stroke Program is one of many inpatient programs offered at TIRR Memorial Hermann. We also offer programs designed for persons with brain injuries, spinal cord injuries, other neurologic injuries, amputations, multi-trauma and orthopedic injuries. To qualify for inpatient services, a patient must require 24-hour nursing supervision and be able to participate in at least three hours of therapy per day. For patients with stroke, this most commonly involves physical, occupational and speech therapies. In addition, a patient may participate in multidisciplinary, goal-centered groups. The primary goal of the inpatient program is to provide the patients and their families the education and skills to be safely discharged to the community, where they will continue their treatment in an outpatient program.

### Outpatient Programs

When a patient is discharged from the hospital, he or she may continue to work on goals in an outpatient setting.

### Other Healthcare Providers

When appropriate, the patient will be referred to other healthcare providers, such as post-acute community re-entry programs, skilled nursing facilities (SNFs), home health agencies, nursing homes or other therapy providers. These will be discussed further in the chapter on discharge.

## TIRR Memorial Hermann Outpatient Locations

### TIRR Memorial Hermann

1333 Moursund St., Houston, TX 77030  
*Inpatient, Outpatient Clinic, Neurological Sleep, Imaging, Research Center*

### TIRR Memorial Hermann Outpatient Rehabilitation at the Kirby Glen Center

2455 S. Braeswood Blvd., Houston, TX 77030  
*Outpatient, Pediatrics*

### TIRR Memorial Hermann Outpatient Rehabilitation on the Campus of Memorial Hermann Memorial City

10125 Katy Freeway, Suite 108, Houston, TX 77024  
*Outpatient, Pediatrics*

### TIRR Memorial Hermann-Greater Heights

1635 North Loop West, Houston, TX 77008  
*Inpatient, Outpatient, Pediatrics*

### TIRR Memorial Hermann Outpatient Rehabilitation at Sugar Land

1111 Highway 6, Suite 195, Sugar Land, TX 77478  
*Outpatient, Pediatrics*

### TIRR Memorial Hermann Outpatient Rehabilitation at West University

2909 West Holcombe Blvd., Houston, TX 77025  
*Outpatient*

### 920 Medical Plaza Dr., Suite 270

The Woodlands, TX 77380  
*Outpatient, Pediatrics, Outpatient Clinic*

## GETTING STARTED AT TIRR MEMORIAL HERMANN

One's experience at TIRR Memorial Hermann will be very different from an experience one would have at most other hospitals. The patient will be up and dressed daily in preparation for therapies and will also begin a "sitting schedule" in order to help increase endurance. During the first few days the patient will meet the primary team members who will complete their evaluations. Based on those evaluation findings, they will establish a comprehensive rehabilitation plan and set individualized discharge goals with input from the patient and family.

## AFTER THE FIRST FEW DAYS

Every patient begins with a different level of therapeutic need, so the intensity and amount of therapy provided daily is driven by those individual needs. At a minimum, most patients in the stroke program will receive one hour of individual occupational therapy, physical therapy and speech therapy. As a patient's endurance and activity level increases, additional group therapies may be added to the schedule. Activities at TIRR Memorial Hermann begin as early as 7:30 a.m. The nursing staff may wake patients as early as 6 a.m. to prepare for their first therapy session. We will post a schedule for each day in the patient's room. While the schedule stays the same from day to day as much as possible, the patient should check the schedule each morning in case changes do occur.

## THE TREATMENT TEAM

The treatment team will work with the patient and caregivers to establish goals, provide treatment and education, and prepare the patient for discharge from TIRR Memorial Hermann. Primary team members are:

- **Physiatrist** A doctor specializing in physical medicine and rehabilitation who is responsible for the overall medical care and treatment, and refers to consultants as appropriate. Fellows and residents are also involved in medical management. They are doctors who are receiving specialty training under the

supervision of an attending doctor.

- **Licensed Nurse (R.N. or L.V.N./L.P.N.)** Provides rehabilitative nursing care around the clock and trains patients and caregivers to provide nursing care after discharge. Nurses also reinforce skills taught by therapists.
- **Patient Care Assistant (PCA)** Assists the primary licensed nurse with direct patient care.
- **Occupational Therapist (OT)** Focuses on facilitation of function and activities of daily living, including feeding, toileting, grooming, bathing and dressing. The OT may also make recommendations for a wheelchair and other adaptive equipment.
- **Physical Therapist (PT)** Focuses on facilitation of movement and mobility skills. Therapy activities include being able to get in and out of a wheelchair, on and off a commode, sitting independently and walking. Recommendations may also be made for equipment.
- **Speech-Language Pathologist (SLP)** Treats patients with swallowing difficulties, as well as difficulties with speech, language and cognition. The speech-language pathologist counsels the family and team in how to effectively communicate with the patient.
- **Neuropsychologist** Provides education and counseling to patients and families about stroke and stroke recovery. The neuropsychologist may conduct an evaluation of cognitive functioning. Test findings are used to determine the course of recovery, whether additional rehabilitation will be of benefit, and if the patient qualifies for long-term disability.
- **Social Worker** Provides patients and families with information on community resources and education materials; assists in the discharge process and planning for the future; and provides counseling, including coping and adjusting strategies to deal with the stress of caring for a loved one after stroke.

- **Case Manager** Coordinates the patient's overall program, communicates the status of goals and the team's recommendations to the patient's funding source and coordinates discharge needs.

Other TIRR Memorial Hermann staff who may be involved with a patient's care include:

- Respiratory care practitioner
- Dietitian
- Music therapist
- Therapeutic recreation specialist
- Chaplain
- Psychiatrist
- Medical consultants
- Pharmacist

### Team Conferences

The entire team will meet weekly to review the patient's goals and progress and to discuss discharge planning. Some doctors will ask that one or two family members or caregivers attend the team conference. Other doctors prefer to speak individually with patients, family members and caregivers during Family Rounds. The social worker will discuss the doctor's preference with the patient and/or caregivers.



## FAMILY RESOURCES

### Family Rounds

Provide an opportunity for patients, family members or caregivers who have not participated in Team Conference to meet with the doctor and some team members (usually the case manager and social worker) who will share the information discussed by the team on the patient's progress and discharge plan and allow the patient or caregivers to ask questions.

### Family Conferences

Provide an opportunity for the family members or caregivers to meet with the primary team members to discuss the treatment plan and goals as well as discharge planning. The social worker will schedule this conference with the caregivers.

### Family Education Series

This family education activity takes place during designated weekdays and on weekends. A series of topics, taught by various disciplines, are addressed on a rotating basis. Please see the posted family education calendars for specific information on dates, times and topics. This group is also a great opportunity to meet and connect with other family members who are going through similar circumstances.

### Family Training

Family/caregiver involvement and understanding of the care the patient will need are crucial for a successful rehabilitation experience. At TIRR Memorial Hermann, we welcome and encourage family participation in the patient's rehabilitation program.

Early in the rehab process, it is important to designate one or two persons who will be primarily responsible for learning the care needs of the patient. These persons will be asked to participate in training sessions and cleared by the therapists and nurses in various aspects of the patient's care needs. It is the caregiver's responsibility to help coordinate specific times with the appropriate team members.

**Passes**

Before discharge, the rehabilitation team may recommend an in-house, therapeutic day and/or overnight pass. The pass will give the patient and caregivers the opportunity to return to the home setting (if practical) and identify specific areas of concern, such as steps and narrow doorways, that can be addressed with the rehab team prior to discharge. Passes are also helpful as the patient and caregivers begin the emotional process of the patient's return to the community. The caregiver may experience physical problems with assisting the patient with care while away from the hospital, and these may need to be discussed with the therapists or nurse. The patient or caregiver may find emotional or social difficulties that need to be addressed with the social worker.

Funding sources will sometimes have limitations on coverage for passes. Be sure to discuss these limitations with the case manager.

**Discharge Planning**

"If we fail to plan, we plan to fail." Planning for discharge means planning where the patient will live after leaving TIRR Memorial Hermann, and identifying who will be responsible for assisting the patient with care.

We'll begin discussing the discharge plan the day the patient is admitted, possibly even before admission. Every team member plays a role in preparing the patient and the caregiver for discharge. We discuss goals for discharge each week in team conference, and a tentative discharge date will be identified as soon as the first week. The discharge date is based on achieving goals that must be met in the inpatient hospital setting. Work on many of these goals will be continued in the home or outpatient settings.

Please let the team members know as soon as possible of any concerns about the discharge plan, including preparation for discharge. Although the idea of leaving the hospital can be frightening, we want to do all that we can to make the transition to the discharge location as easy as possible for the patient and caregivers.

Recovery and rehabilitation will not stop at discharge. The rehabilitation process continues whether the patient is in the hospital or at home. The team will begin discussions with the caregivers about the patient's options for continued rehabilitation, such as outpatient, home health, home exercise programs and Strength Unlimited.

After discharge, the patient will have a follow-up appointment with a physiatrist in the TIRR Memorial Hermann Doctor and Specialty Clinic located near the Lamar Fleming entrance.

**Patient Safety**

TIRR Memorial Hermann makes every effort to keep our patients, families and visitors safe. We encourage patients and caregivers to assist us by becoming involved in the patient's care and letting us know how we can make the environment safer.

**Infection Control**

We take numerous steps to minimize the spread of germs. However, it is impossible to completely eliminate them. Organisms can be found on the skin and in saliva, urine, feces, blood and wounds. Some organisms are highly contagious and do not respond well to medication. That's why it's important to take preventive measures.

**Hand-washing**

Hand-washing is the single most important means of preventing the spread of infection. A minimum of 15 seconds is necessary to effectively remove germs from one's hands.

1. Wet hands with water, keeping hands lower than elbows.
2. Apply a hospital-approved soap or antiseptic. Liquid soap dispensers are available at every sink.
3. Use friction to clean between fingers, palms, back of hands, wrists, forearms, under nails and around jewelry.
4. Rinse hands under warm water.
5. Use a paper towel to dry hands and use the towel to turn off the faucet.

Staff members wash their hands between patient contacts and often change gloves in the middle of a procedure. They may also use the hand sanitizer (waterless hand agent) found in the dispensers outside each patient room. We encourage patients and families to ask staff members if they have washed their hands.

Patients and families can help prevent the spread of germs by washing their hands often or using the hand sanitizer and encouraging visitors to do the same, especially before leaving the patient room or after providing any type of care. Please check with the nursing staff to learn how to properly dispose of soiled items and linen.

Some organisms require the patient to be placed on isolation. If the patient is on isolation there will be a sticker on the door designating the type of isolation. There will also be a cart outside the room containing gowns, gloves, masks and other required equipment. Few patients require these safeguards, and they do not usually require private rooms. In fact, two patients with the same organism often share a room. Infection control consultants are available to our staff and determine what measures need to be taken. Our nursing staff can answer any questions regarding the prevention of the spread of infections.

**Patient Identifiers**

Patient safety guidelines require that staff utilize “double identifiers” before administering medications or procedures. This means that a staff member will check the patient’s wristband to verify the correct name and patient number before giving the medications or performing any procedure. This practice has helped to reduce errors.

The brain is the command center for the body, regulating all of its functions. Understanding where these functions are organized in the brain gives us better appreciation of the effect an injury to the brain such as stroke can have. This chapter provides a basic review of the anatomy of the nervous system.

### NERVOUS SYSTEM OVERVIEW

There are two major divisions of the nervous system, the central nervous system and the peripheral nervous system. The **central nervous system** consists of the brain and spinal cord [See Fig. 4.1]. The **peripheral nervous system** includes the cranial nerves, spinal nerves and autonomic nervous system [See Fig. 4.2]. The **autonomic nervous system** controls general body functions, such as blood pressure and digestion.

The skull and vertebrae support and protect the central nervous system. The **skull** is a fixed rigid bony structure that surrounds the entire brain. Three layers of coverings, the **meninges**, surround and protect the brain. The **dura**, the first layer, is the outermost covering. It is like a thick plastic covering. The middle layer is the **arachnoid**, which is like a web that covers the wrinkles on the outside of the cerebral hemispheres. The **pia** is the layer closest to the brain. These three layers of the meninges serve as shock absorbers to protect the brain, which is also protected by the cerebrospinal fluid. **Cerebrospinal fluid** is produced and circulated through the cavities inside the brain called **ventricles** and the space surrounding the brain and spinal cord.

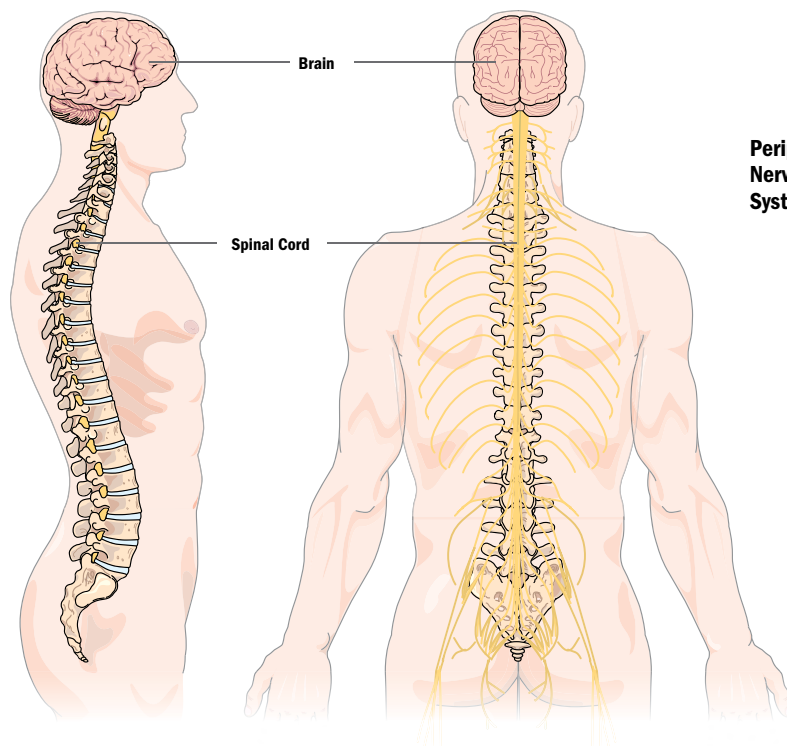


Fig. 4.1

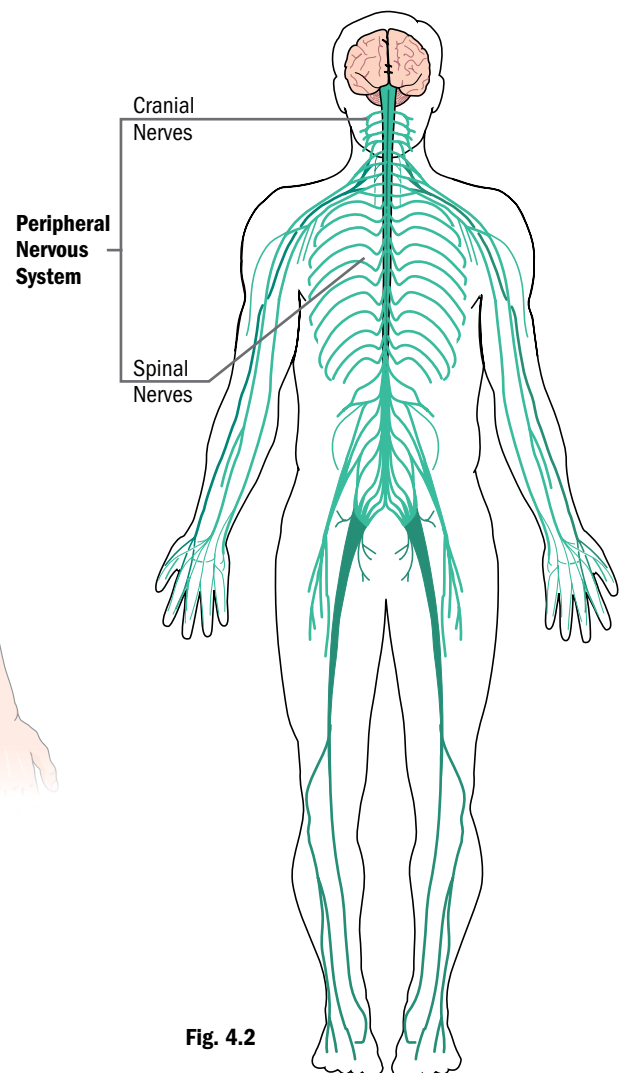


Fig. 4.2

## BRAIN ANATOMY

The brain is subdivided into the cortex (comprised of two hemispheres), the diencephalon, the brainstem and the cerebellum [See Fig. 4.3].

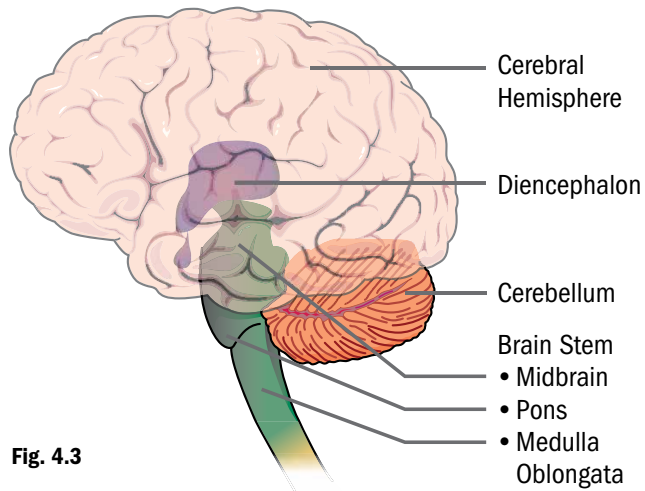


Fig. 4.3

The cortex is further divided into left and right hemispheres. In general, each hemisphere is responsible for controlling actions on the opposite side of the body.

The **right hemisphere** of the brain is involved with the movement of the left side of the body. It also is involved in visual-perceptual abilities, such as judging distance, size, speed and position, and determining how parts are connected to the whole. The **left hemisphere** of the brain controls movement of the right side of the body. It is also involved in speech and language abilities in most people. As speech and language function are usually located on the left side of the brain (with the exception of a proportion of left-handed individuals), it is often called the “dominant hemisphere.”

Each cerebral hemisphere is further divided by function into four lobes: the **frontal, parietal, temporal** and **occipital lobes**. While it is easier to make these divisions for the purpose of teaching, it is important to recognize that the reality is much more complex and there is overlap in function even in these divisions.

## Frontal Lobe

The frontal lobes, the largest part of the human brain, lie behind the forehead and the eyes [See Fig. 4.4]. If you drew a line across the top of your head between the

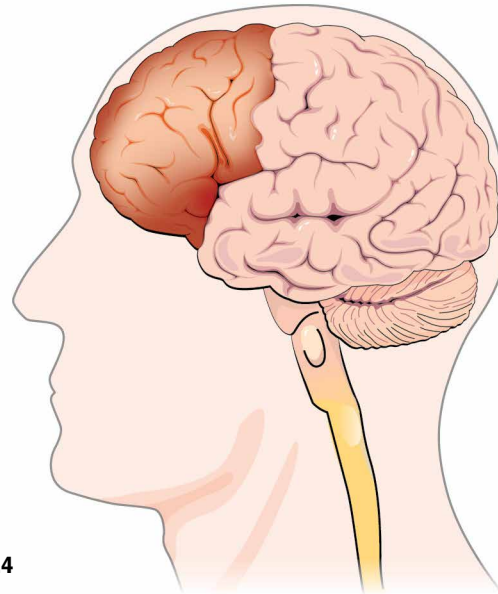


Fig. 4.4

tops of your two ears, the back end of the frontal lobe would touch this line. The frontal lobe helps a person keep attention focused and organizes information so that it makes sense. The frontal lobe helps change an idea into action and stops the action when the goal has been achieved. It helps a person choose the appropriate behavior for a social situation. The back part of the frontal lobe controls voluntary motor activity, including moving one’s limbs and speaking.

Injury to the frontal lobe may cause an inability to move part of the body (**paresis**) or one side of the body (**hemiparesis**). Speech may become halting, disorganized or stop entirely. Personality may change so that the person appears impulsive, irritable or has difficulty using cues from other people to control his or her own behavior. Social rules of behavior may be disregarded. When asked to recall something, the person may produce information that is obviously incorrect (**confabulation**).



A person with injury to the frontal lobe may even have difficulty recognizing the difference between what can help and what may hurt them. People with such an injury may understand everything literally, which is sometimes called **concrete thinking**. Jokes may be taken as serious information, and abstract ideas may no longer be understood. The person may get stuck on an idea or action and not be able to stop (**perseveration**).

### Parietal Lobe

The parietal lobes are behind the frontal lobe and include the upper back part of the brain [See Fig. 4.5].

The parietal lobe has two major functions:

1. To record sensations from the body (touch, heat, cold and pain) and to organize these sensations into ideas (**perception**)
2. To integrate these sensations from the body with information from the eyes and ears

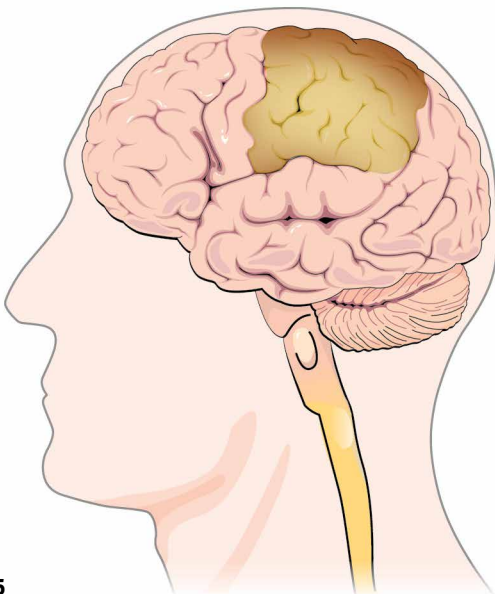


Fig. 4.5

The parietal lobe plays a major role in forming associations, which help place information in long-term memory. Portions of the parietal lobe also play a role in reading, writing, calculating and spelling. Formation of our body image occurs in the parietal lobe. The parietal lobe helps us to orient our bodies in the space around us.

Injury to the front of the parietal lobe may cause someone to lose sensation in part of the body or a side of the body. With injury to the parietal lobe, individuals may become disoriented to their surroundings. They may not understand where their body is in relation to objects around them. For example, they may have difficulty sitting upright or become lost easily, even in places they know very well. They may confuse left and right, or may have difficulty recognizing what they are seeing. In extreme cases, they may not recognize family members.

Such an injury will disturb a person's ability to copy or to work from diagrams, especially three-dimensional diagrams. The individual will have difficulty imagining objects from different visual perspectives. Disorders may be seen in the ability to read, write or do arithmetic.

These people may also demonstrate decreased awareness of their impaired side, even though the muscles work and they have control over them (**neglect syndrome**). In severe cases these individuals do not even recognize that their own limb (arm or leg) belongs to them when it is shown to them.

### Temporal Lobe

The temporal lobes lie behind the eyes and below the frontal and parietal lobes [See Fig. 4.6]. The temporal area contains the primary brain area for hearing. Some

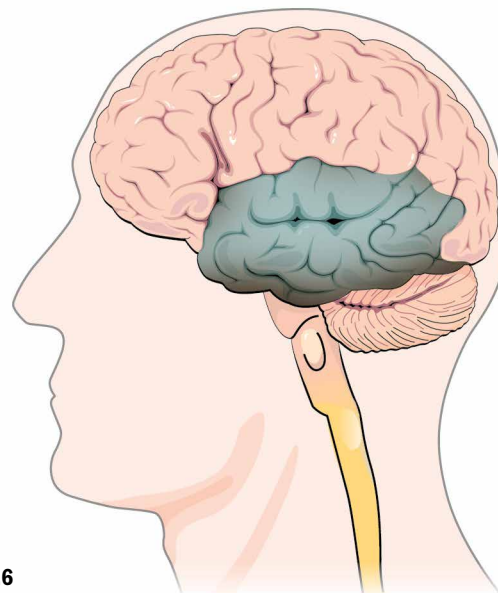


Fig. 4.6

portions of the temporal lobe also help us understand what we see and hear; other parts help to transfer what is seen and what is heard into memory. Connections in the temporal lobe help us add feelings to what we see, hear and experience.

Disorders of new learning and short-term recall are common after a brain injury. After injury to the temporal lobe, a person may have difficulty listening to one person while screening out distractions (**selective attention**). Injuries to the upper part of the temporal lobe can cause a person to misunderstand or be completely unable to understand what is being said. Such people may also make sounds that seem like words but are not recognizable words at all. Injuries to the temporal lobe may also cause a patient to misunderstand body language.

Of particular concern are the emotional changes which sometimes result from injury to the temporal lobe. Such people may experience unexplained panic or unexpected and uncontrolled tearfulness. Injury to some areas may increase a person's desire for sexual contact and reduce social controls for how that person's sexuality is expressed (**disinhibition**). Injuries to other temporal areas may cause a loss of interest in sex.

### Occipital Lobe

The occipital lobes lie at the far back of the brain [See Fig. 4.7]. Because the primary brain areas for vision lie in the occipital area, injuries directly to that area will result in "blindness" in part or all of the visual field. The occipital lobe has many interconnections with the parietal lobe. After an injury to the occipital lobe, people may experience objects as appearing larger or smaller than they really are. They may have difficulty picking things out in the space around them, or they may misperceive pictures or objects a short distance away. When they talk about these misperceptions, it may sound like they are confused or hallucinating. They may also report seeing things flickering or shimmering, a colored fog or even colored spots. Recognition of colors may also be disturbed.

### Basal Ganglia

The basal ganglia are motor control centers that lie deep inside the brain. The basal ganglia appear to operate as a traffic control station for complex motor movements, which are signaled from the frontal lobes. They smooth the coordination among muscles as an act proceeds. They play a role in integrating movements between the two sides of the body. The basal ganglia help control the speed of a movement. A person with injury to the basal ganglia may move more slowly than usual, and the movements may appear stiff.

### Thalamus

The thalamus is a routing station for all incoming information relating to the senses of sight, hearing, touch and taste. It lies below the cerebral cortex and resembles an egg in size and shape. It connects various brain centers with others.

### Cerebellum

The cerebellum is located under the occipital lobe. The major role of the cerebellum is to integrate muscular movements, maintain muscle tone and regulate the crispness of individual muscular movements which make up a complex motor act. The cerebellum contributes to control of balance and coordination.

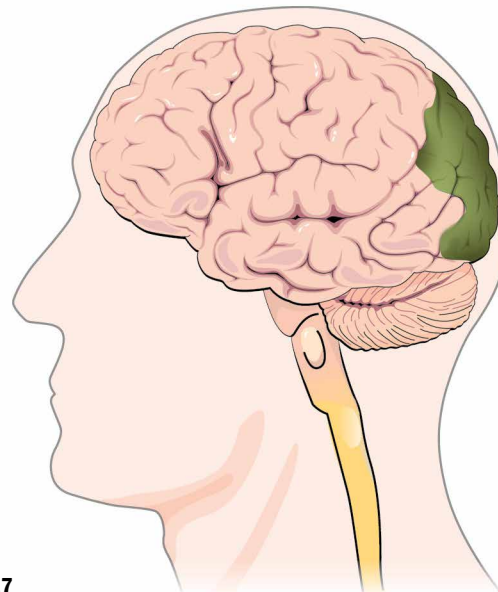


Fig. 4.7

Injury to the cerebellum may cause errors in the timing of muscular contractions and relaxations. Movements may appear choppy, and the range and speed of movements may be too great or too small. Eye movements may also appear choppy (**nystagmus**). A person may have difficulty determining how far to move to reach an object. Muscles usually are weak and fatigue quickly with exertion. Awkwardness (**ataxia**) or tremor is also possible. Tremor is usually worse when getting close to the object for which a person is reaching (**intention tremor**). Speech may also sound sloppy, slurry or distorted (**dysarthria**).

**Brainstem**

The brainstem is the part of the brain that connects the spinal cord with the cerebellum and the cerebral hemispheres [See Fig. 4.8]. The brainstem is important because it is vital for maintaining arousal (staying awake, alert and active). The brainstem controls all involuntary life-support functions such as respiration rate, heart rate and blood pressure. The brainstem is also involved in controlling eye movements, hearing, speech and swallowing. For conscious behavior to occur, these structures and their connections to the two cerebral hemispheres and the midbrain must be functioning.

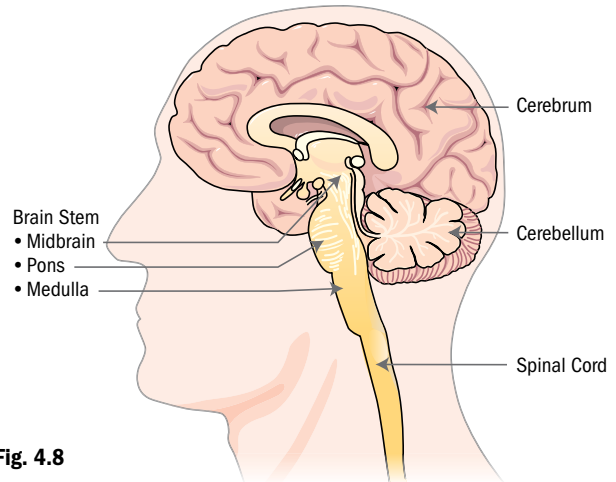


Fig. 4.8

The major effect of injury to these structures is unconsciousness and coma. Because brain structures that facilitate respiration lie within this area, injury may also produce changes in the breathing cycle. Yawning or hiccupping may be seen. Eyes may be fixed with pupils dilated. Pupils may not appear to respond to light changes. Injuries may also produce uncontrolled posturing on one or both sides of the body. Muscles may tighten and limbs may draw up (**contractures**).

**Brain-Behavior Relationships**

Frontal Lobe	Parietal Lobe	Temporal Lobe	Occipital Lobe	Basal Ganglia	Thalamus	Cerebellum	Brainstem
<ul style="list-style-type: none"> <li>• Initiation</li> <li>• Problem-solving</li> <li>• Judgment</li> <li>• Inhibition of behavior</li> <li>• Planning</li> <li>• Self-monitoring</li> <li>• Motor planning</li> <li>• Self-awareness</li> <li>• Organization</li> <li>• Attention</li> <li>• Concentration</li> <li>• Cognitive flexibility</li> <li>• Speech</li> </ul>	<ul style="list-style-type: none"> <li>• Touch</li> <li>• Spatial perception</li> <li>• Visual perception</li> </ul>	<ul style="list-style-type: none"> <li>• Memory</li> <li>• Hearing</li> <li>• Learning</li> <li>• Understanding speech</li> <li>• Sequencing</li> </ul>	<ul style="list-style-type: none"> <li>• Vision</li> </ul>	<ul style="list-style-type: none"> <li>• Motor control</li> <li>• Regulation of motor speed</li> <li>• Integration of movement</li> </ul>	Sensory input for: <ul style="list-style-type: none"> <li>• Vision</li> <li>• Hearing</li> <li>• Touch</li> <li>• Taste</li> </ul>	<ul style="list-style-type: none"> <li>• Balance</li> <li>• Coordination</li> <li>• Smooth muscle movements</li> </ul>	<ul style="list-style-type: none"> <li>• Breathing</li> <li>• Heart rate</li> <li>• Arousal</li> <li>• Consciousness</li> <li>• Sleep/wake cycles</li> </ul>

## STROKE

A stroke is a brain injury that results from interruption of the blood supply to the brain. The blood supply to the brain is essential for the brain to function, because brain cells must have a continuous supply of oxygen and nutrients from blood to survive. To meet the constant demand for oxygen, blood is pumped from the heart to the brain through several major arteries. Within the brain, the cerebral arteries branch into smaller and smaller arteries, and eventually into capillaries that supply the oxygen and nutrients to cells in the brain. A stroke occurs when blood vessels carrying oxygen and nutrients to the brain suddenly rupture or become blocked. When the blood supply to the brain is interrupted, brain cells in the immediate area die. This area of dead brain cells is called an infarct. A stroke is also called a cerebrovascular accident (CVA).

## TYPES OF STROKE

Strokes fall into two major categories, based on whether the disrupted blood supply is caused by a blocked blood vessel (ischemic stroke) or a blood vessel that suddenly bursts (hemorrhagic stroke). About 80 percent of strokes are ischemic strokes. A transient ischemic attack (TIA) is a type of ischemic stroke when blood supply is limited to the brain but symptoms resolve within 24 hours.

### Ischemic Stroke

In everyday life, blood clotting is helpful. When someone is bleeding, blood clots slow and eventually stop the bleeding. In the brain, however, blood clots are dangerous because they can block arteries and cut off blood flow. This process is called **ischemia**. An ischemic stroke results from a blocked blood vessel. Thrombotic and embolic strokes are types of ischemic strokes.

**Thrombotic stroke** is the most common type of stroke. In this type of stroke, a blood clot (**thrombus**) forms inside an artery in the brain or neck and blocks blood flow to the brain. Blood clots form most often in arteries damaged by atherosclerosis. **Atherosclerosis** is a disease in which plaque builds up on the walls of the arteries. Conditions such as high cholesterol, high blood pressure and diabetes make an individual more prone

to atherosclerosis. These deposits gradually narrow the blood vessels, slow blood flow and sometimes result in complete blockage (**occlusion**) of an artery.

**Embolic strokes** occur when a blood clot breaks free from the heart or large arteries of the body and is carried to the brain. The clot travels through the arteries as they branch into smaller vessels until the clot reaches a point where it cannot pass, blocks the vessel and cuts off the blood supply. The sudden blockage of the blood vessel is called an **embolism**.

### Hemorrhagic Stroke

A hemorrhagic stroke occurs when a blood vessel in or around the brain violently ruptures and releases blood into the brain or the areas surrounding the brain. When this occurs, the brain cells supplied by the artery fail to receive oxygen and nutrients and, as a result, they die. In addition, the accumulated blood from the ruptured artery clots, displaces normal brain tissue and interferes with brain functions. There are two main types of hemorrhagic strokes. The parts of the brain affected by the bleeding identify these strokes. **Intracerebral** (also called **intraparenchymal**) **hemorrhages** occur when the bleeding is within the brain. **Subarachnoid hemorrhages** occur when the bleeding is in the space between the brain and the skull.

### Cerebral Aneurysms and Arteriovenous Malformations

A cerebral aneurysm is a bulging out of a weakened blood vessel wall. These weak spots are usually present at birth. Aneurysms develop over a long time period and usually do not cause problems until they burst. An **arteriovenous malformation (AVM)** is a complex, tangled web of connections between arteries and veins that bypass normal capillaries. AVMs may have associated symptoms including headaches, seizures and neurological problems. The rupture of an aneurysm or bleeding from an AVM results in a hemorrhagic stroke.

## THE EFFECTS OF STROKE

When brain cells die, abilities once controlled by that area of the brain are disrupted. This includes functions such as speech, movement, memory, bowel and bladder function, and swallowing. The specific abilities affected depend on the size of the stroke and where in the brain it occurs. For example, someone who has had a mild stroke may only experience minor effects, such as weakness of a leg, while someone who has a larger stroke may become paralyzed on one side or lose the ability to speak. Four primary parts of the brain can be affected by a stroke: the right hemisphere, the left hemisphere, the cerebellum and the brainstem. Of course, one person may have more than one part of the brain affected by a stroke.

### Right Hemisphere Stroke

A stroke in the right hemisphere often causes weakness on the left side of the body. Right hemisphere stroke survivors may also have problems with their **visual-perceptual abilities**. This may lead them to misjudge distances or be unable to guide their hands to pick up an object.

Survivors of right hemisphere strokes may have judgment difficulties that show up in their behavior. These patients may develop an impulsive style in which they are unaware of their impairments. This can be dangerous. The patient may try to walk without help or try to drive a car.

Right hemisphere stroke survivors may also experience **left neglect**. Left neglect causes patients to miss objects or people on their left side.

Some patients with right hemisphere strokes will experience problems with short-term memory. They may be unable to remember who visited in the morning but be able to recount their daughter's wedding 30 years ago in great detail.

### Left Hemisphere Stroke

A left hemisphere stroke often causes weakness of the right side of the body. Someone who has a left hemisphere stroke may also develop speech and language problems (**aphasia**). These problems can

be very specific, affecting only one component of a patient's ability to communicate, such as the ability to control the speech-related muscles to talk clearly. Usually, left hemisphere stroke survivors have problems both in understanding and expressing themselves, as well as in reading and writing.

In contrast to patients with right hemisphere stroke, people with a left hemisphere stroke may develop a slow and cautious behavioral style. They may require frequent instructions and feedback to follow through on tasks.

Similar to right hemisphere stroke survivors, left hemisphere stroke patients may develop short-term memory difficulties.

### Cerebellar Stroke

A stroke in the cerebellum can cause coordination and balance problems and related difficulties, including dizziness, nausea and vomiting.

### Brainstem Stroke

Strokes that occur in the brainstem are particularly devastating since control of breathing, heart rate and blood pressure may be impacted. A brainstem stroke may also affect eye movements, hearing, speech and swallowing. Since impulses generated in other parts of the brain must travel through the brainstem to the arms and legs, patients with a brainstem stroke may also develop paralysis in one or both sides of the body.

## RECOVERY FROM STROKE

Most stroke survivors demonstrate significant recovery. For example, one week after a stroke, up to 88 percent of patients are dependent in some aspect of self-care and mobility. This percentage decreases to 62 percent by six months. At one year, only one-third of patients are dependent in some aspect of self-care and mobility. Prediction of recovery after stroke is difficult because recovery involves many factors, as can be seen in the following table. Determining factors can be placed into several categories: patient characteristics, stroke-related factors, associated medical conditions, treatment factors and social factors.

**Factors Influencing Stroke Outcome**

Patient Characteristics	Associated Medical Conditions	Stroke-related Factors	Treatment Factors	Social Factors
Age	Hypertension	Stroke severity	Availability of neurorehabilitation	Socioeconomic status
Education level	Heart disease	Type of stroke	Types of intervention	Financial resources
Intelligence	Diabetes	Location of stroke	Time of initiating rehabilitation	Caregiver participation in treatment
Personality		Size of stroke	Intensity of therapy	Emotional support
Motivation		Coma at onset	Endurance	Home environment
		Bladder and bowel continence	Pre-stroke health	

**COURSE OF RECOVERY**

Despite the problems in predicting outcome, a few general principles are known about stroke recovery. Recovery begins with impairment of functioning, progresses through a period of improvement and ends with a stable level of performance. The rate of recovery is greatest during the three months following the stroke. However, significant recovery continues to occur up to six months following a stroke. Some patients continue to show improvement for many years following a stroke.

When seen within the first week after stroke, as many as 88 percent of stroke survivors have some **hemiparesis**. This weakness is present in 50 percent of stroke survivors at six months, but only in 30 percent at one year.

The course of recovery is also related to stroke severity. Patients with more severe strokes take longer to recover.

We do not understand much about how the brain recovers after a stroke, but several theories have been suggested. Some brain cells may be only temporarily damaged and may resume functioning later. In some cases, the brain may reorganize its own functioning, or a nearby area of the brain may take over for an area damaged by a stroke.

**Motor Function**

The pattern of motor recovery is another subject about which much remains unknown. Fig. 5.1 demonstrates that the area of brain devoted to movement of body parts is not proportional to the size of those parts. The

hands and facial muscles, which are able to perform numerous complex fine-motor tasks, require more of the brain’s processing ability. This is one of the reasons the upper limb (including the hand, forearm and arm) is more frequently affected than the lower limb and why recovery of upper-limb function is more limited.

The severity of arm weakness after the stroke and the time until return of movement in the hand are both important predictors of motor recovery of the arm. When there is complete arm paralysis after stroke or no measurable grip strength by four weeks, then the prognosis for useful hand function is usually poor. Conversely, if patients show some recovery of the

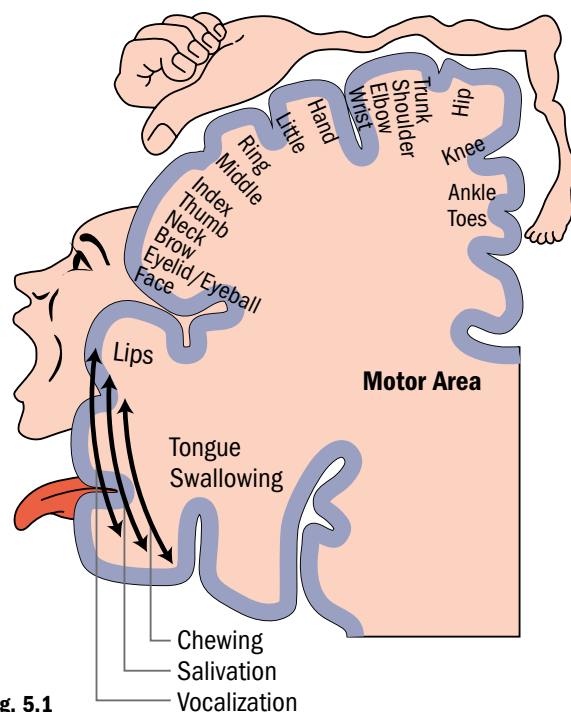


Fig. 5.1

hand by four weeks, as many as 70 percent will make a good or full recovery.

**Language Function**

Approximately one-third of patients with stroke have language problems. At six months, 12 percent of the survivors still have evidence of significant language problems. Patients with large left hemisphere strokes often have language problems that continue. These patients tend to progress slowly, with understanding of language usually improving more than the ability to express oneself.

**Visual-Perception Skills**

As many as half of the patients with right hemisphere stroke experience “left neglect” in which they fail to perceive objects and people on their left side. Neglect

appears to resolve in a majority of patients by eight to 12 weeks. Visual field deficits are reported in 20 percent of patients.

**Bowel and Bladder Function**

Bladder incontinence is common after stroke: It is observed in up to 70 percent of stroke survivors one week after stroke. Most patients recover bladder function within one month. Bowel incontinence has a slower rate of recovery.

**Swallowing**

Swallowing problems (dysphagia) occur in 50 percent of stroke survivors. By one year post-stroke, only 4 percent have swallowing problems.

Following a stroke, an individual faces many health and medical issues. Emergency care for immediate survival is provided in the acute care hospital, followed by intense medical care to address the patient’s physical needs. Patients are transferred to acute rehabilitation when they are medically stable. In the rehabilitation unit, the doctor and multidisciplinary care team address each patient’s continuing significant health and medical needs.

The human body is made up of 10 major organ systems that work together as one unit. The brain is the control center for all of the body’s functions, including basic body functions such as breathing, walking and talking. The brain receives signals from the nerves in the body and controls our physical functions by responding to these signals. When the brain is injured, its ability to control the function of body systems may be changed. A stroke may disrupt one or all of these areas.

In this chapter, we’ve combined certain systems together and will address areas of most concern to patients in rehabilitation. In each section, after addressing the effects on the organ system, we’ll talk about the various treatment approaches we use in rehabilitation. If the patient had previous medical problems, such as heart disease, hypertension, high cholesterol or diabetes, these problems will need continued management. We’ll also discuss tests commonly used to confirm whether a patient has a medical condition.

**NERVOUS SYSTEM**

**Cranial Nerve Injuries**

Cranial nerves relay input from sensory organs in the head such as the eyes, ears and nose, and then control cranial muscles involved in actions such as eye, tongue and facial movement.

**Vision**

Visual information travels a complicated route in the journey from the eyes to the occipital lobes [See Fig. 6.1]. In addition, problems with cranial nerves can affect eye movement, leading to issues such as double vision. For this reason, vision is commonly affected in stroke survivors.

It is often quite difficult to distinguish perceptual problems from visual deficits. For this reason, it is beneficial to have any patients with suspected visual deficits evaluated by a vision specialist. Sometimes, interventions such as new spectacle prescriptions, eye patches or eyeglass prisms can help. Working with therapists specialized in visual rehabilitation can also be beneficial.

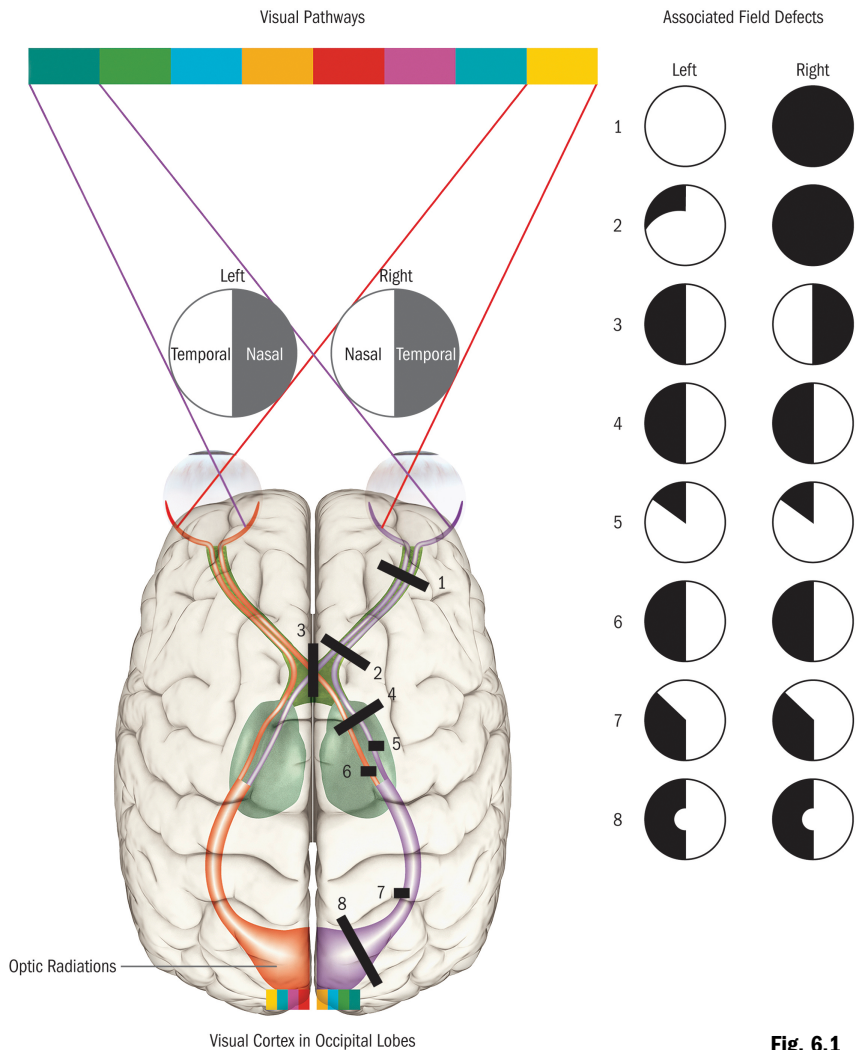


Fig. 6.1



**Hearing**

A stroke can cause changes in a person's ability to hear clearly. The speech-language pathologist may perform a hearing screening to assess whether the patient is experiencing hearing difficulty. If noted, referral to an otolaryngologist (ear, nose and throat doctor) or an audiologist may be helpful to evaluate further.

**Sensory Disturbances**

Stroke patients may lose the ability to feel temperature, touch or position. These deficits may be severe enough to hinder the ability to recognize objects that patients are holding. Some patients experience numbness or odd sensations of tingling or prickling in their weakened limbs (**parasthesias**).

**Pain**

After a stroke, individuals may experience pain. Awareness of pain is a complex experience of sensing, feeling and thinking. Pain experienced from damage to the nervous system is called neuropathic pain. This type of pain is usually characterized by a burning or electrical quality. There are several medications, such as gabapentin, pregabalin and nortryptline that can potentially provide benefit.

**Complex regional pain syndrome (CRPS)** is a pain syndrome in which there is pain in the extremities that radiates toward the hand or foot. The pain is characterized by constant burning and is associated with redness and swelling of the extremity. If oral medications provide insufficient relief, referral may be made to a pain management doctor to perform nerve blocks to alleviate pain.

**Seizures**

A seizure is the temporary increase in electrical activity of brain cells, which interferes with normal brain function. Any type of stroke may predispose an individual to seizure. Patients with hemorrhages are more likely to have a seizure, which may be generalized or partial.

The most common form of **generalized seizure** is a **grand mal** or **tonic-clonic seizure**. A generalized seizure occurs when an overload of electrical energy

occurs throughout the brain. Normal body functions are temporarily disrupted. When the seizure begins, the person will lose consciousness, breathe irregularly, stiffen briefly, have rapid muscle movements and may lose bowel and bladder control. As the muscles tighten around the mouth, the individual may bite the tongue. (The tongue cannot be swallowed.) Eventually, the jerking movements slow down, and the seizure ends naturally. After a few minutes, the person regains consciousness, but may be confused and complain of soreness. Some people may even sleep for a short time.

Another type of generalized seizure is called **absence** or **petit mal**. Characterized by a blank stare, it lasts only a few seconds. The person appears to be daydreaming. It can cause chewing movements and mild twitching of the head and arms. Children and adolescents usually have this type of seizure.

The person experiencing generalized seizures is seldom aware that anything has happened.

**Partial seizures** are also called **focal seizures**. During a partial seizure, there may be brief staring spells or unusual movements. Awareness may be affected or the person can be awake and aware but cannot control body movements. Sometimes things may just look, taste, sound, feel or smell differently for a short time.

One type of partial seizure, the **simple partial seizure (Jacksonian seizure)** is different from other seizures because the person knows when the seizure is happening but cannot control the movements that occur with the seizure. These movements can start in the fingers or toes and move into the arms and legs, causing trembling or jerking.

Another type of partial seizure is called **complex partial**. People suffering from a complex partial seizure may be dazed and unaware of their surroundings, and may act oddly. They will not remember what they did or what happened during the seizure. A complex partial seizure typically lasts only a minute or two. Some people experience a distinctive warning sign called an **aura** before this type of seizure. The aura may be a peculiar odor or a distorted sound. Other names for complex

partial seizures include **psychomotor** and **temporal lobe seizures**. They are also referred to as **automatic behavior seizures** because a similar pattern of behavior occurs with each seizure.

### Myths about Seizures

There are many myths about seizures. The truth is that a seizure:

- Is not a mental illness
- Does not mean the person is less intelligent than others
- Does not change the way one appears
- Does not always keep the person from driving a car
- Does not cause people to swallow their tongues

### Medications for Seizures

If a person has seizures or is at risk for having seizures, the doctor may prescribe medications. The following table lists medications frequently used to treat seizures.

Generic	Brand Name
Divalproex	Depakote®
Gabapentin	Neurontin®
Lamotrigine	Lamictal®
Levetiracetam	Keppra®
Oxcarbazepine	Trileptal®
Phenytoin	Dilantin®
Topiramate	Topamax®
Zonisamide	Zonegran®
Clonazepam	Klonopin®
Phenobarbital	Phenobarbital

The test used to diagnose the presence of seizures is an **EEG (electroencephalogram)** and the results of this test are interpreted by a neurologist.

### Hydrocephalus

Our brains constantly produce and drain **cerebrospinal fluid (CSF)**, which protects the brain. If the brain is injured, the drainage of the CSF may be affected and CSF will build up. The build-up of fluid is called **hydrocephalus**. Symptoms of hydrocephalus include reduced consciousness, decreased balance and difficulty holding urine. Treatment may include draining of the CSF by means of a plastic tube with a pressure-sensitive valve called a **ventriculoperitoneal (VP) shunt**. This device drains excess CSF into the abdomen where it is reabsorbed by the body. CT (computed tomography) of the head can show findings suggestive of hydrocephalus. Sometimes, a series of high-volume lumbar punctures (spinal taps) can be done and the clinical response monitored to predict whether a VP shunt would be helpful.

### Sleep

The normal sleep/wake pattern is to be awake during the day and asleep at night. Often after a stroke, the normal sleep/wake pattern changes. The patient may be awake at 3 in the morning and asleep at 10 a.m. The lack of sleep or appropriate rest interferes with the ability to participate in therapy. The cycle can be altered through medications and changes in the environment, such as implementing a sitting schedule that includes therapy times, and maintaining a darkened, quiet room at night. The goal is not just to re-establish the correct cycle, but to provide rest and encourage daytime alertness so the patient can benefit as much as possible from therapy. Medications such as trazodone, zolpidem (Ambien®), and melatonin are commonly used to help in establishing a good sleep pattern.

Some patients may have pre-existing sleep problems, such as **sleep apnea**. While sleeping, individuals with sleep apnea stop breathing for a short time. This causes them to awaken and interrupts restful sleep. A sleep study is used to diagnose this condition. Breathing machines (CPAP and BiPAP) can be used to help the person sleep through the night.

## MUSCULAR/SKELETAL SYSTEMS

Movement problems following a stroke are complex – muscle strength is only one component of this system. Muscle tone, coordination, posture and balance all contribute to this process. As described above, each hemisphere of the brain controls the strength on the opposite side of the body. This is because the nerve fibers carrying these signals cross in the brainstem prior to travelling down the spinal cord to the spinal nerves supplying muscles in the limbs.

### Muscle Tone

Muscle tone describes the resistance of a muscle to being stretched. When muscle tone is normal, a limb is easy to move. Stroke may damage the normal control of muscle tone. Muscle tone may increase or decrease following a brain injury. Most commonly, there is a decrease in muscle tone initially followed by a gradual increase in muscle tone. One type of increased muscle tone is referred to as **spasticity**, which refers an increase in muscle tone in response to muscle stretch. Spasticity may lead to limited joint range of motion. Over time, this can lead to abnormal muscle shortening known as a **contracture**.

During rehabilitation, many techniques are available to manage spasticity and increase range of motion. Initially, more conservative approaches will be tried, including weight bearing, stretching, casting, splinting and positioning. Oral medications are available but limitations include decreased efficacy and side effects like sedation. Injected medications such as botulinum toxins and phenol are specifically directed to the muscles with the increased muscle tone and are sometimes utilized during the acute rehabilitation stage. If these measures are unsuccessful, a trial of intrathecal baclofen may be attempted. In this procedure, a dose of the medication baclofen is delivered into the spinal fluid through a spinal tap and the response in muscle tone is measured. If successful, implantation of a baclofen pump to continuously deliver the medication may be pursued.

Below is a list of treatment approaches to improve abnormal muscle tone:

- 1. Passive range of motion** helps keep joints flexible and muscles elongated when an individual does not have sufficient control to move the body part independently. A body part may need continued stretching even when the patient has regained control. For example, many patients typically have tight hamstrings that need to be stretched daily.
- 2. Weight bearing** – Allowing a patient to bear weight on an extremity with abnormal tone helps the patient gain control over movement in that extremity. Because the patient does not have control over the movement, the therapist supports the extremity during weight-bearing activities. [see Figure 6.2]



Fig. 6.2

- 3. Exercises** such as standing and riding a bike can stretch and mobilize a tight limb.
- 4. Serial casting and bivalve casts** provide a prolonged stretch to a joint that is extremely tight. Casts are left on for one to five days before a new cast is applied with a slightly increased stretch. Casting is continued until the therapist feels that no more range can be achieved using this method. Casting may also help to decrease spasticity. Bivalve casts are serial casts that have been cut down each side and can be removed

and reapplied. Bivalves allow relief from constant casting while keeping the joint in a prolonged stretch for a long period of time. The therapist provides a schedule for bivalve wear. [see Figure 6.3]



Fig. 6.3

5. **Oral medications** including baclofen (Lioresal<sup>®</sup>), diazepam (Valium<sup>®</sup>), tizanidine (Zanaflex<sup>®</sup>) and dantrolene sodium (Dantrium<sup>®</sup>) can be used to decrease spasticity. However, the use of these medications in large doses causes drowsiness and reduced attention.
  6. Injection of **Botox<sup>®</sup> (botulinum neurotoxin)** into the muscles permits them to relax and allows for more movement. Botox injections are effective for about three months. The effects begin about 10 to 14 days after the initial injections.
  7. **Phenol** is a type of alcohol. When injected at the point where nerves transmit information to the muscles, phenol decreases spasticity. It is frequently used in conjunction with Botox.
  8. The **baclofen** pump is a small, implantable device that administers small, continuous amounts of baclofen into the **spinal canal**. The insertion of a pump requires surgery. Prior to surgery, a baclofen trial is scheduled to determine the effectiveness of baclofen for the patient. Baclofen is injected into the spinal fluid. Over a period of six hours, the patient is tested in a variety of functional positions to determine effectiveness of the medication. If the trial is successful, the patient and family may decide to have the pump implanted. An additional consideration is that the pump must be refilled at regular intervals.
- Muscle Strength and Coordination**
- After a stroke, muscles may show differing amounts of strength. For example, in the leg, some muscles may be stronger than others. It is also important to learn how smoothly, precisely and rapidly muscles can work together (**coordination**). Damage to certain parts of the brain, such as the cerebellum, may result in slow, jerky or difficult-to-control movements. Treatment approaches to improve strength and endurance include the following:
1. **Sitting program.** Many patients are admitted with a limited tolerance for sitting upright, which limits their participation in activities. An occupational therapist will start a sitting schedule to increase the patient's tolerance to sitting upright throughout the day. The schedule is determined based on each patient's therapies and is monitored frequently to increase the tolerance for activity.
  2. **Aerobic activities** have the goal of increasing the heart rate over a short time. The patient is encouraged to maintain these activities on a treadmill, bike or arm bike for five to 20 minutes. The therapist monitors the intensity of the exercise and increases intensity as the patient is ready.
  3. **Exercise.** A therapist guides the patient in performing exercises that strengthen weakened muscles. For example, the therapist frequently has the patient perform activities standing on the impaired side to strengthen weakened limbs. To progress a patient to standing, a therapist uses a variety of equipment. They may begin with a tilt table, progress to a standing frame with a hydraulic lift, to a standing frame with bars and straps, and then standing with therapist's assistance.
  4. **Aquatic therapy** in the pool can be used to improve endurance as water provides resistance to movement so the patient must work harder to move. The buoyancy of the water also allows muscles to move more easily.
- Posture**
- The head, neck and trunk need to be properly positioned in order for the patient to sit, stand and use the limbs. Stroke can affect the muscles that control head, neck

and trunk positioning and can also disrupt the sense of being upright. Initially, the patient may not be able to keep the head or trunk straight without assistance and may require the use of positioning devices in the bed or wheelchair. Treatment approaches are described below:

- 1. Wheelchair positioning:** An appropriate seating system is very important for a patient who cannot move his or her body. A system with good support decreases spasticity by allowing the patient to sit comfortably. [see Figure 6.4]
- 2. Bed positioning:** A good bed-positioning program allows the patient to rest easily with the body supported in tone-reducing positions.



Fig. 6.4

### Balance

Everyone makes small adjustments to ensure their body position is in balance. After a stroke, patients may respond too quickly or slowly, or not at all, to maintain their balance. The therapist designs specific exercises that challenge patients to increase their ability to move while sitting, standing or walking. Balance reactions are reflexes that occur automatically when we lose our balance. These reflexes are often impaired in a patient with a stroke. Allowing the patient to move in a safe environment where balance reactions are challenged helps these reflexes to redevelop. Balance reactions need to be rapid to be effective in preventing a fall.

### RESPIRATORY SYSTEM

When a stroke occurs, the lungs and airway passages may be affected. Damage to areas within the brainstem, where the respiratory centers are located, may affect the quality and rate of respiration. Patients are also at risk of developing breathing problems due to being confined to a hospital bed and being immobile. For example, **pneumonia** can develop in people who are inactive or have weak breathing muscles or lungs. Pneumonia is a lung infection that occurs from pooling of secretions in the lung as a result of immobility, shallow breathing or a poor cough. A chest X-ray assists in diagnosis of pneumonia. Increased saliva, mucous secretions, food, fluids and swallowing problems can all cause **aspiration**, which is the presence of foreign material in the lungs. Due to respiratory problems, patients may be admitted with a **tracheostomy**, a small temporary opening into the trachea that provides a safe airway. The following are respiratory therapy procedures that may be used with patients who have a tracheostomy.

#### Respiratory Therapy Procedures

- 1. Suctioning** involves placing a tube attached to a suction machine into the patient's trachea through the tracheostomy. This clears the airway by removing secretions and fluids when the patient is unable to do so by coughing.
- 2. A nebulizer** treatment gives medication as a fine mist that is breathed into the lungs through the tracheostomy or a face mask.
- 3. A Passy-Muir Valve** (PMV valve or speaking valve) placed on the tracheostomy tube allows the patient to speak. Initially, the PMV is used only during therapy with the speech-language pathologist or with the respiratory therapist. Use of the PMV is the first step in weaning the patient from the tracheostomy.
- 4.** The respiratory therapist will also check the oxygen content of the blood using a **pulse oximeter**.

## CIRCULATORY SYSTEM

### Cardiovascular Problems

If the brainstem is impacted by a stroke, the functions of the cardiovascular system may be altered. Often the heart beats faster and blood pressure increases (**hypertension**). Other cardiovascular problems include low blood pressure (**hypotension**) or **deep vein thrombosis (DVT)**.

Sometimes hypotension occurs when a person changes body position. This is referred to as **orthostatic hypotension**. A rapid change from lying in bed to sitting or standing may cause a sudden drop in blood pressure. Symptoms include dizziness, clamminess and pale complexion. Slowly coming to a sitting or standing position usually prevents the sudden drop in blood pressure. Also, measures such as wearing compression stockings and an abdominal binder may be used to prevent blood from pooling in the lower limbs.

A deep vein thrombosis, or blood clot, may result from prolonged bed rest, immobility or trauma to the blood vessels. The blood clots most commonly form in the legs when blood flow is sluggish. **Doppler ultrasound** is used to diagnose blood clots in the legs. Physical activity, range-of-motion exercises and elastic stockings can help prevent blood clots from developing. When deep vein thrombosis occurs, medical management involves **anticoagulant therapy (blood thinners)**, including medications such as Coumadin® or Lovenox®, or placement of an inferior vena cava filter.

### Hypertension

When the heart pumps blood through the arteries, the blood presses against the walls of the blood vessels. In people with hypertension, this pressure is abnormally high. Several classes of drugs are used to treat hypertension, including: **angiotensin-converting enzyme (ACE) inhibitors, angiotensin receptor blockers (ARBs), diuretics, beta-blockers** and **calcium channel blockers**. The medication a patient is started on depends on numerous factors, including ease of use, side effects and other medical conditions.

Lifestyle modifications can also be used to lower blood

pressure. In patients who require medication, lifestyle modifications may reduce how much medication is needed. Losing weight, increasing physical activity, restricting salt intake and limiting alcohol consumption are important ways to decrease hypertension.

## DIGESTIVE SYSTEM

Good nutrition and adequate fluid intake are essential for maintaining one's health and recovering from a stroke. Following a stroke, a person's appetite and eating habits may change. The person may have an increase or decrease in appetite. Depending upon the specific areas of the brain that are damaged, the person may have difficulty in chewing or swallowing, or may not even want to eat.

### Eating and Feeding

The senses of taste, smell and sight may be affected by a stroke. Eating may be difficult because of poor control of the head and neck or uncoordinated arm and hand movements. Even if the chewing, swallowing and feeding processes are unaffected, thinking or behavior problems may cause problems with eating. For example, the person may forget to eat or be easily distracted when they begin to eat.

If the chewing or swallowing process is affected (**dysphagia**), other ways of providing nutrition and fluids may be necessary, depending on the severity of the dysphagia. These methods include use of a nasogastric (NG) tube or a gastrostomy (PEG) tube. The NG tube passes through the nose and throat and then into the stomach or small intestine. The gastrostomy tube is surgically placed directly through the abdomen. Nasogastric tubes can cause discomfort and may come out, and can also cause complications if they remain for over a few weeks. This is a reason why gastrostomy tube placement is often preferred in patients requiring tube feeds for extended periods of time.

### Swallowing

Once a patient regains consciousness, swallowing can still be difficult. The speech-language pathologist evaluates a patient's ability to swallow before feeding begins. The speech-language pathologist will assess

the patient's mouth, tongue, palate movement and swallowing reflex.

Frequently, a **modified barium swallow (MBS) test** will be used to diagnose the patient's swallowing problems. Another test, the FEES (fiberoptic endoscopic evaluation of swallow) involves placement of a camera through the nose into the airway to monitor swallow function. The speech-language pathologist will create a treatment plan based on a patient's specific swallowing or feeding difficulties. The treatment plan may include altered diet or liquid consistency, strategies and exercises to improve swallowing, strength and safety.

Nurses are also involved in the patient's nutrition. They assist the person with setting up the meal, feeding or assisting as needed, and monitor the swallowing process. The family is encouraged to participate in the feeding process, with training from the speech-language pathologist. It is a good opportunity to learn special techniques while someone is present to answer questions and offer assistance. Nursing staff will monitor the person's weight and report any changes to the doctor.

### Oral Hygiene

Good **oral hygiene** helps with health, good nutrition, appearance and self-esteem. Some people can perform oral hygiene by themselves while others will need assistance. Each patient will receive special instructions on how to perform proper oral hygiene.

Regular oral hygiene is necessary even if the person has a nasogastric or gastrostomy tube. Sometimes a **suction toothbrush**, a special toothbrush that removes saliva and water from the person's mouth, must be used if the person has difficulty swallowing. Some medicines can cause bad breath or a dry mouth. Sometimes the tongue becomes coated with a thick white substance, a condition called thrush. This can be removed gently with a washcloth and is managed through regular oral care, but sometimes requires a medication to treat.

### Nutrition

Some people with a stroke require special diets. For example, a person with diabetes requires a diet limited

in sugar content. The need for calories after the injury is far greater than before the injury. Following a stroke, a person may lose body weight. Several variables that need to be assessed are age, height, weight, activity level, type of injury and pre-injury eating habits. The dietitian will help plan a proper diet to meet the special nutritional needs of the person with stroke.

Diabetes is a result of problems with the hormone **insulin**. Cells need **glucose** to produce energy. Insulin controls the amount of glucose in the blood. Insulin also controls the rate at which glucose is absorbed into cells. In people with diabetes, glucose builds up in the bloodstream instead of being used by cells. This leads to abnormally high levels of glucose in the blood, which can damage blood vessels. This may cause heart disease and stroke. It is important for people with diabetes to control their blood sugar. Simple blood tests are used to monitor glucose levels. Diabetes treatment involves administration of insulin, diet management and exercise.

A high cholesterol level leads to the buildup of fat deposits in the arteries. This blocks blood flow to the brain, heart and other organs. It is one of the primary causes of stroke and heart disease. Cholesterol levels are measured by a blood test. Cholesterol levels can be controlled by medications and changes in diet.

### Bowel Management

After a stroke, a patient may lose control over his or her bowels. Each person usually has a regular schedule for bowel movements, but the frequency of bowel movements varies greatly for each individual. People may be in the habit of emptying their bowels more than once a day, once a day at a regular time or once every few days.

A stroke may disrupt this schedule. A new pattern may need to be established to meet the demands of a different level of activity or to maintain continence between bowel movements. A bowel program is a routine to reestablish regular bowel movements and avoid bowel incontinence. The patient is given high fiber foods, and fluids are closely monitored. Medicines such as a stool softener and a laxative may be used and, if necessary, a suppository can be given.

The goals of a regular bowel program are to:

- Establish a regular, convenient routine (for planning of daily activities)
- Allow for personal control and independence
- Avoid incontinence or bowel accidents
- Prevent constipation by maintaining intake of adequate fluid and fiber, either orally or through a feeding tube

## GENITOURINARY SYSTEM

### Bladder Management

A large proportion of stroke patients have issues with bladder function. Signals travel to the brain from the bladder to indicate how full it is and the brain in turn sends signals down encouraging the bladder to contract (squeeze) and muscles at the bladder neck to relax or tighten depending on whether an individual wants to void. This complex system is often disrupted in individuals suffering from stroke and can lead to many problems. Problems may include the inability to void (urinary retention), variations in urinary frequency, and incontinence. In addition, functional problems such as difficulty transferring out of bed or an inability to communicate the need to void (i.e., patients with speech difficulties) can make development of a bladder management program more difficult.

A complex neurologic system is involved in the management of bladder function and it is often difficult to determine the exact reason an individual is having urinary issues. For this reason, a consultation with a urologist trained in neurologic disorders may be made. The urologist performs urodynamic studies, using a variety of techniques to evaluate bladder function. Based on the findings of these tests, further guidance can be given as to whether any medication or other interventions may be helpful for treatment.

Urodynamic studies are usually done a few months after a stroke. In the interim, conservative means can be utilized to help in the establishment of a regular bladder regimen.

The goals of a bladder management program are to:

- Manage the bladder with the least embarrassment and inconvenience to the person and family
- Increase the patient's awareness of bladder distension signals
- Reduce chances of urinary tract infection
- Protect skin in the groin area

### Bladder Management Program

- 1. Toileting schedule.** The urinal or commode is offered to the person at regular intervals while awake (also known as timed voiding). This helps increase awareness of the function.
- 2. An external or condom catheter** may work for men with problems with incontinence. The catheter is worn over the penis and is connected to a bedside drainage bag while the patient is in bed, or to a leg bag when out of bed. These bags are emptied periodically. Disadvantages of these catheters is the unavailability of a adequate system for females and an increased risk for urinary tract infection.
- 3. A Foley catheter** is a rubber tube that has one end in the bladder and the other connected to a collecting bag. It prevents skin breakdown from incontinence but also increases the likelihood of urinary infection. If used for a long period, it can cause the bladder to lose elasticity.
- 4. Disposable briefs** may be used if the person is incontinent for both bladder and bowel. Briefs are also the preferred method of managing the bladder in a woman while training for bladder continence.
- 5. An intermittent catheterization program (ICP)** is used when the bladder does not empty completely. A bladder scanning procedure is used to determine the amount of urine in the bladder and a catheter is placed directly into the bladder at regular intervals. An intermittent catheterization routine replaces natural bladder emptying and reduces the risk of infection. Good hygiene also reduces the chance of infection. Adequate fluid intake (2 to 3 quarts each day) is important to flush the kidneys and decrease chances of urinary infection.



Signs and symptoms of possible infection include:

- Urine that appears dark and cloudy or contains sediment
- A burning sensation or discomfort during urination
- High fever
- Decreased amounts of urine
- Pain in the bladder or lower back
- Fatigue
- Headache
- Increased confusion

Urine samples are tested to determine whether a patient has a **urinary tract infection (UTI)**, and medications are then used to treat the infection. Medication choice is dependent on the bacteria being treated.

## SEXUALITY

A stroke can alter the way a person experiences and expresses sexuality. Common sexual problems include reduced sex drive (**libido**), erectile problems, inability to reach orgasm, reduced frequency of sex and behaving inappropriately.

Certain parts of the brain are critical in regulating and controlling sexual activity. If these areas are damaged, a person may experience problems having sex. Additionally, the physical problems following a brain injury, such as weakness on one side of the body, changes in sensation and bowel and bladder function will change how sex is experienced. Finally, cognitive and language difficulties, including memory impairment, poor attention, difficulty in planning, reduced ability to comprehend and express thoughts, lack of judgment and poor organization can have a direct impact on sexual functioning and sexual expression.

Other factors can also contribute to sexual problems:

- **Emotions:** depression, anxiety and stress reduce sex drive.
- **Medications:** Certain drugs reduce libido.
- **Relationship issues:** a couple experiencing problems is less likely to have sex.
- **Prior sexual problem:** a stroke can accentuate any sexual problems the person was having before the stroke.

- **Reduced confidence:** a person may feel less confident or attractive after the stroke.
- **Other illnesses:** diabetes and hypertension can decrease libido.

Other problems may occur during sexual activity, such as becoming distracted, talking aimlessly, displaying excessive fatigue, becoming confused, lacking emotional sensitivity, touching that is awkward or too rough and neglecting the needs of the partner.

There are effective treatments for these sexual problems, which usually involve a combination of medications, behavioral programs and counseling. For family members, understanding the changes and being able to support the person while setting limits is a good place to start.

## SKIN

As a result of decreased movement or spasticity, some persons with stroke may have skin problems. If these patients are not repositioned or assisted to reposition, the prolonged pressure to one area can shut off blood circulation in the skin and eventually cause a **decubitus (pressure) ulcer**. The areas most sensitive to skin breakdown are over bony areas like the hips, elbows, back, buttocks, ankles and heels. If pressure is not relieved or the area remains red for more than 20 minutes, there is the danger of skin breakdown.

Some people with stroke will display agitated, restless behavior. This increased movement is often accompanied by a decreased awareness of discomfort or pain. With this type of behavior, **friction burns** may be caused by continuously rubbing the arms and legs on bed sheets. Bruises may result if the person thrashes about in an agitated state hitting arms and legs against the side rails of the bed or wheelchair parts. Skin problems may also develop in the person who is incontinent of bowel and bladder.

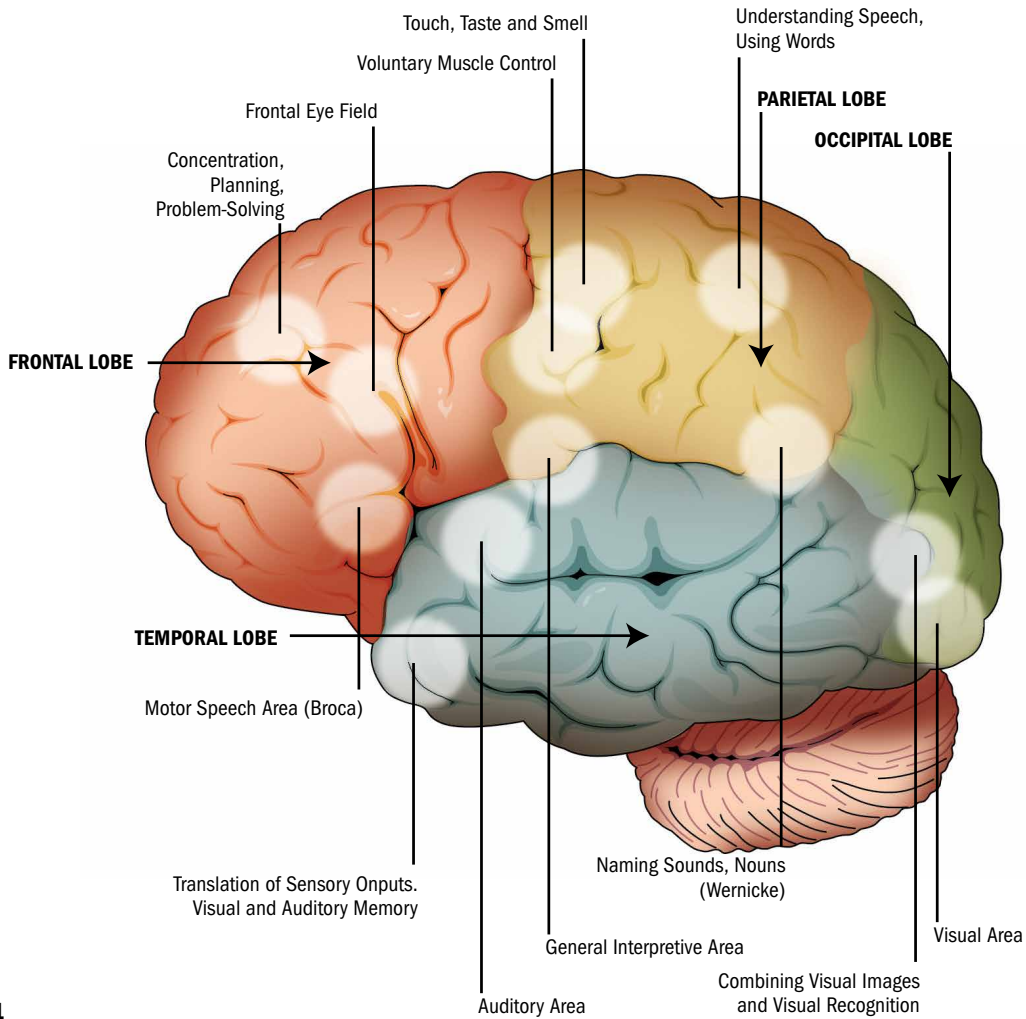
Skin management includes the following:

- Keep the skin as clean and dry as possible.
- Check the temperature of bath and shower water to prevent burns.
- Avoid using extra soap, powder or alcohol-containing lotions, as these dry out the skin.
- Keep clothes and sheets dry and change them if they become soiled with urine, sweat or feces.
- Check the skin at least twice a day (morning and night) for redness, paleness, bruises, scratches, rashes or blisters.
- Should a rash occur, expose the area to as much air as possible to help reduce the rash.
- Use appropriate padding in the bed or wheelchair.
- Use seat belts to prevent the patient from falling out of the wheelchair.
- Change positions often for those patients unable to move freely in bed. In the beginning, they should be turned every two hours. Once adequate bed mobility skills are developed, a turning schedule may no longer be necessary.
- Follow a prescribed sitting schedule.
- Use a special seat cushion for the wheelchair when appropriate to provide adequate tissue-pressure distribution.
- Maintain good nutrition. Both food and fluids help maintain healthy skin.
- Transfer the patient by lifting, not dragging, over surfaces. A sliding board may be used to slide the patient from bed to chair and back. It is important to protect the skin with clothes.

Rehabilitation after a stroke focuses on helping the patient regain lost skills, treating functional disabilities that result from a stroke and working to increase the patient’s independence. After a stroke the patient may have loss of muscle movement, difficulty walking or swallowing, thinking difficulties, pain and changes in behavior. Every person’s recovery is different. How well a patient recovers from a stroke depends on which part of the brain and how much of the brain was damaged or affected. Fig. 7.1 details the areas of the brain and their

specific functions. There are medications that can help aid in the recovery process.

Medicine is one of the best tools the doctor has to treat a stroke. Taking medication as the doctor has prescribed will assist in improving health and speed of recovery. In this section, medications will be discussed in detail for various medical conditions that patients with a stroke may experience.



**Fig. 7.1**

**STROKE PREVENTION MEDICATION**

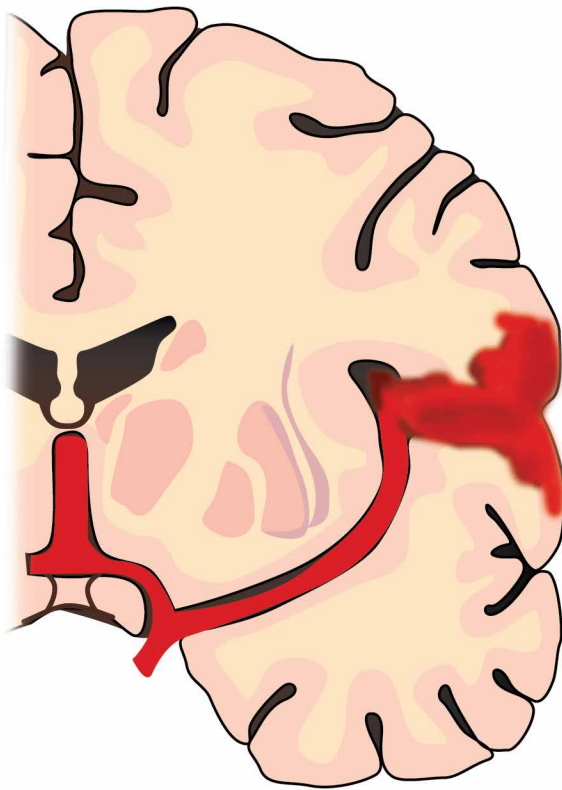
Antiplatelet Agents	Cholesterol Lowering Agents	Clot Preventing Agents	Blood Pressure Lowering Agents
Aspirin	Atrovastatin (Lipitor®)	Enoxaparin (Lovenox®)	Lisinopril (Prinivil®)
Dipyridamole/Aspirin (Aggrenox®)	Simvastatin (Zocor®)	Warfarin (Coumadin®)	Metoprolol (Lopressor®)
Clopidogril (Plavix®)	Rosuvastatin (Crestor®)	Rivaroxaban (Xarelto®)	Hydrochlorothiazide

**Antiplatelet Medications**

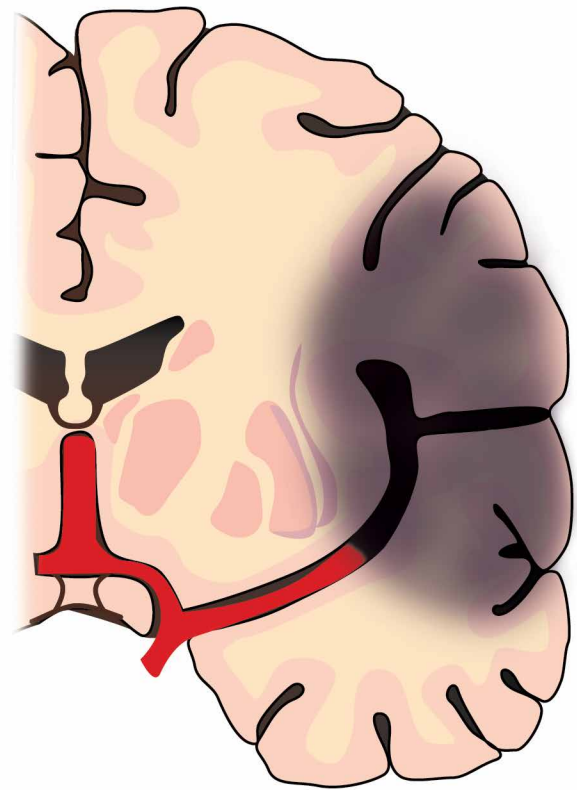
Antiplatelet medications prevent platelets in the blood from sticking together and forming clots. If someone had a stroke due to a clot in the brain, the doctor will decide if taking an antiplatelet medication will help prevent another clot from forming [See Fig. 7.2]. Examples include **aspirin** and **Aggrenox®** (aspirin and

dipyridamole). **Clopidogril** (Plavix®) may be used for people who cannot take aspirin.

Call a doctor right away if any unusual bruising or bleeding occurs.



Hemorrhage - blood leaks into brain tissue.



Clot stops blood supply to an area of the brain.

**Fig. 7.2**

**Cholesterol Lowering Medications**

These medications help lower cholesterol (a fat-like substance found in the blood) and can help prevent another stroke [See Fig. 7.3]. Lowering cholesterol helps to reduce the risk of heart attacks in patients who have heart disease or are at risk for developing heart disease.

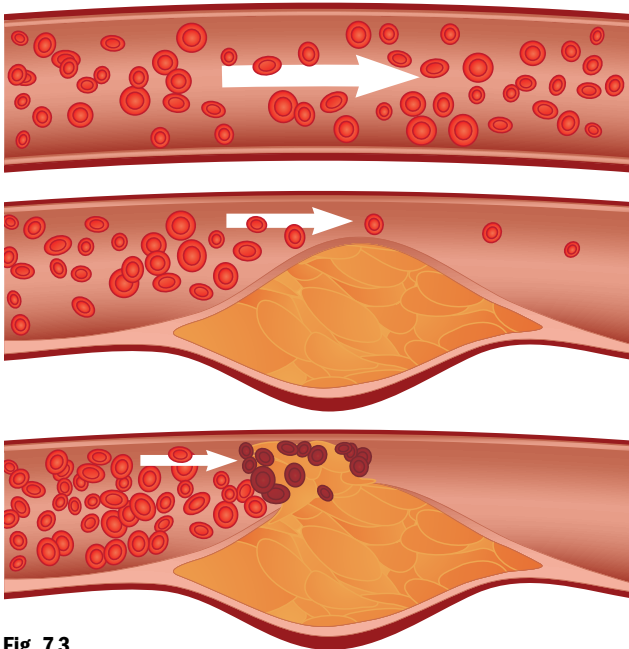


Fig. 7.3

Two of the medications used to lower cholesterol are **atorvastatin** (Lipitor) which can be taken at any time during the day and **simvastatin** (Zocor) which must be taken at bedtime. Drug levels of medications can be increased by grapefruit juice, so avoid drinking large quantities of grapefruit juice when taking this type of medication.

Call a doctor if new muscle weakness or muscle pain occurs at rest.

**Blood Clot Treatment and Prevention Medications**

Blood clots usually develop in the legs, but can also develop in the arms [See Fig. 7.4]. Certain individuals have underlying medical conditions that make it more likely for them to develop clots. These include mechanical heart valves, atrial fibrillation, a decrease in physical activity, blood pooling from prolonged bed rest, and cancer. Clots are dangerous because they can block the flow of blood to organs or tissues like the heart,

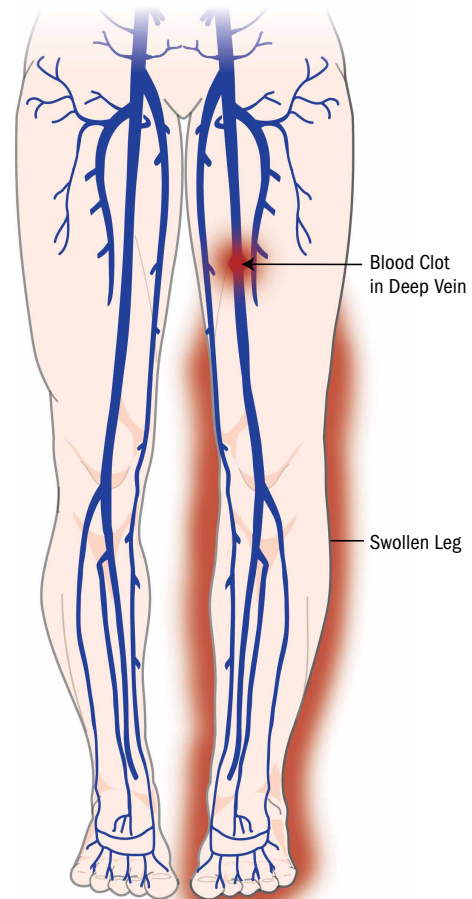


Fig. 7.4

brain, lungs and legs.

Medications called anticoagulants, also known as blood thinners, can be used to prevent and treat a blood clot. These medications do not actually thin the blood but increase the time it takes for a blood clot to form. They help prevent existing blood clots from becoming larger and prevent new ones from forming.

**Enoxaparin** (Lovenox) is an injectable blood thinner used to treat and prevent blood clots. Enoxaparin administration is detailed below:

1. Wash hands. Clean the area of skin with alcohol where the shot will be given (stomach area). The site of the injection should be alternated with each shot.
2. Look at the syringe to be sure the drug is clear and colorless or pale yellow.
3. Take the cap off of the needle. Do not push any air or medication out of the syringe before giving the injection.

4. Lie down and pinch a fold of skin between fingers and thumb. Push the entire needle into the skin and then press down on the syringe plunger to inject the medication, holding onto the skin fold while the medication is being given.
5. Do not rub the site after the shot is given. Rubbing the injection site may increase the chance of bruising.

**Warfarin** (Coumadin) is a blood thinner that can be taken by mouth. It is very important to remember that when warfarin is being taken, the doctor will draw blood to monitor how well the medication is working to treat or prevent the formation of a blood clot. The monitoring test is called an INR and it tells the doctor how well the medication is working.

The amount of vitamin K in one’s diet can slow down how well warfarin works to thin the blood. Vitamin K is usually found in green leafy vegetables. It is important to always eat the **same amount of green leafy vegetables regularly**. The doctor should be notified if drastic changes are made to one’s diet.

**Rivaroxaban** (Xarelto) is a blood thinner taken by mouth. It is used to thin the blood so clots will not form. It will also treat clots that have already formed. The medication can be taken with or without food. If someone was prescribed more than 15 mg per day it is recommended that the medication be taken with food.

It is important to try to take any prescribed blood thinners at the same time every day. Also, a person taking blood thinners may bruise more easily. Be sure to notify the doctor of any unexplained bruising, a nose bleed that cannot be stopped, gums bleeding while brushing teeth, red or pink-tinged urine, or dark or black stools. The doctor should be notified immediately if bleeding from a cut will not stop.

**High Blood Pressure Management Medications**

A doctor may prescribe a medication to help maintain blood pressure at a safe level after a stroke. Controlling blood pressure will help to prevent the occurrence of a second stroke.

**Lisinopril** (Prinivil®) works by causing the blood vessels to relax and make it easier for the blood to pass through them.

**Metoprolol** (Lopressor®) works by slowing down fast heart beats and relaxing blood vessels to lower blood pressure.

**Hydrochlorothiazide** prevents the body from holding onto too much water. Take hydrochlorothiazide with meals early in the day to avoid the need to go to the bathroom during the night.

Common side effects for these blood-pressure medications are dizziness, fainting, low blood pressure when sitting or standing, nausea, slow heart rate and headache.

A doctor should be notified if swelling of the legs, face, mouth or tongue, difficulty breathing, prolonged dry cough, severe dizziness or skin rash is observed.

**MEDICATIONS FOR INCREASED CONCENTRATION AND WAKEFULNESS**

<b>Methylphenidate (Ritalin®)</b>
<b>Modafinil (Provigil®)</b>
<b>Armodafinil (Nuvigil®)</b>
<b>Amantadine (Symmetrel®)</b>

After a stroke, it may become more difficult to concentrate and focus on daily tasks. It can also become more difficult to stay awake during the day and sleep at night. These medications are used to help one stay awake during the day and focus on therapy and daily tasks.

Many of these medications are classified as stimulants. They work by changing the amounts of certain chemicals in the brain that affect awareness, alertness and the ability to focus on tasks. These medications are taken early in the day to prevent side effects such as difficulty falling asleep or staying asleep, and loss of appetite. If these medications are prescribed to be taken twice daily, the first dose should be taken first thing in the

morning and the second dose should be taken no later than noon or 1 p.m. to allow the patient to be able to go to sleep at night. If the patient has problems controlling blood pressure, the blood pressure should be monitored after starting this type of medication and the doctor should be advised of any changes in blood pressure.

Common side effects include difficulty falling asleep or staying asleep, loss of appetite, headache, nervousness, dizziness, anxiety, nausea, high blood pressure and high heart rate.

**MEDICATIONS TO TREAT DEPRESSION OR MOOD IMBALANCE**

<b>Escitalopram (Lexapro®)</b>
<b>Citalopram (Celexa®)</b>
<b>Sertraline (Zoloft®)</b>
<b>Fluoxetine (Prozac®)</b>
<b>Mirtazapine (Remeron®)</b>
<b>Duloxetine (Cymbalta®)</b>
<b>Venlafaxine (Effexor®)</b>

With the life changes that accompany stroke recovery, some patients may become sad or depressed at the new challenges they are facing. Symptoms of depression may include a loss of interest in things that were once pleasurable, feelings of sadness or hopelessness and sleep problems.

Depending on where the stroke occurred in the brain, chemical imbalance can cause mood changes. A person may lack emotional responses such as smiling, laughing, crying, anger or enthusiasm, or these responses may be inappropriate. This may be especially true during the earlier stages of recovery. Medications can help overcome the mood imbalance and help with the recovery process. The above-listed medications take four to six weeks before the full effects of the drugs are observed.

**Mirtazapine** (Remeron) can help improve appetite and sleep, along with mood. **Duloxetine** (Cymbalta) and venlafaxine (Effexor) can help with mood and pain control.

Common side effects include trouble with sleep, dry mouth, nausea, diarrhea, sweating, dizziness, high or low heart rate, increase blood pressure, or sex problems.

**MEDICATIONS FOR INCREASED MEMORY**

<b>Donepezil (Aricept®)</b>
<b>Memantine (Namenda®)</b>

Memory loss can occur as a result of damage to the brain. The patient may have trouble remembering old information, new information, or have trouble with learning new skills. Some medications can help increase the ability to remember activities that will help in functioning independently throughout the day.

Both **Donepezil** (Aricept) and **Memantine** (Namenda) take time for their effects to be noticed and may not be helpful in all patients. If no improvements are noted in six to eight weeks, talk to the doctor about increasing the dose or stopping the drug.

Common side effects include increased wakefulness, weight loss, nausea, diarrhea, headache, fatigue, low blood pressure or high blood pressure, low heart-rate, dizziness and confusion. Notify the doctor immediately of any seizure activity or changes with eye sight.

**MEDICATIONS FOR SEIZURE TREATMENT AND PREVENTION**

<b>Levetiracetam (Keppra®)</b>
<b>Phenytoin (Dilantin®)</b>
<b>Valproic Acid (Depakene®)</b>
<b>Divalproic Acid (Depakote®)</b>

Any type of injury to the brain including a stroke can increase one’s risk of having a seizure. A seizure is identified as episodes of abnormal brain activity that

cause changes in attention, behavior, or movement. The doctor will decide if medication is needed to help prevent seizures from occurring.

Anyone taking seizure medication should wear a **medical alert tag** or carry an **ID card** stating seizure medication has been prescribed. It is also important to inform all medical care providers that a seizure medication has been prescribed.

**Phenytoin** (Dilantin), **Levetiracetam** (Keppra), **Valproic Acid** (Depakene) and **Divalproic Acid** (Depakote) are used to treat and prevent seizures. If the patient has a feeding tube to receive nutrition and medications, **phenytoin** can be affected by the formula that is received. Be sure to ask the doctor and pharmacist for instructions on when to take phenytoin when a feeding tube is used for giving medications.

The doctor will need to check blood levels when starting seizure medications and periodically throughout the year. This is to make sure there is the right amount of drug in the body to help prevent seizures.

Common side effects of seizure medications include drowsiness, slurred speech, swollen or tender gums, headache, agitation, dizziness and vomiting. Call a doctor immediately or get emergency help if there are any signs of fever; restless muscle movement in the eyes, tongue, jaw or neck; confusion; or skin rash.

**MEDICATIONS TO TREAT ANXIETY AND AGITATION**

Agitation Agents	Anxiety Agents
Quetiapine (Seroquel®)	Lorazepam (Ativan®)
Ziprasidone (Geodon®)	Diazepam (Xanax®)
Risperidone (Risperdal®)	Clonazepam (Klonopin®)

It is not uncommon for patients to have anxiety, an overwhelming sense of fear or worry, after a stroke. They may also experience agitation, a feeling of restlessness or increased irritability. The doctor may prescribe medications to help control this anxiety and agitation.

**Quetiapine** (Seroquel), **ziprasidone** (Geodon) and **risperidone** (Risperdal) are used to treat symptoms of agitation, abnormally excited or irritated mood, and inappropriate behavior and emotions. These drugs work by changing the action of chemicals in the brain that affect behavior.

Common side effects of these drugs include increased blood pressure, sleepiness, headache, agitation, dry mouth, jerky and uncontrollable muscle movements, increased appetite, increased blood sugars and increased cholesterol levels.

**Lorazepam** (Ativan), **diazepam** (Valium) and **clonazepam** (Klonopin) are medications used to help with anxiety by calming the brain. They can cause confusion and slowed breathing in some patients. Dependence can form if these drugs are used for long periods.

Call the doctor immediately if trouble breathing, slowed breathing or extreme sleepiness occurs. Do not take with alcohol.

**MEDICATIONS FOR BLADDER CONTROL**

Oxybutynin (Ditropan®)
Tolterodine (Detrol®)
Solifenacin (Vesicare®)

After stroke, bladder control may become more difficult. The patient may be unable to control urination or have trouble completely emptying the bladder. The doctor

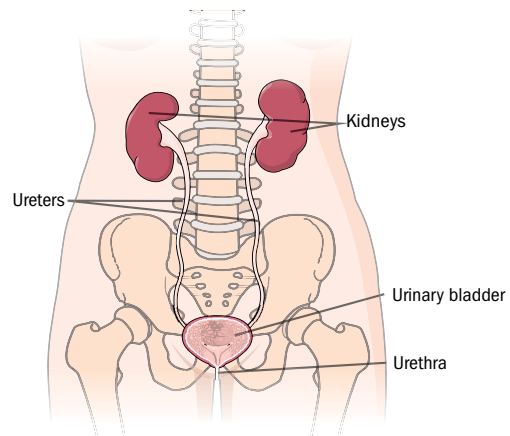


Figure 7.5 – Female Urinary System.



may prescribe medication to help control bladder function.[See Fig. 7.5]

These medications are used to control urgent, frequent or uncontrolled urination in people who have conditions that affect the bladder muscle. They work by relaxing the bladder muscles.

Common side effects include dizziness, sleepiness, dry mouth, constipation, headache, urinary hesitation and blurred vision.

**MEDICATIONS FOR BOWEL MOVEMENT CONTROL**

<b>Bisacodyl (Dulcolax®)</b>
<b>Senna Extract (Senokot®)</b>
<b>Glycerin/Docusate Enema (Enemeez®)</b>
<b>Docusate Sodium (Colace®)</b>

After a stroke, it can become more difficult to control bowel function, including an inability to have a regular bowel movement or inability to control when a bowel movement occurs. Medications can help control bowel movements, prevent constipation and decrease the chance of bowel accidents [See Fig. 7.6].

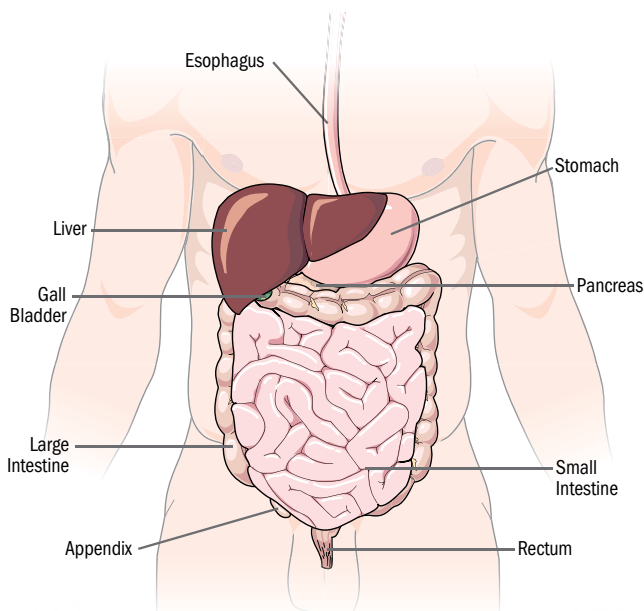


Fig. 7.6

**Bisacodyl** (Dulcolax) is a stimulant laxative. It works by increasing action in the intestines to cause a bowel movement. Bisacodyl is available as a pill to be taken by mouth or as a suppository that is inserted into the rectum. *Suppository Administration* – Remove the foil wrapper prior to inserting into the rectum. Common side effects include stomach cramps, stomach discomfort and rectal irritation.

**Senna Extract** (Senokot) is a stimulant laxative that works by increasing the movement in the intestines to cause a bowel movement. It is important to take **Senna Extract** eight to 12 hours prior to the bowel suppository or mini-enema administration. It will take the **Senna Extract** eight to 12 hours to work. Common side effects include change in the color of urine to brown, stomachache, nausea and stomach cramps. Call the doctor if no bowel movement has occurred in several days or if discomfort occurs.

**Glycerin/Docusate Enema** (Enemeez) contains a lubricating laxative and a stool softener. It works by increasing action in the intestines to cause a bowel movement. *Suppository Administration* – Clip the tip off the enema, insert the tip of the tube into the rectum and squeeze the contents into the rectum. Common side effects include rectal irritation, gas and stomach cramps.

**Docusate Sodium** (Colace) is a stool softener used to prevent constipation. It works by drawing water into the stool to soften it and when taken daily can help to prevent constipation. This medication is available as capsules or as a liquid that can be taken by mouth. The liquid can also be given through a feeding tube. Common side effects include stomach cramps, nausea and vomiting. Taking the liquid by mouth may cause throat irritation.

**MEDICATIONS TO TREAT MUSCLE SPASTICITY**

<b>Baclofen (Lioresal®)</b>
<b>Tizanidine (Zanaflex®)</b>
<b>Botulinum Toxins (Botox, Dysport®, Xeomin®)</b>
<b>Aqueous Phenol Injection</b>

Muscle spasticity is caused by damage to the part of the brain that controls muscle movement. The muscles can become tight and decrease one’s ability to perform normal activities. If severe, muscle spasticity can cause a decrease in flexibility, changes in posture and joint pain, which can lead to lack of or diminished independence.

**Baclofen** (Lioresal) is available as a tablet and as an injection. Baclofen injection is delivered directly to the spinal cord by a special pump that is surgically implanted inside the body. By inhibiting muscle spasms, tightness and pain, baclofen may improve one’s ability to perform daily tasks. The tablet form of baclofen is taken by mouth with doses spaced out during the day. Do not suddenly stop taking baclofen. A sudden stop in taking this medication may result in increased muscle spasms, increase blood pressure and other life-threatening events. This medication should only be stopped under a doctor’s supervision and the dose will slowly be lowered over time until it is safe to stop taking it completely. Common side effects include drowsiness, muscle weakness, low blood pressure and fatigue.

**Tizanidine** (Zanaflex) is used to stop muscle spasms and decrease muscle tightness and is administered orally. Common side effects include low blood pressure, dry mouth, sleepiness and weakness.

**Botulinum Toxins** (Botox, Dysport, Xeomin) are injected into the muscle that is experiencing the most spasms. A change in muscle spasms should be noticed within 10 days to two weeks after injection. This decrease in spasticity will last for up to three months. The doctor may need to repeat these injections, usually every three months. Contact a doctor immediately or get emergency help if problems with swallowing or breathing, swelling or vision changes occur. Common side effects include pain, headache, difficulty swallowing, neck pain, blurred vision and generalized muscle weakness. Side effects usually occur within one week and may last up to several months.

**Aqueous Phenol Injections** are injected by a doctor into the muscle that is experiencing the most spasms. The phenol injection will decrease muscle spasms and

increase one’s ability to perform activities of daily living. The medication may work to prevent muscle spasms for up to six months. Common side effects include pain during injection, burning and/or swelling at the injection site.

**MEDICATIONS TO TREAT NERVE PAIN**

Seizure Medications	Depression Medications	Topical Medications
Gabapentin (Neurontin®)	Duloxetine (Cymbalta®)	Lidocaine Patch (Lidoderm®)
Pregabalin (Lyrica®)	Amitriptyline (Elavil®)	Capsaicin Patch (Quetenza®)
Levetiracetam (Keppra®)	Nortriptyline (Pamelor®)	Capsaicin Cream (Zostrix®)

**What is nerve pain?** Nerve pain is also called neuropathic pain. Nerve pain is caused by nerve damage or a problem with the nervous system. Nerve pain is usually a burning or stinging sensation. The pain can be felt all the time, or it can come and go. Nerve pain is usually worse at rest and at night. For some people with nerve pain, a gentle touch can be very painful. Muscle aches and pain feel different than nerve pain, more like an achy soreness that is better with rest and a decrease in movement.

Most medications that are used to treat nerve pain are also used to treat other conditions. Doctors treat neuropathic pain with medicines for depression, because they work on areas of the brain that process pain. Doctors also treat neuropathic pain with medicines that prevent seizures, because they help with overactive nerves. Some people can get some relief from nerve pain using topical medications.

**Gabapentin** (Neurontin) and **Pregabalin** (Lyrica) are seizure medications that work by calming the nerves. They are the preferred treatment for nerve pain. They can take time to work and the doctor will slowly increase the dose as the patient can tolerate it. Common side effects include drowsiness, dizziness, weight gain, nausea, and swelling of the hands and feet. Do not stop taking these medications without talking with the doctor.

**Duloxetine** (Cymbalta), **amitriptyline** and **nortriptyline** are usually used to treat depression. They work in nerve pain by regulating chemicals in the brain that deal with pain. Common side effects include drowsiness, dizziness, constipation, headache and weight gain. Do not stop taking these medications without talking with the doctor. Call the doctor immediately if heart palpitations and shortness of breath occur.

Topical medications such as a **lidocaine patch** (Lidoderm), or a **capsaicin patch** or **cream** (Zostrix) are used to treat nerve pain by helping take away the feeling of pain in the affected area. A **lidocaine patch** should only be used for 12 hours and then taken off for the next 12 hours. A **capsaicin patch** is applied by the doctor for only one hour but its effect can last up to three months. Apply **capsaicin cream** with gloves on to avoid a burning sensation in the hands. Common side effects include rash and skin blisters at the application site, and/or a burning sensation.

**MEDICATIONS TO TREAT MUSCLE ACHES AND PAIN**

Anti-Inflammation Agents	Opioids	Topical Medications
Ibuprofen (Advil®, Motrin®)	Hydrocodone/Acetaminophen	Lidocaine Patch (Lidoderm®)
Naproxen (Aleve®)	Oxycodone	Diclofenac Patch (Flector®)
Meloxicam (Mobic®)	Morphine	Capsaicin Cream (Zostrix®)
	Methadone	Diclofenac Gel (Voltaren®)

**Muscle and bone pain:** This type of pain is also called musculoskeletal pain. It usually feels like an achy soreness. This pain can be present in many different areas of the body, such as in muscles, bones or joints, or in the areas which connect muscles and bones together. Muscle and bone pain usually gets better with rest and decreasing movement of the injured area.

The doctor can choose from many different medications to treat pain. It is important for a patient to describe the pain to the doctor so the right medication can be chosen

to control it. For mild pain, the doctor may recommend Tylenol®, an anti-inflammation agent, or a topical cream or patch. More severe pain may require a stronger medication such as an opioid.

Common side effects include drowsiness, constipation, blood pressure changes and/or rash. Call a doctor right away if breathing difficulties, chest pain, confusion or severe constipation occur after using these types of medications.

**MEDICATIONS FOR LOW BLOOD PRESSURE MANAGEMENT**

Midodrine (Proamatine®)
Fludrocortisone (Florinef®)

Low blood pressure can occur after sitting or standing up suddenly. The reason this happens is because most of the blood goes to the legs due to gravity. One may feel dizzy or feel faint. Some people may need medications to maintain their blood pressure.

**Midodrine** (Proamatine) works by tightening the blood vessels, which causes the blood pressure to rise. Common side effects include high blood pressure, chills, rash and trouble falling asleep. Do not take this medication within four hours of bedtime or when lying down for a long time.

**Fludrocortisone** (Florinef) helps control blood pressure by controlling the amount sodium (salt) the body retains. Common side effects include dizziness, headache, swollen legs and increased blood pressure.

**MEDICATIONS TO TREAT SLEEPLESSNESS**

Zolpidem (Ambien®)
Escopiclone (Lunesta®)
Trazodone (Desyrel®)
Nortriptyline (Pamelor®)
Melatonin

After stroke, sleep may be affected due to disturbance

in the natural sleep/wake cycle in the brain. One may have trouble falling asleep at night or staying asleep, or may not feel rested when waking up. It may also become more difficult to stay awake during the day. It is not uncommon for the doctor to prescribe medications to assist in falling asleep and staying asleep through the night individually or in combination. Common side effects include dizziness, drowsiness in the morning, and headache. Do not drive or operate machinery after taking any of these medications. Do not use alcohol with these medications. Please call a doctor if confusion or memory problems develop after taking these medications.

**FREQUENTLY ASKED QUESTIONS**

**1. “My doctor said I should take this medication two times a day. When should I take it?”**

The time of day that is best to take medication will depend on the reason for the medication. For example, if the medication is prescribed for increasing wakefulness, it is best to take it early in the morning and again around noon. Taking the medication too late in the day may cause one not to sleep well at night. In general, it is best to evenly space medications during the day for medications that need to be taken more than once per day. Twice-a-day medication may be given at 9 a.m. and 9 p.m.

**2. “I have a lot of medications that I take once a day, is it OK for me to take all of my medications at the same time?”**

Talk to a pharmacist about when is best to take specific medications. For example, if aspirin is taken every day as well as ibuprofen when needed for pain, it is best to separate the time ibuprofen is taken from the time aspirin is taken by eight hours. Ibuprofen may decrease how well aspirin works to help prevent another stroke.

**3. “My family member cannot swallow his pills, he gets his medication through his feeding tube. Can I just put the pill in the feeding tube when I give him his formula food?”**

If your family member is not able to swallow his medication, you may be able to give his medication through

his feeding tube. First, check with your pharmacist to see if the medication is available in a liquid form; this will make it easier to administer.

Before giving a tablet through a feeding tube it must be crushed and mixed with water. If you have a capsule, you can open the capsule, mix its contents with water, and give that mixture through the feeding tube.

The medication should not be given with the tube feed. Depending on the medication, you may need to separate the time you give the tube feed and the medication by two or more hours. Talk to your pharmacist about how best to give your family member’s medication.

Not all medications can be given through the tube. For example, long-acting medications should not be crushed and given through the feeding tube. Talk to your pharmacist about your family member’s medication to make sure you are able to give it through the feeding tube.

**4. “I like to have a glass of wine with dinner. Can I take my medication and drink alcohol?”**

It is probably not a good idea to drink alcohol while taking your medications. Drinking alcohol may increase your risk of serious side effects when taking medications. It is always best to talk to your doctor and your pharmacist before taking any medication with alcohol.

**5. “My pharmacist gave me a generic medication and not the brand name medication my doctor prescribed. Will the generic medication work as well as the brand name medication?”**

Yes, the generic medication will work as well as the brand name medication. It contains all of the main ingredients of the brand name medication and the cost is much lower. Ask your pharmacist if your other medications are available in generic form to help save on medication costs.

**6. “Will all of my medications be covered on my insurance plan?”**

Talk to your doctor, case manager and social worker

about the medications your doctor has prescribed for you. Every insurance plan has a formulary of approved drugs and all medications are not covered on all insurance plans. Your doctor and your social worker can provide answers to your questions. It is also important to find out if your insurance plan provides discounts if the prescription is written for 90 days instead of 30 days.

**7. “What do I do if I miss taking my medication? Should I take it as soon as I remember?”**

Each medication is different and it depends on why you take the medication and the possible side effects of that medication. Always talk to your pharmacist about how you should handle a missing dose. It is different for each medication.

**8. “I see a heart doctor and a different doctor for my bladder problems, they both have prescribed multiple medications to take. My heart doctor gave me a medication for my blood pressure and my urologist gave me another medication that can also lower my blood pressure. Should I take both medications for my blood pressure?”**

It is important that every doctor that you see has a list of all of your medications. It is a good idea to write down a list of your medications and give it to each doctor when you have your appointments.

**9. “My family member has a hard time swallowing one of her medications. The tablet is just too big. Can I cut the tablet in half and give the two halves separately?”**

There are many medications that can be cut in half and then given one half at a time. It is important to ask your pharmacist first before cutting any tablet of medication into halves. You can also ask if that medication is available in liquid form.

**10. “My doctor said I need to take my medication on an empty stomach. When can I take my medication?”**

To be sure you are taking your medication on an empty stomach, it is best to take it one hour before you eat or two hours after you eat.

*There are many medications that are used to treat the medical conditions that may accompany or result from a stroke. If you have questions regarding your medications, your pharmacist can help you understand the indication for use, common side effects, drug-to-drug interactions, common dosing schedules and precautions for all medications your doctor may prescribe.*

**USEFUL REFERENCE WEBSITES:**

National Stroke Association. [www.stroke.org](http://www.stroke.org)

WebMD- Stroke Health Center. [www.webmd.com/stroke/stroke-treatment-directory](http://www.webmd.com/stroke/stroke-treatment-directory)

American Stroke Association. [www.strokeassociation.org](http://www.strokeassociation.org)

The urinary system includes the following:

- **Kidneys**

Two kidneys filter waste from the body and form urine. They also regulate water and electrolytes. If the kidneys are not working properly, waste products in the blood can build up, leading to a life-threatening situation.

- **Ureters**

The ureters are narrow tubes that carry urine from the kidneys down into the urinary bladder.

- **Urinary Bladder**

The urinary bladder is a round organ made up of muscle. The bladder expands as it fills up and contracts to empty urine. It can hold from 350 to 450 cc of urine (approximately 1½ cups) before it is ready to empty. Due to its flexibility, it can stretch to hold a much larger amount of urine, but if the bladder is allowed to overfill, it will become overstretched. If this occurs too often, the bladder muscle may become less flexible and lose its ability to work properly.

- **Urethra**

Urine passes from the bladder out of the body through a tube called the urethra. In men, this tube is about 6 to 8 inches long. Its outer opening, or urinary meatus, is at the tip of the penis. In women, this tube is about 1 to 2 inches in length. The urinary meatus is located just above the vagina.

- **Sphincters**

Two special muscles called sphincters control the flow of urine through the urethra to the outside of the body. The internal sphincter, which is controlled by nerve reflexes, is at the “neck” or base of the bladder. The external sphincter is a well-defined muscle that surrounds the urethra, and is located below the prostate gland in males. In females, it surrounds the middle of the urethra.

The external sphincter is controlled voluntarily (consciously). It usually stays tightly closed until it receives the proper signal from the nervous system to relax and allow urine to flow out of the bladder.

## HOW DOES THE BLADDER WORK?

### Non-neurogenic Bladder

A non-neurogenic (voluntary) bladder responds properly to brain signals to urinate or prevent urination. When one is ready to empty the bladder, the brain sends it messages to squeeze down and to relax the sphincter muscles.

### Neurogenic Bladder

Neurogenic bladder is a dysfunction in urination that results from an interference with the normal nerve pathways that have to do with urination. The most common type found in a brain injury is called “uninhibited,” meaning the normal inhibitory control of the bladder function by the central nervous system is impaired.

## CHANGES IN URINE VOLUME

### High Volume of Urine

The amount of urine that kidneys produce may vary, but usually one’s urine production equals the amount of fluid that has been consumed. Drinking large quantities of fluids will increase the amount of urine produced.

The kidneys may also produce more urine while lying down for long periods, like at night, because the heart works more easily when someone is lying down and more blood is pumped through the kidneys.

Increased urine production helps rid the body of extra fluids that may collect in the legs while one is out of bed. Beverages that contain alcohol or caffeine (e.g., coffee, dark-colored sodas and tea) can cause kidneys to produce more urine. Chocolate products in any form also contain caffeine.

### Low Volume of Urine

Kidneys will produce less urine if someone is losing body fluids through:

- The lungs while breathing rapidly during exercise
- The gastrointestinal tract when vomiting or diarrhea occurs
- The skin while sweating

If fluid is lost from one's body for any of the above reasons, then more fluids should be consumed to maintain an adequate fluid balance and prevent dehydration. The patient should call a doctor if fluid intake has decreased or is inadequate due to vomiting.

### **Excessive Residual Urine**

Excessive residual urine volume can be measured by a bladder scan or by passing a catheter into the bladder within 10 minutes after it releases urine. This is called "post-voiding" residual urine volume, which is the amount of fluid that remains in the bladder after voiding. The difference can help determine how well the bladder and urethral sphincters are working together.

## **OPTIONS FOR BLADDER MANAGEMENT**

### **Timed voiding/prompted voiding/habit voiding**

- This option helps patients to recognize the need to empty their bladder or discriminate their incontinence status and to request toileting from caregivers. The caregiver prompts or "tells" the patient to use the toilet with a goal of the patient voiding no more frequently than every three to four hours.
- Timed voiding prevents the bladder from overfilling and sending urgent messages to empty.

### **Intermittent Catheterization Program (ICP)**

One way to empty a bladder is intermittent catheterization, accomplished by inserting a straight catheter at regular intervals into the bladder to drain the bladder of urine.

Intermittent catheterization avoids prolonged trauma, irritation and possible infections from a catheter staying in the urethra and bladder 24 hours a day. The doctor will order specific times for catheterization depending on the volume of regular fluid intake and on how the urinary system is working.

While a patient is in the hospital, a sterile technique will be used with intermittent catheterization to avoid possible infection by hospital bacteria. Before the patient returns home, the caregiver will be taught how to do intermittent catheterization using clean technique on the patient. Most patients who require catheterization

will continue to use this clean technique after discharge. It involves thoroughly cleaning and preparing the genital area and thoroughly cleaning the catheter and other equipment used. The nurse will provide specific instructions on how to perform intermittent catheterization, including clean technique.

### **Indwelling (Foley) Catheter**

An indwelling catheter has a balloon at the end of the tip. When the catheter is inserted into the bladder, the balloon is inflated to hold it in place, allowing the urine to drain continuously. It's important that there are no loops or kinks in the tubing that might restrict the flow of urine into the drainage bag. The indwelling catheter is typically changed every 30 days.

### **Suprapubic Tube**

A suprapubic tube is a soft rubber catheter that goes through the skin of the lower abdomen and into the bladder to drain urine continuously. The catheter is placed through a long-term opening in the bladder called a stoma. The catheter is held inside the bladder by a balloon on one end. This balloon is filled with air once the catheter is inside the bladder and in the correct position. The catheter is connected to a plastic tube that leads to a bag where the urine stays until it is emptied into the toilet.

### **External Catheters (Male Only)**

An external catheter is similar to a condom and is applied to the shaft of the penis. Tubing from the external catheter allows the urine to drain from the bladder to a leg bag or bedside bag.

The external catheter is used when urinary incontinence is a problem, when indwelling catheterization is no longer medically safe or when there is leakage between intermittent catheterizations. It may also be used if the bladder empties reflexively with less than 2 ounces of residual urine.

If a patient wears a disposable external catheter, it should be changed daily. When using the reusable type, it is recommended that one has at least two or more to alternate from day to day.

Before applying an external catheter, be sure the genital area is clean and dry. Use the size and brand of external catheter that works best for the individual. Medical equipment companies and some drug stores offer a variety of brands.

Experiment with different adhesives to find the one that holds the catheter in place and prevents leaking. A patient's urinary program will be monitored closely to see if they can continue using an external catheter. An indwelling catheter may be reinserted temporarily if one develops a urinary infection.

### Preparation Before Applying External Catheter

1. Wash the penis with soap and water. Use care in cleaning the meatus and the foreskin if not circumcised. Pull back the foreskin toward the body. Wash and dry. Return the foreskin back over the end of the penis.
2. Rinse well, and gently dry with a towel.
3. Observe the genital area closely for rashes or skin irritations, especially where the external catheter comes into contact with skin.
4. Wait 10 to 15 minutes (air dry) before reapplying a new catheter.

*(Note: It may help to place the penis in a urinal or in a towel roll if dribbling is a problem.)*

### Hints about Catheters

- Check the catheter and tubing every one to two hours to make sure they are not twisted and are draining well.
- The catheter will stop draining if the tubing becomes twisted.
- Wear the leg bag below the right knee or on the right lateral (outside) thigh, unless instructed to wear it on the left side. Be sure the leg bag straps are not too tight.
- If the patient chooses to wear undergarments, wear boxer shorts, instead of jockey shorts. Boxer shorts are less binding and less likely to cause a kink in the catheter tubing at the groin.
- The leg bag may be kept on while in bed for a short time (less than an hour). Connect the catheter to the larger bedside bag if in bed for longer than an hour

so the urine will drain better.

- Experiment to find the best way to wear and care for the external catheter.

## POSSIBLE COMPLICATIONS

### 1. Infection

#### Bladder Infection

Bladder infections can occur in many ways. Bacteria can enter the bladder through or around a urinary catheter, leading to an infection of the bladder. A person whose overall state of health is "run down" may be more susceptible to an infection.

Some possible symptoms of a bladder infection are:

- Increased spasticity
- Leaking between catheterizations
- Feeling of weakness or lack of energy
- Foul-smelling urine
- Low-grade fever

Other signs and symptoms of a bladder infection are:

- A burning feeling or pain is felt when urine is passed (if sensation is intact).
- A strong rancid or fish-like smell. Sometimes foul-smelling urine is the temporary result of ammonia from standing urine, or from eating certain foods or taking certain medications. Concentrated, cloudy or foul-smelling urine can be managed by an increased fluid intake.
- If the bladder wall becomes irritated by infection, the urine may appear the color of tea or cola, or blood-tinged. Please note: Certain types of drugs can also change the color of the urine.
- Thick stringy white sediment that looks like pus may appear. However, not all sediment indicates a urinary tract infection.
- It is important to know that bacteria may be present in the bladder without causing an infection. The doctor may decide not to treat the bacteria with antibiotics if no symptoms have occurred.



**Kidney Infection**

If the bacteria migrate upward into the kidneys, a kidney infection may result. Signs of kidney infection include:

- Shaking chills
- Cold sweats followed by high fever
- Dry mouth
- Weak, fast pulse
- Low blood pressure
- Marked decrease in the amount of urine output
- Nausea and vomiting
- Headache
- Blood-tinged urine

A severe kidney infection needs immediate treatment. Go to the emergency room if a doctor cannot be reached.

**Controlling Bladder and Kidney Infections**

To prevent germs from entering the bladder, make sure that everything that comes in contact with the external urethral opening is clean. To accomplish this:

- Wash hands often, but especially before and after touching the genital area or any urinary equipment.
- Wash the genital area with non-irritating soap, such as Dove or Tone. Rinse well with water and dry thoroughly.
- Wash the genital area after bowel movements and sexual activity.
- Avoid sitting on urine-soaked materials such as underwear, clothing, bed linen and wheelchair cushions.
- Wipe after bowel movements from front to back or away from the urethral opening.
- Wash all materials that come in contact with the genital area and buttocks with non-irritating soap and keep dry.
- It is important to use the bladder emptying method that empties the bladder the most thoroughly.

**2. Kidney and Bladder Stones**

Stones in the urinary system are usually the result of repeated infections and of failing to drink enough fluids. Kidney and bladder stones are gravel-like substances consisting of calcium, phosphates and other mineral

salts. A small kidney stone may pass through the ureter, causing extreme pain and possibly infection, especially if it becomes stuck. Bladder stones may cause increased symptoms of bladder infection, severe sweating or increased muscular spasms.

Some changes that may indicate the presence of stones in the urinary system include:

- Tea- or cola-colored urine with blood or blood clots
- Passage of small gravel-like substances during urination
- Pain in the abdomen or lower back
- Increased bladder spasms
- Low or no urine output
- Recurring urinary tract infections
- Fever

Seek treatment from a doctor or go to the emergency room at once if any of the above occurs. A yearly X-ray of one's kidneys is an effective way to check for kidney damage or kidney stones. A cystogram (bladder X-ray) can determine reflux or bladder stones.

**3. Urine Retention**

A high volume of residual (leftover) urine in the bladder can cause problems for a neurogenic bladder. These problems may include recurrent infections and could predispose a person to bladder stones.

Signs and symptoms of urine retention:

- Decreased amount of urine or no passing of urine from the bladder within a six- to 24-hour period
- Enlarged or hardened bladder (easily felt or seen) in the lower abdomen
- Abdominal pain (if sensation is intact)

**4. Reflux of Urine**

Reflux of urine occurs when urine is forced from the bladder back up through the ureters to the kidneys. This may occur when the sphincter muscles are too tight, causing a large amount of residual urine volume. The urine left in the bladder is under high pressure, and this can result in serious damage to kidney function.

## 5. Hydronephrosis

Hydronephrosis is an enlargement of the urine-collecting structure of the kidneys resulting from a backflow of urine to the kidneys. It can also be caused by a blockage in the ureters that lead from the kidneys to the bladder, or by kidney infection.

Periodic evaluation by a urologist or a rehabilitation doctor is crucial to ensure that the kidneys and bladder are working correctly.

### DIAGNOSTIC STUDIES

A doctor may order one or more of the following diagnostic tests as part of a regular health maintenance program or to diagnose possible complications:

- **KUB** (Kidney Ureter Bladder) is a single X-ray, without dye, of the kidneys, ureters and bladder to detect stones.
- **IVP** (Intravenous pyelogram) includes multiple X-rays of the urinary tract following intravenous injection of dye.
- **Renal scan** is a scan of the urinary tract following intravenous injection of a nuclear substance.
- **Renal ultrasound** uses ultrasound waves to create images of the kidneys and sometimes the bladder. Although it gives somewhat less information than IVP, it is noninvasive.
- **Cystogram** is a bladder X-ray following insertion of dye through a catheter in the bladder.
- **Cystoscopy** is inspection of the bladder using an instrument passed through the urethra.
- **Urethrogram** is an X-ray using dye to outline the anatomy of the urethra.
- **Video urodynamic studies** (VUDS) evaluate the urinary tract functioning, including bladder capacity, bladder pressure and coordination of bladder contraction with sphincter relaxation.

### CLEANING AND CARE OF BLADDER MANAGEMENT EQUIPMENT

To maintain a healthy and bacteria-free urinary system, one needs to care not only for oneself, but also for the bladder management equipment.

Clean bladder management equipment thoroughly to remove urine or sediment that could contain bacteria and cause infection and odor.

### Reusable Intermittent Catheterization Equipment

#### Supplies

- A basin or sink of warm water
- An antibacterial soap like Dial liquid soap
- Rubbing alcohol
- A 60-cc syringe
- A clean dry towel or paper towels
- A container or zip-lock bag in which to store the clean catheters

#### Procedure

To begin, add the soap to the basin of warm water to make a soapy solution. Wash the catheters in the solution. Draw up some of the soapy solution into the syringe and then squirt this through the catheters to clean the inside of the tubing. Rinse under running water, making sure to rinse the soap from both the inside and outside of the catheters.

Shake the catheters to remove water from the inside of the tubing and dry with the towel. Rinse out the syringe and use it to draw up some of the rubbing alcohol. Flush the inside of the catheter with the alcohol and shake to dry. The alcohol speeds drying, and bacteria cannot grow inside a clean, dry catheter. Allow the catheters to dry thoroughly and then store in the container. A zip-lock bag, travel toothbrush holder, fanny pack or travel case is ideal for carrying the catheters and supplies.

#### Helpful Tips

Never re-use a catheter without cleaning it and never use a catheter that is rough, stiff, worn, discolored or damaged in any way. There should always be enough clean catheters on hand for a 24-hour period. This will enable one to clean and dry all of the catheters only once a day.

## Urinary Drainage Bags

### Supplies

- 2 basins
- Dishwashing detergent
- Water
- White vinegar
- 60-cc barrel-tip syringe, funnel or pastry (bulb) syringe

### Procedure

1. Prepare two containers:
  - a. Washing solution: few drops of dishwashing detergent to 2 cups water
  - b. Rinsing solution: 1 ounce (2 tablespoons) white vinegar to 1 quart (4 cups) water
2. Obtain a clean 60-cc barrel-tip syringe, funnel, pastry (bulb) syringe or plastic squeeze bottle that has a pointed cap.
3. Pour  $\frac{1}{4}$  cup of the detergent solution into the tubing and bag. (Please note: Be sure the clamp on the tubing is open.)
4. Work the detergent solution back and forth. Be sure the cleaning solution is poured in from the top so it coats the entire inner surface of the tubing and drainage bag.
5. Drain the cleaning solution from the bottom outlet of the drainage bag.
6. To rinse, pour a syringe full ( $\frac{1}{4}$  cup) of vinegar solution into the tubing and drainage bags.
7. Drain the vinegar solution from the bottom outlet of the drainage bag.
8. Hang the drainage bag in a clean place and allow it to dry, preferably in sunlight.
9. If the drainage bag is not used regularly, store in a clean towel or a paper or plastic bag until needed.

### Helpful Tips

- Urinary drainage bags may be obtained through the hospital supply or any medical supply company. The case manager will assist in obtaining the urological supplies. A doctor's prescription may be required.
- To reduce odor in the leg bag and bedside bag, put two aspirin tablets in the bag when in use.
- Clean leg and bedside urinary drainage bags at least once a day.

- Leg bags should be replaced every month (depending on the type and use).
- A bedside bag should be replaced every one or two months, or when a leak develops.
- Have several leg and bedside bags available so that one set can be cleaned and dried, ready for use.

## Reusable External Catheter

### Supplies

- Baking soda
- Cold water (rinse)
- Warm water (solution)
- Tape

### Procedure

1. Disconnect the bedside drainage bag or leg bag and cap the tubing.
2. Gently remove old tape and external catheter. Inspect genitals for redness or skin breakdown.
3. Rinse the external catheter immediately with cold water.
4. Turn the catheter inside out.
5. Soak the catheter in baking soda solution for 15 minutes.
  - a. Baking soda solution = 1 tablespoon baking soda to a quart of warm water
6. Rinse again with plain water and allow it to dry overnight.

### Helpful Tips

- Do not place the external catheter in sunlight or near a hot radiator, as the heat may damage the rubber.

**HIGHLIGHTS**

- The goal of the bowel program is for the patient to return as nearly as possible to his or her pre-injury bowel-emptying schedule.
- S = Schedule a particular time of day for taking bowel medications, performing evacuations, eating, drinking and exercising.
- E = Exercise, increased or decreased, can cause changes in bowel movements.
- L = Liquids, amount and type, can affect one's bowel program.
- F = Fiber adds bulk to the diet and improves regularity of bowel movements.
- Factors regulating a bowel program include: pre-injury bowel habits, medications, emotional stress, psychological factors, positioning and timing.

**HOW THE BOWEL WORKS**

Eliminating the waste products of digestion is accomplished by emptying the bowel. The small intestine absorbs nutrients from the food consumed. Undigested food products move into the large intestine where water is removed, and stool is formed. Stool is stored in the large intestine until the wave-like action of the bowel moves it through the rectum and out of the body.

**STAGES OF A BOWEL PROGRAM**

The goal of a bowel program is to return as nearly as possible to the pre-injury bowel-emptying schedule. To help a patient reach that goal, it is important to understand the stages that the bowels go through after a brain injury.

Immediately after a brain injury, the bowels slow down or become completely inactive for a period of time. One may also experience inconsistency in how the bowel empties. The patient may not feel the urge to have a bowel movement or be able to control a bowel movement.

During and after brain injury one may experience the following:

- Decreased peristalsis (wave-like contractions) in the bowel muscles that normally produces a bowel movement, sometimes accompanied by nausea and gas
- Decreased appetite
- Dehydration due to increased calcium output through the urine
- Constipation due to immobility and lack of physical activity

When a patient first comes to the rehabilitation hospital, it may be necessary to take laxatives and/or enemas to rid the bowels of any accumulated stool. The next step is to begin increasing and balancing the food intake, and increasing the patient's physical activity, all of which affect the bowel program.

The focus is on decreasing involuntary stools (accidents between regularly scheduled bowel programs) and on regulating bowels and learning the proper techniques. One must consider diet and fluid intake, timing, physical activity and exercise, positioning, adjustment of medications, digital stimulation and suppositories. At times the patient may still need to take laxatives and/or enemas to rid the bowels of any accumulated stool.

**HELPFUL HINTS IN CHOOSING AND SETTING UP A PROGRAM**

The word SELF can help in remembering all of the elements of a successful bowel control program:

- S = Schedule
- E = Exercise
- L = Liquids
- F = Fiber

**S = Schedule**

Schedule refers to the designated time of day for daily activities such as taking medications, performing evacuation, eating and drinking, and exercising. All of these activities must be scheduled so the bowel program can work effectively. Oral medications for the bowel must be taken at the proper time to ensure that they take effect at the time the suppository is

due. For example, Senokot® (a laxative) should be taken approximately 6 to 8 hours before inserting the suppository.

Select a convenient time for the bowel program and maintain a consistent, daily schedule until the patient is free of bowel accidents. Once the patient is more comfortable with what works best, he or she may progress from a daily schedule to an every-other-day/night bowel program. If constipation or unscheduled bowel movements develop, return to a daily schedule until the bowel program stabilizes.

### **E = Exercise**

Exercise refers to a normal daily level of activity. Any significant increase or decrease in activity might cause changes in the movement of bowel contents. Long periods of time in bed can result in constipation and require adjustments in one's usual daily routine.

### **L = Liquids**

How much one drinks is as important as what one drinks. Liquids containing caffeine or alcohol, such as coffee, beer, tea or cola, generally will increase bowel activity. Prune juice or apricot nectar helps promote bowel regularity. Large amounts of any liquid may result in diarrhea, and too little liquid intake may result in constipation. Whenever possible, drink at least 2,400 cc (4 to 5 pints) of liquid, preferably water, a day to keep stools soft. Fever from any source may require extra fluids. Remember to keep the bladder program in mind while regulating fluid intake.

### **F = Fiber**

Fiber adds bulk to the diet and improves regularity of bowel movements. It may be beneficial to track the patient's diet for three days to determine which foods are constipating or stimulating.

Examples of foods high in fiber are:

<b>Whole Grain Cereals/Breads</b>	<b>Fruits</b>	<b>Vegetables</b>
• Bran	• Raisins	• Lettuce
• Wheat	• Plums	• Squash
• Oats	• Oranges	• Spinach
• Rye	• Apples	• Cauliflower
• Oatmeal	• Tangerines	• Broccoli
• Granola		

## **FACTORS IN REGULATING A BOWEL PROGRAM**

### **Pre-Injury Bowel Habits**

One's bowel habits before injury, such as use of laxatives, frequency of bowel movements, usual time of emptying bowels, food habits, liquid intake and usual type of stool, all affect how the bowels will function after a brain injury. If possible, schedule the bowel program to be the same as it was prior to the injury.

### **Medications**

Stool softeners and bulk-forming laxatives, such as Metamucil®, can work with a high-fiber diet (see previous list of foods) to regulate the stool so that it is the desired softness. On the other hand, medications such as antibiotics, iron-containing substances and pain medications can also affect the consistency of the stool, often causing constipation. Be familiar with all the medications the patient is taking and how they may affect the bowel program.

### **Emotional Stress**

Anxiety can affect one's bowel program. For example, marital problems, financial problems, or a school exam may cause stress that, in turn, may cause changes in bowel programs.

### **Psychological Issues**

Try to ensure privacy. Allow enough time for the suppository to work and for the bowel to empty completely. Relax and do not hurry.

### **Positioning**

When possible, perform the bowel program sitting and leaning forward on a commode or commode chair.

**Timing**

Set up a consistent time each day for the bowel program. If the patient's personal habits (e.g., food and fluid intake and exercise) are regular, and the bowel program is performed at a consistent time, it can be expected that the bowel program will be regulated. Please note: a hot drink such as coffee, cocoa or warm prune juice stimulates peristalsis (the wave-like motions of the bowels).

It is possible to develop a regular bowel program that avoids accidents. The rehab team members will work with the patient and caregiver to establish such a program that can be continued at home.

Remember, a bowel program is simply a systematic way of emptying one's bowel at a certain time or regular intervals while avoiding accidents in between scheduled programs.

**Bowel Program Basics**

A bowel program may include any of the following:

- Medications
- Suppositories
- Enemas
- Abdominal massage
- Removing impactions manually

**Medications****Stool Softeners**

Softeners are taken to hold water in the stool, making it softer and easier to expel from the bowel. Softeners should be used when the stool is of hard consistency and when food or fluid intake is below normal. When physical activity and food or fluid intake are regulated and adequate, stool softeners may no longer be necessary.

Examples of stool softeners:

- Colace® or docusate sodium
- Surfak® or docusate calcium

**Laxatives**

Laxatives stimulate movement of the muscles of the bowel, helping the stool to move through the bowel. The choice of laxatives will depend upon individual

circumstances. Oral laxatives are adjusted according to how often the bowel is emptied, how long it takes the bowel to empty after stimulation, and the amount of stool emptied.

Examples of oral laxatives:

- Bisacodyl tabs
- Magnesium citrate
- Senokot
- Castor oil
- Milk of magnesia
- Cascara
- Perdiem®

**Combinations of Stool Softeners and Laxatives**

Occasionally stool softeners and laxatives may be combined for convenience.

Examples of combination stool softeners and laxatives:

- Senokot S®
- Correctol®

**Bulk-Forming Laxative Preparations**

If a diet is low in fiber, a bulk laxative may be right. Take bulk laxatives rather than the stool softeners for a more effective bowel movement. Bulk-forming laxatives mix with water in the intestines, then swell and form a soft bulky stool. The bulkiness of the stool stimulates the bowel wall to contract, allowing one to have a bowel movement. Metamucil is an example of a bulk-forming laxative.

**Suppositories**

Suppositories are used with softeners and/or laxatives to stimulate evacuation from the lower bowel and rectum. They are given rectally and work by contact with the wall of the rectum.

Four types of suppositories may be used in a bowel program:

- Bisacodyl, Dulcolax, Senokot and Magic Bullet® are stimulants and work well on persons with high-level injuries.
- Glycerin is a lubricant-type of suppository.
- Ceo-Two® works by releasing carbon dioxide gas. The pressure of this gas against the wall of the rectum stimulates muscle contractions resulting in evacuation.

- Enemeez is a mini-enema. It comes in a plastic container with 5 cc (a teaspoon) of liquid made of mild soap, docusate and glycerine. The long, protruding end must be punctured with a sharp object or clipped with scissors. The open end is placed into the rectum and the liquid is squeezed into the rectum.

The patient or caregiver is responsible for carrying out the program, whether the patient performs it or the caregiver. The rehab team will evaluate the patient and/or the caregiver's capabilities to perform the bowel program and the OT will make recommendations for special devices.

### Suppository Insertion

Suppositories are best if stored at room temperature. Refrigeration delays the action.

- Before unwrapping, place the suppository under running tap water for five to 10 seconds to soften it and activate the process.
- Unwrap the suppository. Do NOT use lubricating jelly with suppositories since this will decrease their effectiveness.
- Put on a glove.
- Sit on the bedside commode chair or toilet or, if in bed, lie on left side with padding materials (Chux<sup>®</sup>) under the buttocks area.
- If the patient is inserting the suppository, simply follow the body "landmarks" to guide the loaded suppository inserter or suppository into the rectum. Feel the gluteal fold, then follow it downward to the rectum.
- If a hard stool is felt, which prevents proper insertion of the suppository, gently remove the stool. The suppository is not effective if it is inserted into a fecal stool mass.
- Insert the suppository, pointed end first, high into the rectum beyond the external and internal sphincter.
- Push the suppository against the side of the rectal wall.
- If the suppository insertion is done in bed, transfer to the commode chair or toilet 20 to 30 minutes later, if possible, for bowel evacuation. Sitting on the commode chair will help to push all the stool out of

the rectum.

### Enemas

Enemas are used to flush out the contents of the lower intestines. They should never, under any circumstances, be considered the total solution to emptying the bowel. One should use an enema only if the bowel program is ineffective despite the use of suppositories. If the bowel is felt to be full, the abdomen is hard and distended, and no emptying has occurred in three days, then the enema may be the recommended option in conjunction with an oral laxative taken about 12 hours before the enema.

Before giving an enema, some general information should be noted about the rectum and bowel. The rectum and bowel are lined with a mucous membrane that is sensitive and can be injured with a rough object or water that is too hot. Some germs (bacteria) contained in the bowel can cause infection of the skin or urinary tract. Females: Clean well after the enema and always wipe away from the urinary opening and toward the rectum.

The enema solution (or type of fluid) determines how the bowel is stimulated to empty. There are several types of enema solutions, including:

#### Saline, Mineral Oil and Glycerin Enemas (SMOG)

The SMOG enema is used for the relief of constipation and for bowel cleansing. It is a combination of saline (300 cc), mineral oil (300 cc) and glycerin (300 cc).

#### Tap-Water or Saline Enemas

These enemas create pressure on the wall of the rectum. The increased volume within the rectum causes a bowel movement.

- 1. Prepare the Solution:** 500 cc (two 8-ounce glasses) of warm (not hot) tap water (does not need to be sterile water). Lubricate the tip of the tubing with water-soluble jelly. Use gloves to prevent contamination.
- 2. If in bed:** Lie on the left side so the lower colon and rectum can collect the fluid. Follow the body "landmarks" to guide the enema tubing into the rectum. Feel the gluteal fold, then move downward to the rectum. Women should ensure that the tubing

is not in the vaginal opening. Hold the container of solution about 18 to 24 inches above the rectum. The higher the solution is held, the greater the pressure, or the force of flow into the colon.

- 3. If sitting on a commode chair:** Tilt forward, then reach behind and insert the tubing (as explained above). Patients who have problems with balance or managing their positions may need to be supported. When the patient is sitting on a commode, do not raise the solution container higher than the waist. If there are no results, try again and hold the container slightly higher.
- 4. “Slush” enema:** Aids in loosening hard stool and removing gas from the lower intestinal tract. Simply allow the enema solution to flow into the rectum until the solution returns from the rectum. Then immediately lower the enema container approximately 18 to 24 inches below the rectum to allow the solution to drain back into the enema container. Repeat this technique approximately four to five times. Small pieces of fecal material may be seen returning into the solution, or the solution may become stool-colored in the container. One may need to stop the flow of solution to check the opening end of the tube to ensure it is not plugged by stool and then continue with the enema. This back and forth action will aid in softening and dislodging stool in the lower colon.
- 5. Colostomy Irrigation Kit:** If the sphincter is flaccid, a colostomy irrigation kit may be used to give the enema. The stoma cone prevents the fluid from running back out through the anus. **NOTE:** If there are no results, repeat the procedure but never use an enema more than three consecutive times.

#### **Milk and Molasses Enemas**

This enema softens hard stool and acts as a lubricant to soften and facilitate passage of hard stool. It consists of 10 ounces of molasses and 2 pints of milk. This solution may be mixed at home.

#### **Abdominal Massage**

It may be helpful to massage the abdomen from right to left in a circular downward (clockwise) motion that follows the direction of peristalsis in the colon. Do this

while the patient is sitting on a commode or commode chair, or in bed, 20 minutes after using a stimulant.

#### **Removing Impactions Manually**

##### **Supplies**

- Gloves
- Water-soluble lubricant (K-Y Jelly<sup>®</sup>, Surgilube<sup>®</sup>, Lubrifax<sup>®</sup>)
- Padding materials (Chux) if in bed
- Soap and water
- Washcloth
- Towel

##### **Procedure**

1. Patient should lie on the left side with padding in place under the buttocks, or sit on the commode or toilet.
2. Put on glove.
3. Lubricate index finger.
4. Insert index finger slowly into rectum.
5. Remove hardened stool gently and place on padding (Chux).
6. Wash buttocks and surrounding area. Dry skin well.
7. Dispose of stool, padding and other soiled material.
8. Remove gloves. Wash hands.

##### **Helpful Tips**

This procedure must be done gently or the wall of bowel may be injured. If the stool is felt higher up in the intestine, use an enema to soften and help expel it. Manual removal of stool should only be used as a starting point for a bowel program or as an absolute last resort. It should never become a regular part of a bowel program.

#### **Bowel Program Challenges**

Problems that may be encountered with a bowel program include:

- Involuntary bowel movements
- Constipation
- Diarrhea
- Hemorrhoids and rectal fissures

#### **Involuntary Bowel Movement**

Until a bowel program is established, it is not



uncommon to have involuntary bowel movements. If this is a problem, take a look at eating and fluid intake habits. The patient should eat a well-balanced diet that includes fiber. If the problem persists, evaluate the entire bowel program, including digital stimulation. The frequency of the planned bowel movements may need to be increased.

### **Constipation**

Constipation can be caused by poor eating habits; certain medications, such as tranquilizers, pain medications, antacids, anticonvulsants, diuretics or iron preparations; low fluid intake; and not following a regular schedule. The type of constipation will depend on what is causing the problem.

If the bowel is not emptying, a laxative at a regularly scheduled time before the bowel program may help, as well as changing to a different type of suppository. If the stool is too hard, a stool softener may be needed, or try to increase fluid intake and increase the amount of roughage in the diet. Bananas, white rice, pastries, sugar and cheese tend to constipate. Consumption of these foods should be reduced if constipation is a problem.

### **Diarrhea**

Diarrhea can be caused by impacted stool, poor eating habits, and medications, such as some antibiotics. Before treating the diarrhea, always check for an impaction. Lower impaction may be felt by using a finger cot. Higher impactions result in diarrhea containing mucus (shiny whitish strands) intermixed with stool. If an impaction is present, try to remove the stool, or use a laxative or an enema. If an impaction is not present, the patient should use any over-the-counter antidiarrheal agent such as Kaopectate<sup>®</sup>, Pepto Bismol<sup>®</sup> or Imodium AD<sup>®</sup> and/or eat more binding foods such as bananas, rice and cheese. Other foods such as chocolate and spicy foods may act as an irritant and cause diarrhea.

### **Hemorrhoids**

Hemorrhoids are caused by chronic constipation and prolonged straining during elimination. Rectal fissures (tears in the anal tissue) are caused by faulty bowel emptying such as constipation or extra large bowel movements. Following bowel management procedures that soften stool and reduce the need to strain excessively can prevent both of these conditions.

## SWALLOWING

Following a stroke, swallowing difficulty (**dysphagia**) occurs in approximately 50 percent of survivors (Gonzales-Fernandez, Marlis and Stephanie K. Daniels. "Dysphagia in Stroke and Neurologic Disease." *Physical Medicine and Rehabilitation Clinics of North America* 19 (2008): 867. Print.). Return of normal swallow function may require extended therapeutic intervention by the speech-language pathologist. The patient may have difficulty chewing, may have reduced ability to use the tongue to manipulate food and liquid, may exhibit poor head control, or demonstrate thinking or behavior problems that cause disturbances with eating. This may include forgetting to eat, being easily distracted when eating or having minimal interest in eating.

Following initial onset of stroke, the patient may not be able to consume enough nutrition orally to maintain adequate health and hydration. Therefore, it is common for patients to have alternative means of nutrition via a **nasogastric (NG) tube** or a **percutaneous endoscopic gastrostomy (PEG) tube**. The NG tube passes through the nose and throat and then into the stomach or small intestine. The PEG tube is surgically placed directly through the abdomen. Nasogastric tubes can cause discomfort, can be distracting to the patient and are more prone to accidental removal than the PEG tube. For these reasons, many doctors prefer a surgically placed PEG tube in patients who need tube feedings for an extended time.

The speech-language pathologist evaluates a patient's ability to swallow before feeding begins via a **clinical bedside swallowing evaluation (CBSE)**. During this assessment, the speech-language pathologist will assess the patient's mouth, tongue, palate movement, swallowing reflex, and strength of cough and throat clear. If deemed appropriate by the therapist, ice chips, liquids of varying thickness and solids may be presented to the patient at bedside. Upon presentation of food or liquid, the therapist observes the patient for signs of aspiration, when food or liquid enters the lungs and can cause pneumonia. Signs of aspiration include coughing, throat clearing, changes in vocal quality, fever

or spike in temperature after eating, and complaints of food feeling stuck in the throat. Patients suffering from a stroke may also be at risk for silent aspiration, which is defined as food or liquid entering the lungs without displaying any of the symptoms of aspiration mentioned above. Up to 2/3rds of patients who have had a stroke demonstrate silent aspiration (Gonzales-Fernandez, Marlis and Stephanie K. Daniels. "Dysphagia in Stroke and Neurologic Disease." *Physical Medicine and Rehabilitation Clinics of North America* 19 (2008): 867. Print.). The only way of ruling out silent aspiration is to complete a modified barium swallow study (MBS) or a fiberoptic endoscopic evaluation of swallowing (FEES).

Frequently, a **modified barium swallow (MBS) study** will be used to diagnose the patient's swallowing problems following the CBSE. The MBS is completed in the Radiology department with a speech-language pathologist, a radiologist and a radiology technician present. The patient is given various consistencies and quantities of food and liquid under video fluoroscopy. This method enables all professionals involved to view a patient's anatomy and physiology in order to assess and determine treatment strategies that may enable the patient to safely ingest food and/or liquid if entry into the airway or risk for entry into the airway is observed. The speech-language pathologist will then formulate a swallowing treatment plan.

Another assessment used by the speech-language pathologist to evaluate swallowing is a **fiberoptic endoscopic evaluation of swallowing (FEES)**. This method uses a flexible endoscope with a camera that is passed through the nose to view and record the inside of the throat during swallow.

The above methods of evaluating a patient's swallow enable the therapist to determine the safest and most appropriate consistency of food and liquid for the patient. Different consistencies of food may include varying degrees of softer or finer food textures. Additionally, liquids may require thickening in order to be safely consumed.

Nurses and patient care assistants are also involved in the patient's nutrition. They assist the person with

setting up the meal, feeding or assisting as needed, and monitor the swallowing process. The family is encouraged to participate in the feeding process, with training from the speech-language pathologist. It is a good way to learn special techniques while someone is present to answer questions and offer assistance. Nursing staff will monitor the person's weight and report any changes to the doctor.

### ORAL HYGIENE

Good **oral hygiene** helps with nutrition, appearance, self-esteem and overall health. Some people can perform oral hygiene by themselves while others will need assistance. Each patient will receive special instructions on how to perform proper oral hygiene.

Regular oral hygiene is necessary even if the person has an NG or PEG tube. Patients who rely on tube feeding are at high risk for aspirating their saliva. Therefore, when a patient does not receive regular oral care, bacteria from their saliva may be entering the lungs, which could result in pneumonia. Sometimes a **suction toothbrush**, a special toothbrush that removes saliva and water from the person's mouth, must be used if the person has difficulty swallowing or is unable to safely consume thin liquids. Some medicines can cause bad breath or a dry mouth. The tongue can become coated with a thick white substance, a condition called **thrush**, which is treated medically.

### NUTRITION

"Just as no two people are exactly alike, no two brain injuries are exactly alike." (Brain Injury Association).

The same applies to nutrition requirements that go alongside different brain injuries or conditions. Upon a patient's admission to TIRR Memorial Hermann, a registered dietitian will conduct an individual nutrition assessment and provide the patient and/or caregivers with a nutrition intervention specific to the patient's needs.

Eating well after a brain injury or stroke is essential to recovery. The American Heart Association has defined

what it means to have ideal cardiovascular health, identifying seven health and behavior factors that impact health and quality of life. Known as "Life's Simple 7," these small changes can make a big difference in living a better life:

- Do not smoke
- Maintain a healthy weight
- Engage in a regular physical activity
- Eat a healthy diet
- Manage blood pressure
- Take charge of cholesterol
- Keep blood sugar (glucose) at healthy levels

Here are some additional tips for eating a healthy diet:

- Eat a variety of nutritious foods from all the food groups:
  - Vegetables and fruits are high in vitamins, minerals and fiber and low in calories. Eating a variety of fruits and vegetables may help with weight control and blood pressure. Include at least five servings of fruits and vegetables per day.
  - Unrefined whole-grain foods contain fiber that can help lower blood cholesterol and help one feel full, which may help with weight management.
  - Eat fish at least twice a week. Recent research shows that eating oily fish containing omega-3 fatty acids (for example, salmon, trout, and herring) may help lower one's risk of death from coronary artery disease.
  - Choose lean meats and poultry without skin and prepare them without added saturated and trans fat.
  - Select fat-free and 1 percent fat dairy products.
- Eat less of the nutrient-poor foods:
  - Cut back on foods containing partially hydrogenated oils to reduce *trans* fat.
  - Cut back on foods high in dietary cholesterol. Aim to eat less than 300 milligrams of cholesterol daily.
  - Cut back on beverages and foods with added sugars.
  - Choose and prepare foods with little or no salt. Season foods with natural ingredients such as herbs or garlic. Aim to eat less than 1,500 milligrams of sodium per day.

## COGNITIVE IMPAIRMENTS

Cognitive impairments include having problems concentrating or organizing thoughts, and becoming easily confused. Some persons will experience difficulty learning and recalling new information. Some will have problems understanding the actions of others and interacting in social situations. Many individuals will have difficulty solving problems, making decisions and planning, as judgment and reasoning are also frequently impaired.

## COGNITIVE SKILL AREAS

Here are some of the cognitive skills affected by a brain injury:

- **Arousal:** The act of becoming awake in response to stimulation (noise, touch, smell, etc.)
- **Attention:** The brain process that allows us to learn through careful observation and listening
- **Concentration:** The ability to pay attention to a specific task for a measurable length of time
- **Orientation:** Awareness of day, date, year, time, place and current situation
- **Learning:** The ability to gain a new skill as a result of instruction and practice
- **Memory:** The ability to store, hold onto, and then access information
- **Organization:** To put together into an orderly arrangement
- **Judgment:** The ability to use thinking skills to make wise decisions
- **Reasoning:** Logically drawing conclusions
- **Problem-solving:** The ability to recognize a challenge and then come up with solutions
- **Goal-setting:** The ability to demonstrate behaviors that lead to achievement of goals
- **Planning:** The ability to make preparations for achieving a specific purpose
- **Initiation:** Action that makes something start, or the action that causes something (opening the mouth to produce a word, moving the hand to pick up an object, etc.)
- **Self-awareness:** Understanding one's impairments at some level

- **Cognitive flexibility:** The ability to see different aspects of an object, idea or situation, or to adjust one's approach when an initial plan fails

## COGNITIVE EFFECTS

In the early stages of recovery, treatment may focus on getting the patient to respond to sound, touch, smell, voice, etc., and on staying awake and alert. As patients become more aware of their surroundings, therapy may begin working on keeping attention for basic activities (eating, grooming, dressing, toileting, etc.). Medications may be used along with therapy to improve skills such as attention, concentration and initiation.

Therapy tasks become more difficult as the communication and cognition of the patient improve. Therapists work to reduce confusion by helping the patient know the day, date, location and situation. Orientation information and the daily therapy schedule are posted in each patient room to be frequently reviewed.

As the patient improves, therapy will focus on more advanced skills. During group and individual sessions, the patient will work on strategies to help improve problem solving, reasoning, organization and other cognitive deficits. Although the speech therapist/language pathologist may be targeting improved thinking skills, cognition is addressed with many members of the treatment team.

The speech-language pathologist may suggest the following when communicating with a loved one who has cognitive impairments: reduce distractions, reduce background noise, use simple speech, avoid giving the patient too much information at one time, and refer to memory aides such as a calendar or pictures when gaps in memory are noticed.

## COMMUNICATION EFFECTS

Language is the use of words to express what we are thinking and to understand what is being said to us. After a stroke, communication problems may

involve both understanding language and using words to express one's thoughts. These language impairments are called **aphasia**. Verbal expression difficulties may include having problems finding the right word, having difficulty forming sentences, and struggling to describe daily events. Patients may also not understand what is being said to them. While they may appear to comprehend things, they may be unable to follow a set of simple instructions or answer basic yes/no questions. Reading and writing abilities are often impaired as well in persons with aphasia.

The speech of a person who has suffered a stroke may also be affected. This is different than aphasia. Examples of speech deficits are slow, slurred or difficult-to-understand speech. This occurs when the areas of the brain that control the muscles involved in speech production are damaged. This type of speech problem is called **dysarthria**.

Other patients may display **apraxia of speech**. In apraxia, the message from the brain to the muscles is

not correctly received. This problem makes it difficult for the person to make the correct sounds for the words they wish to say. For example, a patient may think, "pen," but says, "len." In more severe cases, a patient may not be able to speak any sounds or words. Frequently, patients with apraxia find it easier to say words that are routine and automatic (e.g., "hello" to greet someone or counting from one to 10). Furthermore, patients who have dysarthria or apraxia are at risk for having swallowing difficulties since appropriate movement of the jaw, lips, tongue, palate, etc., is impaired (see Chapter 10: Diet and Nutrition).

The speech pathologist may give the caregiver strategies to use when communicating with a person who has aphasia, apraxia or dysarthria. Strategies may include giving the patient plenty of time to talk or respond, avoiding talking for the patient, giving directions or thoughts one at a time, using simple speech, and remembering that it's OK to tell the patient that you did not understand what he or she said.

Emotional and behavioral problems following brain injury, including stroke, present tremendous challenges to family members as well as those working with brain-injured persons. Emotional reactions may include anxiety, depression and anger, and may be severe enough to affect behavior and daily functioning. In turn, these behaviors can interfere with all aspects of an individual's life, from the rate of recovery, to safety issues, to the ability to socialize.

As a member of the treatment team at TIRR Memorial Hermann, a psychologist/neuropsychologist will be available to assist in identifying any specific emotional or behavioral issues the patient may be experiencing. The psychologist/neuropsychologist will also assist in educating those involved in the care of the patient. If you are the caregiver of a person with a brain injury, we encourage you to read the following information and consult with the rehabilitation team as questions and concerns arise.

### UNDERSTANDING BEHAVIORAL PROBLEMS

Unfortunately, there is no way to predict if behavior problems will occur or how long they will continue. Some individuals with a brain injury do not experience behavioral problems, while others exhibit a variety of problems. Typical behavioral problems of individuals with a brain injury include not being able to control their temper, not being aware of proper social behavior and not obeying directions, as well as restlessness and agitation.

All of these problems have one thing in common: they are all – in whole or in part – caused by the neurological disruption that occurs with a brain injury. It is important to understand that when individuals with a brain injury have behavioral problems, they are not necessarily misbehaving on purpose. Knowing this can help a caregiver or family member understand the patient's behavior. It can also help lessen a caregiver's concern and anxiety when interacting with the patient. In working with persons with brain injury, keep all options open while

responding to problem behaviors.

It is helpful to understand some general principles when dealing with behavior problems:

- First, you cannot control the other person's life or force them to behave in a certain way. Each person is responsible for his or her own life. Thus, the best approach to handling behavioral problems is to **manage one's own behavior and not that of the other person**. This is especially true when dealing with individuals with brain injury.
- It is unrealistic to think that the negative behaviors exhibited by persons with a brain injury can be totally eliminated. Expecting to do so will lead to frustration. A more appropriate goal is to **minimize the inappropriate behavior**, even if there are periodic behavior problems.
- Remember to not take the brain-injured person's behavioral outbursts personally, even though they may behave in a very offensive manner and direct their comments or actions toward the people around them. It is helpful for caregivers to try to distance themselves emotionally from this. **Recognize that it is a neurological problem and not a personal issue**. Remain calm and avoid reacting emotionally to what is occurring.

### AGITATION AND RESTLESSNESS

Agitation and restlessness displayed by individuals with a brain injury are the result of that injury, which can cause them to have a limited attention span, poor reasoning skills and limited memory. This makes it difficult to stay focused on a particular event or topic and to figure out what to do if a problem arises. All of these factors contribute to agitated and restless behaviors.

Agitation and restlessness are sometimes described as a stage in the recovery process, but it is difficult to predict who will experience these symptoms and whether they will be a short- or long-term problem. The length of time that individuals experience these behaviors varies. Often the caregiver may need to "ride the storm" for a few days to see if the

behavior will be short-lived or if interventions such as medication are needed. This means that the caregiver must be very patient and know ways to manage agitated and restless behavior.

### APPROACHING AND INTERACTING WITH AN INDIVIDUAL WITH A BRAIN INJURY

How one approaches and interacts with an individual with a brain injury can affect the patient's behavior. Keep in mind, they may be confused and react impulsively. How caregivers present themselves can influence how restless or agitated the patient becomes.

- **Use a social greeting**, such as "Hi (name), how are you?" at initial contact. A handshake may accompany the greeting. The handshake and greeting are cues to relax. Remember, introduce yourself each time you make contact with the patient. The patient may not remember people from previous contacts due to memory problems.
- **Speak slowly and clearly** during conversations. This gives the person time to process what has been said if his or her cognitive (mental) processing is slowed by the brain injury. Be very direct and brief. It is better to say, "Can I comb your hair?" than "You wouldn't mind if I combed your hair, would you?"
- **Avoid repeatedly disagreeing** with the person. It is important to correct inaccuracies and confusion, but not to an extent that an argument occurs. A good rule of thumb is to correct an error when it first occurs, but do not insist on another viewpoint if the patient claims he or she is right. It is usually not effective to logically reason with an individual who has a tendency toward agitation. It is more helpful to change the subject or make comments that neither agree nor disagree. For instance, he or she may say something is lost when it is not. If a person is not willing to accept that the item is not lost, just assure him or her that the lost item will turn up shortly.
- **Always explain intentions** before beginning an activity. Explain in very brief terms what is going

to happen. This can prevent a startle reaction that could lead to agitation.

- **Avoid sudden touching or grabbing.** Use a greeting and some conversation before touching a person with brain injury. Then only touch with a gentle hand pressure on the shoulder or arm. Grabbing and holding firmly should only be done in situations where there is obvious danger to the person or when other interventions do not work.
- **Redirect the person's attention.** When a person with a brain injury shows signs of becoming upset, change topics or activities to something less disturbing or confusing. Humor can also be a helpful distraction. Laughter shows that one is not too rigid or formal. It is important, however, that a person with a brain injury not feel that others are laughing at him or her.
- **Formally end contact** with a person with brain injury. Although we do not commonly do this in our everyday contacts, it is an important step. Often individuals with a brain injury are not aware of cues that suggest intentions to leave or end a conversation. Therefore, it is important to state intentions, "I have to leave now, (name)."

Most often, following these simple and general rules of contact allows for more positive and effective interactions. There is a lessened chance that agitation, restlessness or other behavioral problems will occur.

### MANAGING THE ENVIRONMENT

Managing the environment can actually be a way to treat behavioral problems and to decrease agitation and restlessness in persons with brain injury. It is often difficult for individuals with a brain injury to remain calm in an active environment. A lot of stimulation, such as loud televisions, loud conversations and crowds, can increase their restlessness.

- Create a calm environment. This may mean guiding the individual with a brain injury to a quiet room, closing a door, or turning off the television.
- Caregivers and visitors should stay in control of

their own behavior. Remember to stay calm and speak in a low, calm voice.

- Use gentle physical contact, such as rubbing the individual's shoulder. Remember to alert the person of intended actions.
- Physical restraints are sometimes needed if there is significant danger to the injured person or others. First discuss the type and use of restraints with the person's doctor. The use of restraints can sometimes increase agitation in individuals with brain injury.

### MEDICATIONS

Medications are another treatment used to manage restlessness and agitation. Please speak to the patient's physical medicine and rehabilitation (PM&R) doctor regarding his or her medication regimen.

### NONCOMPLIANCE WITH TREATMENT

Unwillingness to participate in normal daily activities is a common problem with individuals who have a brain injury, and may include refusing to dress, eat, or participate in therapy sessions. This is often a sign of confusion, or it may be a way of saying that a certain activity is uncomfortable. This can be a difficult situation to handle. While the patient cannot be forced to do something, he or she may need help to see the importance of completing certain tasks. One way to change the patient's mind is to create a situation where she or he wants to participate, even if not enthusiastically.

- **Determine what activity is being refused and why, if possible.** This may be difficult when working with persons who are confused. However, it may make the difference in getting them to participate in an activity. An example is when someone refuses to do a simple daily routine, such as getting dressed. One suggestion is to ask why she or he does not want to get dressed. It may simply be that the color of the clothing is not right or the clothes may be uncomfortable.

Another reason for not wanting to take part in an activity is because the patient is tired and needs some rest periods during the day. If someone takes time to find out the reasons the patient is refusing to do something, the patient's response may provide clues about how to encourage participation in the activity. Remember, something that may not seem important to the caregiver may be very important to the patient.

- **Redirect the attention of persons** with a brain injury when they refuse to take part in an activity. Simply move on to a different activity. Then at some later point, return to the refused task. This often works because of the patient's limited attention span and memory abilities. One way to create a distraction is to play music during an activity or count during tasks, such as when doing stretching exercises. Be aware, however, that the distraction may sometimes interfere with the patient's ability to focus on the task at hand.
- **Explain activities so the patient knows what to expect.** Individuals are usually more likely to refuse to participate when they do not understand what is happening. If an explanation does not work, then try changing the order of the tasks. For instance, if dressing is very difficult, it could be left until the very end of the morning routine. Other tasks can be done first, such as of taking medications and eating breakfast.
- **Provide choices.** As the mental abilities improve, individuals with a brain injury want to have more control over their lives. They may refuse to participate if they think they are being "forced" to do something. This situation can be made easier by providing choices. Just be sure the choices given are acceptable. For instance, let the patient make choices in what to wear or in his or her daily activities. Present the choice as an either/or decision. For example, ask if he or she wants to wear the blue shirt or the red shirt rather than asking, "What do you want to wear today?" Too many choices make it difficult to decide and can increase confusion and agitation.



- **Bargaining** is another way to get persons with a brain injury to cooperate. This works best later in the recovery process. Bargaining is a way to reinforce their participation in an activity. The “bargaining tool” should be something that a person likes to do, such as watching television. If time is an issue, try encouraging the patient to get dressed as quickly as possible so there is time to watch a favorite morning TV show. It may be possible to get him or her to agree to do one activity if an enjoyable activity follows.
- **Written goals** can give a sense of control. Be sure to post the goals where they are easily seen, such as on the refrigerator or the door to an individual’s room. A checklist can be one way to encourage a higher functioning individual to complete his or her activities independently. For example, provide a checklist of activities to be completed every day. This makes a person responsible for carrying through with tasks.
- **Make the tasks meaningful.** This can be challenging. Often, routine activities and tasks are not very motivating. In addition, many individuals are limited in what they can do because of their brain injury. Individuals with a brain injury want to resume their lives and participate in daily activities. For an adult, this may mean returning to work, being with family, driving a car and engaging in social activities. However, the individual may first have to re-learn basic skills, such as balance, dressing and attention skills. Explaining that these basic tasks are stepping-stones to being independent may be helpful.
- **Provide feedback.** This can be done by telling the patient that he or she has done a good job and providing a smile for reassurance. The impact of such comments should not be underestimated. Positive feedback should be used often.

## TEMPER OUTBURSTS

Everyone’s temperament varies. For individuals with brain injury, anger and irritability may occur more frequently than with the average person. The causes

of these temper outbursts after brain injury are often related to the specific location of the injury. If an injury occurs to the frontal areas of the brain, for example, the damage may cause individuals to be unable to hold back their emotional and verbal responses.

While most people become angry from time to time, they are usually able to control their anger or “keep it inside.” However, some individuals with a brain injury have what can be described as a “quick fuse.” It is like the gates fly open and emotions come out. Their tempers rise rapidly and outbursts may occur over relatively minor events. These outbursts are often unpredictable. What makes a person angry today may not cause anger tomorrow.

Individuals with a brain injury are usually not violent but may make harsh or loud comments, or show changes in facial expression. Typically the event lasts only two to three minutes, after which the person returns to normal rather quickly and no longer seems concerned about what just happened, although she or he may give a short apology.

Remember, these temper outbursts are a result of the injury and are not directed at anyone else, so do not take them personally. The best response is to:

- **Remain calm.**
- **Look for any obvious reason for the temper outburst.** Remove the cause if at all possible or direct the individual away from the stimulus.
- **Do not try to reason or get into an argument** with a person with brain injury. This can create more difficulties since many individuals with a brain injury do not have good reasoning skills. When arguing, these individuals are very emotional. Wait until the temper outbursts are over before trying to talk about what caused the outburst and how it might have been handled differently.
- Get control of the outburst or “**nip it in the bud.**” As the caregiver gets to know how the patient reacts to situations, the caregiver may be able to tell when the patient is getting anxious or confused. The caregiver can then intervene before a temper outburst occurs.

- **Use a reinforcement program** to decrease the number of temper outbursts. This works best with individuals who have higher functioning abilities. Keep track of the number of temper outbursts during the day. If the number of outbursts does not exceed a specified number, then the person can choose an activity. For example, if the patient has only one temper outburst in the morning, he or she can watch a movie or play a video game after lunch.
- **Medication.** This should be a final choice to help decrease temper outbursts. Please discuss medication options with the patient's doctor.

### SOCIALLY INAPPROPRIATE BEHAVIOR

Sometimes individuals with a brain injury say things that are rude or insensitive. Again, remember that this is the result of cognitive problems caused by an injury to the brain. These patients are unaware how their behavior affects those around them. It is not meant as a personal comment to the caregiver or whoever it seemed to be targeting. If you react to this behavior by taking it personally, you may create more problems.

Crowds and conversations with more than one person often cause individuals with a brain injury to become more confused. When this happens they are more likely to make inappropriate or irrelevant comments. Some ways to handle this behavior if it occurs in a social setting are to:

- **Redirect attention to another topic.**
- **Try to gently remove the person from the situation.**
- **Use nonverbal cues**, such as a time-out signal. This can let the patient know that there is a problem with his or her behavior.
- **Avoid embarrassing a person** with a brain injury by commenting on his or her behavior in front of others. The individual is still an adult and wants to be treated like an adult. Talk about the improper behavior, but do this one-to-one and in a sensitive manner.

- **Be a role model and teacher.** With daily or regular contact, the caregiver has the chance to be a role model and show the patient proper social behaviors. By being a good listener and not interrupting others, the caregiver can give the patient clues about how to behave. The caregiver can take turns when speaking and show how this gives everyone a chance to speak. It can help to practice having conversations. Select topics that will be interesting, such as family issues, sports, or the weather. Keeping your responses brief to ensure they are understood can help the patient "stay in" the conversation.
- **Role-playing** is another activity to help prevent inappropriate behaviors. For example, when a person with a brain injury makes a sexual comment to others, suggest other responses such as "You have been very nice to me today," or "I like the way you've done your hair." It does not help to correct or criticize the behavior without giving the person some ideas of a better way to respond.

### DENIAL OF DISABILITY

Individuals with a brain injury usually do not fully realize the extent or nature of their problems, which can include cognitive, physical or behavioral issues. Once again, this is in part due to the brain injury itself, especially if it involves areas of the brain that control the ability to monitor oneself and one's surroundings. Injuries to the area of the brain that controls emotions may also prevent individuals from accepting the major limitations they now have due to a stroke.

While it is desirable for a person with a brain injury to understand his or her disability, the person may deny there is any problem. To argue about this may only cause an individual to become more defensive and can increase problems in his or her relationship with caregivers. But there are times when the caregiver must confront this denial of disability, such as when the denial threatens the patient's safety. For example, some individuals with a brain injury may not be able to walk, but believe they can and try to do so. They

must be confronted directly, but in a nice way. The caregiver must explain why the patient cannot do the task now, but emphasize that the situation may change, that in the future the patient may be able to overcome the limitation and begin doing things more independently again.

If denying the disability does not put a person in any danger, it may be easiest to simply ignore it. Change the topic and move on to another activity. In most cases, a person's understanding of his or her abilities will improve with time and with participation in more activities. Just trying to do an activity will often have more effect than simply talking about the problems. Caregivers can gently explain the situation, but avoid any arguments. There are usually few benefits from arguing. In most cases, the individual's lack of awareness is a sign of limited reasoning skill. Remember to avoid embarrassing comments. Do not comment on the disability in front of others or address the patient in a teasing or demeaning manner.

Caregivers can watch for signs of positive growth, such as when a patient does something the caregiver did not think she or he could do. When a person with a brain injury insists on doing something, it is usually best to let him or her try it with supervision. For example, if a person believes she or he can do some chores in the kitchen, start with an easy chore. Begin with activities like simple food preparation, setting or clearing the table, or putting dishes away. This shows the caregiver what the individual can actually do in a safe setting.

### **FINAL WORDS**

The most important thing to remember in living and working with an individual with a brain injury is to remain calm and be flexible. Do not take it personally when she or he exhibits behavioral problems. The caregiver needs a calm and sensitive approach in order to help the injured person as she or he struggles through a difficult time.

Previous chapters have explained what happens to the body after a stroke. The goal of this chapter is to describe the types of mobility skills and equipment that will be introduced during the rehab stay, as well as tasks that will enable the patient to function in the home and community. Muscle tone, strength, coordination, posture and balance affect the ability to perform these tasks. We discussed treatment approaches for these problems in Chapter 5.

Physical therapists and occupational therapists are concerned with the quality of each patient's movement. Therapists strive to teach the patient to move using normal movement patterns and focusing on using both sides of the body. This approach encourages the return of strength to the weaker side. Practice and repetition are necessary to regain movement lost after a stroke.

The therapists work with the patient and caregivers to establish the mobility skills and equipment best suited to the patient, the family, the caregivers and the environment. The patient and caregivers will be taught how to perform and instruct others in these skills.

The training sessions are a very important part of rehab, both to identify the techniques and skills that are the easiest and safest to do, to allow the patient to practice those activities, and to strengthen the muscles and build the endurance needed to perform them throughout the day. Family members or other caregivers who will be assisting the patient will also be involved in training sessions. It's essential that they learn proper body mechanics to keep themselves safe while assisting the patient.

Think of all the activities that are done in a day. Think of all the places in a home and community that may now present some barriers to the patient. These are some of the activities the patient will be concentrating on during therapy sessions and practicing throughout the day while in the rehab hospital. They can include activities of daily living (ADLs), bed mobility, transfers, wheelchair skills, standing and/or walking. Specialized equipment may

be necessary to assist the patient or caregivers with these activities. The therapists will help identify the best techniques and equipment to meet the patient's specific needs.

The physical therapists and occupational therapists at TIRR Memorial Hermann use a treatment approach that focuses on increasing the use of affected extremities. Research has shown that individuals are best able to regain use of an extremity when the person is required to use the affected limb.

The use of certain assistive devices and equipment can foster the development of a condition called "learned non-use." This occurs when a person is not allowed to use the affected limb and depends too much on an assistive device. While it may appear that particular pieces of equipment may be helpful, their use may encourage learned non-use. As a result, the occupational and physical therapists carefully choose the necessary equipment.

### ACTIVITIES OF DAILY LIVING (ADLS)

ADLs [See Figure 13.1] are the everyday tasks that we do for ourselves. They encompass two general categories: self-care and homemaking tasks. Self-care tasks include feeding, toileting, dressing, grooming, hygiene and bathing. Homemaking tasks include childcare, managing emergencies, housekeeping, laundry, meal planning and preparation, money

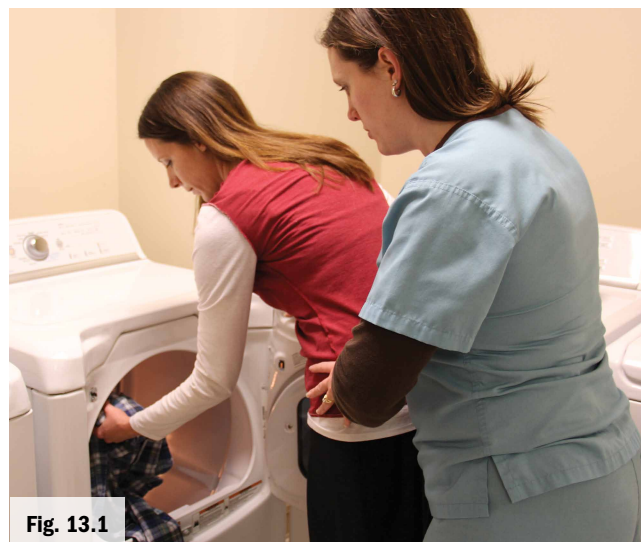


Fig. 13.1

management, safety and shopping. A patient may have difficulty initiating or completing an activity or sequencing the steps to finish an activity.

Occupational therapists work with the patient to improve these abilities. Nurses incorporate skills learned in individual sessions to focus on self-care activities throughout the day. Individual and group occupational therapy sessions are used to address homemaking skills. For example, a cooking task in the occupational therapy kitchen will focus on meal preparation and safety.

Adaptive equipment may be used in order to allow the patient to be more independent with tasks such as the following:

- **Bathing:** Appropriate seating equipment; adaptive tools such as a long-handled sponge, hand-held shower, etc.
- **Dressing/undressing:** Long-handled shoe horn, reacher, hospital bed rails to help with rolling and turning, etc.
- **Grooming/hygiene:** Built-up handles on brushes, toothbrushes, etc.
- **Feeding:** Built-up handles and modified utensils to assist with feeding, cutting food, opening packages, etc.

## BED MOBILITY

Bed mobility is about learning new ways to move around in bed. These skills include rolling from side to side or onto the patient's stomach if permitted, sitting up from lying down and lying down from sitting up. The level of assistance can vary from requiring total assistance, to some assistance from a caregiver, to total independence.

### Assistive Equipment:

- **Hospital bed:** With or without rails to assist with rolling and positioning.

## TRANSFERS

Transfers describe the way the patient moves from the wheelchair to the bed, bathtub or shower, couch,

car, floor, aisle chair for airport travel, etc. [See Figure 13.2]. The technique that the patient and caregivers use will be specific to the patient and taught by the therapist. Please note: The use of good body mechanics is essential for the person performing the transfer. Please be sure to review body mechanics with the therapist before trying techniques at home.



Fig. 13.2

### Assistive Equipment:

- **Sliding boards:** Different lengths can be used for different transfers. Certain board materials work better for some people than others; handholds on the board can assist with board placement. The patient will have the opportunity to try out different boards during the hospital stay.
- **Mechanical lifts:** Power and manual hydraulic lifts are made by different manufacturers with different slings. The patient will be involved in selecting the best lift.

## STANDING

Standing can be an important part of the daily routine for someone after a stroke, [see Figure 13.3]. It offers many benefits such as stretching the joints in the legs, increasing blood flow, and improving digestion and breathing capacity. Current research, however, does not demonstrate a clear link between standing and osteoporosis prevention.

The therapist will help the patient develop an appropriate standing program that will meet the patient's needs after discharge.



Fig. 13.3

#### Assistive Equipment:

- **Tilt table:** Slowly brings the patient from the lying flat position into standing.
- **Stall bars:** An inexpensive means of standing that utilizes straps to hold the patient's legs in position.
- **Standing frame:** Allows the patient to transfer into the seat and then pump the seat up into a standing position.
- **Braces or lower-extremity orthotics:** Provide stability to the legs while standing; may be coupled with a device such as a walker.

#### WALKING

Walking provides psychological benefits as well as exercise, strengthening and functional mobility. Depending on the severity of the stroke, walking may

or may not be something the patient pursues at this time. As with all other daily activities, the patient may need assistance with walking, and equipment may also be necessary.

#### Assistive Equipment:

- **Braces or lower-extremity orthotics:** Necessary to protect the patient's joints and allow him or her to be more stable.
- **Walking assistive devices:** such as a walker, forearm crutches or cane, to help the patient be more independent and safer with walking.
- **Treadmill with body weight support:** To focus on a patient's walking pattern and speed.

#### WHEELCHAIR SKILLS

Wheelchair skills include propelling the wheelchair on different types of floor surfaces and terrain (carpet, grass, gravel), and going up and down curbs and ramps.

#### Choosing Wheelchair and Cushion

Choosing the appropriate wheelchair and cushion is one of the most important decisions that will be made during rehabilitation because it will affect the patient's independence and activities throughout the day. During rehab, the patient will have the opportunity to try out various types of wheelchair seat cushions and specialty backs as needed to optimize positioning.

After trying the various wheelchairs and accessories, a wheelchair "clinic" will be scheduled. This clinic allows the equipment company or vendor representative to meet with the patient, caregivers and occupational therapist to measure and finalize the wheelchair order.

#### HOME MODIFICATION IDEAS AND SUGGESTIONS

The following are recommendations based on ADA guidelines. Please contact your therapists or licensed professional contractor regarding specific **recommendations for your home.**

**OUTSIDE HOME**

**Parking**

- Reserved space in apartment (contact apartment manager to see if a place can be reserved)
- 13-foot-wide space in garage to transfer/unload, at least 5 feet on side of car
- Automatic garage door openers - need 25-foot-long garage to accommodate van with tailgate

**Walkway**

- Level and non-slip surface
- Minimum 48-inch width

**Ramps** [See Figures 13.4 through 13.7 for raming guidelines]

- 12 inches in length for every 1 inch rise; i.e., for every 1 inch in height the ramp must be, you need 12 inches or 1 foot) of length; \*20 inches to 1 inch for exterior if snow, ice, etc., are a factor
- 36- to 48-inch width
- Bilateral guard rails 30 to 32 inches high (width of railing grip 1.5 inch). Extend rails 1 inch beyond the end of the ramp and make sure the ends of the railing are not hazardous.
- 4x4-foot level landing
- If door opens out, need 5x6-foot level landing.
- If ramp changes direction, reaches 30 feet, or rises higher than 3 feet, provide a 5x5-foot level landing to turn or rest
- 4-inch curbing border for ramp and platform to prevent wheelchair from falling off the ramp
- Overhead coverings suggested

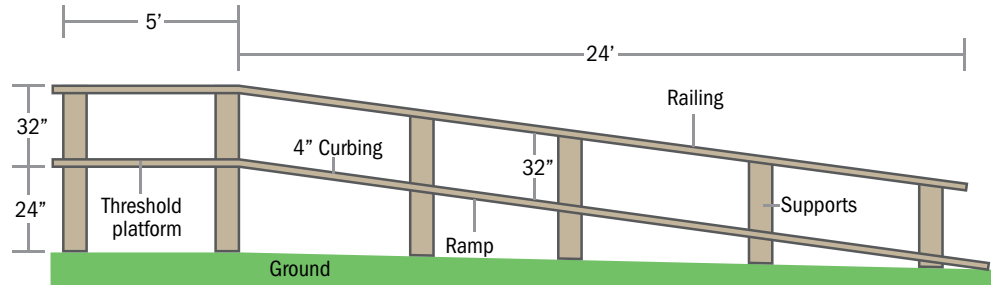


Figure 13.4 - Lateral view of ramp measurements.

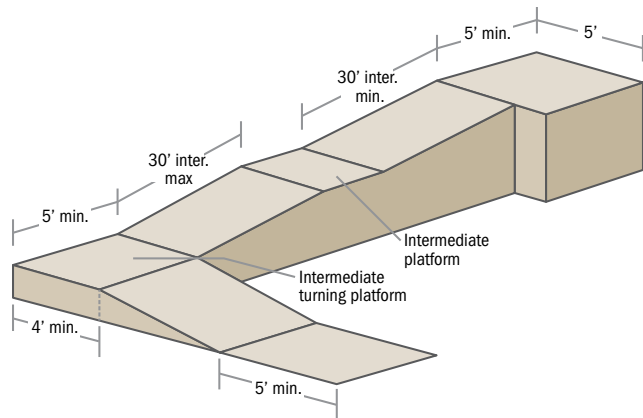


Figure 13.5 - Ramp with turning platform.

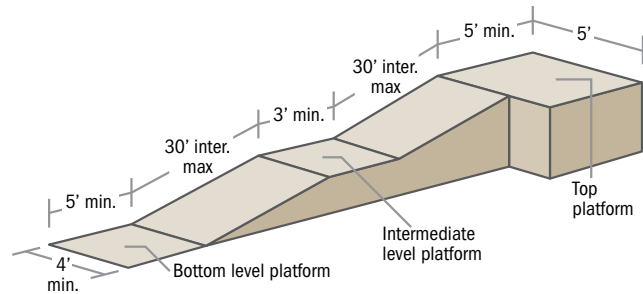


Figure 13.6 - Straight ramp.

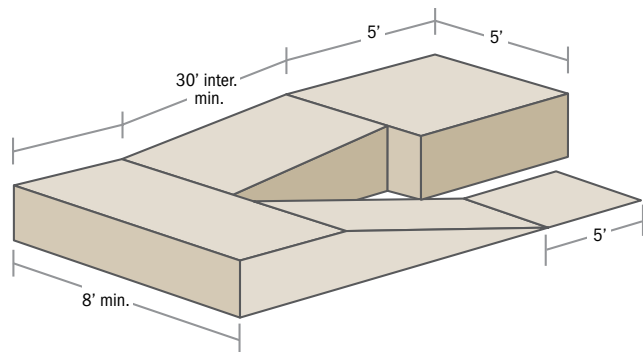


Figure 13.7 - Ramp with intermediate switch-back platform.

**KITCHEN****Stove/Oven**

- Electric preferable to gas
- **Mounted cooking top with staggered burner arrangement**
- Mirror mounted at angle above burners
- Wall mounted oven, with drop front door
- Oven door should allow you to roll under when open (29.5 inches from floor)
- Front of counter no more than 40 inches from floor; rubber cane tip dowel through control can help with dexterity
- Contrasting markings for temperature settings

**Cabinets/Counters**

- Minimum of 5 feet clear floor space between cabinets and walls
- Toe space of 6 inches in depth recessed, and 8 to 11 inches in height under cabinets allow footrests under cabinets to get closer
- Space underneath cabinet should be 28 to 30 inches wide, 27 to 30 inches high and 21 to 24 inches deep
- Insulate pipes under sinks to protect legs from possible burns
- Create a work triangle for stove, refrigerator and sink area to conserve energy and to function efficiently
- Sink should be shallow enough to place hands flat on bottom, 30 to 34 inches from floor and 4 to 5 inches deep
- Single-lever faucets are easier; mount to right or left instead of in back
- Counters used as work surface should be 30 to 34 inches high and 16 to 18 inches deep
- Under the counter storage: roll-out shelves or bins are best

**Refrigerators** - Side-by-side recommended

**Dining area**

- Open leg space
- 30-inch height
- 30-inch table top space

**BATHROOM**

- 45- to 55-square-foot floor space
- Open floor areas 5 feet in diameter to allow for turning
- Mirrors/medicine cabinets – top shelf not more than 50 inches from floor and bottom shelf 40 inches from floor
- Outlets, towel racks, light switch outside the door, and soap dishes mounted not over 40 inches from floor

**Sink**

- 27- to 30-inch clearance under sink; therefore sink should be approximately 34 inches from the floor.
- 27 inches deep
- Insulate pipes under sink to protect legs from possible burns
- Use lever handles

**Toilet**

- Ideal height of toilet is dependent upon patient's transfer status
- 15 to 16 inches standard, 19 to 20 inches elevated
- Shower commode chair will roll over standard-height commode
- Leave space along sides for wheelchair.
- Grab bars – need to withstand 250 pounds and be mounted to wall studs
- Optimum diameter for grab bar, 1.25 to 1.5 inches for adults, 1 to 1.25 inches for children
- Distance between wall and grab bar 1.25 inches

**Bathtubs/Shower**

- Rim not lower than 18 inches from floor
- Please alert therapist if you have a garden tub or specialty tub, as it may affect equipment ordering
- Shower stall should be 5 feet x 5 feet for commode chair
- Shelving 54 inches maximum height from floor
- Set water heater thermostat to medium setting (120 degrees Fahrenheit maximum) or use anti-scald mechanism on individual faucets



**Bedroom**

- Height of bed level with wheelchair 18 to 20 inches with 10- to 13-inch clearance under the bed to accommodate a mechanical lift (if needed)
- Have enough clearance alongside bed to accommodate wheelchair (approximately 3 feet, 8 inches)
- Have within reach of bed: lightswitch, telephone, intercom, clothes

**Closets**

- Lower bars 36 to 48 inches high
- No deeper than 16 inches
- Open shelving
- Maximum height for top shelf should be 54 inches from the floor
- Folding/sliding doors or curtains are easier

**DOORS AND HALLWAYS**

- Width of doorway should be 1.5 to 2 inches wider than overall width of wheelchair
- Doorways leading off 36-inch-wide hallway should also be 36 inches wide to allow wheelchair to pass through doorway, or 48 inches wide
- Doors that open out or pocket doors make better use of space inside the room.
- Low door threshold (sill)
- Remove screen door if access is problem.
- Use latch door handle at 36 to 44 inches high or attach leather strap
- Recessed hinges enlarge doorway by 1.5 to 1.75 inches
- Add rope pull or extra handle in middle of door for easier reach to close
- Kickplate prevents wear on wheelchair and on door.
- Removing door provides additional 1.5 to 2 inches; removing door jamb and molding provides additional space
- Removing doorstops adds 3/4-inch additional space
- Exterior threshold should be beveled with maximum 3/4-inch edge height

**Stairs**

- Handrails should be mounted 1.5 inches from wall and should support 250 pounds
- Vertical rise greater than 6 to 7 inches is dangerous and difficult
- Suggested that the horizontal part of the stair (tread) be **11 inches**

The process of recovering from a stroke usually includes treatment, spontaneous recovery, rehabilitation and the return to community living. Because stroke survivors often have complex rehabilitation needs, progress and recovery are different for each person.

**Treatment** for stroke begins in a hospital with “acute care.” This first step includes helping the patient survive, preventing another stroke and taking care of any other medical problems.

**Spontaneous recovery** happens naturally to most people. Soon after the stroke, some abilities that have been lost usually start to come back. This process is quickest during the first few weeks, but it sometimes continues for a long time.

**Rehabilitation** is another part of treatment. It helps the person keep abilities and gain back lost abilities to become more independent. It usually begins while the patient is still in acute care. For many patients, it continues afterward, either as a formal rehabilitation *program* or as individual rehabilitation *services*. Many decisions about rehabilitation are made by the patient, family and hospital staff before discharge from acute care.

**Neuroplasticity** refers to the brain’s natural ability to form new connections in response to experience. This means the brain can change itself physically and functionally to compensate for injury and disease and to adapt to new situations or changes in the environment. During rehabilitation, the treatment team will assess a patient’s needs and design and implement therapies aimed at maximizing neuroplasticity. Of course, even in a non-injured brain, there are limits to how much it can change and reorganize. After a brain injury, the limits of neuroplasticity depend upon a variety of factors, including the extent and severity of the injury.

The last stage in stroke recovery begins with the person’s return to **community living** after acute care or rehabilitation. This stage can last for a lifetime as the stroke survivor and family learn to live with the effects of the stroke.

Approximately 750,000 Americans suffer a stroke each year. Of those, 5 to 14 percent will have a second stroke within one year. Almost one out of every four women and one out of every three men who have had a stroke will have a second stroke in their lifetime.

After a stroke, survivors tend to focus on their rehabilitation in order to regain the function they have lost as a result of the stroke. Along with this rehabilitation, secondary stroke prevention education is also very important to a positive recovery experience. Recurrent strokes and transient ischemic attacks (TIAs) can be prevented by knowing your risks and addressing them.

### TRANSIENT ISCHEMIC ATTACKS

A TIA is a brief episode of stroke-like symptoms that resolve in less than 24 hours. TIAs usually do not cause any permanent disability but they should be taken as a serious warning. Up to one in three people who have had a TIA will likely have a stroke.

Many studies have been done to help identify the risks and determinants of strokes, and many trials have been done to provide evidence-based recommendations to reduce those risks.

### STROKE RISK FACTORS

There are two types of stroke risk factors, those that you can control, and those you cannot alter.

#### Predetermined/Unchangeable Factors

1. Over 55 years of age
2. Male gender
3. African-American
4. Family history of strokes
5. Diabetes

#### Controllable/ Alterable Factors

**1. Hypertension or high blood pressure:** This is the force of blood pushing against the walls of your arteries, as written in a two-number format. The

top number is your systolic blood pressure (SBP), the force exerted on your vessels when the heart pumps. The bottom number is your diastolic blood pressure (DBP), the force exerted on your vessels when your heart is at rest. Strategies to lower your blood pressure include:

#### a. Life-style Modification:

- i. Weight loss
- ii. Diet rich in fruits, veggies and low-fat dairy
- iii. Regular aerobic physical activity (at least 30 minutes per day for five to six days per week)
- iv. Limited alcohol consumption
- v. Stress reduction

**b. Medications:** Treatment with antihypertensive medications has been associated with significant reductions in recurrent stroke. Some types of blood pressure medications include diuretics (e.g., hydrochlorothiazide), ACE inhibitors (e.g., lisinopril), and beta blockers. Work with your doctor to find the most appropriate regimen for you. It may be necessary to try different medications in different combinations to find what works best.

**2. High Cholesterol and Hyperlipidemia:** High cholesterol increases the risk of stroke by building up in the arteries and not letting blood move freely through the vessels. It can also form a clot which can block the normal blood flow to the brain and cause a stroke to occur. Strategies similar to those used to lower blood pressure can also be used to lower cholesterol.

#### a. Lifestyle Modification:

- i. Weight loss
- ii. Reduction in saturated fats and cholesterol intake
- iii. Increased physical activity

**b. Medications:** A class of medication known as *statins* is recommended to lower cholesterol and reduce the risk of a second stroke. Some examples of statin medications include atorvastatin and simvastatin. In someone with known heart disease or atherosclerotic disease target LDL-C is less than 100mg/dL. In very

high risk individuals (heart disease, diabetes, smoking, heart attack) target LDL-C is less than 70mg/dL. For those individuals who cannot tolerate statins, there are other agents that can be used to lower cholesterol.

**3. Diabetes:** Someone with diabetes may be four times more likely to experience a stroke. Tight control of blood sugar alone does not reduce your risk of a second stroke. It is very important for those with diabetes to also maintain tight blood pressure control and cholesterol lowering.

a. *Medications:* Blood pressure medication of the classes *ACE Inhibitors* and *ARBs* are more effective in reducing the risk of renal disease and are recommended as first choice medications for blood pressure control in diabetes. The goal LDL once again is <70mg/dL.

**4. Cigarette Smoking:** Smokers tend to have double the risk of stroke compared to nonsmokers. Observational studies have shown that risk of stroke decreases after quitting and that the elevated risk disappears after five years. There are several ways to help quit, including:

- a. *Nicotine replacement*
- b. *Smoking cessation medications*
- c. *Counseling*

**5. Alcohol Consumption:** Heavy drinkers are at a significantly higher risk of stroke, as well as an increased risk for high blood pressure, abnormal heart. Stroke survivors may also have an increased vulnerability to the effects of alcohol.

**6. Obesity:** Excessive weight puts former stroke patients at greater risk for high blood pressure, high cholesterol, and potentially even diabetes, all contributing factors to recurring stroke events.

a. *Treatments:* Weight reduction for a goal body mass index (BMI) between 18.5 and 24.9. Speak with a nutritionist about the most appropriate diet for you that is healthy and will promote weight loss, in addition to pursuing a consistent exercise program.

**7. Atrial Fibrillation (Afib):** This type of irregular heart beat can lead to blood clots that can travel to the brain and cause a stroke. Afib can increase your risk of stroke up to five times.

a. *Medications:* Aspirin, warfarin and Xarelto are often prescribed to treat this condition. There are also medications to control the heart rate in this condition. This condition and treatment should be monitored closely by a doctor.

**ANTITHROMBOTIC (BLOOD CLOTTING) THERAPY**

Several antiplatelet agents have been shown to reduce the risk of ischemic stroke after a stroke or TIA and are FDA approved for this indication:

<b>Aspirin</b>
<b>Clopidogrel (Plavix)</b>
<b>Dypyridamole/Aspirin (Aggrenox)</b>
<b>Warfarin (or other anticoagulents)</b>

Warfarin and other anticoagulant medications are often prescribed to prevent clots in those with atrial fibrillation (Afib).

Other important things to remember about preventing secondary strokes include learning ways to reduce stress levels. Additionally, women who have had a stroke are advised against hormone replacement therapy unless there is a clear medical reason for it. And if you suspect you may have sleep apnea you should undergo a sleep study for a definitive diagnosis.

Knowledge is the key, so know your risks and work with your doctor to make sure you are taking all of the necessary steps to control these risks. Compliance with your doctor’s advice, especially in regards to medications and lifestyle, are critical to a successful prevention program.

Not only does a stroke impact the patient, it will also affect the patient's family. There are things that can be done to help both the patient and the caregiver/family. Understanding the grief process as a caregiver is an important step in the patient's recovery.

Rather than experiencing distinct stages of adjustment to loss after a family member is hospitalized, the following milestones may be more likely. Consider these common reactions and needs.

## PHASE I—INITIAL INJURY TO DISCHARGE

### Getting the News

Family members tend to demonstrate a need to recount in detail the events surrounding the injury and receiving the news, along with a description of the intense emotional reaction. Family members then identify the "inventory of injuries" and describe their "first look" at the injured relative.

### Uncertainty

Initially, the focus of uncertainty is on the patient's survival, and a need to be physically close to the patient. The three phases of uncertainty comprise:

1. Not knowing (how severe the injury was, or whether the patient would survive)
2. Waiting (for information regarding the injury, and for the patient to wake up)
3. Uncertainty (of the patient's prognosis, and how much the lives of the family members would change)

### Making Sense of the News

Family members often struggle to understand information received about the patient's injury and prognosis.

### Moving On

Family members absorb information about the injury and prognosis, and begin to shift their focus toward managing family and work, and toward what adjustments might be required in the future. Options for rehabilitation and care begin to be considered.

### Needs of the Family

How a family manages the experience depends on two influences primarily:

1. The family's strengths and interpersonal relationships
2. The ongoing support the family receives from professionals and the community

### Involvement in Care

In the initial days following the injury, it is important for most families to maintain a constant presence by the patient's bedside. While some families feel detached due to the severity of the patient's injuries, simply being present makes others feel involved. Depending on the level of care, family involvement may be limited or may be expected and necessary.

### Looking for Progress

Family members tend to be extremely vigilant about noticing and reporting small improvements in the patient's behavior. These improvements provide a basis for optimism that the patient is recovering and hope that the progress will continue. The moments when the patient first opens his or her eyes, or responds to commands, tend to be intensely positive moments for the family.

### Managing Life

As it becomes evident the patient will survive but recovery will be prolonged, family members begin to recognize that other obligations, including family, work and community life, must become priorities.

### Holding onto Hope

Family members' perspectives tend to be determined by their emotional readiness to work with healthcare staff, their own past life experiences and their cultural background. Hope and spirituality also impact the meaning they give to the situation. While some family members describe having emotional responses of sadness or detachment, others focus on feelings of being positive, optimistic and hopeful.

**Responding to the Family's Needs (What to expect from hospital staff)**

1. First and foremost, the family needs information that is consistent, understandable, honest, specific to the situation and not based on statistics alone. Most families express an intense “need to know” about the patient’s injuries, prognosis and plan of care
2. The combination of relevant, understandable information being delivered to family by the healthcare team in a consistent and caring manner encourages the development of trust and collaboration

**Professional Support**

Concrete supportive actions often identified by the family include access to the patient, a comfortable environment and responsive staff. Responsive staff members are those who demonstrate confidence, are available and honest, and provide reassurance to the family. Interactions that the family feels negative about include staff who do not know the patient and who make patient or family feel insecure about the care being given.

**Community Support**

Emotional support from friends and family during the time the patient is in ICU is important to family members and can include visiting the patient, making phone calls, and giving cards with messages of prayers and hope. Support from the community includes the delivery of meals, providing transportation to the hospital, mowing the grass, providing money, and asking the “right” questions of hospital staff. It is also important that a family member’s own work environment provides emotional and financial support.

Families sometimes find the magnitude of phone calls from friends and relatives overwhelming, and dealing with other people’s questions can leave them feeling drained. Hospital staff can often assist families by limiting the number of calls and limiting visitation with extended family and friends.

**PHASE II—TRANSFER FROM ICU TO DISCHARGE FROM ACUTE CARE (17 – 134 DAYS)****Uncertainty**

Uncertainty continues to be a preoccupation of family members, but is now focused on what quality of life the patient will have. Family members wonder whether the patient will recover, or be in a long-term care facility and dependent on others for all care. They state that the most difficult thing is “not knowing” what the extent of the recovery will be.

**Looking for Progress**

Families continue to monitor the patient’s behavior closely in order to identify any positive changes or indications of “returning to normal.” When the patient’s actions and behaviors show regression, it can be very disheartening for the family, while the patient’s progress encourages the family to have positive feelings about eventual recovery.

**Transition**

The transition from one level of care to another is often a difficult time for families, due to the need to adapt to different staff, and the change of pace in the new unit. The familiarity and support they had come to know changes. In addition, having the patient transferred to a higher level of care (complex continuing care facility) is seen as a negative sign, and re-emphasizes the severity of the injury and the poor prognosis.

**Letting Go of the Past and Building a New Connection**

When the patient remains severely compromised, the family must begin to accept that the injury has forever changed the person they once knew.

**Needs of the Family**

1. **Managing life** – Includes managing the family’s routine, organizing appointments and transportation, providing food for the family, washing laundry, dealing with school, work, insurance companies, etc. Tasks are often given to different family members.
2. **Managing interpersonal issues** – Many family relationships become intensified due to the stress and uncertainty of the situation. In families where interpersonal conflict is already present, the stress sometimes results in a deterioration of relationships.

- 3. Managing self-care** – Self-care includes activities that ensure family members have enough time for sleep, good nutrition and leisure. For most family members, the focus of their energy remains on the patient’s needs, but as the length of time in acute care becomes extended and they realize that the recovery will be prolonged, they begin making time for their own needs. Even so, family members will sometimes experience feelings of guilt when they are enjoying life while the patient is confined to a hospital bed.
- 4. Involvement in care** – Some family members are extremely involved in all aspects of the patient’s care, while others see their role as helping staff understand the patient. Wives and parents of young adults tend to be most involved in giving physical care; some family members want to be more involved but are uncomfortable about caring for a person with such significant injuries.
- 5. Holding on to hope** – Families tend to rely on professional staff to encourage them to maintain hope; doctors are seen as being more pessimistic so encouraging words from them are particularly poignant. Families often speak to other families who have had similar experiences, and surf the net for stories of miraculous recoveries. They don’t want their hope destroyed, even though they may fully understand the severity of the injury.

### **Responding to the Family’s Needs**

The support of members of the community becomes more important as families strive to manage the demands of everyday life while maintaining involvement in the patient’s care.

### **Information**

In the acute care stage, the need for information remains important, although the intense “need to know” tends to be diminished. The steps of the recovery process, and plans for transfer to a different level of care, become pertinent. Most families realize that there are no definitive answers and that they are able to judge the patient’s progress in much the same way as the professionals.

### **Professional Support**

During the Phase II stage of recovery, families tend to express the need for emotional support from professionals rather than the need for information. Nurses are identified as providing support most often, as nurses spend so many hours with both the patient and family, and tend to develop a close link with the family. The quality of doctor support is often judged by the degree to which information is delivered in a supportive manner.

### **Community Support**

Support from the community continues to be a vital factor in assisting family members in coping during this challenging period. Emotional support from friends and family is often described as a necessary part of the recovery process. Instrumental assistance from insurance and financial services and the patient’s place of work begin to be more of a priority, as transferring the patient back into the community becomes imminent.

## **PHASE III—TRANSITION TO REHABILITATION**

### **Managing Hope with Realistic Expectations for Recovery**

The first few days in rehabilitation combine the often overwhelming activity of assessment and evaluation by many different disciplines, and the beginning of new routines of care for the patient. Although patients are required to be medically stable before admission to rehabilitation, the need to balance complex medical realities with increased activity can be difficult for families and patients anxious to see change.

### **The Need to Begin Discussing Plans for Eventual Discharge (revisiting uncertainty)**

Families report reactions ranging from anger to optimism as staff begins to determine discharge goals that will direct the focus of therapy. Discharge planning typically begins during the first few days of admission so the therapy staff can prepare to meet the needs of the patient and family when they arrive at the discharge destination. Other potential discharge destinations include post-acute residential facilities and skilled nursing facilities, depending on the patient’s progress,

the family's ability to care for the patient, and insurance benefits.

**Looking for Progress**

Therapy staff and nurses develop predictable routines for the patient, and the family begins to see changes as therapy outcomes and medication and schedule adjustments begin to lead to recovery. Families should understand that progress is often complicated by medical issues and further surgical procedures.

**Meeting Family's Needs**

Families are encouraged to take advantage of the emotional and educational support available to them through their social worker, as well as the family educational classes, which are held every Wednesday and Saturday at TIRR Memorial Hermann.

**PHASE IV—TRANSITION TO DISCHARGE**

From the acute care rehabilitation setting, the discharge destination is often to home, which can be a very stressful transition for many families. Family members are assisted with training in all aspects of the patient's care, equipment and supplies needed are ordered, and rehabilitation will continue with either home therapy or outpatient therapy.

**References**

Keenan, A., & Joseph, L. (2010). The needs of family members of severe traumatic brain injured patients during critical and acute care: A qualitative study. *Canadian Journal of Neuroscience Nursing*, 32(3), 25-35.



Planning for discharge begins before admission, when the team determines who is currently involved in the patient's care and who is likely to be involved when the patient is ready for discharge. Because of the time and effort that go into a successful discharge, the team will begin to talk with caregivers immediately upon admission about where the patient may go when he or she is discharged. Discharge planning continues throughout the rehab stay. It is a planned, coordinated process to ensure a continuing care plan for each patient.

Discharge planning involves many factors, including:

- Medical status
- Physical, cognitive and behavioral status
- Functional level
- Family's ability to provide care
- Financial resources
- Community resources

The team is responsible for providing the following as appropriate:

- Recommendations for ongoing medical care in the patient's home community
- Follow-up appointment in the TIRR Memorial Hermann Outpatient Medical Clinic
- Referrals for therapy and other outpatient care
- Recommendation and referral to an appropriate discharge placement
- Information on community resources, including financial resources
- Recommendations and referrals for equipment for discharge
- Recommendations for home modifications
- Instructions regarding medications and supplies

The family (and the patient when appropriate) is responsible for:

- Providing accurate information to the team about the ability to care for the patient
- Participating in training
- Completing all appropriate financial applications (for example, Social Security Disability Insurance (SSDI), Texas Department of Assistive and Rehabilitative Services (DARS), etc.) in a timely manner

- Exploring financial options in the community (church, fundraisers, etc.)
- Evaluating the discharge placement options and selecting the appropriate setting in a timely manner
- Attending scheduled family meetings

### SETTING THE DISCHARGE DATE

Many factors are important in setting the discharge date, including:

- Medical necessity of continued inpatient care
- Ability of the patient to continue progress in another level of care
- Determination of appropriate discharge placement
- Financial resources

The estimated discharge date is established early in the admission, but may change. It may be earlier or later than estimated. The caregiver will always be informed about the date. It's important that the caregiver prepare for discharge and make appropriate arrangements in a timely manner.

### DISCHARGE PLACEMENT OPTIONS

The team will recommend and refer the patient to appropriate healthcare providers upon discharge. These may include home health agencies, nursing homes or other medical and therapy providers. The social worker and case manager coordinate possible options upon discharge. Support is provided to the family and patient as they transition from TIRR Memorial Hermann to the next level of care.

Possible options upon discharge include:

- **Home.** Family available to provide care and supervision.
- **Home with home health services.** Recommended therapies (OT, PT, and/or SLP) come to the home and provide treatment. Specific criteria must be met to receive home health nursing services.
- **Home with outpatient therapies.** Recommended therapies (OT, PT, and/or SLP) are provided in an outpatient rehabilitation center.

- **Home with The Challenge Program.** The Challenge Program helps patients return to work, school or independent living. The family provides transportation and any supervision that is required.

Post-acute residential programs: Patients may “live” at these programs until they are discharged.

- 1. Community re-entry programs** help patients with community re-entry activities such as employment, activities of daily living and independent living.
- 2. Behavioral treatment programs** focus on assisting individuals with behavioral problems, including noncompliance, and verbal and physical aggression.
- 3. Assisted living/personal care homes** are residential settings that provide limited supervision, some assistance with activities of daily living and assistance with medication administration.
- 4. Skilled nursing facilities (SNFs)** provide skilled nursing care. The patient must have a skilled need, such as physical therapy or wound care to be admitted to a SNF.
- 5. Nursing homes** may be appropriate for patients who may not have a skilled care need, but require limited nursing and supervision.
- 6. Long-term acute care (LTAC)** programs are for patients with complicated medical issues.

## EQUIPMENT

If the patient is going home, the therapists make arrangements for equipment for home use. If a patient is going to another facility upon discharge, the accepting facility may provide the equipment. Please discuss the situation with the therapists. Equipment may include wheelchairs, hospital beds and lifts.

TIRR Memorial Hermann does not provide equipment. Once staff has identified what equipment is needed, the team will find out how the patient’s insurance company handles these requests. If the patient does not have insurance or the insurance company will not pay for the equipment, the patient or caregiver will have to pay the company that provides the equipment. The patient’s discharge instructions will include the name and phone number of the equipment company for any repairs or questions.

## SUPPLIES

Several days before discharge, the nurse will provide a list of supplies that the patient will need at home. The nurse and the case manager can help identify where to obtain these supplies on an ongoing basis. Supplies may include diapers, gloves, catheters and wound dressings. It is recommended that the family check prices at several stores to find the best price. Supplies can be very expensive and are usually not paid for by insurance. TIRR Memorial Hermann doctors can provide prescriptions for the supplies. This allows the purchase of restricted items to be used as a tax deduction.

## MEDICATIONS

The doctor, pharmacist and primary nurse provide education regarding the medications used during the stay at TIRR Memorial Hermann. Shortly before discharge, the doctor writes prescriptions for discharge medications. Prescriptions should be taken to a local pharmacy to be filled before discharge. **Providing your case manager or nurse the fax number to your local pharmacy will ensure your prescriptions are faxed to the pharmacy and filled, ready for you to pick up when you are discharged.**

The nurse will provide the patient and family with a booklet about the medications. The nurse will review the medication schedule, how the medications are taken, and possible side effects. Below are some special issues related to medication for stroke patients:

- If the patient cannot swallow pills, the medication may be prescribed in a liquid form. If the medication comes only as a pill, ask the nurse if the medication can be crushed.
- Some medications require special orders, extra information to the insurance plan or a special prescription form. For example, shots to prevent blood clots (Lovenox) usually have to be specially ordered, which takes two to three days, and the patient’s insurance plan may refuse to pay for them without a special letter from the doctor. Another example is Ritalin, which requires a special prescription form.

The prescription has to be taken to the pharmacy soon after it is written.

- The patient's TIRR Memorial Hermann doctor will write prescriptions at the time of discharge. However, the patient should return to his or her family doctor or primary care doctor (PCP) soon after discharge. The patient's TIRR Memorial Hermann doctor will not continue to prescribe routine medicines that can be managed by the patient's PCP. For example, the PCP should manage medications such as blood pressure medications.
- For medications that are specific to brain injury and written by a TIRR Memorial Hermann doctor, call the medication refill line in the Outpatient Clinic at 713.797.5999. Always allow at least three working days to get refills called in to a pharmacy.
- The TIRR Memorial Hermann pharmacy does not fill most discharge prescriptions. Insurance companies have contracts with pharmacies to fill prescriptions. The TIRR Memorial Hermann pharmacy does not participate in these plans and, as a result, cannot bill the insurance company for the medications. We cannot charge the costs of medications to the hospital bill. When TIRR Memorial Hermann pharmacy fills a prescription, we require a cash payment for the medication.

## SUPERVISION

Many patients discharged from TIRR Memorial Hermann require supervision 24 hours a day, seven days a week. This level of supervision should be maintained until the patient has the opportunity to meet with the doctor for follow-up in the TIRR Memorial Hermann Outpatient Medical Clinic. If the patient continues in a TIRR Memorial Hermann outpatient program, such as the Day Rehabilitation Program or The Challenge Program, staff can assist with altering these guidelines. Typically, changing these restrictions will be based on the individual's safety, judgment and mobility. One must consider what would happen in a worst case scenario. For example, what would happen if a fire started? Can the person notify a family member or call 911? Can the individual get out of the house without assistance?

These are a few of the questions that must be answered.

## ATTENDANT CARE

The majority of patients need someone to assist them or need to have supervision available at all times after discharge. Family may even want to hire a caregiver or attendant to assist them at home with the patient. Ideally, it is helpful for an attendant to receive training from the rehabilitation team. If that is not possible, the importance of the family's training becomes even greater. The family will be responsible for providing the care and must also be able to train the attendant. It's typical for a patient and family to have many attendants over time and the family will need to know how to train each of them.

Locating the appropriate attendant can be a difficult, time-consuming process. Here are some suggestions that may assist the family in hiring a caregiver:

- Start by identifying the patient's care needs. Develop a checklist of care needs. Also determine the family/primary caregiver's ability to provide this care. For example, how many hours a day can the family provide direct care and maintain their current jobs?
- Write a clear description of expectations of the caregiver. Include the amount of time needed to train a potential caregiver.
- For further assistance, speak with the social worker, who has a list of attendant care resources and can provide detailed instructions that can help in the process of selecting a caregiver.
- If it is preferred to use an agency that provides attendant care, contact several agencies to compare services and prices. Also, discuss the type of care needed as soon as the need for attendant care is identified.
- If the family decides to hire an attendant who works independently, they should determine how to proceed with the hiring process. It is important to check references and a criminal background check should be considered.
- Word of mouth is a good way to locate an attendant, but advertising is also suggested.
- Use a number of advertising approaches. Place ads

in city, local and college newspapers and church bulletins. Post ads on bulletin boards located in churches, civic organizations, community centers, nursing homes, colleges, etc.

- See Chapter 14 on Financial and Community Resources to determine eligibility for state programs.

### SAFETY RESOURCES

- **Fire department decal.** Fire departments often have free decals or stickers for use at the home of a disabled person. The decals can be placed on the front door and on the window of the disabled person's room to alert a fireman that a disabled person lives there. Call the local fire department for information.
- **Personal response systems.** Several personal systems are available to assist disabled or socially isolated persons in living more independently. The Texas Department of Aging and Disability Services (DADS) may also offer a personal response system for income-eligible persons. When choosing a system, consider the cost, the services provided and the

reputation of the system in the community.

- **Special-telephone information.** Information about special telephone equipment and services for persons with hearing, sight, speech or mobility impairment is available through your telephone service provider. If the special phone equipment is going to be needed indefinitely, it may be less expensive to purchase it from a private telephone sales store. A monthly rental charge can be avoided by purchasing the equipment. An occupational therapist may be able to answer questions about what type of special phone could best meet a patient's needs.
- **Handicapped user exemption from directory assistance charges.** Patients may be exempt from payment for directory assistance if they have a physical or visual disability that prevents them from using the phone book. A form must be completed to qualify for this exemption. For information, contact your telephone service provider.

### HELPFUL CONTACT INFORMATION

TIRR Memorial Hermann  
1333 Moursund

Houston, TX 77030-3405  
713.799.5000  
tirr.memorialhermann.org

Nursing Units/Nurses Station:

Unit 3, 3rd Floor..... 713.797.7300  
Unit 3-C, 3rd Floor..... 713.799.6958  
Unit 4, 4th Floor..... 713.797.7400  
Unit 5, 5th Floor..... 713.797.7500  
Unit 6, 6th Floor..... 713.797.7600

Case Management/Social Work..... 713.797.5201

Therapy Dept. – Main Office..... 713.797.5297

DME Office..... 713.797.5963

Outpatient Medical Clinic..... 713.797.5929  
(to schedule an appt. or leave a message for your doctor)  
Prescription Refill Line..... 713.797.5999

Patient Financial Services..... 713.338.5502  
For questions about your hospital bill (located at the Memorial Hermann Corp. Office)

Release of Information/Medical Records... 713.797.7070  
(for copies of your medical records, or an itemized billing statement)

TIRR Memorial Hermann Outpatient Rehabilitation at the Kirby Glen Center.... 713.524.9702  
Fax: ..... 713.383.5713

TIRR Memorial Hermann Outpatient Rehabilitation on the Campus of Memorial Hermann Memorial City ..... 713.242.2290.  
Fax: ..... 713.242.2293

TIRR Memorial Hermann Outpatient Rehabilitation on the Campus of Memorial Hermann Northwest ..... 713.867.2674  
Fax: ..... 713.867.4630  
Volunteer Office..... 713.797.5225

Equipment Donations ..... 713.797.5297  
PT and OT Dept. (to donate equipment you no longer need)

Memorial Hermann Foundation ..... 713.242.4414  
(for donations to TIRR Memorial Hermann)

**EDUCATION AND SUPPORT**

**Welcome to TIRR Memorial Hermann**

A group session open to all inpatients and their caregivers that is attended shortly after admission to help get oriented to TIRR Memorial Hermann programs, educational offerings and support groups. (Please ask your care team what days/times these sessions are offered and if/when you should attend.)

**Brain Injury and Stroke Education Program**

An educational series offered to the families and caregivers includes the following classes:

- Coping and Adjusting: What About Me?
- Strategies for Managing Behavior After BI
- Family’s Role in the Recovery Process
- The Ins and Outs of Swallowing, Diet, Bowel and Bladder

**Family Training Series**

A series of classes offered on a rotating basis on Saturdays and Sundays for patients and their families/caregivers. It includes the following classes:

- Range of Motion
- Transfers
- Home Access and Safety
- Things to Think About Before Discharge

**Support Groups**

The following support groups are offered at TIRR Memorial Hermann Outpatient Rehabilitation at 2455 S. Braeswood. Please note that these support groups may change from time to time. You may contact our outpatient center to check the current schedule of support groups at 713.338.5642 or visit our website [tirr.memorialhermann.org](http://tirr.memorialhermann.org) for support group information.

**Parkinson’s Support Group** for persons with Parkinson’s

**Stroke Support Group** for stroke survivors

**Brain Injured Support Group** for persons with brain injuries, their caregivers and family members

**COMMUNITY RESOURCES**

Texas Department of Aging and Disability Services  
(DADS)

[www.dads.state.tx.us/](http://www.dads.state.tx.us/)

Independent Living Research Utilization (ILRU) (a  
program of TIRR Memorial Hermann, advocating for  
disability)

713.520.0232 voice/TTY

[www.ilru.org](http://www.ilru.org)

Metropolitan Transit Authority  
(Houston bus system)

713.635.4000

METROLift (Handicap accessible transportation via the  
Houston bus system)

713.225.6716

[www.ridemetro.org](http://www.ridemetro.org)

Texas Dept. of Assistive and Rehabilitative Services  
(DARS)

[www.dars.state.tx.us](http://www.dars.state.tx.us)

Strength Unlimited at Kirby Glen

713.524.9702

Houston Aphasia Recovery Center (HARC)

713.787.7100

[www.harctx.org](http://www.harctx.org)

Brain Injury Association of America (BIAA)

[www.biausa.org](http://www.biausa.org)

Texas Gulf Coast Chapter: 1.800.962.9629

Houston Center for Independent Living (HCIL)

Brazoria County Center for Independent Living (BCCIL)

Fort Bend Center for Independent Living (FBCIL)

[www.hcil.cc](http://www.hcil.cc)

Donated Equipment (organizations that provide used  
equipment free of charge)

*Project Mend* (San Antonio)

1.888.903.6363

Fax: 866.514.0876

[www.ProjectMend.org](http://www.ProjectMend.org)

*Project Union* (Houston)

1.866.990.1919

[www.ProjectUnion.org](http://www.ProjectUnion.org)

**For more information on stroke prevention, please  
visit [www.stroke.org](http://www.stroke.org)**

**Abdominal binder.** An elastic garment designed to prevent a patient from pulling at tubes in his or her abdomen.

**Absence seizure.** A generalized seizure characterized by a blank stare and interruption in ongoing activity. Occurs primarily in children. Previously called **petit mal seizures**.

**Acoustic nerve.** The 8th cranial nerve involved in hearing, balance and head position.

**Activities of Daily Living.** Everyday tasks that we do for ourselves, including dressing, feeding, grooming and hygiene, and bathing.

**ADLs.** See **Activities of Daily Living**.

**Admissions, Review and Dismissal (ARD) meeting.** A yearly meeting held to review the goals and objectives of the **Individualized Education Plan** developed for a child receiving special education services.

**AFO.** See **ankle-foot orthosis**.

**Agitation.** A state characterized by extreme restlessness and heightened arousal.

**Ambulation.** Walking.

**Anesthesiologist.** A doctor who specializes in reducing pain by causing partial or complete loss of sensation.

**Aneurysm.** A bulge in the wall of an artery resulting from a weakness in the blood vessel wall. The bursting of an aneurysm causes a hemorrhagic stroke.

**Angiotensin-converting enzyme (ACE) inhibitors.** Category of medication used to treat high blood pressure.

**Angiotensin receptor blockers (ARBs).** Category of medication used to treat high blood pressure.

**Ankle-foot orthosis.** A custom-molded brace that provides support for a weak ankle.

**Anoxia.** Complete lack of oxygen supply to the brain.

**Anticoagulant therapy.** Drug therapy that decreases the tendency of blood to clot. Started after stroke to prevent

thrombi or emboli from forming.

**Apathy.** Emotional indifference.

**Aphasia.** A general term for language and communication problems. This may include impaired ability to speak, read, write or understand.

**Apraxia.** A disorder of learned movement unexplained by problems with strength, coordination, sensation or understanding.

**Apraxia of speech.** Inability to voluntarily use speech when there has been evidence that speech can occur spontaneously on occasion.

**Aquatic therapy.** Therapy exercises that take place in a warm water pool.

**Arachnoid.** The middle of the three layers of the meninges, which cover the brain and spinal cord.

**ARD.** See **Admissions, Review and Dismissal** meeting.

**Arteriovenous malformation.** Abnormal complex of blood vessels between arteries and veins that bypass normal capillaries.

**Atherosclerosis.** A hardening or build-up of plaque and other fatty deposits in the arteries.

**Aspiration.** Foreign material lodged in the lungs.

**Ataxia.** A disorder in which muscle movements are uncoordinated.

**Attorney *ad litem*.** A lawyer appointed by the court to look after the interests of an individual who is incapacitated.

**Attorney-in-fact.** The person given the legal authority to act on your behalf in a Durable Power of Attorney. This individual does not have to be a lawyer.

**Audiologist.** A healthcare professional who diagnoses, evaluates and treats hearing disorders.

**Aura.** Unusual sensations that occur before a seizure.

**Automatic behavior seizure.** See **complex partial seizures**.

**Autonomic nervous system.** The part of the nervous system, which regulates the organs of our body, such as the heart, stomach and intestines.

**AVM.** See arteriovenous malformation.

**Baclofen.** A medication used to decrease spastic movements. Baclofen can be taken by mouth or injected directly into the spinal canal (intrathecal).

**Baclofen pump.** Use of a baclofen pump, which is implanted in the abdomen, allows the medication to be delivered directly into the spinal fluid.

**Balance reactions.** Reflexive movements people use to maintain their center of gravity. After an injury, patients may lose their balance by failing to react or overreacting.

**Basal ganglia.** A major center for the control of motor activity.

**Bed mobility.** Being able to move in bed, including rolling side-to-side, scooting up or down in bed and moving from lying to sitting.

**Bed positioning.** Use of pillows or other devices to correctly position the patient in bed.

**Beta-blockers.** A class of drugs used to treat hypertension and heart disease. May also be used to treat tremors.

**Bivalve casts.** A positioning device made from a fiberglass cast designed to be applied and removed according to a specific wearing schedule.

**Bladder distension.** A condition in which the bladder is overstretched.

**Bladder program.** A schedule for use of the toilet or urinal to improve bladder control.

**Blood thinners.** See **anticoagulant therapy.**

**Blue belt.** A type of soft, padded restraint used to secure a patient in a wheelchair to prevent falls.

**Botox (botulinum neurotoxin).** A chemical that blocks nerve transmission in muscles. Used to treat spasticity.

**Bowel program.** A scheduled time for use of the commode to maximize success in bowel control.

**Brain attack.** A term that more accurately describes the effect of stroke on the brain.

**Brain injury.** Any injury to the brain. Trauma, strokes, anoxia and hypoxia, tumors and infections are the most common causes of brain injury.

**Brain wave test.** See **EEG.**

**Brainstem.** The part of the brain that connects the brain with the spinal cord. Responsible for basic life functions such as breathing, blood pressure and heart rate.

**Brainstem stroke.** A stroke that affects the brainstem, which controls involuntary life support functions, such as breathing, blood pressure and heart rate.

**Buoyancy.** Characteristic of an object to float or be lighter in water. In aquatic therapy, lightness of a limb in water.

**Calcium channel blockers.** A category of medication used to treat high blood pressure.

**Cardiovascular disease.** Disease of the heart and blood vessels.

**Catheter.** A tube.

**Catheterization.** The process of inserting a catheter.

**Central nervous system.** The brain and spinal cord make up the central nervous system.

**Cerebellar stroke.** A stroke that strikes the cerebellum of the brain, which controls coordination and balance.

**Cerebellum.** Part of the brain responsible for coordinating voluntary muscle movements, including balance.

**Cerebral aneurysm.** A bulging out of a weakened blood vessel in the brain. Aneurysms are usually present at birth. They usually don't cause problems unless they burst.



**Cerebral cortex.** The cerebral cortex is the outside layer of the brain. It consists of folded bulges called gyri that create deep fissures called sulci.

**Cerebral hemispheres.** The cerebral cortex is divided into right and left hemispheres.

**Cerebrospinal fluid.** Fluid produced in the brain that cushions brain and spinal cord from jarring injuries.

**Cerebrovascular accident (CVA).** See **stroke**.

**Coma.** State of unconsciousness and decreased responsiveness associated with severe brain injury. Associated with injury to the reticular activating system of the brain, which maintains alertness and arousal.

**Complex partial seizure.** A partial seizure associated with impaired consciousness or impaired responsiveness. May be preceded by an aura. For example, while unconscious, the patient may drive a car, but will not respond to questions. The person will not remember the event. Also called **psychomotor** or **temporal lobe seizures**.

**Complex regional pain syndrome (CRPS).** A complication of immobility characterized by pain, stiffness and swelling in the extremities. Occurs more commonly in the shoulder and hand. Previously called reflex sympathetic dystrophy and shoulder-hand syndrome.

**Computed tomography (CT) scan.** Imaging technique used to visualize the brain and other parts of the body. Used to identify blood in the brain, contusions and conditions such as hydrocephalus.

**Concrete thinking.** The inability to engage in flexible thinking. A tendency to take everything literally.

**Condom catheter.** A catheter used to drain urine in men. The condom, part of the catheter system, is placed over the penis with the urine draining by a tube into a collection bag.

**Confabulation.** The tendency to use plausible but imagined memories to fill in gaps in what is remembered.

**Congenital tumor.** A tumor that is present at birth.

**Consciousness.** State of awareness of self and surroundings.

**Continence.** The ability to control bodily functions, especially bladder and bowel control.

**Contracture.** Abnormal muscle tissue that prevents normal use of a muscle or joint.

**Co-treatment.** Treatment conducted by two therapists from different disciplines. For example, occupational therapy and physical therapy.

**Cranial nerves.** The cranial nerves are the 12 pairs of nerves that can be seen on the bottom surface of the brain. Some of these nerves bring information from the sense organs to the brain, other cranial nerves control muscles, and other cranial nerves are connected to glands or internal organs, such as the heart and lungs.

**CSF.** See **cerebrospinal fluid**.

**CT scan.** See **computed tomography scan**.

**CVA.** See **cerebrovascular accident**.

**Decubitus ulcer.** Skin ulcer due to prolonged pressure against areas of skin. Most common sites are bony prominences.

**DARS.** Abbreviation for Texas Department of Assistive and Rehabilitative Services. A state agency that provides services for the disabled. Formerly the Texas Rehabilitation Commission (TRC).

**Deep Vein Thrombosis.** Blood clot of a vein in the deep venous system of the arms or legs. Usually the result of prolonged immobility.

**Diabetes.** A disorder of sugar metabolism.

**Diplopia.** Double vision.

**Disinhibition.** Loss of inhibition.

**Diuretics.** A category of blood pressure medications that works by increasing urine output.

**Doppler ultrasound.** A test used to determine the presence of deep vein thrombosis.

**Dura.** The outermost and strongest layer of the three membranes that protect the brain.

**Durable Power of Attorney.** When you create and sign this document, you give another person legal authority to act on your behalf.

**DVT.** See **deep vein thrombosis**.

**Dysarthria.** Speech disorder resulting from weakness of the muscles responsible for speech. Characterized by slurring and breathiness.

**Dysphagia.** Difficulty with swallowing.

**EEG.** Brain waves recorded from scalp electrodes. Used to diagnose seizures.

**Egocentrism.** Concerned only with one's own needs.

**Electroencephalogram.** See **EEG**.

**Embolic stroke.** A stroke resulting from the blockage of an artery by a blood clot (**embolus**).

**Embolism.** Sudden blockage of a blood vessel by a blood clot.

**Embolus.** A blood clot which breaks free from the heart or large artery of the body and is carried by the bloodstream.

**Emotional lability.** Mood swings, e.g., from laughter to crying.

**Enclosure bed.** A hospital bed enclosed with netting for the safety of the patient.

**ENT.** A doctor who specializes in diagnosis and treatment of ear, nose and throat disorders. Also called an otolaryngologist.

**Executive functions.** Those capacities, most commonly linked to the frontal cortex, that guide complex behavior over time through planning and decision-making.

**External catheter.** See **condom catheter**.

**Facial nerve.** The seventh cranial nerve that innervates the nerves of the face.

**Flaccid.** Lacking muscle tone.

**Focal seizure.** See **partial seizure**.

**Foley catheter.** See **indwelling catheter**.

**Friction burns.** Burns that can occur from constant rubbing of the body against bed sheets.

**Frontal lobe.** The most anterior part of the brain. Involved in more complex brain processes such as decision-making and problem-solving. Also, a primary motor area.

**Functional mobility.** Movement required for everyday tasks such as transfers and walking.

**G-tube.** See **gastrostomy tube**.

**Gastrostomy tube.** A tube placed into the stomach through the abdominal wall for providing nutrition.

**Generalized seizure.** Generalized seizures affect both sides of the brain from the beginning of the seizure. They produce loss of consciousness, either briefly or for a longer period of time. Tonic-clonic seizures and absence seizures are types of generalized seizures.

**Glucose.** Sugar.

**Grand mal seizure.** See **tonic-clonic seizure**.

**Guardianship.** A court-supervised legal relationship between a competent adult, the guardian, and a person who because of incapacity is no longer able to take care of his or her own affairs.

**Guardianship of the estate.** In some cases, incapacitated individuals can make responsible decisions in some areas of their lives but not others. In this case, the guardian manages the person's material possessions.

**Guardianship of the person.** Guardianship for managing the individual's healthcare decisions.

**Hand mitten.** A soft foam mitten with ties that prevents a patient from pulling at tubes or removing other therapy devices.

**Hematoma.** A localized area of blood in the brain.

**Hemiparesis.** Weakness on one side of the body.

**Hemiplegia.** Paralysis of one side of the body.

**Hemorrhage.** Bleeding from blood vessel rupture.

**Hemorrhagic stroke.** A stroke caused by a ruptured blood vessel and characterized by bleeding within or surrounding the brain.

**Heterotopic ossification.** Bone which is growing in an abnormal location such as muscle.

**Hippocampus.** Part of the brain located in the interior part of the temporal lobe that is important in memory formation.

**Hydrocephalus.** An abnormal increase in cerebrospinal fluid marked by an increase in the size of the ventricles of the brain.

**Hypercholesterolemia.** High cholesterol in the blood.

**Hypertension.** High blood pressure.

**Hypotension.** Low blood pressure.

**ICP.** See **intermittent catheterization program.**

**Incapacitated.** Legal term describing a patient's inability to make decisions.

**Incontinence.** Lack of control over bladder and/or bowel functioning.

**Individual Treatment Plan (ITP).** A weekly document produced by the treatment team to document patient status and progress. It is sent to the insurance company as a means of communicating patient status.

**Individualized Education Plan (IEP).** An annual education plan required for any child or adolescent who receives special education services in the public schools.

**Indwelling catheter.** A tube placed directly into the bladder. Used when the person cannot voluntarily empty the bladder.

**Infarct.** The immediate area of brain cell death caused by a stroke.

**Insulin.** A hormone secreted by the pancreas. Insulin is essential for metabolism of blood sugar.

**Intention tremor.** A tremor that is worse during voluntary movement.

**Intermittent Catheterization Program.** A procedure used for patients who cannot voluntarily empty their bladders. A catheter is placed into the bladder at regular intervals to drain urine.

**Intracerebral hematoma.** A collection of blood within the brain.

**Intracerebral hemorrhage.** A stroke caused by bleeding within the brain.

**Intracranial pressure.** The pressure within the skull.

**Intravenous.** Into a vein. Fluids are given through a small tube inserted into a vein.

**Intubation.** Act of placing a tube into the trachea to help breathing.

**Ischemia.** Lack of adequate blood flow.

**Ischemic stroke.** A stroke resulting from a blocked blood vessel.

**IV.** See **intravenous.**

**Jacksonian seizure.** See **simple partial seizures.**

**Lability.** See **emotional lability.**

**Left hemisphere.** The left half of the brain. Controls actions of the right side of the body as well as language abilities.

**Left neglect.** A lack of awareness of actions or objects on the left side of the body caused by damage to the right hemisphere of the brain. For example, a stroke patient with left neglect may fail to notice food on the left side of the dinner plate.

**Libido.** Sex drive.

**Medical Power of Attorney.** A document that allows a person to designate someone to make healthcare decisions for them when they are unable.

**Meninges.** The three protective layers of tissue that cover the brain. From the outside to the inside, they are the dura, arachnoid and pia.

**Modified barium swallow test.** A test in which the swallowing mechanism is observed using radiologic procedures. The patient drinks or eats barium in solids or liquids.

**Nasogastric tube.** A tube placed through the nose into the stomach for feeding.

**NDT.** See **neurodevelopmental treatment.**

**Nebulizer.** A special machine that delivers medication to the lungs as a fine mist.

**Neglect syndrome.** See **left neglect.**

**Neuropathic pain.** Unremitting, chronic burning pain, which is believed to be due to damage to the central nervous system.

**Neuron.** A nerve cell.

**Neurodevelopmental Treatment.** A therapeutic approach that seeks to re-establish normal motor function and to prevent contractures and deformities.

**Neurotransmitter.** A chemical agent released by a neuron that either facilitates or inhibits the flow of information to the next neuron.

**NG tube.** See **nasogastric tube.**

**Non-penetrating head injury.** See **closed head injury.**

**Nystagmus.** An eye condition characterized by rapid, jerky eye movements.

**Occlusion.** Blockage of a blood vessel.

**Occipital lobe.** The posterior brain region involved with vision.

**Olfactory nerve.** The first cranial nerve, which involves the sense of smell.

**Ophthalmologist.** A doctor who specializes in the diagnosis and treatment of eye diseases and injury.

**Optometrist.** A health professional skilled in testing visual acuity and prescribing corrective lenses. In the Stroke Program, they are vision specialists who assist in visual rehabilitation.

**Oral hygiene.** Cleaning of the mouth and teeth.

**Orthosis.** A brace that is applied to part of the body to correct deformity, improve function, or relieve symptoms of a disease by supporting muscles and bones.

**Orthostatic hypertension.** Increase in blood pressure that occurs when a patient is moved too quickly without allowing the cardiovascular system to adjust.

**Orthostatic hypotension.** Decrease in blood pressure, which occurs when a patient is moved and the cardiovascular system cannot adjust.

**Paralysis.** Complete loss of voluntary movement in one or more muscles.

**Paresis.** Partial loss of voluntary movement in one or more muscles; weakness.

**Paranoia.** Persistent suspicious thinking that others are persecuting the person.

**Paraphasia.** An incorrect word substituted for an intended or target word.

**Parathesias.** Presence of sensation without stimulation. For example, feelings of burning, itching or tingling in the arms or legs.

**Parietal Lobe.** The lobe of the brain lying posterior to the frontal lobe and above the temporal lobe. Involved in sensory perception.

**Partial seizure.** A seizure limited to part of the brain or affecting part of the body.

**Partial complex seizure.** See **complex partial seizure.**

**Passive range of motion.** Performing range of motion on a patient's limbs when the patient is unable to assist in the movement. Used to maximize muscle range.

**Passy-Muir valve.** A speaking valve placed over a tracheostomy that allows the patient to speak by diverting air over the vocal cords.

**PCP.** See **primary care doctor.**

**Perception.** The process of acquiring, interpreting, selecting and organizing sensory information.

**Peripheral nervous system.** Part of the nervous system that consists of the nerves and neurons that reside or extend outside the central nervous system.

**Perseveration.** Multiple repetition of words or actions.

**Petit mal seizure.** See **absence seizure.**

**Phenol.** An alcohol derivative used to treat spasticity, usually in the muscles of the legs. Causes temporary weakness.

**Physiatrist.** A doctor who is a specialist in physical medicine and rehabilitation.

**Pia.** The innermost layer of the meninges, which protect the brain and spinal cord.

**Plaque.** Deposits that block blood vessels.

**PMV.** See **Passy-Muir valve.**

**Pneumonia.** Inflammation of the lungs due to infection.

**Pressure sore.** See **decubitus ulcer.**

**Primary care doctor.** A doctor who manages an individual's routine medical care.

**PROM.** See passive range of motion.

**Psychomotor seizure.** See **complex partial seizures.**

**Pulse oximeter.** A device used to measure levels of oxygen in the blood.

**Rhythmic auditory stimulation.** Uses the rhythmic properties of music as an external cue for physical movement.

**Right hemisphere.** The right half of the brain. Controls the actions of the left side of the body.

**Secondary injury.** Additional injury to the brain that occurs after initial injury. Thought to be the result of physiological, vascular and biochemical events.

**Selective attention.** Paying attention to only one aspect of one's internal or external environment.

**Serial casting.** Casting of a contracted limb to increase range of motion. Plaster or fiberglass casts are changed every few days to gradually stretch muscles and joints.

**Simple partial seizure.** A seizure confined to a group of muscles. The area involved may spread until an entire limb is involved.

**Sitting program.** Specified hours for the patient to sit upright out of bed. Usually, the amount of sitting time is increased with better endurance.

**Skull.** The bony structure which protects the brain.

**Sleep apnea.** Temporary stopping of breathing during sleep.

**Spasticity.** Increased muscle tone, which results from stroke or brain injury.

**Spinal canal.** The hollow canal that contains the spinal cord, cerebrospinal fluid and the blood supply to the spinal cord.

**Spinal cord.** The main pathway for information connecting the brain and peripheral nervous system.

**Standing frame.** A piece of equipment that allows individuals to perform activities in a supported standing position.

**Stroke.** The sudden interruption of blood flow to part of the brain that kills brain cells in that area.

**Subarachnoid hemorrhage.** Leakage of blood into the subarachnoid space. The arachnoid is the middle of the three membranes that protect the brain.

**Subdural hematoma.** A collection of blood in the subdural space. (See **dura.**)

**Suction toothbrush.** A specialized toothbrush used to remove food particles from the mouth when a regular toothbrush cannot be used.

**Suctioning.** Use of portable or wall suction to remove material that is blocking the patient's airway.

**TBI.** See **traumatic brain injury.**

**Temporal lobe.** Lobe of the brain located lateral to and below the frontal and parietal lobes. Contains auditory receptive areas.

**Temporal lobe seizure.** See **complex partial seizures.**

**Thalamus.** The part of the brain that coordinates information relating to the senses of sight, hearing, touch and taste.

**Thrombosis.** The clotting of blood within an artery.

**Thrombotic stroke.** A stroke resulting from blockage of a blood vessel by accumulated deposits. Blockage occurs when a clot lodges on the deposits, preventing the flow of blood.

**Thrombus.** A blood clot that breaks away from a clot in the heart or major artery and becomes lodged in an artery in the brain.

**Thrush.** Fungal infection of the mouth and throat characterized by white patches in the mouth.

**tPA.** Abbreviation for tissue plasminogen activator. tPA is a medication used to dissolve blood clots, which cause strokes. To be effective, tPA must be administered within the first three hours of the stroke.

**Tilt table.** A table that can be raised from a horizontal position to the vertical position by degrees. Used with patients who have problems with postural hypotension.

**Tonic-clonic seizure.** A generalized seizure with sudden loss of consciousness and rapid contraction of muscles. Bowel and bladder incontinence, and biting of the tongue frequently occur. The patient does not remember the event. Sleepiness and confusion are common after the seizure. Previously called **grand mal seizure**.

**Trachea.** The airway that extends from the larynx to the lungs.

**Tracheostomy.** A tube placed in the trachea to allow an airway to be maintained when the trachea is blocked. Often performed when an endotracheal tube has been in place for several weeks.

**Transfers.** Skills involved in moving from one surface to another, such as from a wheelchair or standing to bed, chair, car, toilet or shower.

**Traumatic brain injury.** Brain injury caused by external force. This may result from a car wreck, blow to the head, a fall or gunshot to the head.

**Urinary tract infection (UTI).** Infection in the bladder.

**Ventricles.** Spaces inside the brain that contain cerebrospinal fluid.

**Ventriculoperitoneal shunt.** A plastic tube surgically inserted between a ventricle in the brain and the abdomen to divert excessive cerebrospinal fluid away from the brain.

**Ventriculostomy.** A soft tube placed through the top of the head into the ventricles of the brain. The ventriculostomy is used to drain excess cerebrospinal fluid as a means of decreasing intracranial pressure.

**Vertebrae.** The individual bones that make up the spine.

**Visual field deficits.** Areas of blindness or altered vision in the field of vision.

**Visual-perceptual abilities.** Visual skills related to judging distance, size, speed and position of objects, as well as perceptual abilities related to how parts are connected to the whole.

**Watershed areas of cerebral cortex.** Areas that lie between the territories of major cerebral arteries. A significant drop in blood pressure or anoxia will result in infarcts in these areas.

**Wheelchair positioning.** Use of devices attached to the wheelchair to maintain correct posture.



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