Head Injury

REACH
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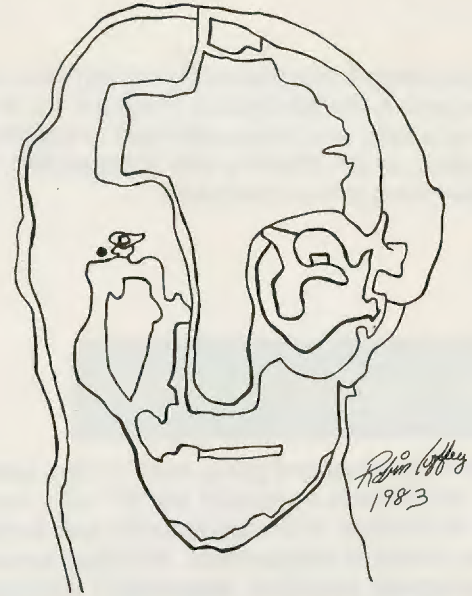

COGNITIVE REHABILITATION PROGRAM

Saint Joseph Rehabilitation Services

Saint Joseph Hospital of Fort Worth now offers a Cognitive Rehabilitation Program for brain-injured adults who have continued to experience problems which interfere with independent, productive living in the community.

PURPOSE

Both individual and group sessions are used to help participants re-acquire the life skills necessary to function in the community and in many cases, return to employment. Individual sessions are designed based on assessment information with the focus on remediation of problems preventing independence.

PROGRAM

The Cognitive Rehabilitation Program is an eight-week, outpatient program. Sessions are held from 8:45 a.m. until 12:30 p.m., Monday through Thursday. There is a two-week interim between sessions. It may be recommended that participants attend more than one eight-week program.

ELIGIBILITY

1. Ages 18 to 55 years.
2. Completed acute rehabilitation.
3. Functional communication system.
4. Nearing independence in self care.
5. Potentially employable and interested in pursuing employment.
6. Not a danger to self or others; able to control behavior.

EVALUATION

Potential participants are evaluated by each of the Cognitive Rehabilitation Program staff. The screening and testing will be scheduled the week prior to each eight-week session. Family information and assessment results are used to develop a problem list.

THERAPIES

The Cognitive Rehabilitation Program staff, under the direction of a Board-certified physiatrist, includes the following health professionals: occupational therapist, speech pathologist, recreational therapist and psychologist who serves as the team coordinator. The therapists perform varied functions on the team, often working beyond their areas of specific responsibilities. Using an interdisciplinary team approach, the therapists provide all areas of expertise working with head-injured individuals.

On the Cover — Robin Coffey is a 19-year-old woman from the Indianapolis area who was head-injured in an automobile accident in 1982. On our cover is her portrait of a brain-injured person.

Permission granted for reprint of cover from Volume 2, Issue 1 of Cognitive Rehabilitation magazine, P.O. Box 29344, Indianapolis, Indiana 46229.

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HI

This manual is dedicated to head injury patients and their families. It is hoped that the information found here will enable them to better understand the nature of head injuries and the long recovery process that follows such an injury.

HEAD INJURY MANUAL

I C U

Visiting the patient for the first time in the intensive care unit (ICU) can be an unsettling, confusing, and even frightening experience. Having an explanation about how the patient might look and the possible equipment which surrounds them might reduce some of the stress and confusion.

Patients with severe head injury are often in a coma (see Levels of Cognitive Functioning). It is important that the patient's visitors talk to the patient in a reassuring manner even if the patient does not appear to respond. It is felt that the hearing or auditory system may still function even when the patient is in a coma.

Patients with a traumatic head injury are often pale and may be severely or minimally bruised. If surgery or stitches were necessary to repair a head wound the head may have been partially or completely shaved. The patient may have a snug fitting turban type dressing around the head. The patient may appear very stiff with extended or flexed arms and legs or they may appear totally relaxed. If the patient becomes restless or agitated, bed restraints and padding on the side rails may be necessary for the patient's safety and to prevent the patient from detaching necessary tubes.

The patient with a moderate-severe head injury may require some or all of the following equipment while in the ICU.

Nasogastric (NG) tube - This is a small tube which is inserted through the nose and down the back of the throat to the stomach. The NG tube is first inserted and attached to suction to keep the stomach empty for a few days to prevent the aspiration of food particles into the lungs. It is later converted to a feeding tube if the patient remains unconscious or is unable to manage foods orally. The doctor will want to hear bowel sounds in the abdomen to ensure that the body is able to process liquid or solid foods before beginning the NG tube feedings.

Endotrachial tube - This tube is inserted through the mouth or nose to provide respiratory support. It may or may not be connected to the respirator depending on the patient's ability to breathe independently. If it is not connected to the respirator it may be inserted to keep the airway open. The endotracheal tube passes between the vocal cords so the patient will be unable to talk or make sounds. Patients who have had an endotracheal tube for an extended period of time may experience temporary hoarseness of the voice when the tube is removed.

Respirator - The respirator helps to regulate the amount of oxygen to the brain. The patient may be placed on a respirator not only because of difficulty with breathing independently but often to increase oxygen to the brain and/or to hyperventilate the patient to keep the pressure from swelling within the brain below a dangerous level.

Tracheostomy - If it is necessary to keep the endotracheal tube in for an extended period of time, a tracheostomy may be performed. A tracheostomy is a relatively simple procedure wherein a small hole is made in the windpipe or trachea at the base of the neck. A tracheal tube is then inserted to keep the airway open. The trach may have an inner piece called the inner cannula. This piece is removed and cleaned and the trach tube itself is suctioned to remove secretions. Prior to the removal of the trach tube, the patient will have the trach plugged for varying lengths of time to ensure that the patient will be able to breathe in the normal way. Special procedures have to be followed when feeding the patient with a trach to prevent food particles from going into the lungs. Because the tracheal opening is below the level of the vocal cords, air will not pass through the vocal cords so the patient will not be able to talk or make sounds. When the trach is plugged the air will again pass through the vocal cords in the normal way to produce sounds.

Intracranial Pressure (ICP) monitoring devices - It is often necessary to monitor pressure from brain swelling. Intracranial pressure (ICP) is discussed briefly in the neuroanatomy section but it is important also to know how ICP is being monitored. The physician may elect to monitor ICP in one of the following ways: a subarachnoid screw or subarachnoid bolt, an epidural catheter or a ventriculostomy. These three methods will both measure ICP and drain excess fluid from the brain. If ICP monitoring is used, the patient will have required minor head surgery in which the head may have been partially shaved. The drains can be seen protruding from the dressing on the head.

Electrocardiogram (EKG) monitor - This piece of equipment is routine for ICU patients and is used to monitor heart rate.

Foley catheter - An indwelling device which monitors urine output.

Peripheral IV - This is used to administer medication to the patient who is unable to swallow.

Chest tube - When the patient has associated injuries such as internal injuries a chest tube may be inserted to drain fluid and to help the chest inflate.

Swan-Ganz Catheter - The physician may elect to use this device for close monitoring of heart functioning.

Other minor equipment the patient may have might include: an Egg Crate mattress pad to help prevent pressure areas or bed sores on the body, high top tennis shoes or "space boots" to prevent abnormal positioning of the foot or "foot drop", and splints to maintain proper hand and wrist position.

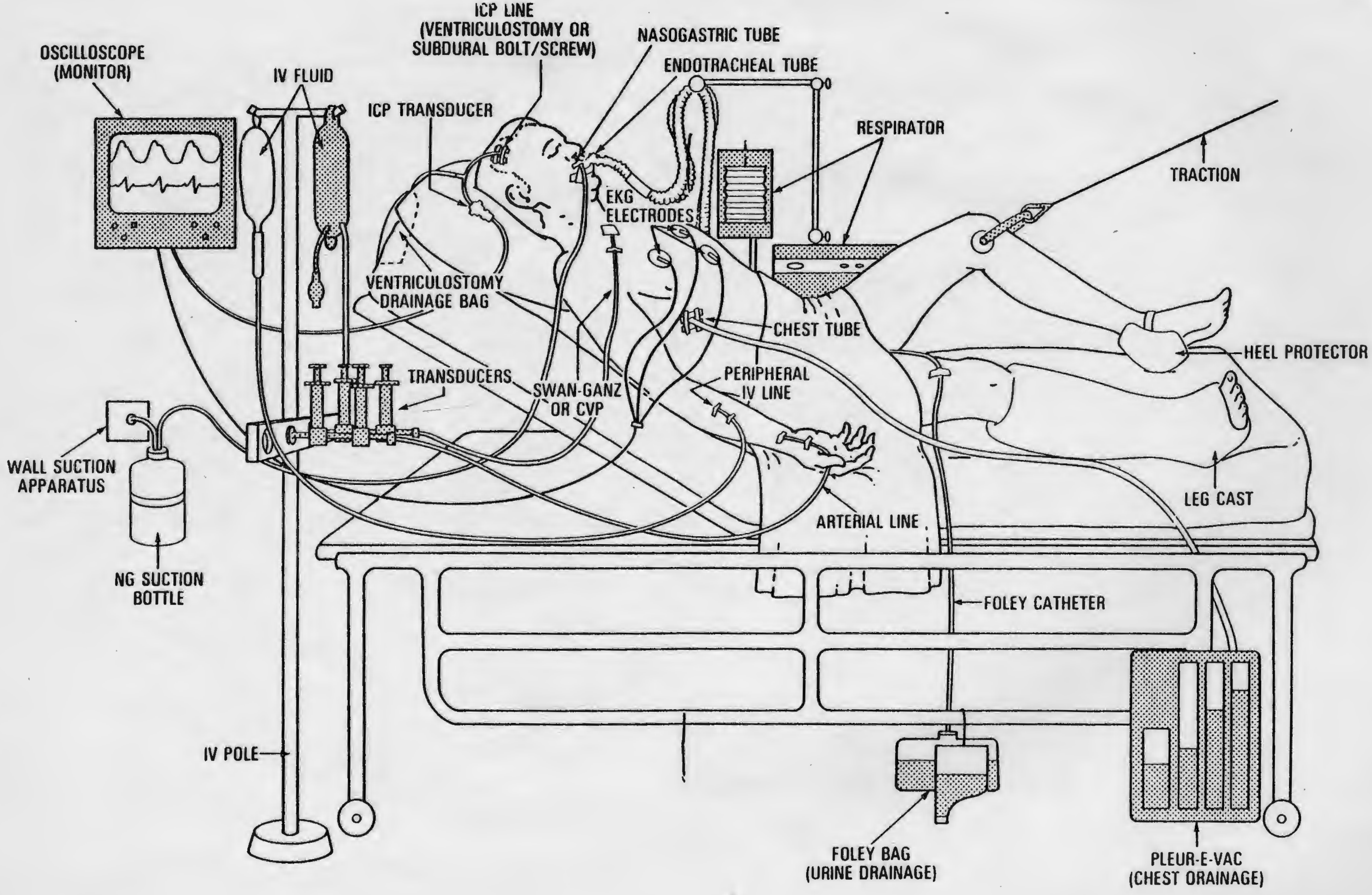
The patient with a head injury with associated cervical spine injury may have TONGS inserted into the skull bone so that cervical traction can be applied to keep the bones in alignment and minimize pressure on the spinal cord. Special beds may be used for the head injured patient with or without associated cervical spine injury and include:

Kinetic bed - This bed rotates the patient from side to side and helps to prevent pneumonia and promotes circulation.

Stryker bed - This is used to maintain alignment of the body and has the advantage of being able to turn the patient to prevent skin breakdown.

Clinitron bed - The patient floats on a bed of moving air bubbles to prevent skin breakdown. Use of these beds enables staff to be able to care for and place the patient in optimal positions to maintain function and muscle tone.

Family members should ask the patient's physician or nurse to explain the function of equipment being used in order to better understand its purpose.


ICP LINE (VENTRICULOSTOMY OR SUBDURAL BOLT/SCREW)
NASOGASTRIC TUBE
ENDOTRACHEAL TUBE
OSCILLOSCOPE (MONITOR)
IV FLUID
ICP TRANSDUCER
RESPIRATOR
TRACTION
EKG ELECTRODES
VENTRICULOSTOMY DRAINAGE BAG
CHEST TUBE
HEEL PROTECTOR
TRANSDUCERS
SWAN-GANZ OR CVP
PERIPHERAL IV LINE
WALL SUCTION APPARATUS
ARTERIAL LINE
LEG CAST
NG SUCTION BOTTLE
FOLEY CATHETER
IV POLE
FOLEY BAG (URINE DRAINAGE)
PLEUR-E-VAC (CHEST ORAINAGE)

PROGRESSION OF REHABILITATION

With any kind of disabling disease or injury there are a series of steps involved in learning to live with the disability. Recovery involves physical as well as psychological adaptations. Physical adaptations always have psychological effects just as physical limitations have psychological effects.

It is important to note that a person's ability to deal with trauma is determined by many factors: how they cope with problems, the support system they have, how much the injury effects their ability to do the kind of work they had been doing or plan to do in the future, and how important the body was to their self-image.

The time span associated with the rehabilitation of a head injured person depends upon the location(s) and severity of the trauma. The process can take up to 4 years post-injury, or may never be completed. It is also possible for a person to go only so far and then cease to progress.

Progress with the head trauma individual generally follows a series of stages. A person must go through one step before he is ready for the next. For example, in physical rehabilitation, a person must work on strengthening before he or she can even think about going to work. Likewise, with psychological rehabilitation the patient must go through the initial depression before making the decision to live and get on with his or her life.

The physical steps in the recovery process often have psychological effects as mentioned above. By engaging in all types of therapy, patients begin to find out about their "new selves". Finding out what they can and cannot do may speed the psychological recognition and ultimately acceptance of the disability.

The family must work to help the individual deal with the necessary life adjustments. A strong, supportive family is very important. Family and friends are a crucial part of each patient's rehabilitation. Emotional support is very important. There may be times when patients are hostile or angry at themselves or at a body which won't "cooperate". Like any other person, a person with a head injury needs to be listened to and comforted in their pain.

This manual was compiled to help our patients and their families understand the ongoing process of recovery from a head injury. The manual certainly does not have all of the answers, but we hope you find it useful as an explanation of our program and as a reference manual for your questions.

BLENDING PHYSICAL & PSYCHOLOGICAL STEPS
IN REHABILITATION OF THE HEAD INJURED INDIVIDUAL

A. Introduction

1. Massive insult to system
2. Body image and self-esteem disturbed
3. Loss of control of environment
4. Therapy role
   - a. Use purposeful activities to regain control of environment
   - b. Mesh correct steps of physical rehabilitation with psychological stages for optimum rehabilitation

B. Stage I of Rehabilitation - Initial/Acute Stage (Level I - III)

1. Problems
   - a. Possible coma
   - b. May be stiffly extended or flexed arms and legs or may be absolutely relaxed with no movement at all
   - c. Surgery stitches? Shaved head? Breathing tube? Tracheostomy?
   - d. "Sick", infections, difficulty breathing, urinary tract infection
   - e. Initial psychological depression - "Why did this happen to me?"
   - f. Changes in body images
   - g. Control lost
     - 1) Internal
     - 2) External
2. Therapy Role
   - a. Begin reestablishing body image and control
     - 1) Correct positioning for tonal changes, prevention of breakdown, extremities within visual field, etc.
     - 2) Help move as much as possible
     - 3) Teach any elements of control: push buzzer, on/off T.V., scratch face, etc.
     - 4) Have patient choose each day what is to be done to her/him
   - b. Prepare for functional motion after initial screening.

C. Stage II of Rehabilitation - Rehabilitation (Levels IV - V)

1. Present Status - Physical
   - a. Still somewhat "sick" - infections, sluggish circulation
   - b. Swelling in brain decreasing
   - c. Poor endurance
   - d. Coma has been replaced by increased wakefulness - accompanied by the various stages (please refer to Levels of Cognitive Functioning)
   - e. Attempts at normalization of muscle tone continue, muscles present can be strengthened and endurance gained
   - f. Still mainly dependent

2. Present Status - Psychological

   a. Still disturbed body image and little control of environment
   b. May be confused, agitated, inappropriate
   c. Lacks consistent purposeful interaction with his/her environment

3. Overall Therapy Approach

   a. Strengthen awareness of self, awareness of environment and muscles
      1) Physiological changes occurring due to time and healing process
      2) Psychological changes occurring due to discovery of new body through movement, exercises and incoming sensations
   b. Strengthen self-esteem by developing body image and control
      1) Use muscles and problem-solving to manage the environment
      2) Be successful in something
      3) Explore ways of using new body
      4) Use element of choice in treatment
         a. Chose activity
         b. Choose treatment time
         c. Choose use of assistive equipment if needed

D. Stage III of Rehabilitation - Rehabilitation (Levels VI - VII)

1. Present Status - Physical

   a. Slow down or cessation of muscle return and control
   b. Bowel and bladder and respiratory status are more medically stable
   c. Endurance is better
   d. Self-care skills have improved

2. Present Status - Psychological

   a. Discovery of disability - awareness of changed body and lack of control leads to this
   b. Orientation, attention span, retention and memory have improved
   c. Continues to need supervision mainly for safety due to errors in judgement

3. Overall Therapy Approach

   a. Strengthen muscles
   b. Teach compensatory techniques for lost abilities
   c. Build endurance
   d. Slowly relinquish control and decision - making back to the patient - to become responsible for himself
   e. Explore alternatives in living
      1) Orthosis? Assistive equipment?
      2) Patient should know bowel/bladder/skin care and good nutrition but it should be a background to living and not a dominant force
      3) Plan for learning driving
      4) Plan for living independently - attendant care?

E. Stage IV of Rehabilitation

At this time it becomes appropriate to look at alternative sources for continued programs such as

a. Cognitive Rehabilitation

b. Pre-vocational Rehabilitation

c. Vocational Rehabilitation

Resources and referral information are available from the Manager of Physical Medicine and Rehabilitation.

INTRODUCTION TO NEUROANATOMY

Serious traumatic head injury is one of the common threats to normal brain function. Having a basic understanding of the brain and how it functions will help the family to have some insight into the complex nature of their family member's possible difficulties. The central nervous system is composed of the brain and the spinal cord. The brain is the receiver and interpreter of messages. Through its integrated processes it is able to coordinate thought processes and body movements. It receives messages from sensory organs, interprets the messages and formulates responses to them resulting in body movements, speech, and general body functions.

The brain is divided into: the cerebrum, which performs the thinking processes; the cerebellum, which controls skilled muscular coordination and the brain stem which controls the body's vital functions. The cerebrum is divided into a right and left hemisphere, each of which control movement on the opposite side of the body. It is further divided into four lobes: the frontal lobe, the parietal lobe, the temporal lobe and the occipital lobe, each of which is determined to serve specific but overlapping functions. (See Figure 1 & 2.) In the normal brain the frontal lobes are primarily responsible for the ability to plan actions and carry them through. The parietal lobes appear to be the major areas involved in learning skilled, coordinated movements. The temporal lobes are responsible for the comprehension and processing of auditory information while the occipital lobes are the primary visual association areas. It is portions of the frontal, parietal, and temporal lobes usually in the left hemisphere which are responsible for the comprehension and expression of speech and language skills. The brain stem includes a variety of structures: the pons, medulla oblongata, cranial nerves, midbrain, and the reticular formation. It is the reticular formation that is of particular importance to the patient with a head injury since this structure is involved with levels of consciousness, drowsiness, and the ability to attend. Breathing, pulse, and blood pressure are also controlled by parts of the brain stem.

The brain is encased in the skull and is further protected by three membranes which enclose the brain and the spinal cord. The space between the two innermost membranes is filled with cerebrospinal fluid, a clear, colorless fluid which helps to cushion and protect the brain against injury. Within the brain are open spaces called ventricles. The ventricles are filled with the same cerebrospinal fluid that surrounds the brain and spinal cord.

The kinds of symptoms observed as a consequence of traumatic head injury will depend upon the area and extent of injury to the brain. When a head injury occurs from a moving vehicle accident, in most cases the frontal lobes of the brain sustain the initial and strongest impact. The bones of the skull may become compressed or broken resulting in a skull fracture. Some skull fractures require surgery to protect the brain from further damage.

In severe head injuries the brain will twist back upon itself at the brain stem. As a result the brain becomes unable to transmit messages through the cranial nerves which pass through the brain stem and out to the body. The person becomes unconscious and is usually considered to be in a coma. The word **COMA** is usually used to describe a loss of consciousness wherein the patient may not respond in any way to external stimulation. Between consciousness and coma are a variety of altered states of consciousness. (Refer to Levels of Cognitive Functioning.)

The person may experience bleeding inside the skull as a result of the injury. The medical term for bleeding is **HEMORRHAGE**. When a mass of blood from a hemorrhage collects in a confined space it is called a hematoma (See Glossary). A hematoma causes problems in that it deprives the brain of proper blood flow to certain areas and it is confined to an area of limited space which results in increased pressure on the brain. Intracranial pressure (ICP) from brain swelling or hematoma will be constantly monitored. Nurses and doctors will carefully observe the patient's outward behavior for signs of increased ICP as well as monitoring pressure within the skull if necessary. It is important that the pressure be decreased by reducing the build up of blood within the brain. The usual treatment for a hematoma is to remove it by surgery. If surgery is necessary the head will have been partially or completely shaved, however, the hair will grow back.

A procedure known as a CT scan (Computerized Tomography) is usually performed following traumatic head injury and may be requested by the physician at various points during the recovery process. Although CT scanning in patients with head injury frequently visualizes a specific area of brain injury confined to a single hemisphere, as a general rule this lesion is superimposed on a diffuse cerebral injury of varying severity. (See Figure 3 & 4.)

In traumatic head injuries the damage is random and often cannot be pinpointed to a specific area of the brain such as in the case of stroke. The term Contra Coup is used to describe this phenomenon of diffuse injury wherein on traumatic impact to the head the brain rebounds off the inside of the skull producing multiple places of injury in the process. When this happens a mechanical shearing or stretching of nerve fibers occurs. These micro tears in the nerve cells are frequently responsible for those difficulties the patient will present with which cannot be accounted for when viewing x-rays or CT scans.

This makes it difficult to accurately predict the extent and type of damage or the possible outcome. Each traumatic head injury can be expected to present a unique set of brain injuries and problems.

The Lobes of the Brain

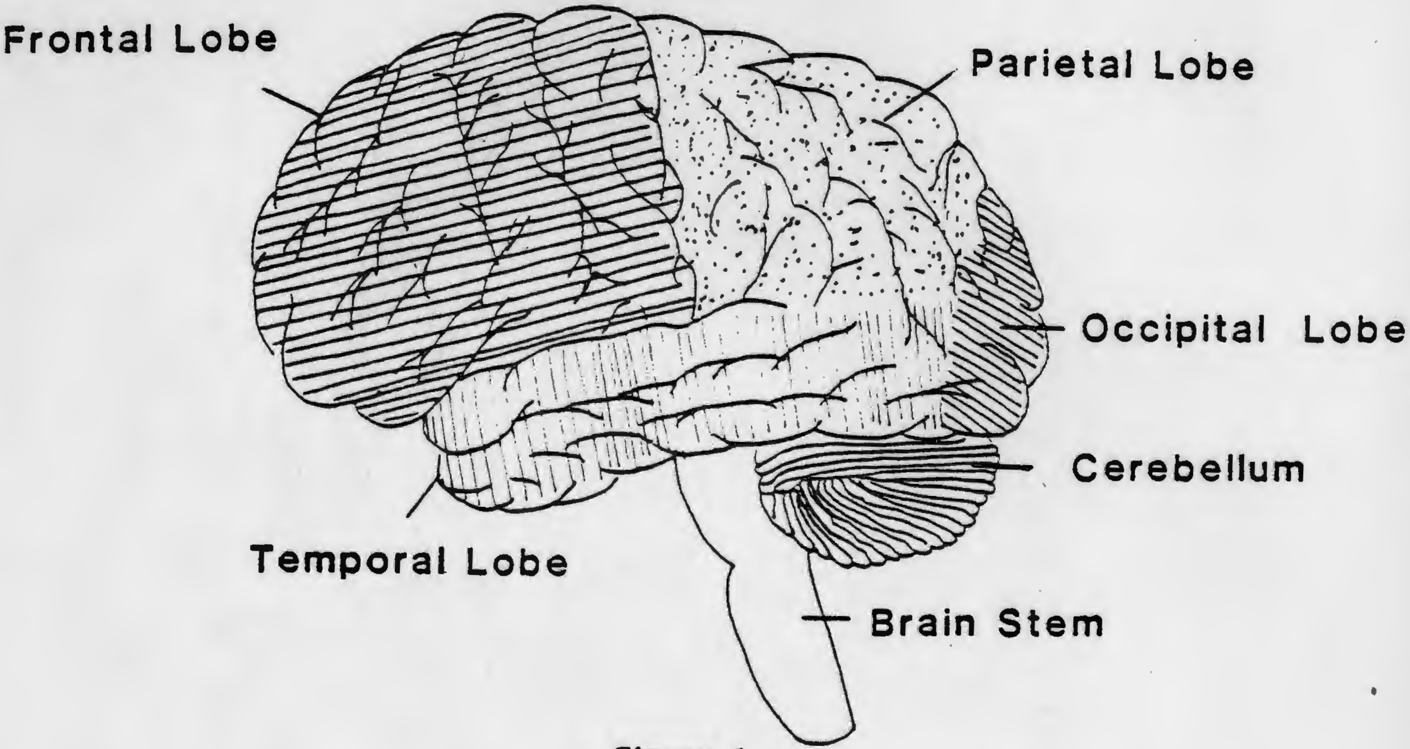


Figure 1

Upper Surfaces of the Brain

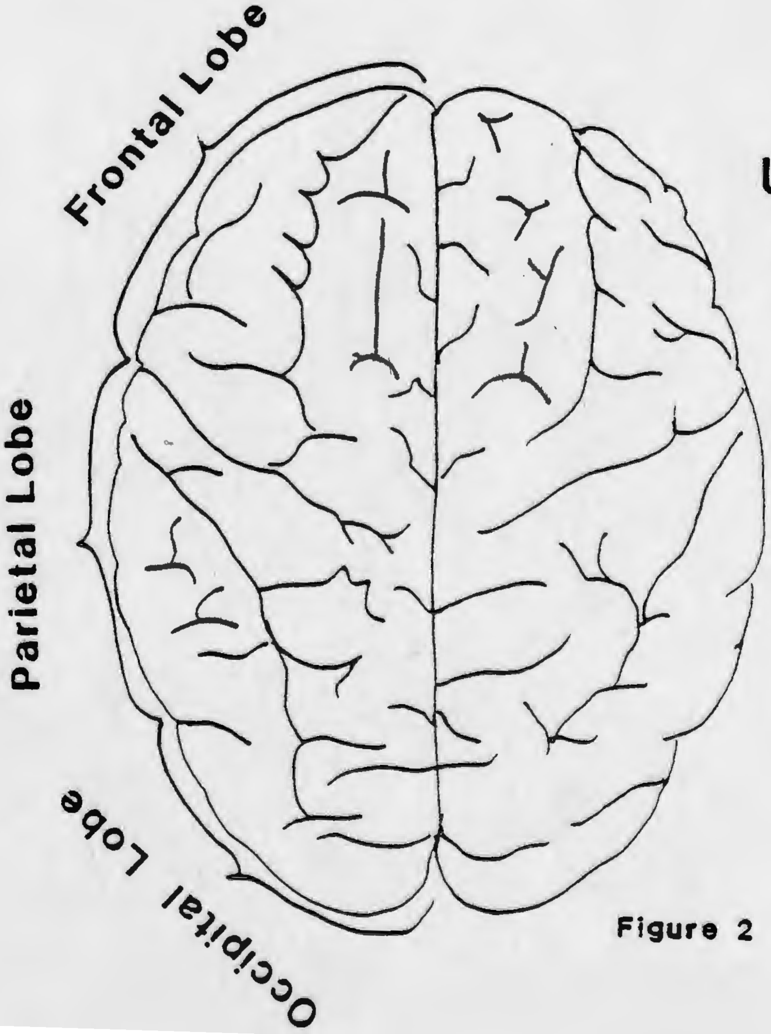


Figure 2

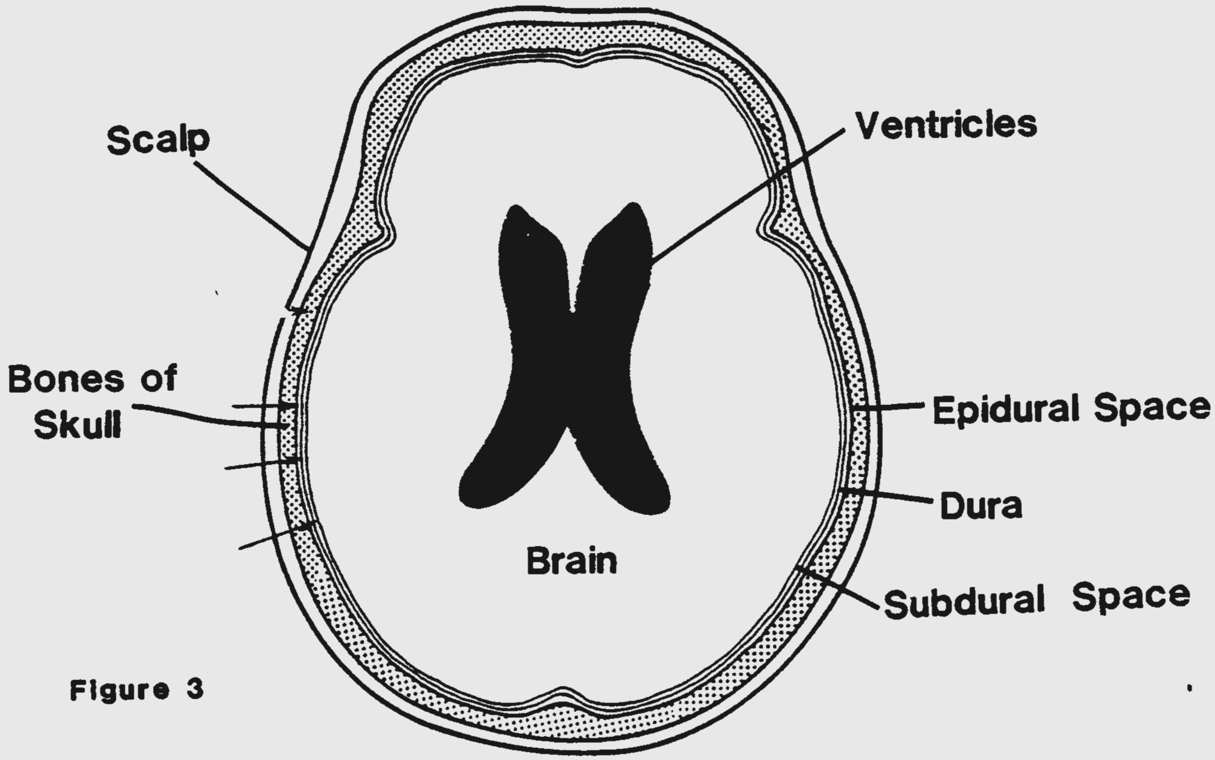


Figure 3

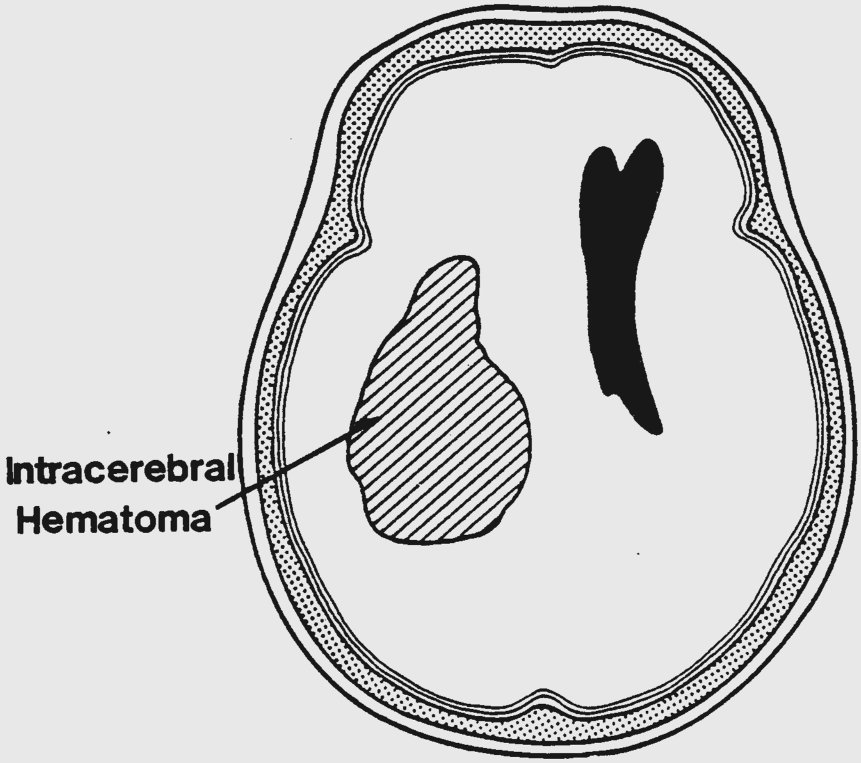


Figure4

LEVELS OF COGNITIVE FUNCTIONING - A Guideline[1]

I. No Response

Patient is unresponsive and appears to be in a deep sleep. No observable change is noted when patient is provided with visual, auditory or painful stimuli.

II. Generalized Response

Patient reacts inconsistently and nonpurposefully to stimuli. These responses may be seen as: gross body movements, vocalization or physiological changes. Oftentimes, the response is delayed and the same regardless of the type of stimulus. Usually the first patient reaction is to deep pain and may be seen as a reflexive movement

III. Localized Response

Patient reacts specifically but inconsistently to stimuli. Responses are directly related to the type of stimuli presented. Responses seen in this phase may include: single word responses, withdrawal or vocalization to painful stimulus, turning toward or away from sounds, blinking when a strong light crosses the visual field, following moving objects when passed within the visual field, pulling on tubes or restraints due to discomfort, or following simple commands in an inconsistent manner such as closing eyes or squeezing hand. He may also show bias by responding only to certain people such as family, friends or familiar faces.

IV. Confused, Agitated

Patient is in an increased state of activity with severe decreased ability to process information. He is detached from the environment and responds primarily to his own internal confusion. Behavior is frequently bizarre and nonpurposeful to the immediate surroundings. Responses seen in this phase may include: crying out or screaming in a seemingly unnecessary manner, displaying emotions that are out of proportion to stimulus, attempting to remove restraints, crawling out of bed, and striking out at others. He is unable to cooperate with treatment efforts.

Attention span is typically brief and selective. Short term memory is usually lacking and inability to perform self care persists. Some motor skills may be exhibited such as sitting or walking, but they are usually seen as automatic activities and will not be done upon request or as a purposeful act.

V. Confused - Inappropriate - Non-Agitated

Patient appears alert and is able to respond to simple commands in a fairly consistent manner. However, as commands become more complex or less structured, responses tend to be nonpurposeful and fragmented reflecting confusion and lack of goal direction. Agitation is seen more as a response to external stimuli instead of a reaction to internal confusion as in level IV. Attention span is increased from level IV, but patient is still highly distractable and lacks ability to focus on a task without constant redirection and prompting. Patient frequently talks inappropriately. Memory is often severely impaired, confusing present and past. Patient is frequently unable to initiate tasks and carryover is often absent for purposes of learning. Patient can usually perform self care activities with assistance and may accomplish feeding with supervision. He responds best to self, body, comfort and, often, family members. If patient is mobile, management may be difficult, as he may wander away from unit or treatment area with the vague intention of "going home".

VI. Confused - Appropriate

Patient may now show goal directed behavior and thus begins to actively participate in therapy programs. However, he is dependent on external structure for direction. He is inconsistently oriented to time and place and no longer wanders. He begins to follow simple directions consistently and shows carryover for tasks he has already learned but little or no carryover for new learning. Behavior response to discomfort is appropriate and patient is able to tolerate unpleasant experiences when they are explained. Past memory shows more depth and detail than recent memory. Selective attention to tasks is still impaired but functional for common daily activities. He may begin to show recognition of staff and his basic needs.

VII. Automatic - Appropriate

Patient appears appropriate and oriented in familiar hospital and home settings. Daily routine activities are automatic and lack previous confusion but recall is still shallow. Environmental awareness is increased but somewhat superficial lacking good judgements, problem solving, insight and realistic planning for the future. Carryover for new learning is apparent but at a decreased rate. Minimal supervision is required for safety and learning. He demonstrates independence in self care activities. With structure he is able to initiate tasks or social and recreational activities in which he is interested. Pre-vocational evaluation and counseling may be indicated.

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[1] Levels of Cognitive Functioning, Rancho Los Amigos, Downey, California.

REHABILITATION TEAM MEMBERS

All team members strive to restore the head injured person to the highest level of independence possible. Since the patient with brain trauma often has deficits in physical, cognitive and social areas a cooperative effort between team members is utilized to evaluate and formulate an individual program to regain function in those efforts.

The role of the various team members is as follows:

MEDICAL DIRECTOR

A Board-certified Physiatrist (specialist in Physical Medicine) serves as Medical Director for the program, acts as consultant to other physicians and team members, and chairs team meetings.

PHYSICAL THERAPY

The physical therapy program will include a series of activities such as: sitting and standing balance, transfers, mobility and gait, as well as exercise to improve concentration and perception. All of these activities will be designed to achieve strength, balance, coordination and quality purposeful movement. Throughout the entire restoration process, ongoing assessments will be made and changes implemented as needed. All of these activities require hard work, determination and family participation. During the patient's stay on the Rehab Unit, the family will be instructed in effective techniques to aid the patient before and after discharge to facilitate a more successful return to family and community life.

OCCUPATIONAL THERAPY

The role of occupational therapy is to develop a program of instruction which will help each patient achieve maximum independence in activities of daily living and in skills needed to readjust into the social environment. Remediation may be required in one or more of the following areas: motor skills; attention span and concentration; thought organization; problem-solving; visual perception and body scheme.

RECREATIONAL THERAPY

Patients who have suffered head trauma commonly experience physical and cognitive problems which prevent them from participating in previously enjoyed recreational activities. Recreational therapy works with patients to overcome or compensate for those problems. The recreational therapist assesses each patient's social skills, preferred recreational activities, community skills, and awareness of the importance of constructive use of leisure time. Physical, cognitive, perceptual-motor, and communication skills are also assessed as they relate to the patient's participation in recreation and leisure activities. Recreational activities, such as field trips, swimming, games and group discussions are designed to enhance psychosocial functions, sensory-motor skills and cognitive and communicative functioning.

CHAPLAIN

The Chaplain attends to the spiritual needs of patients and counsels with patient and family in crisis situations, whether they occur while the patient is on the Rehabilitation Unit or after discharge. As a member of the rehabilitation team, the Chaplain shares relevant information about patient and family with the team and is available to team members for assistance when necessary. The Chaplain's function is to help the patient and family with spiritual needs during the hospital stay and offer support in readjusting to home and community life.

SPEECH PATHOLOGY

The role of speech pathology in working with the head injured patient and family is a very complex one which involves not only the patient's ability to understand conversation or to be a verbal communicator but quite often it begins at the most basic level of sensory arousal before the patient shows signs of being aware of his environment. Frequently, the speech pathologist will work with the dietitian to structure a program for the redevelopment of those oral skills necessary to manage food and liquids. This skill precedes the redevelopment of the finer, more precise movements involved in verbal communication. The long term goals of speech/language therapy are to stimulate and guide spontaneous recovery through the natural progression of communication redevelopment, to strengthen impaired skills and to teach compensation techniques for those difficulties which persist.

The speech pathologist may utilize all or portions of one or more of the available tests to obtain a more complete picture of the existing cognitive and communication deficits. A structured program to address and improve these difficult areas is then implemented. Emphasis in speech/language therapy is to assist the patient in getting to a level of functional communication which may include the development of a communication device such as a communication board to aide expressive communication. The speech pathologist will address the areas of speech, language, listening, reading and writing as needed; along with the prerequisite skills of attention, concentration and retention. Higher level language skills such as thought organization, visual/logical sequencing and abstract reasoning may be addressed. The family is involved in the speech/language therapy process and is usually asked to take an active role in the communication rehabilitation of the patient.

PSYCHOLOGY

Psychology works with patients who have suffered brain trauma as well as with their families to help them understand and deal with the changes which have occurred because of the injury. Behavior changes resulting from the trauma are often quite distressing for both the patient and his or her family.

The psychologist may perform specific "neuropsychological" tests to clearly identify the problems that the patient is experiencing. If formal testing is not indicated, the psychologist may work with the patient to observe his or her behavior. These behavioral observations are then compared with observations made by other team members to develop an overall picture of the patient's abilities and deficits.

Once the behavioral description of the patient has been formulated, therapeutic interventions can be devised. Interventions may include:

behavior control programs to deal with aggressive or hostile behavior, cognitive rehabilitation sessions, and recommendations about vocational rehabilitation. The psychologist will also be coordinating team treatment efforts and instructing the family in methods to help the patient cope with his or her specific problems.

PHARMACY

The pharmacist as a member of the rehabilitation team is available to contribute any needed information concerning a patient's drug therapy. This can include such information as drug interactions, side effects, indications and dosage regimen. With written request by the doctor the pharmacist can provide the patient or family with drug information. The pharmacist also provides inservice education to other members of the treatment team.

NUTRITION

Good nutrition is of vital importance in progress toward recovery. The clinical dietitian is responsible for making an assessment of nutritional needs, then consulting with the physician and other team members to make recommendations for the best approach to take in order to maintain or achieve good nutrition.

Therapeutic needs for specific nutrients and calories, along with physical limitations and food preferences, are all taken into consideration in planning the patient's diet. The dietitian coordinates menu selections so that the diet is well-balanced and appropriate for individual needs and works with nursing staff and other team members to ensure this.

Nutrition education and counseling are also provided to the patient and family throughout the hospital stay so that maintenance of a good diet may continue at home.

REHABILITATION NURSING

Rehabilitation nursing consists of registered nurses, licensed vocational nurses and nursing assistants. Nursing helps and encourages the patient to become as independent as possible in such self-care activities as feeding, bathing, hygiene, dressing, shaving and transferring. Rehabilitation nurses work with the patient, family and other team members toward the common goal of restoring the patient to maximum potential.

The rehabilitation nurse will complete an initial nursing assessment and develop a plan of care identifying specific problems and needs, defining nursing directives and determining expected outcomes. He or she will provide nursing care based on physician's orders, the nursing care plan and patient needs. In addition, the rehabilitation nurse is responsible for reinforcement of goals set with the rehabilitation team by encouraging patient independence in activities of daily living and time management.

SOCIAL WORK

The role of the rehabilitation social worker is to help the patient and family cope with the emotional and social tensions of head injury. During the patient's stay on the Unit, the social worker will meet with the patient and family to provide support and education. These talks may be individual or in groups. The social worker works with the family in identification of resources, application for benefits, and planning for long-range goals. Particular emphasis is placed on post-hospitalization head injury programs. The social worker can facilitate paperwork and guide the patient through this process. Areas of discussion may also include improvement of communication among family members or helping to develop new coping skills.

The planning of living and other arrangements after discharge begins with the initial interview. Staffing meetings will be held with the family, social worker and other rehab team members to determine individual needs and resources. Goals for discharge are monitored and discussed so that equipment, attendant-care, transportation, home modifications or alternative living arrangements can be obtained in an orderly manner by or before the time of discharge. The patient and family will be made aware of resources within the community and referred to them as necessary.

THE PATIENT!

Please understand that our team cannot function effectively without the valued and ongoing input and work from the patients and their families. We are here to work together to restore the head injured individual to his optimum level.

rehab

REHABILITATING BEHAVIORAL RESPONSES

COGNITIVE REHABILITATION

Some of the work with head injured patients in the acute stages of recovery can be classified as typical "physical therapy" and "occupational therapy"; however, much of what the therapists actually do with the head injured patient can be termed cognitive rehabilitation or cognitive retraining. There are many techniques used to rehabilitate cognitive (or thinking) abilities. The techniques differ depending (1) on the patient's level of cognitive-behavioral functioning (see Levels of Cognitive Functioning in HI section of this manual), and (2) on the goals which the therapists are working toward achieving. Goals depend heavily on the level of cognitive recovery, however.

The purpose of cognitive rehabilitation is to direct the patients' responses to their external environments in such a manner that will maximize their abilities to relearn socially appropriate and adaptive behavior. Recovery from a head injury can be divided into three phases, each addressed by different retraining techniques with different goals for each phase.

Phase I

Cognitive rehabilitation begins when patients are still in the coma and, at this phase, focuses on stimulating any responses to the external environment. Decreased response level is thus the first cognitive "problem" that is addressed.

Phase II

In later stages of recovery, where behavior is characterized by agitation and confusion in responding to the external environment, the problems addressed by cognitive rehabilitation are the opposite of decreased responding. Some of the problems and their consequences at this phase are (1) short attention span and hyperactivity - which quickly wears out anyone spending any amount of time with the patient, (2) confusion -

often resulting in agitation and sometimes hostile, aggressive behavior, (3) memory deficits and impaired receptive and expressive language functioning - which may greatly frustrate the patient's efforts to deal with the external environment and result in much confusion and agitation. At this phase of cognitive-behavioral recovery the goal is to decrease and direct the the responses through structured and consistent repetition of behavioral tasks.

Phase III

The third phase of recovery also requires a different set of cognitive-behavioral techniques. The patients' problems during this phase may appear subtle to those who do not work with them closely. Yet, those people who spend much time with the patients will be able to pick out the behaviors (and identify the situations in which they occur) which will cause difficulties in re-adjusting to life in the community. Problems at this phase include (1) poor ability to sustain attention to a task, (2) inability to follow tasks through to completion and sometimes an inability to independently start tasks, (3) impaired memory, (4) unrealistic estimation of abilities which may cause patients to put themselves in potentially dangerous situations (e.g., driving a car before they're ready) and, (5) poor ability to logically work out the solution to problems (could be any type of problem - a math problem or a problem in a relationship). The goal at this stage is training patients to use their abilities to cope with their deficits. For example, patients who have memory problems are trained to use a notebook to write down reminders for themselves.

In this manual we will describe the cognitive rehabilitation techniques which may be used by the therapists and family members in the first two phases. Phase III is typically dealt with in outpatient or residential treatment programs after the patients have completed acute rehabilitation. Cognitive rehabilitation techniques for Phase III will not be discussed here since this manual focuses on acute rehabilitation. Saint Joseph Hospital offers an outpatient Cognitive Rehabilitation Program for Phase III recovery, and brochures are available from the Department of Physical Medicine and Rehabilitation.

COGNITIVE REHABILITATION TECHNIQUES

The purpose of cognitive retraining in the first two recovery phases is to direct the patient's thinking in order to elicit behavior which is functional and adaptive. Behavioral problems almost always reflect cognitive or thinking problems of some kind. The techniques used to deal with patients in the first phase of recovery are very different from the techniques used in the second phase even though the overall purpose is the same. Team members, family and friends must become good observers of the patient's behavior and learn to determine cause-effect relationships. That means that when they deal with the patient they must try to find out what occurrences in the external environment (i.e., causes) bring about what behaviors in the patient (i.e., effects). With this information the environment can be structured to help the patient control his or her behavior. It is important to note that the stages discussed here are convenient groupings of behaviors which appear to be similar. There is often no specific point in time when patients "graduate" from Phase I to Phase II. Behavior may vary dramatically from day to day, and even from minute to minute, in a head injured person. Gradually, you will notice that the patient spends less and less time in the coma phase and begins to respond more and more to the external environment and, thus, you can track the move from Phase I to Phase II.

Suggestions for techniques to deal with the patient are listed below. These are the approaches that the therapists use, and family members are encouraged to use them too. Guidelines are provided.

Phase I - Coma

The major problem during this phase is that the person has greatly decreased responses to stimulation. Techniques used to facilitate arousal from coma-like states include stimulating the patient in a variety of ways, using all the different sense modalities. Providing different sounds, odors and touch sensations is done in order to help the patient "wake-up" and attend to the external environment. Tape players or radios can be used to provide patients with their favorite music; spices or things such as vinegar, perfume or shaving lotion that have a distinctive odor can be held under the patient's nose and are used for olfactory (smell) stimulation;

things that have different textures (both coarse and soft) such as loofa sponges, silky or velvety material, and smooth stones can be rubbed on the patient or put in his or her hand for tactile (touch) stimulation.

The therapists will also be doing range of motion (ROM) exercises to keep the patients joints limber and their muscles working while they are unable to move purposefully on their own. It is a good idea for the family to learn these exercises and to work out a schedule with the therapists for doing the ROM exercises. These exercises not only help keep the patient mobile, but also provide good tactile stimulation. It is also important for the family to learn any positioning techniques from the therapists so that they can help keep the patient in positions which are most comfortable and which will help minimize long-term physical complications such as contractures.

General Rules for Coma Stimulation

While stimulating the patient in this stage there are some important considerations to keep in mind:

1. Although conversation around (and to) the comatose patient is a good type of stimulation it is important to be careful what is said. The person could become aware at any time and it is very important that he or she not hear something said which may be frightening, alarming or demeaning.

2. Stimulation should be done in 15 to 30 minute sessions. More than that at one time is beyond the patient's limited ability to maintain an optimal state of responsiveness. Sessions should be provided at least several times a day. Remember, you can overdo stimulation.

3. Familiar voices, objects, sounds and smells should be used for stimulation. Things that are familiar to the patient are most likely to elicit responses. Patients may respond by squeezing your hand, squeezing their eyes closed tight, moaning or moving some part of their body. Responses will not occur every time the patient is stimulated in a particular way - this is normal.

4. Stimulation should be presented to one or two senses at a time. Avoid stimulus overload. For example, don't have a conversation going on among several people, the T.V. on, and a radio going all at the same time. This is very disruptive for the comatose patient.

5. Briefly explain the stimulation being given to the patient before, during and after you present it. Do not surprise the patient. Fully explain what you are going to do before you begin stimulation - don't try to explain and stimulate at the same time.

6. Verbally explain as much as seems appropriate to the patient about what has happened to him or her.

7. Notify the nursing staff or other team members when you notice any changes in response to stimulation. Observations about responses to various types of stimulation are crucial for monitoring progress.

8. Observe the patient carefully and notice if he or she responds to one particular type of stimulation more than others (e.g., particular sounds, smells or touches). Notify the nursing staff or treatment team to see if they are getting similar responses. This is important because often family members begin getting responses before treatment staff does.

Conversations Around the Comatose Patient

Since hearing is often the first sense to return in a comatose person everyone who comes in contact with the patient should talk in soothing tones using normal conversation at all times. Conversations about familiar subjects with familiar voices are most likely to be arousing to the patient. Family members must help educate the team about special interests of the patient.

When family members talk to the comatose person they should sit close to him or her and talk as if the conversation could be heard and understood. Positive subjects should be emphasized. Discussing past events which were enjoyable to the patient (such as birthdays, vacations, etc.) is a good strategy. Family members are encouraged to touch the patient while they are talking. It is important to avoid "baby talk" when addressing the person. Frequent rest periods are required. Talking "around" the patient to others present in the room does not qualify as a rest period since the patient is still receiving the verbal stimulation. Again, be careful of what you say in the patient's room.

Phase II - Confusion & Agitation

Once the patient comes out of the coma phase there are many types of behavior problems which can occur. Cognitive rehabilitation techniques are very different from those used in Phase I. The overall purpose is still to direct the responses, however, now attempts must be made to control the behavior rather than to elicit any behavior (which was the goal in Phase I). The problem has changed from providing stimulation to get a response to limiting the responses by structuring the external environment.

Confusion and agitation are the most salient problems of patients in Phase II. Agitation has been described as characterizing the transition from minimal responsiveness to confusion. The confusion may be due to a variety of specific problems. Patients are rarely oriented to reality after they awake from a coma. That means that they don't know where they are or why. They may not be able to remember names (perhaps not even their own!) and probably do not know the date or time of year. Memory problems are usually quite noticeable in this phase. There is probably no memory of the accident, and memory loss for some period of time before (called retrograde amnesia) and after (called post-traumatic amnesia) the accident is common. Sometimes patients make up stories about what happened to them to fill in the memory blanks - this is called confabulation. Memory for events which happened prior to the accident may be temporarily disrupted, but this retrograde amnesia should gradually disappear. Problems with "new learning" or memory for things which happen after the accident are more troublesome, and may persist indefinitely depending on the nature and extent of the damage.

In addition to orientation and memory problems head injured persons may have difficulty understanding what is said to them or difficulty in expressing their ideas. They may be totally unable to speak. Vision may be affected so that the patient has blurred vision, double vision, or an inability to see to one side or the other.

Problems in maintaining attention also become apparent when the patient comes out of the coma. Initially, the head injured person cannot pay attention to one thing for more than a few seconds at a time. Patients are very distractable. They appear to be trying to attend to everything around them at once, but are *unable to focus* attention on anything. Another problem with attention is apparent with *perseveration*. Sometimes head injured persons will perseverate or stick on one topic or idea even after other ideas have been discussed - they may sound like a broken record saying the same thing over and over. They may also perseverate on particular gestures and use the same gesture repeatedly (patients seem to take particular delight in using obscene gestures because of the reaction it gets from family members and staff!). *Neglecting* or not paying attention to part of their visual field despite an absence of actual visual problems is an attentional problem for some patients. As an example of neglect, patients with *left neglect* may not notice people standing to the left side of them even if those people are talking, or they may only eat the food on the right half of their plates and think that they've finished eating.

This is only a partial list of problems which may occur after head injury. Because there are so many behavioral and emotional consequences, family and friends should observe the patient carefully to identify the problems which seem most significant. Family members tend to "make excuses" for the patient's behavior, but it is important not to dismiss the problems that the patient is having as "accidents". Behavioral observations provide very important information. Once the problems have been identified, treatment strategies can be worked out to help the patient cope with his or her difficulties.

It is often difficult for family and friends to understand the patient's behavior, much of it seems to make no sense and to have no logical cause or planned effect. Remember that the person has had a head injury which has caused the brain to function differently. The responses are not normal and frequently are not directed at events in the external environment. Patients are reacting to their own inner confusion in this phase and have little control over their behavior.

General Rules for Dealing with Confused Behavior

The most important thing for the treatment team and family to remember is that the patients are reacting to their own distorted reality caused by the brain trauma. They must not be blamed or punished for behavior that they have little control over. Rather, efforts must be made to provide the patients with a soothing, stable environment and thereby help them control their behavior. Since the head injured are unable to control their inner experience, structure and consistency in the external environment are crucial to help them adapt and slowly regain that inner control. This is the purpose of cognitive rehabilitation efforts at this time. Here are some rules and suggestions to keep in mind:

1. Keep interactions with the patient simple. Speak in simple, short sentences. Do not have many people in the room at one time. This is very distracting to the patient and may cause agitated behavior.

2. If you ask the patient to do something give the verbal instructions in a slow, clear manner. Allow plenty of time for a response since the patient's reaction time is probably very slow.

3. Work with the patient on orientation information - who they are - name, age, grade in school, family names, etc.; where they are - hospital, rehabilitation unit; who various team members are; how long they've been in the hospital and why; the present date - day, month, year. This information will have to be presented over and over again. Try to present it in the same way and the same order each time to provide consistency and maximize the patient's learning.

4. A bulletin board for family pictures and pictures of the patient and friends is helpful for work on orientation.

5. If the patient becomes agitated, gently try to redirect him or her away from whatever seems to be causing the problem. Act calm and controlled. Speak in a soothing, reassuring voice.

6. Don't argue with the patient. Try to correct errors gently and if the patient insists he or she is right just go on to another topic.

7. Don't expect the patient to pay attention to one task or topic of conversation for very long. Be prepared with different topics or activities which you can switch frequently. You will not have trouble telling when the patient is ready for a change.

8. Patients in this phase may do very little initiating of behavior or discussions, so you must take the lead. Because they do not initiate does not mean that they do not want to talk or engage in activities - they may still need external stimulation or <u>cues</u> in order to respond.

9. Begin to talk to the patient about his or her deficits, and develop a good strategy to explain them. You will have to repeat explanations over and over again. Be patient.

10. Gently point out inappropriate behaviors such as swearing, making obscene gestures, hitting, spitting, scratching or kicking. This is probably the most difficult strategy because it is difficult to react calmly to such emotion-provoking behavior. Try to interpret the patient's behavior. For example, you might say, "I understand that you are frustrated, but you may not behave this way. You need to learn to talk to us about what's upsetting you. That way we can try to change it."

11. Don't talk to the patients as though they were children. It can be very distressing and puzzling if family and friends suddenly begin relating to them in a strange manner.

You can see that the general rules that run throughout the treatment strategies are STRUCTURE, CONSISTENCY, and REPETITION. These rules must be followed in all your dealings with the head injured patient, and you are responsible for educating any visitors about the treatment principles. Do not assume that other relatives and friends will know how to deal with the patient. Our first impulses in how to react to the head injured person's behavior are often wrong from a therapeutic standpoint. It is especially difficult to react in a therapeutic manner to agitated or hostile and aggressive behavior. Even though head injured persons' behaviors may be very difficult to understand and deal with, it is important to remember that they are not purposefully trying to hurt or provoke others. They are simply trying to figure out how to deal with a very frightening and confusing world. Please understand that, although the patient's behavior in this phase may be upsetting, it represents progress and continued cognitive recovery.

Discharge

If the patient is mobile enough to get around the unit, weekend passes may be granted so that families may have a trial at home with him or her. The family will then be able to see how the patient functions in the environment outside of the hospital. Plans are now being made for discharge and the family has the difficult task of deciding what course of action is best for the patient and family, and what is feasible financially. This is often a very stressful time. Some families decide to take the patient home and have him or her continue rehabilitation as an outpatient. The rationale for cognitive rehabilitation techniques at this phase (usually Phase III) and suggestions for implementing those techniques are provided below. Ideally, a home program should be worked out with the therapists prior to discharge.

When patients leave the structure and familiarity of the rehabilitation unit they may feel that they are leaving their "security blanket" behind, despite the fact that they are going home. Patients and families sometimes think that everything will magically be alright once they are discharged from acute rehabilitation and that all the problem behaviors were the result of how the patient was being treated by the staff. These are the families who are going to have the hardest time adjusting to the patient's disability and who will have the most trouble structuring the home setting to help the patient make the necessary adjustments. A more realistic appraisal of the patient's continuing problems will make the transition to home much easier.

In the hospital, structure is provided by scheduling the patients' time and by having the same staff members work with the patients each day. Staff members try to be consistent in the way that they deal with the patients in a further effort to provide a predictable environment. Structure and predictability allow the patients to function somewhat independently. Cognitive rehabilitation efforts in Phases I and II are aimed at adjusting the environment based on the patients' problems. When the patients go home, it is important to continue to provide structure and consistency, but the emphasis changes to helping the patients learn how to control their environments themselves.

At home the patient needs to learn what his or her problems are and in what situations they interfere the most. Structure must gradually be reduced and more responsibility must be given to the patient for things like awakening on time, self-care such as bathing, brushing teeth and dressing. The emphasis now becomes to help the patient learn problem-solving techniques so that he or she can learn how to cope with a relatively uncontrolled and unstructured environment. Rehearsal, repeated training and practice are important to enable the patient to relearn life skills.

Many of the strategies used in Phase II still apply in home training. Constant repetition, logical and simple presentation of instructions, and encouragement to use compensation techniques are important in helping the head injured person adapt to home living. Before going home, you should get together with the treatment staff at the rehabilitation center to discuss the compensation techniques that the patient has been taught to use and ways you may need to modify them for use at home.

Recovery from brain injury takes a number of years and no one escapes without some residual deficits. Whatever the consequences of the injury they are a great source of frustration for the head injured person. After discharge is the time when they need the most love, understanding, and support from their families. Unfortunately, this is also the time when families are most emotionally and physically exhausted - after dealing with the coma phase and the confused and agitated phase.

There really is no good way to end this section of the manual. Spectacularly successful treatment programs and techniques remain to be discovered and used throughout the country. We are left to attempt trial and error methods which appear to work - different strategies work with different patients. The psychologist and the social worker from the acute rehabilitation unit can discuss concerns with you after discharge. They should know about available treatment programs and whether those programs are appropriate for your family member. There is also a group called the Texas Head Injury Foundation which offers phone contact with persons who have a head injured person in their family and weekly discussion/support groups. Information about this group can be found in the help section of this manual. Good luck. We can be reached at Saint Joseph Hospital Rehabilitation Services if you would like more information.

References

Howard, Michael. Traumatic Head Injury. Manual from lecture presentation sponsored by Resource Applications, Inc.. October, 1983.

Malkmus, Danese. Integrating cognitive strategies into the physical therapy setting. Physical Therapy, 63, 1952-1959, December, 1983.

health

SKIN CARE

The skin is a vital part of the human body. The skin covers the entire body surface. One of its major functions is protection. Specifically, the skin acts as a physical barrier to prevent injury and infection. Because of its protective function, the skin can be described as our first line of defense.

Due to the head injury, there may be a decrease in movement, sensation and local skin circulation. These factors in turn can lead to skin problems. For example, if you are unable to feel, you may accidentally burn or bruise yourself without knowing. In addition, if there is a decrease in movement, the patient may tend to lie or sit in one position for too long, causing damage to the skin from prolonged pressure (a "pressure sore"). Skin problems, especially pressure sores, can lead to other complications such as:

1) prolonged hospital stay and increased hospital cost (i.e. including possible surgical treatment)
2) delays or "setbacks" in ability to participate in therapy programs
3) increased susceptibility to recurrent breakdowns.

However, the most important thing to remember is that skin problems are preventable. This section is designed to provide information about recognizing and preventing skin problems. Although much of the observation, prevention and care will be done by the nursing staff, families need to know their role and responsibilities when the patient is ready to go on home visits.

First, let us begin with a description of healthy skin. Healthy skin is intact, well lubricated with natural oil and nourished by a good blood supply. To keep skin healthy, a well rounded <u>diet</u> is essential. In addition, <u>good hygiene</u>, <u>regular skin inspection</u> and <u>pressure relief</u> help to insure adequate blood supply to the skin.

PRESSURE SORES

Unrelieved pressure slows down the blood supply to the skin. Specifically, pressure forces blood out of the tiny blood vessels which nourish the skin and the underlying tissue. Such loss of blood supply leads to death of tissue. Damage can occur rapidly with pressure sores developing in minutes and hours. Many areas are especially prone to damage as a result of unrelieved pressure.

Pressure sores progress through various stages with characteristics as detailed below:

Stage 1. Initially skin becomes white (blanched) or lighter in color. This indicates that pressure is preventing adequate circulation to the skin. At this stage we need to be especially sure that a regular turning schedule in bed and wheelchair push ups are performed.

Stage 2. Skin becomes reddened. It may also feel warm and appear swollen when pressure is relieved. If the patient is dark skinned and a redness cannot be detected, feel for warmth with the back of your fingers. At this stage it is still possible to prevent a sore from developing. Do not rub the red area or put anything on it. The patient needs to stay off the area until all redness is gone. Redness that does not disappear 30 minutes after pressure is relieved is a danger sign indicating too much pressure or pressure for too long a period of time has been applied to the skin.

Stage 3. A blister develops over the red area. Skin may also have a blue or purple color. Often the blister will open. This stage indicates that pressure has not been completely removed from a red area and damage to the skin is frequently deeper than what is seen. At this point the patient must continue to stay off the affected area and the doctor or nurse should be contacted for further instructions.

Stage 4. Center of the open sore turns to a dark purple, black or brown and a yellow white discharge may be seen. At this stage infection is very likely. As noted above; the most severe damage is usually done under the surface where you can't see it. So, what may at first look like only a small darkened area, may in fact already have a tunnel or "tract" of breakdown underneath which sometimes leads to the bone itself. If there is much drainage with the sore, the body loses protein. Protein is essential for healing and therefore adequate protein must be included in the diet. In addition, the patient must stay off the area. Cover the area with a sterile dressing, and contact the doctor.

OTHER SKIN PROBLEMS

In addition to pressure, there are several other potential skin problems including the following:

1. Friction - Signs of friction burns include redness as well as areas where skin has been scraped away. Possible causes of friction damage to the skin are: pulling bare skin across a surface; breaking in of new shoes; and spasms even during sleep. Also, chafing of skin may occur as a result of direct contact with coarse or heavily dyed fabrics.

2. Wetness - Wetness as the result or urine, spilled liquids, excessive perspiration (especially in weight bearing areas and increases where two body folds meet), incomplete drying after bathing or showering can lead to skin breakdown.

3. Heat - Burns as noted by redness of skin and possible blisters can result from a number of causes. These include: spilling of hot liquids; hot bath water; heating pads; hot water bottles; electric blankets; matches; lighters; hot pots, pans and dishes.

4. Rashes - Rashes may occur where skin comes in contact with skin (ex. groin, armpits, under breasts). A combination of moisture and lack of air can lead to rashes. Signs include: pimples, red blotches, itching.

5. Bruising - Bruises may result from bumping part of your body during any type of transfer activity.

6. Foot Problems - Since the feet are furthest away from the heart, circulation to them is less efficient. Decreased circulation and air to the feet may result in dry, scaling skin. In addition ingrown toenails (usually on large toe) may result from toenails cut too short or rounded at the corners.

As with pressure sores, the above skin problems warrant special attention including contacting the physician for treatment instructions.

UNDERSTANDING AND MANAGING THE BOWEL PROGRAM

After a head injury, some persons may have interruption of a normal bowel routine. This section is provided to assist in understanding the care related to a bowel program.

When food is swallowed, it goes into the stomach where it is acted upon by enzymes (chemicals that help speed up the digestive process). As food passes out of the stomach, it first goes through the small intestine, (small bowel) then on to the large intestine (large bowel). During this time nutrients and liquids are absorbed by the body. The solid waste (stool) is what remains in the bowel. The rectum is empty until the stool is ready to be eliminated. This is when the urge to have a bowel movement is felt.

Sometimes after a head injury, messages from the rectum to the brain and from the brain to the rectum are interrupted. Therefore, when the urge is not felt, control of the sphincter to move the bowels is absent, this can result in problems. Unpredictable bowel movements, constipation, and impactions can occur. Impactions can be serious.

One may wonder if the patient can ever get back into a normal routine again. Yes! It is possible to develop a regular bowel program that will avoid accidents. The nurse will help to work out the best program for the patient.

In the beginning, the program will probably be as simple as a suppository every other night, which will cause the rectum to empty of stool. Routine use of laxative is discouraged. Enemas are used only if a suppository is ineffective. As time goes on, a pattern should start to develop and the patient should have bowel movements fairly regularly. The goal of the program is to have a bowel movement at a predictable time. If needed, medication can be given to make the stool soft enough and also to make a sluggish bowel work better.

There are lots of things that can help the bowel function properly, and at a predictable time:

1. It is important to choose foods high in bulk (roughage). These are fresh fruits, vegetables and whole grain foods.

2. Include enough fluids to keep the stool soft. Prune juice is a great natural laxative. Learn by experimenting which foods cause constipation or very hard stools--usually meats and dairy products, which are low in roughage. You will also learn which foods cause diarrhea or loose stools--spicy, greasy foods, onions, etc.

3. If a suppository is used, schedule at the same time of day. This will encourage regularity.

4. Activity, or the lack of it, affects the bowel by causing constipation. Helping the patient stay active is important.

5. Once the patient is having bowel movements at a predictable time that fits their lifestyle, it will be wise to stick to the program as much as possible. Skipping the program can cause constipation, impaction and bowel accidents.

Usually, if something is wrong with the program, it is with one of these preceding five points. Remember to think about each one if a difficulty occurs.

THE BLADDER

The urinary system plays an important part in keeping healthy because it eliminates liquid waste. Damage to this system, especially to kidneys, interferes with this function and can be serious. The information provided in this section describes the urinary system and its care. Although much of the assessment and care will be done by the nursing staff, it will become vital information to utilize when the patient is able to go on home visits.

How the Urinary System Works

There are two kidneys, one on each side of the back of the body just below the ribs. They remove waste products from the blood in the form of urine which moves down through the ureters into the bladder where it is stored. Because of this very important function, we must keep the kidneys healthy. The bladder is like a balloon as it fills, stretches, empties and shrinks. As more and more urine enters the bladder, pressure builds up and a message is sent to the brain indicating that the bladder is getting full. When urination is to take place, a message comes from the brain through the spinal cord to relax the sphincter. Then urine passes through the urethra and out of the body. There is a valve where the ureter enters the bladder which keeps the urine from going back up the ureters and into the kidney. (See Figure 1 or 2.)

What Can Be Done?

Sometimes an internal catheter is put in soon after the head injury occurs. The catheter has a small balloon on the end, the balloon is blown up with a small amount of water after the catheter is inserted into the bladder. The balloon acts as an anchor to keep the catheter in the bladder. (See Figure 3 or 4.)

Whenever there is an internal (Foley) catheter for some time the patient is more likely to get urinary infections, so the doctor will order the catheter to be removed when feasible. When the catheter is removed, the goal is for complete emptying of the bladder, so that the bladder will not become overfilled and force urine backward up into the kidneys.

Some people with head injuries don't have normal control of urination for a period of time. Boys and men may wear an external condom collecting device called an external catheter. (See figure 5) See procedure for application of external catheter. As yet, there is no external device for girls and women, so they usually wear waterproof panties with liners.

After the catheter is removed, we will begin to retrain the bladder back to a normal elimination pattern. This is done by placing the patient on the bedpan, bedside commode or commode in bathroom depending on the patient's mobility, at least every 2 hours consistently during the daytime and every 4 hours at night until a specific pattern is established. Make sure that when a pattern of urination has been established that it is adhered to, until the patient has complete awareness of the process of urination. Make sure the patient is in a comfortable, upright position to help facilitate emptying of the bladder. Running water in the sink or dropping warm water on the perineal area, may help the patient start to void.

Controlling the patient's times of fluid intake will decrease the chances of urinary incontinence. Although this does not mean to decrease the patient's fluid intake, just to make sure the majority of the fluids are given in the day time hours. The patient should drink at least 3000 cc (3 quarts) of fluid per day, one can tell if the patient is drinking enough fluids by the color of their urine. If it is light and clear, their intake is adequate.

Male Urinary Tract

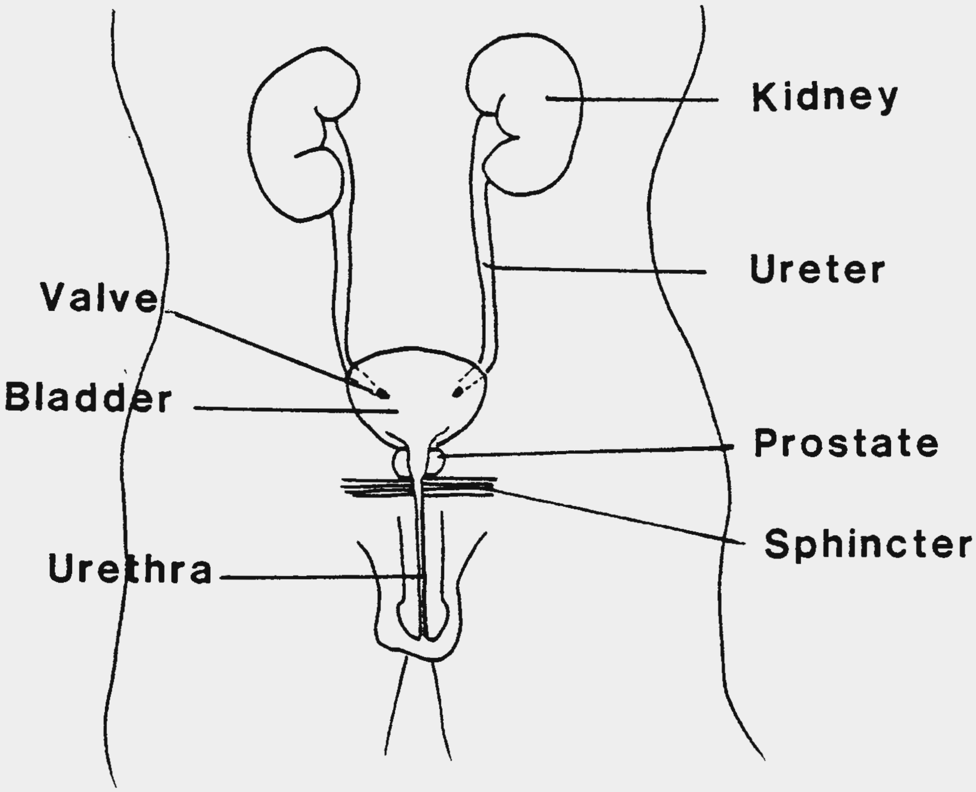

Figure 1

Female Urinary Tract

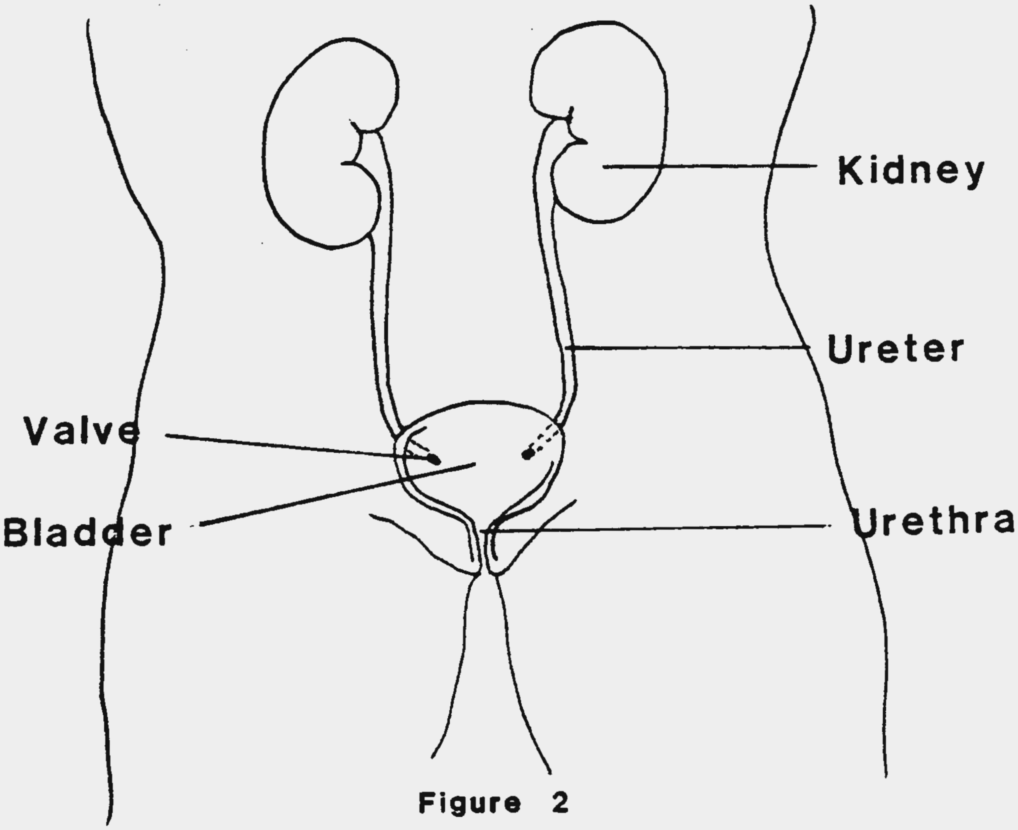

Figure 2

EXTERNAL CATHETER APPLICATION FOR MALE

An external catheter is a device which facilitates the collection of urine outside the body. (See Figure 5)

Supplies needed:

1. External catheter
2. Drainage bag (bedside or leg)
3. Soap and water
4. Wash cloth
5. Towel

Procedure:

1. Wash, rinse and dry skin over genital area.
2. Check skin of penis for redness, discoloration or abrasions.
3. Apply external catheter, being sure meatus (urinary opening) is centered in cup directly in line with tube opening.
4. Roll sheath onto shaft of penis. Allow roll to extend all the way to base of penis. Make sure that foreskin is not retracted.
5. Place elastic tape provided with catheter below roll of the sheath at base of penis and fasten securely but not too tight.
   NOTE: Edema (swelling) will occur if the tape is too tight and constricts the blood supply.
6. Attach the extension to drainage bag.
7. Secure drainage bag to bedside or leg.
8. The external catheter should be checked hourly after application for the first 4 hours, then every 3 hours. Make sure there is no swelling or constriction by the strap being too tight. Also check for leaking of urine.
9. Remove external catheter then wash and dry the genital area daily. Clean catheter with soap and water each time it is removed. Meticulous cleansing is important in preventing skin irritations.

(See Figure 5.)

The family will be taught and demonstrate the proper technique for application of the external catheter before pass or dismissal from the hospital.

External Catheter Applied with Tape

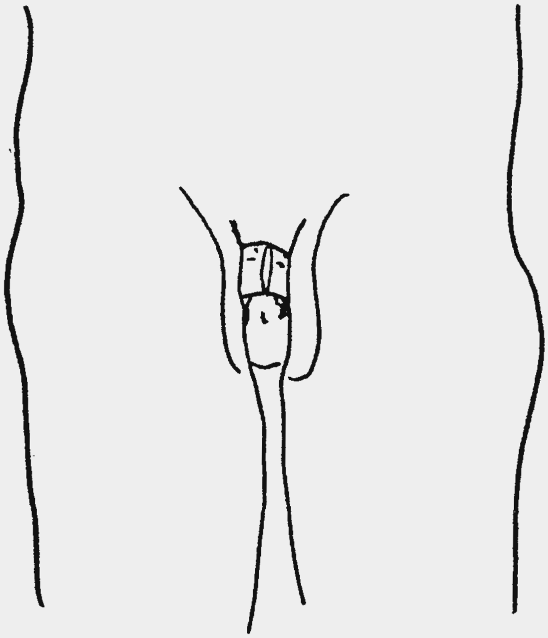

Figure 5

The topics discussed in these pages are intended to assist in understanding the care necessary in establishing a bladder program for each individual patient.

If any questions arise regarding the bladder program, please contact a member of the nursing staff.

NUTRITION

Good nutrition is of vital importance in good health and in progress toward recovery. Compromised nutritional status may prevent optimal participation in rehabilitation therapy and delay or prevent potential progress.

While in the hospital the patient will probably find that a great area of concern is diet and weight. There are many reasons for this concern.

When eating a poorly balanced diet one is more susceptible to loss of body weight (muscle mass as well as fat), infections, skin irritations and pressure sores, poor wound healing, anemia and other problems.

If very much underweight one is more likely to develop pressure sores and may have less energy than needed to keep going through a busy day of therapy. If overweight, it is more difficult moving and doing transfers. Skin irritations are also more likely to develop on areas of surplus flesh.

Possible nutritional deficiencies are determined by assessing height, weight, lab values, and a nutritional history. Feedback from other therapists concerning energy and fatigue levels are also considered. If the current dietary intake is inadequate, daily calorie and protein counts will be kept and the dietitian will work to provide foods or supplements which the patient will be able to accept.

Family members play a critical role in the nutritional welfare of the patient with head injury and their understanding, involvement, cooperation and support are very important. It is not unusual for a patient to develop anorexia (decreased desire to eat or refusal to accept food) or bizarre eating habits such as excessive intake of certain foods; ie, candy, sugar, chocolate, milk, etc. It is natural and tempting for family members to bring these favorite foods to the patient but it is important to discuss this with the dietitian first to make sure these foods do not interfere with the patient's intake of balanced meals.

Patients who are receiving nutritional support by tube feeding will be monitored closely to assure that adequate amounts are given and well tolerated. When oral feedings begin, care will be made to assure adequate intake as the patient progresses in food textures from pureed to soft or regular foods. Adjustments will be made in the diet and supplements given as necessary.

A well-balanced diet is one that provides adequate energy, protein, vitamins, minerals and fluids. Meats, fish, poultry, eggs and dairy products are good sources of protein. Fruit, vegetables, breads and cereals, as well as the protein foods, add important vitamins and minerals to the diet. They all contribute energy (calories).

Some roughage or dietary fiber is needed for proper bowel function and this is easily obtained from many food sources. Dietary fiber is the part of plant food - vegetables, fruit and grains - that is not broken down in the digestive process as are other parts of food. This fiber is important in the function of the digestive tract as it 'holds' water in the intestine, adds bulk and softens the stool, and helps food waste move through the body. Good sources of dietary fiber are:

Fruits and Vegetables -

Fresh: Apples, peaches, pears, berries; squash, potatoes with skins, cabbage, broccoli, carrots, etc.

Dried: Peas, beans, lentils, figs, stewed prunes, etc.

Juices*: Citrus, prune, fruit nectars, etc.

*juices do not add dietary fiber but are extremely important for the fluid and laxative action they contribute.

Breads and Cereals -

Bran type cereals and breads, whole grain cereals, bread and crackers, brown rice, oatmeal, etc.

Fluids are an important part of the diet. There may be a period when fluid restriction is required. At this time all beverages and fluid foods will be measured and limited to the specified amount. This will include all liquids given with medications. When no restriction is put on fluid intake, it is important to consume plenty of liquids to aid the urinary system, maintain proper hydration and prevent constipation.

A vitamin or mineral supplement may be prescribed by the doctor if needed. Adequate protein in the diet is very important in the prevention of pressure sores as it helps keep the body tissues and skin healthy. If pressure sores do develop, protein is lost through the open, draining sores, and thus must be replaced by increasing it in the diet.

It is a good idea and opportunity to develop sound eating habits while in the hospital and to continue these good habits when home. This should minimize weight gain which often occurs as patients over indulge in home-cooked foods or physical activity decreases.

The right kind of nourishment to maintain ideal body weight and for optimal functioning of all body systems should help the patient stay healthy and feel his best.

family

THE FAMILY

A severe head injury is one of the most serious injuries an individual can sustain and still survive. The trauma associated with brain injury affects not only the patient but the family and friends as well. The family, in particular, needs support and guidance throughout the treatment process. Much of what we will share in this section is based on our experience with the families of head injured patients. Although no two head injuries are the same and family structure differs from family to family, we hope families will find some comfort in knowing others have been in a similar place and are surviving. We are very grateful to our families for sharing their insights with us.

In the beginning. . .

The loved one will probably be in a coma for several weeks. Even though the patient may appear non-responsive, conversation should be conducted as if the patient could hear what was being said. Touching or stroking the patient is very important at this time, even when the patient does not appear to be responding. It is also important to become familiar with all treatment modalities, their purpose and function. The staff welcomes questions and will make every effort to give the relevant information needed to help the family understand the treatment process.

The stress level of the family is heightened throughout the treatment process. It is not uncommon for the family to experience feelings of guilt about the accident. Threat of the loss of a loved one promotes feelings of guilt and incompetence among family members. Family focus seems to be on their failures as a spouse/parent. There is a tendency to try to make up for what they feel led to this trauma, which can immobolize the family. They wonder if the disagreement they had that day two years ago was the cause of the accident. The questions vary but the underlying feelings of guilt and responsibility are the same. All families experience these feelings to a lesser or greater degree. It is a natural phenomenon to think of the "bad" experiences and exclude the positive effect we have had on a loved one. We tend to illuminate our imperfections like a bright neon sign, blurring our vision of the caring, but frightened persons we are. No matter what has transpired between the patient and family member, neither is to blame. Families need to know that we all drift into self-criticism in times of personal crisis. At this point in treatment it is helpful to look to the staff for support and guidance. The psychologist and social worker are always available to offer assistance.

The family is crucial to the rehabilitation of the patient. The family member knows the patient best. We need families to share as much of the patient's pre-injury personality as possible. The recovery process is long and the patient responds best to consistent feedback from interaction with familiar faces.

The loved one responds . . .

Feelings of relief are accompanied by frustration. The loved one may exhibit behavior that is sometimes demanding, ill-mannered and at times dangerous. The family may find itself trying to balance emotions of gratefulness and exasperation. Personality changes prompt unspoken feelings about the loved one who seems to be living in a strange body. Families may find themselves relentlessly searching for some sign, gesture that will tell them that the patient is still there as they were pre-injury. Oftentimes families are unable to express feelings of anger and frustration because they feel these responses would be unacceptable or cruel.

In many ways the patient will have regressed to an earlier stage of development. There might be a tendency to infantalize the patient instead of acknowledging that the patient's behavior is a result of the head injury. We encourage families to look at the loved one as dealing with his loss the best way he knows how.

The loss experienced in disability is similar to the loss experienced with death. However, there is a difference in the degree of sadness and loss between death and disability. With disability we are dealing with a person who is still alive. The loss is never complete. Every time a new loss is experienced the old feelings about loss are triggered off. It is important to allow ourselves the opportunity to grieve. This process is particularly painful because in grieving we give up precious memories of our loved ones. Perhaps the most painful journey the family will undertake is the realization that the loved one, as he once was known, does not exist. Perhaps we need "to learn how to mourn the loss of the old person, and learn to love the new one." This is no easy undertaking.

The hospital routine . . .

Visiting the hospital on a daily basis can be exhausting. What some of us forget is that the family's life goes on. They need to go to their jobs, meet deadlines, do household chores, take care of other family member's needs, worry about finances, broken dreams, and how they are going to provide emotional support for their loved one. They arrive at the hospital tired, oftentimes without dinner and if that isn't enough, they need to pretend they are energetic and in good humor. These demands on the family cause feelings of entrapment. They have little or no time for their personal needs and feel isolated. Family members think the patient is suffering so much that they are not entitled to take time for themselves. Feelings of isolation are exacerbated by feelings of abandonment from other family members and friends. Although friends mean well, they cannot be expected to fully understand the day-to-day pressures involved in the care of the patient. Friends tend to stay away for lack of knowing how to relate to the patient. The staff will be continuously encouraging family members to take care of their needs, to rest and relax. At first, the family may resist suggestions to break the hospital routine. They need to know that unless they take care of themselves they may also become patients. Mental exhaustion takes its toll and burnout must be avoided.

In most cases the family will be the patient's outlet in expressing feelings of frustration about their dependency and incompetency.

This expression of feelings sometimes takes the form of hostility and bitterness. The staff will help to deal with effective ways of handling the patient.

Other members of the family . . .

Children usually experience a sense of loss when a sibling is brain injured. They sometimes feel neglected and feelings of guilt are accompanied by feelings of jealousy. They may place unrealistic expectations on themselves and feel that they must be model children and not be a burden on their parents. The parents find themselves trying to balance their time between the home and hospital. It is not unusual for one of the children to begin having problems at school or with other peers. The school counselor can help in some cases and the staff is available to help also.

Depression is a natural reaction for family members. Most of the families of our brain injured patients are more or less settled in a career and/or lifestyle. Change in lifestyle and social activities are difficult adjustments to be made at a time when the family needs consistency and outside support. Families need to share these feelings with friends and staff to help them through this period. The Head Injury Group can also be a source of support for patients and families.

Realistic concerns about management of homecare, especially when the caregiver is the sole support of the family adds to stress. Cost of treatment at other facilities and financial stress heightens anxiety. The Social Worker will help with aftercare planning and share information on alternate facilities.

In summary, anger, frustration and despair are natural feelings experienced by the families of the brain injured patient. They may feel trapped by a situation that they feel they have no control over. It is a long and weary road to recovery. Sometimes families will have difficulty in coping with the multitude of mixed feelings they have about the patient and his injury. They need to know we all experience feelings of frustration and anger especially during crises and when we are fatigued and feeling defeated. It is extremely difficult to keep spirits high when there seems to be no end in sight. We can't overemphasize the need for families to take care of themselves. It is important to maintain good health and part of this task is proper diet and rest. Some time spent away from the hospital in some enjoyable activity is a good idea. The patient needs the family even more when he returns home. Families need to know they have a responsibility to take care of themselves. Taking care of oneself also means setting standards for other family members so that they will support and respect one's judgment concerning the care of the patient.

We hope we have helped with some concerns. We particularly hope we have communicated our desire to help families get through this difficult time. We encourage you to utilize our support. We are here for you.

help

DISCHARGE PLANNING

Planning and coordination are essential components in assuring the patient appropriate and timely continued health care. Since most head trauma patients ultimately require further treatment at another facility, it is vital that this information be given to the patient and family immediately upon admission to the program. Well managed discharge planning also allows the patient/family to prepare psychologically for the next level of care.

Our experience with post head injury programs is that they are practically non-existent, costly and have long waiting lists. Early contact with these facilities is crucial to effective placement. The following staffing meetings have been implemented to help prepare the family and facilitate this process. It is imperative that the family attend all meetings.

Initial Staffing

This staffing is held within the first two weeks after admission to Saint Joseph Hospital. The purpose of this meeting is to discuss the nature of head injury treatment and prognosis, acquaint the family with the head injury program, and to distribute a list of referral sources. It is crucial to visit the facility, check on insurance coverage of the program and place the patient on a waiting list.

Second Staffing

The second staffing is held about midpoint in the head injury patient's stay. By this time the patient is nearing plateau in treatment. The purpose of this meeting is to set a discharge date and make recommendations for further treatment. The social worker will help facilitate application to and familiarization with guidelines to the facility of choice. Medical records will be sent to the facility/facilities of choice at this time.

Third Staffing

The third staffing is held the week of discharge. The purpose of this meeting is to go over all discharge plans with the family and finalize plans for future placement. Financial planning is completed and transportation to the facility is arranged.

If no facility is appropriate or available at this time, a discharge date will be set for discharge home or to an extended care facility until placement is feasible.

REFERRAL SOURCES

The following list of referral sources can aid with future placement. Handouts on admission procedures are available through the Social Service Department.

Cognitive Rehabilitation Out-Patient Program
Saint Joseph Rehabilitation Services
Saint Joseph Hospital
1401 South Main Street
Fort Worth, Texas 76104
817-336-9371

The Ranch Treatment Center
1106 West Dittmar
Austin, Texas 78745
1-800-252-2878 (within Texas)
1-800-252-5151 (outside Texas)

Medical Center
Del Oro Hospital
8081 Greenbriar
Houston, Texas 77054
713-790-8100

Transitional Learning Community
P.O. Box 1228
1528 Post Office Street
Galveston, Texas 77553
713-762-6661

The Key School
4113 Warnock Court
Fort Worth, Texas 76109

OTHER SOURCES

Easter Seal Society for Crippled Children and Adults of Tarrant County, Inc.
617 Seventh Avenue
Fort Worth, Texas 76104
817-336-8693

Texas Rehabilitation Commission
3014 Sandage
Fort Worth, Texas 76109
817-926-7943

The Texas Head Injury Foundation
North Central Chapter
617 West 7th Avenue
Fort Worth, Texas 76104
817-877-3959

National Head Injury Foundation
18A Vernon Street
Framingham, Massachusetts 01701
617-879-7473

BIBLIOGRAPHY

Type	**Title & Author**	**Publisher**	**Remarks**
Article	"Living with the Characterologically Altered Brain Injured Patient by Muriel D. Lezak	J. of Clin. Psychiatry 39:592-598, July 1978	Recommendations for dealing with common family problems
Booklet	"Head Injury by Marshall, Sadler & Bowers	The Comprehensive CNS Injury Foundation, P.O. Box 9494 San Diego, CA 92109	Hand-out for families
Book	"When Bad Things Happen To Good People" by Rabbi Harold Kushner		Highly recommended as a useful exploration of guilt
Article	Head Injuries - What Happens to Survivors by Bruce Ford	Medical Journal of Australia 1:603-605, 1976	
Manual	Family Survival Handbook	Family Survival Project 1736 Divisadero Street San Francisco, CA 94115	
Manual	FSP Training Manual "Learning to Survive"	Family Survival Project 1736 Divisadero Street San Francisco, CA 94115	
Article	"Who Cares for Head Injuries?" by Brian Jennett	British Medical Journal, 1975	
Article B0482	"Some Disturbing Thoughts About the Loss of a Mind" by Mark M. Guydish	National Head Injury Foundation June 1982	
Article B0883	"Speech and Language Disorders" by Danese Malkmus, M.A.	National Head Injury Foundation April 1983	
Magazine	Cognitive Rehabilitation A Publication for the Therapist, Family and Patient	Cognitive Rehabilitation P.O. Box 29344 Indianapolis, Indiana 46229	

glossary

GLOSSARY

agnosia - the inability to recognize familiar objects thru sensory perceptions - visual, auditory, tactile or olfactory

agraphia - inability to express ideas in writing

anesthesia - complete loss of sensation

aphasia - loss of the faculty of language usage (motor) and comprehension (sensory) in any form (speaking, reading, writing, hearing)

aphonia - loss of voice

apraxia - inability to use an object properly in spite of knowing its name and function

areflexia - loss of reflex action

astereognosis - inability to identify familiar objects by feel (feeling objects such as key, comb)

ataxia - inability to perform coordinated movements

atony - loss of muscle tone

atrophy - wasting of tissue

body scheme - postural model one has of himself, having to do with how one perceives the position of the body and the relationship of his body parts.

catheter - a tube used to withdraw fluids from a cavity of the body, especially one for introduction into the bladder through the uretha for the withdrawal of urine

cerebral cortex - a thin layer of grey matter on the surface of the cerebral hemisphere

cerebrospinal fluid - fluid present in the brain and spinal cord

cognitive - thinking, or having to do with the relationship between thoughts and behavior

coma - a state of unconsciousness from which the patient cannot be aroused

contraction - shortening of a muscle in response to an external stimulus or a voluntary act

contracture - persistent abnormal contraction of a muscle - results from actual tightening of soft tissues about joints cranium - the skeleton of the head including most of the bones of the head

deficit - lack of, or problem

deglutition - act of swallowing

diplegia - paralysis of corresponding parts on both sides of the body (both arms or both legs)

diplopia - double vision

dorsal - pertaining to the back

dorsiflexion - bending back

dysarthria - impaired articulation; motor speech problem due to weakness, paralysis or incoordination of one or more of the muscles used in speaking

dysphagia - difficulty in swallowing

dysphasia - impairment of the comprehension or the expression of ideas through speech due to a brain lesion

echolalia - automatic, parrot-like repetition of words heard or questions asked

echopraxia - automatic imitations of motions made by others

EEG - electroencephalogram (tracing of brain activity)

EKG - electrocardiogram (tracing of heart activity)

endotracheal tube - a tube in the trachea

eversion - the act of turning outward

flaccid - without tone; limp

gait - the manner of walking

hematoma - a localized collection of blood, usually clotted in an organ, space, or tissue, due to a break in the wall of a blood vessel

hemianesthesia - loss of sensation of one side of the body

hemianopsia - blindness of one half field of vision

hemiplegia - loss of power of or paralysis, one side of the body; hemiplegic, hemi.

hypesthesia - impaired perception of touch hyporeflexia - lower intensity of reflex response

hypotonia - diminished muscle tone

ICU - Intensive Care Unit

innervation - the nerve supply to a part

intracranial pressure - pressure within the skull resulting in brain dysfunction

IV - intravenous

monoparesis - weakness of one extremity

monoplegia - paralysis of one extremity

neuroanatomy - the study and structure of the nervous system

objective - anything that may be perceived by the external senses

palsy - paralysis

paresis - muscular weakness

paralysis - loss of the ability of the muscle to contract, loss of use of muscle

paraplegia - paralysis of the lower extremities

parasthesia - abnormal sensation (burning, itching, crawling, prickling)

perception - the meaning the brain places on the messages it receives through the senses

physiology - the science pertaining to the functions of the living organism and its parts

physiological - pertaining to physiology

psychology - that branch of science pertaining to the mind and mental operations, especially as they are shown in behavior

psychological - pertaining to psychology

quadraplegia - paralysis of the four extremities

range of motion (ROM) - total degrees of the arc of movement available at a joint

reflex - involuntary response to a stimulus rehabilitation - the restoration of normal form and function after injury or illness

NG tube - nasogastric tube

remediation - a relearning of an old task or alleviation of a problem

retention (of urine) - accumulation of urine within the bladder because of inability to urinate

spasm - sudden violent contraction of muscle

spasticity - abnormal increase in muscle tone; involuntary reflex contraction of muscles

spastic paralysis - paralysis in which the muscles are stiff and movements awkward

splints - rigid or flexible appliances for the fixation of displaced or movable parts

subjective - anything that can be perceived only by the affected individual

subluxation - incomplete dislocation

tone - the inherent degree of tension of a muscle

tracheostomy - surgical creation of an opening into the trachea through the neck, for insertion of a tube to provide the passage of air to the lungs

verbal apraxia - condition in which the person has impaired ability to make speech sounds voluntarily, even though he can perform such automatic acts as eating, sucking, swallowing

visual-spatial perception - ability to accurately recognize the relationships of objects in space