II. Stroke Rehabilitation

By REHABILITATION STUDY GROUP
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Abstract:

Rehabilitation offers means by which persons disabled after a stroke can be returned to patterns of daily living as close to normal as possible. Often simple and readily available restorative techniques suffice, but sophisticated methods and facilities may be needed in many cases. Certain complex problems require specialized attention by persons with detailed knowledge and specific training. Among these are rehabilitation of language and the management of incontinence, sensory loss, pain, spasticity, and psychosocial problems. High-quality rehabilitation is best delivered by a closely cooperating team, including the family physician, medical specialists, nurses, allied health professionals (physical therapist, occupational therapist, social worker, dietitian, rehabilitation counselor, speech therapist, psychologist), the patient's family, and also the patient. To accomplish these ends, hospitals, rehabilitation centers, extended care facilities, and nursing homes should give specific attention to the special needs of stroke patients. Careful discharge planning and follow-up are necessary in all cases. The home environment and the family attitudes may require considerable revision to meet the patient's individual needs. The family physician can offer many rehabilitation services in his office, and additional education in medical school and on a postgraduate level will help him to reach his full potential in aiding both the acutely ill and the chronically disabled stroke patient.

Introduction

Our understanding of the underlying neurophysiological mechanisms for functional recovery following central nervous system injury is inadequate. Notwithstanding, it is generally accepted that for patients with residual deficits from a stroke, rehabilitation offers the only means by which such persons can return to the normal stream of daily living. However, a wide gap exists between the needs of stroke patients for rehabilitation and accessible resources to meet these needs. Many patients for whom rehabilitation services are indicated cannot obtain optimal treatment because none is available in their community. In other instances, resources are inadequate or there is a failure in initiating rehabilitation services to the disabled patient. Some physicians and other workers take the attitude that the outlook for stroke is hopeless. Such individuals are ill-prepared to deal with this broad problem.

Requests for reprints should be directed to: Joint Committee for Stroke Facilities, Suite 1010, 1776 K Street, N. W., Washington, D. C., 20006.

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Actually, much can be done for these patients.

The type and extent of rehabilitation services provided to stroke patients in a particular locality will depend on a variety of factors:

1. Experience and availability of trained rehabilitation personnel.
2. Community attitudes toward health care delivery.
3. Financial resources, e.g., federal, state, local, or private.

Patients with stroke have not only physical disabilities but, equally important, psychological, social, and vocational problems which need the concerted efforts of many persons in varied disciplines for their solution. It is important that the needs of these persons be recognized and identified as early as possible, so that proper decisions can be made regarding their referral to either specialized and centralized facilities or to less-sophisticated but competent rehabilitation services within their community.

The majority of patients who survive a stroke can and should be rehabilitated under the family physician’s direction. Furthermore, an increasing number of nurses and other allied health professionals are being trained to use rehabilitative techniques.

**Principles of Rehabilitation**

Rehabilitation for the patient after an acute stroke follows these principles:

1. To prevent or minimize secondary complications such as contractures, infections (including those from a skin breakdown), or effects of disuse which may interfere with natural recovery of function; the latter may be motor (muscular weakness) or cardiovascular (inability to satisfy the energy requirements associated with standing, walking, or climbing stairs). Consequently, levels of performance demanded should be within the limits of current ability and the patient should be protected from damage which may result from an abnormal or inadequate level of function;

2. To compensate for sensory loss which can result in a variety of deficits such as inability to walk effectively or judge whether the body is upright;

3. To encourage social participation and to provide the environmental stimulation needed for recovery;

4. To produce the high degree of motivation necessary for successful cooperation in a rehabilitation program. As each patient is different and has his own problems, individualized programs must be designed in order to achieve maximum motivation and results;

5. To substitute for a function either partially or totally lost, once the level of recovery has been estimated or anticipated;

6. To enable independent home living or, if this is impossible, to attain sufficient improvement to permit future care with the least amount of assistance and supervision;

7. To achieve, in some cases, sufficient vocational rehabilitation to enable placement in competitive employment or in a sheltered workshop.

The purpose of this section is to outline the essentials for comprehensive stroke rehabilitation. Arbitrarily it has been elected to discuss first physical, speech, psychosocial, and vocational rehabilitation and then to stress the technical details of optimal delivery.

**Physical Rehabilitation**

**DETERMINANTS OF THE LEVEL OF REHABILITATION**

Both rehabilitation undertreatment and overtreatment for stroke patients occur. The latter, which is less common, usually results from lack of knowledge, from anxiousness to please the patient or his family and, occasionally, from conscious economic abuse. Undertreatment is due most often to lack of knowledge or disinterest, unavailability of medical services and facilities, and inadequate financial resources. The attending physician interested in stroke rehabilitation can and should determine the type and level of rehabilitation program most suitable for his patient.

During the acute phase of a stroke, it is difficult to decide about the type, intensity, and duration of rehabilitation therapy. In predicting the likelihood of benefit resulting from treatment, estimates are important as to the level of recovery of the following:

2. Ultimate total functional capacity.
3. Degree of residual function in areas of deficit, such as speech or paretic limbs.
4. Degree of deficit.
5. Survival and probability of further complications.
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Only a few factors taken by themselves correlate sufficiently with rehabilitation potential to be of practical value in individual cases. In most instances, several items to be discussed subsequently must be considered in combination to select those patients unlikely to respond.

REHABILITATION FOR THE MILDELY DISABLED PATIENT
In general, a patient with the following characteristics requires less-sophisticated rehabilitation techniques and can be treated as an outpatient or at home:
1. Early partial recovery of dorsiflexion of the paretic foot, even though the ipsilateral arm may remain functionless.
2. Intact sensation or only partial loss of sensory modalities.
3. Minimal or no speech impairment.
4. Preservation of intellect.

REHABILITATION FOR THE SEVERELY DISABLED
The more severely involved patients will require a higher level of rehabilitation and, in planning the programs for such patients, the attending physician may need the advice of a specialist thoroughly familiar with stroke rehabilitation. In particular, the following groups will need specialized attention:
1. The hemiplegic child.
2. The young adult who has suffered a stroke.
3. The patient with bilateral cerebral or cerebellar involvement.
4. The patient with extreme spasticity or with prolonged flaccidity.
5. The patient for whom special efforts seem justified, e.g., for vocational reasons, either in retraining a paretic hand or in attempting to overcome the results of sensory impairment, including hemianopia.
6. The patient for whom formal speech therapy is indicated.

Restoration of Function

INITIAL MANAGEMENT
Following a stroke, as soon as there is medical stability and the patient's condition permits, the patient should be out of bed and involved in his active restorative program (see: Physical Restoration). However, during the acute period following a stroke, when lifesaving medical management is predominant, it is important that procedures also be utilized which will prevent contractures and decubitus ulcers, since these complications may significantly delay subsequent rehabilitation. Patients who will require prolonged bed confinement need sophisticated nursing care especially, to avoid such contractures and decubitus ulcers. Contractures frequently occur in the shoulder adductors and rotators, the wrist and finger flexors, the hip flexors and external rotators, the knee flexors, and the foot plantar flexors. To avoid these deformities, correct bed positioning and range of motion activities are essential.

BED POSITIONING
The bed should have a firm mattress, using a bed board if necessary. The supine patient should lie straight, with the involved upper extremity positioned using a pillow placed between the chest and upper arm so that the shoulder is in abduction and mild external rotation, and support is provided for the forearm and hand with the wrist in extension. An equinus position of the foot is prevented by a foot board with a space of three to four inches between the sole of the foot and the mattress to prevent heel pressure. Support at the knee or foot, using pillows or appropriately folded towels, will prevent external rotation at the hip. In some instances, a cradle may be placed over the legs and feet to prevent pressure from bedcovers.

Whenever the patient must be in bed, he should be kept in a horizontal position except during mealtimes when a semireclining position is more comfortable and better functionally. Failure to return to the horizontal position shortly after eating may result in the more severely disabled person sliding down in bed, a situation which he cannot correct. The paretic leg, which the patient is unable to move away from the foot of the bed, will flex at the knee, while the unaffected limb will escape sideways. Any combination of this "forced knee-bent position," along with the use of pillows under the knee, or too much uninterrupted sitting in a chair will cause a hip-flexion and knee-flexion contracture. If such contractures cannot be overcome by stretching and/or hip and knee extensor muscle strengthening, walking will be severely impaired.

RANGE OF MOTION ACTIVITIES
Passively moving each joint of the affected extremity through a full range three times at least once, and preferably twice daily, is...
Along with avoiding contractures, the prevention of fixed contractures is essential in preventing motion for the lower extremities includes bending and straightening of the hip, knee, and ankle and should be given initially even in the mildly involved. However, these exercises can be discontinued as soon as patients are walking, unless otherwise indicated. Conversely, full flexion of the shoulder, extension of the elbow, pronation-supination of the forearm, dorsiflexion of the wrist, and straightening and bending of the thumb and fingers are a routine which must be followed faithfully for a prolonged period. Whereas initially these exercises are provided by a nurse or therapist, as soon as he is able to do so the patient is taught to perform the exercises by himself, using his uninvolved hand. Those with marked spasticity have a tendency to substitute hyperextension of the lumbar spine for full flexion of the paretic shoulder, a movement which should be discouraged. Passive supination and pronation of the forearm should be accomplished by grasping the distal forearm instead of the paralyzed hand, since the latter may produce wrist injury. The finger flexors are stretched by opposing the palms of both hands tightly and dorsiflexing the weak wrist while sliding the palm of the uninvolved hand distally. Separate thumb extension, and abduction and interweaving of the fingers of both hands also should be carried out. When extending the fingers, the wrist should be in a dorsiflexed position.

**PREVENTION OF ISCHEMIC ULCERS**

Along with avoiding contractures, the prevention of decubitus ulcers is essential. As long as the patient is comatose or unable to move himself in bed, he should be turned at least every two hours from the supine to a side position. If the patient's condition permits, turning to the prone position should be included. The prevention of pressure at the heel or lateral malleolus is especially important. An early lesion at these areas is easily overlooked, since it is often pinpoint in size or initially is merely an erythematous discoloration. However, the pain from such lesions produces a withdrawal reaction with flexion at the hip and knee. Thus distal pain in the paralyzed leg is another reason for a transition from the classic knee-extension posture of spastic hemiplegia to a knee-flexion contracture. A reflex tendency of severely hemiplegic patients is to lie on the involved side. Any extended period of time in this position is to be avoided, since it may result in ulcers near the trochanter and/or malleolus.

**MOBILITY TRAINING**

With recovery from the acute episode that resulted in hemiplegia, a stroke patient will require evaluation as to the degree both of disability and of residual abilities. These evaluations will involve a thorough neurological examination with exact determinations of the sensory and motor deficits as well as of residual functions; a complete medical assessment to recognize any medical complications which may impede rehabilitation so that either they may be corrected or allowances made for them; and lastly social and psychological evaluations (see: Psychosocial Factors in Stroke Rehabilitation). Based upon the above assessments, an active program for the stroke patient is instituted.

**MOBILIZATION ACTIVITIES**

A mobilization program is initiated whereby active range of motion exercises are performed for all joints of the involved side as soon as the motor power is sufficient to carry the joint through a full range. With paralysis or paresis, the passive range of motion exercises originally provided during the acute stage are continued by the patient himself whenever possible and when not, by nursing or therapy personnel.

Elevation activities progressing from sitting to walking are started as soon as possible after the stroke, provided full consciousness has returned and there are no medical contraindications such as acute myocardial infarction. A cerebral hemorrhage with prolonged periods of stupor or unconsciousness, or a hemiparesis with simultaneous confusion are conditions making early elevation and ambulation either risky or impossible. In addition, the blood pressure must be stable before the patient is allowed up from the recumbent position. Susceptibility to orthostatic hypotension may follow cerebral infarction and is dangerous, since a severe fall in blood pressure may cause an individual to faint or may compromise the brain's collateral circulation and further aggravate the ischemic injury. Indiscriminate efforts at sitting and ambulation without concomitant blood pressure determinations should be avoided, and the blood pressure should be measured as each new

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position is undertaken. Postural hypotension frequently is self-limited and requires no special management other than the use of elastic stockings and a gradual increase in the time allowed for sitting and standing. Occasionally further measures are necessary, using an abdominal binder and a tilt table to raise the patient slowly from the horizontal to the vertical position.

SITTING

Elevation activities are started under supervision, with the patient bringing himself to a sitting position in bed. He may need a trapeze or a half side rail to help himself to the sitting position. Since the hemiplegic patient tends to lean toward the involved side when sitting, balance training with over-correction toward the opposite side is usually indicated. When able to sit in bed, the patient progresses to sitting on the side of the bed adjacent to his normal extremities. To achieve a sitting position on the side of the bed requires placing the normal lower extremity under the paretic limb and then swinging both legs over the side of the bed, simultaneously pulling the body erect by using a bed rail on the uninvolved side or a trapeze.

STANDING AND STANDING TRANSFERS

When the patient is able to sit with good balance, without fatigue, or signs of postural hypotension, standing and standing transfers can be initiated. In transferring from the bed to a chair, the latter is placed on the same side as the normal extremity. The patient comes from the bedside sitting position to standing beside the bed using his normal leg and pushing up with the normal arm. As soon as he is standing and balanced, the patient quickly reaches for the outside arm of the chair with his uninvolved hand and simultaneously pivots on his normal foot until he is able to lower himself into the chair. Transferring from chair to bed follows the same procedure except that the chair is placed with the patient's uninvolved extremity closest to the bed. When bed to chair and chair to bed transfers are safely accomplished, training in chair to toilet transfer is initiated. A standing pivot transfer is used, with the normal side closest to the toilet. Grab bars fastened to the wall facilitate this activity.

WALKING

Ambulation and transfer training and an exercise program for the paretic muscles are usually provided concurrently. In general, whenever participating in ambulation activities, the patient should wear secure, broad-heeled shoes and never slippers. There are some exceptions to this rule, e.g., in cultures where the patient may never have worn shoes or where rubber-soled slippers provide some patients with a greater feeling of security, when getting up at night, for example.

Preliminary to ambulation training, individuals with a moderate recovery of voluntary motor activity may profit from balancing exercises requiring a shift of body weight alternately from one leg to the other. Patients without a fair degree of motor recovery will not profit from these exercises, since they will have difficulty in recovering balance while leaning toward the hemiplegic side, or may be unable to do so. For this reason, they need to be taught always to lean toward the uninvolved side while sitting and standing, and especially while walking.

The hemiparetic person with moderate to good recovery of motor function will relearn walking with simple encouragement, and without special equipment. The severely impaired hemiplegic should be taught initially to walk between parallel bars. Only after he has established a gait pattern in which he persistently leans toward his good side should he be allowed to walk outside the bars, leaning on a cane. He should have demonstrated also a tendency to lean slightly forward while walking and to have ceased the initial tendency to pull himself forward with his good hand step-by-step along the bars. With proper motivation and vigorous concentration, some patients may learn to bend the knee and dorsiflex the foot during the “swing” phase of walking rather than employ a gait in which they swing the extremity with an extended knee and scrape their toes on the floor. Therefore, such a patient must be made to use the former, more nearly normal method of walking which should soon become automatic. Failure to achieve automaticity in three to four weeks reduces the hope of developing this gait pattern with further training. The last statement does not necessarily apply to the young hemiplegic.

While some patients with good sensory-motor return can walk safely without the use of a cane, most will require such support on the side opposite the involved lower extremity for
periods of five minutes every hour are highly effective. The more severe loss in the involved leg. A weak handgrasp of the noninvolved hand, particularly in older persons, often necessitates use of a thicker-handled cane.

Ambulation exercises can be done at home also, as an important adjunct to more formal training. Heavy chairs can be employed instead of parallel bars, or inexpensive parallel bars may be constructed. Often the physical stress of supporting and protecting patients not using bars may be sufficient to discourage personnel, even devoted family members, from providing their assistance. Ambulation training should be given at least twice a day. For some older patients with limited endurance short periods of five minutes every hour are highly effective. When the best walking pattern obtainable on level ground is achieved, then training in climbing and descending stairs, ramps, or curbs is added.

The hemiparetic patient with good strength and balance is taught to climb and descend stairs with alternate steps or “step-over-step” as used normally. The more severely involved individual must learn to proceed one step at a time. In climbing he should advance his normal leg first and then pull up the paretic extremity, and in descending he should advance the involved leg to the lower step, while lowering himself by bending his normal limb. There should be handrails on both sides of the staircase.

During the period of training in elevation activities, and until the patient has achieved safe independent walking, all personnel attending a hemiplegic patient should place themselves on his paralyzed side when he attempts to stand or walk because of a tendency to fall in that direction. When assistance in standing or walking is necessary, the paretic arm should not be grasped, and a belt around the waist should be used instead of semicarrying the patient.

BRACING

The patient with hemiparesis who is unable to dorsiflex his foot during the “swing” phase who may have a spastic equinovarus will need a short drop-foot leg brace attached to sturdy shoes. This need should be recognized early, and a fitting made at the time ambulation training starts. This brace will not only prevent scuffing of the foot on the floor during the “swing” phase, but will enable the patient to put his weight on the paralyzed leg more securely during the “stance” phase.

WHEELCHAIRS

A wheelchair can be an effective adjunct in treating the hemiplegic patient, since it allows increased mobility and greater independence during the early period of rehabilitation, and also can give improved awareness of self-positioning, better sitting posture, and bimanual facilitation. The wheelchair should be of the standard universal type with the backrest and seat of fabric or synthetic plastic material and with detachable legrests that can be moved or lifted out of the way. The wheel brakes should be of the lever type and located at the front so that they are easily accessible on both sides to the uninvolved hand. They should always be in the locked position when the patient is getting in or out of the chair.

Wheelchair training is started after transfer techniques between bed and chair have been mastered (see: Standing and Standing Transfers). The footrest is removed from the normal side, and the other footrest is used to support the paretic lower limb. The patient is first taught to operate the wheel brakes on both sides. Where there is hemianopia or extinction, he will need to be reminded frequently to lock the brakes on both sides and particularly on the affected side. The patient is then taught to propel the chair by using his uninvolved hand on the handrim and the normal foot, which has floor contact, for guiding and directing the chair. If a safety strap is needed, it should be adjusted loosely enough to allow flexion and extension at the hip, since body motion is required for good wheelchair locomotion. The patient should be taught also to use the wheelchair on rough as well as smooth ground, and instructed how to go through doors and to enter and leave elevators. The mastering of
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wheelchair transfers will enable the patient to become independent earlier in getting on and off a toilet or commode, in and out of a car, in dressing, and in other self-care activities. For most stroke patients the wheelchair is a temporary expedient and its use is necessary only until security in walking is gained. A patient or his family should be advised not to consider the purchase of a wheelchair until walking is shown to be impossible or clearly unsafe. If a wheelchair is required permanently, specific modifications of the standard chair can be obtained according to the individual's height, weight, physical limitations, and other special needs. Some of these are elevating legrests which may be advisable for persistent lower extremity edema; swinging legrests to enable moving the chair closer to furniture or bathroom facilities; detachable arms for a closer approach to bed or commode, thus making a sliding transfer rather than a standing transfer possible; desk-style arms which will allow elbow support and maintenance of the shoulder in some abduction.

One-arm drive wheelchairs are available but are not recommended since they are expensive, are too wide for many doorways, and often are difficult to operate, particularly for the mildly confused. However, for triplegic patients or patients with an amputation on the uninvolved side, a one-arm drive may increase independence of activity. Motorized wheelchairs are not indicated for hemiplegic patients.

PHYSICAL RESTORATION

Concurrently with the training programs to develop independence in transfers, use of a wheelchair, and ambulation, most hemiplegic patients will need a program to restore or improve muscle function. Progressive restorative exercises may be needed for those muscles in the normal limb-shoulder depressors, elbow extensors, wrist flexors and extensors, hip extensors and abductors, and knee extensors used in standing transfers or walking.

The program of restorative exercises for the hemiplegic side will depend upon the degree of residual function which is present. Muscle reeducation is indicated during the early period after complete paralysis to reinforce or assist in stimulating the spontaneous recovery which may occur. Such therapy is usually provided initially to the proximal muscle groups and later to those more distal as functional recovery returns. Muscle reeducation is discontinued, usually after four weeks, if there is no evidence of voluntary motor control return by that time. Coordination exercises or those utilizing associated reflex movements also can be given, if necessary. Strengthening exercises are indicated when there are functional but paretic muscles on the involved side. These will depend upon the degree of weakness present and will include a spectrum from active assistive to progressive resistive exercises.

To develop the skills required in performing the elevation activities previously described, a mat exercise program may be beneficial. Active and active assistive exercises for the muscles of the involved extremities, particularly those of the proximal joints, also can be performed on the mat, using a powder or skate board.

A graded program for the involved upper extremity should be provided, based upon maximal utilization of residual functions and substitutions for those lost. Bimanual activities are used to assist in developing coordinate controlled motions of the shoulder and elbow. A deltoid assist suspension sling is frequently of benefit in providing for greater range of shoulder motion, as well as when other activities are performed. Following possible recovery of forearm and hand function, the program should concentrate first upon the development of controlled grasp and release, and then on finer coordinate motions.

Self-help and Activities of Daily Living

Most hemiplegic patients can achieve independence in the essential activities of daily living. Routines should be established for each patient which can be followed at home, and which will enable him to care for his own needs. An occupational therapist or rehabilitation nurse can provide direction and assistance in the training and development of self-care skills. Cooperation from the family, friends, and hospital personnel in giving the encouragement and time necessary for self-care may require skillful explanation and persuasion. Cultural factors also may be of significance and must be taken into account, as when a sense of obligatory responsibility for parental care
discourages resumption of independent activities.

Independence in dressing should be achieved early. Patients with a functionless upper extremity can be taught to dress themselves without help in several ways. The hemiplegic patient should also be instructed in performing his own personal care, transferring out of bed and onto a wheelchair, and using the toilet, shower, and one-handed manipulative skills for other needs. These activities are beneficial, not only of themselves, but also because they strengthen and train unaffected muscles in new functions and stimulate activity in paretic limbs. Independence in self-care is extremely valuable for the morale of the patient and his family.

Most hemiplegics can be taught homemaking and kitchen activities using one hand only, and they should be instructed in energy-saving principles similar to those used by patients with heart disease. Some aspects of homemaking can be practiced in the hospital, such as folding linen, rinsing out clothes, bedmaking, and cleaning. There are a number of assistive devices which can be useful in promoting independent function. One-handed utensils may be needed, and these can be made by the occupational therapist or a member of the family for home use. Patients who will be involved in homemaking can get one-handed equipment for breaking eggs, preparing vegetables, opening cans, and ironing. Other types of useful devices are special knives for one-handed meat-cutting, suction holders for brushes used in denture-cleaning, and nail-cleaning, long-handed sponges, and reaching tongs. Independent dressing is facilitated by attaching buttons with elastic thread. Consistent use of these should be practiced and correct body mechanics stressed. Emphasis should be placed on activities either useful to the patient or those in which he has interest. Assistive aids should be provided specifically for each patient's needs, and withdrawn when he has progressed to effective function without their help.

**Special Considerations in Rehabilitation Management**

**BOWEL INCONTINENCE**

Most hemiplegic patients regain lost bowel control within a few days following stroke onset, particularly when they are able to use the toilet or a bedside commode. Few patients with bowel incontinence which persists for three to four weeks after a stroke will profit from a program of rehabilitation. This difficulty usually relates closely to the severity of brain damage and generally indicates bilateral cortical injury or brain stem dysfunction. Exceptions include incontinence due either to local abnormalities of the lower bowel or rectum, as in diabetic neuropathy, or to faulty bowel care resulting in fecal impaction. Problems of the latter type will be recognized by an experienced physician or nurse and will respond to proper bowel care and training.

**URINARY INCONTINENCE**

Urinary incontinence alone does not imply a poor prognosis for rehabilitation. Initially a hemiplegic patient may require an indwelling catheter to prevent distention of a flaccid bladder. However, as consciousness is regained, bladder tone also returns so that continuous drainage may cause a contracted bladder, eventually leading to urinary incontinence. This preventable condition will respond favorably to a bladder training routine. With recovery of consciousness, intermittent catheterization is preferred until the patient regains normal bladder control, usually within four to five days, and especially when he is able to go to the bathroom or use a bedside commode. Some hemiplegic patients develop bladder control only after they learn to walk independently. Persistent urinary incontinence after independent walking is usually indicative of either a structural lower urinary tract disorder or bilateral pyramidal tract disease.

**HYPERTENSION**

Hypertension adversely affects the general prognosis and longevity of a hemiplegic patient, but is of little importance to the outcome of specific rehabilitation measures. Indicated treatment to reduce hypertension should, of course, be carried out.

**AGE**

The essentials of rehabilitating the stroke patient are applicable to all ages. However, the degree and the effect of the disability are different for each patient so that the rehabilitation program must be individualized to accommodate for age and other variables. Hemiplegic children have a fairly good outlook for improvement or recovery (see: Section on...
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Strokes in Children). Mild disability seems to be characteristic of older stroke patients seen in rehabilitation centers, probably because the more severe cases in this age group either die or are not referred for treatment. The cumulative effect of multiple strokes in persons of advanced age usually results in a different picture in the elderly hemiplegic from that seen in a young or middle-aged stroke patient. (See: Section on Clinical Management.)

INTERVAL BETWEEN TIME OF STROKE AND INITIATION OF REHABILITATION

Immediate institution of therapy following a stroke probably improves the eventual result of rehabilitation. However, this opinion remains unproved because most studies fail to account for individual differences in severity of involvement and also because referral for treatment may be delayed in severely ill patients. Nevertheless, it is generally agreed that the rehabilitation aspects of stroke management should be initiated as early as possible, so that total management is a continuum.

SOCIAL ENVIRONMENT

Factors influencing the success of stroke rehabilitation, but which are difficult to measure, include the attitudes of family, hospital staff, and physicians, the availability and quality of technical and financial resources, and continuity of medical care (see: Psychosocial Factors in Stroke Rehabilitation).

PERSISTENT HAND PARALYSIS AND HYPOTONIA

The absence of any return of voluntary motor control in the paralyzed hand after approximately four to six weeks makes functional recovery highly improbable, and further therapy directed at restoration of hand function is probably not indicated. Persisting hypotonia and areflexia have a similar unfavorable connotation.

SPEECH DYSFUNCTION

Aphasia, even when profound, is not a contraindication for rehabilitation, since this disability alone may not preclude teaching the patient to walk, dress himself, or take care of his other needs (see: Rehabilitation of Language and Speech).

BILATERAL BRAIN DISEASE

Bilateral motor involvement due either to disease of both cerebral hemispheres or to involvement of the brain stem may seriously interfere with rehabilitation, particularly if there are accompanying changes in mental status, such as memory failure, irritability, lack of judgment, aggressiveness, and emotional lability.

SENSORY LOSS

Unilateral somesthetic loss imposes a serious handicap on a stroke patient, not only slowing or preventing rehabilitation, but also acting as a major source of frustration to the patient and therapist. Parietal lobe involvement resulting in extinction, ignoral, and denial of the contralateral extremities and environment are additional significant deterrents to successful rehabilitation.

SPASTICITY

Although the degree of spasticity and severity of paralysis are related to some extent, there is no strict correlation. Diazepam (Valium) may be a useful drug in reducing spasticity which interferes with functional use of the extremities. However, effective doses may induce drowsiness. For selectively reducing spasticity in a single muscle or muscle group, partial neuroectomies or chemical neurolysis can be used.

KNEE FLEXION CONTRACTURES

Knee flexion contractures have two components. At first a reflexly conditioned flexor spasm is dominant. Gradually fibrous changes at the joint are superimposed and eventually a fixed contracture becomes the major factor. The earlier stage can be recognized by the development of a transient knee flexion spasm when the patient rises from a chair but which subsequently does not interfere with walking. Another early sign is the maintenance of the paretic limb in a knee-flexed position while the patient is in bed. The best treatment is to increase the frequency of ambulation, since during walking the mechanical effect of body weight, reflex-supporting reactions, and mild plantar flexor spasticity assist in straightening or even hyperextending the knee, thereby preventing the development of a fixed knee flexion contracture.

An established knee flexion contracture of more than 15 to 20 degrees usually does not permit independent walking. For reasons that are poorly understood, hemiplegic patients with this disorder are also unable to transfer by themselves from bed to wheelchair, or from
wheelchair to a toilet seat. Prolonged stretching procedures or surgical intervention are usually unsuccessful.

**OSTEOARTHRITIC DISEASE**

The knee of a paretic lower extremity with clinically inapparent osteoarthritis may become painful and swollen shortly after gait training has been started. If conventional therapy, such as infrared heat, intra-articular hydrocortisone, and quadriceps strengthening exercises, are without benefit, a long leg brace with a free knee joint should be provided. This type of brace will assure lateral knee stability, permit flexion or extension of the knee, and prevent further damage to the joint itself.

**DECUBITUS ULCERS OF THE PARETIC FOOT**

Early ambulation may help in the treatment of small decubitus ulcers according to W. T. Foley (Circulation 15:689, 1957). The best therapy is to cover the involved areas with adequate thicknesses of soft, protective material and to avoid direct pressure until they are healed.

**LOCALIZED PAIN**

Any immobilized joint may become painful. The most common sites of joint pain in the hemiplegic patient are the shoulder, wrist, and hip of the involved extremities.

**Shoulder Pain**

The development of pain and limitation of motion of the shoulder, especially on the paralyzed side, is often overlooked or ignored despite the fact that it may interfere significantly with the patient's cooperation in his program of rehabilitation. The presence of shoulder involvement is determined by applying pressure laterally between the acromion and the head of the humerus at the insertion of the supraspinatus tendon, or by firmly palpating the long tendon of the biceps immediately below the clavicle. The pain produced by passive abduction and external rotation of the shoulder also will identify this condition. Tenderness and pain on motion can be ascertained easily, even in an aphasic patient, by the facial expressions. This condition can be prevented by the previously described passive range of motion exercises or treated by active exercises. In more severe and nonresponsive cases, local hydrocortisone injections or even surgery may be necessary. Pain at the shoulder will produce protective spasm and subsequent fixed contrac-

ture. This complication is often confused with the adduction and internal rotation position due to spasticity usually present at this joint after a stroke.

Subluxation of the shoulder may occur during sitting or ambulation. There is a difference of opinion concerning the value of a suspension sling in the prevention and treatment of this complication. However, intermit-
tent use of a sling such as the "V.A. Sling" may be desirable and provide comfort for some patients.

**Wrist Pain**

A painful, swollen wrist on the paralyzed side appears occasionally. A localized, tender swelling of the wrist can occur and should be differentiated from the diffusely swollen hand which is also common following a stroke. The former, if not due to such conditions as arthritis or gout, is best treated by a few days of immobilization. The latter, which is usually secondary to vascular stasis, should be man-
gaged by movement and elevation. A third cause of wrist pain is alleged to be the result of reflex sympathetic dystrophy, or shoulder-hand syn-
drome, and is treated by sympathetic blockade and movement.

**Hip Pain**

Pain at the hip can be due to an inflammation of the bursa between the greater trochanter and the fascia lata, and may interfere with ambulation. The best treatment is to inject hydrocortisone into the area.

**PERIPHERAL NERVES**

Injuries of the peripheral nerves in the paralyzed limbs do occur and cause additional disability. An example is a traction injury of the brachial plexus which can result in a flaccid paralysis of the forearm or hand muscles; unless recognized and correctly splinted, a claw hand may result. Complicating deficits occur also when the peroneal or ulnar nerves are compressed. Good nursing care and properly fitted braces and splints should prevent such complications by avoiding pressure on nerves in susceptible locations.

**HIP FRACTURE**

Hemiplegic patients fall more frequently than do normal persons of a corresponding age. Prevention is accomplished by thoroughly training the patient and his family in the principles of safe ambulation. Hip fractures

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usually occur on the hemiplegic side. Patients with such fractures should have orthopedic management. The surgeon may elect to reduce the fracture and employ internal fixation, or to insert a prosthesis to permit early resumption of weight-bearing.

CARCINOMA

Heart disease and stroke often coincide. The former condition should be relatively stable before ambulation begins, because stroke patients expend greater energy in walking than do normal persons. A short leg brace may partially reduce this additional energy requirement.

PAIN OF CENTRAL NERVOUS SYSTEM ORIGIN

"Central pain" presents difficulties. Focal abnormalities such as a "frozen shoulder" may aggravate this condition and effective treatment of the secondary problem gives considerable relief. Carefully supervised therapy with diphenylhydantoin (Dilantin) or carbamazepine (Tegretol) may alleviate persisting discomfort, but neurological consultation is indicated in severe and protracted cases.

ADAPTATION TO ENVIRONMENT

A severely brain-damaged person has difficulty in adapting to environmental changes, thereby accounting for the confusion commonly seen during the first days after entering a hospital, a nursing home, or his own home. If a patient is to be discharged to his home, the family should be advised against making significant changes or rearrangements. Initially there may be difficulty both in walking and with independent self-care at home following inpatient rehabilitation, where both were performed well before discharge. Therefore, to facilitate adaptation, several home visits before discharge, with appropriate family instructions, may be advisable. When supervised rehabilitation is discontinued prematurely, there are indications that the female patient tends to improve at home through her own efforts; whereas under similar circumstances the male patient who is separated from his usual work often deteriorates.

Rehabilitation of Language and Speech

INTRODUCTION

A frequent complication of stroke is impaired communication. Deprived of this capacity, the patient may become bewildered, frustrated, and angry as interaction with others proves difficult. All personnel concerned with rehabilitation of the stroke patient must recognize the extent, significance, and management of language handicaps.

The two primary speech disorders resulting from stroke are aphasia and dysarthria. Although frequently found together, they are distinct in terms of underlying neural mechanisms, symptoms, and management. Their separate identification is important in developing an efficient rehabilitation program. The characteristics and management of each will be considered.

APHASIA

Definition

Aphasia is an impairment of the central language process manifested by a reduced capacity for interpretation and formulation of symbols of communication. This condition is not attributable to mental deterioration, confusion, memory loss, impairment of special senses, or paralysis, but there may be deficits of these types as a result of the primary process.

The essential components of language processing are: a body of words (vocabulary, set of symbols) to which meaning is assigned; a set of rules for putting these words together and discerning the meaning of certain word sequences (the syntax of the language code); an auditory retention span sufficient to enable the listener to retain language units long enough for processing; the capacity to select appropriate input and output channels, arrange and respond to the competing signals, and select appropriate responses among infinite choices. Many aphasic patients have selective retention of certain language functions which can be utilized effectively to improve communication.

Although patients with aphasia usually demonstrate impairment of all four language components (listening, reading, speaking, and writing), the disability is not necessarily of the same degree in all modalities. The inefficiency in listening which accompanies aphasia may resemble deafness. Familiar words cannot be grasped or retained, although the patient may nod so knowingly that his family often believes his comprehension to be intact. Testing reveals that this is not so. In severe aphasia all recognition of words, pictures, or objects may be lost, but other elements such as agnosia may
be interjected into the picture. With less severe impairment there may be restriction of retention span, with fragmentary comprehension. For example, the patient with restricted auditory retention can follow only simple commands, complains of not being able to "listen fast enough," and often is able to repeat a few words but not a longer sentence. Reading presents similar problems, with single words often looking unfamiliar. The patient struggles through a sentence word by word, misreading some, and not appreciating his mistakes. When he finishes, the meaning has evaporated and the whole process must be repeated.

The aphasic patient finds that words elude him, and in severe cases he can manage only telegraphic speech. Some patients with a severe receptive difficulty will speak with a continuous flow of meaningless words without being aware of their errors. When asked to name pictures or objects, patients may respond slowly, fail to find the right word, produce a substitute similar in sound or meaning, or indicate that they do not know. They usually have difficulty in expressing ideas, defining words, explaining proverbs, or answering open-end questions. Sometimes the patient may be able to produce many nouns but cannot connect them into a proper sentence. Those with less severe expressive problems may speak redundantly or fail to convey the intended meaning. An aphasic patient makes errors in writing similar to those in speaking. Omissions, misspellings, and inability to form letters are examples of common difficulties. With less impairment, spontaneous writing may be reasonably accurate but slow and sparse.

Bewilderment, frustration, anxiety, and depression may appear in aphasic patients, who sometimes develop guilt feelings, panic, or disorganized behavior as reactions to their disability.

**LANGUAGE REHABILITATION**

**Goals**

The aphasic patient retains his acquired system of language including syntax and vocabulary, but has impairment in retrieving certain elements of this system. The speech therapist attempts to stimulate maximal function, recognizing that normal language may not be regained ultimately but that heightened efficiency in processing input and in generating output can be achieved. In addition to his primary function, the speech therapist provides information, insight, and reassurance. He attempts to lessen self-criticism and anxiety, and tries to make the patient understand that his problem can be dealt with constructively. The support he provides is an essential psychological ingredient and an important factor in treatment.

**Nature of Therapy**

Relatively few data are available concerning the overall efficacy of language therapy. The results of treatment vary greatly, depending upon many factors. However, except for the severely aphasic patient, formal language therapy probably helps, particularly if initiated early and continued for an extended period.

One recommended type of speech therapy employs the "stimulation approach." A rich sensory input, presented ideally at times when the patient seems most responsive physiologically, is designed to reduce barriers to proper function. The clinician capitalizes upon the patient's motivation to communicate by choosing content relevant to his life situation. Overstimulation should be avoided.

Therapy consists primarily of intensive auditory stimulation, although other sensory channels, particularly visual, are not neglected. The therapist does not demand a reaction but instead encourages some type of response. Various approaches are used, such as spelling words aloud, writing to dictation and reading in unison (Schuell H: Aphasia in Adults: Diagnosis, Prognosis, and Treatment. New York, Hoeber, 1964). Emphasis is placed upon the understanding and production of complete words and long units rather than individual sounds. Receptive and expressive aspects of language are emphasized simultaneously. Correct responses are always given positive reinforcement, whereas errors are minimized.

In recent years "programmed instruction" has received increased attention. A series of very small but carefully programmed steps is designed to help in acquisition of specific words or syntax. Continuous reinforcement is provided by confirmation of correct answers. The patient is encouraged to master progressively more difficult units and more complicated responses. The relative merits and limitations of these methods have not been determined.
STROKE REHABILITATION

Organization of Therapy
Ideally, language therapy should begin early, as soon as the patient has adequate orientation and the capacity to respond, thereby favoring spontaneous recovery and helping to avoid anxiety caused by an untreated language problem. Aphasic patients vary widely in age, intelligence, and other characteristics. Therefore, individually tailored and administered programs are mandatory, although supplementary values may be obtained from group therapy sessions in which stimulation occurs through social interaction. Treatment sessions should be scheduled with sufficient frequency, probably once or twice daily, to make a significant impact. Duration of therapy should be adjusted to the patient's fatigue level and may vary from 15 to 60 minutes.

Prognostic Signs
Recovery from aphasia depends upon a number of factors:

Age of patient at onset of aphasia. In general, the younger the patient, the better the prognosis. Nevertheless, therapy should be tried with older individuals.

Intelligence. A reasonable assumption can be made that the higher the patient's original level of intelligence, the greater the gain to be expected from speech therapy. On the other hand, such patients, although highly motivated, also may be more sensitive to their language difficulties, more discontented with the apparent lack of progress, and more likely to be discouraged and disillusioned.

Social milieu. Social environment affects the level of language function. The patient with an understanding family and associates who have insight into his problem and who are careful not to provoke, pressure, or dishearten him is likely to do better than one who is neglected and treated less sympathetically.

Etiology of the aphasia. Etiology of the aphasia often determines the rate and degree of recovery; patients with ischemic strokes tend to recover more rapidly and completely than do those with hemorrhagic lesions.

Site and extent of lesion. The more restricted the lesion, the better are the chances for recovery. Temporoparietal lesions on the dominant side usually cause more extensive deficit than do those in other areas of the brain.

Time elapsed from onset to institution of therapy. Early institution of therapy, particularly in the first two months, leads to better recovery than if treatment is delayed. After lapse of a year or more, significantly less improvement can be expected from therapy.

Severity of aphasia. The more severe the initial aphasia, the worse is the outlook for recovery. Certain specific deficits which persist for several weeks, including total loss of speech, the inability to identify named objects, or to write words to dictation, are indicative of poor recovery.

Personality characteristics. The introverted individual who cooperates reluctantly has a less favorable prognosis than the highly motivated person.

GUIDING PRINCIPLES IN MANAGEMENT OF APHASIA
Good care of the aphasic involves responsibility by many professionals in addition to the speech therapist. Everyone in direct contact with the patient, including his family, should understand the nature of his speech problem and factors promoting or hindering his recovery. The following basic rules are offered for the guidance of all who deal with persons having impaired communication:

1. Do not discuss in technical terms and before a group (such as on ward rounds) the patient's condition and prognosis in his presence. Even though severely aphasic, he may be able to grasp fragments of conversation and be sensitive to the mood in which opinions are expressed.

2. Keep the patient informed privately, using simple language, about the diagnosis, treatment program, and probable prognosis. He should be reassured that help is available.

3. Provide generous stimulation. Therapy is conceived as stimulating disrupted processes to function maximally, not as a reteaching of lost skills.

4. Make the stimulus adequate. One way to circumvent the difficulty in understanding is to simplify and slow conversation, shorten sentences, and limit the choices he must make in responding.

5. Do not "talk down" to the patient. Despite inadequate communication skills, social awareness and sensitivity are not affected. Do not treat the patient as though he were a child—through tone of voice, facial expression, body posture, or oversolicitude.
6. Give him a chance to respond. The aphasic patient needs to understand the messages and to make appropriate responses. Make him a real partner in the conversation; do not put words in his mouth too quickly.

7. Do not correct his errors. As functions improve, errors will lessen. Efforts are better spent in eliciting more responses than in making the patient struggle to correct his mistakes.

8. Do not exert pressure to elicit a response. A sense of urgency or an attitude of impatience will only serve to heighten anxiety.

9. Do not shout. A conversational tone of voice will often improve rather than hinder communication. A loud voice tends to be self-defeating.

10. Talk to the patient in terms he understands. Use common words in easy sentences about interesting matters important to him. Encourage participation in familiar activities—scanning the newspaper, watching television, going to church, leafing through magazines, and visiting with understanding friends.

11. Be supportive and optimistic. Failure and threat of failure discourage the patient. Success and reassurance can motivate him effectively to continued effort.

For those who want additional information, a number of pamphlets and books are available (see: References, Aphasic Patients).

When professional guidance for language therapy is not available locally, responsibility for providing help with communication problems may rest largely with the family. With proper instruction, though without formal training, they can provide useful assistance. Workbooks and kits prepared for this purpose offer suitable materials for adult language stimulation and guidance (see: References, Adult Language Stimulation).

EVALUATION OF APHASIA

The neurologist, psychologist, or speech pathologist who is asked to evaluate the nature and extent of the patient’s language impairment and the nature of the communication skills still available to him will probably make use of one or more of the following tests: Functional communication profile; Language modalities test of aphasia; Minnesota test for differential diagnosis of aphasia; Neurosensory Center comprehensive examination for aphasia; Porch test of communicative ability (see: References, Tests for Evaluation of Aphasia).

DYSAERTHRIA

Description

Dysarthria is disordered motor speech due to damage of the central and/or peripheral nervous system. The term implies weakness, slowness, or incoordination of the muscles producing speech. These disturbances of function may be seen in one, several, or all of the basic motor processes involved in speech.

Lesions of the corticobulbar, bulbar, cerebellar, extrapyramidal, and peripheral motor systems may result in dysarthria. Further information can be obtained by referring to the articles by Darley, Aronson and Brown (see: References, Speech-Language Rehabilitation). Following a stroke, spastic dysarthria is most frequent. The distinctive auditory characteristics of this condition include imprecise and slow articulation, low pitch, and harshness of voice.

Management of Dysarthria

Treatment consists of teaching the most efficient use of remaining motor skills, compensating whenever possible to circumvent the effects of disturbed function. The speech therapist helps the patient to build on his memory of premorbid performance by teaching him to monitor his speech self-critically. He learns to adjust the rate so that paretic muscles can produce difficult sounds as accurately as possible, and to mobilize the extra effort for firmer palatopharyngeal closure and clearer articulation. Learned purposeful articulation can be substituted for the automatic performance previously exercised. Slow, deliberate speech is adopted to enable pronunciation of individual syllables, thereby giving the articulatory muscles an opportunity to assume the correct position. Intelligibility is improved by exaggerating consonants. Key words are emphasized to improve understanding.

DIAGNOSTIC PROBLEMS

Although aphasia and dysarthria are the most common speech disorders observed after a stroke, other impairments of communication may occur and must be differentiated.

Apraxia of Speech

Considerable controversy exists concerning the validity of this entity as a separate or
identifiable speech disorder. Some authorities consider it to be a form of aphasia, recognizable clinically by the occurrence of dysarthric speech following a left hemispheral lesion in the absence of other neurological deficits which could cause disturbed articulation. Others believe that speech apraxia is an independent condition often existing in conjunction with aphasia.

Patients considered as having this disorder presumably are inefficient in programming speech movements and in maintaining the proper sequence of such activities. There may be no slowness, weakness, or incoordination of the speech muscles in movements unconnected with speech. The patient knows what he wants to say but he cannot position his speech muscles correctly. Often the initial sound of a word cannot be pronounced. To avoid mistakes, the patient speaks more slowly, spaces his words and syllables evenly, and stresses them equally so that the melodic patterning (prosody) of his speech is altered. The degree of articulatory accuracy depends on the complexity of the task, and the length of words and sentences.

Supporters of this concept believe that differentiation from dysarthria and aphasia is possible. In dysarthria the muscles of speech are slow, weak, or uncoordinated for non-speech movements; the errors are predictable simplifications of a difficult articulatory task in contrast to the variable mistakes with substitutions, additions, and repetitions present in speech apraxia. As contrasted to aphasia, patients with apraxia of speech are said to have difficulty with programming rather than processing speech mechanisms.

According to the proponents of this theory, treatment is by reestablishing lost motor patterns through demonstrating the required phonetic placements which the patient endeavors to imitate while watching himself in the mirror. Maximum use is made of visual, tactile, and kinesthetic cues. Practice usually starts with isolated sounds and progresses to syllables and words and subsequently to attempts at mastering pairs of words beginning or ending with the same sound. The patient then learns to shift from one sound to another, particularly in cases where substitutions are common.

Confusion
Following a stroke some patients are disoriented for time, place, and person and in addition they may have varying degrees of consciousness. These conditions may be mistaken for aphasia. However, the confused patient’s language is usually normal in a structured task such as naming pictures or objects, reading single words, or following simple instructions. In more complex situations, when asked to define words, explain proverbs, or carry out detailed instructions, he is likely to give irrelevant responses, but usually fails to understand that they are inappropriate. Nevertheless, structure, fluency, word choice, and syntax are unimpaired.

Generalised Mental Impairment
Some patients display a generalized mental impairment which requires differentiation from aphasia. As language items become more difficult, inadequacies of performance become apparent. Patients will demonstrate reduced efficiency in all speech modalities, but greater disability is evident in tasks requiring attention, retention, and powers of abstraction and generalization. In mental deterioration, the degree of language impairment will be roughly proportional to the loss of other mental functions, whereas in aphasia the language disturbance predominates. Psychometric testing may be helpful in differentiating these conditions.

Akinetic Mutism
In this disorder, speech and other motor functions are almost completely inhibited. Virtual muteness and immobility occur; only the patient’s open eyes following objects in the environment indicate awareness and seem to “give promise of speech.” Less severe degrees of this disorder have been described in which, after a long latent period, imperfect responses may be whispered in monosyllabic words or brief sentences.

Psychosocial Factors in Stroke Rehabilitation

INTRODUCTION
Psychological factors deserve an important place in consideration of the stroke patient. The acute change in life patterns and potentials inevitably produces psychic trauma and disturbance in adaptation. A mixture of psychological and organic mental difficulties usually
occurs following cerebral infarction, and causes numerous psychosocial problems. Some of these can be elicited by responses to appropriate questions directed toward the patient’s understanding of, and reaction to, his condition.

Responses to seemingly simple questions may be useful in deducing the patient’s insight into the nature and cause of his disability, his understanding of his rehabilitation program, and his hope for recovery. Additional information of importance in evaluating the stroke patient includes educational and vocational background, intelligence, premorbid and present personality, age, duration of disability, family attitudes, and sexual function. Proper management in rehabilitation is concerned not only with recovery of skills but also with issues such as where will the patient live and what will he do when the program is completed.

CHANGES IN MENTAL FUNCTION AND BEHAVIOR
While it is clear that strokes damage the brain, the resulting changes in mental function vary from mild to severe. Many patients apparently return to full mental capacity and appropriate emotional responsiveness; others have persisting qualitative alterations in personality and mentation which indicate that the stroke has caused basic and profound changes. Organic disturbances in mental function include memory, judgment, perception, thinking, motivation, and emotion; they are manifested by such symptoms as insecurity, anxiety, and difficulty in organizing daily routines. Successful rehabilitation is less likely when organic involvement becomes more severe.

PREMORBID PERSONALITY, INTELLIGENCE, AND EDUCATION
Physically disabled individuals with premorbid life patterns showing high intelligence, achievement, and drive generally have the best prognosis. However, some people with consistent histories of successful vocational attainment fail in adapting to a disability. This is most likely to happen in those who achieve success by denying their needs in other areas through limited cultural interests, poor interpersonal relations, and an inability to accept even limited dependency imposed by disability. Patients with borderline psychological and emotional adjustments may become psychotic with the added stress of disease. Certain factors such as education, ethnicity, and economic position play little role in the reacquisition of motor and sensory abilities or emotional balance following a stroke.

EMOTIONAL REACTIONS
Anxiety
Anxiety is a common reaction to stroke, characterized by increased emotional tension and feelings of impending distress or disaster. Anxiety ordinarily plays a useful role in mobilizing a person to think about realistic problems, but when excessive, a variety of psychological defenses may be used in attempting to preserve emotional balance. Skill and understanding are essential to the management of this important symptom.

Anger
Anger and resultant aggression are difficult to manage because they tend to provoke retaliatory measures. Frequently aggravated by frustrations of dependency or disability, anger is often directed toward a staff member. In dealing with an angry individual it is important to be patient, sympathetic, and nonreactive.

Depression
Anger directed toward self, resulting in depression, is usual and appropriate following a stroke, but this reaction requires attention when it interferes with rehabilitation or raises the possibility of suicide. Crying is a common response in many patients to a variety of factors. Crying in response to illness should be differentiated from that occurring in the specific condition known as pseudobulbar palsy with pathological emotionality. In organic disorders crying has an explosive character and, if he can communicate, the patient will deny being depressed, but will admit that he cannot control his behavior.

Suicide in stroke patients is unusual. A suicidal threat, however, always requires careful evaluation and management and should be taken seriously when associated with the following: severe depression; past history of suicidal attempts; repeated threats; dreams of death, mutilation, and funerals; persistent hopelessness; agitation; poor appetite; and insomnia.

PERCEPTION AND THINKING
Perceptual disturbances are difficulties in organizing environmental stimuli of both psychological and physical origin. Responses become hesitant, stereotyped, fragmented, and
STROKE REHABILITATION

ineffective. When given a task requiring the organization of material derived from sensory stimuli, the patient may complain of inability to perform instead of trying to solve the problem. In such instances less difficult tasks should be utilized.

Thinking disturbances, which occur in many brain-damaged people, are characterized by failures of abstraction and include the following deficits: inability to account for thoughts and actions; tendency to shift from one aspect of a situation to another; failure to keep in mind all aspects of a task or to grasp the essentials of a problem as a whole; failure to consider the future, focusing attention instead on the immediate present; withdrawal from reality; inability to grasp conceptual symbols or to identify common properties in diverse settings.

VERBAL-VISUAL-SPATIAL SKILLS
In the right-handed individual, damage to the right cerebral hemisphere may cause a deficit in visual-spatial skills; injury to the left (dominant) hemisphere is accompanied by impairment in verbal skills. In about 50% of left-handed individuals, the right hemisphere is dominant, and consequently the relation of lesion site to type of impairment is reversed.

Failures in performance may be similar in appearance but result from causes which differ. For example, patients may be unable to learn to move in and out of a wheelchair either because of left hemisphere disease resulting in failure to understand instructions, or because of a right cerebral lesion causing loss of visual-spatial skills. Delineating cognitive and perceptual defects is important and may require modern psychological and neurological testing techniques.

BODY IMAGE
Brain-damaged persons frequently have distorted concepts of themselves and their bodies. Body image is a term used to describe the following phenomena: familiarity with body parts; ability to follow directions pertaining to body parts; ability to localize distances on the body; and finger recognition. Disturbances of these concepts are often accompanied by serious emotional reactions.

DENIAL
Denial is the refusal or inability to acknowledge the presence of unpleasant reality. While the tendency to ignore illness may be constructive under some circumstances, it often impedes therapeutic efforts. We can distinguish two types of denial which are important for rehabilitation. One type is the denial either of illness itself or of disability in body parts. This type may be a symptom of brain disease, particularly of the right parietal lobe. It may occur in left hemispheral damage as well but is difficult to detect because aphasia is frequently present. A second type of denial is the acknowledgment of the disability but a refusal to think of its consequences or the future. The latter is more common. It typically takes the form where the patient refuses to plan to return to work until his paralyzed arm is totally recovered. The strict adherence to denial usually implies a poor prognosis.

REGRESSION
Most individuals who become ill develop some degree of regression, which is the return to an immature form of adaptation. When exaggerated, this reaction may lead to profound dependency and inability to be objective. While the behavior may be childlike in some respects, certain evidences of normal functioning are retained. Family attitudes may contribute to this phenomenon. A conference with the family at discharge may be helpful in reducing the possibility that they will aggravate such a situation.

OTHER FACTORS OF IMPORTANCE
Etiology, location, and size of lesion
The location of a brain lesion is all-important, whereas size is significant mainly in terms of location, unless it becomes excessive and produces increased intracranial pressure. Differences in right and left hemispheral disorders, stroke syndromes causing focal deficits, and etiological factors are discussed in other parts of this Section.

Age of onset
In very young children certain deficits resulting from cerebral lesions, particularly those of language, can be compensated for by the contralateral hemisphere. The young patient with a cerebral infarct usually has a better prognosis for survival, recovery, and ability to adapt than his older counterpart. Age is important also because it plays a role in determining the demands of living, financial obligations, presence of complicating disease, and other major factors relating to adaptation and recovery.
Duration
Disturbed mental function usually improves progressively following a stroke. Exact time-tables cannot be set, but recovery is greatest during the first three months and diminishes after one to two years.

The family
A stroke patient introduces severe problems for other family members. Their anxieties parallel his, shifting from preoccupation with the acute condition to concern for long-range management and prognosis. A previously dependent spouse may now have to assume new responsibilities.

Many problems arise when patients return home. Among these are the handling of finances, dealing with sexual drives, managing depression, providing stimulation, and informing the patient of a family crisis. Families often underestimate or overestimate the patient's defects. Each of these questions requires careful evaluation and judgment. Many difficulties can be resolved with a little support from an interested physician, visiting nurse, or social worker. All must be examined in terms of the context in which they occur; for example, sexual difficulties might be viewed differently in a young couple with a history of poor marital relations and in persons of advanced age. When situations are complicated, the opinion of mental health personnel should be sought.

PSYCHIATRIC CONSULTATION
A psychiatrist should be consulted for the management of gross behavioral disturbances, overt psychopathology, depression with suicidal ideas or acts, and poor motivation. Psychiatric consultation can be helpful also in dealing with family problems associated with decision-making.

PSYCHOLOGICAL EVALUATION
Psychological evaluation can be useful in detecting the presence and extent of brain damage, in planning a treatment program, in assisting in management, and in determining prognosis for response to rehabilitation treatment. Psychological tests are valuable in the detection of brain damage with high accuracy and are useful for this purpose with some important qualifications. Brain damage can usually be identified by other means, sometimes making these tests unnecessary. Psychological tests are not foolproof and they probably are least sensitive where they are most needed—in cases of minimal brain damage.

The approaches used by clinical psychologists usually are an adequate basis for judgment. However, recently developed tests provide further refinements in analyzing behavioral deficits. For example, patterns of aberrant response to visual tasks are correlated with frequency of accidents in the treatment programs of hemiplegics, denial of inability to read, faulty spatial judgment, and seemingly inappropriate interpersonal behavior.

PSYCHOLOGICAL MANAGEMENT
Management must be individualized in terms of the patient's motivation and problems, family resources, types of available treatment, and community facilities. The psychologist can assist in the following circumstances:

1. Patients unable to cope with problems and having feelings of hopelessness are frequently helped by increasing their ability to handle situations. For example, perceptual difficulties might be viewed differently in a young couple with a history of poor marital relations and in persons of advanced age. When situations are complicated, the opinion of mental health personnel should be sought.

2. Depressed individuals focus on their loss, and consequently may not be able to consider alternative modes of action. Help is often provided by reducing the patient's feeling of loss and enlarging the patient's scope of values.

3. The physician must decide priorities in treating more than one functional disturbance. It is best to begin with those activities which can be mastered most easily. Often complex problems of sexual, interpersonal and vocational adjustment can be resolved after the patient is doing something to help himself.

4. Rather than dealing directly with exaggerated emotional reactions (denial, anxiety, anger) which cause reasoning and logic to be ineffective, one should treat the patient's disability, introducing rehabilitation procedures gently and with tact. A good rule is never to ridicule or belittle the patient's behavior. If severe emotional problems persist, it may be necessary to revise rehabilitation goals, obtain psychiatric consultation, and/or use medications to modify behavior.

5. The therapist's personal interest and sympathy are vitally important. Sufficient time should be devoted to the patient so that he can
express his problems and also gain the feeling that the therapist is really listening to him.

6. Driving is a special problem for stroke patients. Many states lack laws governing this situation and, in the absence of established criteria, a careful and realistic appraisal must be conducted in each case.

7. Vocational problems are often resolved by the patient and his family. However, when difficulties appear, consultation may be required.

VOCATIONAL COUNSELING

State vocational rehabilitation services can help in returning individuals to employment when sufficient clinical improvement has occurred. Although less than 10% of stroke victims treated in medical rehabilitation centers return to work through the efforts of state agencies, these figures are misleading to some extent because many patients resume work without the aid of such services. In addition, clinical experience suggests that the successful vocational rehabilitation of these patients requires more prolonged counseling and a longer time for vocational adjustment than is presently allowed. Vocational rehabilitation counselors may become involved with stroke patients at any point in the rehabilitation process. However, persons with problems of language or perception need special evaluation and treatment before job training is considered. Difficulties of this type usually have an adverse effect on the prognosis for return to work.

Patients who have suffered a stroke are often concerned about their ability to perform functions previously done habitually, such as reading or writing. Considerable time for relearning these skills must be provided, in part because the patient does not trust himself. The vocational counselor must use psychological testing and consultation with speech, occupational, and physical therapists as well as the physician. The vocational evaluation of stroke patients usually is a long-term process. An initially unfavorable prognosis may improve considerably in six to nine months. A single standard evaluation is helpful as a screening device only if the patient is either intact or severely impaired. Several professional and community services are available to help the patient in job training and placement. These are detailed in another section (see: Section on Community Health Services). The vocational counselor might serve his client by attempting to develop advisory groups from various community organizations including business and industry to assist in job placement. Intensive follow-up is required.

Delivery of Rehabilitative Care for the Stroke Patient

INTRODUCTION

Rehabilitation is a complex, dynamic process of comprehensive patient care beginning at the time of the acute stroke and continuing until the maximum physical, psychological, social, and vocational functions for each individual have been achieved. The rehabilitation of the stroke patient is based upon the concept that every disabled individual has the right to be treated by the best techniques available so that he may again participate within his society to the fullest extent of which he is capable.

A stroke rehabilitation program should be established in every hospital where patients with cerebrovascular disease are treated, although the details will vary with the size, location, and resources of the institution. However, for rehabilitation to be successful, the program, wherever provided, must reflect the many needs of each patient. In order to attempt solution of the total problems presented, there must be close cooperation by the physicians, the nurses, and the other allied health personnel who, by forming a team of experts that will work together, can thereby identify problems, provide optimal treatment, and initiate early discharge planning. Inherent in the rehabilitation process is effective communication with both the patient and his family to ensure their total and continuous involvement.

ORGANIZATION OF THE STROKE REHABILITATION PROGRAM

To be effective, each hospital program will require adequate facilities, suitable personnel trained in rehabilitation techniques, effective organization of resources, and opportunities for education and training in stroke care.

The Rehabilitation Team

The essential ingredient of a successful stroke rehabilitation program is the constant and active teamwork of properly trained personnel. Experience has shown that a coordinated team effort leads to effective utilization of time and facilities, encourages rehabilitation to be prac-
JOINT COMMITTEE FOR STROKE

ticed throughout the hospital, and allows all persons, including the attending physician, house staff, nursing personnel, rehabilitation specialists, family, and patient to cooperate effectively in formulating and executing an integrated rehabilitation plan suited to the individual problems and disabilities of each patient.

Although physical plant and equipment are important and will be discussed later, they are secondary to the effective utilization of personnel. The philosophy of cooperation with maximum communication, particularly verbal, providing for immediate feedback and exchange among all involved persons is essential to the patient's welfare and the successful outcome of treatment, and can be applied in every type of setting. An important function of a rehabilitation center or a hospital rehabilitation service is to provide for face-to-face interchange of information which will contribute significantly to the desired integration and coordination required in the total management of a disabled patient and his problems.

Large or specialized hospitals, particularly those in a university setting or those dealing with many patients having cerebrovascular disease, should be able to organize a sophisticated stroke rehabilitation team along lines to be discussed below. In smaller institutions where a basic group of rehabilitation specialists direct their efforts to all patients with a disability, including those who have had a stroke, the team will need to possess, or will have to acquire, the skills and interest necessary for treating neurologically disabled patients. The kinds of personnel who are important for successful rehabilitation in most hospitals are given in the following listing, although the combinations of disciplines which will be involved and the precise duties will vary with the size and goals of the institution, the therapeutic facilities, and the availability of staff for employment.

**Physicians**

Stroke rehabilitation must be under medical supervision, preferably by a physician with specific skills and interests in the problems such patients present. In addition the physician responsible for the medical supervision of a patient must be knowledgeable about the functions and responsibilities of the other rehabilitation personnel who are contributing to the program. The following physicians are most frequently involved in stroke rehabilitation.

**Physiatrist.** A physiatrist's role is to coordinate the rehabilitation program by making rounds with team members, evaluating the patient for his functional abilities both present and potential, and prescribing the specialized forms of treatment required for each individual.

**Neurologist.** A neurologist's important role in stroke rehabilitation is the interpretation of the patient's neurological status, physical condition, capabilities, and prognosis.

**Personal physician.** The cooperation of the patient's own physician is essential for overall rehabilitation management and he must be consulted frequently by rehabilitation personnel. If possible, he should attend the staff conferences concerned with his patients.

**House staff physicians.** In hospitals with teaching programs the house staff should participate actively in rehabilitation planning, both from the general educational viewpoint and for the specific purpose of dealing with problems present in patients assigned to their care.

**Other physicians.** In smaller communities, where neither a neurologist nor a physiatrist is available, an interested physician, usually the family physician, should be responsible for leading the rehabilitation team. In addition, the services of internists, neurosurgeons, vascular surgeons, orthopedists, urologists, ophthalmologists, psychiatrists, and other specialists may be required under certain circumstances.

**Nurses**

**General nursing staff.** The nursing staff is a vital part of the rehabilitation team. Good nursing management in the acute stage of a stroke, with careful attention to pulmonary, cardiac, excretory, and musculoskeletal functions, not only will save lives but will shorten recovery time by many weeks. All nurses working with disabled patients, and in particular the stroke patient, must be knowledgeable and skilled in rehabilitative measures.

Under the direction of the charge nurse, the nursing staff should have the authority and responsibility to initiate and implement specific nursing measures. In the area of rehabilitation these are: prevention of deformities, positioning correctly in bed, institution of active and passive range of motion exercises, helping the
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patient to perform essential activities of daily living, bowel and bladder training, and initiating transfer and ambulation. Nurses should promote continuity of care by appropriate referrals for community services, particularly when a social worker is not available.

The rehabilitation nurse. Ideally a stroke rehabilitation team will include a nurse with special training in rehabilitation, although any interested nurse who has successfully completed an educational program in rehabilitative nursing of stroke can fulfill this function. A listing of such programs can be obtained from the American Nurses' Association and the National League for Nursing. Among the rehabilitation nurse's duties are the following:

1. Making early patient contact to evaluate for prompt referral to hospital-based resources;
2. Ensuring that the rehabilitation plan jointly agreed upon is followed, working closely with the general nursing staff to assess special needs, planning with nurses an appropriate written nursing care plan and assisting in the cooperative planning, initiating, and implementing of the restorative nursing measures devised for each patient.
3. Initiating staff conferences to ensure communication between nursing personnel, other allied health personnel, the physicians, and the family;
4. Training other personnel (licensed practical nurses, nurses' aides and attendants) and families in appropriate restorative nursing techniques and care;
5. Aiding the family in planning discharge to home, nursing home, extended care facility, or intermediate care facility and making certain that the social worker is involved whenever necessary.

Physical Therapist

One or more physical therapists are key team members. The work of the physical therapist is expedited and enhanced by total and coordinated participation in the team effort in a setting where there is mutual communication. Far too often the physical therapist is isolated and becomes frustrated by an inability to ensure progressive modifications of the rehabilitation program both in the hospital and after discharge. Frequently, when there is a lack of free and open exchange of information, the physical therapist does not learn details of the patient's medical, economic, and emotional problems, thereby hindering proper evaluation and treatment.

Major functions of the physical therapist include the following:
1. Determining functional motor abilities;
2. Ascertaining joint mobility and reasons for limitations of motion;
3. Evaluating the patient for sensory disturbances which may interfere with successful rehabilitative efforts;
4. Instructing the family and patient in the rationale and methods of the treatment program;
5. Initiating a therapeutic program including range of motion and strengthening exercises, transfers, wheelchair activities, and ambulation;
6. Working with the nursing staff in the provision of the rehabilitation practices of good patient management;
7. Working closely with all other personnel involved in the rehabilitation program and in the formulating and carrying out of an effective and comprehensive plan of care.

Occupational Therapist

The occupational therapist has an important role in analyzing obstacles to performance when patients present complex overlapping problems such as hemianopia, communication disorders and spasticity. She has at her command certain techniques which may enable the successful management of these and other difficult situations.

The occupational therapist performs the following major treatment functions:
1. Evaluating patients to determine range of motion and sensory deficits, and their ability to perform motor tasks, to follow simple instructions, and to utilize retention and recall;
2. Developing a positive program in functional activities and self-care methods;
3. Supplementing limited motor recovery of an upper extremity by teaching one-handed techniques, training in the use of self-care assistive devices and/or adaptive equipment, advising of needed environmental changes, and modifying approaches for successful accomplishment of a specified activity;
4. Instructing other rehabilitation personnel and the patient’s family in the above techniques.

Social Worker
The provision of social services is essential to proper rehabilitation. In small hospitals the part-time services of a social worker consultant may have to suffice. The master’s degree in social work should be required of the consultant or the person supervising the delivery of social services in situations where it is impossible to include a fully qualified social worker on the rehabilitation team. Major responsibilities of the social worker are as follows:

1. Assessing the social and psychological needs, home and community adaptations, and economic resources of the patient and his family;
2. Aiding in case finding (all team personnel should recognize this need and participate in case finding);
3. Performing the customary casework services including initial evaluations, discharge planning, referral to community resources, and assistance in job finding;
4. Attending staff conferences, ward rounds, and other clinical sessions, thereby ensuring close communication between the social worker and all other involved personnel in preparing a comprehensive rehabilitation plan;
5. Apprising the physician and other personnel of all social problems that might hinder or prolong recovery.

Rehabilitation Counselor
The rehabilitation counselor is an important team member and has the following functions (in small hospitals these can be assumed by the social worker or family coordinator):

1. Interviewing the patient and his family to determine sociopsychological and vocational problems;
2. Providing counseling, if indicated, to the family and/or patient during hospitalization;
3. Informing other rehabilitation personnel about family relations and situations that might inhibit optimal rehabilitation.

Speech Therapist
The important functions of the speech therapist include:

1. Evaluating communication problems;
2. Providing consultation to hospital staff, the patient, and/or his family;
3. Suggesting methods of language stimulation to the family;
4. Initiating speech therapy when appropriate.

Psychologist
The psychologist acts as consultant to the rehabilitation team, usually in the following areas:

1. Providing in-depth patient psychological evaluations when required;
2. Providing limited therapy under crisis conditions during hospitalization;
3. Testing in certain situations, such as determination of organic mental deficit.

Dietitian
The dietitian as a team member ensures that nutrition, a basic need in maintaining health, is included in the comprehensive plan for care of the stroke patient. A high protein diet usually is recommended to help reduce muscle weakness and to ensure skin integrity. Many stroke patients have other diseases or conditions, e.g., diabetes, hypertension, obesity, for which a therapeutic diet must be prescribed. Extreme obesity is a detriment to effective rehabilitation and such patients should be encouraged by the dietitian to follow a reduction diet. The dietitian performs the following functions in relation to the stroke patient.

1. Estimates present and/or past dietary status;
2. Provides a diet meeting the therapeutic and nutritional needs of the individual, taking into consideration food preferences and normal eating pattern;
3. Assesses food consistency the patient is able to tolerate; particularly valuable is her aid in helping with preparation of formulas for those unable to swallow;
4. Provides early and continuous dietary counseling to the patient and his family, particularly the member preparing the meals;
5. Reports at team conferences the patient’s dietary treatment and his progress;
6. Recommends to the appropriate community nursing agency the continuing dietary follow-up needed by the patient after hospital discharge.
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The Family

The family is the most important resource available to the stroke patient and his physician in every phase of rehabilitation. Family members are most closely related to the patient physically and emotionally and have great motivation to help him reach maximum goals medically, socially, and vocationally. Full utilization of this crucial asset requires active and continuing involvement of key family members by all professional personnel who care for the patient during the course of acute, restorative, and follow-up care wherever the patient may be— in a hospital, rehabilitation center, extended care facility, nursing home, or his own home. Active involvement implies full, frank, realistic explanation and discussion of the patient's condition at all times, the purpose of specific procedures undertaken, ultimate prognosis for recovery, probable permanent limitations and deficits as these become established, and the possible adaptations to compensate for or adjust to these residuals. In the absence of such preparation, without frank sharing based on realistic assessment, efforts of family members at sustained support and stimulation of the patient's motivation for recovery, unfortunately, may wane or disappear as time passes.

Procedural Methods for Stroke Rehabilitation

INTRODUCTION

With individual members functioning as described, the activities of the rehabilitation team begin at the time of hospital admission when the rehabilitation nurse (or other designated person) notes the clinical problem, discusses the case with the patient's physician and, with his permission, initiates the active participation of the nursing staff and other specialized therapeutic personnel. Team members, the patient's physician, and other medical specialists communicate frequently. The family is contacted early, and social, vocational, psychological, and economical problems are given prompt consideration. As soon as a realistic rehabilitation program is formulated, the team members—nursing staff, allied health personnel, attending physician, and other medical specialists—and, if feasible, family members confer at an appropriate time to determine an optimal plan suited to the patient's total requirements.

Follow-up procedures are also initiated by the team since the rehabilitation process must not stop at the time of discharge. When the critical stage of illness has passed and recovery is expected, thoughtful discharge planning and arrangements for post-hospital care become equal in importance to the hospitalization itself. Arrangements must be made for continuing the rehabilitation program on an outpatient basis, in an extended care facility, or in a nursing home. The social and physical aspects of the new situation should be investigated. The patient's economical and psychological problems should be considered and dealt with appropriately and, whenever feasible, he should be seen periodically after discharge by a social worker or visiting nurse to ensure that prescribed treatment is being followed and all problems are managed effectively.

THE REHABILITATION ADVISORY COMMITTEE

An organized Stroke Advisory Committee performs an important role in establishing and maintaining a successful program. This committee should include interested and knowledgeable physicians, nurses, other members of the hospital staff, and a representative from hospital administration. Whether the group is an independent organization concerned solely with the therapeutic, diagnostic, and rehabilitative aspects of stroke management or an identifiable part of a committee responsible for the general rehabilitation program of the hospital, the following should be under its surveillance:

1. Organizing the rehabilitation program;
2. Determining the intent and scope of the hospital's participation in rehabilitation, varying from a simple program in a small hospital involving perhaps only one individual knowledgeable in rehabilitation techniques, to a comprehensive and well-staffed plan for a large institution;
3. Supervising the hiring of rehabilitation personnel;
4. Providing space and facilities for rehabilitation activities;
5. Establishing policies and procedures for admission of stroke patients (hospitals caring for strokes should not restrict admissions only to patients who are unconscious, unable to swallow, or seriously ill with other medical complications).
6. Providing the mechanisms by which hospitalized stroke patients will be channeled into the rehabilitation process;
7. Establishing methods of communication with referring physicians, nursing homes, and extended care facilities, including provision of a discharge summary which will be sent to the family physician and will also accompany the patient to his next destination;
8. Consulting frequently with rehabilitation personnel about their needs and responsibilities;
9. Reviewing and evaluating the activities of the stroke or rehabilitation program by the study of individual charts, procedures used, length of hospital stay, and disposition (this process should provide good quality control and help to discover special areas of weakness and strength).

**PHYSICAL FACILITIES**

Suitable rooms and proper equipment are important for a rehabilitation program. Nevertheless, therapy must be offered under whatever conditions exist and should not be deferred even if improvisation becomes necessary. However, the following facilities are recommended.

**Area for Rehabilitation Therapy**

Every hospital accepting stroke patients should have a separately designed area properly equipped for rehabilitation. The amount of space in a particular institution should be appropriate to the number of patients treated. Hospitals planning such facilities should consult physiatrists, physical therapists, occupational therapists, nurses, specialists in hospital design, and others who will help in avoiding expensive and embarrassing errors in construction.

**Patient Facilities**

Beds for handicapped patients should be close to rehabilitation services and, ideally, all should be located in one or more designated areas, thereby providing for efficient use of team personnel and the developing of a staff indoctrinated in the rehabilitation process. Separation of these patients from acute and critical cases is particularly important. The latter inevitably demand more attention. The elimination of any competition for nursing services between acute cases and the nonacute stroke patient contributes to maintaining a unified and concerted rehabilitation program. In the patient areas, handrails, specially designed toilets and bathtubs, and other facilitative devices helpful in managing the physically handicapped should be installed where appropriate.

**Other Space Requirements**

Space, including conference rooms, should be provided for counseling, speech therapy, interviews, and family instruction. A combination lounge and dining room enables handicapped patients to eat away from the bed and to socialize with others similarly afflicted.

**Special Considerations in Planning Stroke Rehabilitation Facilities**

**SIZE OF HOSPITAL**

Precise guidelines as to the scope a stroke rehabilitation program should encompass in different types of hospitals are difficult to establish. However, the following generalizations can be made.

University medical centers and major community hospitals should have comprehensive programs. In the hospital of medium size there should be a full rehabilitation team which works with all types of handicapped patients but with a special emphasis on neurological problems, particularly strokes. For the needs of a small community hospital, the basic rehabilitation team should consist of the physician, a rehabilitation nurse, social worker/family coordinator, and physical therapist, while other specialists, such as a physiatrist, occupational therapist, speech pathologist, psychologist and rehabilitation counselor, may be employed on a part-time basis, as available. Where personnel and facilities are limited even more severely, important basic functions can be fulfilled by including on the staff at least one or two persons with rehabilitation training. In addition, a physical therapist and a nurse trained in rehabilitation procedures should be available for consultation. A social worker from the community can be employed as needed to handle special problems. Very small or isolated hospitals—which usually lack the sophisticated personnel or equipment to deal adequately with complex rehabilitation problems—should refer such patients immediately to an institution with the requisite service.
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REQUIREMENTS FOR SPEECH-LANGUAGE REHABILITATION

Special attention is given to the facilities and personnel required for speech-language rehabilitation because the complex problems involved in providing these services are generally less well understood than are other aspects of therapy.

In university medical centers there should be an established department of speech pathology and audiology in order to render complete diagnostic, therapeutic, and counseling services. Senior faculty members should be responsible for patient care and for the teaching of interns, residents, and staff. The additional staff members needed for treatment should be employed in numbers proportionate to the patient load. The staff should attend teaching ward rounds and rehabilitation team staff conferences. Adequate space should be allotted and equipment provided to furnish high-quality evaluation and treatment.

In major community hospitals and rehabilitation centers, speech rehabilitation services, including evaluation and treatment, should be available for inpatients and outpatients, as well as for family counseling and instruction. Space should be provided for patient evaluation and treatment, with necessary equipment including tape recorder, audiometer, and training devices such as the Language Master. Clinical Management is discussed under Rehabilitation of Language and Speech. Included as a member of the hospital staff should be a consulting speech pathologist from a nearby university or college speech clinic or a rehabilitation center. This consultant could serve several cooperating hospitals. He should attend selected hospital rounds in order to identify problems, suggest therapy, and be involved in the total management of speech problems.

Rehabilitation Centers

A rehabilitation center may exist as a separate, independent facility, at times in a location at some distance from a hospital. However, when physically separate, it should have a close working relationship with a hospital. On the other hand, the functions of a center often are provided within a hospital, in which case there will be a rehabilitation service with beds and facilities for treating both inpatients and outpatients. In addition, a rehabilitation center or service may be part of an extended care facility. A rehabilitation center may also function for the purpose of providing primarily vocational assessment and training.

There may be difficulties in deciding whether the stroke patient who has recovered from his acute illness should receive his rehabilitation in a rehabilitation center or hospital rehabilitation service, as an inpatient or as an outpatient, or whether he should be transferred to an extended care facility. Although this decision should be based primarily on what is best for the patient, there must be taken into consideration also the extent of disability (for example, speech involvement), economical factors, degree of family or other social support, and the nature of available resources. A number of factors justify hospitalization for rehabilitation. One of the most important for the stroke patient is his usual need for an integrated, comprehensive program of management requiring the coordinated provision of skills of a number of professionals. Concomitant medical disorders, such as congestive heart failure or significant renal disease, may require simultaneous treatment and the need for hospitalization. In addition, neurological disabilities produced by the stroke, particularly severe cerebellar ataxia or brain stem infarction with dysphagia, may necessitate inpatient management. Lastly, patients initially treated in smaller hospitals may require the additional diagnostic and therapeutic resources of a major medical center, a rehabilitation service, or those of a rehabilitation center.

Regardless of whether care will be provided on a rehabilitation service of a hospital or by a center closely affiliated with a general hospital, capabilities for comprehensive care are necessary, including vocational evaluation, intensive speech-language therapy, psychological support and counseling, and an ability to obtain an adequate knowledge of home and community resources. For optimum effectiveness, all services must be genuinely coordinated and operated on a 12-month basis for patients of all ages. Provisions should exist for periodic reevaluations and for long-term management following discharge.

Extended Care Facilities

In theory an extended care facility provides less intensive services than those available in the hospital but more than exist in a nursing
home. This facility is generally utilized for patients still requiring certain limited therapeutic measures, when their level of need does not justify hospitalization or when outpatient care is not feasible. An extended care facility may provide some services included under rehabilitation such as physical therapy. Occupational therapy, when available, is usually provided from the affiliated general hospital, a rehabilitation center, or from “mobile” occupational therapists serving several such facilities.

In addition, an extended care facility providing services for stroke patients should have available measures to meet the social and emotional needs of these patients as described for nursing homes.

Nursing Homes
Many licensed nursing homes offer only custodial care. Others with rehabilitation orientation have the services and capabilities for providing long-term management programs to maintain or improve the functional level of stroke patients. An important service of a nursing home is the provision of social and environmental stimulation. In addition to meeting standards established by the local licensing body, nursing homes providing stroke care should take into account some of the following measures to meet the patient's social/emotional needs:

1. A central dining room for patients able to share the social experience of eating with others,
2. Available barber and beauty shop services,
3. Nutritious and varied menus, attractively served, with provision for special diets,
4. Religious services for those interested through arrangements with local churches and synagogues,
5. Organized, regular recreation programs,
6. Sufficient numbers of conveniently located telephones,
7. Television sets,
8. Toilet facilities modified for use by the handicapped,
9. Absence of architectural impediments that would interfere with safe independent function of the disabled whether ambulatory or using a wheelchair.

The following personnel should be associated with the nursing home as full-time or part-time employees, or as consultants on call:

1. The patient's own physician or, in his absence, a physician on call who is available for both emergency and routine medical care.
2. Registered nurses, licensed practical nurses, and aides specially trained in rehabilitation techniques and with an understanding of the stroke patient.
3. Availability, upon the attending physician's request, of physical therapist, occupational therapist, speech pathologist, neurologist, psychiatrist, psychologist, or other specialist.
4. A social worker as part of the staff, full-time or part-time, to evaluate the patient and family situation in other than medical areas; to assist in the patient's initial adjustment to the setting; to handle problems as they arise between patients or in the family; to contact community agencies for their services as needed in the nursing home or in the patient's own home; and to help in the discharge process if this becomes feasible.

All nursing homes should have sufficient supplies of equipment routinely required such as wheelchairs, walkers, canes, and the like, to avoid cumbersome “sharing” schedules. They should also have defined arrangements with x-ray and laboratory resources as well as contact with local pharmacies for medications and supplies.

The Patient's Home
Although the provision of rehabilitation in the patient's home cannot substitute for that provided in a hospital or other facility in which sophisticated and broad-ranged services are available, nonetheless, this location often has to serve, partially or wholly, as the primary site for this program. In such situations, therefore, the local community must provide for a well-structured home-care program which encompasses as many as possible of the services a stroke patient may require, including arrangements for transfer from home to a facility providing an organized rehabilitation program whenever this is deemed necessary for medical, social, or psychological reasons. Ideally, when a home program is necessary, a social worker should maintain continuing contact with the family to offer supportive help as needed, to find and use proper community resources in...
behalf of the patient and his family, to alert other team members to changing moods and needs, to identify practical and emotional problems which may arise from time to time, and to alert the physician in regard to such matters as physical aspects of the home, need for recreational activity, and follow-up medical care.

The Physician's Office

Physicians are responsible for selectively utilizing all available methods and procedures in order for their patients to achieve maximum recovery. In doing so they must recognize the need for rehabilitation when indicated, regardless of whether their disabled patients are hospitalized, treated at home, or managed in the office. Since most patients with acute cerebrovascular disease require hospitalization, often the recognition of rehabilitation needs comes from hospital personnel, particularly in institutions with strong rehabilitation programs. However, every physician should have the knowledge to identify when a patient needs rehabilitation and to arrange for, or provide, the necessary services for all of his patients.

The rehabilitation approach employed in an office practice will vary depending upon the extent of disability. A seriously disabled person will require close supervision and attention, provision of home nursing services, and detailed family instruction. On the other hand, less intensive care might be employed for the person with minimal dysfunction. Although patients with transient cerebrovascular ischemia usually do not require physical rehabilitation, they may need vocational, social, and psychological counseling. When such patients also need comprehensive diagnostic evaluation requiring hospitalization, these rehabilitation services often can be obtained at the same time. (See: Section on Clinical Prevention; Section on Clinical Management.) Among rehabilitation roles which a physician can assume in his own office the following are important.

Recognition of Rehabilitation Potential

Some patients are discharged from the hospital without an evaluation of their recovery potential, a situation which the physician should recognize, and either perform an adequate evaluation or make an appropriate referral. Changes in the patient's physical condition occurring subsequently often require modification of the original appraisal and rehabilitation goals. In general, patients with bilateral cerebral disease, severe sensory deficits, persisting hypotonia, and severe communication problems should be directed to specialists for evaluation of their rehabilitation potential. In addition, the prognosis will be influenced significantly by associated cerebral or systemic disease and by age. However, dogmatic rules cannot be made, and each patient must be considered individually when he is seen by his physician.

Treatment, Supervision, and Follow-up

A physician should recognize various complications that may interfere with rehabilitation when they occur and institute corrective measures which, in many instances, may require him to obtain consultations with rehabilitation specialists. In supervising the care of patients who have undergone a stroke rehabilitation program in the hospital or on an outpatient basis, the physician must insist upon obtaining all of the necessary information he will require for the patient's continuing care and medical supervision. At office visits during the follow-up period, the physician must recognize complications which may develop and be prepared to recommend, or institute, the necessary corrective measures and treatment changes.

Emotional Support

Emotional support by his physician is needed particularly during the trying period when the patient first returns home, or is sent to an extended care facility, or a nursing home. At this stage, family cooperation, which is essential, can often be secured only through the efforts of the family physician. He can correct a patient's misinterpretations and misconceptions by explaining the need for certain procedures and activities, and can encourage close rapport between the patient, his family, and rehabilitation personnel. Since speech and language problems require special explanations, the family physician must be able to differentiate these disorders so that he can counsel the patient and family regarding their nature, management, and prognosis. He should have sufficient information regarding the availability of speech services to refer the family to the appropriate resources when indicated or to provide a list of instructions and materials if
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**DETERMINATION OF DISABILITY STATUS**

The family physician is often asked to render judgment on the physical and mental status of disabled patients. Such requests occur on insurance forms and employment questionnaires, from drivers' licensing bureaus and the Social Security Administration. He is also asked by schools and employers to decide the types of allowable activity for handicapped individuals. In performing these functions the physician must be aware not only of the patient's present disability but of factors determining rehabilitation potential. In order to act confidently, he must have specific knowledge and the willingness to consult with the proper specialists.

**Community Health Services**

Ideally the following range of services should be available at home to the stroke patient who is unable to travel to organized sources of care:

1. Visiting physician service (family physician/internist and other specialists) for both regular follow-up and emergency care, the nurse, physical therapist, social worker, or family having freedom to call in the physician between visits if the patient's condition appears to warrant medical attention;
2. Mobile x-ray and laboratory units when such services are ordered by doctors;
3. Nursing service as indicated by the needs of the patient, with specialized treatment as prescribed by the physician;
4. Physical therapy as prescribed by the physician, with close attention to nature and timing of the modalities used and their termination when appropriate;
5. Occupational therapy, medically oriented, as ordered by the doctor, including evaluation of physical aspects of the home and recommendations for feasible changes;
6. Psychiatric, psychological and social work evaluation, and therapy when indicated;
7. Financial help for medical/rehabilitation and/or maintenance requirements, if and when needed;
8. Speech evaluation and therapy, when indicated;
9. Special assistive devices (medical/physical and activities of daily living), when needed;
10. Dietary counseling, when needed;
11. Homemaker or household assistance, when indicated;
12. Vocational services, including provision of homebound work, as necessary;
13. Volunteer or friendly visitor service for social/recreational purposes when need is seen by medical/paramedical personnel or family;
14. Delivery of nutritionally balanced meals for the lone, isolated stroke patient unable to cope with such matters as shopping and cooking.

Whenever the patient is able to leave home to procure necessary services in an organized center, this should be encouraged strongly. However, the physician should balance the relative merit of this course of action versus services in the home in terms of demands on the patient and family physically, emotionally, and financially. When the patient is safely ambulatory and in need of social, recreational, or vocational training stimulation, the community should provide such services through day care centers for adults and through sheltered workshops.

Following is an outline of the optimum feasible care regarding communication problems which should be provided by home care health services:

1. Means should be established for accomplishing referral from public health nurses to a consulting speech pathologist;
2. Direct care to patients could be provided by personnel from a hospital or rehabilitation center, or by a mobile speech therapist serving nursing homes as well;
3. The program should include family counseling and training in home management procedures to supplement direct therapy.

**Home Without Community Services**

The family constitutes a "rehabilitation facility" both at an early stage when the patient cannot be moved and later when he returns home from some other treatment setting. If the spouse or other family member is to serve as therapist, such persons must receive instruction and be counseled regarding the alteration of roles on the part of both patient and spouse which the stroke creates. Both must be helped to adjust to a new set of "ground rules" if...
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therapy is to be beneficial. So guided, the spouse can:

1. Follow an outlined schedule of home treatment, using recommended workbooks and other materials;
2. Exploit the more intact language modalities (visual versus auditory, gesture versus speech, typewriting versus writing);
3. Reorganize the home environment in terms of problems such as visual field defect, hemiplegia, or other disabilities, so as to foster communication and general adjustment;
4. Assist the patient to master special devices for communication, such as picture or word boards, special writing aids;
5. Plan for social carry-over of language retraining, relating therapy to activities of everyday life, vocation, hobbies, contact with friends, and church attendance.

Educational Components of Rehabilitation

EDUCATION OF THE PHYSICIAN IN REHABILITATION

Every physician should be a therapist in his own right, as well as proficient enough in rehabilitation to evaluate, advise, and supervise a rehabilitation program. Because he serves in many ways as a referral and information source for patients and for rehabilitation personnel, he should have the expertise to select patients requiring special rehabilitation measures and to know where they should be sent. His role in this system is vital and presupposes an educational program which should begin when he is a medical student, and should be reinforced at the postgraduate level and after he is in practice. Important in this regard are the educational efforts of hospitals, Regional Medical Programs, and individual rehabilitation personnel.

MEDICAL SCHOOLS

Unfortunately, in most schools of medicine, the student is given almost no exposure to rehabilitation beyond a modicum of information about physical therapy. Rehabilitation concepts and procedures to provide for the patient's total physical, social, economical, and psychological recovery are virtually ignored in the curriculum.

Increased attention to rehabilitation in medical education will require some schools to develop resources they do not have at present. These should include a well-staffed department or division of rehabilitation medicine and sufficient curriculum time to allow the medical student more than a casual contact with the following:

1. Indications for and techniques of rehabilitation in office practice,
2. Availability of rehabilitation facilities,
3. Functions performed by various rehabilitation specialists and how to work effectively with them,
4. Acquaintance with rehabilitation methods to enable intelligent utilization of these resources,
5. The importance of considering treatment for the patient's total recovery needs rather than his physical complaints only,
6. Special training in the particular requirements of neurologically handicapped individuals, especially those with stroke.

INTERNSHIPS AND RESIDENCIES

The intern and resident should learn about the rehabilitation resources for problems occurring in the patients assigned to his care. Certain specialties, including orthopedics, rheumatology, and neurology, should provide more extensive training experience, such as attending rounds with rehabilitation staff and rotating through the rehabilitation service. The knowledge gained will enable the resident to order and supervise his patients' rehabilitation programs effectively.

CONTINUING EDUCATION OF THE PRACTICING PHYSICIAN

The physician in practice who lacks expertise in rehabilitation methodology or is unaware of new developments in this field should make use of all available resources to correct the situation. The following aids are suggested.

The most useful single procedure for helping the family physician is to acquaint him with the functions, capabilities, and utilization of existing community rehabilitation resources. These might be included in a "physician's handbook" or "desk reference" prepared by community or state rehabilitation personnel, such as members of the Division of Vocational Rehabilitation or of voluntary agencies and welfare departments. Included therein should be detailed information about rehabilitation centers, visiting nurse services, nursing homes, extended care facilities, voluntary health agencies, welfare programs, and other resources.
The functions, costs, and referral mechanisms for each service should be stated clearly. The Regional Medical Programs Service could make a major contribution by providing information about rehabilitation resources and capabilities throughout the country. These data can be distributed through individual Regional Medical Programs, county and state medical societies, medical schools, and medical journals.

CLINICAL EDUCATION

Generally, the best method of physician instruction is at the bedside in relation to his own patients. Such an approach requires a hospital setting with both active rehabilitation programs and teaching personnel. Physician education in rehabilitation will be an important result of integrated participation in stroke rehabilitation team activities. Demonstrations, formal programs, and physician contact with the team and its functions can be utilized to accomplish this purpose.

In addition, wherever possible, hospitals should provide physicians with educational programs in stroke management. House staff should also participate as members of the rehabilitation team, thus learning rehabilitation theory and practice, and how to work with, and effectively utilize, the other rehabilitation specialists.

All hospital personnel, including attending physicians, house staff, nurses, and other health professionals, should have the opportunity to receive instruction in basic principles and techniques of stroke rehabilitation. Where possible, the continuing education programs provided should be multidisciplinary, thereby encouraging all involved personnel to learn from one another and to work cooperatively. An active educational program for attendants, nurses' aides, nursing students, licensed practical nurses, and registered nurses should be maintained continuously in all hospitals to develop a constant awareness of the needs for good rehabilitation practice and to teach its methodology. Instruction should be provided by knowledgeable physicians and rehabilitation team members. Active participation in patient conferences by the nursing staff with the physicians and other members of the rehabilitation team is another important element of inservice education.

Recommendations of Study Group

1. This Study Group urges the formation of local committees to encourage improvement in the evaluation and management of cerebrovascular disease. Despite the present high incidence of strokes in the United States, a surprising number of individual physicians have only occasional acquaintance with these disorders. Although many general physicians can manage the patient adequately during the acute phase of the disease, most would benefit from advice and special consultation—particularly in relation to rehabilitation problems. The organization of a committee (much like a hospital tumor board) with particular interest in the stroke patient would aid the attending physician during the acute stages of illness and be of inestimable value in assisting with long-term management.

A stroke advisory committee should consist of a small group of concerned physicians, at least one of whom has special interest and experience in rehabilitation. The committee should also include one or more nurses and representatives of other concerned allied health professionals when available. They should be willing to meet as often as required to discuss ongoing problems, new patients, and follow-up care. Individual members should make themselves available to answer questions and offer advice to attending physicians on an informal “curbside consultation” basis.

The group should represent an autonomous local district, such as a community hospital, a regional medical unit, or a county, community, or other political subdivision. The committee would have multiple responsibilities in developing basic criteria for management of the stroke patient and encouraging highest standards of care both in the acute state in the hospital and during rehabilitation and return to the community. These include:

a. Diagnostic evaluation, and medical and surgical treatment, individualized in consultation with the patient's attending physician;

b. Nursing care, including establishment of standing orders, with advice of the attending physician, so that positioning, active and passive range of motion exercises, mobilizing the patient, instruction in activities of daily
STROKE REHABILITATION

living, and other similar measures will be carried out early and effectively;

c. Channeling the stroke patient (through action of his physician) into appropriate facilities for evaluation, management, and rehabilitation either in the local setting or elsewhere if necessary;

d. Providing educational opportunities for physicians and others in all aspects of stroke management;

e. Encouraging the acquisition and development of adequate facilities, equipment, and personnel to accomplish both acute and long-term management of stroke patients.

Where committees of this type have been active, they have improved the management of stroke, usually with minimal effort by individual members. We firmly believe that this single measure would greatly enhance the use of available resources.

2. Interest in stroke rehabilitation should be fostered in disciplines beyond the physicians' and nurses' ranges of responsibility. Physical therapists, occupational therapists, speech therapists, social workers, psychologists, dietitians and others can make important contributions to stroke patient care.

3. Education of the physician in stroke rehabilitation should begin in medical school and continue throughout his years of practice. Means for continuing instruction should be provided for all persons involved in care of the stroke patient, including members of the family.

4. An up-to-date registry of community facilities and resources should be maintained and distributed widely for the use of those involved with stroke care, wherein the functions, cost, and referral mechanism for each community service are stated clearly.

5. Present regulations regarding the admission of Medicare patients to extended care facilities should be modified.

References

APHASIC PATIENTS

Nontechnical


2. Boone DR: An Adult Has Aphasia, ed 2. Cleveland Hearing and Speech Center, 11206 Euclid Avenue, Cleveland, Ohio, 44106, 1961


Semitechnical


ADULT LANGUAGE STIMULATION

Workbooks and Kits for Use of Family


TESTS FOR EVALUATION OF APHASIA


Stroke, Vol. 3, May-June 1972
JOINT COMMITTEE FOR STROKE

PATIENTS AND THEIR FAMILIES

Nontechnical Booklets*

34. Strike Back at Stroke. Booklet EM 232
36. Up and Around—Booklet to Aid the Stroke Patient in Activities of Daily Living. Booklet EM 358

SPEECH-LANGUAGE REHABILITATION

47. Schuell H: Aphasic difficulties in understanding spoken language. Neurology 3: 176-184, 1953

*Booklets can be ordered from the local American Heart Association.

Stroke, Vol. 3, May-June 1972
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doi: 10.1161/01.STR.3.3.375

Stroke is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
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Print ISSN: 0039-2499. Online ISSN: 1524-4628

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://stroke.ahajournals.org/content/3/3/375

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