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REHABILITATION AND TRAUMA

JACK M. GOLDSTEIN*

ASIDE FROM the effects on the individual involved, traumatic episodes have widespread medical, economic and legal implications. Acute medical care, including surgery where indicated, is followed by rehabilitative procedures which are designed to restore the patient to his maximum functional capacity. Economic costs are enormous on a national basis and frequently on a personal basis as well. While these costs, as well as the equitable adjustment of legal and financial rights and responsibilities, are beyond the scope of this paper, some comment will be made in order to show the perspective in which rehabilitation medicine functions.

In strictly personal terms the injured person is precipitously faced with the consequences of his injury on a variety of levels. Injuries may range from trivial insults to the person to disabling catastrophe. There is a total difference in kind as well as in degree between the slight injury which causes disability for a day or even a week and the major injury which results in long-term or permanent incapacitation. How the individual is affected by the injury is dictated not only by the extent of the trauma but by his personality, family responsibilities, and the amount of alternative income. All too often the evaluation of disabilities is confined to physical findings only. One must also take into consideration the total patient and his functional ability to become a useful member in both his family and in the community.

The classical medical approach to illness or injury was predominantly geared to the pathology involved rather than to the patient. While this was a great service to the patient, it was a narrow one insofar as it largely ignored his human needs other than the medical. Sur-

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gical intervention, for example, which is limited to the removal or correction of gross pathology, is frequently self-defeating to the total medical objective of restoration of health and function.

The injured person has many needs besides the medical. Economic needs and responsibilities do not cease, rather they continue and are most often additionally subject to the strain of all or part of the medical expenses. Emotional complications spring from medical and psychological stress. Family relationships are frequently disturbed. It is clearly in everyone's interest that the injured person be helped to return as quickly as possible to a situation as close to his normal pattern of living as conditions allow. This requires that he be seen as a whole human being whose well being is many-faceted.

Rehabilitation, medical rehabilitation or rehabilitation of the physically handicapped all mean the restoration of the patient to his maximum physical, social and economic capacity. To be most effective it should be initiated at the onset of any illness or trauma, acute or chronic. Residual disability is often caused not by the original insult but by inactivity such as excessive immobilization, or activity in a faulty position because of weakness and pain. For example, flexion contractures, decubitus ulcers and painful restricted extremities are avoidable if rehabilitation is started early. Furthermore, the patient's psychological response to his trauma or illness is much more favorable if he knows that the physician's goal in treatment goes beyond the immediate medical problem to include restoration to useful function.

Rehabilitation medicine is a comparatively new field of medicine. It became a recognized specialty after World War II when a large number of the physically handicapped had to be returned to an active society as quickly as possible. During World War II, through the development of surgical skills and chemotherapy, many lives were saved that would previously have been lost. These patients had to be returned to a useful life, and it was then under the leadership of Dr. Howard A. Rusk and others that the specialty of rehabilitation medicine evolved.

As stated by Dr. Rusk, medical rehabilitation has been frequently termed the third phase of medicine:¹ the first phase being preventive medicine, the second phase, curative medicine and surgery, and the third phase, one in which a dynamic program of rehabilitation is

¹ RUSK, REHABILITATION MEDICINE 11 (2d ed. 1958).

carried out. The first objective of rehabilitation medicine is to eliminate the physical disability, if this is possible; the second is to reduce or alleviate the disability to the greatest extent possible, and the third, to return the person with a residual physical disability to live and work within the limits of the disability, but to the hilt of his capabilities.

A specialty training program for physicians was developed, and with the inclusion of paramedical personnel, the team approach to the patient came into being. During the specialty training the medical trainee is exposed to subjects such as anatomy, neuro-anatomy, kinesiology (study of muscles in motion), neurology, orthopedics, and to the application of appliances such as prosthetic limbs, bracing, self-aid devices, and to the scientific use and prescription of wheelchairs. The physician is exposed to various types of physical disabilities, and because of his exposure, he becomes expert in their evaluation, prognosis and treatment.

It is this ability to evaluate and correlate the patient's disability with his ability to become functional as a person that makes the physiatrist an invaluable expert witness. In the field of personal injury the knowledge of the physiatrist with his team approach and the use of the paramedical staff consisting of the psychologist, social worker, vocational counselor, physical therapist, occupational therapist and speech therapist all help in treatment, and ultimately, the most constructive disposition of the case.

The techniques used in rehabilitation are primarily clinical and educational in nature. The use of various therapeutic modalities in the form of exercise, heat, and appliances help to reduce the physical incapacities resulting from trauma. Basic physical measures include positioning the patient, splinting, and bracing. Within the limits of his residual ability, the patient is helped to regain his functional capacity with or without the aid of orthopedic devices.

In addition to psychological and economic disorganization, needlessly protracted medical care can result in decubital sores, contractures, urinary involvements and other physical effects with far reaching consequences on the recovery of the patient. If a rehabilitation program is undertaken early, many of the dangers of unnecessarily extended medical care can be avoided. For example, in cases of paraplegia resulting from trauma, discharge can usually be attained in six to eight months. While admittedly this is a protracted period of care, and in the end, the patient may only be capable of carrying out

the activities of daily living required for self care, it is vastly preferable in every sense to permanent hospitalization or total dependence at home, and in many cases the discharged paraplegic can return to some form of gainful activity. Another example is the low back injury where early diagnosis and effective rehabilitation techniques can often prevent the development of a chronic low back syndrome. A worker who suffers a severe traumatic injury to the leg resulting in surgical amputation will serve as a further illustration. Psychological shock, complete cessation or a sharp decrease of income, and anxiety about future employment will ordinarily complicate the problem. If these factors are ignored, or handled with vague and undirected assurances, the recovery of the patient will be slow at best, and he will probably never achieve the most productive life style that would have been possible with more sophisticated help. If the surgery is performed and the patient discharged with a broad directive to go out and buy himself an artificial leg, irreparable harm can be done. Medical rehabilitation is concerned with effective return to functional living, not merely with the alleviation of physical pathology.

In another situation, a young man in his early twenties was involved in an accident which resulted in a fracture dislocation of the spinal vertebrae in the thoracic column, involving complete severance of the spinal cord. Following surgery, it was found that irreparable damage had been caused to the spinal cord, and the young man is now what is termed a "paraplegic," with loss of both motor power and sensation of the lower extremities. The level of the loss depends upon the level of injury at the cord. Besides the loss of both motor power and sensation, there was also loss of control of both bladder and bowel. It is at this point that the physiatrist and the concept of the team approach is introduced as the third phase of treatment. Even to restore this individual to a partially functioning level, a dynamic approach is necessary. The individual, following the realization of the overwhelming disaster that has befallen him, becomes depressed; his motivation is at its lowest ebb, and at this time, he requires the help of the psychologist and the skilled social worker to overcome his emotional problem.

One of the most important medical considerations in the treatment of the paraplegic is the prevention of decubital ulcers due to loss of sensation of the skin and deeper tissues of the body. These ulcerations occur with special frequency over weight-bearing bony prominences covered only by skin and small amounts of muscle and subcutaneous

tissue, namely, the areas over the sacrum, trochanters and ischial tuberosities. Skin breakdown is one of the most feared complications, and early in the training period of the patient, he must be taught proper skin care and methods of relieving pressure over the exposed areas of pressure. Early treatment in the form of exercises for strengthening of the upper extremities are taught the patient so that he will be able to transfer from the bed to the wheelchair. To prevent contractures of the muscles of the lower extremities, the patient is placed on a regimen of passive range of motion of the lower extremities, so that he can be ultimately fitted with braces. When the patient has reached this stage, he is provided with crutches and taught to carry his body weight upon his shoulders. He may even be able to ambulate for short distances with the aid of his crutches and braces. The bladder is carefully watched for infections, stones, and reflux reactions. Both bladder and bowel may be trained or devices used so that the lack of control may not become offensive.

While the patient described above is admittedly left with major disabilities, his situation must be seen in perspective. Prior to the era of rehabilitation medicine, a case of this type faced a short life span because of the many complications that would develop and the fact that the total patient was not treated. The patient often found himself abandoned with no further prospect of ever becoming a functional member of the community. But in a rehabilitation context, as this patient progresses through the various phases of his training and learns to live within the framework of his disability, the vocational counselor explores possibilities for occupational retraining. The patient may even be taught to drive his own vehicle with the aid of mechanical devices and so become more independent with this improvement in his mobility.

To further illustrate the role of the physiatrist in several areas of disability, and the present day concept of rehabilitation medicine, several types of situations involving trauma will be presented.

First, returning to the traumatic amputation referred to above, amputations are musculoskeletal problems of a special nature because disability results from either traumatic or pathological origin, necessitating the removal of a limb. The ratio of traumatic amputation to pathological amputation is approximately 1:6.² Rehabilitation of a patient who has had an amputation is an achievement reached through

² COMMISSION ON PROSTHETIC-ORTHOTIC EDUCATION OF THE NATIONAL ACADEMY OF SCIENCES 8 (1966).

successful management of the patient in a number of stages and is a step by step procedure. It requires teamwork among the doctors, nurses, therapists and limb maker. The state of the patient's health is important. If a cardiac condition is present, the energy cost required in the use of the limb may be so great that the patient may not be a candidate for a prosthetic limb.

The first stage is surgical—the removal of all or part of the limb. In the case of hip disarticulation (total removal of limb), a Canadian prosthesis (“bucket seat”) is fitted, and the patient is trained in its use. If only part of the limb is removed, conditioning and shaping of the stump follows. Full range of motion is maintained at the hip, and resistive exercises are carried on for strengthening the upper extremities since the weight of the body will be carried by the shoulders while training crutches are being used. Body balance is taught by using parallel bars and crutches. A person who can handle crutches well during this stage has a good prognosis insofar as his ability to ambulate with a prosthesis is concerned.

In the past several years a newer technique called “immediate fitting” has been developed, and is in use in the major medical centers. In the past, amputation of the lower extremity was followed by prolonged bedrest, followed by training the individual in ambulation with use of a pylon, and finally fitting with the prosthesis. This usually required an extensive stay in the hospital, with all of the resulting costs to the individual and his family. In the “immediate fitting” technique a plaster cast is applied to the stump of the amputated limb in the operating room with a pylon attached so that when the patient awakens in his bed the sensation of a limb being present is immediately experienced. Usually on the following day standing is permitted, and on the second day, ambulation in the parallel bars is begun. About fourteen days after the cast is removed, an early fitting for a permanent prosthesis may be made. Treatment is thus reduced by several months and the patient should be able to return to his community and vocation in a shorter period of time.

Another area of particular concern to physicians and attorneys in trauma practice is that of back injury. A more detailed examination of this syndrome will help to illuminate some of the subtleties inherent in identifying and evaluating trauma. Diagnosis and etiology of back complaints are difficult, and at times impossible, to determine with certainty. This is an area in which malingering is sometimes suspected.

Serious injuries to the back account for twelve and one-half per cent of all injuries incurred in New York state,³ and since workmen with back injuries lose twenty-five per cent more time on the average than those with other traumatic injuries, the importance of this type of injury is self-evident. Despite these percentages, it should be remembered that other types of injuries are ten times as likely to leave permanent residual disabilities than is true of back injuries.⁴

The etiology of chronic back pain has caused more division among the medical profession than any other medical symptom. A logical approach is to classify the cause of back pain from a functional standpoint, the function being impaired by the following causes: (1) stress and strain, (2) chronic fatigue, (3) instabilities, or (4) other causes. It is estimated that approximately sixty per cent of patients with back pain have been affected by stress and strain, thirty per cent by chronic fatigue, five per cent by instabilities, and five per cent by other causes.⁵

Under stress and strain, back muscles may fail momentarily when they are required to resist a force greater than their tolerance. The resultant overstretching creates pain, sensitivity, and tightness, and after a few hours, spasmodic reactions occur. Examination of the back reveals stiffness, listing (functional scoliosis), and pain on movement. The medical objective in such cases is to relieve the sensitivity at the site of the injury, eliminate the spasm, and restore muscular balance. These objectives are attained by strapping the back for immobilization of the muscles, complete bed rest, injection of local anesthetics, and spraying with ethyl chloride (to relax muscles and to eliminate pain). The majority of patients with acute stress and strain injuries can be made comfortable within a few days and functional in ten to fourteen days.

Some of the most troublesome cases of back pain are found in the chronic fatigue category. This is a state of muscular inadequacy associated with prolonged tension without adequate relaxation. The most usual cause in these cases is faulty posture, the basis of which is either habitual, developmental or occupational. An example of occupationally induced faulty posture would be the worker whose tasks necessitate a strained work posture for prolonged periods. Developmental types

³ Russek, *Medical and Economic Factors Relating to the Compensible Back Injury*, 36 ARCH. PHYS. MED. 316, 317 (1955).

⁴ *Id.* at 318.

⁵ *Id.* at 320.

include the sequelae of pathological conditions such as poliomyelitis, muscular dystrophy, multiple sclerosis, or fusion of the spine following Marie-Strumpell Disease. Once chronic fatigue develops, the sensitive tissue is easily irritated, with resulting backache. Changes from sedentary to heavy work should be preceded by conditioning. Similarly, conditioning should precede any unaccustomed heavy activity, including sports. There are few forms of work or other activity which by themselves are more likely to cause back pain than others. The crucial factor is fitness for a particular activity, not the activity itself.

Instabilities as a class are structural anatomical weaknesses of the bone, ligament or muscle. In the back, these are for the most part congenital although a small percentage are acquired. Relevant examples of congenital instabilities which might precipitate a lesion under stress are the undetected existence of spina bifida occulta (spinal malformation of a developmental nature), or a tendency to have vertebral slippages because of minor anatomical malformations. In the acute stage, treatment for lesions which occur because of instabilities is similar to that used for stress and strain and chronic fatigue as described above. However, if pain persists it may be necessary to use surgical intervention to stabilize the back.

In cases of violent injury it is not difficult to diagnose acute back pain nor to establish a course of treatment. X-ray examination will make it possible to determine with fair certainty whether or not injury has been sustained by the bone structure. In cases of soft tissue injury, muscle spasm will be present. If injury has been sustained, standard orthopedic procedures are used. From a rehabilitation standpoint, however, every effort must be made to avoid the superimposition of residual disabilities which may result from the treatment itself or from the development of disuse atrophy in any part of the body. Acute back injuries without bone involvement usually heal spontaneously under protected conditions. Complete bed rest is prescribed with supportive therapy for the relief of muscle tensions and pain (heat, massage, gentle exercise), accompanied by reassurance to the patient.

The balance of trauma situations in which back injuries are involved result from other causes, primarily of a violent nature. Contrary to the ordinary lay view, violent trauma constitutes only a very small part of injuries in the population. For example, back pain occurring in females who are actually suffering from a gynecological condition may be falsely attributed to trauma. Menopausal osteoporosis, malposi-

tion of the uterus, or tumor masses may be the source of the back pain which is nevertheless ascribed to the effects of work. It is of the first importance for the attorney to realize this so that he will be alert to the fact that most trauma has a complicated etiology. It is self-evident that the equitable assessment of responsibility is heavily dependent on an accurate understanding of the facts.

The compensable back injury has certain special features and differs from other industrial injuries in terms of dollar costs and loss of time. From the rehabilitation standpoint early recognition of the functional diagnosis, etiology, and treatment of the total patient produces a better end result. While it is true of all situations requiring rehabilitation, it is especially important that individuals who are suffering from chronic conditions be helped by the appropriate medical and paramedical disciplines.

In determining liability in situations involving injury serious attention must be given to the possible existence of pre-existing morbid conditions. Many cases of back pain are the result of structural defects of the spine and its supporting structures. Such defects could be of a congenital or developmental nature. Skillful elicitation of the medical history is vitally important in arriving at a diagnosis in back complaints. An employee when seeking treatment for back pain may ascribe his injury to "lifting a package," "twisting his back" while performing a work task, or "slipping on a doorstep." Whether or not these stated reasons were the actual or sole reasons for the pain is frequently problematical. In many situations a carefully taken medical history will demonstrate that the back pain has been intermittently present for years. For example, the worker may reveal this information, followed by, "But, when I lifted the box my back gave out." A situation of this kind does not fall in the same class with injuries which are caused by accidental violence resulting in trauma. At a minimum, pre-existing morbidity should have a mitigating effect in determining liability.

Back pain as a symptom is all but impossible to evaluate in terms of severity because of the individual factor. Personality structure and varying degrees of tolerance to pain prevent the development of even relatively standard measurement scales. Every effort must be made to evaluate pain as carefully as possible, especially in the absence of muscular spasm, neurological signs, or other positive indications. Frequently the worker will claim that he is unable to work because of pain that is not present when he is at rest. This type of case is compounded

by the fact that physical examination is often hampered because of pain; or if examination is complete, the diagnosis is often not based on positive signs. In such situations different examiners may reach antithetical conclusions with regard to disability.

From the moment that the trauma patient enters the hospital, his total concerns as a human being, insofar as they affect his recovery and future adjustment, are included in the therapeutic plan. As the leader of the medical team, the physician coordinates the activities of the paramedical specialists who are concerned with various facets of the patient. Skillful coordination of the team efforts is required to avoid the fragmentation of the patient's interests into poorly related segments.

The psychologist and social worker are directly concerned with the personality structure of the patient as it affects his motivation, his adjustment to the physical loss, and to the effects on his personal life. Help is given, as required, to alleviate depression, to arrange alternate income, to stabilize disturbances in family relationships, or to obtain retraining and change of vocation. Obviously, these are merely examples of the kinds of help which may be needed. They can make the difference between protracted or even permanent disability, with all of the implicit costs in human and economic terms, and rapid recovery and full or partial return to constructive living.

A recent development in the field of rehabilitation has broadened the possibilities of restoring disabled individuals to a better level of functional capacity. This is the collaboration with bio-engineers in the research and utilization of electronic principles in medical care. Motorized wheelchairs with sensitive toggle switches have made it possible for paralyzed individuals to achieve a fair degree of mobility. In conjunction with adaptive automotive devices, some paralyzed individuals can enormously extend their mobility. Many, who might otherwise have been unable to leave their beds or homes for the remainder of their lives, are thus enabled to attend school or work.

The most recent development is an electronically operated artificial prosthetic arm. This is a sophisticated device by means of which the amputee can flex the fingers and arms by literally willing them to flex as is the case with the natural arm. The mechanism is operated by minute electrical impulses which are generated in the muscles of the arm stump when the brain wills them to contract. Amplification of these impulses triggers the motor-driven arm and fingers. The impor-

tance of this development, as well as the continuing research which is going on in this and related areas, is best seen when compared with the conventional prosthetic arm which is basically cosmetic rather than practical, and which was frequently not used by the patient because its awkwardness outweighed its utility.

Rapid development has taken place in both numbers and quality of rehabilitation facilities in the United States, especially in metropolitan centers. At the same time the rehabilitation concept has increasingly permeated the entire country. Paralleling this development there has been a sharp increase in the number of physicians specializing in physiatrics, and a comparable rise in the number of individuals in the paramedical disciplines. Despite the significant growth in all of these areas a serious shortage of facilities and professional personnel still exists.

Rehabilitation care may be difficult to obtain in some parts of the country because of the shortage of facilities and because many physicians are not yet fully acquainted with how to utilize this comparatively new specialty. Also, treatment is apt to be expensive because of the number of disciplines involved and the relatively protracted nature of the care required. Nevertheless, the dollar benefits of rehabilitation have been repeatedly substantiated.

In recent years insurance carriers have become intensely interested in the impact of rehabilitation medicine on the reduction of disability, and consequently, the lessening of legal liability. The Insurance Company of North America and Liberty Mutual Insurance Company have been pioneers in this field. Research centers, such as Mend Institute of North America, have been established to develop training techniques and devices for the disabled which will shorten the period of disability and maximize functional capacity and return to work. The avoidance of unnecessary complications such as restriction in joint motion resulting from prolonged immobilization is a characteristic rehabilitation approach.

Space does not permit a full discussion of the physician as an expert witness, and the duty of the attorney to prepare himself in certain basic medical fundamentals of trauma. Whether the physician witness is friendly or hostile it is imperative that the attorney know the ground to the degree that he can utilize the knowledge of the former and protect his client from the partisanship of the latter. Included in the basic fundamentals is a reasonable degree of familiarity with the potentialities and techniques of rehabilitation medicine.

In the preparation of the physician as a friendly witness, the attorney should arrange one or more conferences for the purpose of mutual orientation and exchange of relevant data. The physician should have a clear picture of the lay facts of the case to which he is to relate his medical opinion. Perhaps even more important the attorney should thoroughly understand, at least in general terms, the medical principles and pertinent terminology. The physician should make clear any probable areas in which controversy might arise as well as the various implications which might follow. In terms of the case in point, the attorney should be completely familiar with the type of injury sustained and the resulting disability, whether of a long or short-term nature. An understanding of the role of rehabilitation is essential in order to fully understand the therapeutic possibilities.

The attorney should inform himself as to diagnosis, prior vocation, type of trauma involved, prior medical and work history, and the psychological make-up of the patient. He should be alert to the fact that stress and strain injuries as well as certain others are frequently associated with prior pathology. Thorough preparation is the watchword. Accurate medical history and careful examination will often reveal physical defects which pre-dated the injury, as well as previous accidents and their effects. The sudden revelation of such information during the course of trial can have devastating effects. The attorney should call on the expertise of the physician in determining whether there was a gradual or acute onset of pain, the nature of the pain, whether there are radicular symptoms, and what the findings were of neurological tests, myelograms, or electromyographic studies. Similarly he should inform himself as to residual physical effects and whether they will be permanent or temporary.

When the physician is being examined on the stand it is important to guard against responses which are excessively technical and which may thereby omit or obscure valuable information. This situation might arise because of the professional orientation of the physician or because of the nature of the questions which are directed to him. If the competent physician has a full discussion with the attorney prior to being put on the stand, and if he is prepared in advance regarding the pertinent lay facts, he should have no difficulty in giving effective testimony. However, physicians frequently volunteer information which is confusing and sometimes damaging. No question should be answered by the physician unless it is asked and until he fully understands it.

Whether in direct or cross-examination of the physician, the attorney should be well grounded in the basic medical facts affecting the case. It is my impression, after many years of experience as an expert witness, that it is not advisable for the attorney to indulge in "fishing expeditions" (*i.e.*, interrogating the physician in areas where the attorney is totally uninformed). This can be dangerous since the physician can be expected to know more than the attorney in medical matters. It is likewise advisable not to involve the witness in minutiae since this distracts the jury from a consideration of the basic facts and also gives the witness an opportunity to exercise partisanship in a sometimes uncontrolled way. On the other hand, the well-prepared attorney can destroy the effectiveness of the testimony of a partisan expert.

Extreme caution should be used before attempting to elicit testimony which labels a worker as a malingerer. This charge is usually difficult to establish and may result in introducing or strengthening an unwelcome element of doubt. This is especially true if the physician fails to substantiate the charge or else attempts to do so in a tentative or hesitant manner.

The focal question of return to work is intimately related to a variety of factors. What was the individual's vocation prior to the accident, and will he be able to resume work at his full capacity, at a lesser capacity, or not at all? Is retraining in another line of work necessary or possible, and if so, how long will it take and what will be the effect of his new situation in terms of earning ability?

It is apparent that unless the attorney is conversant with the role of rehabilitation medicine in a situation involving trauma, his evaluation of the merits of the case will be dangerously limited. Prognosis as to recovery of functional ability, length of incapacitation, and degree of residual disability is heavily dependent on the effective use of rehabilitation techniques. A general orientation in this area is essential for the attorney to fully understand the medical situation and to seek an equitable adjustment.