THE HIGH COST of health care delivery makes it mandatory for the physician to separate effective therapeutic measures from those which are costly yet of marginal benefit to the patient. This is particularly important in dealing with the treatment of chronic neurologic disorders, such as stroke, where the total medical costs involved in caring for a patient can be astronomical.

Factors which can make it difficult for physicians to decide what sort of treatment to employ are:
1. Lack of carefully controlled clinical trials demonstrating the effectiveness and/or benefit of various therapeutic measures.
2. Lack of data on the total cost of chronic care.
3. Pressure from peers, patients, and families to “do everything possible” even if therapeutic intervention is of questionable value and is costly.

Since vigorous treatment may not always return the patient to a reasonably happy and productive life, but may, instead, produce an unhappy, dependent, chronically disabled and isolated individual, the physician should consider the following guidelines in making therapeutic decisions:
1. What type of medical, surgical and rehabilitative treatment will be most effective?
2. Will the treatment be beneficial to the patient, his family, and/or society?
3. What is the actual cost of the treatment?

Effectiveness of Rehabilitation. Effectiveness of Rehabilitation. Many studies have demonstrated that stroke rehabilitation is effective and that it can significantly improve functional ability even in patients who are elderly, medically ill, and who have severe neurological and functional deficits. Our own studies show that after an average of 43 days approximately 80% of our patients can go home, 85% are ambulatory on discharge, and 50–62% are completely independent in self-care activities. Age (below 80), sex, and the presence of concurrent medical problems did not seem to hamper functional return. Even patients with poor prognostic signs frequently improved with short-term, intensive, multidisciplinary treatment provided in a regional stroke rehabilitation unit. These data support similar findings by other investigators and strongly suggest that therapeutic nihilism, with early referral to chronic care facilities, can no longer be condoned when appropriate rehabilitative care is available.

Effectiveness of Rehabilitation and its Relationship to Length of Hospitalization. How long should a patient remain in the hospital? Little information is available which meaningfully answers this question, but several studies have suggested that length of stay (LOS) should be based mainly on the severity and type of associated neurologic deficits and not on the H-ICDA coding. Attempts to assign LOS criteria based on major diagnostic categories often do not accurately reflect the real need for hospitalization. These studies also showed that such co-existing medical conditions as diabetes, hypertension, arteriosclerotic heart disease, hyperlipidemia, or various combinations of these disorders did not significantly increase average LOS in a disability oriented stroke rehabilitation unit even though they may affect LOS in the acute care hospital. The type and severity of the stroke-induced functional and neurologic deficits were much more directly related to eventual outcome and LOS than were the associated medical conditions.

Effectiveness of Rehabilitation and its Relationship to Type of Hospital Rendering Acute Care. Since few patients who sustain significant neurologic disability following stroke can be managed at home during the acute phases, where should the patients be hospitalized?

By analyzing outcome data on a large group of patients referred to a regional stroke center for a short period of rehabilitation (124 referred from large New York City hospitals and 315 from community hospitals), outcome was found to be similar for both groups, yet costs were about 50% less for those patients initially cared for in community hospitals. (There were no significant intergroup differences in important medical, neurological or demographic variables.)
Methods of Improving Effectiveness — Early Institution of Therapy. By beginning rehabilitation as soon as the patient is medically stable, functional return can be maximized and LOS minimized. Some studies have suggested that the easiest way to improve outcome is to begin rehabilitation in the acute hospital within the first 2 or 3 days after the onset of the stroke and/or to refer patients to regional rehabilitation centers when they were medically stable.

Outcome following referral to tertiary care centers is related to the time from the onset of the neurologic deficit to the time of admission to the rehabilitation center. Outcome can be significantly improved by early referral of appropriate candidates to regional rehabilitation facilities. When patients are not so referred it may be due to

- Reluctance of many physicians to vigorously treat elderly patients with multiple medical problems who have had a major stroke.
- Skepticism about the effectiveness of rehabilitation in modifying stroke-related deficits.
- Lack of enough convincing data supporting the cost-effectiveness of rehabilitation.
- Lack of economic incentives for physicians to rapidly evaluate and transfer acutely ill patients with chronic diseases to tertiary care centers.
- Lack of facilities adequately equipped to rehabilitate stroke patients.

These factors frequently prolong hospitalization in acute care facilities, delay institution of appropriate rehabilitative treatment, result in premature referral of many patients to nursing homes or extended care facilities, and contribute to the increase of health care costs.

Methods of Improving Effectiveness — Development of Guidelines for Stratification of Health Care Services. There is little scientifically derived information which provides guidelines for determining which stroke patients can and should be rehabilitated in acute care hospitals, and which patients can and should be referred to regional stroke rehabilitation centers, chronic disease hospitals, skilled nursing homes, and/or health-related facilities. Without good guidelines, health care planners cannot adequately assess present and future needs. Hence, facilities to provide optimal care may continue to be unavailable in most communities. Several reports have alluded to the problems of stratifying health care services for stroke patients but there is no study which has realistically addressed the overall problem.

Methods of Improving Effectiveness — Regionalization of Health Care Services: The rationale for regionalization of health care services has recently been presented. McCann has demonstrated the benefits of regionalizing stroke care within an acute care hospital and Howard has demonstrated the success of a community hospital, regionalized, disability-oriented stroke rehabilitation unit. In Howard's study of over 1,300 patients, the average LOS was 28 days. Half of the group returned home with the help of community agencies, 30% were referred to nursing homes or extended care facilities, and 20% expired. Patients unable to return home because of residual disabilities theoretically constituted a group who would be referred to a regional stroke rehabilitation center if one had existed in that area. It was estimated that approximately 3 patients per 1,000 population per year would need the comprehensive services offered in a tertiary care facility.

An interesting question raised by these statistics is whether the improvement in mortality and morbidity following institution of Howard's program was due to regionalization of care within the hospital (that is, having all stroke patients on the same unit) or due to the impact of better medical management in an enlightened community.

In an attempt to determine whether or not disability oriented units can affect outcome, per se, we recently examined outcome and LOS in 2 groups of patients admitted to a regional stroke rehabilitation center: 1 group was cared for on a disability-oriented stroke unit (SU group); patients in the other group were cared for elsewhere in the hospital, using similar therapeutic programs. The data showed that although the SU group had more concurrent medical problems and more severe neurological and functional deficits, they were more likely to go home after treatment and walked better at the time of discharge. LOS was similar for both groups. Substantial improvement in outcome thus may be realized by regionalizing care into disability-oriented units, not only in acute care hospitals, but also in rehabilitation facilities.

Benefits

"Benefit" and "Quality of Life." The rehabilitation literature often confuses "benefit" to the patient with "effectiveness" of treatment. Several studies have shown that functional gains made in active rehabilitation programs are, indeed, maintained after discharge but little attention has been given to the "quality of life" following expensive and often long-term treatment. Unless this factor is considered, any statistics analyzing the benefits of treatment are incomplete and may be misleading. "Quality of life," however, is exceedingly difficult to define or measure in a meaningful and objective fashion.

Following stroke, there may be significant changes in:

- Desire to perform self care activities.
- Activity patterns at home, work, or school.
- Leisure activities at home and/or away from home.
- Position in the home.
- Personality patterns.
- Sexual patterns.
- Types of close personal relationships.
- Degree of life satisfaction.
- Degree of socialization.

Studies addressing these issues are badly needed. They should include:

- Some measure of premorbid lifestyle and of the changes in lifestyle caused by the stroke.
- Objective and subjective determinations of an in-
dividual's satisfaction with his premorbid and post-ictal lifestyle.

Preliminary data analyzing some of these factors in a large group of elderly patients attending the Burke Day Hospital — most suffering from chronic neurological diseases — showed that a majority of these patients who participated in a long term rehabilitation program continued to be satisfied with their current functional level and with their postictal lifestyle as long as 1 year after admission to the program.22

Methods of Improving Benefit. After surviving a major physical, psychological and socioeconomic catastrophe, the rehabilitated stroke victim is often shunned by society, is unable to return to work and reeducation. His savings may be depleted and he may be forced to seek public assistance. It is not unusual for the stroke victim to become depressed, withdrawn, apathetic, and bitter that modern medicine has saved his life only to have "The System" make it difficult for him to resume a reasonably normal existence.

Physicians can help improve the quality of life by offering psychological and sexual counseling, by referring patients to appropriate vocational and avocational programs, and by making patients aware of community agencies and/or programs specifically designed to aide the disabled, such as local visiting nurse associations or rehabilitation programs, travel and homemaking services, stroke clubs, and stores and places of entertainment free of architectural barriers. Physicians may also suggest that their patients get in touch with their clergyman since he can often assist patients and their families to work through problems without the added expense of formal psychiatric intervention.

Perhaps the most important question a physician can ask a stroke patient is how he spends a typical day since the answer to this question may not only reveal the presence of depression, apathy, or bitterness but also may reveal the degree of socialization and participation and the relationship between the patient and his family. Since severe economic distress can often produce depression, withdrawal, anxiety, and bitterness, physicians must also ask how the stroke patient is solving his financial problems. If there are no funds to pay for a homemaker, transportation, or for medical care, the physician may then be able to help his patient get these services by assisting with some of the complicated paperwork necessary to get through the confusing and often quixotic regulations which may prevent good follow up medical care.

Cost

What is Total Cost for Caring for a Stroke Patient? We recently presented data showing that the average cost of initial care for a patient suffering an acute cerebral infarction was $19,285 per patient per stroke for patients hospitalized in a typical New York City teaching hospital (summer 1976) and then referred to a stroke rehabilitation unit for short term treatment.14 For patients referred to the same unit from local or community hospitals, the cost was $13,052 per patient per stroke. Physicians' fees, costs of lab tests and medications, the added expenses of ICU care or special duty nurses, and various incidental costs were not included in these figures, nor was the cost of maintaining stroke patients after discharge nor the loss of income due to stroke related handicaps. Therefore, the actual cost of stroke remains unknown.

Methods of Minimizing Cost. There have been no additional costs incurred when acute care or rehabilitation hospitals have centralized stroke care by creating specialized stroke care units.19, 23 Regionalization of stroke care within the hospital can thus improve outcome without increasing the cost of health care services.

Cost can also be minimized by teaching interested friends and family members basic principles of rehabilitation and then enlisting their aid in performing a range of motion activities, transfers, activities of daily living, ambulation training and basic speech activities. By harnessing this untapped resource, rehabilitation can be started within 24–48 hours after admission to a hospital often eliminating the added expense of hiring extra staff to provide these services. This approach has already been used successfully.

Although it is difficult at present to develop an objective cost-effectiveness model for stroke rehabilitation or to perform a cost-benefit analysis, recent studies have examined some of the issues involved in setting up a stroke model and perhaps will point the way toward mathematical models.

The information presented can provide guidelines for improving outcome while simultaneously decreasing the cost of health care delivery by:

• Beginning rehabilitation in the acute care hospital as soon as the patient is medically stable.
• Initiating rapid referral to regional rehabilitation facilities, if available.
• Establishing disability oriented units in both acute care and rehabilitation facilities.
• Basing treatment and duration of hospitalization on the functional and neurologic deficits rather than on diagnostic category.
• Enlisting and educating interested friends and family members to help provide rehabilitation services during all phases of stroke treatment.
• Providing better acceptance of the handicapped, more enlightened health care legislation, and more educational/vocational and avocational opportunities for stroke victims.

Thus effectiveness and benefits may be maximized while health care costs are minimized.

Joel S. Feigenson, M.D.
Burke Rehabilitation Center
White Plains, New York 10605

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