Progress Review

Stroke Rehabilitation Units: Concepts, Evaluation, and Unresolved Issues

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NO SINGLE MEDICAL MEASURE would make such a contribution to the quality of life in old age as the prevention of stroke.1 The continuing decline in the incidence of stroke might suggest that we are on the road to achieving this. But this has not been accompanied by a change in prevalence which has remained more or less constant over the past several decades as a result of major improvements in long-term survival following cerebral infarction.2-3 The future position is likely to deteriorate in developed and lesser developed countries alike as increasing proportions of elderly and very elderly arising from the "ageing" of their populations bring an increase in the size of the problem of stroke in their wake.4 What can be done to alleviate the important and increasing burden which stroke is placing on health services, and in particular on the hospital sector? Despite numerous therapeutic trials, the indications for medical treatment following stroke remain few.5 As a recent editorial in Stroke concluded, there is little scientific evidence to suggest that intensive care has any impact on stroke mortality during the immediate period following onset.6 Thus it may be time to give more emphasis to improving the prognosis of those patients who survive the immediate period of mortality by determining the most effective means of rehabilitating stroke survivors. The role and value of stroke rehabilitation units is central to this issue.

Concept

The basic principles for the rehabilitation of stroke patients are well established.7 But what has been hotly contested for the past 30 years is whether or not departments of internal medicine or neurology with their emphasis on the diagnostic investigation and 'cure' of disease are equipped in terms of staff or facilities to handle the 'care' problems inherent in the detailed planning required for the rehabilitation of strokes. What are the components of a stroke rehabilitation unit? These have been defined as either: "a team of specialists who are knowledgeable about the care of the stroke patient and who consult throughout a hospital wherever a patient may be, or a special area of a hospital that provides beds for stroke patients who are cared for by a team of specialists."8 Another definition which has been suggested is "a geographic location within the hospital designated for stroke and stroke-like patients who are in need of rehabilitation services and the skilled professional care that such a unit can provide."9 A major advantage which has been put forward for having a special unit is the opportunity of developing a collaborative policy for stroke rehabilitation.10 Such a policy should include a comprehensive assessment of all aspects of patients' illness and disability, close collaboration between the different disciplines involved, identification and awareness of objectives of rehabilitation and an educational role.

Many different disciplines have been suggested for inclusion in a stroke rehabilitation team. In the Stroke Unit at the Burke Rehabilitation Centre 19 different disciplines were included, ranging from dietician to neurologist, ophthalmologist to chaplain, neuro-psychologist to audiologist.11 Most stroke rehabilitation teams would not be as extensive as this, but all should contain: a physician, nursing staff, physiotherapist, occupational therapist, speech therapist and medical social worker, all of whom have important contributions to make to stroke rehabilitation.12 Constituting such a group will not in itself provide optimal conditions for rehabilitation. Co-ordinated action is required to formulate and execute an integrated rehabilitation plan suited to the individual problems and disabilities of each patient. This will involve frequent staff conferences and team ward rounds with each member of the team participating in all the activities of the stroke unit.

Important factors to be considered are the psychological and therapeutic effects which a stroke rehabilitation unit could have on patients.13 A ward routine geared down to the capacity of the stroke patient together with the encouragement and competitive stimulus of group treatment in the company of similarly afflicted patients may have an important effect on their prognosis. The concept of the therapeutic community in rehabilitation has also been put forward as a reason why stroke rehabilitation units may get better results than medical units.14 The rehabilitation unit has been visualised as a community where the close relationship between hospital staff and patients has a profound effect in maintaining the rehabilitation gains produced by hospital care. Another advantage which has been claimed for such a unit is the creation of an atmosphere of stroke awareness in a hospital or community.15 By working closely together in a highly co-ordinated manner, the members of a stroke team can remove the artificial separation that exists between acute nursing care and the longer term rehabilitation care of stroke patients.

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Evaluation

Several reports which have described the work of stroke rehabilitation units have all concluded that this is an effective and satisfying way of providing rehabilitation for severely disabled stroke patients of all ages. [6-20] But descriptions of the work of these units did not compare the results of treating patients in stroke units with similar groups of patients rehabilitated by other means. Several studies have attempted to assess the effectiveness of stroke rehabilitation units under more scientific conditions, but differences in the evaluation processes have made it difficult to interpret the conclusions reached by different authors. So opinion is divided.

On the one hand, Waylonis, Keith and Aseff [21] found that a stroke rehabilitation team introduced into a small community hospital had no effect on functional outcome. However, much of the data relating to the outcome of the control group of patients with whom the stroke rehabilitation group were being compared was not presented. A randomised controlled trial conducted as part of the Birmingham Stroke and Rehabilitation Study compared standard University hospital care with intensive multidisciplinary rehabilitation. [22] Numbers admitted to the study were too small to give a reasonable chance of reaching statistical significance and a high proportion of post-randomisation dropout was encountered in the control group. The conclusion reached was that although the results of intensive rehabilitation were encouraging, the relative effectiveness of lengthy and expensive rehabilitation had not proved to be of value.

On the other hand, the proportion of strokes of equal severity going home from a stroke rehabilitation unit in Portland, Oregon, rose from 13 per cent to 58 per cent, with no corresponding increase in the proportion of controls going home from other hospitals. [23] No attempt was made at matching variables between cases and controls, and outcome was not based on functional status. A comparison of two groups of patients treated 'before' and 'after' a stroke rehabilitation unit had been commissioned was reported from Northern Ireland by Adams. [24] During the period 1948-56 when elderly strokes were rehabilitated in medical wards, 40 per cent regained sufficient functional independence to enable them to be discharged home. During the period 1956-58, a stroke rehabilitation unit was established and thereafter, the proportion of patients discharged home rose to 60 per cent, with a consequent lowering of both the proportion of patients requiring long stay care and those dying within two months of onset. No data on the comparability of patient selection, treatment methods or uniformity in applying the criteria of functional status over the long period of observation was given. McCann and Culbertson [25] compared the effectiveness of a stroke rehabilitation unit with the medical service of a general hospital in Rhode Island. The stroke unit adopted a policy of aggressive rehabilitation, with "specialisation" of nursing and therapy personnel who were concerned only with stroke patients. There was also a major emphasis on family involvement. Comparison was made between 224 patients treated in the stroke unit and 110 patients approved for stroke unit admission who were treated in medical wards because the stroke unit was full. Functional status of patients on admission was expressed as mild, moderate and severe disability. No significant difference was found between the stroke unit and medical wards for mild or severe disability gradings, but the stroke unit attained better results for strokes presenting with moderate disability. Feigenson, Gitlow and Greenberg compared 589 patients treated in a disability-orientated stroke unit with only 78 patients admitted to other units of the same rehabilitation centre. [26] Both groups had similar treatment programmes provided by staff who had rotated through the Stroke Unit. They concluded that even in a rehabilitation centre specialising in treating functional disabilities, patients with stroke are more likely to improve if placed in a disability-orientated unit than if they are admitted to mixed disability units which are scattered throughout the hospital.

The controversy surrounding the value of stroke rehabilitation units can now be taken a step further with the recent publication of three further studies carried out in Scotland, England and Sweden. The Scottish study was a randomised controlled trial which compared the management of elderly patients with acute stroke in a stroke unit and medical units. [27] General practitioners serving a catchment population of 470,000 notified patients aged 60 years and over who had a focal neurological deficit of presumed vascular origin that had been present for at least six hours but no longer than three days. Medical staff were on call 24 hours a day to undertake home visits to confirm the practitioner's diagnosis. The outcome of the acute phase of rehabilitation was assessed when discharge was imminent or at a cut-off point of 16 weeks after admission, using an activities of daily living unit designed to reproduce the patients' circumstances at home. [28] A significantly higher proportion of patients discharged from the stroke unit (78 of the 155 admitted) were assessed as functionally independent compared with patients discharged from medical units (49 of the 152 admitted). The intensive use of rehabilitation therapy did not occur, although almost all the patients admitted to the stroke unit received occupational therapy compared with only 47 per cent of patients admitted to medical units. The delay before starting therapy was significantly shorter in the stroke unit.

In the second study carried out in South-East England, 225 patients were randomly allocated to treatment in a 20-bedded stroke rehabilitation ward or to medical wards. [29] Survivors were observed at four-month intervals for one year. A higher proportion of stroke unit patients than medical unit patients were discharged home (63 per cent and 52 per cent respectively) and at the end of one year, a higher proportion of stroke unit patients (47 per cent) were independent in activities of daily living such as walking, toileting and dressing compared with patients from medical units (38 per cent). Levels of physiotherapy, occupational therapy
and speech therapy received were all substantially higher among patients treated in the stroke unit, although intervals from hospital admission to commencement of rehabilitation therapy are not given. Finally, a study from Umeå, Sweden reported in the last issue of Stroke describes the outcome of 293 comparable patients admitted to a six-bedded stroke unit (110 patients) or general medical wards (183 patients). 39 Three months after onset, only 15 per cent of survivors admitted to the stroke unit compared with 39 per cent of survivors from medical wards were still in hospital. A higher proportion of surviving stroke unit patients were independent in walking, personal hygiene and dressing.

The results of these studies have all produced results which point to gains in functional independence being made in patients admitted to stroke rehabilitation units following recent onset of acute ischaemic cerebrovascular disease. The studies emphasised the importance of admission to the stroke unit soon after onset (within 72 hours up to 21 days), early commencement of rehabilitation therapy (particularly occupational therapy in the Scottish study), higher proportions of patients receiving therapy but not at levels of greater intensity, and improvements in survival (in the two British studies but not in Sweden), and active family participation in rehabilitation, including educational programmes for patients and family members. Above all, they emphasised the importance of a small, integrated, multidisciplinary rehabilitation team in realising the full rehabilitation potential of patients admitted to stroke units.

Unresolved Issues

Despite these encouraging results, a number of matters require further clarification or simply remain unresolved.

(i) Selection of Patients

The recently completed Scottish trial emphasised ‘triage’ in the selection of patients for the study. Stroke presentations were divided into three bands: ‘upper’, ‘middle’ and ‘lower’, using selection criteria derived from previous studies of the natural history of stroke. 30 Patients placed in the ‘middle’ band of strokes: those conscious at onset and with an established or developing hemiplegia, were eligible for the study. The ‘upper’ band contained patients who were likely to do poorly whether they were rehabilitated or not. The ‘lower’ band contained patients who were likely to recover spontaneously and who would not require a sustained period of rehabilitation. Concentrating on the ‘middle’ band of strokes allowed a more realistic comparison to be obtained of the relative effectiveness of a stroke unit and medical units in rehabilitating those patients whose prognosis in terms of years of life was good, but who were likely to have residual disability which would require ongoing support. Selection criteria were also applied to patients admitted to the English and Swedish studies. 38-39 Further work is now required to identify the characteristics of the “band” of stroke patients who will derive most benefit from admission to a stroke rehabilitation unit. In other words, which patients will become functionally independent if they are rehabilitated in a stroke unit and which will not, even if they are admitted to a stroke unit?

(ii) Mix of Resources

While studies have been able to obtain information on the use of several of the components that are advocated for the rehabilitation of acute stroke such as diagnostic investigations, drug therapy, social work involvement, nursing dependency, aids and adaptations prescribed as well as the use of physiotherapy, occupational therapy and speech therapy, no data is available on the relationship between the contribution of these various components to stroke rehabilitation. For example, to what extent were nursing staff providing additional physiotherapy, or occupational therapy to patients in stroke units when the trained therapy staff has gone off duty? Moreover although the recently published Scottish, English and Swedish studies have provided information on the timing, duration and amount of therapy used by patients in the stroke and medical units, it was not possible to obtain any information about the actual methods of rehabilitation used.

(iii) Size of Stroke Unit

The stroke units in the Scottish, English and Swedish studies were relatively small comprising 15, 20 and 6 beds respectively. This may have contributed important psychological benefits, but leaving aside the question of the ideal size of a stroke unit as a therapeutic community, how many beds are required for a stroke unit to serve a catchment population of a certain size? This will depend not only on admission criteria, but also on factors such as the incidence of eligible strokes, the mean duration of stay in the stroke unit, case fatality following admission and bed occupancy rate. When these factors were taken into account in the Scottish trial, it was estimated that a stroke unit would require 15 beds to serve a population of 250,000, 18 per cent of whom were aged 60 or over. 31 Further epidemiological studies are needed in order to confirm this finding.

(iv) Continuing Management

Each of these European studies followed-up patients for one year after admission and perhaps surprisingly in view of the fact that each of the stroke units were similar in nature, came up with quite different findings. In the English and Swedish studies, improvements in functional independence which had been achieved up to the time of hospital discharge were sustained. However in Scotland, the improvement in functional outcome that had been achieved through the establishment of a stroke unit had disappeared by one year. 32 Factors which might have contributed to this surprising finding included overprotection by the families of patients who had been treated in the stroke unit, who were not permitted to carry out activities of daily living in which they were independent, and the early
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